License Application for sustainable hand-harvesting of *Ascophyllum nodosum* in Kenmare Bay.

Appendix 5:
Impact assessment of *A. nodosum* harvesting activities in Kenmare Bay.

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Contents

1. Introduction

This document provides a detailed impact assessment of the proposed *A. nodosum* harvesting activities in Kenmare Bay, covering various aspects of the receiving environment and the conservation requirements of the SAC. Section 2 includes a detailed description of the following:

- Description of the receiving environment
- Summary of qualifying interests, conservation objectives and requirements
- Description of conservation objectives: Marine habitats and species.
- Description of conservation objectives: Coastal habitats.
- Conservation objectives: Otters and Birds.
- Species & habitats of general interest
- *A. nodosum* Biotope and species therein
- Continual disturbance, broad, cumulative and in combinational effects and spread of invasive species.

Section 3 of this document includes a detailed assessment of the likely effects of hand harvesting with regard to the above, and includes details of control measures, monitoring & corrective actions where required. Section 4 of this document provides further details of the risk evaluation system employed in this assessment, along with detailed explanations as to the scientific reasoning behind each decision made and scores assigned.

2. Receiving environment and conservation requirements

2.1. Overview

This section describes several important aspects to the Kenmare Bay area, (a) providing a description of the receiving environment and (b) focusing primarily on the protected species, qualifying interests and conservation objectives of the NPWS. In addition, several other important aspects are described including species and habitats within the region in general and those within the *Ascophyllum nodosum* biotope. Details of habitats and species and conservation objectives where applicable, are outlined throughout this section. On this basis, a risk assessment was carried out by scientists at BioAtlantis. This allowed for the development of a harvesting system which ensures minimal impact on protected species and habitats in the SAC. Details of this assessment and associated control measures, monitoring and corrective actions are provided in Section 3. As a number of moderate risks were identified, the potential requirement for a Natura Impact Statement (NIS) was considered, along with appropriate mitigation measures. The NIS was subsequently prepared by Ecofact Environmental Consultants Ltd. and is attached as a stand-alone document to this application.
The conservation objectives for qualifying interests in the Kenmare Bay areas as identified by BioAtlantis, are summarized below, along with details for other relevant habitats and species.

2.2. Description of the receiving environment

A synopsis of Kenmare River SAC and important sites therein, is provided below.

(a) Introduction:

Kenmare Bay has been assigned a status as an SAC. In addition, Kenmare River SAC also includes a number of SPAs and Proposed Natural Heritage Areas (pNHA):

- Iveragh Peninsula SPA (site code: 004154).
- Beara Peninsula SPA (site code: 004155).
- Deenish Island and Scariff Island SPA (site code:004175).
- Eyeries Island pNHA (site code: 1051).
- Spanish Island pNHA (site code:. 001378).
- Rossdohan Island pNHA (site code: 001375).
- Roughty River Estuary pNHA (site code: 0002092).

A number of important sites also located close to Kenmare River SAC include:

- Old Domestic Building, Dromore Wood SAC (Site Code 000353)
- Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342)
- Drongawn Lough SAC (site code: 002187)
- Glanmore Bog SAC (site code: 001879)
- Cleanderry Wood SAC (site code: 001043)
- Mucksna Wood SAC (site name: 001371)

The maps associated with this application highlight the areas directly and indirectly impacted by the proposed plan or Project, summarized as follows:

- Location of plan relevant to the surrounding regional and local environment (inc. Maps).
- Annex II (Harbour Seals) species hosted in the receiving area.
- Sites of relevance to wintering and breeding bird species (Annex I, E.U. Birds Directive)
- Operations/activities already existing in the receiving environment.

Characteristics of these sites are described as follows.

(b) Kenmare River SAC

Kenmare River SAC is characterised by an important complement of marine and terrestrial habitats, many of which are listed on Annex I of the E.U Habitats Directive (NPWS, 2013C), with a number of species that are listed on Annex II of this Directive. There are also populations of rare Red Data Book species, in addition to important ornithological interests in the area. Kenmare River SAC is a long and narrow and partially sheltered facing bay, facing the south west of Ireland. It represents an example of a drowned glacial valley, characteristically deep with bedrock of Old Red Sandstone forming reefs throughout. Some shelter is provided by the numerous islands and inlets along the length of the bay. A variety of habitats, communities and species occur in Kenmare River SAC, in different exposed coastal and ultra-sheltered areas. As the area has been designated an important SAC (site Code: 002158), there are several conservation objectives specified for many of these habitats and species. An overview of the various habitats and species in Kenmare River SAC is provided as follows, based largely on the site synopsis provided by the NPWS:

Natura Code	Species/Habitat
[1160]	Large Shallow Inlets and Bays
[1170]	Reefs
[8330]	Sea Caves

[1220] Perennial Vegetation of Stony Banks
[1230] Vegetated Sea Cliffs
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[2120] Marram Dunes (White Dunes)
[2130] Fixed Dunes (Grey Dunes)*[priority]
[4030] Dry Heath
[6130] Calaminarian Grassland
[1014] Narrow-mouthed Whorl Snail (*Vertigo angustior*)
[1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)
[1355] Otter (*Lutra lutra*)
[1365] Common (Harbour) Seal (*Phoca vitulina*)

- **Gravels and medium sands areas:** Sublittoral sediment in exposed areas is composed of coarse shelly sand and gravel forming small dunes frequently with sparse bivalves, including *Lutraria* sp.
- **Muddy sand areas:** Characterised by burrowing megafauna, including the Norwegian Prawn *(Nephrops norvegicus)*, the burrowing sea cucumber *Neopentadactlya mixta,* the burrowing anemone *Pachycerianthus multiplicatus,* burrowing brittlestars (e.g. *Ophiopsila annulosa, Amphiura securigera*). Red calcareous free living algae ('maerl' or 'coral') also occur.
- **Beach areas:** composed of coarse, mobile sand with sand hoppers and polychaete worms in the high and low shore respectively.
- **Sheltered cove areas, often backed by sand dunes:** characterised by sandhoppers (upper shore), Lugworm (*Arenicola marina;* mid shore) and Razor Shell (*Ensis arcuatus*) and the burrowing sea-urchin *Echinocardium cordatum* (lower shore).
- **Sea caves:** occur midway along the south coast of the SAC and support encrusting sponges, ascidians and bryozoans.
- **Littoral, infralittoral and circalittoral reef communities:** found at the extremely exposed area at the mouth of the SAC. The community composition varies according to depth and exposure along the length of the bay.
- **Rare, notable and uncommon species and communities:** only known site in Ireland for the Northern Sea-fan (*Swiftia pallida*) co-occurrence with and the Southern Sea-fan (*Eunicella verrucosa*) co-occur.
- **Salt meadows:** Found in areas from Derrynane Bay to Kilmakillogue Harbour. Five of 6 areas surveyed in detail to date are of the fringe type on peat. A bay type saltmarsh is located at Derrynane on mud on sand, also associated with a sand dune system. Species present include: Sea Rush (*Juncus maritimus*), Sea-milkwort (*Glaux maritima*), oraches (*Atriplex* spp.), Thrift, Red Fescue (*Festuca rubra*), Sea Plantain (*Plantago maritima*), Common Saltmarsh-grass (*Puccinellia maritima*) and Sea Aster (*Aster tripolium*).
- **Perennial vegetation of stony banks:** found at Pallas Harbour and Rossdohan Island and include the following species:. Thrift (*Armeria maritima*), Common Scurvygrass (*Cochlearia officinalis*), Rock Samphire (*Crithmum maritimum*) and Sea Campion (*Silene vulgaris* subsp. *maritima*).
- **Derrynane Bay area on the south side of the Iveragh Peninsula:** Several important species including: Dry heath including the rare Red Data Book species, Kerry Lily (*Simethis planifolia*), fixed dunes, Marram dunes, sea cliffs and salt meadows (both Atlantic and Mediterranean types). Kerry Lily is protected under the Flora (Protection) Order, 1999, and is restricted to the Kenmare River SAC area. Betony (*Stachys officinalis*), is also protected and is found on rocky knolls in the site.

Uncommon plant species of importance include: Chaffweed (*Anagallis minima*), Crowberry (*Empetrum nigrum*), Wild Madder (*Rubia peregrina*) and Roseroot (*Rhodiola rosea*).

- **Heath:** occurs along coastal strips, from sea level to the high slopes. Species associated with the heath habitat include: Heather (*Calluna vulgaris*), Western Gorse (*Ulex gallii*), Bell Heather (*Erica cinerea*), Gorse (*Ulex europaeus*), Bracken (*Pteridium aquilinum*), Bilberry (*Vaccinium myrtillus*), Sheep's-bit (*Jasione montana*), Creeping Willow (*Salix repens*), Mat-grass (*Nardus stricta*), Purple Moor-grass (*Molinia caerulea*), Juniper (*Juniperus communis*), Burnet Rose (*Rosa pimpinellifolia*) and the protected Kerry Lily and Betony are components of the heath.
- **Sea cliffs:** occur throughout the site, are often vegetated and support plant species including: Thrift, Sea Campion, Rock Sea-spurrey (*Spergularia rupicola*), Rock Samphire and Sea Spleenwort (*Asplenium marinum*).
- **Calaminarian grassland:** occurs in association with old mine workings at Allihies. The habitat includes a range of rare bryophytes.
- **Fixed dune:** found in Derrynane, on the northern shores. Common species include: Red Fescue, Common Bird's-foot-trefoil (*Lotus corniculatus*), Smooth Meadow-grass (*Poa pratensis*), Lady's Bedstraw (*Galium verum*), Bulbous Buttercup (*Ranunculus bulbosus*), Ribwort Plantain (*Plantago lanceolata*), *Homalothecium lutescens, Rhytidiadelphus squarrosus* and *Hypnum cupressiforme.*
- **White dune:** The mouth of Derrynane hosts an extensive area of white dune dominated by Marram (*Ammophila arenaria*). Species such as Sea Bindweed (*Calystegia soldanella*), Ribwort Plantain, Yorkshire-fog (*Holcus lanatus*), Red Fescue, Sea-holly (*Eryngium maritimum*), Portland Spurge (*Euphorbia portlandica*), Kidney Vetch (*Anthyllis vulneraria*) and Common Ragwort (*Senecio jacobaea)*.
- **Harbour seal and otter:** a population of ~n=391 harbour seals is present. The seals occupy rocky islets near Sneem, Templenoe and Castle Cove, Brennel Island, Illaunsillagh, Kilmakillogue Harbour and Ballycrovane Harbour. Otter also use the site. Both species are listed on Annex II of the E.U. Habitats Directive.
- **Lesser Horseshoe Bat:** 2 internationally important roosts for this Annex II species are found at the site. N=100 hibernating bats were recorded in a souterrain near Dunkerron in 2001. Over 100 bats have been counted in a two-storey cottage near Killaha.
- **Narrow-Mouthed Whorl Snail (*Vertigo angustior*):** found in damp slacks amongst the sand dunes at Derrynane.
- **Natterjack Toad:** This nationally endangered and protected Red Data Book species is present in the area, established following a re-introduction programme.
- **Birds:** Common/Arctic Tern (95+ pairs in 2008) have been recorded breeding on rocky islands in Derrynane Bay, Eyeries Island, Spanish Island and Brennel Island. Little Tern bred in the past and Sandwich Tern occasionally breed.

Potential impacts to the SAC:

- Aquaculture, fishing, dumping of wastes and water pollution are the principal threats to the nature conservation interests of Kenmare River.
- Resorts for water sports, popular beaches, recreational activities.
- Bait digging.
- Housing developments in dry heath areas.
- Disturbance to vulnerable seals and bats.
- Grazing at Derrynane near dune habitats and potential effects on rare species therein.

The maps associated with this application highlight the area directly and indirectly impacted by the proposed plan, summarized as follows:

- Location of plan relevant to the surrounding regional and local environment (inc. Maps).
- Likely location of Annex I habitats.
- Annex II (Harbour Seals) species hosted in the receiving area.
- Sites of relevance to wintering and breeding bird species (Annex I, E.U. Birds Directive)
- Operations/activities already existing in the receiving environment.

(c) Iveragh Peninsula SPA (site code: 004154)

- **Site description:** a large site situated on the west coast of Co. Kerry, encompassing high coast, sea cliff sections and land adjacent to the cliff edge (NPWS, 2015F). It ranges from west of Rossbehy in the north, to the end of the peninsula at Valencia Island and Bolus Head, and eastwards towards Lamb's Head. The site also includes sand dune areas at Beginish and Derrynane. The seaward boundary is largely marked by the high water mark. The site contains Devonian sandstones, siltstones and mudstones, with small areas of igneous rocks (dolerite and gabbro) at Beginish and the nearby shore.
- **Vegetated sea cliffs:** occur throughout the site and support a range plant species including Thrift (*Armeria maritima*), Sea Campion (*Silene vulgaris* subsp*. maritima*), Sea Spleenwort (*Asplenium marinum*) and Rock Sea-spurry (*Spergularia rupicola*). The cliff-tops supports coastal grassland or health. The site also includes areas of dry heath, wet heath, upland acid grassland, dense Bracken (*Pteridium aquilinum*), semi-improved and improved pasture grassland, dune grassland, streams, bedrock shores and islets.
- **Birds:** The site is an SPA under the E.U. Birds Directive and is of special conservation interest for the following species: Chough, Peregrine, Guillemot, Fulmar, and Kittiwake. N= 106 breeding pairs of cough were recorded in 1992 and n=88 in 2002/03. Cough are found throughout the coast from Lamb's head (south west) to Rossbehy (north). Small numbers of Cough occur inland, including areas around the Macgillycuddy's Reeks. Cough occur at high densities at Valencia Island (n=42 birds; autumn count between 2002-2004). N=64 choughs have been observed in autumn at dune systems at Rossbehy in the north and at Inch. Derrynane sand dunes also provide habitat for Cough, with n=33 birds identified in October 2003. Roosts exist on Lamb's Head and at the western tip of Valencia Island. Chough are observed around the coast and mountainous upland areas throughout the year. Chough forage within 300m of the cliff tops. Nationally important populations of four species at this site are as follows: Peregrine (5 pairs observed in 2002), Guillemot (2,860 pairs in 1999-2000), Fulmar (766 pairs in 1999-2000) and Kittiwake (1,150 pairs in 2000). Other species present in the SPA include: Great Black-backed Gull (63 pairs) and Black Guillemot (118 individuals), Razorbill (90 pairs), Herring Gull (30 pairs), Cormorant (33 pairs) and Shag (11 pairs). Iveragh Peninsula SPA

(d) Deenish Island and Scariff Island SPA (site code:004175)

- **Site description:** highly exposed, small- to medium-sized islands located 5-7 km west of Lamb's Head. Scariff island is rugged, steep sided and reaches 252 m in height. The island has a number of cliffs, the highest being located on the south side (NPWS, 2015E).
- **Vegetated areas:** consists of grassland, Bracken *(Pteridium aquilinum)* dominated areas and heathy areas with Ling Heather *(Calluna vulgaris).* Deenish island reaches 144 m in height at the

southern half, with the northern half considerably lower and flatter. Vegetated areas mainly contain grassland with some heath on the higher ground. Bracken and brambles (*Rubus* spp.) grow in some fields.

- **Birds:** The site is a Special Protection Area (SPA) for the following species: Fulmar, Manx Shearwater, Storm Petrel, Lesser Black-backed Gull and Arctic Tern. The islands support important populations of breeding seabirds. Deenish Island and Scariff Island SPA supports a number of important seabird populations. N=2,311 pairs of Manx Shearwater were identified on Scariff Island and Deenish in 2000. Shearwaters breed in burrows on the cliff tops on the south and west of Scariff island, in ruins and the souterrain below the oratory. Birds breed in burrows on steep grassy slopes with rock outcrops on the south-east side of Deenish island. It is estimated that both islands support ~n=6,200 pairs of Storm Petrel. N=385 pairs of fulmar and n=97 Lesser Black-backed Gull were identified on Scariff in 2000. N=54 pairs of Arctic Tern present on Deenish Island in 1995 and represents a population of national importance. Other breeding species identified in 2000 include Shag (n=5 pairs), Herring Gull (n=28+ pairs), Great Black-backed Gull (n=7 pairs) and Black Guillemot (several pairs). Chough are resident on Scariff (n=2 pairs identified in 1992). Oystercatcher, Skylark, Wheatear, Stonechat, Rock Pipit and Raven also breed in the island. Deenish Island and Scariff Island SPA is considered a site of high ornithological importance given the presence of Storm Petrel Manx Shearwater, Fulmar, Lesser Black-backed Gull and Arctic Tern. Storm Petrel and Arctic Tern and Chough, are listed on Annex I of the E.U. Birds Directive.

(e) Kenmare Islands pNHA (site code: 000363)

- **Site description:** consists of a group of islands in the north east (Dunkerrons Islands, Greenane Islands, Illaungowla, Illaunkilla, Fox Island, Carrignaluinga, Dronnoge, Cappanacush Island, Brennel Island), mid-north (Sherkey Island, Inishkeelaghmore, Illaunkeagh) and north-west (Leaghillaun and Grey island) of the SAC.
- **Harbour seals:** the islands in the north east of the SAC are particularly important for harbour seals. Sherkey Island and Inishkeelaghmore is also reported as important for harbour seals.
- **Birds:** Brennel Island is reported as important for Arctic Tern, Common Tern, Little tern, Sandwich Tern.
- **Potential impacts to the pNHA:** Potential impacts would include activities that would give rise to significant negative impacts on harbour seals and tern species.

(f) Lehid Harbour pNHA (site code: 0001364)

- **Site description:** consists of a inland and marine areas around Lehid Harbour. The main habitat of interest is mixed woodland containing both native and exotic tree species (NPWS, 2009H).
- **Birds:** A range of species have been reported in Hehid Harbour including: Black-headed Gull *(Larus ridibundus),* Common Gull *(Larus canus),* Cormorant *(Phalacrocorax carbo),* Great Black-backed Gull *(Larus marinus),* Great Northern Diver *(Gavia immer),* Greenshank *(Tringa nebularia),* Kingfisher *(Alcedo atthis),* Little Grebe *(Tachybaptus ruficollis*), Mediterranean Gull *(Larus melanocephalus),* Oystercatcher *(Haematopus ostralegus),* Red breasted merganser *(Mergus serrator*), Redshank *(Tringa totanus),* Turnstone *(Arenaria interpres;* see Appendix 6).
- **Potential impacts to the pNHA:** Potential impacts would include activities that would give rise to significant negative impacts on bird species.

(g) Eyeries Island pNHA (site code: 1051)

- **Site description:** A rocky marine island.
- **Birds:** reported as a nesting ground for between 10 and 20 pairs of common and/or Arctic terns (Fahy E, 1972 and NPWS, 2013C).
- **Potential impacts to the pNHA:**
  It was recommended that future development should be in accordance with the scientific value of the area (Fahy E, 1972). Potential impacts would include activities that would give rise to significant negative impacts on common and/or Arctic terns.

(h) Spanish Island pNHA (site code: 001378)

- **Site description:** A small shingle island located near to the shore. The island has low vegetation (NPWS, 2013C; Goodwillie, 1972).
- **Birds:** the island is suitable for nesting terns and 60-70 pairs of arctic or common terns are reported to nest.
- **Potential impacts to the pNHA:** Disturbance events represent a significant threat to the successful breeding of terns. An increase in the numbers of black-headed gulls would also be considered detrimental. It has been recommended that access to the island be discouraged (Goodwillie, 1972).

(i) Rossdohan Island pNHA (site code: 001375)

- **Site description:** Located on the south side of the Iveragh peninsula, ~4.5km south-east of the village of Sneem in Co. Kerry. The area includes the rocky and shingle shoreline of Rossdohan Island, 200m from the low water mark and a number satellite islands (NPWS, 2009A).
- **Harbour seals:** ~n=12-14 individuals observed at the site in 1994 and reported as being frequent visitors to the site.
- **Birds:** Colonies of Arctic Tern (5 pairs) and Black-Headed Gull (45 individuals) were identified here in 1984 (NPWS, 2009A).
- **Potential impacts to the pNHA:** Potential impacts would include activities that would give rise to significant negative impacts on harbour seal or bird species.

(j) Roughty River Estuary pNHA (site code: 0002092)

- **Site description:** located at the head of Kenmare River ~1km south-east of Kenmare town (NPWS, 2009F). The site is comprised of the estuary of the Roughty River estuary and parts of the river under tidal influence. Most of the NHA comprises mudflats and estuarine channels. In addition, saltmarsh, woodland and damp grassland occur.
- **Birds:** Surveys from 1984/85-86/87 show that the pNHA supports wintering birds including Mute Swan (11),Wigeon (194), Teal (62), Mallard (32), Scaup (7), Oystercatcher (46), Dunlin (60), Curlew (57), Redshank (60) and Greenshank (7).
- **Potential impacts to the pNHA:** Potential impacts would include activities that would give rise to significant negative impacts on bird species.

(k) Old Domestic Building, Dromore Wood SAC (Site Code 000353)

- **Site Description**: contains a large, three-storey stone building in Dromore Wood, approximately 9 km west of Kenmare, Co. Kerry (NPWS, 2013G). This surrounding forestry is included in the

site. The site is a Special Area of Conservation (SAC) selected for the following: [1303] Lesser Horseshoe Bat (Rhinolophus hipposideros)

- **Lesser Horseshoe Bat:** an artificial hibernation sites for this species, created by modifying an unused cellar in the building which was colonised by bats. The hibernation site is surrounded by coniferous forestry, providing foraging habitat. Approximately 200 bats were hibernating in winter 1995/96. A nursery roost used to existed in an out-building within 0.5 km of this hibernation site.
- **Potential threats to the SAC:** Removal of the woodland would be detrimental.

(I) Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342)

- **Site description:** Located in a U-shaped glacial valley on the northern side of Caha Mountain range, west of Kenmare, Co. Kerry (NPWS, 2016A). It includes four large lakes, smaller mountain lakes, inter-connecting rivers and streams, and the oak woodlands at Uragh Wood. Cloonee Lough system includes three lowland oligotrophic lakes. One lake is situated close to Kenmare River estuary and is connected via the Beal-na-Shannin River to the middle and upper lakes. Upper Cloonee Lough is linked to Inchiquin Lough by the Ameen River. Uragh Wood, a Nature Reserve, is situated on south-west of Inchiquin Lough. The land rises to ~500m at Knockreagh Mountain. Two smaller lakes, Lough Napeasta and Lough Cummeenadillure, are present on the hillside. The geology of is Old Red Sandstone. The site is a Special Area of Conservation (SAC) selected for the following:

  - [3110] Oligotrophic Waters containing very few minerals
  - [4010] Wet Heath
  - [4030] Dry Heath
  - [8220] Siliceous Rocky Slopes
  - [91A0] Old Oak Woodlands
  - [1024] Kerry Slug *(Geomalacus maculosus)*
  - [1303] Lesser Horseshoe Bat *(Rhinolophus hipposideros)*
  - [1421] Killarney Fern *(Trichomanes speciosum)*
  - [1833] Slender Naiad *(Najas flexilis)*

- **Lakes:** The lakes within the site are vulnerable to eutrophication, through fertilizer run-off from surrounding land. Submerged lake flora include Pipewort *(Eriocaulon aquaticum),* Quillwort *(Isoetes lacustris),* Six-stamened Waterwort *(Elatine hexandra),* Water Lobelia *(Lobelia dortmanna)* and Intermediate Bladderwort *(Utricularia intermedia),* Common Reed *(Phragmites australis)* and Great Fen-sedge *(Cladium mariscus),* Blue-eyed-grass *(Sisyrinchium bermudiana).* Rare aquatic plant species include Slender Naiad *(Najas flexilis),* listed on the Flora (Protection) Order, 2015, the Red Data Book, and Annex II of the E.U. Habitats Directive. Pennyroyal *(Mentha pulegium)* and Betony *(Stachys officinalis)* are also present. They are Red Data Book species and legally protected.
- **Uragh Wood:** an oceanic, semi-natural oak woodland. The soil is shallow: brown podsol near the lake and peaty podsol on upland edges of the wood. The wood is dominated by Sessile Oak *(Quercus petraea)* and Downy Birch *(Betula pubescens).* Other tree species include Rowan *(Sorbus aucuparia),* Ash *(Fraxinus excelsior)* and Rusty Willow *(Salix cinerea subsp. oleifolia).* Understorey species include Holly *(Ilex aquifolium),* Hazel *(Corylus avellana)* and Aspen *(Populus tremula).* Strawberry Tree *(Arbutus unedo),* Juniper *(Juniperus communis)* and Yew *(Taxus baccata)* occur near the lakeshore. Ground flora includes Heather *(Calluna vulgaris),* Bilberry *(Vaccinium myrtillus),* Bog-myrtle *(Myrica gale)* and Purple Moor-grass *(Molinia caerulea).* Species-poor areas of the ground include Bracken *(Pteridium aquilinum),* Tufted Hair-grass *(Deschampsia cespitosa)* or Bramble *(Rubus fruticosus agg.).* Killarney Fern *(Trichomanes speciosum)* occurs in the wood. It is a rare, legally protected Red Data Book species, listed on Annex II of the E.U. Habitats Directive as well as the Flora (Protection) Order, 2015. Other ferns include the Hay-scented Buckler-fern *(Dryopteris aemula),* Hard Fern *(Blechnum spicant)* and

Filmy Ferns (*Hymenophyllum* spp.). Bird's-nest Orchid *(Neottia nidus-avis)* is scare but has been recorded. Hyper-oceanic woodland bryophytes include: *Cyclodictyon laetevirens, Lejeunea flava, L. holtii, Hypnum uncinulatum, Radula holtii, R. voluta, Sematophyllum demissum* and *S. micans. Leptogium juressianum,* a rare lichen, also occurs. The rare myxomycete fungus, *Stemonitis nigrescens,* has been recorded at woodland at Cloonee Lough.

- **Surrounding lands:** a mixture of exposed sandstone rock, with large areas of wet or dry heath communities and deeper peat blanket bog areas. Oblong-leaved Sundew *(Drosera intermedia),* Brown Beak-sedge *(Rhynchospora fusca)* and Large-flowered Butterwort *(Pinguicula grandiflora)* are found. Adjacent fields contain scarce plants such as Chamomile *(Chamaemelum nobile),* Yellow Bartsia *(Parentucellia viscosa)* and Moonwort *(Botrychium lunaria).*
- **Kerry Slug:** the Kerry Slug *(Geomalacus maculosus),* a species listed on Annex II of the E.U. Habitats Directive,is recorded in Uragh Wood.
- **Other invertebrates:** Arctic Char *(Salvelinus alpinus),* a Red Data Book fish species, occur in Inchiquin and Cloonee Loughs.
- **Lesser Horseshoe Bat:** an Annex II species occurring within the site. A summer roost of > 100 bats was identified in a disused cottage at Glaninchiquin in 1999. The surrounding area includes conifer, oak, lake and improved grassland, which provides foraging habitat.
- **Birds:** The site supports breeding Peregrine, a species listed on Annex I of the E.U. Birds Directive.
- **Grazing:** the site is largely fenced to prevent sheep and feral goats from grazing. Grazing by deer within the wood continues.
- **Potential threats to the SAC:** eutrophication, alterations in land use practices, afforestation.

