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Marine Scotland

Sustainability Appraisal of proposed Marine Protected Areas

Sustainability Appraisal

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For:

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1.1 Background

1.1.1 The Scottish Government has made a long-term commitment to ensuring the sustainable management of the marine environment by balancing the competing interests of use and protection of the sea. This has included developing and implementing a coherent network of Marine Protected Areas (MPAs) to benefit the conservation of vulnerable and characteristic marine species and habitats in Scottish waters. The designation of MPAs is a high policy priority and fulfils duties in domestic and European legislation, as well as contributing to wider UK and international networks of protected areas.

1.1.2 Currently, there are 18 Nature Conservation MPAs designated under the Marine (Scotland) Act 2010 located inshore or within territorial waters (i.e. within 12 nautical miles (NM) of the coast)[1]. A further 13 Nature Conservation MPAs are designated in the offshore environment (i.e. from 12NM off the coast, or within non-territorial waters)[2]. One Demonstration and Research MPA is designated under the Marine (Scotland) Act 2010[3]. There are also eight Historic MPAs (HMPAs) that are designated for nationally important historic assets, predominately shipwrecks[4].

1.1.3 Four additional MPAs are proposed to be designated to extend the existing MPA network. These were originally introduced for consideration as areas of search in 2012. However, at that time it was concluded that additional information and advice was required to inform the selection of MPAs from within these areas of search, and this was subsequently provided by SNH[5]. In light of that advice, all four areas are now being proposed for designation as MPAs. The designation of these four proposed MPAs (pMPAs) is the subject of this Sustainability Appraisal (SA).

[1] SNH (2017) Nature Conservation Marine Protected Areas [online] Available at: http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/mpas/ (accessed 17/10/2018)

[2] JNCC (2015) Nature Conservation Marine Protected Areas (MPAs) [online] Available at: http://jncc.defra.gov.uk/page-5269 (accessed 17/10/2018)

[3] Marine Scotland (2016) Fair Isle Demonstration and Research MPA Consultation [online] Available at: https://www.gov.scot/Topics/marine/marine-environment/mpanetwork/DandRMPAs/FairIsleDRMPA (accessed 17/10/2018)

[4] Historic Environment Scotland (2016). Scotland's Historic Marine Protected Areas 2016.

[5] SNH (2014) Commissioned Report No. 780: Further advice to Scottish Government on the selection of Nature Conservation Marine Protected Areas for the development of the Scottish MPA network [online] Available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202014%20-%20SNH%20Commissioned%20Report%20780%20-%20Further%20advice%20to%20Scottish%20Government%20on%20the%20selection%20of%20Nature%20Conservation%20Marine%20Protected%20Areas%20for%20the%20development%20of%20the%20Scottish%20MPA%20network.pdf (accessed 17/10/2018)

1.2 Sustainability Appraisal

1.2.1 The Marine and Coastal Access Act 2009 (Schedule 6 s10) requires that "a marine plan authority preparing a marine plan must carry out an appraisal of the sustainability of its proposals for inclusion in the plan". Whilst this applies to the statutory marine planning undertaken through the National Marine Plan process, the designation of the four new Nature Conservation MPAs has also been subject to a SA for consistency in approach and in accordance with Marine Scotland practice.

1.2.2 The SA considers the potential environmental, social and economic effects of the designation of the MPAs and potential management scenarios and alternatives to them drawing on information contained in the Strategic Environmental Assessment (SEA)[6] and Socio-Economic Impact Assessment (SEIA)[7]. It ensures that decision-making is informed by relevant environmental and socio-economic information. The SA also provides opportunities for the public to consider this information and use it to inform their views.

1.2.3 The SEA has been undertaken in fulfilment of The Environmental Assessment (Scotland) Act 2005 ("the 2005 Act") which requires that certain public plans, programmes and strategies be assessed for their potential effects on the environment[8].

1.2.4 The SEIA has been undertaken as a matter of Scottish Government policy. This assessment aims to identify and assess the potential economic and social effects of a proposed development or policy on the lives and circumstances of people, their families and their communities. The SEIA investigates the potential cumulative economic benefits and costs, and associated potential social impacts, of designating the MPAs and subsequently implementing potential management scenarios at each individual MPA.

1.2.5 The findings from both the SEA and the SEIA have been combined to provide an overall SA of the designation of the MPAs, to accompany the consultation document. The inputs from the SEA[9] constitute the 'Environment' sections of the SA. The inputs from the SEIA[10] inform the 'Economy and Other Marine Users' and 'People, Population and Health' sections of the SA.

1.2.6 The views of the public, the Consultation Authorities and the Consultation Bodies on the proposed designation of the MPAs and the findings of this SA Report are now being sought.

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[6] Marine Scotland (2018) Strategic Environmental Appraisal Environmental Report for Proposed Marine Protected Areas, Strategic Environmental Assessment, Environmental Report, February 2019.

[7] Marine Scotland (2018) Socio-Economic Impact Assessment for Proposed Marine Protected Areas, February 2019.

[8] Environmental Assessment (Scotland) Act 2005, asp 15 [online] Available at: https://www.legislation.gov.uk/asp/2005/15/introduction (accessed 04/09/2017)

[9] Marine Scotland (2018) Strategic Environmental Appraisal Environmental Report for Proposed Marine Protected Areas, Strategic Environmental Assessment, Environmental Report, February 2019.

[10] Marine Scotland (2018) Socio-Economic Impact Assessment for Proposed Marine Protected Areas, February 2019.

1.2.7 The remainder of this report is structured as follows:

- Section 2 provides information on the wider MPA network, the proposed designation of four additional pMPAs and their policy context;
- Section 3 presents the approach to the SA and the methods used;
- Section 4 sets out the results of the SA; and
- Section 5 considers the next steps.

2 Marine Protected Areas

2.1 Background

2.1.1 Scotland's seas host an estimated 6,500 varieties of marine flora and fauna, making them among the most species rich in the world[11]. Furthermore, several sites are strongholds for UK populations of particular species, such as marine mammals and sharks[12]. The long-term biological success of these species is heavily dependent on having assured access to high quality habitats. For highly mobile species such as cetaceans and sharks, such habitats are likely to be found across a range of geographical locations and environmental conditions, each supporting a different key life cycle activity such as breeding, feeding, courtship, or raising young[13]. However, Scotland's marine environment faces pressures to its health and productivity from climate change, commercial fishing, pollution and the loss of coastal and estuary habitat to development[14].

2.1.2 The MPA network is intended to benefit the marine environment, historic features, coastal communities, marine industries and recreational users[15]. In total, it consists of 231 sites covering 22% of Scotland's seas[16]. The network comprises Special Areas of Conservation (SAC), Special Protection Areas (SPAs), Sites of Special Scientific Interest (SSSI) and MPAs (Nature Conservation, Historic, and Demonstration and Research)[17].

[11] ClimateXChange (2016) How is climate change impacting on Scotland's marine environment, infrastructure and industry? [online] Available at: https://www.climatexchange.org.uk/media/2346/marine_and_coastal_change.pdf (accessed 17/10/2018)

[12] ibid

[13] SNH (2014) Commissioned Report No. 780: Further advice to Scottish Government on the selection of Nature Conservation Marine Protected Areas for the development of the Scottish MPA network [online] Available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202014%20-%20SNH%20Commissioned%20Report%20780%20-%20Further%20advice%20to%20Scottish%20Government%20on%20the%20selection%20of%20Nature%20Conservation%20Marine%20Protected%20Areas%20for%20the%20development%20of%20the%20Scottish%20MPA%20network.pdf (accessed 17/10/2018)

[14] Scotland's Environment (2014) Scotland's State of the Environment Report, 2014 [online] Available at: https://www.environment.gov.scot/media/1170/state-of-environment-report-2014.pdf (accessed 17/10/2018)

[15] ibid

[16] Scottish MPA Network – Parliamentary Report [online] Available at: https://www.gov.scot/publications/marine-protected-area-network-2018-report-scottish-parliament/ (accessed 28/01/2019)

[17] Scottish Government (2017) Marine Protected Areas (MPAs) [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork (accessed 17/10/2018)

2.1.3 Nature Conservation MPAs seek to ensure that nationally important marine wildlife, habitats, geology and undersea landforms receive adequate protection against disturbance and degradation. Specifically, they aim to either conserve features or remove pressures in order to allow them to recover. They also contribute to the survival and maintenance of species of international significance by complementing other systems of protection, both spatially and through the alignment of conservation objectives[18].

2.2 Designation of the MPA network to date

2.2.1 The Marine (Scotland) Act 2010[19] and the Marine and Coastal Access Act 2009[20] gave Scottish Ministers powers to designate MPAs in Scottish territorial and offshore waters, respectively. To inform this process, the Scottish MPA Project was established to ensure MPAs are designated in the most appropriate locations for their particular objectives. SNH is responsible for providing advice on Nature Conservation MPAs in Scottish territorial waters, while the Joint Nature Conservation Committee (JNCC) advise on possible designations in the offshore environment[21].

2.2.2 In 2012, SNH and JNCC submitted advice to the Scottish Government on 33 proposed MPAs in both the inshore and offshore environment, as well as four areas of search[22]. The proposals were subject to public consultation in the summer of 2013 as part of Marine Scotland's integrated 'Planning Scotland's Seas' process, which sought views on marine planning, Sectoral Marine Plans for offshore renewable energy, MPAs and Priority Marine Features (PMFs)[23]. An SEA Environmental Report (ER), which looked at the potential environmental effects of the designations, was among the suite of consultation documents made available at that time[24].

2.2.3 The Marine (Scotland) Act 2010[25] and the Marine and Coastal Access Act 2009[26] gave Scottish Ministers powers to designate MPAs in Scottish territorial

[18] Scottish Government (2017) Marine Protected Areas (MPAs) [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork (accessed 17/10/2018)

[19] Scottish Government (2017) Marine (Scotland) Act [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/marineact (accessed 17/10/2018)

[20] Scottish Government (2014) Marine and Coastal Access Act 2009 [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/marineact/ukbill (accessed 17/10/2018)

[21] SNH/JNCC (2012) Commissioned Report No. 547: Advice to the Scottish Government on the selection of Nature Conservation Marine Protected Areas (MPAs) for the development of the Scottish MPA network [online] Available at: http://www.snh.org.uk/pdfs/publications/commissioned_reports/547.pdf (accessed 17/10/2018)

[22] ibid

[23] Scottish Government (2015) Planning Scotland's Seas [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/national/marine-consultation (accessed 17/10/2018)

[24] Scottish Government (2013) Planning Scotland's Seas: 2013 - Possible Nature Conservation Marine Protected Areas Consultation Overview - Strategic Environmental Assessment Report [online] Available at: http://www.gov.scot/Publications/2013/08/2591 (accessed 17/10/2018)

[25] Scottish Government (2017) Marine (Scotland) Act [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/marineact (accessed 17/10/2018)

[26] Scottish Government (2014) Marine and Coastal Access Act 2009 [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/marineact/ukbill (accessed 17/10/2018)

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2.2.4 In 2012, SNH and JNCC submitted advice to the Scottish Government on 33 proposed MPAs in both the inshore and offshore environment, as well as four areas of search[28]. The proposals were subject to public consultation in the summer of 2013 as part of Marine Scotland's integrated 'Planning Scotland's Seas' process, which sought views on marine planning, Sectoral Marine Plans for offshore renewable energy, MPAs and Priority Marine Features (PMFs)[29]. An SEA ER, which looked at the potential environmental effects of the designations, was among the suite of consultation documents made available at that time[30].

2.2.5 The SEA of the second phase of management measures commenced in October 2017 and work on both the development of the management measures and the SEA is ongoing. The consultation on the management measures is expected to take place in 2019.

2.2.6 In addition to the 30 MPAs designated in 2014, Ministers issued an Order to immediately designate an additional emergency MPA in Loch Carron following damage to the world's largest expanse of flame shell beds due to a dredging incident in 2017[31]. This was the first such instance of Ministers invoking powers under the Marine (Scotland) Act 2010 to immediately designate an MPA[32]. However, the current designation is temporary and will expire in 2019[33]. The potential to designate Loch Carron as a permanent MPA was the subject of a recent public consultation which ran to 13 June 2018.

2.2.7 A description of these 31 existing inshore and offshore Nature Conservation MPAs, including their respective protected features and conservation objectives, can be found in Table 1.