(m) Drongawn Lough SAC (site code: 002187)

- **Site description:** moderate-sized, deep, silled, polyhaline saline lake lagoon in almost pristine condition, situated on the northern side of the Kenmare River inlet in Co. Kerry, ~6 km to the east of Sneem (NPWS, 2014D). The lagoon is separated from a tidal bay by a narrow, silled inlet which restrict tidal exchange. The lagoon varies in depth reached 18m in places. The lake bed is largely solid rock or stone. The substrate consists mainly of peaty silt in sheltered bay locations. The site is a Special Area of Conservation (SAC) selected for: [1150] Coastal Lagoons.
- **Algae :** *Polyides rotundus, Chondrus crispus, Codium fragile and Phyllophora pseudoceranoides, Fucus serratus, Chaetomorpha linum* and *Cladophora* spp. Extensive beds of Spiral Tasselweed *(Ruppia cirrhosa)* are found to occur.
- **Aquatic fauna:** ~69 taxa recorded in 1996. Lagoonal specialists include *Palaemonetes varians*, *Hydrobia ventrosa, Cerastoderma glaucum* and *Neomysis integer*. Crustaceans include *Jaera forsmani, Erichthonius difformis* and *Lembos longipes.*
- **Part salt tolerant vegetation:** The lagoon is fringed in parts Sea Rush *(Juncus maritimus)*, Thrift *(Armeria maritima),* Sea Plantain *(Plantago maritima)* and Sea Arrowgrass *(Triglochin maritima).*
- **Beetles:** six species of carabid (ground beetles) and ten species of staphylinid have been identified. *Stenus lustrator* has also been identified.
- **Small brackish type lake:** Drongawn Lough Lower, occurs east of the main lagoon.
- **Land:** contains a mix of heath, blanket bog and wet grassland. Flush vegetation occur around small areas of the lagoon. Some of the wet grassland and heath is grazed and is partly improved in the eastern part of the site. Land is in the general vicinity of the site is of low intensity.

- **Potential threats to the site:** there are no known significant threats.

(n) Glanmore Bog SAC (site code: 001879)

- **Site description:** situated 3km north-west of Hungry Hill, Co. Cork and 8km south-west of the village of Lauragh, Co. Kerry. The geology is Old Red Sandstone (NPWS, 2016B). Overall, this site is of considerable conservation significance given the presence of five habitats and two species which are listed on the E.U. Habitats Directive. The site is a Special Area of Conservation (SAC) selected for the following:
  [3110] Oligotrophic Waters containing very few minerals
  [3260] Floating River Vegetation
  [4010] Wet Heath
  [6230] Species-rich *Nardus* Grassland*
  [7130] Blanket Bogs (Active)*
  [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
  [1421] Killarney Fern (*Trichomanes speciosum*)
- **Small hanging valley bog:** An important feature of the SAC. It's vegetation includes Common Cottongrass (*Eriophorum angustifolium*), Heather (*Calluna vulgaris*), Black Bog-rush (*Schoenus nigricans*), moss *Racomitrium lanuginosum*, Bogbean (*Menyanthes trifoliata*), Greater Tussock-sedge (*Carex paniculata*), Star Sedge (*Carex echinata*) and *Campylopus* moss species. The rare *C. shawii* has been recorded.
- **Other areas of blanket bog:** occur along the ridge near Eskatarriff. A mosaic with heath and exposed rocks is present on the southern side of the Glanmore River. These bogs are largely more Heather-dominated.
- **Heath:** Wet heath is dominant and can occur in association with upland grassland, exposed rock, bog and dry heath. The heath is dominated by Purple Moor-grass (*Molinia caerulea*). Ericoid species, such as Heather and Cross-leaved Heath (*Erica tetralix*) are scarce. Other heath species include Heath Bedstraw (*Galium saxatile*), Tormentil (*Potentilla erecta*), Mat-grass (*Nardus stricta*), Heath Rush (*Juncus squarrosus*) and Sharp-flowered Rush (*Juncus acutiflorus*).
- **Glenbeg Lough:** an oligotrophic (nutrient-poor) lake. Vegetation includes Quillwort (*Isoetes lacustris*), Shoreweed (*Littorella uniflora*), Water Lobelia (*Lobelia dortmanna*), Floating Bur-reed (*Sparganium angustifolium*) and Six-stamened Waterwort (*Elatine hexandra*), stonewort *Nitella flexilis*, pondweeds *Potamogeton natans* and *P. perfoliatus*, and Common Reed (*Phragmites australis*). Heath, upland grassland, siliceous rocks and gully streams are observed at the steep slopes surrounding the lough. Gorse (*Ulex* sp.) occurs near the lake edge. On the slopes, the following occur: St. Patrick's-cabbage (*Saxifraga spathularis*), Hard Fern (*Blechnum spicant*), *Radula holtii*, *R. carringtonii*, *R. voluta*, *Acrobolus wilsonii*, *Daltonia splachnoides*, *Lejeunea hibernica*, *Antitrichia curtipendula*, *Dumorteria hirsuta* and *Leptodontium recurvifolium*.
- **Species-rich Nardus Grassland**: reported from the site according to the Irish Semi-natural Grasslands Survey, 2008. This is a priority habitat on Annex I of the E.U. Habitats Directive.
- **Rivers:** Ownagappul and Glanmore rivers have floating river vegetation, a habitat listed on Annex I of the E.U. Habitats Directive. The Ownagappul River is a fast flowing acidic river with a stone/gravel bottom and runs from Glenbeg Lough to the sea at Cappul Bridge. It supports Bulbous Rush (*Juncus bulbosus*), Alternate Water-milfoil (*Myriophyllum alterniflorum*), Lesser Spearwort (*Ranunculus flammula*) and the moss *Fontinalis antipyretica*. In the eastern section

of the site, the headwater streams of the Glanmore River occur. This river has pondweeds (*Potamogeton* spp.) and *Ranunculus* species.

- **Killarney Fern:** occurs within the site and is an Annex II species under the E.U. Habitats Directive, and a legally protected species under the Flora (Protection) Order, 1999.
- **Freshwater Pearl Mussel:** present in the site. Listed on Annex II of the E.U. Habitats Directive.
- **Birds:** Chough is found within the site and a small number of pairs are thought to breed (~2). This species is listed under Annex I of the E.U. Birds Directive. Other birds present include Dipper, Stonechat, Snipe and Raven.
- **Landuse**: sheep grazing occurs on the uplands and steeper slopes. Cattle graze some lower slopes at Glenbeg Lough and around Ardgroom.
- **Fishing**: carried out on the lake.
- **Afforestation**: has occurred outside the site. Little afforestation occurs within the catchment of Glenbeg Lough or the Ownagappul River.

(o) Cleanderry Wood SAC (site code: 001043)

- **Site description**: occurs on a steep slope directly above the coastline, situated along the south side of the Kenmare River inlet, 10km north of Castletownbere in Co. Cork (NPWS, 2013H). It contains is a small oak *(Quercus sp.)* woodland which faces north-west, crossed by a number of cascading streams. The site includes Derryvegal Lough Upper and an outlet stream associated with the river. The site is a Special Area of Conservation (SAC) selected for:
  - [91A0] Old Oak Woodlands.
  - [1421] Killarney Fern (Trichomanes speciosum).
- **Woods**: Sessile Oak *(Quercus petraea)* and Hazel *(Corylus avellana)* are dominant, with Holly *(Ilex aquifolium)* and birch *(Betula sp.)* also occurring. Ground vegetation is well developed as grazing pressure is low. Bilberry *(Vaccinium myrtillus),* Ivy *(Hedera helix)* and Honeysuckle *(Lonicera periclymenum),* with Velvet Bent *(Agrostis canina),* Common Cow-wheat *(Melampyrum pratense),* Hard-fern *(Blechnum spicant)* and Hay-scented Buckler-fern *(Dryopteris aemula)* occur, the latter of which is threatened within Europe. Kidney Saxifrage (Saxifraga hirsuta), Irish Spurge *(Euphorbia hyberna)* and Wilson's Filmy-fern *(Hymenophyllum wilsonii)* occur at the western part of the wood.
- **Heath**: a mosaic of heath, wet acidic grassland and rock outcrops is observed to occur. Wet heath includes Cross-leaved Heath *(Erica tetralix),* Tormentil *(Potentilla erecta),* Purple Moor-grass *(Molinia caerulea)* and some bog mosses (*Sphagnum* spp.). In the drier areas, Heather *(Calluna vulgaris),* Western Gorse *(Ulex gallii)* and Deergrass *(Scirpus cespitosus)* are found.
- **Killarney Fern:** The site supports the rare Killarney Fern *(Trichomanes speciosum),* a species listed on the E.U. Habitats Directive and on the Flora (Protection) Order, 1999.

(p) Mucksna Wood SAC (site name: 001371)

- **Site description**: Mucksna Wood is located south of Kenmare on the shores of the Kenmare River, Co. Kerry. It contains native and exotic tree species. The soil is quite rich and likely of glacial drift origin. The northern margin of the woodland borders onto the fringe of a saltmarsh beside the Kenmare River. The site is a Special Area of Conservation (SAC) selected for the following: [91A0] Old Oak Woodlands
- **Muchsna Wood:** ~40-50% of the woodland area is dominated by oak, mainly Pedunculate Oak *(Quercus robur)* and some Sessile Oak *(Q. petraea).* Other trees include: Ash *(Fraxinus excelsior),*

Alder *(Alnus glutinosa),* Beech *(Fagus sylvatica),* Sycamore *(Acer pseudoplatanus),* fir *(Abies sp.)* and Scots Pine *(Pinus sylvestris),* Elm *(Ulmus* sp.) and Hornbeam *(Carpinus betulus)* are also found. Common in the understorey species include: Hazel *(Corylus avellana),* Holly *(Ilex aquifolium)* and Hawthorn *(Crataegus monogyna).*

- **Soil:** exhibits considerable variation. Includes shallow rocky facies, deeper and more fertile facies, and wet and waterlogged facies.
- **Ground flora:** includes Pignut *(Conopodium majus),* Bluebell *(Hyacinthoides non-scripta),* Bugle *(Ajuga reptans),* Lesser Celandine *(Ranunculus ficaria),* Enchanter's-nightshade *(Circaea lutetiana),* False Brome *(Brachypodium sylvaticum),* Wood Anemone *(Anemone nemorosa),* Primrose *(Primula vulgaris),* Wood Speedwell *(Veronica montana),* violets (*Viola* spp.), Wood-sedge *(Carex sylvatica),* Irish Spurge *(Euphorbia hyberna),* Golden Saxifrage *(Chrysosplenium oppositifolium),* Remote Sedge *(Carex remota)* and Sanicle *(Sanicula europaea).* On more acidic soils, Bilberry *(Vaccinium myrtillus),* Heather *(Calluna vulgaris),* Bell Heather *(Erica cinerea),* Hard Fern *(Blechnum spicant)* and Wood-sorrel *(Oxalis acetosella)* are observed. The following also occurs: ferns, e.g. Lady-fern *(Athyrium filix-femina),* Scaly Male-fern *(Dryopteris affinis),* Broad Buckler-fern *(D. dilatata),* Hay-scented Buckler-fern *(D. aemula)* and Tunbridge Filmy-fern *(Hymenenophyllum tunbridgense),* and mosses on large boulders, e.g. *Plagiomnium undulatum, Mnium hornum, Hookeria lucens* and *Hylocomium brevirostre*. St Patrick's-cabbage (Saxifraga spathularis) is found to occur on large boulders.
- **Birds:** The wood supports a variety of birds. A heron rookery is present.

(q) Other areas/species of interest

- **Birds**: According to NPWS, Birdwatch Ireland, I-Webs and data held by the National Biodiversity Data Centre and others, there are a range of sites in Kenmare River SAC utilized by birds. In addition to SAC/SPA sites and sub-sites within Kenmare river SAC (described above), an additional ~25 sites are known to be of relevance to birds in this area. Approximately 124 bird species were assessed.

2.3. Summary of qualifying interests, conservation objectives and requirements

(a) Kenmare River SAC and sites therein.

1. **Protected species & habitats.**
   In accordance with the NPWS and Annex I & II of EU Habitats Directive 92/43/EEC (Anon, 1992), there are 8 main conservation objectives and targets relevant to Kenmare River SAC, covering both marine and coastal areas, summarised as follows:
   Marine habitats & species.
   - Objective 1: To maintain the favourable conservation condition of Large shallow inlets and bays in Kenmare River SAC (ref: pg. 17-19, NPWS, 2013A).
   - Objective 2: To maintain the favourable conservation condition of Reefs in Kenmare River SAC (ref: pg. 20, NPWS, 2013A).
   - Objective 3: To maintain the favourable conservation condition of submerged or partially submerged sea caves in Kenmare River SAC (ref: pg. 21, NPWS, 2013A).
   - Objective 4: To maintain the favourable conservation condition of harbour seal in Kenmare River SAC (ref: pg. 22, NPWS, 2013A).

Coastal habitats.

- Objective 1: To maintain the favourable conservation condition of Perennial vegetation of stony banks (ref: pg. 8, NPWS, 2013B).
- Objective 2: To maintain the favourable conservation condition of Atlantic salt meadows, *Glauco-Puccinellietalia maritimaev (1330)* and Mediterranean salt meadows, *Juncetalia maritimae* (1410; ref: pg. 12, NPWS, 2013B).
- Objective 3: To maintain the conservation condition of sand dune habitats (ref: pg. 21, NPWS, 2013B).
  a) Shifting dunes along the shoreline with *Ammophila arenaria* (white dune, 2120): To maintain the favourable conservation condition.
  b) Fixed coastal dunes with herbaceous vegetation (2130): To restore the favourable conservation condition.
- Objective 4: To maintain the conservation condition of vegetated sea cliffs of the Atlantic and Baltic coasts (ref: pg. 27, NPWS, 2013B).

Otters and birds:
Otter (Annex II of the E.U. Habitats Directive).
Several wintering and breeding bird species (Annex I of the E.U. Birds Directive, 2009).

2. **Species & habitats of general interest.**
   There are many important habitats and species of general interest in the Kenmare River SAC Complex for which EU-specified conservation objectives may not specifically apply.
3. **Ascophyllum *nodosum* biotope and species therein**
   The *Ascophyllum nodosum* biotope is species rich and contains many flora and fauna of interest, for which conservation objectives may or may not directly apply. These are described in detail in Section 2.8. The *A. nodosum* biotope is of considerable interest given its growth on intertidal reef substrate and that *A. nodosum* will be subject to harvest.

(b) Iveragh Peninsula SPA (site code: 004154): Birds: Objective 1: To maintain or restore the favourable conservation condition of bird species listed as Special Conservation Interests for this SPA (NPWS, 2015B).

(c) Deenish Island and Scariff Island SPA (site code:004175): Birds: Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA (NPWS, 2016E).

(d) Eyeries Island pNHA (site code: 1051): Birds: Objective 1: future development should be in accordance with the scientific value of the area (Fahy E, 1972).

(e) Spanish Island pNHA (site code:. 001378): Birds: Objective 1: recommended that access to the island be discouraged (Goodwillie, 1972).

(f) Rossdohan Island pNHA (site code: 001375): Harbour seals & birds: While objectives are not specified, efforts should made to ensure that negative impacts on species do not occur (NPWS, 2009A).

(g) Roughty River Estuary pNHA (site code: 0002092): Harbour seals & birds: While objectives are not specified, efforts should made to ensure that negative impacts on species do not occur (NPWS, 2009F).

(h) Old Domestic Building, Dromore Wood SAC (site code: 000353): Lesser Horseshoe Bat: Objective 1: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (Lesser Horseshoe Bat *(Rhinolophus hipposideros)*, (NPWS, 2013G)).

(i) Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342): Coastal habitats and species: Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (NPWS, 2016A):

Code Description:

- 3110 Oligotrophic waters containing very few minerals of sandy plains *(Littorelletalia uniflorae).*
- 4010 Northern Atlantic wet heaths with Erica tetralix.
- 4030 European dry heaths.
- 8220 Siliceous rocky slopes with chasmophytic vegetation.
- 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles.
- 1024 Kerry Slug *(Geomalacus maculosus).*
- 1303 Lesser Horseshoe Bat *(Rhinolophus hipposideros).*
- 1421 Killarney Fern *(Trichomanes speciosum).*
- 1833 Slender Naiad *(Najas flexilis).*

(j) Drongawn Lough SAC (site code: 002187): Marine and coastal habitats and species: Objective 1: To maintain the favourable conservation condition of Coastal lagoons in Drongawn Lough SAC (NPWS, 2014D).

(k) Glanmore Bog SAC (site code: 001879): Coastal habitats and species: Objective 1: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (NPWS, 2016B):

Code Description:

- 3110 Oligotrophic waters containing few minerals of sandy plains *(Littorelletalia uniflorae).*
- 3260 Water courses of plain to montane levels with *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
- 4010 Northern Atlantic wet heaths with Erica tetralix
- 6230 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe).
- 7130 Blanket bogs.

(l) Cleanderry Wood SAC (site code: 001043): Coastal habitats and species: Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (NPWS, 2013H):

Code Description/name:

- 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles
- 1421 Killarney Fern *(Trichomanes speciosum)*

(m) Mucksna Wood SAC (site name: 001371): Coastal habitats and species: Objective 1: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (NPWS, 2016D):

Code Description/name

- 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles.

2.4. Description of conservation objectives: Marine habitats and species.

This section provides a detailed description of the distribution, extent and conservations objectives for protected marine habitats and species in Kenmare River SAC.

Objective 1: To maintain the favourable conservation condition of Large shallow inlets and bays in Kenmare River SAC.

1. **Permanent habitat area:** Encompasses all Annex I habitats in Kenmare SAC.
   Conservation requirements: These areas must be maintained at favourable conservation conditions to ensure stability of the permanent habitat area (Ref: Target 1 of Objective 1, NPWS, 2013A, page 17).

2. ***Zostera, Maerl & Pachycerianthus multiplicatus*:** Seagrass community dominated by eelgrass, *Zostera marina*, occurs at depths of 2-6m. Zostera occurs extensively on the north shore, off Templenoe, in Coongar Harbour, north of Leaghillaun and at Derrynane Harbour. Zostera is also found in southern areas such as Ballycrovane Harbour. Sediment in these areas includes mud, muddy sand to coarse sand. The levels of Zostera may be abundant (12 individuals/m^2) or frequent (6 to 11 individuals/m^2). Species associated with this complex include: anthozoans *(Anemonia viridis* and *Anthopleura ballii),* asteroids *(Marthasterias glacialis),* green alga *(Ulva lactuca),* decapods *(Necora puber),* polychaetes *(Chaetopterus variopedatus)* and anthozoans *(Haliclystus auricular). Maerl* is recorded off the quay at Gleesk to off Templenoe (northern shore in mid area of the SAC), with bed depth ranging from 5-6m. Species associated with the maerl community complex include: decapods *(Necora puber, Pisidia longicornis, Liocarcinus depurator),* polychaetes *(Eupolymnia nebulosa, Chaetopterus variopedatus),* asteroids *(Marthasterias glacialis),* marine crab *(Pagurus bernhardus)* and some unidentified maerl species. Kenmare River SAC is also host to the large, tube-dwelling *anthozoan Pachycerianthus multiplicatus*, which is found between Inishkeragh and Rossdohan Island at ~15m depths. It is reported as providing a variety of microniches and in turn, increases in localised biodiversity. Associated infauna includes coarse sediment which is dominated by polychaetes communities. In these areas, the seafan *(Swiftia pallid)* and anemones *(Cerianthus lloydii* and *Peachia cylindrical)* also occur.
   Substrate: *Zostera* is found in mud, muddy sand to coarse sand environs. Mearl is mainly found in muddy sand environs. *Pachycerianthus multiplicatus* and associated community is found in coarse sediment and area from rocky outcrops.
   Conservation requirements: Maintain the extent and conserve the high quality of *Zostera* & *maerl*-dominated communities and the *Pachycerianthus multiplicatus* community (Ref: Targets 2-5 of Objective 1, NPWS, 2013A, pages 17, 18).

3. Community complexes associated with muddy fine sands, fine to medium sands and coarse sediment

- Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex, occurs extensively in Kenmare River SAC from western to eastern boundaries of the channel, recorded in depths 0-84m. The substrate is fine with silt-clay and a range of very fine sand fractions and to a much lesser extent, coarse sand fractions. The community complex is species rich and includes the following fauna: polychaetes *(Abyssoninoe hibernica, Aonides oxycephala, Caulleriella alata, Lumbrineris gracilis, Diplocirrus glaucus, Euclymene oerstedii, Scalibregma inflatum, Nephtys sp., Nephtys cirrosa, Nephtys hombergii, Magelona alleni, Melinna palmate, Notomastus sp., Pholoe baltica, Protodorvillea kefersteini, Ancistrosyllis groenlandica, Spiophanes kroyeri, Terebellides stroemi),* phoronids *(Phoronis sp),* ophiuroids *(Amphiura filiformis, Amphiura chiajei),* bivalves *(Mysella bidentata, Kurtiella bidentata, Abra nitida),* Nematoda, sea anemodes *(Edwardsiidae),* gastropods *(Cylichna cylindracea, Hyala vitrea),* anopla marine worms *(Tubulanus polymorphus),* Nemertea "ribbon worms". Anthozoans *(Virgularia mirabilis)* and crustaceans *(Nephrops norvegicus)* occurs at the east of the site at Dunkerron Island west to Rossdohan Island. Variants of this community complex are found in some sheltered areas and harbours and off a number of headlands, including: the inner reaches of Parknasilla and Cove Harbour, ranging from intertidal depths to 53m. The sediments in these areas is variable and includes muddle sandy gravel and gravelly mud. As the sediment is quite variable, so too is the numbers of species which vary from high numbers to low abundances and include: polychaetes *(Melinna palmata, Pholoe baltica, Euclymene oerstedii, Aonides oxycephala, Scalibregma inflatum, Lumbrineris gracilis, Terebellides stroemi* and *Caulleriella alata),* burrowing anemones of the family *Edwardsiidae* and the seapen *Virgularia mirabilis.*
- Fine to medium sand with crustaceans and polychaetes community complex, occur in a patch-wise fashion along the shores from the east of Kenmare Bay (Lackeen Rock) to the site's western edges, occurring at depths of 0-42m. Important species include: crustaceans *(Aoridae, Bathyporeia elegans, Ampelisca brevicornis, Eurydice spinigera, Cumopsis fagei* and *Iphinoe trispinosa),* polychaetes *(Spiophanes bombyx, Nephtys cirrosa,* and *Owenia fusiformis),* gastropods *(Polinices pulchellus),* bivalves (*Fabulina fibula, Phaxas pellucidus),* ribbon worm *(Nemertea),* sea urchin *(Echinocyamus pusillus).* The entrance of Kilmakillogue and Ardgroom Harbour are characterised by a high abundance of the polychaete *Caulleriella alata* and the cumacean *Iphinoe trispinosa*. Derrynane Bay and Ballydonegan Bay are characterised by a high abundance of the amphipods *Pontocrates altamarinus* and *Nototropis swammerdamei*. The polychaete *Chaetozone christiei* occurs at high levels at Rath Strand and at low levels at the outer reaches of Kenmare River.

  Substrate: a mixture of predominantly fine to medium sand; with some coarse, very course, silt clay and gravel.
- Coarse sediment dominated by polychaetes community complex occurs extensively throughout the western areas of Kenmare River SAC, occurring at depths between 4-68m into the bay along the shores. Species within the community complex include: polychaetes *(Mediomastus fragilis, Glycera lapidum, Notomastus sp., Pholoe baltica, Polycirrus sp., Protodorvillea kefersteini, Sphaerosyllis bulbosa),* unidentified polynoids (scaleworms), unidentified nematodes and nemerteans (ribbon worms), annelid worm *(Pomatoceros lamarcki)* and brittle star *(Amphipholis squamata).* High abundance of *M. fragilis, P. kefersteini*

and the holothurian *Thyone fusus* are recorded at the outer reaches of Kenmare River, with *G. lapidum* occurring moderately throughout. Iniskeragh Island is characterised by high abundance of the crustacean *Pisidia longicornis*. While the chiton *Stenosemus albus* is characterised by variable and patchy distribution, but is present at high levels at inner Kenmare River SAC, including Iniskeragh Island, Ormond's Island, Coongar Harbour and westerly off Kilcatherine's Point. Amphipods including *Leptocheirus hirsutimanus, L. tricristatus* and *Tryphosella sarsi,* have been recorded in Coongar Harbour and Kilcatherine's Point.

Substrate: very coarse and course sand account for most of the sediment, with medium and fine sands and fine materials occurring at lower levels.

Conservation requirements: Conserve the following community types in a natural condition: Intertidal mobile sand community complex; Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex; Fine to medium sand with crustaceans and polychaetes community complex; Coarse sediment dominated by polychaetes community complex (Ref: Target 6 of Objective 1, NPWS, 2013A, pages 19).