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[27] SNH/JNCC (2012) Commissioned Report No. 547: Advice to the Scottish Government on the selection of Nature Conservation Marine Protected Areas (MPAs) for the development of the Scottish MPA network [online] Available at: http://www.snh.org.uk/pdfs/publications/commissioned_reports/547.pdf (accessed 17/10/2018)

[28] ibid

[29] Scottish Government (2015) Planning Scotland's Seas [online] Available at: http://www.gov.scot/Topics/marine/seamanagement/national/marine-consultation (accessed 17/10/2018)

[30] Scottish Government (2013) Planning Scotland's Seas: 2013 - Possible Nature Conservation Marine Protected Areas Consultation Overview - Strategic Environmental Assessment Report [online] Available at: http://www.gov.scot/Publications/2013/08/2591 (accessed 17/10/2018)

[31] Scottish Government (2018) Protection for world's biggest plan shell bed [online] Available at: https://news.gov.scot/news/protection-for-worlds-biggest-flame-shell-bed (accessed 17/10/2018)

[32] SNH (2017) Loch Carron Urgent Nature Conservation Marine Protected Area (NCMPA) [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/marine-protected-areas/nature-conservation-2 (accessed 17/10/2018)

[33] SNH (2017) Loch Carron possible MPA [online] Available at: https://www.nature.scot/loch-carron-possible-mpa (accessed 17/10/2018)

Table 1 Existing Nature Conservation MPAs in Scotland

Nature Conservation MPA	Year designated	Protected features	Draft conservation objectives
Inshore			
Loch Sunart	2014	Biodiversity: flame shell beds; northern feather star aggregations on mixed substrata; serpulid aggregations	Conserve
Lochs Duich, Long and Alsh	2014	Biodiversity: burrowed mud, flame shell beds	Conserve
Loch Creran	2014	Biodiversity: flame shell beds Geodiversity: Quaternary of Scotland	Conserve
Small Isles	2014	Biodiversity: black guillemot; burrowed mud; circalittoral sand and mud communities; fan mussel aggregations; horse mussel beds; northern feather star aggregations on mixed substrata; northern sea fan and sponge communities; shelf deeps; white cluster anemones Geodiversity: Quaternary of Scotland – glaciated channels/troughs, glacial lineations, meltwater channels, moraines, streamlined bedforms	Conserve
Wyre and Rousay Sounds	2014	Biodiversity: kelp and seaweed communities on sublittoral sediment; maerl beds Geodiversity: marine geomorphology of the Scottish shelf seabed	Conserve
East Caithness Cliffs	2014	Biodiversity: black guillemot	Conserve
Loch Sunart to the Sound of Jura	2014	Biodiversity: common skate Geodiversity: Quaternary of Scotland – glaciated channels/troughs	Conserve
Monach Isles	2014	Biodiversity: black guillemot Geodiversity: marine geomorphology of Scottish shelf seabed; Quaternary of Scotland – landscape of areal glacial scour	Conserve
Noss Head	2014	Biodiversity: horse mussel beds	Conserve
South Arran	2014	Biodiversity: burrowed mud; kelp and seaweed communities on sublittoral sediments; maerl beds; maerl or coarse shell gravel with burrowing sea cucumbers; ocean quahog aggregations; seagrass beds; shallow tide-swept coarse sands with burrowing bivalves	Recover maerl beds, conserve other features

Nature Conservation MPA	Year designated	Protected features	Draft conservation objectives
Fetlar to Haroldswick	2014	Biodiversity: black guillemot; circalittoral sand and coarse sediment communities; horse mussel beds; kelp and seaweed communities on sublittoral sediment; maerl beds; shallow tide-swept coarse sands with burrowing bivalves	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed	
Clyde Sea Sill	2014	Biodiversity: black guillemot; circalittoral and offshore sand and coarse sediment communities; fronts	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed – sand banks; sand ribbon fields; sand wave fields	
Loch Sween	2014	Biodiversity: burrowed mud; maerl beds; native oysters; sublittoral mud and mixed sediment communities	Conserve
Mousa to Boddam	2014	Biodiversity: sandeels	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed	
Papa Westray	2014	Biodiversity: black guillemot	Conserve
		Geodiversity: marine geomorphology of the Scottish shelf seabed – sand wave field	
Upper Loch Fyne and Loch Goil	2014	Biodiversity: burrowed mud; flame shell beds; horse mussel beds; ocean quahog aggregations; sublittoral mud and specific mixed sediment communities	Recover flame shell beds, conserve other protected features
Wester Ross	2014	Biodiversity: burrowed mud; circalittoral muddy sand communities; flame shell beds; kelp and seaweed communities on sublittoral sediment; maerl beds; maerl or coarse shell gravel with burrowing sea cucumbers; northern feather star aggregations on mixed substrata	Recover maerl beds and flame shell beds, conserve other features
		Geodiversity: marine geomorphology of the Scottish shelf bed – banks of unknown substrate; Quaternary of Scotland – glaciated channels/troughs, megascale glacial lineations, moraines; seabed fluid and gas seep – pockmarks; submarine mass movement – slide scars	
Loch Carron (Urgent MPA)	2017	Biodiversity: flame shell beds	Recover

Nature Conservation MPA	Year designated	Protected features	Draft conservation objectives
Offshore			
Central Fladen	2014	Biodiversity: burrowed mud Geodiversity: sub-glacial tunnel valley	Conserve
East of Gannet and Montrose Fields	2014	Biodiversity: offshore deep sea muds; ocean quahog aggregations	Conserve
Faroe-Shetland Sponge Belt	2014	Biodiversity: deep-sea sponge aggregations; offshore subtidal sands and gravels; continental slope Geodiversity: continental slope channels; iceberg plough marks; prograding wedges and slide deposits	Conserve
Firth of Forth Banks Complex	2014	Biodiversity: ocean quahog aggregations; offshore subtidal sands and gravels; Shelf Banks and Mounds Geodiversity: moraines	Conserve
Geikie Slide and Hebridean Slope	2014	Biodiversity: burrowed mud (seapens and burrowing megafauna); offshore subtidal sands and gravels; offshore deep-sea muds; continental slope Geodiversity: slide deposit and slide scars	Conserve
Hatton-Rockall Basin	2014	Biodiversity: deep-sea sponge aggregations; offshore deep sea muds Geodiversity: sediment drifts; polygonal faults	Conserve
North-east Faroe-Shetland Channel	2014	Biodiversity: deep-sea sponge aggregations; offshore deep-sea muds; offshore subtidal sands and gravels; continental slope Geodiversity: range of features representative of the West Shetland Margin Palaeo-depositional, Miller Slide and Pilot Whale Diapirs Key Geodiversity Area	Conserve
North-west Orkney	2014	Biodiversity: sandeels Geodiversity: sand banks, sand wave fields and sediment wave fields	Conserve
Norwegian Boundary Sediment Plain	2014	Biodiversity: ocean quahog aggregations (including sands and gravels as their supporting habitat)	Conserve

Nature Conservation MPA	Year designated	Protected features	Draft conservation objectives
Rosemary Bank Seamount	2014	Biodiversity: deep-sea sponge aggregations; seamount communities; seamount	Conserve
		Geodiversity: range of features representative of the Rosemary Bank Seamount (and adjacent sea floor) Key Geodiversity Area, including iceberg ploughmark fields, slide scars, sediment drifts, sediment wave fields and the seamount scour moat	
The Barra Fan and Hebrides Terrace Seamount	2014	Biodiversity: burrowed mud (seapen and burrowing megafauna communities); seamount communities; offshore deep-sea muds; offshore subtidal sands and gravels; orange roughy; continental slope; seamounts	Conserve
		Geodiversity: iceberg ploughmark field; prograding wedges; continental slope turbidite canyons; slide deposits; scour moat; continental slope; Hebrides Terrace Seamount	
Turbot Bank	2014	Biodiversity: sandeels	Conserve
West Shetland Shelf	2014	Biodiversity: offshore subtidal sands and gravels	Conserve

2.3 Proposals for four additional pMPAs

2.3.1 As stated earlier, the pMPAs were initially introduced for consideration as areas of search, with the expectation these would lead to four additional MPAs that, when designated, would extend the network. Specifically, the pMPAs would extend protection to basking shark, minke whale, Risso's dolphin, burrowed mud, shelf banks and mounds and shelf deeps. However, at the time MPA advice was provided in 2012, SNH concluded that additional assessment work would be needed before formal advice could be provided to Scottish Ministers[34].

2.3.2 Habitat modelling, basking shark tagging and additional seabed habitat surveying were carried out and presented in further advice to Scottish Ministers in 2014[35]. The findings served to both corroborate and revise existing conclusions as to the presence and density of protected features as well as the extent to which they rely on particular areas to support key life cycle activities. In assessing the areas of search against the MPA Selection Guidelines, SNH looked at the following criteria: representation, replication, resilience, range and geographic variation of features, and any key linkages[36].

2.3.3 As a result of this additional research, the sites were eventually modified, either in terms of their boundaries or their proposed protected features, and a recommendation was made that all four sites be designated as MPAs[37].

2.3.4 The proposed designation of these MPAs is the subject of this present assessment. Table 2 below provides a description of the four pMPAs, including their general location, proposed protected features and draft conservation objectives. Figure 1 provides a map of the location of the pMPAs.

[34] SNH (2012) Commissioned Report No. 547: Advice to Scottish Government on the selection of Nature Conservation Marine Protected Areas (MPAs) for the development of the Scottish MPA network [online] Available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202012%20-%20SNH%20Commissioned%20Report%20547%20-%20SNH%20and%20JNCC%20MPA%20network%20advice.pdf (accessed 17/10/2018)

[35] SNH (2014) Commissioned Report No. 780: Further advice to Scottish Government on the selection of Nature Conservation Marine Protected Areas for the development of the Scottish MPA network [online] Available at: https://www.nature.scot/sites/default/files/2017-07/Publication%202014%20-%20SNH%20Commissioned%20Report%20780%20-%20Further%20advice%20to%20Scottish%20Government%20on%20the%20selection%20of%20Nature%20Conservation%20Marine%20Protected%20Areas%20for%20the%20development%20of%20the%20Scottish%20MPA%20network.pdf (accessed 17/10/2018)

[36] Scottish Government (2011) Marine Protected Areas in Scotland's Seas: Guidelines on the selection of MPAs and the development of the MPA network [online] Available at: http://www.gov.scot/Resource/0051/00515466.pdf (accessed 17/10/2018)

[37] SNH (2017) Scottish Marine Protected Areas Project [online] Available at: https://www.nature.scot/professional-advice/safeguarding-protected-areas-and-species/protected-areas/national-designations/marine-protected-areas/scottish-marine-protected-0 (accessed 17/10/2018)

Table 2 Characteristics of the four pMPAs under assessment

pMPA	Proposed protected feature	Draft conservation objectives
North-east Lewis (NEL)	Biodiversity: Risso's dolphins; sandeels	Conserve
	Geodiversity: marine geomorphology of the Scottish shelf bed (*longitudinal bedform field*); Quaternary of Scotland (*glaciated channels/troughs, landscape of areal glacial scour, megascale glacial lineations*)	
Sea of the Hebrides (SOH)	Biodiversity: basking sharks; minke whales; fronts	Conserve
	Geodiversity: marine geomorphology of the Scottish shelf seabed (*Inner Hebrides Carbonate Production Area*)	
Shiant East Bank (SEB)	Biodiversity: circalittoral sands and mixed sediment communities; Northern sea fan and sponge communities; Shelf banks and mounds	Conserve
	Geodiversity: Quaternary of Scotland (*drumlinoid forms, glacial lineations, iceberg ploughmarks, streamlined bedrock*)	
Southern Trench (STR)	Biodiversity: burrowed mud; minke whales; fronts; shelf deeps	Conserve
	Geodiversity: Quaternary of Scotland (*subglacial tunnel valleys and moraines*); Submarine Mass Movement (*slide scars*)	

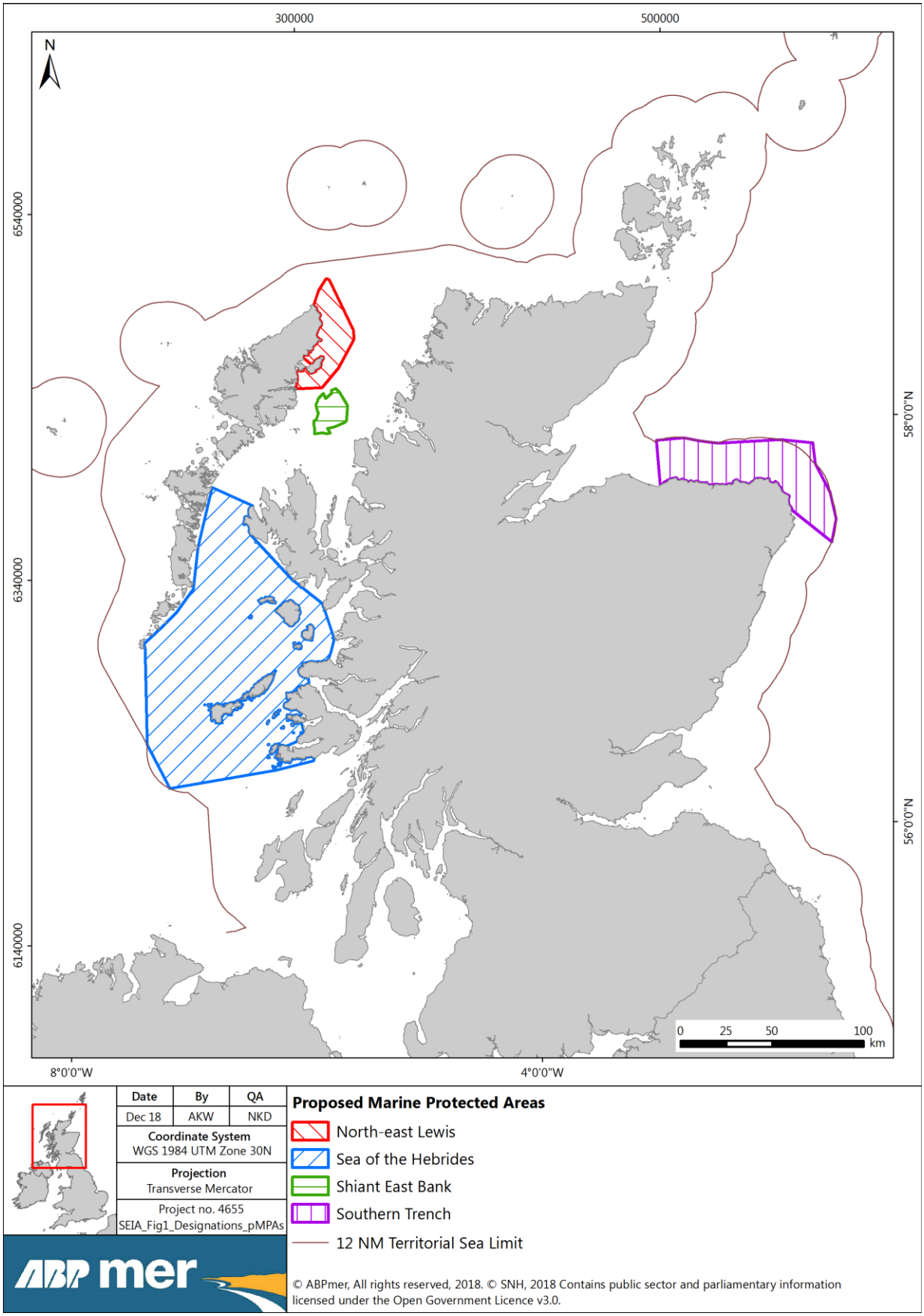

Figure 1 Map of four pMPAs

2.4 Policy context overview of the pMPAs

2.4.1 The 2005 Act requires Responsible Authorities to define the plan's broader policy context, particularly any relevant environmental protection objectives that will influence the plan's development and implementation.