4. **Community complexes associated with shingle, intertidal reef, subtidal reef, *Laminaria* and estuarine mud.**
   - Shingle consisting of pebbles and gravel characterise some inner areas of Kenmare Bay, most notably in southern shore areas. They feature along upper shore locations, often situated behind fucoid dominated reef. Species associated with shingle areas are talitrid amphipods which occur in areas where dead algae is found to accumulate.
   - Intertidal reef community complex occurs along shore of the SAC, including mainland and island shores. Species of brown seaweeds are found in reef areas, including *Pelvetia* canaliculata, *A. nodosum*, *Fucus spiralis*, *Fucus vesiculosus, Fucus serratus*, *Laminaria digitata* and *Himanthalia sp.* Species of red algae include: *Mastocarpus stellatus, Lomentaria articulata, Porphyra umbilicalis, Osmundea pinnatifida* and *Palmaria palmata*. Macrofauna include: gastropods *(Littorina neritoides, Littorina saxatilis, Patella vulgata, Patella ulyssiponensis, Littorina littorea, Gibbula cineraria* and *Nucella lapillus),* anemones *(Actinia equine)*, sponges *(Hymeniacidon sp., Halichondria sp.* and *Ophlitaspongia sp.)* and barnacles *(Elminius modestus, Semibalanus balanoides* and *Chthamalus stellatus).* A variety of lichens *(Xanthoria parietina, Verrucaria maura, Ochrolechia parella, Ramalina sp., Anaptychia runcinata* and *Lecanora atra)* can be found in more exposed areas of the shore (Table 8). Characteristics of the *A. nodosum* biotope are described in greater detail in Section 2.8.
   - Substrate: vertical rock walls which are observed to be interspersed amongst boulder fields and sloping and flat bedrock. In sheltered areas, cobbles and boulders are observed to occur as field or on bedrock. In the northern shore west of Raheercarrig and southern shore, west of Leaghillaun, areas of vertical rock wall are observed at extensive levels.
   - *Laminaria*-dominated community complex occurs throughout the SAC, occurring between 4-22m depth, in inner, western areas and southern (Dursey Sound) areas of the site. The primary species associated with these areas is *Laminaria hyperborea*. Other flora include brown algae *(Dictyota dichotoma),* coralline red algae, red algal species *(Bonnemaisonia asparagoides, Plocamium cartilagineum, Cryptopleura ramosa, Delessaria sanguinea* and *Brongniartella byssoides).* Bryozoan *(Membranipora membranacea)* and boring sponge *(Cliona celata)* have also been identified in these areas.

- Subtidal reef with Echinoderms and faunal turf community complex: this community occurs in depths between 15-50m from the east at Ormond's Island to western areas of the site. Species associated with this community include: anthozoans *(Alcyonium glomeratum, Alcyonium digitatum, Swiftia pallida, Caryophyllia smithii),* bryozoans *(Parasmittina trispinosa),* gastropods *(Calliostoma zizphinum),* Coralline red algae, echinoderms *(Echinus esculentus, Aslia lefevre, Holothuria forskali, Luidia ciliaris, Marthasterias glacialis, Antedon bifida* and *Pawsonia saxicola and Asterias rubens),* the boring sponge *(Cliona celata)* and the brachiopod *Neocrania anomala.* A variant of this community type occurs on the vertical walls and overhanging bedrock of seacaves, with depths that do not exceed 4m. Species include: sponge species *(Dysidea fragilis, Leuconia nivea, Clathrina coriacea, Pachymatisma johnstonia, Protosuberites incrustans, Haliclona sp., Haliclona simulans, Aplysilla rosea* and *Aplysilla sulfurea)*, as anthozoans *(Corynactis viridis* and *Caryophyllia smithii),* polychaetes *(Pomatoceros triqueter),* encrusting and erect bryozoans, tunicates *(Didemnidae family)* and crustaceans *(Palaemon serratus).*
  Substrate: flat/sloping bedrock, cobble/boulder mosaic bedrock, cobble/boulder fields, vertical rock walls.
- Estuarine mud/estuarine mud community: soft mud occurs within the river Blackwater and Sneem river estuaries, and host small polychaetes and oligochaetes.

Conservation requirements:
Conserve the following community types in a natural condition: Shingle; Intertidal reef community complex; Subtidal reef with echinoderms and faunal turf community complex; and Laminaria-dominated community complex (Ref: Target 6 of Objective 1, NPWS, 2013A, pages 19).

Objective 2: To maintain the favourable conservation condition of Reefs in Kenmare River SAC (ref: pg. 20, NPWS, 2013A).

Intertidal reef occurs along the shore of the SAC, including mainland and island shores, sometimes situated beyond *Laminaria* dominated reef and also in some areas which become exposed at low tide. In some areas, intertidal reef may be situated just beyond areas of muddy fine sands or fine to medium sands. *Laminaria* dominated reef is located throughout the shores in deeper, subtidal waters. See point 4 of Objective 1 for details of species associated with reef areas. The extent of intertidal reef, subtidal reef and *Laminaria* reef and their associated community complex are 681ha, 4838ha and 3678ha respectively, with extent and distribution calculated by spatial interpolation of actual values.
Conservation requirements: The distribution of reefs is stable or increasing, the permanent reef area is stable and associated community complexes are conserved (Ref: Target 1-3 of Objective 2, NPWS, 2013A, page 20).

Objective 3: To maintain the favourable conservation condition of submerged or partially submerged seacaves (ref: pg. 21, NPWS, 2013A).

There are at least N=35 seacaves in the SAC. However, there are likely to be more.
Conservation requirements: The distribution of seacaves and human activities should occur at levels that do not adversely affect the ecology of seacaves (Ref: Targets 1 and 2 of Objective 3, NPWS, 2013A, page 21).

Objective 4: To maintain the favourable conservation condition of harbour seals in Kenmare River SAC (ref: pg. 22 and 23, NPWS, 2013A).

1. **Species range:** Harbour seals occupy aquatic and terrestrial habitats in Kenmare River SAC which are exposed during tidal cycles. The species is present during all aspects of its annual life cycle including breeding (approx. May-July), moulting (approx. August-September) and phases of non-breeding foraging and rest (approx. Oct-April).
   Conservation requirements: Species range is not restricted by artificial barriers to site use (Ref: Target 1 of Objective 4, NPWS, 2013A, page 22).

2. **Breeding sites:** Harbour seals and their pups are vulnerable to disturbances during May-July, the time period just prior to and during the annual breeding season. This is due to the large amount to time spent in shallow waters or ashore. Established breeding sites are as follows: Dronnoge, the Greenane Islands, Illaunakilla, Cappanacush Island and Brennel Island in inner Kenmare River, Carrignaronomore, Hog Island, Kilmakillogue Harbour, Ardgroom Harbour, Coongar Harbour, Rossdohan Island, Brown Island and adjacent skerries, inner Sneem Harbour, outer Sneem Harbour and Parknasilla, Potato Island, Illaunsillagh, and Cove Harbour (West Cove).
   Conservation requirements: breeding sites are conserved in a natural condition (Ref: Target 2 of Objective 4, NPWS, 2013A, page 22).

3. **Moulting sites:** Established sites for moulting include: Dronnoge, the Greenane Islands, Illaunakilla, Cappanacush Island, Dunkerrow Island West, Illaungowla and Brennel Island in inner Kenmare River, Carrignaronomore, Ormonde's Island, Hog Island, Kilmakillogue Harbour, Ardgroom Harbour, Coongar Harbour, Rossdohan Island pNHA (001375), Brown Island and adjacent skerries, inner Sneem Harbour, outer Sneem Harbour and Parknasilla, Potato Island, Sherky Island, Illaunanadan-Inishkeragh, Inishkeelaghmore, Eyeries Island and Illaunnameanla in Coulagh Bay/Ballycrovane Harbour, Illaunsillagh and Cove Harbour (West Cove).
   Conservation requirements: moult haul-out are conserved in a natural condition (Ref: Target 3 of Objective 4, NPWS, 2013A, page22).

4. **Resting sites:** Established resting sites in Kenmare River SAC include: the Greenane Islands, Cappanacush Island and Brennel Island in inner Kenmare River, Carrignaronomore, Hog Island, Kilmakillogue Harbour, Coongar Harbour, Rossdohan Island, Brown Island and adjacent skerries, inner Sneem Harbour, Illaunslea, outer Sneem Harbour and Parknasilla, Illaunnameanla in Ballycrovane Harbour, Illaunsillagh and Cove Harbour (West Cove).
   Conservation requirements: resting haul-out sites are conserved in a natural condition (Ref: Target 4 of Objective 4, NPWS, 2013A, page 22).

5. **Human activities:** Man-made energy such as underwater noise or light, etc., or activities which deteriorate resources (e.g. water quality, feeding), can have a negative impact on natural behaviours and resources of harbours seals.
   Conservation requirements: human activities should occur at levels that do not adversely affect the harbour seal population at the site (Ref: Target 5 of Objective 4, NPWS, 2013A, page 23).

2.5. Description of conservation objectives: Coastal habitats.

Coastal habitats also fall under the SAC status of Kenmare River SAC. Similar to marine habitats and species, the NPWS have developed a set of standards to minimise human interference and damage to these areas (Ref: NPWS, 2013B). This covers the following four coastal habitats:

- Perennial vegetation of stony banks (1220);
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*, 1330) and Mediterranean salt meadows (*Juncetalia maritimae*, 1410);
- Shifting dunes along the shoreline with *Ammophila arenaria* (white dune, 2120);
- Fixed coastal dunes with herbaceous vegetation (2130);
- Vegetated sea cliffs of the Atlantic and Baltic coasts (1230).

Objective 1: To maintain the favourable conservation condition of Perennial vegetation of stony banks (ref: pg. 8, NPWS, 2013B).
Defined as vegetation found at or above the mean high water spring tide mark on shingle beaches. Recorded at Pallas Harbour and Rossdohan Island, but may be found elsewhere. In some cases, it can be associated with intertidal shingle, rocky shore and salt marsh (Moore and Wilson, 1999).

Objective 2: To maintain the favourable conservation condition of Atlantic salt meadows, *Glauco-Puccinellietalia maritimaev (1330)* and Mediterranean salt meadows, *Juncetalia maritimae* (1410; ref: pg. 12, NPWS, 2013B).

Two of the four types of salt marshes listed under Annex I of EU Habitats Directive (92/43/EEC), are listed as a "Qualifying Interest" for Kenmare River SAC, namely Atlantic salt meadows (ASM) and Mediterranean salt meadows (MSM). ASM are stands of vegetation which occur along sheltered coasts. They are flooded periodically by the sea, restricted to an area between mid-neap tide level and high water spring tide level. Unlike ASM, MSM are characterised by the presence of tall, sea rush *Juncus maritimus*. Salt marsh habitats are found in Derreen House, Dinish, Tahilla and West Cove, estimated to account for 2.65 and 17.9 hectares respectively, calculated on the basis of the total SAC and mosaic areas.
Substrate: mainly over peat, potentially mud or sand. Typical salt marsh species include (NPWS 2013B):

- Lower Marsh: *Salicornia* spp., *Suaeda maritima, Puccinellia maritima, Aster tripolium,*
- Low-Mid Marsh: *Puccinellia maritime, Triglochin maritima, Plantago maritima, Atriplex portulacoides, Aster tripoliu, Spergularia* sp., *Suaeda maritima, Salicornia* spp., *Glaux maritima,* Turf fucoids,
- Mid-Upper marsh**:** *Festuca rubra, Juncus gerardii, Armeria maritima, Agrostis stolonifera, Limonium humile, Glaux maritima, Seriphidium maritimum, Plantago maritima, Aster tripolium, Juncus maritimus, Triglochin maritima, Blysmus rufus, Eleocharis uniglumis, Leontodon autumnalis, Carex flacca, Carex extensa,* Turf fucoids,
- Species associated with ASM include ((NPWS 2013B): Red Fescue (*Festuca rubra*), Sea Plantain (*Plantago maritima*), Common Scurvygrass (*Cochlearia officinalis*), Saltmarsh Rush (*Juncus gerardii*), Buck's-horn Plantain (*Plantago coronopus*), Sea Arrowgrass (*Triglochin maritimum*), Sea Milkwort (*Glaux maritima*), White Clover (*Trifolium repens*), Creeping Bent (*Agrostis stolonifera*), Curled Dock (*Rumex crispus*), Autumn Hawkbit (*Leontodon autumnalis*), Sea Rush, Glaucous Sedge (*Carex flacca*), Soft Rush (*Juncus effusus*), Jointed Rush (*Juncus articulatus*), Sea Plantain,

Common Saltmarsh-grass, Lax-flowered Sea Lavender (*Limonium humile*) and Sea Aster (*Aster tripolium*).

- Species associated with MSM include (NPWS 2013B)**:** Sea Rush, Red Fescue, Creeping Bent and Saltmarsh Rush, Sea Pink, Common Scurvy-grass, Autumn Hawkbit, Sea Arrowgrass, Sea Aster, Sea Milkwort and White Clover. Lax-flowered Sea Lavender, Common Reed and Sea Club-rush, brackish wet grassland community dominated by Purple Moorgrass *(Molinia caerulea),* Sea Plantain, Saltmarsh Rush and Common Scurvygrass.

Objective 3: To maintain and restore the conservation condition of sand dune habitats (ref: pg. 21, NPWS, 2013B).

- Shifting dunes along the shoreline with *Ammophila arenaria* (white dune, 2120):
  Occurs in areas in which sand accumulates at a rapid rate. Marram grass (*Ammophila arenaria*) represents a key species in this biological environment, acting to invade and initiate transition of sand accumulation to mobile dunes. Growth of this species is actively stimulated by sand accumulation. These areas are dynamic and unstable. The total area (ha) within the SAC of this habitat is 1.67 hectares.
- Fixed coastal dunes with herbaceous vegetation (2130):
  Fixed dunes are more stable dune systems and are present in areas of reduced wind speed and lower tidal inundation and salt spray. Associated with these systems is a relatively stable 'carpet' of vegetation adapted to this system, i.e. sand-binding species. The total area (ha) within the SAC of this habitat is 20.41 hectares.

Objective 4: To maintain the conservation condition of vegetated sea cliffs of the Atlantic and Baltic coasts (ref: pg. 27, NPWS, 2013B).

There are two categories of sea cliff, hard/rocky cliffs and soft/sedimentary cliffs. Soft cliffs are quite vulnerable to erosion as they contain soft rock (e.g. shale) or materials such as glacial till. Hard cliffs on the other hand contain granite, limestone, sandstone or quartzite, rendering them more resistant to erosion. Vegetation on hard cliffs is typically more stable than on soft cliffs, which can host fast-colonizing pioneer species which arise due to occurrence of slope failure. The total area of coastline of seacliff within the SAC boundary is 76km, encompassing the following sites: Lamb's Head, Coomatloukane East, Coolmatloukane West, Reenearagh, Dogs Bay to Kilcatherine Point, Cod's Head, Garnish Point & Crow Head, Dursey Island, Rossdohan Island, Ardea, Loughaunacreen, Carrignalour, Eyeries (North), Gortgarriff and Eyeries (South). Sea cliffs are important for a variety of flora and fauna, and notably a range of bird species including: Fulmar, Great Black-backed gull, Lesser Black-backed gull, Black Guillemot, Razorbill and Herring Gull. Choughs also nest within the site (NPWS 2013B and references therein).

2.6. Conservation objectives: Otters and Birds.

This section describes the distribution, extent and conservations objectives for otter and bird species in Kenmare River SAC and sites therein.

1. Otter *(Lutra lutra)*

Otters are widespread in Ireland in freshwater and coastal habitats. While the otter has declined in Ireland since the 1980s (NPWS, 2007), the species is still considered widespread and healthy compared to most European countries (current range covers 75 % of the total area of Ireland, Marnell *et al.,* 2011). Eleven out of twelve sites surveyed in an area spanning the entire length of Kenmare River SAC, recorded the presence of the otter (Bailey and Rochford 2006). An otter assessment during 2010/11 provided similar data (Reid *et al.,* 2013). Otters may feed to some extent on fish within the *A. nodosum* biotope, in additional to the wider range of marine habitats where they also forage (Kelly L. *et al.,* 2001). However, otters may be more driven to habitats conducive to obtaining an adequate food source, for example, a positive relationship has been found between otter numbers and angling sites in Ireland (Bailey and Rochford, 2006). While otters are somewhat tolerant to human presence, the species is considered to be in decline in many parts of Europe with significant risks including roads, fishing nets and lobster pots (NPWS, 2007). Organochlorine pesticides are also widely accepted as having severely reduced otter population sizes in the UK (Jones and Jones, 2004). In terms of extent and distribution of the species in Kenmare Bay, otters utilize a wide number of habitats and areas spanning the length of the site, summarized as follows:

- **Freshwater aquatic & terrestrial:** Otters may occupy freshwater rivers and lakes associated with Kenmare SAC. There are several rivers, lakes in the general area, including: River Sheen, Lough Inchiquin, River Finnihy, Kerry Blackwater, River Sneem, Glan Lough and Roughty River.
- **Marine aquatic and terrestrial:** Otters have potential to forage extensively through the site. Their extent is likely to encompass the entire SAC, including the islands.
- **Coastal sites:** Bailey, M. and Rochford J. (2006) identified 11 sites in Kenmare SAC which showed signs of otter activity. These includes sites at the following locations:
  - Two sites between the N71 bridge at Kenmare Old and Roughty Bridge at the mouth of the River Roughty (2 sites)
  - Sneem.
  - Lauragh
  - Tahilla.
  - A site in the vicinity of Ardgroom.
  - A site between Fay and Kilcatherine Point.
  - Travara.
  - Allihies.
  - A site between Lambs head and Dursey Island.
  - A site between west Rath, Abbey Island and Derrynane.

In addition to the sightings above, otters have also been reported in a range of sites throughout Kenmare River SAC (ref: Data held by the National Biodiversity Data Centre). Please consult Appendix 9 for further details.

Otters require that marine and freshwater habitats be maintained to levels which facilitate a broad array of biological imperatives including foraging, breeding and resting. Otters are sensitive to disturbance particularly during the period of breeding, rearing, hibernation and migration.

Conservation requirements:

As for many SACs relevant to the otter, the favourable conservation condition of otter should be maintained, according to the following targets:

- No significant decline in distribution (i.e. positive survey sites).
- No significant decline in extent of terrestrial habitat.
- No significant decline in extent of marine habitat.
- No significant decline in extent of freshwater (river) habitat.
- No significant decline in extent of freshwater (lake/lagoon) habitat.
- No significant decline in number of Couching sites and Holts (minimize disturbance)
- No significant decline in fish biomass.
- No significant increase in barriers to connectivity.

2. Birds:

Kenmare River SAC is not designated as a Special Protection Area (SPA). Nonetheless, it is important to assess the potential impact(s) associated with hand harvesting of *A. nodosum* on protected bird species in the SAC given that:

(a) the SAC supports a number of breeding and wintering bird species.

(b) there are a number of important SPAs located near to Kenmare River SAC, such as Beara Peninsula SPA (Site code 004155), Deenish Island and Scariff Island SPA (Site code 004175). A number of pHNAs supporting important bird species are also present.

Species assessed: Based on NPWS (NPWS, 2013C), Birdwatch Ireland, I-Webs and data held by the National Biodiversity Data Centre and others, n=124 bird species were assessed (see Appendix 6 for more details): Arctic Tern *(Sterna paradisaea)* , Balearic Shearwater *(Puffinus mauretanicus),* Barn Owl *(Tyto alba),* Barn Swallow *(Hirundo rustica),* Barnacle Goose *(Branta leucopsis),* Bar-tailed Godwit *(Limosa lapponica),* Black Guillemot *(Cepphus grylle),* Black-headed Gull *(Larus ridibundus)* , Black-legged Kittiwake *(Rissa tridactyla),* Black-tailed Godwit *(Limosa limosa),* Black-throated Diver *(Gavia arctica),* Brent Goose *(Branta bernicla hrota),* Chiffchaff *(Phylloscopus collybita),* Chough *(Pyrrhocorax pyrrhocorax),* Common Eider *(Somateria mollissima),* Common Guillemot *(Uria aalge),* Common Gull *(Larus canus)* , Common Kestrel *(Falco tinnunculus),* Common Linnet *(Carduelis cannabina),* Common Sandpiper *(Actitis hypoleucos),* Common Scoter *(Melanitta nigra),* Common Starling *(Sturnus vulgaris),* Common Swift *(Apus apus),* Common Tern *(Sterna hirundo),* Coot *(Fulica atra),* Cormorant *(Phalacrocorax carbo),* Corn Crake *(Crex crex),* Curlew *(Numenius arquata),* Curlew Sandpiper *(Calidris ferruginea),* Dipper *(Cinclus cinclus),* Dunlin *(Calidris alpina),* Eurasian Tree Sparrow *(Passer montanus),* European Greenfinch *(Carduelis chloris),* European Shag *(Phalacrocorax aristotelis),* European Turtle Dove *(Streptopelia turtur),* Fulmar *(Fulmarus glacialis),* Gadwall *(Anas strepera),* Gannet *(Morus bassana),* Glaucous Gull *(Larus hyperboreus),* Goldcrest *(Regulus regulus),* Golden Plover *(Pluvialis apricaria),* Goldeneye *(Bucephala clangula),* Goosander *(Mergus merganser),* Great Black-backed Gull *(Larus marinus)* , Great Crested Grebe *(Podiceps cristatus),* Great Northern Diver *(Gavia immer),* Great Skua *(Stercorarius skua),* Green Sandpiper *(Tringa ochropus),* Greenshank *(Tringa nebularia),* Grey Heron *(Ardea cinerea),* Grey Plover *(Pluvialis apricaria),* Grey Wagtail *(Motacilla cinerea),* Hen Harrier *(Circus cyaneus),* Herring Gull *(Larus argentatus),* Hooded Crow *(Corvus cornix),* House Martin *(Delichon urbicum),* House Sparrow *(Passer domesticus),* Iceland Gull

(Larus glaucoides), Jay *(Garrulus glandarius),* Kingfisher *(Alcedo atthis),* Lapwing *(Vanellus vanellus),* Lesser black-backed Gull *(Larus fuscus),* Little egret *(Egretta garzetta),* Little Grebe *(Tachybaptus ruficollis),* Little Gull *(Larus minutus),* Little Plover *(Charadrius dubius),* Little Stint *(Calidris minuta),* Little Tern *(Sterna albifrons),* Long eared owl *(Asio otus),* Mallard *(Anas platyrhynchos),* Manx Shearwater *(Puffinus puffinus),* Meadow Pipit *(Anthus pratensis),* Mediterranean Gull *(Larus melanocephalus),* Merlin *(Falco columbarius),* Moorhen *(Gallinula chloropus),* Mute Swan *(Eala bhalbh; Cygnus olor),* Northern Goshawk *(Accipiter gentilis),* Oystercatcher *(Haematopus ostralegus),* Peregrine *(Falco peregrinus),* Pochard *(Aythya ferina),* Puffin *(Fratercula arctica),* Purple Sandpiper *(Calidris maritima),* Raven *(Corvus corax),* Razorbill *(Alca torda),* Red breasted merganser *(Mergus serrator),* Red Grouse *(Lagopus lagopus),* Red Knot *(Calidris canutus),* Redshank *(Tringa totanus),* Red-throated Diver *(Gavia stellata),* Redwing *(Turdus iliacus),* Ring Ouzel *(Turdus torquatus),* Ring-billed Gull *(Larus delawarensis),* Ringed Plover *(Charadrius hiaticula),* Rock Pipit *(Anthus petrosus),* Roseate Tern *(Sterna dougallii),* Sand Martin *(Riparia riparia),* Sanderling *(Calidris alba),* Sandwich Tern *(Sterna sandvicensis),* Scaup *(Anas marila),* Shelduck *(Tadorna tadorna),* Short-eared Owl *(Asio flammeus),* Shoveller *(Anas clypeata),* Skylark *(Alauda arvensis),* Smew *(Mergellus albellus),* Snipe *(Gallinago gallinago),* Sparrowhawk *(Accipiter nisus),* Spotted Flycatcher *(Muscicapa striata),* Stock Dove *(Columba oenas),* Stonechat *(Saxicola torquata),* Storm Petrel *(Hydrobates pelagicus),* Teal *(Anas crecca),* Tufted Duck *(Aythya fuligula),* Turnstone *(Arenaria interpres),* Twite *(Carduelis flavirostris),* Velvet Scoter *(Melanitta fusca),* Wheatear *(Oenanthe oenanthe),* Whinchat *(Saxicola rubetra),* White Tailed Sea Eagle *(Haliaeetus albicilla),* Whooper Swan *(Cygnus cygnus),* Wigeon *(Anas Penelope),* Willow Warbler *(Phylloscopus trochilus),* Wood Pigeon *(Columba palumbus),* Woodcock *(Scolopax rusticola)* and Yellowhammer *(Emberiza citrinella).*

Distribution: Protected bird species and their distribution in Kenmare River SAC is described in detail in Appendix 6. Datasets were obtained from the sources outlined below.

- The Irish Wetland Bird Survey (I-WeBS): data describing the broad distribution of bird species within a number of subsites of Kenmare River SAC (personal correspondence with BirdWatch Ireland).
- National Biodiversity Data Centre.
- NPWS Site Synopsis for Kenmare River SAC (NPWS, 2013C).
- Sites of relevance include: Iveragh Peninsula SPA (site code: 004154), Deenish Island and Scariff Island SPA (site code:004175), Eyeries Island pNHA (site code: 1051), Rossdohan Island pNHA (site code: 001375), 2m Island, Ardea West (Tuosist), Ardgroom, Ardgroom Harbour, Ballycrovane Harbour, Blue Islands, Allihies Bay, Bridaun Beg, Coornagillagh, Coulagh Bay, Dromquinna Manor, Illaunleagh, Illaunleama, Inishfarnard, Kilcatherine point to Doonagh, Kilmackillogue Harbour, Leahcarrig, Lehid Harbour (Tuosist), Oysterbed (Sneem), Pallas Strand (Eyeries), Parknasilla, Kilcatherine point to Doonagh, Leahcarrig, Lehid Harbour.

Conservation requirements: none specified by NPWS 2013A or 2013B. Kenmare River SAC is not an SPA. However, there are a number of important sites within the complex which support protected species of breeding and wintering birds. In some cases these areas are defined as SPA or pNHAs with objectives as follows:

- Iveragh Peninsula SPA (site code: 004154): Objective 1: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Fulmar *(Fulmarus glacialis),* Peregrine *(Falco peregrinus),* Kittiwake *(Rissa tridactyla),* Guillemot *(Uria aalge),* Chough *(Pyrrhocorax pyrrhocorax).*

- Deenish Island and Scariff Island SPA (site code:004175): Objective 1: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA. Fulmar *(Fulmarus glacialis),* Manx Shearwater *(Puffinus puffinus),* Storm Petrel *(Hydrobates pelagicus),* Lesser Black-backed Gull *(Larus fuscus),* Arctic Tern *(Sterna paradisaea).*
- Eyeries Island pNHA (site code: 1051): Objective 1: future development should be in accordance with the scientific value of the area (Fahy E, 1972). Potential impacts would include activities that would give rise to significant negative impacts on common and/or Arctic terns.
- Spanish Island pNHA (site code:. 001378): Objective 1: Disturbance events represent a significant threat to the successful breeding of terns. An increase in the numbers of black-headed gulls would also be considered detrimental. It has been recommended that access to the island be discouraged (Goodwillie, 1972).
- Rossdohan Island pNHA (site code: 001375): While objectives are not specified, efforts should be taken to ensure that negative impacts on the following species do not occur: Arctic Tern (5 pairs) and Black-Headed Gull colonies.
- Roughty River Estuary pNHA (site code: 0002092). While objectives are not specified, efforts should be taken to ensure that negative impacts on the following species do not occur: Mute Swan, Wigeon, Teal, Mallard, Scaup, Oystercatcher, Dunlin, Curlew, Redshank and Greenshank.