2.4.2 This section sets out the immediate policy context in which the pMPAs, as a component of the greater MPA network, sit. This policy context is illustrated in Figure 2. Appendix A of the SEA ER[38] includes a detailed review of the overarching marine policy objectives and the environmental protection objectives covering the SEA topics that have been scoped into the assessment.

MPA network

2.4.3 Nature Conservation MPAs are one example of an MPA in Scotland, the others being SACs, SPAs, SSSIs, Historic MPAs, and Demonstration and Research MPAs[39]. The overall MPA network is intended to help protect nationally and internationally important marine wildlife, habitats and underwater geodiversity, while also benefiting the greater marine environment, historic features, coastal communities, marine industries and recreational users[40].

2.4.4 The MPA network fulfils a number of legislative and conservation needs. They are a key element of the Scottish Government's commitment to ensuring the sustainable management of the marine environment and balancing the competing interests of use and protection of the sea. They contribute to progress towards Good Environmental Status (GES) as set out by the Marine Strategy Framework Directive 2008/56/EC[41]. They also form part of the OSPAR Convention network of protected sites found throughout the North East Atlantic Ocean[42]. In addition, they aim to maintain and enhance biodiversity, which is a focus of the Habitats (92/43/EEC)[43] and Birds (2009/147/EC)[44] Directives.

[38] Marine Scotland (2018) Strategic Environmental Appraisal Environmental Report for Proposed Marine Protected Areas, Strategic Environmental Assessment, Environmental Report, February 2019.

[39] Scottish Government (2017) Marine Protected Areas (MPAs) [online] Available at: http://www.gov.scot/Topics/marine/marine-environment/mpanetwork (accessed 17/10/2018)

[40] SNH (2017) Nature Conservation Marine Protected Areas [online] Available at: http://www.snh.gov.uk/protecting-scotlands-nature/protected-areas/national-designations/mpas/ (accessed 17/10/2018)

[41] Scottish Government (2011) Marine Protected Areas in Scotland's Seas – Guidelines on the selection of MPAs and development of the MPA network [online] Available at: http://www.gov.scot/resource/doc/295194/0114024.pdf (accessed 17/10/2018)

[42] OSPAR Commission (2015) Marine Protected Areas [online] Available at: https://www.ospar.org/work-areas/bdc/marine-protected-areas (accessed 17/10/2018)

[43] European Commission (1992) The Habitats Directive [online] Available at: http://ec.europa.eu/environment/nature/legislation/habitatsdirective/index_en.htm (accessed 20/12/18)

[44] European Commission (2009) The Birds Directive [online] Available at: http://ec.europa.eu/environment/nature/legislation/birdsdirective/index_en.htm (accessed 20/12/18)

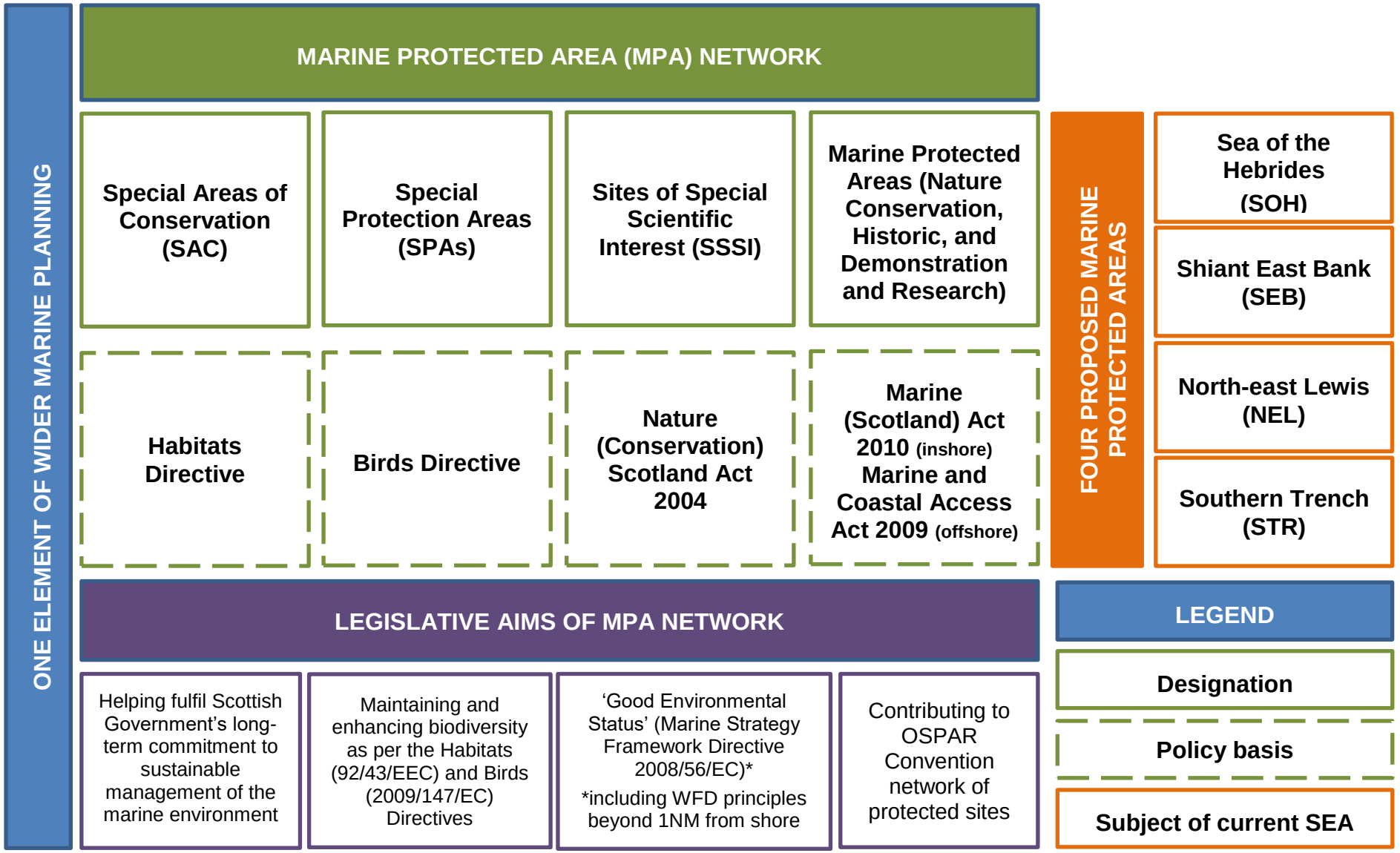

Figure 2 Policy context of the MPA network in Scotland

3 Approach to the Sustainability Appraisal

3.1 Introduction

3.1.1 The following sections set out a brief overview of the processes used in the SEA and SEIA. Full details are provided in the SEA ER[45] and SEIA[46].

3.2 SEA Approach

3.2.1 The SEA has built on the following SEAs of relevant marine conservation work undertaken by the Scottish Government:

- The designation of the first round of Nature Conservation MPAs (assessed in 2013)[47];
- Proposals for an additional suite of marine SPAs (currently under assessment)[48];
- Phase one (assessed in 2014)[49] and proposals for phase two (currently under assessment) of the implementation of MPA management measures; and
- Proposals for management measures applying to PMFs (currently under assessment).

3.2.2 The SEA presents a high level and qualitative account of the type and potential magnitude of environmental effects that might be expected to arise from the designation of the pMPAs alone. The SEA also assessed the potential effects that could arise at each pMPA from the management scenarios that were developed as reasonable alternatives.

3.2.3 The SEA objectives that were developed to reflect the proposed scope of the SEA and the environmental protection objectives are set out in Table 3.

[45] Marine Scotland, 2018. SEA of Proposed Marine Protected Areas, Strategic Environmental Assessment, Environmental Report, February 2019.

[46] Marine Scotland (2018). Socio-Economic Impact Assessment for Proposed Marine Protected Areas, February 2019

[47] Scottish Government (2013) Planning Scotland's Seas: 2013 – Possible Nature Conservation Marine Protected Areas Consultation Overview – Strategic Environmental Assessment Report [online] Available at: http://www.gov.scot/Publications/2013/08/2591/0 (accessed 18/10/2018)

[48] Scottish Government (2018) SEA of Marine Proposed Special Protection Areas Strategic Environmental Assessment Environmental Report August 2018. Available at: https://consult.gov.scot/marine-scotland/sea-for-15-proposed-special-protection-areas/supporting_documents/Marine%20SPA%20SEA%20%20Consultation%20document%20%20September%202018.pdf (accessed 18/10/2018)

[49] Scottish Government (2014) Proposals for statutory management measures in Marine Protected Areas and Special Areas of Conservation Environmental Report Addendum. November 2014. Available at: https://www2.gov.scot/Resource/0046/00464215.pdf (accessed 18/10/2018)

Table 3 SEA objectives

SEA Topics	SEA Objective
Biodiversity, Flora, and Fauna	▪ To safeguard and enhance marine and coastal ecosystems, including species, habitats, and their interactions; ▪ To maintain and protect the character and integrity of the seabed; ▪ To avoid the pollution of seabed strata and/or bottom sediments; ▪ To avoid pollution of the coastal and marine water environment; ▪ To maintain or work towards achieving 'Good Ecological Status' and 'Good Environmental Status' of water bodies; and ▪ To preserve and enhance existing marine carbon stocks and carbon sequestration potential.
Soil	▪ See Biodiversity, Flora, and Fauna.
Water	▪ See Biodiversity, Flora, and Fauna.
Climatic Factors	▪ See Biodiversity, Flora, and Fauna.

3.2.4 Information about the existing marine environment was used to inform the assessment and define the SEA objectives. The assessment identified the individual and collective effects of the proposals on a number of topics scoped into the SEA, specifically Biodiversity, Flora and Fauna, Soil (geodiversity), Water (the ecological status of water bodies) and Climatic Factors (carbon cycling, storage and sequestration). In order to recognise the interlinkages of these SEA topics, these were collectively given consideration under the overarching Biodiversity, Flora and Fauna topic.

3.2.5 The SEA identified positive and negative effects, including 'cumulative' effects. The scope of any potentially significant environmental effects was largely limited to beneficial effects for species and habitats that fall within the pMPAs or regularly use them; spillover benefits beyond site boundaries; and potential adverse effects outwith pMPAs as a result of the displacement of activities and the intensification of activities in areas where they already occur. Consideration was also given to the potential for increased fishing effort in pMPAs from other gear types that are not targeted by any potential future management measures.

Reasonable alternatives

3.2.6 The scoping exercise identified some strategic alternative conservation measures to the designation of the pMPAs that might achieve the same protection outcomes. However, these different conservation measures would not extend the existing MPA network and therefore would not help to fulfil a number of legislative and conservation requirements. They would also not direct developers to consider the proposed protected features in detail when they are siting projects and/or in any environmental assessments that are required in support of marine licence applications.

3.2.7 The different ways in which the four pMPAs might be managed in the future to support the achievement of site conservation objectives could be considered reasonable alternatives. Marine Scotland has developed a lower, intermediate and upper 'management scenario' for managing pressures/activities at each of the proposed pMPAs based on advice provided by SNH and other sources of information.

3.2.8 The management scenarios are provided for indicative purposes and do not constrain future decisions or represent the final management measures that may be adopted by the Scottish Government for individual sites. Any specific management measures that are subsequently required to meet the objectives of the pMPAs will be subject to further consideration under the 2005 Act and are likely to require their own SEA.