2.7. Species & habitats of general interest

This section describes the conservation requirements, where applicable, for species and habitats of general interest in Kenmare River SAC.

1. Fish species:

Rivers Roughty, Finnihy and Sheen are important sites for spawn, fry and mature salmon or trout. Salmon or trout smolts or post smolt adults enter the sea at Kenmare River SAC, and feed within the bay. Other fish species may potentially use *A. nodosum* zones intermittently for purposes which include feeding, reproduction or sheltering (Kelly L. *et al.,* 2001 and references therein). Commercial species of relevance however are not dependent on the *A. nodosum* zone for fulfilling life cycle functions and instead, utilize a wide range of non-seaweed habitats.

Conservation requirements: none specified by NPWS 2013A or 2013B. However, Salmon are Annex II species listed under the EU habitats Directive.

2. West Cove, Tahilla, Dinish Island, Dirreen House areas

These areas are particularly important from a conservation perspective as they contain a number of Atlantic Salt Meadow and Mediterranean Salt Meadow habitats.

Conservation requirements: The favourable conservation condition of salt marsh habitats must be maintained (ref: Objectives 1 & 2, NPWS, 2013B, pg. 12).

3. Derrynane

Derrynane is considered a "site of ecological interest" by NPWS (ref: NPWS 2013B, pg. 75). This region is of most importance from a conservation perspective as it contains several important sand dune habitats, including embryonic shifting dunes, shifting dunes along the shoreline with *Ammophilia arenaria*, fixed coastal dunes with herbaceous vegetation and humid dune slacks. In addition, Derrynane supports a wide range of habitats, including residual saltmarsh, reedmarsh and planted woodland and exotic tree species. It is also supports a number of important bird species.

Conservation requirements: The favourable conservation condition of sand dune habitats must be maintained (ref: Objective 3, NPWS, 2013B, pg. 21).

4. Old Domestic Building, Dromore Wood SAC (Site Code 000353)

The sites contains a large, three-storey stone building in Dromore Wood. The site is a Special Area of Conservation (SAC) selected for the following: [1303] Lesser Horseshoe Bat (Rhinolophus hipposideros). The area includes an artificial hibernation sites for this species. The hibernation site is surrounded by coniferous forestry, providing foraging habitat.

Conservation requirements: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II Lesser Horseshoe Bat (Rhinolophus hipposideros). Removal of the woodland would be detrimental.

5. Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342)

Located on the northern side of Caha Mountain range, west of Kenmare, Co. Kerry (NPWS, 2016A), including four lakes, smaller mountain lakes, inter-connecting rivers and streams, and the oak woodlands at Uragh Wood. The site support range of species and habitats of interest.

Conservation requirements: To maintain or restore the favourable conservation condition of the following:

- [3110] Oligotrophic Waters containing very few minerals
- [4010] Wet Heath
- [4030] Dry Heath

- [8220] Siliceous Rocky Slopes
- [91A0] Old Oak Woodlands
- [1024] Kerry Slug *(Geomalacus maculosus)*
- [1303] Lesser Horseshoe Bat *(Rhinolophus hipposideros)*
- [1421] Killarney Fern *(Trichomanes speciosum)*
- [1833] Slender Naiad *(Najas flexilis)*

6. Drongawn Lough SAC (site code: 002187)

Moderate-sized, deep, silled, polyhaline saline lake lagoon in almost pristine condition, situated on the northern side of the Kenmare River inlet in Co. Kerry, ~ 6 km to the east of Sneem (NPWS, 2014D).

Conservation requirements: To maintain the favourable conservation condition of Coastal lagoons in Drongawn LoughSAC.

7. Glanmore Bog SAC (site code: 001879)

Situated 3km north-west of Hungry Hill, Co. Cork and 8 km south-west of the village of Lauragh, Co. Kerry. The geology is Old Red Sandstone (NPWS, 2016B). Overall, this site is of considerable conservation significance given the presence of five habitats and two species which are listed on the E.U. Habitats Directive.

Conservation requirements: To maintain or restore the favourable conservation condition of the following:

- 3110 Oligotrophic waters containing very few minerals of sandy plains *(Littorelletalia uniflorae)*
- 3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
- 4010 Northern Atlantic wet heaths with Erica tetralix
- 6230 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)
- 7130 Blanket bogs (if active bog)

8. Cleanderry Wood SAC (site code: 001043)

Occurs on a steep slope directly above the coastline, situated along the south side of the Kenmare River inlet, 10 km north of Castletownbere in Co. Cork (NPWS, 2013H). It contains is a small oak (Quercus sp.) woodland which faces north-west, crossed by a number of cascading streams.

Conservation requirements: To maintain or restore the favourable conservation condition of the following:

- 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles
- 1421 Killarney Fern *(Trichomanes speciosum)*

9. Mucksna Wood SAC (site name: 001371)

Mucksna Wood is located south of Kenmare on the shores of the Kenmare River, Co. Kerry. It contains native and exotic tree species. The soil is quite rich and likely of glacial drift origin. The northern margin of the woodland borders onto the fringe of a saltmarsh beside the Kenmare River.

Conservation requirements: To maintain or restore the favourable conservation condition of the following:

- 91A0 Old sessile oak woods with Ilex and Blechnum.

2.8. *A. nodosum* Biotope and species therein

A. nodosum is present at sheltered locations throughout Kenmare River SAC. In very sheltered areas, *A. nodosum* is present at high densities. It may also be found interspersed in areas of *Fucus sp.* cover. According to Hession *et al.,* (1998), *A. nodosum* is present at the locations listed below, varying in quantities from 20 to 500 tonnes per site surveyed. The figures provided by Hession *et al.,* (1998) are considered conservative. Nevertheless, the data provides a good framework in which to target discrete locations of interest.

Kenmare River SAC area/region (sustainable tonnes/annum)

- Knocknasulhy to Vedanona, via West Cove (130)
- Vedanona to Parknasilla (50)
- Coongar harbour to Rossmore Island (150)
- Derreennamaken to Kenmare Pier (90)
- Coornagillagh to Kenmare Pier (500)
- Lehid Harbour (60)
- Bunaw to Collarus (inc. Derreen & Lauragh), covering Killmakilloge Harbour (100)
- Ardgroom Harbour to Cappul Bridge (60)
- Ballycrovane harbour (20)

An important consideration when harvesting *A. nodosum* are the species residing within the biotope. The *A. nodosum* biotope in Ireland supports a diverse epibiota including members of the *Animalia*, *Plantae, Chromalveolata* Families and several Phyla therein. This includes sessile epibiota attached to *A. nodosum*, mobile fauna and predatory animals (fish, birds, otters). The impact of hand harvesting of *A. nodosum* on the biodiversity within the *A. nodosum* biotope has been assessed in two regions of the west of Ireland by Kelly L. *et al.,* (2001). This data provides a strong framework in which to assess the potential impacts of the plans by BioAtlantis to hand harvest *A. nodosum* on this biotope. The study by Kelly L. *et al.* (2001) is detailed in its scope and includes those listed below in Kingdoms *Animalia*, *Plantae, Chromista* and *Fungi.* The asterisk symbol, '*', denotes species specified by NPWS (2013A) as associated with or near to the intertidal reef community complex and/or the *A. nodosum* biotope. The dagger symbol, ' †', denotes species specified by NPWS (2013A) as being associated with intertidal reef community complex but not assessed by Kelly *et al.,* (2001).

- Kingdom *Animalia*
  - Phylum Mollusca: *Melarhaphe neritoides* (formerly *Littorina neritoides)†, Littorina saxatilis*, Littorina littorea*, Littorina obtusata* (Winkles), Limpets *(Patella sp.)*, Gibbula cineraria*, Nucella lapillus*)*
  - Phylum Arthropoda (Barnacles; *Elminius modestus*, Semibalanus balanoides** and *Chthamalus stellatus†)*
  - Phylum Cnidaria (Hydroid. e.g. *Dynamena pumila Linnaeus, Actinia equine**)
  - Phylum Porifera (Sponges, e.g., *Leucosolenia sp. Bowerbank*, *Halichondria panacea* Pallas*, *Hymeniacidon perleve Montagu, Hymeniacidon sp.* Ophlitaspongia*†)
  - Phylum Chordata (Sea squirts, e.g. *Ascidiella*)
  - Phylum Arthropoda (Amphipods, isopods crabs, *Chironomida*, *Halacaridae*, *Ostracoda*).
  - Phylum Platyhelminthes (e.g. *Turbellaria*)
  - Phylum Annelida

- Phylum Foraminifera
- Phylum Nematoda

- Kingdom *Plantae*
  Phylum Rhodophyta (Red algae, e.g.: *Polysiphonia lanosa (Linnaeus) Tandy*, *Mastocarpus stellatus (Stackhouse) Guiry**, *Chondrus crispus Stackhouse*, *Corallinaceae, Palmaria palmata†*, *Porphyra umbilicalis**; Ephemeral green algae, e.g. *Cladophora rupestris (Linnaeus) Kützing*, *Ulva sp.*, *Linnaeus* and *Enteromorpha* sp. Link;); Other seaweed species: *Lomentaria articulata (Hudson) Lyngbye**; *Membranoptera alata (Hudson) Stackhouse, Osmundea pinnatifida**).
- Kingdom *Chromista*
  Phylum Heterokontophyta *(Ascophyllum nodosum**, *Fucus vesiculosis Linnaeus**, *Fucus serratus Linneaus**, Fucus spiralis*),* Phylum Ochrophyta (*Pelvetia canaliculata*, Himanthalia sp.**)*
- Kingdom *Fungi*
  Lichens found in coastal areas: *Xanthoria parietina†, Verrucaria Maura*, Ochrolechia parella†, Ramalina sp.†, Anaptychia runcinata†* and *Lecanora atra†).*

Summary of species residing within the *A. nodosum* biotope:

- Barnacles and limpets (e.g. *Semibalanus balanoides Linnaeus*, *Elminius modestus Darwin*, *Chthamalus stellatus* and *Patella sp.*).
- Gastropods: *Littorina obtusata Linnaeus*, *Littorina littorea Linnaeus* (graze some epiphytes from *A. nodosum* surface)*, Littorina saxatilis* (feeds on diatoms, filamentous algae and plant litter); *Melarhaphe neritoides* (formerly *Littorina neritoides;* feeds on algae and lichens), *Nucella lapillus (Dog Winkle):* carnivore which preys on barnacles, mussels, cockles, bivalves and gastropods (e.g. limpets), *Gibbula cineraria* (Top shell, herbivore/detritivore)
- *Fucus vesiculosis Linnaeus* and *Fucus serratus Linneaus* (occurs alongside *Ascophyllum*). *Fucus spiralis* lives upper part of the intertidal zone, just beyond where *A. nodosum* grows at high density.
- Red algae *Polysiphonia lanosa (Linnaeus) Tandy* (epiphyte of *Ascophyllum nodosum*), *Mastocarpus stellatus (Stackhouse) Guiry*, *Chondrus crispus Stackhouse*, *Corallinaceae* (located beneath the canopy).;
- Ephemeral green algae (e.g. *Cladophora rupestris (Linnaeus) Kützing*, *Ulva sp*. *Linnaeus* and *Enteromorpha* sp. Link; low densities).
- Other seaweed species: *Lomentaria articulata* (Hudson) *Lyngbye* and *Membranoptera alata (Hudson) Stackhouse*, occur under tidal swept conditions; *Osmundea pinnatifida* occurs on the lower, mid and backshore. *Pelvetia canaliculata* occurs on the upper shore, *Himanthalia sp* occurs where the shore is moderately exposed, just above where *Laminaria* species occur, below where Fucoids become more dominant.
- Hydroid (*Dynamena pumila Linnaeus*; may be found on tips of *A. nodosum; Actinia equine*).
- Sponges (e.g., *Leucosolenia* sp. *Bowerbank*, *Halichondria panicea Pallas* and *Hymeniacidon perleve Montagu*; occur on steep surfaces and under boulders in areas of strong tidal currents). *Ophlitaspongia* may occur on rocks in shallow subtidal areas or potentially within the lower intertidal zone.
- Ascidians (e.g. *Dendrodoa grossularia van Beneden* and *Ascidiella scabra O.F. Müller*; occur on steep surfaces and under boulders in areas of strong tidal currents).
- Mobile species: Amphipods, isopods crabs, *Annelida*, *Chironomida*, *Foraminifera*, *Halacaridae*, *Mollusca*, *Nematoda*, *Ostracoda*, *Turbellaria*.

- Lichens: *Xanthoria parietina, Verrucaria Maura (*common on rocky coasts on the upper limit of the intertidal, in particular on exposed coasts)*, Ochrolechia parella* (found on silicaeous rock inland and in coastal areas, also grows on trees., *Ramalina sp. (e.g.. R. siliquosa* grows on the upper portions of rocky sea shores)*, Anaptychia runcinata* (occurs inland and on hard coastal rock) and *Lecanora atra* (occurs on siliceous rocks at the splash zone and beyond*).*

Conservation requirements: As part of the Kenmare SAC, it is important to assess the potential impacts that hand harvesting could have on the *A. nodosum* biotope and associated environment, particularly given the presence of the biotope on intertidal reef substrate and associated community complex.

2.9. Continual disturbance, broad, cumulative and in combinational effects and spread of invasive species.

To assess the potential impact of harvesting on conservation objectives for Kenmare River SAC it is important to consider the following:

(a) Continual disturbance levels,
(b) The broader effects of *A. nodosum* harvesting,
(c) In combination and cumulative effects
(d) Potential spread of invasive species,

Key aspects of these requirements are summarised below:

(a) Continual disturbance levels:

NPWS recommend that continuous disturbance of each community type should not exceed an approximate area of 15% (NPWS 2013A), covering:

- *Zostera* Community – 20ha
- *Maerl* Dominated community - 47ha
- *Pachycerianthus multiplicatus* community – 6ha
- Intertidal mobile sand community complex - 63ha
- Muddy fine sands dominated by *polychaetes* and *Amphiura filiformis* community complex – 20150ha
- Fine to medium sand with crustaceans and *polychaetes* community complex – 1989ha
- Coarse sediment dominated by *polychaetes* community complex – 8314ha
- Shingle – 1ha
- Intertidal reef community complex - 526ha
- Subtidal reef with echinoderms and faunal turf community complex – 4808ha
- *Laminaria*-dominated community complex - 3358ha

(b) Broad, holistic examination of effects:

It is required that a broad, holistic examination of the effects of hand harvesting be carried out with respect to:

1. The spatial extent of harvesting techniques and activities:
   - Management of expansive and prolonged operations.
   - Numbers of personnel and exploitation levels.

2. The potential interaction effects of seaweed harvesting:
    - Targeted removal of species.
    - Non-targeted removal of species.
    - Disturbance and displacement of species and habitats.
    - Changes in community structure.
    - Changes in hydrodynamics and water quality.
    - Potential disturbance of marine fauna.
    - Potential interactions with coastal habitats.

(c) Cumulative and in-combinational effects

1. Existing Operations: Potential cumulative, in-combination effects and interactions:
    - Unlicensed, traditional and casual harvesting of seaweed.
    - Recreation, Tourism, Sport, Growth & Development.
    - Aquaculture and fisheries activities.
    - Harvesting of invertebrates.
2. Planned Operations: Potential cumulative, in-combination effects and interactions:
    - Other planned harvest activities.
    - Recreation, Tourism, Sport, Growth & Development.
    - Aquaculture and fisheries activities.
    - Harvesting of Invertebrates.

(d) Vector potential of harvest activities in the spread of invasive species.

3. Assessment of likely effects of hand harvesting

3.1. Identification of likely effects of proposed plan.

3.1.1. Introduction

The Impact Assessment described in this section formed a key foundation in the development of the management plan and the harvesting Code of Practice (Appendix 4). In assessing the potential impacts of the plan to hand harvest *A. nodosum* on the conservation objectives of the Kenmare River SAC, a conservative, precautionary approach was employed and in the case of uncertainty, it was assumed that the effects have potential to be significant. This allowed for the development of a plan based on best scientific knowledge to ensure that any potentially negative impact(s) of hand harvesting of *A. nodosum* on the biological environs of this region are prevented or minimized. This assessment was also used to develop a management system with appropriate control measures, monitoring and corrective actions for potential hazards. This is outlined in Tables 1-4 of this document (see index below).

Kenmare River SAC:

- Table 1 : Summary of Results of Risk Assessment.
- Table 2: Impact on protected marine habitats and species and coastal habitats in Kenmare River SAC.
- Table 3 : Impact on general species & habitats of Kenmare River SAC.
- Table 4: Impact on the *Ascophyllum nodosum* Biotope and species therein.

On identification of a number of potential hazards, BioAtlantis proceeded to contact Ecofact Environmental Consultants Ltd. in order to assess whether or not a Natura Impact Statement (NIS) was required. The NIS is attached as a separate stand-alone document to this application and validates the mitigation measures and Code of Practice developed by BioAtlantis in ensuring that the sustainable harvest management plan does not negatively impact on species and habitats of the SAC.

3.1.2. Data sources:

Kenmare River SAC is part of an ecological network of protected areas in the EU, known as 'Natura 2000'. Article 6, EU habitats Directive (92/34/EEC), states:

"Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives".

In accordance with NPWS requirements (NPWS, 2012) and EU Law, the likelihood of this plan affecting Kenmare River SAC must be assessed based on:

(a) preliminary consideration of the likely impacts of a proposed activity and

(b) determination of whether there is a risk that the effects identified could be significant.

In assessing the potential impact of hand harvesting of *A. nodosum* in Kenmare River SAC, all direct, indirect and cumulative effects have been considered by BioAtlantis through use of all available and

applicable information. This includes the peer-reviewed literature, existing datasets and environmental impact reports undertaken in the area.

Records and biodiversity surveys within Kenmare River SAC has been utilized by NPWS to develop site specific conservations objectives for marine species and habitats in Kenmare River SAC (Summers *et al.,* 1980; Warner, 1983; Harrington, 1990; BioMar (Picton &Costello) 1995, Aquafact 2003, Cronin *et al.,* 2004; Lyons, 2004; Heardman *et al.,* 2006, Roycroft *et al.,* 2006; Cronin *et al.,* 2007A, Cronin, 2007B; Cronin *et al.,* 2008; Cronin *et al.,* 2009; ERM 2009, MERC, 2009,. This includes annual monitoring surveys for harbour seals within the SAC which have been carried out since 2009 (NPWS, 2010; NPWS, 2011A, NPWS, 2011B; NPWS, 2012). In the case of coastal habitats, BioAtlantis have assessed the conservation objectives outlined by the NPWS (2013B). The many surveys/reports undertaken in these areas provide an important basis for the targets which have been set. These include the National Shingle Beach Survey (NSBS; Moore & Wilson, 1999), the Saltmarsh Monitoring Project (SMP; McCorry, 2007; McCorry & Ryle, 2009) and the Coastal Monitoring Project (CMP) (Ryle *et al.,* 2009). This has allowed BioAtlantis to assess potential risks to relevant coastal environments and to develop a plan which minimizes and prevents any potential negative impact of *A. nodosum* hand harvesting activities. This is outlined in the following pages, with specific reference to the objectives, targets and attributes described by the NPWS, 2013B. Otters are listed as Annex II protected species within this SAC. Close attention was placed by BioAtlantis on major sites of relevance to otters, as outlined in Bailey, M. and Rochford J. (2006) and an assessment carried out during 2010/11 which provided similar data (Reid *et al.,* 2013). Emphasis was placed on avoiding fresh water environs in the area and measures to ensure disturbance events do not occur. While not a SPA, Kenmare River SAC is host to a number of Annex I species protected under the EU Birds Directive. Datasets provided courtesy of BirdWatch Ireland were utilized to evaluate the types of birds present in Kenmare River SAC and site of relevance, if any. Species specific mitigation measures were developed to ensure disturbance events do not occur.

7.2.1.3. Preliminary consideration of the likely impacts of a proposed activity:

A number of potential effects to the proposed plan have been identified and include:

1. Permanent habitat loss (e.g. sand, shingle, stones)
2. Displacement/exclusion of species (e.g. harbour seals)
3. Visual presence (e.g. harbour seals)
4. Noise disturbance (e.g. harbour seals)
5. Abrasion / Physical disturbance (e.g. *A. nodosum* growth substrate)
6. Selective extraction of target species (e.g. *A. nodosum*)
7. Selective extraction of non-target species (e.g. *Fucus sp.*)
8. Suspended sediment (e.g. intertidal sand, estuarine mud,).
9. Changes in hydrodynamic regime*
10. Changes in nutrient levels (*A. nodosum* as a source of carbon)*
11. Introduction/spread of non-native species *(e.g. Bonamia ostreae, Botrylloides violaceus, Caprella mutica, Crassostrea gigas, Crepidula fornicate, Didemnum vexillum, Perophora japonica, Sargassum muticum, Spartina anglica, Schizoporella errata* and *Styela clava)*†

*covered in Section 3.5.3, part (e) and (g).

†covered in Section 3.6.4

Important potential effects which are deemed to have no relevance to this application include: Smothering, desiccation, changes in emergence regime, changes in water flow rate, changes in temperature, changes in turbidity, synthetic compound contamination, heavy metal contamination, hydrocarbon contamination, changes in salinity, changes in oxygenation, introduction of microbial, pathogens / parasites.

3.2. Risk Assessment (Scope & Methodology)

3.2.1. Scope of the Assessment

The scope of the risk assessment for Kenmare River SAC carried out by BioAtlantis Ltd. covers the following six categories:

- Impact on protected marine and coastal habitats & species in Kenmare River SAC (according to Annex I & II of EU Habitats Directive 92/43/EEC; see Sections 3.3.1 – 3.3.3).
- Impacts on /Otters and birds (Section 3.3.4).
- Impact on species & habitats of general interest (Section 3.3.5).
- Impact on the *A. nodosum* biotope and species therein (Section 3.3.6).
- Continuous disturbance levels (not exceeding an area of 15%; see Section 3.4).
- Broad, holistic examination of the nature, extent and impact of hand harvesting (Section 3.5).
- Cumulative and in Combination Impacts (Section 3.6).
- Spread of invasive species (Section 3.6.4).

3.2.2. Methodology employed

The initial risk assessment by BioAtlantis involved:

(a) The identification of the nature of the potential hazard (i.e. biological, chemical or physical),

(b) Calculation of the probability of such hazards occurring and

(c) Determination of the severity of a given hazard as measured by their impact on the conservation objectives for the Kenmare River SAC region.

The pre-cautionary principal was applied in each calculation, with significance measured by means of 5x5 risk evaluation matrices. Data and information used in this assessment included all relevant environmental impact assessments in the Kenmare River SAC area, the peer-reviewed scientific literature, NPWS requirements and information and data existing in the public domain. Mitigation measures were deemed absolutely necessary for risk ratings exceeding a score of 15. For moderate risks of 8-12, control measures were deemed necessary to ensure sufficient control and oversight over potential hazards. In such cases, it was deemed necessary to proceed with working in conjunction with independent environmental consultants to determine whether or not a full NIS was required. Where low risks were identified (1-6), control measures were developed where appropriate. This approach provided a framework for developing a management system with clearly specified action/non-conformance limits, monitoring schedules and analytical procedures, coupled with robust corrective actions and verification methods (see tables in Sections 3.3.6 & 3.6.5). A Code of Practice for protection of sensitive species in the SAC was also developed and is provided in Appendix 4. The risk evaluation system and decision tree employed are described in detail in Section 4 of this current document.

3.3. Results of Risk Assessment (Direct and indirect impacts):

3.3.1 Summary.

The following section describes the findings of the risk assessment undertaken by BioAtlantis (see Table 1 for brief results summary). Detailed tables are provided in Section 3.3.6 and 3.6.5, which outline the results of the associated risk assessments along with control measures, action limits and monitoring and verification methods where applicable. The decision matrices used in calculating probability, severity and risk are also provided in Section 4 of this document, along with detailed explanations as to the scientific reasoning behind each decision made and scores assigned. In brief, risk ratings have been grouped into three categories:

15 – 25 High risk, requiring mitigation measure; NIS is required.
8 - 12 Moderate risk, establish control procedures; NIS may not be required*.
1 – 6 Low risk, establish control procedures if appropriate; NIS may not be required.

*External consultation required to establish if NIS is required.

The potential risk level associated with hand harvesting of *A. nodosum* on protected species and habitats, general species and habitats of interest, and those within the *A. nodosum* biotope, are provided in summary format in Table 1. The table also includes results from analysis of extent of continual disturbance, broad examination of impacts and potential in combination and cumulative impacts and potential impacts on the spread of invasive species. See Tables in Section 3.3.6 and 3.6.5 for a summary of control measures, monitoring & corrective actions. See Section 4 of this document for details of the analysis.