Table 4 Alternative management scenarios

Pressure/Activity	Site(s) affected	Scenarios		
		Lower	**Intermediate**	**Upper**
Aquaculture	SOH NEL	Follow current best practice guidelines.	50% of Acoustic Deterrent Devices (ADDs) to be replaced with basking shark/cetacean appropriate devices at end of their life.	Replacement of all Acoustic Deterrent Devices (ADDs) with antipredator nets.
Boat use[50]	SOH NEL STR	Follow Scottish Marine Wildlife Watching Code (SMWWC) and produce vessel management plans as required by licensing.		Vessel speeds[51] restricted to <6 knots within the 'shark awareness zones' between June and October (SOH).
Cables/pipelines	SOH NEL STR SEB	Follow existing best practice and licensing process for installation of new cables/pipelines by minimising disturbance to sandeel habitat (SOH, NEL), burrowed mud (STR), circalittoral sand and mixed sediment communities, and northern sea fan and sponge communities (SEB).		New cable/pipeline routes should avoid northern sea fan and sponge communities (SEB).
Noisy activities[52]	SOH NEL STR	Follow existing best practice mitigation measures/guidance.		No noisy activities during minke whale and basking shark high season (April-October) (SOH). No noisy activities during Risso's dolphin high season (May-October) (NEL).

[50] MoD activities are reserved and therefore cannot be controlled or limited. MoD has its own best practice guidelines for meeting obligations.

[51] All vessels except lifeline ferry services.

[52] Noisy activities include all activities which produce underwater noise which may disturb the protected features (particularly basking sharks and cetaceans). This includes, but may not be limited to, construction activities (pile driving and blasting) and marine surveys (seismic, side-scan sonar, mutlibeam, sub-bottom profiling). MoD activities are reserved and therefore cannot be controlled or limited. MoD has its own best practice guidelines for meeting obligations.

Pressure/Activity	Site(s) affected	Scenarios		
		Lower	Intermediate	Upper
				No noisy activities during minke whale high season (June-October) (STR).
Coastal development (excluding noise)	STR NEL SOH	Follow existing best practice and licensing process.	Minimise footprints of development to limit disturbance to burrowed mud (STR) and sandeel habitats.	
Life line ferry services	All	No additional management.		
Fishing (bottom-contacting mobile gear)	SOH NEL STR SEB	Follow best practice to minimise risk of bycatch of basking shark (SOH).	Exclusion of hydraulic gear from sandeel habitat (SOH, NEL, STR). Exclusion of mobile/active gear from northern sea fan and sponge communities (SEB). Exclude targeted fishing for sandeels (SOH, STR, NEL). Exclude mobile gear from 20% of burrowed mud (STR) and circalittoral sand (SEB).	Exclude mobile gear from 40% of burrowed mud (STR) and circalittoral sand (SEB).
Fishing (static gear)	SOH STR NEL	Reduce risk of entanglement of basking shark (SOH), minke whale (SOH, STR) and Risso's dolphin (NEL) by following best practice.	Exclusion of drift nets and set nets between April and October in 'shark awareness zones' (SOH). Exclusion of drift nets and set nets in the southern half of site (NEL).	Exclusion of drift nets and set nets between April and October across site (SOH). Exclusion of drift nets and set nets between June and October (STR). Exclusion of drift nets and set nets between May and October (NEL).
Fishing (pelagic)	STR NEL	Reduce risk of entanglement of minke whale (SOH, STR), basking shark (SOH) and Risso's dolphin (NEL) by following best practice.		Limit herring and sprat fishing effort to current levels (SOH, STR).

Pressure/Activity	Site(s) affected	Scenarios		
		Lower	Intermediate	Upper
	SOH			
Marine disposal sites	STR NEL SOH	Current best practice followed.		Siting of new marine disposal sites to minimise impacts on burrowed mud (STR) and sandeel habitat.
Ports and harbours	STR NEL SOH	See 'Coastal Development' and 'Noisy Activities' for relevant scenarios.		
Renewable energy	STR NEL SOH	Current best practice used to minimise impacts on burrowed mud (STR) and sandeel habitat.		Exclude development which could create a barrier to species movement in shark awareness zones (SOH).
Scientific survey/research	SOH STR NEL SEB	Survey work adhering to Scottish Marine Wildlife Watching Code (SMWWC) and current species licensing requirements (SOH, NEL, STR) Best practice adopted to minimise effects on burrowed mud (STR), sandeel habitat (NEL), sensitive sea fan and sponge communities, and circalittoral sand (SEB).		
Wildlife tour operators	STR NEL SOH	Follow existing best practice including Scottish Marine Wildlife Watching Code (SMWWC) and Wildlife Safe (WiSe) scheme.		Vessel speeds restricted to <6 knots within the 'shark awareness zones' between June and October (SOH).

3.3 SEIA Approach

3.3.1 The SEIA methodology applied built on previous marine socio-economic assessments for MPAs, particularly the assessment of Scottish Nature Conservation MPAs[53], and the assessment of phase 2 fisheries management measures in Nature Conservation MPAs[54]. It is consistent with Better Regulation Executive guidance on impact assessment, the Green Book methodology[55] for economic assessment and Scottish Government guidance on Business and Regulatory Impact Assessment (BRIA)[56].

3.3.2 The methodology sets out:

- General project assumptions;
- Establishing a baseline against which impacts can be assessed;
- Assessment of costs and benefits for each site; and
- Combined assessment.

Collation and preparation of baseline information

3.3.3 A range of baseline information was collated, including:

- The distribution of biodiversity and geodiversity features within and adjacent to the pMPAs and how this might change over the assessment period (in the absence of the intervention);
- The distribution and intensity (number of sites/volume/value) of human activities within and adjacent to the pMPAs and how this might change over the assessment period (in the absence of the intervention); and
- Information on ecosystem service values associated with the marine environment and how these may change over the assessment period (in the absence of the intervention).

Biodiversity and geodiversity features

3.3.4 SNH provided information on the distribution of biodiversity and geodiversity features, including population estimates for marine mammals, and area estimates for habitats and geodiversity features where available.

3.3.5 These data sources were used to develop a best understanding of the spatial distribution of the biodiversity and geodiversity features for which each pMPA site is being proposed.

[53] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

[54] Marine Scotland, 2018. Proposed Inshore MPA/SAC Fisheries Management Measures – Phase 2. Socio-Economic Impact Assessment. October 2018. Report prepared by ABPmer & eftec for the Scottish Government.

[55] HM Treasury, 2018. The Green Book. Central Government Guidance on Appraisal and Evaluation. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/685903/The_Green_Book.pdf

[56] https://beta.gov.scot/publications/bria-guidance/.

Human Activities

3.3.6 Relevant data on the spatial distribution and intensity of marine activities occurring within and adjacent to the pMPA sites was collated within ArcGIS. This included the following activities:

- Aquaculture (finfish);
- Aquaculture (shellfish);
- Carbon Capture and Storage;
- Coast Protection and Flood Defence;
- Commercial Fisheries (including salmon and sea trout);
- Energy Generation;
- Military Interests;
- Oil and Gas (including exploration, production, interconnectors, gas storage);
- Ports and Harbours;
- Power Interconnectors;
- Recreational Boating;
- Shipping;
- Telecom Cables;
- Tourism (including heritage assets); and
- Water Sports.

3.3.7 Aggregates and aviation sectors were also considered but were scoped out of the assessment and not taken forward in the SEIA. There is currently no existing or planned marine aggregate extraction in Scottish waters and aviation was not considered to pose a significant risk to any of the site features.

3.3.8 The baseline took account of possible changes in the distribution and intensity of human activity over the time period of the assessment to provide a dynamic baseline. This drew on previous work to develop a dynamic baseline for the Nature Conservation MPA assessment[57]. In considering potential future development activity, various assumptions were made, and these are documented in Appendix A of the SEIA report[58].

[57] Marine Scotland, 2013. Planning Scotland's Seas: 2013 - The Scottish Marine Protected Area Project – Developing the Evidence Base tor Impact Assessments and the Sustainability Appraisal Final Report.

[58] Marine Scotland (2018). Socio-Economic Impact Assessment for Proposed Marine Protected Areas, February 2019.

Quantification of Potential Impacts (Costs and Benefits)

3.3.9 Lower, intermediate and upper estimates have been developed to assess the potential range of impacts, which reflect a range of possible management options that may be applied. The management options have been developed for the purposes of the assessment by Marine Scotland based on advice from Scottish Natural Heritage (SNH) and other sources (Table 4). They take into account the sensitivity of features proposed for designation in relation to the scale and intensity of pressures associated with human activities, but do not anticipate final advice on management measures, nor do they reflect the management measures that may be adopted by the Scottish Government for individual sites. The assumptions used for each sector and each estimate are documented in Appendix C of the SEIA.

3.3.10 All the methods generally entail making estimates of the cost of implementing management scenarios and/or the impact of implementing the management scenarios on operating revenues. Consistent unit costs have been used within most marine activity sectors as a basis for estimating these impacts, although it is recognised that the actual costs that may be incurred by specific activities within individual sites may be higher or lower than these 'average' values.

3.3.11 For some sectors, there may also be impacts associated with delays in consenting as a result of the designations or impacts on investor confidence. However, it has not been possible to quantify these potential impacts as it is not possible to predict whether or where they might occur. It is recognised that these costs could potentially be large for some sectors and possibly larger than some of the costs that have been quantified.

3.3.12 Where possible, all impacts have been quantified in monetary terms, with these values converted to 2019 prices using the relevant GDP deflators. Where impacts on economic activities have the potential to give rise to a change in the level of output, direct and indirect impacts on Gross Value Added (GVA) and employment have been estimated using appropriate multipliers. This is only the case for the fisheries sector, which is the only sector for which the management scenarios have the potential to affect output through loss of landings.

3.3.13 Following a decision to designate individual sites, costs may be incurred by the public sector in the following broad areas, although not all measures listed will be needed at all sites, i.e. these requirements are site-specific:

- Preparation of Marine Management Schemes;
- Preparation of Statutory Instruments;
- Development of voluntary measures;
- Site monitoring;
- Compliance and enforcement;
- Promotion of public understanding; and

- Regulatory and advisory costs associated with licensing decisions and review of consents.

3.3.14 The social impacts generated by the proposed management scenarios will be strongly connected to the nature, scale and distribution of the economic impacts (on both income and employment). Any significant change in employment, for example generated as a result of restrictions on fishing activity, can have significant social impacts (e.g. on health, crime). Economic and social impacts have been assessed through a distributional analysis.

3.3.15 In assessing the impacts on ecosystem services, the SEIA provides a qualitative description of the potential changes in ecosystem service provision associated with the implementation of indicative management measures to support the achievement of conservation objectives for individual features. The analysis of changes to ecosystem services has considered both on-site and off-site positive and negative impacts of management scenarios.

3.3.16 For further detail on the SEIA methodology see the full SEIA report[59].

[59] Marine Scotland (2018). Socio-Economic Impact Assessment for Proposed Marine Protected Areas, February 2019.

4 Results of the Sustainability Appraisal

4.1 Environment

Environmental Effects

4.1.1 Environmental Impact Assessments (EIAs) are required to be undertaken on regulated activities such as aquaculture or marine renewables. EIAs assess the significant environmental effects of a project, including on current and proposed nature conservation sites such as pMPAs. The designation of the pMPAs will provide developers with a better understanding of the species and habitats that need to be protected. This greater clarity and confidence will help to ensure that developers undertake more effective EIAs for future developments. This in turn may reduce pressures associated with regulated activities in pMPAs. This is particularly the case for pMPAs with protected features that are not currently protected (e.g. fronts and shelf deeps).

4.1.2 Alternatively, developers may look to avoid progressing consented developments that have not been built and re-locating regulated activities away from pMPAs as they will require further assessment and the consideration of appropriate mitigation measures. The avoidance of these sites by potentially harmful activities would therefore result in future environmental benefits within pMPAs.

4.1.3 Overall, the increased protection that will result from the designation of the four pMPAs will provide potential environmental benefits for the overarching topic Biodiversity, Flora and Fauna, and contribute to the achievement of the SEA objectives.

4.1.4 In addition to the potential benefits afforded by the designation of the sites described above, the manner in which the sites are managed to ensure that the conservation objectives for the protected features are achieved has the potential to result in significant environmental changes.

4.1.5 In generic terms, management measures have the potential to result in beneficial effects on the overarching topic Biodiversity, Flora and Fauna and contribute to the achievement of the SEA objectives where these target specific activities and pressures that currently, or might in the future, occur within the pMPAs. In turn, these may also result in the potential for marginal spillover benefits beyond pMPA site boundaries. For example, avoiding certain harmful activities in sensitive areas may result in the potential spillover of species from protected areas into unprotected areas if there is a

population surplus and the carrying capacity of the protected area is surpassed[60,61].

4.1.6 The implementation of management measures may also result in the potential displacement of an activity and its associated pressures outwith the boundaries of the pMPA resulting in potential adverse environmental effects in other areas, where such activities are not managed. It is also possible that management measures could result in increased levels of non-targeted fishing activities within pMPAs. For example, removal of mobile fishing gear effort could facilitate greater use of some static gears.

Reasonable Alternatives

4.1.7 Further to the potential benefits afforded by the designation of the pMPAs described above, a detailed assessment of all the potential additional environmental effects that might arise from the lower, intermediate and upper management scenarios that have been identified as reasonable alternatives (see Section 3.2) has been undertaken at each site and is included in Appendix C of the SEA ER[62]. This has included an assessment of the contribution of each management scenario to the achievement of individual SEA objectives. A summary of the overall (cumulative) environmental effects on the overarching topic of Biodiversity, Flora and Fauna is included in Table 5. A full justification for the outcomes of this assessment is provided in Appendix C of the SEA ER[63].