Table 1: Summary of Results of Risk Assessment

No	(a) Marine & Coastal species & habitats (as protected under Annex I & II of EU Habitats Directive 92/43/EEC).	Potential Risk
1	**Permanent habitat area**	Low- Moderate
2	**Seagrass, *Zostera* marina (and associated communities).**	Low
3	***Maerl* Dominated communities**	Low
4	***Pachycerianthus multiplicatus* community complex.**	Low
5	***Polychaetes* & *Amhiura filiformis* community complex (muddy fine sand areas).**	Moderate
6	**Crustaceans & polychaetes community complex (fine-medium sand).**	Low
7	***Polychaetes* community complex:** Distinguishing species: *Prionospio sp., M. palmate, T.flexuosa, M. bidentata, A. alba.*	Low
8	***Polychaetes and oligochaete species (Estuarine mud)***	Moderate
9	***Intertidal mobile sand community complex***	Low
10	**Shingle (pebbles and gravel):** Associated communities: Talitrid amphipods	Low
11	**Reef:** *Intertidal reef Associated communities include: A.nodosum, Fucus sp., L.hyperborea, L. digitata, A. digitatum, M. senile, E. fucorum, M. fimbriata, P. canaliculata, F. spiralis, L. saccharina, S. polyschides, C. celata, H. panicea, A. lefevrei, P. saxicola.* ***NOTE:*** *A. nodosum & associated communities are assessed separately in (c) below.*	Moderate
12	**Sea Caves** (submerged or partially submerged).	Low
13	**Harbour seals:** General population	Moderate
14	**Harbour seal:** Effects on species range due to restriction by artificial barriers to site use	n/a
15	**Harbour seal:** Breeding sites.	Moderate
16	**Harbour seal:** Moulting sites.	Moderate
17	**Harbour seal:** Resting sites.	Moderate
18	**Perennial vegetation of stony banks**	Low
29	**Saltmarsh habitat (Atlantic salt meadows and Mediterranean salt meadows)**	Low
20	**Sand dune habitats** • Shifting dunes along the shoreline with *Ammophila arenaria* (white dune, 2120); • Fixed coastal dunes with herbaceous vegetation (2130);	Low
21	**Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)**	Low
22	**Otter *(Lutra lutra)***	Low
23	**Birds assessed (n=124)**: Arctic Tern *(Sterna paradisaea)* , Balearic Shearwater *(Puffinus mauretanicus),* Barn Owl *(Tyto alba),* Barn Swallow *(Hirundo rustica),* Barnacle Goose *(Branta leucopsis),* Bar-tailed Godwit *(Limosa lapponica),* Black Guillemot *(Cepphus grylle),* Black-headed Gull *(Larus ridibundus)* , Black-legged Kittiwake *(Rissa tridactyla),* Black-tailed Godwit *(Limosa limosa),* Black-throated Diver *(Gavia arctica),* Brent Goose *(Branta bernicla hrota),* Chiffchaff *(Phylloscopus collybita),* Chough *(Pyrrhocorax pyrrhocorax),* Common Eider *(Somateria mollissima),* Common Guillemot *(Uria aalge),* Common Gull *(Larus canus)* , Common Kestrel *(Falco tinnunculus),* Common Linnet *(Carduelis cannabina),* Common Sandpiper *(Actitis hypoleucos),* Common Scoter *(Melanitta nigra),* Common Starling *(Sturnus vulgaris),* Common Swift *(Apus apus),* Common Tern *(Sterna hirundo),* Coot *(Fulica atra),* Cormorant *(Phalacrocorax carbo),* Corn Crake *(Crex crex),* Curlew *(Numenius arquata),* Curlew Sandpiper *(Calidris ferruginea),* Dipper *(Cinclus cinclus),* Dunlin *(Calidris alpina),* Eurasian Tree Sparrow *(Passer montanus),* European Greenfinch *(Carduelis chloris),* European Shag *(Phalacrocorax aristotelis),* European Turtle Dove *(Streptopelia turtur),* Fulmar *(Fulmarus glacialis),* Gadwall *(Anas strepera),* Gannet *(Morus bassana),* Glaucous Gull *(Larus hyperboreus),* Goldcrest *(Regulus regulus),* Golden Plover *(Pluvialis apricaria),* Goldeneye *(Bucephala clangula),* Goosander *(Mergus merganser),* Great Black-backed Gull *(Larus marinus)* , Great Crested Grebe *(Podiceps cristatus),* Great Northern Diver *(Gavia immer),* Great Skua *(Stercorarius skua),* Green Sandpiper *(Tringa ochropus),* Greenshank *(Tringa nebularia),* Grey Heron *(Ardea cinerea),* Grey Plover *(Pluvialis apricaria),* Grey Wagtail *(Motacilla cinerea),* Hen Harrier *(Circus cyaneus),* Herring Gull *(Larus argentatus),* Hooded Crow *(Corvus cornix),* House Martin *(Delichon urbicum),* House Sparrow *(Passer domesticus),* Iceland Gull *(Larus glaucoides),* Jay *(Garrulus glandarius),* Kingfisher *(Alcedo atthis),* Lapwing *(Vanellus vanellus),* Lesser black-backed Gull *(Larus fuscus),* Little egret *(Egretta garzetta),* Little Grebe *(Tachybaptus ruficollis),* Little Gull *(Larus minutus),* Little Plover *(Charadrius dubius),* Little Stint *(Calidris minuta),* Little Tern *(Sterna albifrons),* Long eared owl *(Asio otus),* Mallard *(Anas platyrhynchos),* Manx Shearwater *(Puffinus puffinus),* Meadow Pipit *(Anthus pratensis),* Mediterranean Gull *(Larus melanocephalus),* Merlin *(Falco columbarius),* Moorhen *(Gallinula chloropus),* Mute Swan *(Eala bhalbh; Cygnus olor),* Northern Goshawk *(Accipiter gentilis),* Oystercatcher *(Haematopus ostralegus),* Peregrine *(Falco peregrinus),* Pochard *(Aythya ferina),* Puffin *(Fratercula arctica),* Purple Sandpiper *(Calidris maritima),* Raven *(Corvus corax),* Razorbill *(Alca torda),* Red	Low

No	(a) Marine & Coastal species & habitats (as protected under Annex I & II of EU Habitats Directive 92/43/EEC).	Potential Risk
	breasted merganser *(Mergus serrator),* Red Grouse *(Lagopus lagopus),* Red Knot *(Calidris canutus),* Redshank *(Tringa totanus),* Red-throated Diver *(Gavia stellata),* Redwing *(Turdus iliacus),* Ring Ouzel *(Turdus torquatus),* Ring-billed Gull *(Larus delawarensis),* Ringed Plover *(Charadrius hiaticula),* Rock Pipit *(Anthus petrosus),* Roseate Tern *(Sterna dougallii),* Sand Martin *(Riparia riparia),* Sanderling *(Calidris alba),* Sandwich Tern *(Sterna sandvicensis),* Scaup *(Anas marila),* Shelduck *(Tadorna tadorna),* Short-eared Owl *(Asio flammeus),* Shoveller *(Anas clypeata),* Skylark *(Alauda arvensis),* Smew *(Mergellus albellus),* Snipe *(Gallinago gallinago),* Sparrowhawk *(Accipiter nisus),* Spotted Flycatcher *(Muscicapa striata),* Stock Dove *(Columba oenas),* Stonechat *(Saxicola torquata),* Storm Petrel *(Hydrobates pelagicus),* Teal *(Anas crecca),* Tufted Duck *(Aythya fuligula),* Turnstone *(Arenaria interpres),* Twite *(Carduelis flavirostris),* Velvet Scoter *(Melanitta fusca),* Wheatear *(Oenanthe oenanthe),* Whinchat *(Saxicola rubetra),* White Tailed Sea Eagle *(Haliaeetus albicilla),* Whooper Swan *(Cygnus cygnus),* Wigeon *(Anas Penelope),* Willow Warbler *(Phylloscopus trochilus),* Wood Pigeon *(Columba palumbus),* Woodcock *(Scolopax rusticola)* and Yellowhammer *(Emberiza citrinella).*	
24	**Other Cetaceans which may be present in Irish waters:** **Whales in Irish Waters:** •Common and Regular Species: Minke Whale *(Balaenoptera acutorostrata),* Fin Whale *(Balaenoptera physalus),* Humpback Whale *(Megaptera novaeangliae),* Long-finned Pilot Whale *(Globicephala melas),* Killer Whale / Orca *(Orcinus orca)* •Occasional or Rare Species: Sei Whale *(Balaenoptera borealis),* Sperm Whale *(Physeter macrocephalus),* Northern Bottlenose Whale *(Hyperoodon ampullatus),* Blue Whale *(Balaenoptera musculus),* Cuvier's Beaked Whale *(Ziphius cavirostris),* Sowerby's Beaked Whale (Mesoplodon bidens), True's Beaked Whale *(Mesoplodon mirus),* Gervais' Beaked Whale *(M. europaeus),* Blainville's Beaked Whale *(M. densirostris).* **Dolphins in Irish Waters:** •Common and Regular Species: *Common* Dolphin *(Delphinus delphis),* Bottlenose Dolphin *(Tursiops truncatus)* – both resident and offshore populations, Risso's Dolphin *(Grampus griseus),* White-beaked Dolphin *(Lagenorhynchus albirostris),* Atlantic White-sided Dolphin *(Lagenorhynchus acutus).* •Occasional or Rare Species: Striped *Dolphin (Stenella coeruleoalba),* Fraser's Dolphin *(Lagenodelphis hosei),* Rough-toothed Dolphin *(Steno bredanensis).* **Porpoises in Irish Waters:** Harbour Porpoise *(Phocoena phocoena)* – widespread and commonly seen cetacean.	Low
No	**(b) Impact on species & habitats of general interest in Kenmare River SAC.**	**Risk**
1	Fish: Rivers Roughty, Finnihy and Sheen are important sites for salmon and trout.	Low
2	West Cove, Tahilla, Dinish Island, Dirreen House areas (Salt Marsh areas)	Low
3	Derrynane areas (Sand dunes).	Low
4	Iveragh Peninsula SPA (site code: 004154)	No risk
5	Deenish Island and Scariff Island SPA (site code:004175)	No risk
6	Kenmare Islands pNHA (site code: 000363)	Moderate
7	Lehid Harbour pNHA (site code: 0001364)	Low
8	Eyeries Island pNHA (site code: 1051)	Low
9	Spanish Island pNHA (site code:. 001378)	Low
10	Rossdohan Island pNHA (site code: 001375)	Moderate
11	Roughty River Estuary pNHA (site code: 0002092)	Moderate
12	Old Domestic Building, Dromore Wood SAC (site code: 000353)	No risk
13	Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342)	No risk
14	Drongawn Lough SAC (site code: 002187)	No risk
15	Glanmore Bog SAC (site code: 001879)	No risk
16	Cleanderry Wood SAC (site code: 001043)	No risk
17	Mucksna Wood SAC (site name: 001371)	No risk
No	**(c) Impact on the *Ascophyllum nodosum* biotope and species therein**	**Risk**
1	***A. nodosum***	Moderate
2	***Fucus (Fucus vesiculosis, Fucus serratus, Fucus spiralis)***	Moderate
3	***Pelvetia canaliculata***	Low
4	**Red algae:** *Polysiphonia lanosa (Linnaeus) Tandy*	Low
5	**Red algae:** *M. stellatus Guiry, P. palmata, P. umbilicalis, L. articulata Lyngbye, O. pinnatifida*	Low
6	***Laminaria* spp.**	Low
7	***Himanthalia sp.***	Low

No	(a) Marine & Coastal species & habitats (as protected under Annex I & II of EU Habitats Directive 92/43/EEC).	Potential Risk
8	***Littorina littorea ('common periwinkle').***	Moderate
9	***Littorina obtusata ('flat periwinkle').***	Moderate
10	***Littorina saxatilis (rough periwinkle)***	Low
11	***Melarhaphe neritoides (formerly Littorina neritoides; the 'small periwinkle')***	Low
12	***Gibbula cineraria (Grey Top Shell)***	Low
13	***Nucella lapillus (Dog Welk)***	Low
14	***Patella Vulgata* and *Patella ulyssiponensis* (Patellid limpets)**	Moderate
15	**Barnacles:** *Elminius modestus.Semibalanus balanoides, Chthamalus stellatus.*	Moderate
16	**Anemone:** *Actinia equine.*	Low
17	**Lichens:** *Xanthoria parietina, Verrucaria maura, Ochrolechia parella, Ramalina sp., Anaptychia runcinata* and *Lecanora atra.*	Low
18	**Hydroid:** *Dynamena pumila Linnaeus*.	Low
19	**Sponges:** *e.g., Ophlitaspongia, Halichondria sp. and Hymeniacidon sp.*	Moderate
20	**Sea squirts:** *e.g. Dendrodoa grossularia van Beneden* and *Ascidiella scabra O.F. Müller.*	Low
21	**Other mobile species:** Phylum *Arthropoda* (Amphipods, isopods crabs, Phylum *Platyhelminthes*), Phylum *Annelida*, Phylum *Foraminifera*, Phylum *Nematoda*.	Low
22	**Ephemeral green algae:** e.g. *Cladophora rupestris (Linnaeus) Kützing, Ulva sp. Linnaeus* and *Enteromorpha sp. Link.*	Low
No	**(d) Continuous disturbance**	**Risk**
1	**Zostera Community**	Low
2	**Maerl Dominated community**	Low
3	***Pachycerianthus multiplicatus* community**	Low
4	**Intertidal mobile sand community complex**	Low
5	**Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex**	Low
6	**Fine to medium sand with crustaceans and polychaetes community complex**	Low
7	**Coarse sediment dominated by polychaetes community complex**	Low
8	**Shingle**	Low
9	**Reef**	Moderate
10	***Laminaria* community complex**	Low
No	**(e) Broad, holistic examination of the nature, extent and impact of hand harvesting.**	**Risk**
1	**The spatial extent of harvesting techniques and activities.**	---
(i)	**Management of expansive and prolonged operations**	Moderate
(ii)	**Numbers of personnel and exploitation levels**	Moderate
2	**The potential interaction effects of seaweed harvesting**	---
(i)	**Targeted removal of species**	Moderate
(ii)	**Non-Targeted removal of species**	Moderate
3	**Disturbance and displacement of species and habitats**	---
(i)	**Reef**	Moderate
(ii)	**Amphipods and isopods**	Moderate
4	**Changes in community structure**	Moderate
5	**Changes in hydrodynamics and water quality**	Low
6	**Potential disturbance of Marine Fauna**	Low
7	**Potential interactions with coastal habitats**	---
(i)	**Perennial vegetation of stony banks**	Low
(ii)	**Salt Marsh habitats**	Low
(iii)	**Sand dune habitats**	Low
(iv)	**Vegetated Sea Cliffs**	Low
No	**(f) Existing Operations: potential cumulative effects, in-combination effects and interactions.**	**Risk**
1	**Other harvesting activities**	Low

No	(a) Marine & Coastal species & habitats (as protected under Annex I & II of EU Habitats Directive 92/43/EEC).	Potential Risk
2	**Recreation, tourism, sport, growth and development**	Moderate
3	**Aquaculture:**	Moderate
4	**Harvesting of invertebrates:**	Moderate
No	**(g) Planned Operations: potential cumulative effects, in-combination effects and interactions.**	**Risk**
1	**Other harvesting activities**	Low
2	**Recreation and Tourism.**	Moderate
3	**Aquaculture.**	Moderate
4	**Harvesting of invertebrates.**	None identified
No	**(h) Invasive species**	**Risk**
1	**Potential introduction/spread of species such as:** *Bonamia ostreae, Botrylloides violaceus, Caprella mutica, Crassostrea gigas, Crepidula fornicate, Didemnum vexillum, Perophora japonica, Sargassum muticum, Spartina anglica, Schizoporella errata and Styela clava, etc.*	Low

3.3.2 Impact on marine habitats and species in Kenmare River SAC.

The results of the risk assessment, undertaken by BioAtlantis, on the potential impact of hand harvesting on protected marine habitats and species is described in this section, along with the control measures where applicable.

Objective 1: To maintain the favourable conservation condition of Large shallow inlets and bays in Kenmare River SAC (ref: pg. 17-19, NPWS, 2013A).

Permanent habitat area: Encompasses all Annex I habitats in Kenmare SAC.

- Risk of affecting site/species: Low-moderate risk of biological, chemical and physical hazards (range rating of 5-10, see Table 2 and Section 4 of this document).
- Explanation:
  - Biological: The likelihood of sand and rocks being removed along with harvested *A. nodosum* is low given that:
    (a) such materials may damage production equipment and training will be provided, where necessary, to ensure that harvesters use correct cutting, and loading techniques.
    (b) harvested *A. nodosum* will be collected in floating nets/bags. This system ensures settlement to the seabed of any rarely occurring sand or other shore material that may be attached to the bottom or sides of the bag or in the netting containing the harvested weed.
  - Chemical: It is highly improbable that a chemical hazard will occur given that no chemicals will be carried on board boats, except for small quantities of standard cleaning material and fuel oil. Fuel oil is unlikely to leak as boat engines will be regularly maintained.
  - Physical: hazards in the form of debris or plastic waste being inadvertently deposited into the environment are unlikely to occur, as harvesters will receive general cleaning, hygiene and waste disposal training.
- Control measures (if applicable): control measures are in place to ensure adequate training is provided to harvesters, where necessary, to ensure no removal of permanent habitat area (e.g. measures are in place to prevent removal of excessive levels of sand, shingle, stones, *A. nodosum* holdfast, etc). Harvested seaweed will be inspected on collection, on the boat, at the pick-up point and/or at the processing facility. Having the ability to trace the seaweed to a specific harvester will ensure that issues such as excessive levels of sand, shingle or debris are identified and addressed effectively. Should excess material be observed in water, the separator or mill during production, additional training for harvesters will be provided where necessary. Production Operators will inspect the incoming harvest and record details as to the quality of the harvested seaweed on production logsheets, including the presence or absence of contaminants such as *Fucus sp.*, sand, stones and holdfast material, etc. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

***Zostera,* Maerl *& Pachycerianthus multiplicatus* community complex.**

- Risk of affecting site/species: Low risk of potential biological hazard in the form of removal of habitat of rare & endangered species (risk rating=5). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).

- Explanation: It is highly improbable that the distribution, abundance, diversity or area occupied by *Zostera, maerl* or *P. multiplicatus* will be affected due to harvesting of *A. nodosum* given that: (a) *Zostera, maerl* and *P. multiplicatus* communities occur at depths of ≥2m, ~5 and ~10m respectively and exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested and (b) *Zostera,* maerl and or *P. multiplicatus* growth substrates are insufficient to support growth of *A. nodosum* and thus, will not be affected by harvest activities.
- Control measures (if applicable): Harvest will not occur in these areas. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Polychaetes and *Amphiura filiformis* community complex (Muddy fine sand areas)

- Risk of affecting site/species: Moderate risk of potential biological hazard in the form of removal of habitat of rare & endangered species (risk rating=10). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: It is unlikely that the distribution, abundance, diversity or area of muddy fine sands dominated by Polychaetes & *Amphiura filiformis* community complex, will be significantly altered due to harvesting of *A. nodosum* given that:
  (a) the majority of this community complex predominates in deeper waters throughout the site, ranging from depths of 0m to 84m, and thus will be largely unaffected by activities,
  (b) the muddy fine sand areas containing these communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested,
  (c) muddy fine sand areas are generally insufficient to support growth of *A. nodosum* and thus, will not be targeted for harvest activities and
  (d) accessing rocky shorelines that lie beyond muddy fine sand areas at low tide in particular, is very difficult and will generally be avoided.
- Control measures (if applicable): Boats shall only be operated at high tide or when the tide has begun to recede, when seeking to access rocky shorelines located beyond muddy fine sand areas. A code of practice will be put in place to ensure that harvesters do not disrupt these areas (see Appendix 4). This is particularly relevant at inner, north-east reaches of the site, Collorus to Bunaw, Ardgroom Harbour and parts of Sneem and Parknasilla and the North eastern region of Kenmare SAC. For further details on action limits, analytical procedures monitoring and corrective actions (see Table 2 and Section 4 of this document).

***Crustaceans and polychaetes community complex* (Fine-medium sand areas)**

- Risk of affecting site/species: Low risk of potential biological hazard in the form of removal of habitat of rare & endangered species (risk rating=5). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: The probability of the distribution, abundance, diversity of crustaceans and polychaetes community complex being altered due to harvesting of *A. nodosum* is reduced given that: (a) a large proportion of this community complex predominates in deeper waters (0-42m), most often beyond the *Laminaria* zone and beyond the intertidal zone, and thus will be largely unaffected by activities, (b) the fine medium sand areas exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested, (c) fine-medium sand areas are insufficient to support growth of *A. nodosum* and thus, will not be targeted for harvest activities and (d) accessing rocky shorelines that lie beyond fine-medium sand areas at low tide in particular, is very difficult and will generally be avoided.

- Control measures (if applicable): Ensure implementation of Code of Practice to ensure that boats contact with coastal areas is minimal, thus ensuring no damage is inflicted to either the boats or the underlying habitat. Harvesters are required to approach the shore at slow pace so as to minimize contact with fine-medium sand which may occur in proximity to the intertidal *A. nodosum* during periods of time when substrate is exposed (e.g. low tide). Particularly relevant in areas where fine-medium sand occur in close proximity to intertidal reef areas, e.g. the complex mosaics of substrate in close proximity to (1) an area in Kilmackillogue Harbour located between Collorus Pt. and Laughaunacreen near Bunaw and (2) an area in the vicinity of Cove Harbour and Castlecove, (3) Derrynane, (4) North Allihies to Coomeen and (5) just west of Garnish Island. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Polychaetes community complex and associated coarse sediment areas

- Risk of affecting site/species: Low risk of potential biological hazard in the form of removal of habitat of rare & endangered species (risk rating=5). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: the probability of affecting the distribution, abundance, diversity or area of polychaetes community complex and associated coarse sediment areas due to harvesting of *A. nodosum* is reduced given that: (a) this community complex occurs in deeper waters (4-68m), beyond the intertidal *A. nodosum* zone, (b) *A. nodosum* does not grow on this sediment, and therefore will not be subjected to harvest activities and (c) this habitat exhibits little overlap with the rocky shorelines where *A. nodosum* grows.
- Control measures (if applicable): Harvest will not occur in these areas. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

***Polychaetes* and *oligochaete* species (Estuarine mud)**

- Risk of affecting site/species: Moderate risk of potential biological hazard in the form of removal of habitat of rare & endangered species (risk rating=10). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: The probability of Polychaetes and oligochaete and their habitat (estuarine mud) being altered due to harvest activities are relatively low given that:
  (a) estuarine mud is largely insufficient to support growth of *A. nodosum* and thus, will not be targeted directly for harvest activities.
  (b) accessing rocky shorelines that lie beyond estuarine mud areas at low tide in particular, is very difficult and will generally be avoided.
- Control measures (if applicable): Boats shall only be operated at high tide or when the tide has begun to recede, when seeking to access rocky shorelines located beyond estuarine mud areas. A code of practice will be put in place to ensure that harvesters will not disrupt these areas (see Appendix 4). This particularly relevant in areas where estuarine mud occur in close proximity to intertidal reef areas, e.g. River Sneem and River Blackwater. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Intertidal mobile sand community complex

- Risk of affecting site/species: Low risk of potential biological hazard in the form of removal of habitat of rare & endangered species (risk rating=5). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: The probability of intertidal mobile sand community complex being altered due to harvest activities is very low given that *A. nodosum* does not grow in clean fine sand areas such Derrynane Bay, Rossdohan, Leaghillaun.
- Control measures (if applicable): According to the Code of Practice, harvesting will not occur on clean, sandy beaches, thus preventing any impact on this habitat. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Shingle and associated communities

- Risk of affecting site/species: Low risk of potential biological/physical hazards in the form of removal of habitat of rare & endangered species or disruption or damage to shingle (risk rating=5). No chemical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: It is unlikely that distribution, abundance, diversity or area of shingle will be altered due to harvesting of *A. nodosum* given that removal of shingle with seaweed would be considered contamination which would be detected on collection or delivery of harvest (i.e. GRN or means). Presence of contaminants such as shingle will also be assessed in production facilities as presence of shingle could damage extraction equipment. While Talitrid amphipods feed on dead algae which accumulates in these areas, dead algae will not be harvested, thus it is unlikely that these species will be affected. Impacts on shingle are also unlikely considering that the area of shingle affected by harvest activities represents 0% of the total shingle community type in the SAC.
- Control measures (if applicable): Training will be provided, where necessary, to ensure that harvesters are trained in safe boating and hand harvest techniques to ensure that holdfast, or friable, shingle-type substrate is not removed or disturbed. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Objective 2: To maintain the favourable conservation condition of Reefs in Kenmare River SAC (ref: pg. 20-21, NPWS, 2013A).

- Risk of affecting site/species: Moderate risk of potential biological/physical hazard in the form of removal of habitat of rare & endangered species or disruption or damage to reef (risk rating=10). No chemical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: It is unlikely that distribution, abundance, diversity or area of reef in Kenmare River SAC will be altered due to harvesting of *A. nodosum* for the following reasons:
  - While *Ascophyllum nodosum* may be harvested in from rocky shores which contain reef as underlying substrate, the hand harvesting technique used ensures that *A. nodosum* vegetative growth is severed well above the point of contact with reef. Contact with reef would also lead to damage to the harvesters sickle/blade, thus, reef substrate will always be avoided. It is unlikely that significant levels of disturbance or displacement would occur, to levels which would lead to co-removal of reef with or without holdfast material. This is due to the fact that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate. **NOTE:** *A.*

nodosum species and associated communities are assessed separately in Section 3.3.6 of this document, with results outlined in Table 4.

- Subtidal and *Laminaria* dominated reef will not be subject to harvesting. This community occurs in deeper waters (15-50m). There will be no removal of Subtidal reef with Echinoderms and faunal turf community complex *(Caryophyllia smithii, Corynactis viridis, Aslia lefevre, Dysidea fragilis, Echinus esculentus, Pomatoceros triqueter, Marthasterias glacialis, Encrusting bryozoans, Parasmittina trispinosa, Alcyonium digitatum, Holothuria forskali, Antedon bifida, Luidia ciliaris, Calliostoma zizphinum, Asterias rubens, Tunicates, Cliona celata, Erect bryozoans, Coralline red algae, Encrusting sponges).*
- *Laminaria*-dominated community complex occurs in deeper waters (4-22m) beyond the intertidal *A. nodosum* zone. There will be no removal of *Laminaria*-dominated community complexes *(Laminaria hyperborea, Bonnemaisonia asparagoides, Coralline red algae, Dictyota dichotoma, Delessaria sanguine, Cryptopleura ramose, Brongniartella byssoides, Plocamium cartilagineum, Membranipora membranacea, Cliona celata).*

➢ Control measures (if applicable): A system is in place which ensures that:

- Hand harvest techniques employed along rocky shores will ensure that *A. nodosum* is severed above point of contact with underlying substrate. See “Code of Practise” for details (Appendix 4).
- Levels of disturbance or displacement that could give rise to presence of reef and/or associated holdfast material, will be monitored and recorded via ‘Good received Notes’ (GRN) or other formats by electronic or other means and/or at production facilities.
- Cutting of seaweed will be limited to reef areas in the intertidal zone and will not include subtidal reef.
- A code of practice will be implemented to ensure that harvesters employ good boating practices, particularly when landing on shores.

For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Objective 3: To maintain the favourable conservation condition of submerged or partially submerged seacaves (ref: pg. 21, NPWS, 2013A).

- Risk of affecting site/species: Low risk of potential biological hazard in the form of removal of habitat of rare & endangered species (risk rating=5). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: The probability of sea caves and their habitat being altered due to harvest activities is relatively low given that:
  - Intertidal *A. nodosum* zone is largely confined to unexposed, sheltered areas and will rarely occur in the vicinity of seacaves.
  - There will be no activities which will negatively affect key resources to sea caves, including water quality.
- Control measures (if applicable): According to the Code of Practice, harvesting will not occur in these areas, thus preventing any impact on this habitat. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Objective 4: To maintain the favourable conservation condition of harbour seal in Kenmare River SAC (ref: pg. 22 and 23, NPWS, 2013A).