4.1.8 In addition to the potential environmental benefits that will result from the designation of the four pMPAs described above, the lower management scenario will have no further overall impact at SEB and the potential to result in future additional benefits at NEL, SOH and STR (see Table 5). The intermediate management scenario will have an overall negligible to very minor additional immediate beneficial impact on the environment at NEL, a minor additional immediate beneficial impact at SOH and STR, and a moderate additional immediate beneficial impact at SEB, with a greater potential for further future benefits at all sites. The upper management scenario will have an overall negligible to minor additional immediate beneficial impact on the environment at NEL, a minor additional immediate beneficial impact at SEB and STR, and a moderate additional immediate beneficial impact at SOH, with greater potential for future benefits at all sites.

[60] Buxton, C.D., Hartmann, K., Kearney, R. and Gardner, C., 2014. When is spillover from marine reserves likely to benefit fisheries?. PloS One, 9(9), p.e107032.

[61] Kerwath, S.E., Winker, H., Götz, A. and Attwood, C.G., 2013. Marine protected area improves yield without disadvantaging fishers. Nature Communications, 4, p.2347.

[62] Marine Scotland, 2018. SEA of Proposed Marine Protected Areas, Strategic Environmental Assessment, Environmental Report, February 2019.

[63] Marine Scotland, 2018. SEA of Proposed Marine Protected Areas, Strategic Environmental Assessment, Environmental Report, February 2019.

Table 5 Overall assessment of management scenarios

Site name	Management scenario	Assessment
NEL	Lower	The lower management scenario for NEL pMPA will have **no immediate impact on the environment but a greater potential for future benefits**. Assuming that best practice is being followed by existing activities there will be no immediate benefits to habitat and species within the pMPA. The lower management scenario will not limit or restrict any human pressures/activities and therefore there will be no potential spillover benefits, no potential adverse environmental effects resulting from the displacement of activities and no potential adverse environmental effects resulting from increased fishing effort from other gear types that are not targeted.
	Intermediate	The intermediate management scenario for NEL pMPA will have an overall **negligible to very minor immediate beneficial impact on the environment and a greater potential for future benefits**. The existing scale of activities that will be prohibited by the measures (namely hydraulic gear fishing in sandeel grounds and targeted fishing for sandeels) are very small, but their exclusion will potentially provide benefits to some habitats and associated species. The scale of benefit of reducing the number of Acoustic Deterrent Devices (ADDs) at finfish aquaculture sites operating at mid or high frequencies is negligible in the immediate term given that there are currently no active finfish aquaculture sites within NEL pMPA, however, there is the potential for future benefits should any new finfish aquaculture sites be proposed at this site. The scale of benefits from the measures is unlikely to result in significant spillover benefits outside the boundaries of NEL pMPA. The adverse impacts on the environment will be negligible as a direct impact of displacement as the amount of effort displaced will be very small and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. Furthermore, a change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there would still be areas within and outwith NEL pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.
	Upper	The upper management scenario for NEL pMPA will have an overall **negligible to minor immediate beneficial impact on the environment and a greater potential for future benefits**. The existing scale of activities that will be prohibited or restricted by the measures (namely hydraulic gear fishing in sandeel grounds, targeted fishing for sandeels, exclusion of drift nets and set nets between May and October, and noisy activities during Risso's dolphin high season) are small, but their regulation will provide some benefits to habitats and species. The scale of benefit of replacing all Acoustic Deterrent Devices (ADDs) at finfish aquaculture sites with antipredator nets is negligible in the immediate term given that there are currently no active finfish aquaculture sites within NEL pMPA, however, there is the potential for future benefits should any new finfish aquaculture sites be proposed at this site. The scale of benefits from the measures is unlikely to result in significant spillover benefits outside the boundaries of NEL pMPA.

Site name	Management scenario	Assessment
		The adverse impacts on the environment will be negligible as a direct impact of displacement as the amount of fishing effort displaced will be very small and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. Furthermore, a change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there would still be areas outwith NEL pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.
SOH	Lower	The lower management scenario for SOH pMPA will have **no immediate impact on the environment but a greater potential for future benefits**. Assuming that best practice is being followed by existing activities there will be no immediate benefits to habitat and species within the pMPA. The lower management scenario will not limit or restrict any human pressures/activities and therefore there will be no potential spillover benefits, no potential adverse environmental effects resulting from the displacement of activities and no potential adverse environmental effects resulting from increased fishing effort from other gear types that are not targeted.
	Intermediate	The intermediate management scenario for SOH pMPA will have an overall **minor immediate beneficial impact on the environment and a greater potential for future benefits**. There are currently six active finfish aquaculture sites within SOH pMPA and therefore reducing the number of Acoustic Deterrent Devices (ADDs) at these sites that operate at mid or high frequencies would result in an immediate minor benefit to the environment. There are two harbours located close to sandeel habitat and therefore the scale of immediate benefits associated with reducing disturbance to sandeel habitat is considered minor. The existing scale of activities that will be prohibited by the measures (namely hydraulic gear fishing in sandeel grounds, targeted fishing for sandeels and exclusion of drift nets and set nets between April and October in 'shark awareness zones') is negligible to low, but their exclusion will potentially provide some negligible to minor benefits to habitats and associated species. The scale of these benefits is unlikely to result in significant spillover benefits outside the boundaries of SOH pMPA. The adverse impacts on the environment will be negligible as a direct impact of displacement as the amount of effort displaced will be very small and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. Furthermore, a change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there would still be areas within and outwith SOH pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.
	Upper	The upper management scenario for SOH pMPA will have an overall **moderate immediate beneficial impact on the environment and a greater potential for future benefits**. There are currently six active finfish aquaculture sites operating within SOH pMPA and therefore replacing all Acoustic Deterrent Devices (ADDs) with antipredator

Site name	Management scenario	Assessment
		nets has the potential to result in an immediate moderate benefit to the environment if these follow best practice. There are four harbours located in the 'shark awareness zones' and therefore reducing vessel speeds within these zones during sensitive periods will result in an immediate moderate benefit to basking sharks and the wider environment. There are two harbours located close to sandeel habitat and therefore the scale of immediate benefits associated with reducing disturbance to sandeel habitat is considered minor. The existing scale of activities that will be prohibited or restricted by the measures (namely noisy activities during basking shark high season, hydraulic gear fishing in sandeel grounds, targeted fishing for sandeel, exclusion of drift nets and set nets between April and October across site, and limiting herring and sprat fishing effort to current levels) are negligible to low, but their regulation will provide some negligible to minor benefits to habitats and species. The scale of these benefits is unlikely to result in significant spillover benefits outside the boundaries of SOH pMPA. The adverse impacts on the environment will be negligible as a direct impact of displacement as the amount of fishing effort displaced will be very small and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. Furthermore, a change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there would still be areas outwith SOH pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.
SEB	Lower	The lower management scenario for SEB pMPA will have **no impact on the environment**. Assuming that best practice is being followed by existing activities there will be no benefits to habitat and species within the pMPA. The lower management scenario will not limit or restrict any human pressures/activities and therefore there will be no potential spillover benefits, no potential adverse environmental effects resulting from the displacement of activities and no potential adverse environmental effects resulting from increased fishing effort from other gear types that are not targeted.
	Intermediate	The intermediate management scenario for SEB pMPA will have an overall **moderate immediate beneficial impact on the environment and a greater potential for future benefits**. The existing scale of activities that will be prohibited by the measures (namely excluding mobile/active gear from northern sea fan and sponge communities and from 20% of circalittoral sand) is low, but their exclusion will potentially provide some moderate environmental benefits given the sensitivity of habitats and associated species that will be protected. These moderate environmental benefits have the potential to result in minor spillover benefits outside the boundaries of SEB pMPA given the nature and scale of existing human pressures/activities in the area and also the fact that the site supports spawning and nursery grounds for several fish species. The adverse impacts on the environment will be negligible as a direct impact of displacement as the amount of effort displaced will be small and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing

Site name	Management scenario	Assessment
		pressures. Furthermore, a change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there is a low level of fishing by non-targeted gear types and there would still be areas outwith SEB pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.
	Upper	The upper management scenario for SEB pMPA will have an overall **minor immediate beneficial impact on the environment and a greater potential for future benefits**. The existing scale of activities that will be prohibited or restricted by the measures (namely new cable/pipeline routes that avoid northern sea fan and sponge communities, excluding mobile/active gear from northern sea fan and sponge communities and from 40% of circalittoral sand) is moderate. Their regulation will therefore provide some moderate benefits to habitats and species. These moderate environmental benefits have the potential to result in minor spillover benefits outside the boundaries of SEB pMPA given the nature and scale of existing human pressures/activities in the area and also the fact that the site supports spawning and nursery grounds for several fish species. The environmental effect of the displacement of cables/pipelines is considered to be minor given the nature and scale of impacts on the seabed and sensitivity of habitats. The effect of displacement of fishing activities is considered negligible as the amount of existing fishing effort displaced will be small and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. Furthermore, a change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there is a low level of fishing of non-targeted gear types and there would still be areas outwith SEB pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.
STR	Lower	The lower management scenario for STR pMPA will have **no immediate impact on the environment but a greater potential for future benefits**. Assuming that best practice is being followed by existing activities there will be no immediate benefits to habitat and species within the pMPA. The lower management scenario will not limit or restrict any human pressures/activities and therefore there will be no potential spillover benefits, no potential adverse environmental effects resulting from the displacement of activities and no potential adverse environmental effects resulting from increased fishing effort from other gear types that are not targeted.
	Intermediate	The intermediate management scenario for STR pMPA will have an overall **minor immediate beneficial impact on the environment and a greater potential for future benefits**. There are currently three minor ports, several harbours and four licensed disposal grounds located within and/or close to sandeel habitat and therefore the scale of immediate benefits associated with reducing disturbance to sandeel habitat is considered minor. The existing scale of activities that will be prohibited by the measures (namely hydraulic gear fishing in sandeel grounds, targeted

Site name	Management scenario	Assessment
		fishing for sandeel and exclusion of mobile gear from 20% of burrowed mud) is low to high, and their exclusion will potentially provide some moderate benefits to habitats and associated species. The scale of these benefits is likely to result in minor spillover benefits outside the boundaries of STR pMPA. The adverse impacts on the environment will be minor as a direct impact of displacement as the amount of effort displaced will be low to moderate and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. A change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there would still be areas within and outwith STR pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.
	Upper	The upper management scenario for STR pMPA will have an overall **minor immediate beneficial impact on the environment and a greater potential for future benefits**. There are currently three minor ports, several harbours and four licensed disposal grounds located within and/or close to sandeel habitat and therefore the scale of immediate benefits associated with reducing disturbance to sandeel habitat is considered minor. The existing scale of activities that will be prohibited or restricted by the measures (namely noisy activities during minke whale high season, hydraulic gear fishing in sandeel grounds, targeted fishing for sandeel, mobile gear from 40% of burrowed mud, drift nets and set nets between June and October across site, and limiting herring and sprat fishing effort to current levels) are low to high, and their regulation will provide some major benefits to habitats and species. The scale of these benefits is likely to result in minor spillover benefits outside the boundaries of STR pMPA. The adverse impacts on the environment will be moderate at most as a direct impact of displacement as the amount of fishing effort displaced will be moderate to major and the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. A change in fishing effort from targeted to non-targeted fishing gears (e.g. from hydraulic gear to creeling) is considered unlikely given that there would still be areas within and outwith STR pMPA that are available for targeted fisheries to fish. Therefore, the benefit of protection is likely to be greater than the negative impacts associated with displacement.

Cumulative Effects

4.1.9 Taken together, the designation and management of the pMPAs are likely to result in cumulative benefits to the overarching topic Biodiversity, Flora and Fauna, in terms of protection provided to the MPA features and wider environment. In addition to the benefits that will be provided by the designation of the pMPAs, the lower management scenario will result in no overall additional immediate environmental impact across all four sites. The intermediate and upper scenarios will result in an overall moderate additional immediate beneficial environmental impact. The potential for greater future benefits exists under all management scenarios.

4.1.10 The management of the pMPAs also has the potential to result in cumulative adverse effects on the overarching Biodiversity, Flora and Fauna topic from the displacement of existing activities to other areas, where such activities are not managed. For regulated activities, such as renewable energy or aquaculture developments, environmental assessments would be required before an activity could take place, thus limiting the potential for significant cumulative adverse effects to occur.

4.1.11 In terms of activities not subject to development consent, such as fishing, the lower management scenario will result in no potential cumulative adverse environmental effects across all four sites from the displacement and intensification of fishing activity. The intermediate and upper scenarios will result in minor and moderate cumulative adverse effects respectively from the displacement of fishing activities. The combined scale of effort displaced will range from moderate for the intermediate scenario to major for the upper scenario. However, the areas into which effort is likely to be displaced are already fished and thus have a community composition that is already characterised by fishing pressures. Overall, there is no potential for the displacement of fisheries activities from the pMPAs to overlap and therefore no potential for cumulative environmental effects to interact across the four sites.