Introduction

It is well established that harbour seals are highly sensitive to human behaviour. Disturbance events are caused by factors which result in alterations to seal behaviour, particularly during breeding, moulting and resting periods. This can culminate in significant numbers leaving haul-out sites during periods of time important to their life-cycle. Recent analysis of anthropogenic disturbances on seals in Kenmare River SAC and other regions have provided an important platform in which to make informed management decisions which prevent harmful or potentially harmful activities from occurring. Assessments in Kenmare River SAC have been undertaken by the NPWS as part of the "Harbour Seal Pilot Monitoring Project". The overall benefits of assessing harbour seal behaviour by NPWS and others is that they establish the impact of human activity on behavioural responses and in doing so, this provides useful and practical information. In turn, they provide a platform for more informed management decisions which are based on both science and the practicalities of modern life. These studies often provide information relating to the:

1. Characterisation of human causes (human activities) and their effects on wildlife behaviour
2. Characterisation of long-term biological significance of short-term responses.

BioAtlantis have developed a Code of Practice (Appendix 4) based on findings from the published peer-reviewed literature, NPWS guidelines and recommendations from organizations such as the Hampshire & Isle of Wight Wildlife Trust (Anon, 2016B). The Code of Practice in Appendix 4 ensures that harvesters are fully informed and equipped with best practice knowledge on how to ensure that disturbances of seal behaviour does not occur. Central to the Code of Practice are specific site-specific mitigation measures which are based on knowledge of established sites of important to harbour seals, particularly during breeding and moulting season, as determined by NPWS. Important aspects of seal behaviour, sensitivity, tolerance, recovery and habituation are described as follows:

- **Sensitivity**

The Harbour Seal Pilot Monitoring Project, 2010 (NPWS 2011B) has identified a number of activities which led to disturbance of the harbour seals in selected sites in Ireland, including: occupation of shorelines adjacent to hauled out seals (e.g. by shellfish harvesters), quad bike activity on sandflats, approach of a low-flying aircraft, wildlife tour vessels, sea kayak activity, presence of small inshore fishing vessels, people walking recreationally, passing small fishing/angling boats, horse riders and dogs. NPWS also recorded instances where even members of scientific survey teams impacted on seal behaviour. The effectiveness of reserves to prevent human-induced disturbances to harbour seal population were recently evaluated in the Anholt seal reserve of Denmark (Andersen *et al.,* 2011 & 2012). In this study, harbour seals were found to be alerted by boats at a distance of 560–850m and pedestrians at a distance of 200–425m. Flight initiation was observed at 510–830m for boats and 165–260m for pedestrians. These studies highlight the sensitivity of harbour seals to human presence. However, harbour seal behaviour is highly complex and seals are known to exhibit varying levels of tolerance to human, depending on the nature of the contact and the time of year.

- **Varying levels of tolerance to human activities**

Tolerance is defined as 'the intensity of disturbance that an individual tolerates without responding in a defined way' (Bejder *et al.,* 2009 and references therein) and is measured over short term periods. Tolerance is distinct from processes of habituation or sensitisation which are only measurable over the long term. For example, during habituation, individual tolerance levels increase, while during sensitisation, tolerance levels will decrease (Bejder *et al.,* 2009). Habituation may occur following repeated exposure to a specific stimulus. In the case of the harbour seal, several studies indicate varying levels of tolerance to human activities.

Boat Traffic

Henry *et al.,* (2001) demonstrated that boat traffic in Métis Bay area of Canada have only a temporary effect on the haul-out behaviour of harbour seals. Several studies point to slow moving or stopped vessels such as kayaks as causing the most severe disturbance to seals (Johnson *et al.,* 2007, Allen *et al.,* 1984, Suryan and Harvey 1999, Henry and Hammill 2001). In particular, Johnson *et al.,* (2007) demonstrate that seals were disturbed by kayaks and by stopped powerboats at distances of >91m from haul out sites, while being unaffected by moving powerboats approaching as close as 39m. Effects of kayak activities have also been reported in Ireland by the NPWS (2011B). This data suggests tolerance to brief and passing presence of vessels which do not pay attention to the seals themselves (Johnson *et al.,* 2007), while disturbances are mainly caused by vessels that linger or move at slow pace (e.g. kayaks and stalled boats) along haul out sites. These effects were reported by Allen *et al.,* (1984), Suryan and Harvey (1999), Henry and Hammill (2001). These findings indicate that boating activities themselves will have minimal impacts on seal populations, provided that boats refrain from running at low speed for prolonged durations or stall.

Seasonal tolerance

Henry *et al.,* (2001) demonstrate that seals were less affected during August, potentially due to increased tolerance associated with hormonal and physiological changes which occur during moulting (Ashwell-Erickson *et al.,* 1986). Greater motivation to remain hauled out was also

observed during moulting periods. Seasonal tolerance was also observed in a study of the Anholt seal reserve of Denmark (Andersen *et al.,* 2011 & 2012) in which an increased tendency to return to haul out sites following disturbance during the breeding season was identified. However, tolerance was not identified before or after the breeding period, therefore suggesting that the tolerance did not give rise to habituation. Harbour seals are also more sensitive to human activities during obligate resting periods (October to April).

Recovery

Data from Henry and Hammil, 2001, indicates a limited effect of disturbance on the recovery of seal numbers on haul out sites, to pre-disturbance levels. Johnson *et al.,* 2007, also reported that seals quickly recover from disturbance, returning back to haul out sites in less than 1 hour. In only 21% of disturbance cases did seal numbers not reach pre-disturbance levels.

Habituation or site-specific tolerance

There is some evidence for habituation of harbour seals to high traffic levels. In a study by Osborn (1985), of an area close to a busy harbour in Elkhorn Slough, Monteret Bay, California, 74% flushing was observed with disturbance at <30m. While habituation may explain these observations, findings such as these may be attributed to increased tolerance to human activities, such as during the breeding season.

On the basis of this information and data on sites of relevance to harbour seals in Kenmare River SAC, a risk assessment was carried out with respect to conservation objectives for the SAC. This is outlined below:

Human Activities (General population):

- Risk of affecting site/species: Moderate risk of potential hazards in the form of human presence or related activities (e.g. 'flushing out' and entering the water of seals, man-made energy (ariel or underwater noise), deterioration of resources such as water quality or food source; risk rating=10; (see Table 2 and Section 4 of this document).
- Explanation: The probability of negatively effecting the harbour seal population in Kenmare River SAC due to human activity is reduced given that breeding and moulting sites are designated as out of bounds during relevant stages of the year. Harvesting may only occur at resting sites between October to April, subject to the sites being unoccupied by harbour seals. This will be verified using binoculars prior to landing. Boats will operate in a manner known to least affect seal behaviour.
- Control measures (if applicable): As a control measure, BioAtlantis will issue the code of practice for the protection of the harbour Seal (See Appendix 4), to ensure that harvesters:
  (a) Have full knowledge of the sites in Kenmare River SAC known to be relevant the harbour seal.
  (b) Full knowledge of harbour seal sites which are out of bounds at relevant times of the year.
  (c) Understand the steps required to ensure that all contact with seals is prevented from day to day.
  (d) Operate boats according to practises which minimise impact on harbour seal.
  For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Species range:

- Risk of affecting site/species: Extremely low risk of potential physical hazard in the form of restriction of the harbour seal species range. No biological or chemical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: Hand harvest of *A. nodosum* will not involve the use of artificial physical barriers which would restrict or affect the species range of harbour seals in Kenmare River SAC.
- Control measures (if applicable): not applicable. Physical barriers which could block access to harbour seals and site of importance to their species will not be installed in Kenmare River SAC.

Breeding Sites:

- Risk of affecting site/species: Moderate risk of potential biological hazard in the form of human presence or activities (risk rating=10 each respectively). No chemical of physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: The probability of human presence or activities affecting harbour seals at known breeding sites of Kenmare River SAC is reduced given that harvesters cannot harvest at these sites during the breeding period (May-July).
- Control measures (if applicable): As a control measure, the BioAtlantis code of practice for the protection of the harbour seal will be implemented (See Appendix 4) to ensure:
  - No disturbance events occur; e.g. no harvest at breeding sites during sensitive times of year, between May-July.
  - Navigation guidelines to ensure that seals are not disturbed to levels which would result in entry or 'flushing' into the water.

  For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Moulting Sites:

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of human presence or activities (risk rating=10 each respectively). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: The probability of human presence or activities affecting harbour seals at known moulting sites of Kenmare River SAC is reduced given that harvesters cannot harvest at these sites during the moulting period (Aug-Sept).
- Control measures (if applicable): As a control measure, The BioAtlantis code of practice for the protection of the harbour seal will be implemented (See Appendix 4) to ensure:
  - No disturbance events occur; e.g. no harvest at breeding sites moulting sites during sensitive times of year, between Aug-Sept.
  - Navigation guidelines to ensure that seals are not disturbed to levels which would result in entry or 'flushing' into the water.

  For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Resting Sites:

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of human presence or activities (risk rating=10 each respectively). No chemical or physical hazards have been identified (see Table 2 and Section 4 of this document).

- Explanation: The probability of human presence or activities affecting harbour seals at known resting sites of Kenmare River SAC is reduced given that harvesters cannot land at a resting site during the obligate resting period (Oct-April), unless they have verified harbour seal absence from the site.
- Control measures (if applicable): As a control measure, the BioAtlantis code of practice for the protection of the harbour seal will be implemented (See Appendix 4) to ensure:
  - Harvest will only take place at resting sites when sites are unoccupied.
  - Boats operated using methods which have least effects on harbour seals.

For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

3.3.3 Impact on coastal habitats and species.

The results of the risk assessment on the potential impact of hand harvesting on protected coastal habitats, is described in this section along with the control measures where applicable.

Objective 1: To maintain the favourable conservation condition of Perennial vegetation of stony banks (1220; ref: pg. 8, NPWS, 2013B).

- Risk of affecting site/species: Low risk of potential biological or physical hazards in the form of removal of habitat of rare & endangered species or disruption and damage to vegetation (risk rating=5 respectively). No chemical hazards have been identified (see Table 2 and Section 4 of this document.
- Explanation: It is highly improbable that Perennial vegetation of stony banks in will be affected due to harvesting of *A. nodosum* given that:
  (a) existing piers, quays, harbours and established route ways will be required pick up the load - use of banks for this purpose will not occur,
  (b) *A. nodosum* does not grow at high levels in these locations, and therefore will not be subject to harvest activities,
  (c) contamination with other materials may result in damage production equipment and end product and
  (d) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species such as perennial vegetation.
- Control measures (if applicable): Neither harvest or transport activities will take place in these areas. All harvest and pick up locations will be recorded on GRNs. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Objective 2: To maintain the favourable conservation condition of Atlantic salt meadows, *Glauco-Puccinellietalia maritimaev* (1330) and Mediterranean salt meadows, *Juncetalia maritimae* (1410; ref: pg. 12, NPWS, 2013B).

- Risk of affecting site/species: Low risk of potential biological or physical hazards in the form of removal of habitat of rare & endangered species or disruption and damage to vegetation (risk rating=5 respectively). No chemical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: It is highly improbable that saltmarsh habitat will be affected due to harvesting of *A. nodosum* given that:
  (a) existing piers, quays, harbours will be required to will be required pick up the load - use of Atlantic and Mediterranean salt meadow areas for this purpose will not occur,
  (b) *Ascophyllum nodosum* does not grow at high density in these locations, and therefore will not be subject to harvest activities,
  (c) harvest will mainly occur along rocky shorelines rather than in the areas of mud or sand substrate which is required for salt marsh environs & associated species,

  (d) contamination will other material may result in damage production equipment and end product and

(e) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species characteristic of Atlantic and Mediterranean salt meadows.

- Control measures (if applicable): Neither harvest or transport activities will take place in these areas. All harvest and pick up locations will be recorded on GRNs. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Objective 3: To maintain and restore the conservation condition of sand dune habitats (ref: pg. 21, NPWS, 2013B).

- Risk of affecting site/species: Low risk of potential biological or physical hazards in the form of removal of habitat of rare & endangered species or disruption and damage to Shifting dunes along the shoreline with *Ammophila arenaria* (white dune, 2120) and Fixed coastal dunes with herbaceous vegetation (2130; risk rating=5). No chemical hazards have been identified (see Table 2 and Section 4 of this document.
- Explanation: It is highly improbable that sand dune habitats or species therein will be affected due to harvesting of *A. nodosum* given that:
  (a) Loading and transport activities will occur exclusively using established piers, quays, harbours and road networks,
  (b) *A. nodosum* does not grow in these locations, and therefore will not be subject to harvest activities,
  (c) contamination with other material may result in damage to production equipment/end product and
  (d) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species in sand dune habitats.
- Control measures (if applicable): Harvest, storage and transport activities will not occur in these locations. Harvest must occur along rocky shorelines followed by transfer of harvested seaweed for collection, as outlined in the Code of Practice. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Objective 4: To maintain the conservation condition of vegetated sea cliffs of the Atlantic and Baltic coasts (ref: pg. 27, NPWS, 2013B).

- Risk of affecting site/species: Low risk of potential biological or physical hazards in the form of removal of habitat of rare & endangered species (risk rating=5). No chemical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: It is highly improbable that sea cliffs and associated habitats or species therein will be affected due to harvesting of *A. nodosum* given that:
  (a) Loading and transport activities will occur exclusively using established piers, quays, harbours and road networks,
  (b) *Ascophyllum nodosum* does not grow in these locations, and therefore will not be subject to harvest activities,
  (c) contamination with other material may result in damage to production equipment/end product and
  (d) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species in sand dune habitats.

- Control measures (if applicable): Harvest, storage and transport activities will not occur in these locations. Harvest must occur along rocky shorelines followed by transfer of harvested seaweed for collection, as outlined in the Code of Practice. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

3.3.4. Impact on Otters and Birds.

The results of the risk assessment undertaken by BioAtlantis, on the potential impact of hand harvesting on protected otter and bird species is described in this section, along with the control measures where applicable.

Otters *(Lutra, lutra):*

- Risk of affecting site/species: There is a low risk of potential biological hazard in the form of affecting the distribution, extent of terrestrial, marine and freshwater habitats, number of couching sites and holts. There is low risk of disturbance at couching sites and holts. There will be no negative impacts upon available food resources such as species of fish (risk rating=5). There will be no barriers to connectivity. No chemical hazards have been identified (see Table 2 and Section 4 of this document).
- Explanation: It is unlikely that harvesters will cause significant disturbance to otters as:
  - Hand harvesting of *A. nodosum* will occur in the intertidal zone with no activities in freshwater habitats.
  - Hand harvesters will not engage in activities which would block sites of relevance to otters, including holt sites.
  - There will be no barriers to block access to otters to and from and between sites.
  - Harvesting is unlikely to result in entrapment or direct physical injury otters.
  - It is highly improbable that otter food supply will be depleted due to harvest activities as harvest will take place in a sustainable manner.

  Nevertheless, it is important to put mitigation measures in place to avoid any potential interactions in general and at a number of key locations. For instance, otters are particularly sensitive during the period of breeding, rearing, hibernation and migration. Therefore it is important to prevent interactions a sites where their presence has been confirmed such as sites identified by Reid *et al.,* 2013 and those reported in the database of the National Biodiversity Data Centre of Ireland and others (See Appendix 9 for list of otter sites).
- Control measures (if applicable):
  - All freshwater habitats are excluded from harvest activities.
  - Avoid freshwater rivers and connecting lakes all year round to ensure no impact fish and otters. e.g. freshwater areas of River Sheen, Lough Inchiquin, River Finnihy, Kerry Blackwater, River Sneem, Glan Lough and Roughty River.
  - BioAtlantis will manage activities in a sustainable manner to prevent excessive removal of *A. nodosum* and in turn, circumvent any potentially negative effects on species further along the food chain, e.g. fish & otters. Harvest will not exceed 20% of the total available *A. nodosum* biomass per site per annum.
  - Otters may be sensitive to human presence and alterations of food source and supply. To avoid or prevent disturbance or interactions with otters, ensure the following:
    - All activities are maintained within the intertidal *A. nodosum* zone. Avoid linear habitats located beyond the intertidal zone or marine riparian areas beyond the foreshore. Only use existing routes.
    - Never interfere with couching sites, holts, access paths/routes, that may be present near coastal areas, agricultural fencing, roads, slipways, access points or other areas.

- Avoid large trees near coastal areas as they can represent important otter breeding and resting sites. Avoid undisturbed areas (e.g. impenetrable scrub/reeds) which are refuges for otters.
- Do not behave in an obtrusive or noisy manner around otters.
- Never interfere with, deliberately approach or disturb otters or their cubs that are resting, sleeping, hunting, feeding or foraging in water or on the shore during the daytime, dawn or dusk. Ensure caution during the periods of breeding, rearing and hibernation.
- If migrating/commuting otters are encountered in water, do not obstruct their movement. Slow down boat and give sufficient space to pass without "boxing" them in, blocking narrow channels or acting as a barrier to commuting or connectivity.
- If encountered on the shore, allow otters free access and ample opportunity to escape to the water/land. Do not behave in manner causing them to move away or flee human disturbance.
- To prevent in combination effects, adhere to the above measures at all times, particularly when working in areas known to exhibit signs of otter activity.

- To prevent impacts on the dietary and other requirements of otter, the following measures apply:
  - Follow pre-planned schedules and harvest in areas defined by BioAtlantis. Harvesting is limited to 20% of the total available *A. nodosum* biomass per site per annum, to allow for sufficient regrowth.
  - Harvesting must not take place beyond the *A. nodosum* zone, as these habitats represent the broader habitat range of the otter's prey during adult and early life stages, including: flowing and static freshwater areas (rivers, streams, canals, lakes, reservoirs, ponds), deep water subtidal areas (>30m), shallow subtidal areas (<30m), exposed areas, estuarine mud areas, brackish waters, subtidal gravel/coarse bottom substratum, intertidal soft bottom (sand/mud), lagoons, maerl, rock pools, saltmarsh habitats, seagrass, subtidal soft bottom (sand/mud) and exposed waters in the vicinity of rocky cliffs.
  - Avoid exposed and non-sheltered areas that represent the otter's broader habitat range, hunting ground and foraging area.
  - Avoid co-harvesting non-*A. nodosum* material near coastal habitats, near the shoreline or on the shore. Ensure that inadvertent by-catch of other algae, dead/senescing algae, amphipods, isopods or other Animalia or material is prevented and minimized.
  - Do not remove the *A. nodosum* holdfast and take care not to disturb rocky/crevice substratum.
  - Avoid all freshwater aquatic linear habitat and riparian environments including lakes and rivers and other areas .
  - Harvesting cannot occur in fresh water habitats. This prevents potential impacts on salmon, trout and European eel, in turn preventing any impacts on otter.

- A wide range of measures to protect otters are included in the code of practise in Appendix 4. For further details on action limits, analytical procedures monitoring and corrective actions, see Table 2 and Section 4 of this document.

Bird species:

NOTE: This section summarizes the results of an assessment of 124 species of birds. Please see Appendix 6 to this document for details of this analysis and risk assessment.

- Risk of affecting site/species: Low risk of potential biological hazard in the form of negative impacts on habitats relevant to species of bird or alteration to behaviour due to presence of humans (risk rating=5). No physical or chemical hazards have been identified (see table 2 and Appendix 6 for details).
- Explanation: Kenmare River SAC supports a wide range of bird species. These species have important breeding, nesting, feeding and wintering requirements. Therefore, activities during *A. nodosum* harvesting should be carried out in a manner which does not impact on their key biological imperatives. Species vary in their dietary requirements, habitats and sensitivity to human disturbance. As *A. nodosum* may provide a habitat for marine life, some bird species may be attracted to *A. nodosum* beds when hunting for food. In the absence of appropriate systems of management, monitoring and verification, there is increased likelihood of excess removal of *A. nodosum* and in turn, increased chance of affecting birds who may use these zones for feeding purposes. Additionally, human presence may negatively impact on bird behaviour, particularly during breeding season, which could lead to nest desertation. Unexpected human activity is also a risk factor as it can lead to flight events for some wintering species. However, it is unlikely that species of bird will be affected by harvest activities in Kenmare River SAC given the following:
  - Harvest of *A. nodosum*: this will be undertaken sustainably and will not exceed 20% of the available biomass per site per annum, thus ensuring maintenance of the *A. nodosum* habitat. Therefore, the probability of affecting fish and in turn bird species in Kenmare River SAC, is considerably reduced.
  - Diet and foraging behaviour: While some species of birds may use the *A. nodosum* zone as a habitat for feeding, reproduction or sheltering purposes, none are exclusively dependent on the *A. nodosum* biotope for fulfilment of life cycle functions (reviewed by Kelly L. *et al.,* 2001).
  - Substrate: many species utilize areas/habitats which do not support *A. nodosum* growth (e.g. sandy beaches, sand dune and/or salt marsh habitats. These habitats and areas will be avoided (see Appendix 6 for details).
  - Low number of harvesters: The low number of harvesters over such a large area reduces the likelihood of contact with breeding and wintering birds.
  - Significant disturbance due to hand harvesting is unlikely, given (a) the low number of boats and people involved and (b) bird species assessed are not limited to the intertidal *A. nodosum* zone where harvest activities will occur.
  - Harvest will not take place at breeding and wintering sites at sensitive times of the year for a number of important species outlined below.
  - Nesting and breeding requirements: harvesting will take place within the *A. nodosum* zone, thus ensuring that nesting and breeding requirements inland, or in areas near the foreshore are not affected.
  - There is no significant risk of harvest activities impacting on food source or habitat. The bird species assessed are not reliant on *A. nodosum* for feeding requirements or habitat type.
  - There is no evidence for strong bottom-up forcing of *A. nodosum* harvesting on birds' site visitation (Johnston, EM., et al. 2024).

While it is unlikely that bird species will be affected by harvest activities, it is still considered important to put mitigation measures in place to avoid any interactions at specific locations and with respect to breeding or wintering requirements. See Appendix 6 for details of the distribution, requirements and control measures for avian species of interest in Kenmare River SAC. See Appendix 4 for Code of Practice.

- Control measures (if applicable):
  - Harvest of *A. nodosum* beds will not exceed 20% of the available biomass per site per annum, thus ensuring the maintenance of the *A. nodosum* habitat. BioAtlantis will manage activities in a sustainable manner to prevent excessive removal of *A. nodosum* and in turn, circumvent any potentially negative effects on species further along the food chain, e.g. fish & birds.
  - Always follow pre-planned harvest schedules provided by BioAtlantis.
  - Harvesting activities are prohibited at a number of important breeding sites for certain periods during Spring/Summer.
  - Harvest activities are prohibited at a number of wintering sites during certain periods of autumn/winter.
  - To minimise disturbance of birds, ensure that all activities on islands are maintained within the intertidal *A. nodosum* zone.
  - Estuarine areas containing soft mud or marsh: The following species are potentially vulnerable to human disturbance in estuarine areas**:** Bar-tailed Godwit *(Limosa lapponica),* Black-headed Gull *(Larus ridibundus),* Black-tailed Godwit *(Limosa limosa),* Brent Goose *(Branta bernicla hrota),* Dunlin *(Calidris alpine),* Goldeneye *(Bucephala clangula),* Green Sandpiper *(Tringa ochropus),* Greenshank *(Tringa nebularia),*Mediterranean Gull *(Larus melanocephalus),* Oystercatcher *(Haematopus ostralegus),* Red Knot *(Calidris canutus),* Redshank *(Tringa tetanus),* Scaup *(Anas marila),* Shelduck *(Tadorna tadorna).* Shelduck, Black-tailed Godwit, Redshank and Bar-tailed Godwit are sensitive during feeding. Black-tailed Godwit and Oystercatcher are sensitive during roosting. To prevent disturbance to these species, the following must be observed:
    - Estuarine areas containing soft mud or marsh will be avoided during winter (Sept-April) at the mouths of Roughty River, River Sneem, River Sheen, River Blackwater and River Finnihy, Kenmare Estuary, and all other rivers. Ensure caution if in the vicinity of these areas between May-Aug.
    - Avoid approaching, chasing, scaring or putting birds to flight at any time, including roosting or feeding birds.
  - Arctic Tern *(Sterna paradisaea):* Human presence may lead to trampling of nests. Therefore:
    - No harvest during breeding season (Mar- Sept) at sites of relevance (Rocky islands in Derrynane Bay, Eyeries Island, Spanish Island , Brennel Island).
    - Harvesters will avoid areas of coast beyond the intertidal zone between Mar-Sept, thus avoiding contact with nests on ground areas beyond the high tide mark.
    - Avoid approaching, chasing, scaring or putting birds to flight at any time.
  - Bar-tailed Godwit *(Limosa lapponica):* This species can be sensitive to human disturbance. Therefore:
    - No harvest at sites of relevance during winter season (Oct-April) at sites of relevance (Derrynane).

- Estuarine areas containing soft mud or marsh will be avoided during winter (Oct-April) at the mouths of Roughty River, River Sneem, River Sheen, River Blackwater and River Finnihy.

- Black-headed Gull *(Larus ridibundus)*: May be sensitive to human presence. Therefore:
  - No harvest at sites of relevance during winter season (Mar-Sept) at sites of relevance (Kilmakillogue harbour, Ardgroom Harbour, Dinish Island.)
  - During breeding season (Mar- Sept), harvesters will ensure the following:
    - Keep distance from colonies of black-headed gull.
    - Avoid approaching, chasing, scaring or putting birds to flight at any time.
- Brent Goose ***(Branta bernicla hrota):*** **May be sensitive to human presence. Therefore:**
  - Avoid approaching, chasing, scaring or putting birds to flight at any time, including roosting or feeding birds.
  - If approaching shore at high tide, move slowly and keep distance from groups of resting birds.
  - Avoid shores at dusk or night, where possible.
- Black-tailed Godwit *(Limosa limosa),* Brent Goose *(Branta bernicla hrota),* Dunlin *(Calidris alpine),* Goldeneye *(Bucephala clangula),* Greenshank *(Tringa nebularia),* Shelduck *(Tadorna tadorna),* Red Knot *(Calidris canutus),* Scaup *(Anas marila):* These species can be sensitive to human disturbance. Shelduck and Black-tailed Godwit are sensitive during feeding, the latter of which is also sensitive during roosting. An important environment for these species is estuarine areas containing soft mud or marsh. To prevent disturbance:
  - Estuarine areas containing soft mud or marsh will be avoided during winter (Sept-April) at the mouths of Roughty River, River Sneem, River Sheen, River Blackwater and River Finnihy.
  - Avoid approaching, chasing, scaring or putting birds to flight at any time.
- Common gull *(Larus canus):* Intensive human activity can cause nest desertion. Therefore:
  - Shingle banks will be avoided between March to September.
- Common Tern *(Sterna hirundo):* Human disturbance at nesting colonies can lead to abandonment of nest or chicks.
  - No harvest during breeding season (Mar-Oct) at sites of relevance (Rocky islands in Derrynane Bay, Eyeries Island, Spanish Island , Brennel Island).
  - Harvesters will avoid areas of coast beyond the intertidal zone, thus avoiding contact with nests on ground areas beyond the high tide mark.
  - Avoid approaching, chasing, scaring or putting birds to flight at any time.
- Cormorant *(Phalacrocorax carbo):* Human presence may cause cormorants to leave nests. Therefore:
  - There must be no harvest during breeding season (April- July) at sites of relevance (Kilmakillogue harbour).
  - Avoid approaching, chasing, scaring or putting roosting or feeding birds to flight at any time.
- Great Black-backed Gull *(Larus marinus):* Human presence can cause nest abandonment. Therefore:

- Harvesters will avoid areas of coast beyond the intertidal zone, thus avoiding contact with nests beyond the high tide mark.
- During breeding season (Mar- Sept), harvesters will ensure the following:
  - Keep distance from colonies of Great Black-backed Gull.
  - Avoid approaching, chasing, scaring or putting birds to flight at any time.