4.1.12 The pMPAs will, together with the wider MPA network and existing protection measures, further benefit the overarching topic of Biodiversity, Flora and Fauna in Scottish waters and contribute to the achievement of SEA objectives.

4.1.13 There may be cumulative adverse effects on the environment from the displacement of fishing activities resulting from previous plans in-combination with the designations and management of the four additional pMPAs. The previous plans which could lead to cumulative effects and have

been assessed are the Phase 1 fisheries management measures in MPAs[64] and proposals for Phase 2 fisheries management measures in MPAs.

4.1.14 The SEA for the Phase 1 fisheries management measures identified displacement from only one site (Luce Bay and Sands SAC) is likely to cause significant environmental impact. This site is not located close to any of the four additional pMPAs and their alternative fishing grounds and therefore there is no potential for cumulative adverse effects.

4.1.15 The SEA that has been undertaken on the Phase 2 fisheries management measures assessed the environmental impact at the displacement locations to be negligible in most cases, and at most minor (specifically at Fetlar and Haroldswick MPA and Sound of Barra SAC). There is no potential for the displacement of fishing activity at Fetlar and Haroldswick MPA to overlap with any of the four additional pMPAs and their alternative fishing grounds, but the Sound of Barra SAC is located adjacent to Sea of the Hebrides pMPA and therefore there is potential for displacement of fishing to overlap and lead to greater adverse environmental effects. A more detailed assessment of cumulative effects will be undertaken should any management measures for the pMPAs be proposed in future.

4.1.16 The assessment of management measures for PMFs is ongoing and is yet to be fully consulted upon. In consequence, it is not possible at this stage to ascertain whether there may be cumulative effects arising from interactions between the designation of four additional pMPAs and these proposals. This possibility will be assessed by the forthcoming SEA for the PMF fisheries management measures.

4.2 Economy and Other Marine Users

Aquaculture – finfish

Potential quantified cost impacts[65] to the finfish aquaculture sector are summarised in

[64] Scottish Government (2014) Proposals for statutory management measures in Marine Protected Areas and Special Areas of Conservation Environmental Report Addendum. November 2014. Available at: https://www2.gov.scot/Resource/0046/00464215.pdf (accessed 20/12/18)

[65] Note, for all tables of results, totals may not sum due to rounding.

4.2.1 Table 7. The costs are primarily associated with additional assessments required to take account of the pMPA protected features in the lower estimate, and replacement of acoustic deterrent devices in the intermediate and upper estimates. It has been assumed that any additional survey costs associated with the Inner Hebrides Carbonate Production Area in Sea of Hebrides pMPA would be required as part of the protection of Priority Marine Features and hence are not included in this assessment.

Table 6 Potential cost impacts to the finfish aquaculture sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	9	71	107
Sea of the Hebrides pMPA	29	198	300
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	0	0	0
Total	39	269	407

4.2.2 The total estimated cost impacts vary across the three scenarios, with the lower scenario estimated cost approximately 10% of the intermediate estimate. The bulk of the cost in the intermediate and upper scenarios is driven by proposed management scenarios to replace ADDs with either cetacean-friendly ADDs (intermediate) or anti-predator nets (upper). Current sites which overlap with similar management measures proposed for the Inner Hebrides and the Minches SAC have been excluded, as costs have been considered under the applicable study for the SAC. The combined cost of £0.76m (Intermediate estimate, present value over 20 years (2019 to 2038) at 2019 prices) is minor relative to the annual turnover of the industry (approximately £765m in 2016[66]). However, this cost is relatively high per aquaculture site (approximately 3% of Scottish aquaculture sites are within SOH or NEL) and it is noted that salmon farming is an international industry subject to strong competition and any additional costs could affect both individual sites and the Scottish industry's competitiveness.

Aquaculture - shellfish

Potential quantified cost impacts to the shellfish aquaculture sector are summarised in

[66] Marine Scotland Science, 2017. Scottish fish farm production survey 2016. Available online at: https://www.gov.scot/Resource/0052/00524803.pdf

4.2.3 Table 7. The costs are primarily associated with additional assessments required to take account of the pMPA protected features. It has been assumed that any additional survey costs associated with the Inner Hebrides Carbonate Production Area in Sea of Hebrides pMPA would be required as part of the protection of Priority Marine Features and hence are not included in this assessment.

Table 7 Potential cost impacts to the shellfish aquaculture sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	9	9	9
Sea of the Hebrides pMPA	66	66	66
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	0	0	0
Total	**76**	**76**	**76**

4.2.4 The total estimated cost impacts are the same for all three scenarios. The combined cost of £0.076m (Intermediate estimate, present value over 20 years (2019 to 2038) at 2019 prices) is minor relative to the annual turnover of the industry (approximately £12.4m in 2017[67]).

Carbon capture and storage

4.2.5 Potential quantified cost impacts to the carbon capture and storage sector are summarised in Table 8. There is currently only one proposed carbon capture and storage project in Scottish waters — the ACT Acorn CCS project which will export carbon dioxide from via existing pipeline infrastructure for long-term storage in the Captain Sandstone saline aquifer 100km offshore. The proposed pipeline infrastructure for the ACT project would run through the STR pMPA (see Appendix A of the SEIA). Minor additional costs may be incurred under all scenarios in providing additional information to inform the assessment for the Marine Licence and other planning permissions to ensure that protected features are adequately protected during construction activity.

Table 8 Potential cost impacts to the carbon capture and storage sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	0	0	0
Sea of the Hebrides pMPA	0	0	0
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	5	5	554
Total	**5**	**5**	**554**

[67] Marine Scotland Science, 2018. Scottish Shellfish Farm Production Survey 2017. Available online at: https://beta.gov.scot/publications/scottish-shellfish-farm-production-survey-2017-9781788518703/.

4.2.6 There is potential for significant costs under the upper scenario, based on the potential for restricting survey effort to the winter (November to April). This is likely to have a knock on effect on costs by increasing the number of days of weather downtime for each survey.

4.2.7 It is possible that additional carbon capture and storage projects may come forward for consenting within the impact assessment period. Depending on the location and nature of such development this may mean that the quantified cost estimate will be an underestimate of the costs likely to be incurred over the period of the impact assessment.

4.2.8 There is also potential for the carbon capture and storage sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with any delays in consenting processes or deterrent to investment. These cost impacts have the potential to be greater than the quantified cost impacts identified in this assessment.

4.2.9 The total estimated costs are similar for the lower and intermediate scenario, based on additional assessment required for the single identified project. The upper scenario, however, is considerably higher (£554,000) due to the impact of potential weather delays on survey activities during the winter period. This figure is based on an approximate doubling of the time required for survey, and could potentially be higher or lower depending on the actual weather conditions experienced.

Coastal protection

4.2.10 Potential quantified cost impacts to the coastal protection and flood defence sector are summarised in Table 9. The costs are primarily associated with additional assessments required to take account of the pMPA protected features.

Table 9 Potential cost impacts to the coastal protection and flood defence sector (present value of total costs over 20 years, £000s)

Site	**Estimate**		
	Lower	Intermediate	Upper
North-East Lewis pMPA	16	16	16
Sea of the Hebrides pMPA	16	16	16
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	16	16	16
Total	**49**	**49**	**49**

4.2.11 The total estimated cost impacts are the same for all three scenarios. The combined cost of £0.05m (Intermediate estimate, present value over 20 years (2019 to 2038) at 2019 prices) is considered to be negligible, and unlikely to impact on maintenance or development of coastal protection or flood defence assets in or near the pMPAs.

Commercial fisheries

The proposed management scenarios could result in impacts on GVA as a result of a reduction in output (loss in value of landings). Potential impacts to GVA for the commercial fisheries sector are summarised in

4.2.12 Table 10. The equivalent figures expressed in terms of potential impacts on the annual value of landings affected are presented in Table 11. These impacts could arise as a result of reduced landings from areas in pMPAs where fishing effort would be restricted under the assessed management options for each site.

The total cost for all pMPAs of £2.1 million over 20 years (

4.2.13 Table 10, intermediate scenario, present value of direct and indirect GVA over 20 years at 2019 prices) is relatively small compared to the GVA of the fishing sector (£296 million annually, 2016[68]). This equates to an annual average value for affected landings of £266,000 per year (Table 11), compared to £557 million[69] landings for the Scottish fishing sector as a whole in 2016.

4.2.14 The estimated impacts are zero under the lower scenario and minor to moderate under the intermediate and upper scenarios. Under the intermediate and upper estimates, the impacts are mainly related to Southern Trench pMPA, where there is potential for a large impact on demersal trawls operating on burrowed mud (i.e. likely to be *Nephrops* trawls), particularly the over-12m sector, due to the restriction in mobile bottom gear effort across burrowed mud, which is an important *Nephrops* fishing ground.

4.2.15 Impacts under the intermediate and upper estimates are mainly in the Moray and Buchan regions, arising from Southern Trench pMPA.

[68] Marine Scotland, 2018. Scotland's Marine Economic Statistics. Published by The Scottish Government, October 2018. 77 pages. Available at: https://www.gov.scot/Resource/0054/00542012.pdf. Accessed 22/10/18.

[69] Scottish Government, 2017. Scottish Sea Fisheries Statistics 2016. Available at: https://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries. Accessed 22/10/2018.

Table 10 Potential GVA impacts to the commercial fisheries sector (direct effect and the combined direct and indirect effect) (present value of total GVA impact, £000s)

Site	Estimate (Direct GVA)			Estimate (Direct + Indirect GVA)		
	Lower	Inter-mediate	Upper	Lower	Inter-mediate	Upper
North-East Lewis pMPA	0	N.D.	N.D.	0	N.D.	N.D.
Sea of the Hebrides pMPA	0	16	25	0	23	36
Shiant East Bank pMPA	0	177	296	0	257	429
Southern Trench pMPA	0	1,288	2,570	0	1,864	3,721
Total	**0**	**1,481**	**2,892**	**0**	**2,144**	**4,187**

N.D. Value cannot be disclosed. Where data represent 5 or fewer individuals/vessels/companies, their value cannot be disclosed for data protection reasons.

Table 11 Potential annual average loss in value of landings for the commercial fisheries sector (£000s, 2019 prices)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	0	N.D.	N.D.
Sea of the Hebrides pMPA	0	2	4
Shiant East Bank pMPA	0	30	50
Southern Trench pMPA	0	234	467
Total	**0**	**266**	**521**

N.D. Value cannot be disclosed. Where data represent fewer than 5 individuals/vessels/companies, their value cannot be disclosed for data protection reasons.

4.2.16 Potential direct and indirect impacts on employment for the commercial fisheries sector are summarised in Table 12. These impacts arise as a result of the reduced landings and GVA impacts discussed above, which may have knock-on effects on employment in the catching sector (direct) and the upstream supply chain (indirect).

4.2.17 The total direct and indirect employment impact is between zero and 8 full-time equivalents (FTE) under the upper scenario, and 4 FTEs under the intermediate estimate.

4.2.18 Impacts mainly arise from the Moray and Buchan regions (3.5 FTE under the intermediate estimate) from the Southern Trench pMPA, followed by North Minch (0.5 FTE) from the Shiant East Bank pMPA. Under the upper scenario, the impacts arise from the same regions, with 0.1 FTE impact also arising from Sea of the Hebrides pMPA, which straddles both North Minch and South Minch regions.

Table 12. Potential direct and indirect employment impacts to the commercial fisheries sector (full-time equivalents)

Site	Estimate (Direct and Indirect FTEs)			Estimate (Direct, Indirect and Induced FTEs)		
	Lower	Inter-mediate	Upper	Lower	Inter-mediate	Upper
North-East Lewis pMPA	0.0	N.D.	N.D.	0.0	N.D.	N.D.
Sea of the Hebrides pMPA	0.0	0.0	0.1	0.0	0.1	0.1
Shiant East Bank pMPA	0.0	0.5	0.8	0.0	0.5	0.8
Southern Trench pMPA	0.0	3.5	7.1	0.0	3.8	7.6
Total	**0.0**	**4.0**	**7.9**	**0.0**	**4.4**	**8.5**

N.D. Value cannot be disclosed. Where data represent fewer than 5 individuals/vessels/companies, their value cannot be disclosed for data protection reasons.

Energy generation

4.2.19 Potential quantified cost impacts to the energy generation sector are summarised in Table 13. The potential cost impacts identified relate exclusively to the offshore wind sector. The only identified cost impact relates to seasonal restrictions on future survey of the export cable for the Moray East offshore wind farm.

4.2.20 It should be noted that further offshore renewables development is likely to come forward for licensing during the period of the impact assessment, including offshore wind, wave and tidal developments. However, the location and nature of such development is uncertain, with draft plan option areas yet to be defined for offshore wind and the development of tidal and wave energy in Scotland has been slow to begin. It has therefore not been possible to make a meaningful assessment of potential impacts. This means that the cost estimate may be an underestimate of the costs likely to be incurred over the period of the impact assessment.

4.2.21 It is noted, however, that the potential restriction on development within the shark awareness zones within SOH, overlaps with a draft plan option area for wave energy identified in the Sectoral Marine Plan for Wave Energy. While there are no current plans for development, this could be considered an opportunity cost for the industry should development of the area be prevented.

4.2.22 There is also potential for the offshore renewables sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with any delays in the consenting processes or deterrent to investment. The extent to which these impacts might arise as a result of the pMPA designations is unknown.