- Little Tern *(Sterna albifrons):* Human disturbance at nesting sites can lead to nest failures
  - No harvest during breeding season (April-August) at sites of relevance (Rocky islands in Derrynane Bay, Eyeries Island, Spanish Island , Brennel Island).
  - Beaches will be avoided all year round.
  - Harvesters will avoid areas of coast beyond the intertidal zone, thus avoiding contact with nests on ground areas beyond the high tide mark.
  - Avoid approaching, chasing, scaring or putting birds to flight at any time.
- Oystercatcher *(Haematopus ostralegus):* Human presence may alter behaviour and disturbance may lead to flight events. Therefore:
  - Open sandy coasts, beaches, dunes and salt marsh areas will be avoided all year round.
- Redshank *(Tringa tetanus):* If disturbed, Redshank may stop feeding and potentially fly away. Therefore:
  - There must be no harvest at sites of relevance during winter season (Oct-April) at sites of relevance (Derrynane Bay).
  - Estuarine areas containing soft mud or marsh will be avoided during winter (Oct-April) at the mouths of Roughty River, River Sneem, River Sheen, River Blackwater and River Finnihy.
- Ringed Plover *(Charadrius hiaticula):* May be sensitive to human disturbance. Human presence may affect breeding pairs. Therefore:
  - Exposed sandy beach areas will be avoided all year round.
- Sandwich Tern *(Sterna sandvicensis):* Vulnerable to human disturbance (e.g. tourists) near breeding colonies on beaches early in the breeding season.
  - No harvest during breeding season (April-August) at sites of relevance (Rocky islands in Derrynane Bay, Eyeries Island, Spanish Island , Brennel Island).
  - Beaches will be avoided all year round.
  - Harvesters will avoid areas of coast beyond the intertidal zone, thus avoiding contact with nests on ground areas beyond the high tide mark.
  - Avoid approaching, chasing, scaring or putting birds to flight at any time.
- Turnstone *(Arenaria interpres):* This species tends to be faithful to wintering sites and is particularly sensitive to human disturbance when resting/rooting at night and at high tide. Therefore:
  - Avoid shores at dusk or night.
  - When approaching shore at high tide, move slowly and keep distance from groups of resting birds.
  - Avoid approaching, chasing, scaring or putting roosting or feeding birds to flight at any time.
- White Tailed Sea Eagle *(Haliaeetus albicilla):* Frequent human disturbance can cause breeding failures. Therefore, harvesters will ensure the following between February to August:
  - Keep distance from perched eagles.

- Avoid approaching, chasing, scaring or putting birds to flight at any time.

- Derrynane:
  Harvesting will not take place in Derrynane Bay given its importance as follows:
  - Oystercatcher (open sandy coasts, beaches, dunes and salt marsh areas)
  - Bar-Tailed Godwit (winters between October to April)
  - Ringed Plover (exposed sandy beach areas).
  - Great Black-backed Gull breeding season (present between Mar- Sept)
  - Rocky Islands near Derrynane Bay (Breeding sites): important for Arctic Tern, Common Tern, Little Tern and Sandwich Tern during breeding season (March-Oct).
- Harvesters may access existing quays, harbours and piers all year round.

A wider range of measures for protection of bird species are included in the code of practise in Appendix 4. For further details on action limits, analytical procedures monitoring and corrective actions, see table 2. For details on the distribution, biological requirements and control measures for avian species of interest in Kenmare River SAC, see Appendix 6.

3.3.5. Impact on species & habitats of general interest.

This section describes potential impacts and mitigation measures where appropriate for species and habitats of general interest in Kenmare River SAC.

Fish species:

- Risk of affecting site/species: Low risk of potential biological hazards in the form of removal of zones important for feeding, reproduction and/or sheltering of fish species such as trout and salmon (risk rating=5). No physical or chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: In the absence of appropriate systems of management, monitoring and verification, there is increased likelihood of excess removal of *A. nodosum* which in turn, may potentially impact upon species of fish who use these zones for feeding, reproduction and/or sheltering. However, it is highly improbable that fish numbers will be affected by harvest activities in Kenmare River SAC, given that:
  - Harvest of *A. nodosum* will be undertaken sustainably and will not exceed 20% of the total available biomass per site per annum thus ensuring maintenance of the *A. nodosum* habitat.
  - River Roughty, River Finnihy and River Sheen are important sites for fish such as salmon and will be excluded from all harvest-related activities.
  - There will be no activities which impede or capture salmon or trout smolts or post smolt adults. Thus, smolt & post smolt abundance will be unaffected.
  - Spawn, fry and mature salmon or trout will be unaffected as river areas are not subject to harvesting activities.
  - Fish will not be captured or physically impeded by hand harvesting.
  - Water quality will not be affected by harvest activities.
- Control measures (if applicable): BioAtlantis Ltd. will manage harvesting activities in a sustainable manner to ensure that excessive removal of *A. nodosum* does not occur and is limited to 20% of

the total available biomass per site per annum, which in turn, circumvents any potentially negative effects on species further along the food chain, e.g. fish, birds, otters. In addition, no activities will take place in important areas of River Roughty, River Finnihy and River Sheen, thus preventing any impact during important life-cycle stages.

- A wider range of measures for protection of fish and fisheries species are included in the code of practise in Appendix 4. For further details on action limits, analytical procedures monitoring and corrective actions, see table 3 and Section 4 of this document.

Salt Marsh areas at West Cove, Tahilla, Dinish Island, Dirreen House areas

- Risk of affecting site/species: Low risk of potential biological or physical hazards in the form of removal of habitat of rare & endangered species or disruption and damage to vegetation (risk rating=5 respectively). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: The distribution of Salt Marsh areas in a number of key areas is described in NPWS (2013B). This includes coastal areas of West Cove, Tahilla, Dinish Island and Dirreen House. It is highly improbable that Atlantic salt meadows, *Glauco-Puccinellietalia maritimaev* (1330) and Mediterranean salt meadows, *Juncetalia maritimae* habitats will be affected due to harvesting of *A. nodosum* given that:

  (a) established piers, quays, harbours and existing route ways will be required to pick up loads - use of Atlantic and Mediterranean salt meadow areas for this purpose will not occur,

  (b) *Ascophyllum nodosum* does not grow at high density in these locations, and therefore will not be subject to harvest activities,

  (c) harvest will mainly occur along rocky shorelines rather than in the areas of mud or sand substrate which is required for salt marsh environs & associated species,

  (d) contamination will other material may result in damage production equipment and end product and

  (e) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species characteristic of Atlantic and Mediterranean salt meadows.
- Control measures (if applicable): Neither harvest or transport activities will take place in these areas. All harvest and pick up locations will be recorded on GRNs. For further details on action limits, analytical procedures monitoring and corrective actions, see table 3 and Section 4 of this document.

Derrynane: sand dunes, saltmarsh, woodland and bird species.

- Risk of affecting site/species: there is a low risk of potential biological or physical hazards in the form of removal of habitat of rare & endangered species, disruption and damage to Shifting dunes, Fixed coastal dunes, saltmarsh areas, woodland areas or risk of disturbance to bird species in Derrynane (risk rating=5). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Derrynane is considered a “site of ecological interest” by NPWS (ref: NPWS 2013B, pg. 75). It is highly improbable that coastal habitats or species therein will be affected due to harvesting of *A. nodosum* given that:

  (a) Loading and transport activities will occur exclusively using established piers, quays, harbours and road networks,

(b) *Ascophyllum nodosum* does not grow at high densities in sand dune, saltmarsh and woodland areas. Therefore, such areas will not be subject to harvest activities,

(c) Contamination with other material may result in damage to production equipment/end product and

(d) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species in sand dune habitats.

It is also highly unlikely that bird species will be affected at Derrynane (see Section 3.3.4 above for details and Appendix 6 for risk assessment in relation to birds). Nevertheless, it is important to put mitigation measures in place to avoid any interactions at Derrynane and with respect to breeding or wintering requirements.

- Control measures (if applicable):
  - Coastal habitats and species: To ensure no impacts on coastal habitats and species, harvest, storage and transport activities will not occur in these locations. However, harvesters may use established piers, quays, harbours or existing route ways all year round.
  - Birds at Derrynane Bay: hand harvesting will not take place in Derrynane Bay given its importance to arrange of species (described in section 3.3.4). For further details on action limits, analytical procedures monitoring and corrective actions, see table 3 and Section 4 of this document.

Iveragh Peninsula SPA (site code: 004154)

- Risk of affecting site/species: No risk (risk rating=0). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Harvesting will not take place at this site.
- Control measures: not applicable.

Deenish Island and Scariff Island SPA (site code: 004175)

- Risk of affecting site/species: No risk (risk rating=0). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Harvesting will not take place at this site.
- Control measures: not applicable.

Kenmare Islands pNHA (site code: 000363)

- Risk of affecting site/species: Moderate risk of disturbance-related impacts on protected bird species and harbour seals. (risk rating=10). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Kenmare Islands pNHA comprises a range of islands throughout the bay which are of relevance to a number of harbour seal and bird species (see Appendix 4 & 6). There is potential therefore that activities could lead to disturbance events.
- Control measures: the Code of Practice ensures that harbour seals and bird species are not impacted by harvest activities (see appendix 4 for details). This includes a number of site specific and species specific mitigation measures.

Lehid Harbour pNHA (site code: 0001364)

- Risk of affecting site/species: Low risk of disturbance-related impacts on protected bird species and harbour seals. (risk rating=5). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Lehid harbour pNHA is of relevance due to the presence of a mixed woodland containing both native and exotic tree species (NPWS, 2009H). Activities will not take place inland beyond the intertidal zone, therefore impact on woodland will not occur. A number of bird species also utilize the area (see Appendix 6). There is potential therefore that activities could lead to disturbance events.
- Control measures: the Code of Practice ensures that bird species are not impacted by harvest activities (see appendix 4 for details). This includes a number of site specific and species specific mitigation measures.

Eyeries Island pNHA (site code: 1051)

- Risk of affecting site/species: Low risk of disturbance-related impacts on protected bird species. (risk rating=5). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Eyeries Island pNHA is of relevance to common and/or Arctic terns (see Appendix 6). There is potential therefore that activities could lead to disturbance events.
- Control measures: the Code of Practice ensures that bird species are not impacted by harvest activities (see appendix 4 for details). This includes a number of site specific and species specific mitigation measures.

Spanish Island pNHA (site code:. 001378)

- Risk of affecting site/species: Low risk of disturbance-related impacts on protected bird species. (risk rating=5). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Spanish Island pNHA is of relevance to breeding terns (see Appendix 6). There is potential therefore that activities could lead to disturbance events.
- Control measures: the Code of Practice ensures that bird species are not impacted by harvest activities (see appendix 4 for details). This includes a number of site specific and species specific mitigation measures.

Rossdohan Island pNHA (site code: 001375)

- Risk of affecting site/species: Moderate risk of disturbance-related impacts on protected bird species and harbour seals. (risk rating=10). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Rossdohan Island pNHA is of relevance to harbour seals and Arctic Tern and Black-Headed Gull (NPWS, 2009A). There is potential therefore that activities could lead to disturbance events.
- Control measures: the Code of Practice ensures that harbour seals and bird species are not impacted by harvest activities (see appendix 4 for details). This includes a number of site specific and species specific mitigation measures.

Roughty River Estuary pNHA (site code: 0002092)

- Risk of affecting site/species: Moderate risk of disturbance-related impacts on protected bird species and harbour seals. (risk rating=10). No chemical hazards have been identified (see table 3 and Section 4 of this document).

- Explanation: Roughty River Estuary pNHA is of relevance to harbour seals and a number of bird species (NPWS, 2009F). There is potential therefore that activities could lead to disturbance events.
- Control measures: the Code of Practice ensures that harbour seals and bird species are not impacted by harvest activities (see appendix 4 for details). This includes a number of site specific and species specific mitigation measures.

Old Domestic Building, Dromore Wood SAC (site code: 000353)

- Risk of affecting site/species: No risk of affecting Lesser Horseshoe Bat *(Rhinolophus hipposideros)*, risk rating=0. No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Harvest activities will not take place inland, therefore, there will be no impact on diet of horseshoe bat (insects).
- Control measures: not applicable.

Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342)

- Risk of affecting site/species: No risk (risk rating=0). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Harvest activities will not take place inland.
- Control measures: not applicable.

Drongawn Lough SAC (site code: 002187)

- Risk of affecting site/species: Low risk of unauthorized activity along the fringes of the lagoon - related (risk rating=5). No chemical hazards have been identified (see table 3 and Section 4).
- Explanation: This area is highly sheltered and may contain *A. nodosum* near the fringes of the lagoon. However, density is unlikely to high to warrant harvest activities.
- Control measures: Harvest must not take place along the fringes of Drongawn Lough SAC (see Appendix 4).

Glanmore Bog SAC (site code: 001879)

- Risk of affecting site/species: No risk (risk rating=0). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Harvest activities will not take place inland.
- Control measures: not applicable.

Cleanderry Wood SAC (site code: 001043)

- Risk of affecting site/species: No risk (risk rating=0). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Harvest activities will not take place inland.
- Control measures: not applicable.

Mucksna Wood SAC (site name: 001371)

- Risk of affecting site/species: No risk (risk rating=0). No chemical hazards have been identified (see table 3 and Section 4 of this document).
- Explanation: Harvest activities will not take place inland.
- Control measures: not applicable.

3.3.6. Impact on the *Ascophyllum nodosum* biotope and species therein

This section describes the potential impact of harvesting on *A. nodosum* and the associated biotope. This analysis is also of relevance considering the potential for impact on species further down the chain (i.e. fish, otters, birds, etc).

***A. nodosum* species (ref: pg. 10 & 11, NPWS, 2013A).**

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of excess removal of *A. nodosum* habitat (risk rating=10). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: Lauzon-Guay *et al.,* 2023, shows that harvest of *A. nodosum* (at sites with a 20 + year history of commercial harvesting) does not have long-term impact on the morphology of the algae or on the abundance of its main inhabitants. A scientific review of sustainability aspects to harvesting *A. nodosum* and its use as a renewable raw material resource has also recently been published by Sujeeth et al. (2022). A study by Kelly et al., (2001) in particular has shown that the impact of hand harvesting of *A. nodosum* is influenced by a number of factors: the amount harvested, size of harvested area, homogeneity of the harvest and equipment used (Kelly L. *et al.,* 2001). Factors influencing the rate of regeneration of *A. nodosum* include: year of regeneration (higher the first year than successive years), harvesting regimes, age structure of the population, extent and pattern of branching and determined by the shore type/exposure, presence or absence of grazers (Baardseth E, 1955). Immediate effects of cutting of *A. nodosum* between 10-15cm (4-6 inches) above the holdfast are likely to include: removal of seaweed from the area, destruction of epifauna & flora, increase in desiccation, erosion and predation, potential settlement of other species and stimulation of bushy-type *Ascophyllum* growth (Boaden and Dring, 1980). Impacts of harvesting are considered to be similar to those occurring due to natural disturbances, i.e. removal of all or portions of populations and providing space for other species to initiate succession (Kelly L. *et al.,* 2001, and references therein). The structure of the *A. nodosum* population can change from a complex to a more uniform structure following harvest, which may cause alterations to community structure long term (Kelly L. *et al.,* 2001,and references therein). In the west of Ireland, harvest has been found to be associated with alterations in *Fucus vesiculosis*, ephemeral algae and periwinkle *Littorina obtusata*, with *Fucus* found to be increased post-harvest in some areas.

  Environmental impact assessments in the west of Ireland indicate almost complete recovery of *A. nodosum* cover ~11 to 17 months post-hand harvest (Kelly L. *et al.,* 2001). Provision of a 4-5 year window for recovery of *A. nodosum* post-harvest remains the current consensus amongst decision makers. Recovery periods such as these are essential, as in the absence of oversight over harvesting, there is increased probability that excessive removal of *A. nodosum* habitat may occur. Natural causes of *A. nodosum* mortality include storms, which can detach *A. nodosum* from substrate or both together. In addition, large or dense *A. nodosum* growth may become loose over time, leading to holdfast detachment. As natural events can cause substantial *A. nodosum* mortality, it is critical that man-made harvest techniques do not cause any significant increase in mortality beyond natural background levels. Unregulated over-harvesting and inappropriate use of certain harvest methodologies can cause significant increases in *A. nodosum* mortality due to holdfast removal. The 'rake cutter' method can potentially give rise to >6% of harvest containing holdfast material (Ugarte R, 2011B). In real terms, holdfast removal could give

rise to reductions in *A. nodosum* plant numbers and density and increased mortality. In turn, this could allow for species such as *Fucus* to grow in vacant areas which have been left.

Significant levels of *A. nodosum* mortality is unlikely to be acceptable in an SAC such as Kenmare River SAC. Harvest which contains holdfast material will be considered as representing a severe non-conformance by BioAtlantis Management and could lead to disciplinary procedures. A mitigation measure has been put in place to ensure that the technique employed in Kenmare River SAC does not allow for greater than 1% mortality, i.e. partial or complete removal of the entire *A. nodosum* plant and holdfast during harvest (see 'Code of Practice', Appendix 4). This process will be monitored by the Resource Manager and details recorded on the GRN. Inspections will also take place at production facilities to ensure no holdfast or other contaminants are present (recorded on production logsheets). As holdfast removal will be avoided, the potential for exposure of understory species to predators such as birds, will also be prevented.

It is critical that hand harvesting does not negatively impact on community structure on the foreshore in general. Central to achieving this aim will be to ensure that canopies are maintained at levels which provide adequate coverage of underlying substrate and prevent invasion by species such as *Fucus*. Traditional practices in Ireland involve cutting between ~150-180 or 200mm (Kelly L. *et al.,* 2001). To ensure that harvesting is carried out in a safe and practical manner, harvesters will receive a high level of training, where necessary, so as to inform them of the importance of cutting as high as possible. They will be required to cut at levels between 8-12 inches. BioAtlantis will take an approach which prevents cutting less than 200mm (8 inches), which would represent a non-conformance and would require corrective actions (see Appendix 4 'Code of Practice'). This standard will be monitored by the Resource Manager and recorded on the Site Inspection Form (Appendix 3). These standards will also be assessed by means of quarterly and annual audits (Appendix 4 & 8).

Rake methods of hand harvesting at high tide may be more suitable in areas with large, solid substrata, while hand harvesting at low tide may be preferable in regions with a heterogeneous mix of small rocks, pebbles, and friable materials. In Canada, where the hand-harvesting "rake" method is used, *A. nodosum* biomass typically recovers within 2 to 5 years (Sharp and Tremblay, 1989, and references therein). Recovery has been observed as early as 3 years after 50% biomass removal (Sharp and Tremblay, 1989; Lauzon-Guay et al., 2021, and references therein). This rapid regrowth may result from stimulated shoot growth and branching in suppressed clumps (Ugarte et al., 2006). A study by Lauzon-Guay et al., 2023, shows that harvest of *A. nodosum* at sites with a 20 + year history of commercial harvesting in Canada, does not have long-term impact on the morphology of the algae or on the abundance of its main inhabitants. During the operational phase of the license, BioAtlantis will evaluate both hand-harvesting methods (hand harvesting at low-tide on the shore, and harvesting at high tide with the rake) to determine their applicability and suitability.

- Control measures (if applicable):
  BioAtlantis will ensure that harvest activities are monitored, recorded, controlled and limited to 20% harvest of the available biomass per site per annum. Moreover, the system will require that *A. nodosum* plants will not be cut below 200mm from the holdfast (see Appendix 4). Cutting will be applied throughout the area rather than within specific patches, thus ensuring no extensive loss in *A. nodosum* coverage. This will ensure that *A. nodosum* in harvested in a manner which

minimizes any impact to the canopy and associated species, whilst maximizing rates of recovery. This level of regulation is in keeping with the GMP+ Certification status of BioAtlantis, Ltd. and thus will ensure that the probability of over-harvesting of *A. nodosum* resources in Kenmare River SAC is lowered. Important components of the management system include:

- Harvest will be carried out at low tide. This ensures:
  - *A. nodosum* holdfast removal is avoided.
  - *Fucus* by-catch is reduced
  - A lower incidence of by-catch of benthic invertebrates, as most species are relatively inactive at low tide, taking cover beneath the *A. nodosum* canopy.
  - Understory species are not contacted as cutting occurs higher up along the *A. nodosum* plant.
- Training: Training will be provided to harvesters, where necessary, to ensure competence in skills required to harvest *A. nodosum* in an environmentally friendly and sustainable manner.
- Protocols and schedules:
  Activities carried out according to clearly defined protocols to ensure that (a) no damage to the environment or underlying growth substrate, and (b) re-growth and re-generation of the vegetation post-harvest is sufficiently facilitated. Standard protocols and methods will include:
  - Site determination: identification of areas suitable for harvest, e.g. areas predominated by short *A. nodosum* fronds will not be harvested.
  - Harvest Methods: Use of sickle/knife to cut between 200-300mm (8-12 inches) above frond base, without damaging holdfast or underlying substrate.
  - Method for bagging of cut weed in nets/bags.
  - Methods of removal from islands and shores.
  - Method for communicating with BioAtlantis.
  - Method for reporting incidents to BioAtlantis.

Responsibility**:** Oversight, planning and training provided by BioAtlantis staff and environment personnel along with regularly auditing to assess for compliance with procedures and for potential areas of improvement. The Resource Manager will also have responsibilities for several aspects of hand harvesting in Kenmare River SAC. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document. For further details, see *A. nodosum* hand harvest Code of Practice (Appendix 4).

Fucus *(Fucus vesiculosis, Fucus serratus, Fucus spirali;* ref: pg. 10 & 11, NPWS, 2013A).

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of alterations to density of *Fucus* (risk rating=10). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: Increases in the density of Fucus species may potentially occur due to hand harvesting of *A. nodosum* (Kelly *et al.,* 2001). However, the probability of inadvertent harvest of these fucoid species is low, given that:
  - Harvest will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base.
  - *Fucus* is considered a contaminant and will be recorded as such in the GRN.

- Control measu*res (if app*licable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Pelvetia canaliculata* (ref: pg. 10 & 11, NPWS, 2013A).**

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of *Pelvetia canaliculata* (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: *Pelvetia canaliculata* typically occurs on the upper shore. Kelly *et al.,* (2001) found no impacts of hand harvesting *A. nodosum* on this species. The probability of inadvertent harvest of this species is very low, given that harvest will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base.
- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Red algae: *Polysiphonia lanosa (Linnaeus) Tandy*

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of habitat important to epiphytes of *A. nodosum*, e.g. red algae, *Polysiphonia lanosa (Linnaeus) Tandy* (risk rating=4). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation*:* This species is hemiparasitic which predominantly uses *Ascophyllum nodosum* as a host (Guiry, M.D. & Guiry, G.M., 2013B). This species is present throughout the north Atlantic including the west of Ireland (Kelly L. *et al.,* 2001). It resides more rarely within other fucoid biotopes such as *Fucus vesiculosis*. The risk of hand harvest activities affecting this species is considered low. This is due to the fact that spores from these species are highly successful in colonizing *A. nodosum,* and given the sustainable nature of the harvest system, effects are unlikely to be detrimental to the species.
- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Red algae: *Mastocarpus stellatus (Stackhouse) Guiry, Palmaria palmata, Porphyra umbilicalis, Lomentaria articulata (Hudson) Lyngbye, Osmundea pinnatifida;* ref: pg. 11, NPWS, 2013A).

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of these species (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: It is unlikely that *Red algae, Mastocarpus stellatus (Stackhouse) Guiry, Palmaria palmata, Porphyra umbilicalis* or *Lomentaria articulata (Hudson) Lyngbye* will be altered due to harvesting of *A. nodosum* given:
  (a) The relatively rare occurrence of these species within the *A. nodosum* canopy.
  (b) Harvest of *A. nodosum* will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base, generally above the contact level with these species.
  (c) Species other than *A. nodosum* are considered contaminants and will be recorded as such in the GRN.
  (d) *Mastocarpus stellatus (Stackhouse) Guiry* mainly occurs on exposed shores outside the A. nodosum zone. It may also be found on shore with less exposed shores under fucoid species

(Kim SK, 2015). The species was identified to be present at low level beneath the *A. nodosum* canopies in the west of Ireland (Kelly L. *et al.,* 2001).

(e) *Palmaria Palmata* grows on littoral and sublittoral zones to a depth of 20 m in areas which are sheltered or moderately exposed (Hill JM. 2008), typically outside the *A. nodosum* zone. The species can grow epilithically on rocks of epiphytically on *Fucus* or *Laminaria* (Hill JM. 2008).

(f) *Porphyra umbilicalis* mainly occurs where spray wets the upper shore, also occurring up to 15m above the high tide level on coasts which are wave exposed (Cole KM and Robert S, 1990 and references therein), typically outside the *A. nodosum* zone.

(g) *Lomentaria articulata (Hudson) Lyngbye* generally grows to ~ 4 inches, substantially less than the 8 inch cutting limit for *A. nodosum* harvesting. Found in the middle and lower shore growing on rocks and in pools, shady places or under other seaweed. Also occurs in deeper waters of ~18 m outside the *A. nodosum* zone (Pizzolla PF 2008A).