Table 13. Potential cost impacts to the energy generation sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	0	0	0
Sea of the Hebrides pMPA	0	0	0
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	0	0	548
Total	**0**	**0**	**548**

4.2.23 The only quantified cost arising from the designation and management of the pMPAs to the energy generation sector are related to seasonal restrictions on the survey of submarine export cables within the STR pMPA. This cost (£548,000) is minor relative to the capital expenditure associated with the construction, operation and maintenance of the offshore wind farm which has been estimated to be around £6bn[70].

Military activities

4.2.24 Potential cost impacts to military activities at a national level are summarised in Table 14.

4.2.25 The costs are estimated to be the same in each scenario. The costs relate to the need for the Ministry of Defence (MoD) to amend and update its Marine Environment and Sustainability Assessment Tool (MESAT) (and other MoD environmental tools) together with subsequent costs to maintain and comply with these updates. The assessment has been made at a national level because it is not possible to assign these costs to individual site proposals.

Table 14. Potential cost impacts to military activities (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
National assessment	195	195	195
Total	**195**	**195**	**195**

[70] BVG Associates, 2011. Wave and tidal energy in the Pentland Firth and Orkney waters: How the projects could be built. A report commissioned by The Crown Estate and prepared by BVG Associates. May 2011.

Oil and gas

4.2.26 Potential quantified cost impacts to the oil and gas sector are summarised in Table 15. The cost estimates have only identified any cost to the oil and gas industry in the upper scenario in STR, based on seasonal restrictions for survey of current pipeline infrastructure, originating from St Fergus and Peterhead.

4.2.27 There is also potential for the oil and gas sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with any delays in consenting processes or deterrent to investment, and additional costs associated with any future pipeline construction and subsequent survey in the pMPAs.

Table 15. Potential cost impacts to the oil and gas sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	0	0	0
Sea of the Hebrides pMPA	0	0	0
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	0	0	7,502
Total	**0**	**0**	**7,502**

Ports and harbours

4.2.28 Potential cost impacts to the ports and harbours sector are summarised in Table 16. The quantified costs are primarily associated with additional assessment of marine licence applications for port development or dredge material disposal licence renewals together with possible requirements for additional monitoring to test environmental impact assessment predictions in relation to major port development proposals. Some minor costs may also be incurred in developing and distributing notices to mariners to disseminate information regarding speed restrictions in shark awareness zones within SOH in the upper scenario.

4.2.29 There is also potential for ports to experience other cost impacts which have not been quantified in this assessment. These include the potential for consequential impacts to ports and harbours revenues associated with reductions in activity by other marine sectors, for example, commercial fisheries and energy generation, as well as the impact of any delays in consenting processes or deterrent to investment. The extent to which such impacts might arise is very uncertain and it has therefore not been possible to quantify such costs within the impact assessment.

Table 16. Potential cost impacts to the ports and harbour sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	**Intermediate**	**Upper**
North-East Lewis pMPA	27	27	27
Sea of the Hebrides pMPA	59	59	62
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	92	92	92
Total	**179**	**179**	**182**

4.2.30 The total estimated cost impacts are similar for all three scenarios. The combined cost of £0.18m (Intermediate estimate, present value over 20 years (2019 to 2038) at 2019 prices) is minor relative to the annual turnover of the industry (approximately £598m in 2015[71]).

Power interconnectors and transmission lines

Potential quantified cost impacts to the power interconnectors and transmission lines sector are summarised in

[71] Marine Scotland Science, 2018. Scottish Shellfish Farm Production Survey 2017. Available online at: https://beta.gov.scot/publications/scottish-shellfish-farm-production-survey-2017-9781788518703/.

4.2.31 Table 21. Cost impacts are only anticipated to occur in relation to the NEL and STR pMPAs. The potential costs are associated with the future assessment and subsequent construction and monitoring of the Western Isles HVDC (NEL) and the construction and monitoring of the Caithness to Moray transmission reinforcement (STR).

4.2.32 There is also potential for the power interconnectors and transmission lines sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with future as yet unidentified power cable projects, the impact of any delays in consenting processes or deterrent to investment. These cost impacts have the potential to be greater than the quantified cost impacts identified in this assessment.

4.2.33 The current route for the Western Isles HVDC has been reviewed and is assumed not to transect SEB. Therefore, there are assumed to be no costs derived from re-routing the cable to avoid northern sea fan and sponge communities.

Table 17. Potential cost impacts to the power interconnectors and transmission lines sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	6	6	478
Sea of the Hebrides pMPA	0	0	0
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	0	0	588
Total	**6**	**6**	**1,066**

4.2.34 The potential costs associated with the low and intermediate scenarios are limited to assessment of the Western Isles HVDC route in NEL and are considered negligible. In the upper scenario, however, the combined costs over the 20 year assessment period of £1.07 million is based on the seasonal restriction on survey activities to the winter months, and the subsequent likely additional weather downtime associated with the requirement to survey the cable routes regularly.

Recreational boating

4.2.35 Potential quantified cost impacts to the recreational boating sector are summarised in Table 18. There are no predicted costs under the low and intermediate scenarios and only minimal costs under the upper scenario. This minor cost relates to a possible need for the Royal Yachting Association Scotland (RYA) to disseminate information to members regarding potential speed restrictions in the shark awareness zones. It has been assumed that implementation of the speed restrictions will not impose any significant costs on recreational boaters or their supply chains.

Table 18. Potential cost impacts to the recreational boating sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	0	0	0
Sea of the Hebrides pMPA	0	0	1
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	0	0	0
Total	**0**	**0**	**1**

Shipping

4.2.36 Potential cost impacts to the shipping sector are summarised in Table 19. Cost impacts are only anticipated to occur in relation to the Sea of Hebrides MPA.

4.2.37 There are no predicted costs under the lower and intermediate scenarios. Within the Sea of Hebrides pMPA minimal cost impacts (£1,000) may arise under the upper scenarios associated with a requirement for the UKHO to update nautical charts and disseminate information regarding the potential shark awareness zones.

4.2.38 Due to the small size of the shark awareness zones and the exclusion of ferry traffic from the restrictions there is assumed to be no cost to the shipping industry associated with implementation of the speed restrictions.

Table 19. Potential cost impacts to the shipping sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	0	0	0
Sea of the Hebrides pMPA	0	0	1
Shiant East Bank pMPA	0	0	0
Southern Trench pMPA	0	0	0
Total	**0**	**0**	**1**

Telecom cables

4.2.39 Potential quantified cost impacts to the telecom cables sector are summarised in Table 20. The identified costs relate to potential replacement of existing telecom cables within the period of IA and the need for assessment of any impacts to protected features (within 12nm of the territorial baseline), where cable routes transect MPA habitat features. For one site, Shiant East Bank, it has been assumed that it may be necessary to route the cable around specific habitat features under the upper scenario.

4.2.40 There is also potential for the telecom cables sector to experience other cost impacts which have not been quantified in this assessment. These include cost impacts associated with future as yet unidentified telecom cable projects, the impact of any delays in consenting processes or deterrent to investment. These cost impacts have the potential to be greater than the quantified cost impacts identified in this assessment.

Table 20. Potential cost impacts to the telecom cables sector (present value of total costs over 20 years, £000s)

Site	Estimate		
	Lower	Intermediate	Upper
North-East Lewis pMPA	4	4	4
Sea of the Hebrides pMPA	4	4	4
Shiant East Bank pMPA	4	4	319
Southern Trench pMPA	4	4	4
Total	**16**	**16**	**331**

4.2.41 The cost associated with additional assessment is applicable across all three scenarios, and therefore the lower and intermediate scenarios have the same cost estimate (£16,000). Potentially larger costs could be incurred in the upper scenario for Shiant East Bank pMPA if telecom cables needed to be re-routed to avoid sensitive habitat features, and therefore the combined cost over 20 years for the upper scenario is £0.33 million.

Tourism

4.2.42 There are no costs associated with the implementation of management scenarios to the tourism industry, as the industry is assumed to currently follow best practice measures, and the restriction of vessel speeds in shark awareness zones is assumed to be integrated with no associated cost to industry, particularly where tourism activities are actively aimed at viewing basking sharks as a target species.

Water sports

4.2.43 There are no costs associated with the implementation of management scenarios to the water sports sector, as the sector is assumed to currently follow best practice measures, and the restriction of vessel speeds in shark awareness zones is assumed to be integrated with no associated cost.

4.3 People, Population and Health

4.3.1 This section summarises the potential distributional and social impacts of the proposed management scenarios that could arise from impacts on other marine activities. It also includes potential costs to government, as these are costs borne by society. More detail on this analysis can be found in the SEIA[72].

[72] Marine Scotland (2018). Socio-Economic Impact Assessment for Proposed Marine Protected Areas, February 2019.

4.3.2 This section additionally summarises the review of potential impacts / benefits on ecosystem services.

Economic Importance of the Commercial Fishing Sector

4.3.3 The designation of the entire suite of proposed pMPAs is estimated to:

- Reduce the average annual value of output landed by the commercial fisheries sector by between £0m and £0.5m;
- Reduce GVA (direct and indirect) over the 20 year assessment period by £0 to £4.2 million (present value); and
- Reduce the average (mean number of jobs, direct, indirect and induced) by between 0 FTEs and 9 FTEs.

4.3.4 The range reflects the different management options and assumptions assessed across the estimates.

Distribution of Economic Costs

4.3.5

4.3.6 Table 21 presents the annual loss of landings affected by region and home port of the vessels affected, providing an indication of where employment impacts may fall. It covers all sizes of vessels – those greater than 12m and less than 12m. Over 90% of the impacts are on over-12m vessels in both the intermediate and upper scenarios. There are no estimated impacts for either over-12m or under-12m vessels in the lower scenario.

4.3.7

4.3.8 Table 21 and Table 22 show that:

- The expected costs of the proposed management scenarios are predominantly on the East Coast (in the Moray region). It is estimated that over 70% of the total landings lost in Scotland due to all combined management scenarios across the sites would be lost from Fraserburgh. Losses at Stornoway, Buckie, Mallaig, Campbeltown and Ullapool would be between 3-4% of the landings lost in Scotland due to all management scenarios. Note these totals are not the percentage of landings lost at the respective ports.
- A similar pattern of impacts arises under the upper estimate, but with a greater proportion of impacts at Fraserburgh (nearly 80%), and lower proportions at Campbeltown and Ullapool (2%).

Table 21. Annual average value (£000) of landings affected by region and home port of vessels affected, 2019 prices

Home Fishing Region/Port		Scenarios		
		Lower	Intermediate	Upper
		Total value of landings affected at port		
Buchan	Aberdeen	0	N.D.	N.D.
	Peterhead	0	6	13
	Buchan total:	0	6	13
Clyde	Ayr	0	0	1
	Campbeltown	0	7	9
	Clyde total:	**0**	**8**	**10**
Clyde and South Minch	Oban	0	1	2
	Clyde and South Minch total:	**0**	**1**	**2**
Forth	Eyemouth	0	0	1
	Pittenweem	0	N.D.	N.D.
	Forth total:	**0**	**0**	**1**
Moray	Buckie	0	9	18
	Fraserburgh	0	206	412
	Moray total:	**0**	**215**	**430**
North Minch	Kinlochbervie	0	1	1
	Lochinver	0	N.D.	N.D.
	Stornoway	0	10	20
	Ullapool	0	7	12
	North Minch total:	**0**	**18**	**33**
Northern Isles	Kirkwall	0	0	1
	Scrabster	0	0	0
	Lerwick	0	N.D.	N.D.
	Northern Isles total:	**0**	**1**	**1**
South Minch	Mallaig	0	9	17
	Portree	0	3	5
	South Minch total:	**0**	**12**	**22**
Other UK Ports		0	4	8
TOTAL		**0**	**266**	**521**

N.D. Value cannot be disclosed. Where data represent fewer than 5 individuals/vessels/companies, their value cannot be disclosed for data protection reasons.

Table 22. Distribution of total landings affected across all sites, by region and home port of vessels

Home Fishing Region/Port		Scenarios		
		Lower	Intermediate	Upper
		As % of total value of landings affected across all ports		
Buchan	Aberdeen		N.D	N.D.
	Peterhead		2%	2%
	Buchan total:		**2%**	**2%**
Clyde	Ayr		0%	0%
	Campbeltown		3%	2%
	Clyde total:		**3%**	**2%**
Clyde and South Minch	Oban		1%	0%
	Clyde and South Minch total:		**1%**	**0%**
Forth	Eyemouth		0%	0%
	Pittenweem		N.D.	N.D.
	Forth total:		**0%**	**0%**
Moray	Buckie		3%	3%
	Fraserburgh		77%	79%
	Moray total:		**81%**	**82%**
North Minch	Kinlochbervie		0%	0%
	Lochinver		N.D.	N.D.
	Stornoway		4%	4%
	Ullapool		3%	2%
	North Minch total:		**7%**	**6%**
Northern Isles	Kirkwall		0%	0%
	Scrabster		0%	0%
	Lerwick		N.D.	N.D.
	Northern Isles total:		**0%**	**0%**
South Minch	Mallaig		3%	3%
	Portree		1%	1%
	South Minch total:		**4%**	**4%**
Other UK Ports			2%	2%
TOTAL		**0%**	**100%**	**100%**

N.D. Value cannot be disclosed. Where data represent fewer than 5 individuals/vessels/companies, their value cannot be disclosed for data protection reasons.

4.3.9 The value of landings lost as a result of the proposed management scenarios represents a very small proportion of total landings by home port

for the large majority of Scotland's districts and ports affected for the intermediate and upper estimates.

4.3.10 The largest impacts under the upper estimate affect the same ports as mentioned above. The scale of job losses at Fraserburgh is potentially significant, and is estimated to be 3 to 6 jobs at risk under the intermediate and upper estimates, at worst a 1% reduction in the local fishing workforce. This worst-case upper estimate could result in social impacts for the local community.

Consequential Social Impacts

4.3.11 Further potential social impacts in the local communities affected, such as on culture, heritage, crime, health education access to services, or changes to the local environment are not considered likely to occur.

Ecosystem Services Impacts

4.3.12 The ecosystem services changes expected from the proposed management scenarios produce a variety of benefits to people. An attempt can be made to identify the economic value of these benefits. However, much of the valuation evidence available is uncertain, and the evidence base has very significant gaps. When combined with the uncertainties over the levels of ecosystem services changes, this makes accurate valuation of the full benefits of the management scenarios difficult. The timing of realisation of benefits is also uncertain.

4.3.13 In order to gauge the ecosystem services accruing from marine protected areas, relevant valuation literature has been assessed including a recent review prepared as part of the NEA Follow-On project Marine chapter[73] and Turner and Schaafsma[74].This section considers additional values from individual MPAs.

Provisioning Services

4.3.14 By their very nature provisioning services are those services most closely tied to the market economy. Goods (fish, shellfish, oil, gas) from marine ecosystems are sold in existing markets and so have a market value: the total value of Scottish fish landings was £560 million in 2017[75]. Such market values do not include the externalities of extracting the good from the ecosystem.

4.3.15 It is reasonable to assume that protection by the proposed management scenarios of features in MPAs that are important for fish and shellfish

[73] Austen, M., Malcolm, S., Frost, M., Hattam, C., Mangi, S., Stentiford, G., 2011. Marine. In: The UK National Ecosystem Assessment Technical Report. UK National Ecosystem Assessment. Cambridge: UNEP-WCMC.

[74] R.K. Turner and M. Schaafsma eds (2015) Coastal Zone Ecosystem Services, ch 6, Springer, Switzerland.

[75] Scottish Government (2018). Scottish Sea Fisheries Statistics 2017. Available at: https://www.gov.scot/publications/scottish-sea-fisheries-statistics-2017/

lifecycles (e.g. bivalves, seagrass in the Inner Hebrides Carbonate Production Area) could increase the health and size of stocks. This will benefit commercial fisheries in surrounding areas, but it is not possible to quantify this likely benefit.

4.3.16 Other provisioning services are also difficult to quantify, particularly at a site level. For example, Potts *et al.*[76] identified medicines and blue biotechnology as an important marine service. However, apart from horse mussels, they could only cite expert opinion on the importance of a range of habitats and species for this benefit.

Regulating Services

4.3.17 Marine regulating ecosystem services provide some essential functions. For example, carbon sequestration and storage in the marine environment helps regulate the global climate. Marine regulating services are generally difficult to quantify in scientific terms and therefore are difficult to value in monetary terms. Given the size of habitat features and management scenarios being considered, the value of impacts of the proposed management scenarios on regulating services are not expected to be high.

Cultural Services

4.3.18 The majority of cultural services from the marine environment are dependent on the quality of the marine environment, which is likely to be enhanced (or is less likely to be degraded) by the proposed management scenarios. However, the extent of this improvement is very hard to predict.

4.3.19 Cultural services and non-use values are classified in different ways in different marine ecosystem services studies. The main evidence available relates to non-use value for biodiversity (see below) and use values for recreation, therefore the following analysis looks at these two areas in detail. Other cultural services, such as the value of research and education, are hard to quantify or value either in total or in terms of the expected changes from management scenarios. However, they could be significant if sites are subject to long-term research studies.

Recreation and Tourism

4.3.20 The marine environment provides a location for recreational activities and tourism, with many if not all activities to some extent linked to the quality of the marine environment. Much ‘marine’ recreation activity relates to beaches, and therefore is not always relevant to the expected impacts of MPA management. However, some valuation evidence for marine recreation and tourism is available. This data is estimated from the expenditure of individuals on a particular marine recreation activity (Prof. Kerry Turner,

[76] Potts T, Burdon D, Jackson E, Atkins J, Saunders J, Hastings E, Langmead O., 2014. Do marine protected areas deliver flows of ecosystem services to support human welfare? *Marine Policy* 44; 139–148.

University of East Anglia, pers. comm.). Only one study, by Lawrence[77], has a value of a change in the condition of the marine environment which might reflect the changes expected from MPAs. The other studies estimate the total expenditures on activities, and therefore only give an indication of the scale of the values which might change due to the impacts of management measures.

4.3.21 The lack of published valuation studies showing the effects of MPA management on marine nature-based recreational activities found in the UK (or similar locations) is a limitation in understanding what impacts the proposed management scenarios will have on recreational users. This in turn restricts the ability to identify socio-economic benefits from increased recreation activity as a result of management of the sites.

4.3.22 Evidence from the socio-economic monitoring of MPAs[78] suggested that a number of tourism and recreation initiatives were under development following the designation of MPAs. However, as with impacts on the fishing sector, it is too early for the socio-economic consequences of these initiatives to be identified.

4.3.23 It should be noted that any socio-economic benefits associated with recreation and tourism will occur in coastal, often remote communities. These communities may be the same as those where many of the costs identified in paragraphs 4.3.5 to 4.3.8.

Supporting Services

4.3.24 Supporting services, such as nutrient production, are perhaps the most critical set of services provided by features in MPAs. Supporting services underpin all other ecosystem services, and therefore few studies are able to extract the contribution and therefore value of each ecosystem process. Valuing supporting ecosystem services brings a significant risk of double-counting, as they support the provisioning, regulating and cultural services from MPA sites discussed above. However, not valuing supporting services also brings a risk of under-valuing benefits if MPA management measures increase supporting services that give rise to final ecosystem services outside site boundaries, and these values are not captured because the available evidence is applied only to changes in final services inside the boundaries.

Total Economic Value

4.3.25 As well as limited evidence on the value of different ecosystem services, there are studies that attempt to estimate the total value of the protection of the marine environment. They are not directly relevant to the value of the

[77] Lawrence, K.S. (2005) Assessing the value of recreational sea angling in South West England. *Fisheries Management and Ecology* 12: 369–375.

[78] Marine Scotland Science, 2017. Scotland Marine Protected Areas Socioeconomic Monitoring. 2016 Report. Marine Analytical Unit, Marine Scotland Science, Scottish Government. Available online at http://www.gov.scot/Resource/0051/00514589.pdf. Accessed 19 April 2018.

proposed management scenarios being considered, as they generally relate to the existence of marine protected areas, rather than the introduction of management measures within existing sites.

4.3.26 An international study by Brander *et al.*[79] concluded that the benefits to people of expanding MPAs generally outweighed the costs. They considered the benefits of protection based on a meta-analysis of values. Their meta-analysis function could be used to estimate the benefits of the Scottish MPA network, but not of the proposed management scenarios being assessed.

4.3.27 A study by Gubbay[80] reviewed the evidence for benefits of MPAs set up for the conservation of marine biodiversity. They found some direct evidence that MPAs can protect and enhance ecosystem services comes from situations where habitats and species protected by MPAs are known to provide specific services. They concluded that highly protected MPAs lead to overwhelming positive effects on biodiversity (i.e. higher densities, biomass, size and diversity of certain species or groups of species). There is some evidence of positive species community effects such as greater complexity of food webs and increased primary and secondary productivity in MPAs as a consequence of protection.

4.3.28 The extent to which the non-use values identified in the McVittie and Moran[81] study are relevant to the proposed management scenarios in MPAs is related to the contribution that the measures will make to halting marine biodiversity loss. As a result, the site assessments in this study mainly identify moderate non-use values for the MPAs, with a low-moderate level of confidence. For the four sites, there are charismatic species and features that contribute to marine foodwebs, so the non-use value is assessed as moderate-high.

4.3.29 In large part, this conclusion is due to the uncertainties in how ecosystem services will change with respect to management scenarios. The assessment of benefits has focussed on the changes to ecosystem services that are expected to result from the proposed management scenarios. While the sites undoubtedly support a considerable range and value of ecosystem services, evidence on the baseline contribution of the site features to these ecosystem services, and on the expected nature of these changes in scientific or economic terms, is extremely sparse. As a result, the assessment of changes in ecosystem services at individual sites (see Table 9a in Site Reports, Appendix C of the SEIA) is uncertain.

[79] Brander *et al.,* 2015. The benefits to people of expanding Marine Protected Areas. IVM Institute for Environmental Studies.

[80] Gubbay, S., 2006. Marine Protected Areas. A review of their use for delivering marine biodiversity benefits. English Nature Research Reports, No 688.

[81] McVittie, A., & Moran, D., 2008. Determining monetary values for use and non-use goods and services: Marine Biodiversity–primary valuation. Final Report to Defra.

4.3.30 The potential direct and indirect impact on GVA is a reduction between £0 (lower estimate), £2.1 million (intermediate estimate) and £4.2 million (upper estimate) over the study period (present value over 20 years, 2019 prices), associated with potential reductions in output from commercial fishing, which may have knock-on impacts on the fish processing industry. This is lower than the estimated non-use values of the sites in Kenter *et al*.[82] which assess:

- the benefits of designating each site as several £millions, with a total of over £20 million; and
- the benefit of implementing the proposed management scenarios as at least £5 million in total for the four sites.

4.3.31 However, it should be noted that there is a high level of uncertainty in using these values.

4.4 Limitations and Uncertainties in the Assessment

4.4.1 There are limitations and uncertainties data used to underpin assessment of fisheries impacts. Full explanation of the uncertainties is contained within the SEIA. The key limitations and uncertainties are related to distribution of activity of under-12m vessels from ScotMap; limitations in vessel monitoring system data for over-12m vessels; classification of gear types; extent of displacement of fishing effort rather than loss in the value of landings, and its environmental impacts; potential changes trends in future activity and landings; and changes to fishing patterns in the last five years from implementation of Phase 1 MPA management measures.

4.4.2 A variety of assumptions have been used in order to develop costs to the other sectors. These assumptions have been based, where possible, on available evidence or industry experience, the rationale for which is reported in the SEIA. However, these assumptions introduce limitations in the confidence of the assessments. Specifically, uncertainties in the location and nature of future activity in the marine environment introduce an uncertainty in the estimation of costs and benefits reported.

4.4.3 The application of multipliers to estimate indirect GVA impacts and employment impacts, based on national multipliers applied at a site and gear specific level, introduces some uncertainty and does not account for the potential for reductions in output to be offset by increases in prices due to a reduction in supply.

[82] Kenter, J.O., Bryce, R., Davies, A., Jobstvogt, N., Watson, V., Ranger, S., Solandt, J.L., Duncan, C., Christie, M., Crump, H., Irvine, K.N., Pinard, M. & Reed, M.S., (2013). The value of potential marine protected areas in the UK to divers and sea anglers. UNEP-WCMC, Cambridge, UK.

4.4.4 In general, there is moderate uncertainty on the extent of ecosystem service impacts, although this varies across services and sites. There is high uncertainty in the monetary valuation of these benefits, and robust values are not available to support cost-benefit analysis.

5 Next Steps

5.1.1 The consultation on the SEA Environmental Report, SEIA and Sustainability Appraisal is now open. Views and opinions on this are now invited and should be provided by 30 August 2019.

5.1.2 Please respond to the consultation online at: https://consult.gov.scot/marine-scotland/four-new-marine-protected-areas

5.1.3 Following the consultation period, the responses received will be analysed, and a Post-Adoption Statement will be prepared. The Post-Adoption Statement will explain how issues raised in the assessments, and associated views in response to the consultation, have been addressed.

5.1.4 If you have any enquiries please contact: Marine_Conservation@gov.scot

5.1.5 Or send your inquiry by post to:

pMPA Consultation
Scottish Government
Marine Planning and Policy Division
Area 1-A South
Victoria Quay
Edinburgh
EH6 6QQ

Appendix A Abbreviations

BRIA	Business and Regulatory Impact Assessment
CCS	Carbon Capture and Storage
EC	European community
ER	Environmental Report
ES	Ecosystem Services
GDP	Gross Domestic Product
GES	Good Environmental Status
GVA	Gross Value Added
HVDC	High Voltage Direct Current
IA	Impact Assessment
JNCC	Joint Nature Conservation Committee
MESAT	Marine Environment and Sustainability Assessment Tool
MoD	Ministry of Defence
MPA	Marine Protected Area
NEA	National Ecosystem Assessment
NEL	North-east Lewis
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic (Oslo/Paris)
pMPA	proposed Marine Protected Area
RYA	Royal Yachting Association
SA	Sustainability Appraisal
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SEB	Shiant East Bank
SEIA	Socio-Economic Impact Assessment
SMWWC	Scottish Marine Wildlife Watching Code
SNH	Scottish Natural Heritage
SOH	Sea of the Hebrides
SSSI	Site of Special Scientific Interest
STR	Southern Trench
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
VMS	Vessel Monitoring System
WISE	Wildlife Safe

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