(h) *Pepper dulse (Osmundea pinnatifida).* Occurs intertidally on middle and lower rocky shores, pools and on rocks, often with a greenish-yellow turf like appearance. Grows to ~3.5 inches (Pizzolla PF, 2003), substantially less than the 8 inch cutting limit for *A. nodosum* harvesting.

- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Laminaria* spp. *(L. digitata, L. hyperborea;* ref: pg. 10 & 11, NPWS, 2013A).**

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of *Laminaria* spp. (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: It is unlikely that *Laminaria spp*. will be altered due to harvesting of *A. nodosum* given the following:
  - *Laminaria digitata* occurs subtidally and will not be targeted for hand harvesting.
  - *Laminaria hyperborea* occurs in deeper waters at depths of between 4m and 22m, outside the *A. nodosum* zone.
- Control measures (if applicable): as described for *A. nodosum* above. Additionally:
  - Harvesting will be limited to *A. nodosum* within the intertidal zone.
  - The code of practice ensures that appropriate navigation methods are used when accessing the foreshore, thus preventing damage to *Laminaria* and its substrate at low tide.

  For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Himanthalia sp.* (ref: pg. 10 & 11, NPWS, 2013A).**

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of *Himanthalia sp.* (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: It is unlikely that *Himanthalia sp.* will be altered due harvesting of *A. nodosum* given that species will not be targeted for harvesting, thus the probability of affecting its density or distribution is very low. In addition, *Himanthalia sp.* occurs on exposed to moderately exposed lower eulittoral bedrock, where *A. nodosum* is rarely found (Tillin HM & Budd G, 2016).
- Control measures (if applicable): as described for *A. nodosum* above. Additionally:
  - Harvesting will be limited to *A. nodosum* within the intertidal zone.
  - Himanthalia will not be harvested.

- The code of practice ensures that appropriate navigation methods are used when accessing the foreshore.

For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Littorina littorea* (common periwinkle; ref: pg. 11, NPWS, 2013A).**

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of alterations to density of *Littorina littorea* or removal of habitat important to this species (risk rating=10). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: *Littorina littorea* are species of periwinkles which are widespread in the northwest Atlantic. They graze on other seaweeds besides *A. nodosum*, e.g. *Fucus*. These herbivorous species provide an important function in this ecosystem as they also graze certain epiphytes from the surface of *A. nodosum*. Studies also indicate that the polyphenols in *A. nodosum* serve as chemical defences to inhibit direct feeding by *Littorina littorea* (Geiselman, JA., and McConnell OJ, 1981), thus suggesting a complex relationship and co-evolution between these species. The study by Kelly *et al.,* (2001) did not identify any significant impacts of hand harvesting on *L. littorea*. The likelihood of hand harvesting impacting on *L. littorea* is considered low for the following reasons:
  - Removal of habitat: The risk of excess removal of habitat is reduced, as the hand harvesting system is designed to be minimally invasive and prevents overharvesting.
  - Non-targeted removal: *Littorina littorea* actively feeds at high tide, seeking shelter within the canopy at low tide. The technique employed by BioAtlantis ensures that harvest takes place at low tide when periwinkles are more likely to be dormant at the canopy base or covered by *A. nodosum* fronds. Harvest will not take place during the feeding stage at high tide when periwinkles are out of their shells. Hence, the probability of removal of periwinkles as non-target species is reduced considerably.
  - Reproduction: *L. littorea* eggs are released with the tide. Following development from a free-living form, *L. littorea* settles at the base of the *A. nodosum* canopy. Severe reductions in canopy could affect settlement of free-living form, *L. littorea*. The risk for negatively affecting reproductive requirements is reduced as the harvesting system ensures that overharvesting of the canopy does not occur.
  - Anthropogenic effects: *L. littorea* is relatively inactive at low tide at the base of fucoid canopies, thus reducing the likelihood of direct anthropogenic impacts.
  - Other niches: As periwinkles reside within other fucoid biotopes besides *A. nodosum* (e.g. *Fucus vesiculosis*), the likelihood of harvesting reducing or having a detrimental effects the overall periwinkle population of intertidal reef community complexes in Kenmare River SAC is considered low.
- Control measures (if applicable): as described for *A. nodosum* above. Additionally:
  - Canopy damage:
    Harvesters will learn to avoid periwinkle disturbance by:
    (a) cutting at low tide,
    (b) aiming to leave between 200-300mm (8-12 inches) of material behind and
    (c) under no circumstances cutting less than 200mm above the holdfast.
    (d) avoiding holdfast removal

- Other habitats: harvesters will be trained, where necessary, to avoid *Fucus vesiculosis* and *F. serratus*, which are additional habitats for periwinkles.
- By-catch: Animalia by-catch observed post-harvest must be returned to the water, where possible.

For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Littorina obtusata (flat periwinkles)

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of alterations to density of *Littorina obtusata* or removal of habitat important to this species (risk rating=10). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: While Kelly et al (2001) show that reductions in *L. obtusata* numbers were observed in winter months, harvesting did not have an impact on the size distribution of this species. Notably, this species of periwinkle is not listed as present in the Kenmare SAC intertidal reef community complex (ref: NPWS, 2013A). Should *L. obtusata* be present in Kenmare River SAC, the likelihood of hand harvesting impacting on this species is considered low for the following reasons:
  - Removal of habitat: The risk of excess removal of habitat is reduced, as the hand harvesting system is designed to be minimally invasive and prevents overharvesting.
  - Non-targeted removal: *Littorina obtusata* tends to feed at high tide. At low tide, *L. obtusata* crawls into the algae canopy and remains dormant unless conditions are favourable, such as dampness, etc (Williams *et al.,* 1990). The technique employed by BioAtlantis ensure that harvest takes place at low tide when periwinkles are more likely to be dormant or covered by *A. nodosum* fronds. Harvest will not take place during the feeding stage at high tide when periwinkles are out of their shells. Hence, the probability of removal of periwinkles as non-target species is reduced considerably.
  - Reproduction: *L. obtusata* lays white, oval eggs masses contain a large number of eggs, on *Ascophyllum, Fucus vesiculosis* and *F. serratus*. The eggs masses are clearly visible to the naked eye. Hand harvesting could lead to reductions in eggs numbers by removing fronds containing egg masses. The risk for negatively affecting reproductive requirements is reduced as the harvesting system requires avoidance of visible periwinkle egg masses and ensures that overharvesting of the canopy does not occur.
  - Anthropogenic effects: periwinkles are relatively inactive at low tide at the base of the fucoid canopies, thus reducing the likelihood of direct anthropogenic impacts.
  - Other niches: As periwinkles reside within other fucoid biotopes besides *A. nodosum* (e.g. *Fucus vesiculosis*), the likelihood of harvesting reducing or having a detrimental effects the overall periwinkle population of intertidal reef community complexes in Kenmare River SAC is considered low.
- Control measures (if applicable): As above for *A. nodosum* and *L. littorea*. Additionally, harvesters will be trained, where necessary, to identify and avoid *A. nodosum* plants or fronds which contain visible *L. obtusata* egg masses. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Littorina saxatilis* (rough periwinkle; ref: pg. 11, NPWS, 2013A).**

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of *Littorina saxatilis* or removal of habitat important to this species (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation:
  - The study by Kelly *et al.,* (2001) did not identify any significant impacts of hand harvesting on *L. saxatilis*. The likelihood of hand harvesting impacting on *L. saxatilis* is considered very low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs and is relatively inactive at low tide when harvesting occurs.
  - Removal of habitat: *L. saxatilis* is found within bedrock crevices, beneath stones or in empty barnacle shells, occurring from the upper eulittoral zone to the littoral fringe of the intertidal zone. It can occur in a range of habitats including firm mud banks, salt marshes or submerged attached to Zostera or *Fucus* (Ballerstedt, S. 2007). *L. saxatilis* is quite tolerant to desiccation. *L. saxatilis* is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting.
  - Non-targeted removal: *Littorina saxatilis*: grazes on microalgae covering rocks. The species has a short feeding period generally around high tide when food substrate is wet (Sokolova IM and Pörtner H, 2003) and references therein), retiring to its refuge microhabitat at low tide (Little and Kitching, 1996). Hand harvesting occurs at low tide when *L. saxatilis* is more likely to be dormant, thus reducing the probability of by-catch.
  - Reproduction: Reproduction involves separate sexes, with internal fertilization. Some sub-species lay eggs within crevices of rocks, with young emerging into the rocks, post hatch. Reproduction in other subspecies is ovoviviparous, and young emerge from the female on the rock substrate (Anon, 2016A). The likelihood of negatively affecting reproductive requirements is low as the system ensures that overharvesting of the canopy does not occur and that other relevant habitats are unaffected.
  - Anthropogenic effects: *L. saxatilis* is relatively inactive at low tide, thus reducing the likelihood of direct anthropogenic impacts.
- Control measures (if applicable): As above for *A. nodosum* and *L. littorea*. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Melarhaphe neritoides* (small periwinkle, formerly *Littorina neritoides*; ref: pg. 11, NPWS, 2013A).**

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of *Melarhaphe neritoides* or removal of habitat important to this species (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: The likelihood of hand harvesting impacting on *M. neritoides* is considered very low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs and is relatively inactive at low tide when harvesting occurs. For example:
  - **Removal of habitat:** *M. neritoides* lives inside old barnacles or high on rocky shores in cracks & crevices, typically outside the *A. nodosum* zone. *M. neritoides* often co-occurs with *L. saxatilis*. *M. neritoides* is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting.

- **Non-targeted removal:** Similar to *L. saxatilis*, *M. neritoides* retires to its refuge microhabitat at low tide, emerging to graze on lichens and detritus on rocks at high tide (pg. 94 and 95, Little and Kitching, 1996). Hand harvesting occurs at low tide when *M. neritoides* is more likely to be dormant, thus reducing the probability of by-catch.
- **Reproduction:** Separate males and females. Release floating (pelagic) egg capsules at high tide from which free living offspring hatch. The likelihood of negatively affecting reproductive requirements is low as the harvesting system is minimally invasive on canopy coverage.
- **Anthropogenic:** *M. neritoides* is relatively inactive at low tide, thus reducing the likelihood of direct anthropogenic impacts.

➢ Control measures (if applicable): As above for *A. nodosum* and *L. littorea*. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Gibbula cineraria* (the Grey Top Shell; pg. 11, NPWS, 2013A).**

➢ Risk of affecting site/species: Low risk of potential biological or physical hazards in the form of alterations to density of *Gibbula cineraria* or removal of habitat important to this species (risk rating=5). No chemical hazards have been identified (see table 4 and Section 4 of this document).

➢ Explanation:

- Kelly *et al.,* (2001) did not identify any significant impacts of harvesting on *G. cineraria*. The likelihood of hand harvesting impacting on *G. cineraria* is considered low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs.
- Removal of habitat: *G. cineraria* lives throughout the Eulittoral zone. *G. cineraria* is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting.
- Non-targeted removal: *G. cineraria* feeds on detritus and microalgae. The likelihood of by-catch due to harvesting is relatively low, as *G. cineraria* generally does not graze directly on fucoid species.
- Reproduction: Spawning and fertilization occur in the sea. The likelihood of negatively affecting reproductive requirements is low as the harvesting system is minimally invasive.
- Anthropogenic: While the likelihood is quite low, anthropogenic impacts may occur due to its propensity for *G. cineraria* activity during the day, irrespective of tide. *G. cineraria* is observed on the tops of rocks during daytime, retreating during darkness. The diurnal migration mechanism controlling this process is independent of tides (pg. 96, Little and Kitching, 1996). The activity of *G. cineraria* on the foreshore during daytime raises the potential for anthropogenic impacts during harvesting, e.g. physical impact with *G. cineraria* present on the surface of boulders.

➢ Control measures (if applicable): As above for *A. nodosum* and *L. littorea*. Additionally, harvesters will be trained, where necessary, to identify and avoid physical impacts with clusters of *G. cineraria* on or beneath boulders. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Nucella lapillus* (Dog Welk; pg. 11, NPWS, 2013A).**

- Risk of affecting site/species: Low risk of potential biological or physical hazards in the form of alterations to density of *Nucella lapillus* or removal of habitat important to this species (risk rating=5). No chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation:
  - Kelly *et al.,* (2001) did not identify any significant of harvesting on *N. lapillus*. The likelihood of hand harvesting impacting on *N. lapillus* is considered low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs.
  - Removal of habitat: *N. lapillus* occurs from the mid shore downwards on both exposed and sheltered rocky shores. *N. lapillus* is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting.
  - Non-targeted removal: *N. lapillus* is carnivorous and feeds on barnacles and mussels. *N. lapillus* bores holes into the shells of target prey using a modified tooted radula with secretion of shell softening agents (Anon, 2016A). Paralyzing chemicals and digestive enzymes are secreted into the shell, which can then be ingested via the welks extendable proboscis. The likelihood of by-catch due to harvesting is relatively low, as *N. lapillus* does not graze on fucoid species.
  - Reproduction: Reproduction involves separate sexes, with internal fertilization. Eggs are laid in rock crevices. The likelihood of negatively affecting reproductive requirements is low as the harvesting system is minimally invasive and will not expose rock crevices.
  - Anthropogenic: While the likelihood is low, anthropogenic impacts may occur due to its propensity for activity during the day, irrespective of tide. *N. lapillus* can be active at low tide, thus increasing the likelihood of anthropogenic impacts during harvesting, e.g. physical impact with *N. lapillus* present on the surface of boulders, etc.
- Control measures (if applicable): As above for *A. nodosum* and *L. littorea*. Additionally, harvesters will be trained, where necessary, to identify and avoid physical impacts with clusters of *N. lapillus* on or beneath boulders. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

***Patella Vulgata* and *Patella ulyssiponensis* (Patellid limpets; ref: pg. 11, NPWS, 2013A).**

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of alteration to density of limpets and/or habitat important to limpets (risk rating=10). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: Limpets are resident in fucoid canopies as grazers, playing important roles in the *A. nodosum* biotope. Kelly L. *et al.,* (2001) demonstrate that hand harvesting of *A. nodosum* can be associated with increases and decreases in limpet density and size. However, as these species also reside within other fucoid biotopes such as *Fucus vesiculosis*, the potential hazard of overharvesting of *A. nodosum* would not represent a detrimental threat to these species. The risk of lowering the density of these populations is further reduced as hand harvesting will be carefully managed and controlled to ensure no excess removal of the *A. nodosum* canopy, i.e. *A. nodosum* will not be cut less than 200mm above the holdfast
- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document. Additionally,
  - Canopy damage:
    Harvesters will learn to avoid limpet disturbance, as follows:

(a) cutting at low tide, when species are more likely to be dormant/inactive.
(b) aiming to leave between 200-300mm (8-12 inches) of material behind.
(c) under no circumstances cutting less than 200mm above the holdfast.
(d) avoiding holdfast removal.

- Other habitats: harvesters will be trained, where necessary, to avoid *Fucus vesiculosis* and *F. serratus*.
- By-catch: *Animalia* by-catch observed post-harvest must be returned to the water, where possible.

Barnacles *(Elminius modestus, Semibalanus balanoides, Chthamalus stellatus;* ref: pg. 11, NPWS, 2013A).

- Risk of affecting site/species: Moderate risk of potential biological hazards in the form of alteration to density of barnacles or habitat important to barnacles (risk rating=10). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: Barnacles are resident in fucoid canopies as filter feeders. Some studies indicate that harvesting of *A. nodosum* can be associated with reduced cover of barnacles. For example, Boaden and Dring (1980) reported a reduction in barnacle numbers due to *A. nodosum* harvest when *A. nodosum* was cut at low levels between 10-15cm (4-6 inches) above the holdfast. These effects were not reported by Kelly L. *et al.,* 2001. As hand harvesting will be sustainable and seaweed will be cut higher up the canopy, there is a low risk of excess removal of *A. nodosum*. This reduces the potential for negative effects on barnacle numbers.
- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Anemone *(Actinia equine;* ref: pg. 11, NPWS, 2013A).

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alteration to density of anemones or habitat important to anemones (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: There is a low likelihood that harvesting would significantly impact on species of *Anemone*, as they are not limited to the *A. nodosum* zone.
- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Lichens *(Xanthoria parietina, Verrucaria maura, Ochrolechia parella, Ramalina sp., Anaptychia runcinata* and *Lecanora atra*; ref: pg. 11, NPWS, 2013A).

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alteration to density of lichens or habitat important to lichens (risk rating=5). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: There is a very low likelihood that harvesting would impact on species of lichen, as these species are generally found in areas outside the *A. nodosum* zone:
  - While *Xanthoria parietina* and *Verrucaria Maur* are common on rocky coasts on the upper limit of the intertidal zone, these occur frequency on exposed coasts where *A. nodosum* is not found.

- While *Ramalina sp.: (e.g. R. siliquosa)* grows on the upper portions of rocky sea shores, these species are rare within the *A. nodosum* biotope.
- *Ochrolechia parella:* found on silicaeous rock inland and in coastal areas, are also grown on trees. Thus this species is not limited to the *A. nodosum* zone.
- *Anaptychia runcinata* occurs inland and on hard coastal rock. Hence this species is not limited to the *A. nodosum* zone.
- *Lecanora atra:* occurs on siliceous rocks at the splash zone and beyond. This species is not limited to the *A. nodosum* zone.

➢ Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Hydroids (e.g. *Dynamena pumila Linnaeus*)

➢ Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of Hydroid (*Dynamena pumila Linnaeus*) or habitat important to these species (risk rating=6). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).

➢ Explanation: The presence of hydroids on the tips of *A. nodosum* may increase the probability of altering their density during harvest. Kelly L. *et al.,* (2001) did not find evidence that hand harvesting of *A. nodosum* in the west of Ireland is associated with alterations to density of hydroid species. *Dynamena pumila Linnaeus* also grow on other fucoid biotopes such as *Fucus*. Therefore, overharvesting of *A. nodosum* should it occur, would not represent a detrimental threat to these populations. The risk of altering hydroid density is further reduced as hand harvesting will be carefully managed and controlled to ensure no excess removal of the *A. nodosum* canopy.

➢ Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Sponges *(Ophlitaspongia, Halichondria sp.* and *Hymeniacidon sp.* ; ref: pg. 11, NPWS, 2013A).

➢ Risk of affecting site/species: Moderate risk of potential biological hazards in the form of alteration to density of sponges (risk rating=10). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).

➢ Explanation: While Boaden and Dring (1980) identified changes in density of *Hymeniacidon* and *Halichondria* species due to harvest of *A. nodosum*, the harvest methodology was quite invasive and involved cutting between 10-15cm (4-6 inches). There is a low likelihood of excess removal of *A. nodosum* through hand harvesting in the current application. This reduces the potential for negative effects on species of sponge.

➢ Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Sea squirts (e.g. *Ascidiella*)

➢ Risk of affecting site/species: Low risk of potential biological hazards in the form of alteration to density of Sea squirts (e.g. *Dendrodoa grossularia van Beneden* and *Ascidiella scabra O.F. Müller*;

risk rating=2). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).

- Explanation: Kelly L. *et al.,* 2001, demonstrate that *Ascidiella* occur at low levels in the *A. nodosum* zone of the west of Ireland. The probability of negatively impacting on these species is likely to be low, as hand harvesting will be sustainable.
- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Other mobile species: (Phylum Arthropoda (Amphipods, isopods crabs, *Chironomida*, *Halacaridae*, *Ostracoda*), Phylum Platyhelminthes (e.g. *Turbellaria*), Phylum Annelida, Phylum Foraminifera, Phylum Nematoda)

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to the density of habitat important for mobile species (risk rating=4). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: Kelly L. et al., 2001 found no evidence that the mobile species listed above were affected by hand harvest activities. Most amphipods & isopods are relatively inactive at low tide. Harvest at low tide avoids potential by-catch of species which would be active in the intertidal zone during high tide. The likelihood of displacement will be low and harvesters will have full view and control of their activities. As hand harvesting will be sustainable, there is a low risk of excess removal of *A. nodosum*. In turn, there is a low risk of potential negative effects on mobile species.
- Control measures (if applicable): as described for *A. nodosum* above. Also, measures are in place which ensure that *Animalia* by-catch observed post-harvest are returned to the water, where possible. Harvesters will be required to work to ensure that co-harvesting of other species does not occur. Additional measures are outlined in the Code of Practice (Appendix 4). For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Ephemeral green algae (e.g. *Cladophora rupestris (Linnaeus) Kützing*, *Ulva sp. Linnaeus* and *Enteromorpha* sp. Link)

- Risk of affecting site/species: Low risk of potential biological hazards in the form of alterations to density of ephemeral green algae (risk rating=3). No physical or chemical hazards have been identified (see table 4 and Section 4 of this document).
- Explanation: It is unlikely that ephemeral green algae (e.g. *Cladophora rupestris (Linnaeus) Kützing, Ulva sp. Linnaeus* and *Enteromorpha sp. Link)* will be altered due to harvesting of *A. nodosum* given that:
  (a) Kelly L. *et al.,* 2001, found that hand harvesting had no significant impact on ephemeral green algae over time.
  (b) These species are not exclusively depends on the intertidal zone where *A. nodosum* grows and are not directly dependent on *A. nodosum* canopy.
  (c) These species are very distinctive in appearance and will not be confused with *A. nodosum*.
  (d) Harvest of *A. nodosum* will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base, generally above the contact level with these species.

(e) *Cladophora rupestris* grows up to 20 cm in height (Budd GC, 2007), just less than the 8 inch cutting limit for *A. nodosum* harvesting. Found in rock pools, rocks surfaces, crevices or as undergrowth to macroalgae throughout the shore.

(f) *Ulva sp. Linnaeus* grows up to 30cm in length, spreading across substrates as a broad, crumpled, translucent, membranous fronds. It occurs in a range of intertidal habitats and brackish habitats, also occurring in estuaries (Pizzolla PF, 2008B).

(g) *Enteromorpha sp. Link;* (e.g. *Ulva intestinalis),* can grow to ~30cm and occurs in a range of habitats throughout the shore, including rocks, mud, sand and in rock pools. Can also occur in brackish water in the splash zone (Budd GC and Pizzolla, PF, 2008).

(h) Other species of seaweed will be considered as contaminants during intake of harvested *A. nodosum*, and this will be recorded as such on the GRN.

- Control measures (if applicable): as described for *A. nodosum* above. For further details on action limits, analytical procedures monitoring and corrective actions, see table 4 and Section 4 of this document.

Table 2: Results of assessment, control measures, monitoring and corrective actions.

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
1	**Permanent habitat area**	Encompasses all Annex I habitats reefs and submerged or partially submerged seacaves in Kenmare River SAC.	The permanent habitat area is stable or increasing, subject to natural processes (Ref: Target 1 of Objective 1, NPWS, 2013A, page 17).	B	2	5	10	M	Training where necessary to ensure: • No removal of permanent habitat area (i.e. preventing the removal of excessive levels of sand, shingle, pebbles, gravel, stone, etc.). • No removal of *A. nodosum* holdfasts which may carry sand, shingle, stone, etc.	• Non-conformance at in-take of raw material (i.e. presence of unacceptable levels of, shingle, stones, debris, or holdfasts).	• Visual inspection of harvested weed via Goods Received Notes (GRNs) and production logsheets, etc. • Inspection of GRNs and production logsheets, etc.	Resource Manager, production operators QC	Each batch of harvested seaweed. Quarterly audit	• Depending on the nature, source & extent of non-conformance, take the following steps: • Presence of sand, shingle/debris: -Removal by sand filter and decanter and clarifier. • Presence of rocks/stones: -reductions in weed price • A Non-Conformance Report will be filed and sent to management where deemed necessary (see Appendix 3 for Non-conformance Report Form (NCR). • Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements
				C	1	5	5	L	• Routine maintenance of boat engines	Non-conformance during audit.	Regular Inspection of engine of boats Audit	Resource Manager	Ongoing basis		
				P	1	5	5	L	Training where necessary, to ensure good general waste disposal practices.	Non-conformance during audit.	Hygiene audit	Resource Manager	Ongoing basis		
2	**Seagrass, *Zostera* marina (and associated communities).**	Primarily off Templenoe, Coongar Harbour, north of Leaghillaun and NW of Derrynane Harbour, Ballycrovane Harbour **Dept:** 2-6m	Maintain natural extent and high quality of *Zostera* dominated communities (Ref: Targets 2-3 of Obj.1, NPWS, 2013A, pg:17,18).	B	1	5	5	L	Harvest will not occur in these areas.	Unauthorized harvest in protected areas.	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs and Site Inspection	Resource Manager QC	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Ensure that management instructions are adhered to. (b) Review communication system. (c)Harvester undergoes re-training as required	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
											Forms.				
3	***Maerl* Dominated communities**	**Large patches:** Found on the northern shore in mid Kenmare River area, just beyond Gleesk Quay and towards Templenoe. **Dept:** 5-6m	Maintain natural extent and high quality of Maerl dominated communities (Targets 2 & 4 of Obj.1, NPWS, 2013A, pg:17,18).	B	1	5	5	L	As above for seagrass *(Table 2(2))*.						
4	***Pachycerianthus multiplicatus* community complex.** Infauna: coarse sediment dominated by polychaetes community.	Found in coarse sediment and area from rocky outcrops **Dept:** >15m	Maintain Pachycerianthus multiplicatus and associated community (Ref: Targets 2 & 5 of Objective 1, NPWS, 2013A, pages 17, 18).	B	1	5	5	L	As above for seagrass *(Table 2(2))*.						
5	**Polychaetes & *Amhiura filiformis* community complex (Muddy fine sand areas).**	Occurs extensively in Kenmare River SAC from western to eastern boundaries of the channel, recorded in depths 0-84m.	Conservation of muddy fine sand areas with Polychaetes & Amhiura filiformis community complex (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19).	B	2	5	10	M	A code of practice will be in place to ensure that harvesters do not attempt to navigate at low tide to rocky shorelines located beyond muddy fine sand areas. Access by boats to rocky shores located beyond these areas must be undertaken at high tide or when the tide has begun to recede. (see Appendix 4).	Unauthorized navigation at low tide to reach harvest sites located beyond muddy fine sand areas	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs and SIFs, etc. • Check Incident reports	Resource Manager QC	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
6	**Crustaceans & polychaetes community complex (fine-medium sand).**	Predominates in deeper waters (0-42m), most often beyond the Laminaria zone and beyond the intertidal zone.	Conservation of polychaetes community complex and associated fine-medium sand areas (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19).	B	1	5	5	L	The code of practice ensures that appropriate navigation methods are used when accessing the foreshore, thus preventing damage to fine-medium sand areas containing Crustaceans & polychaetes community complex.	Non-compliance with boating code of practice.	• Inspection of boat practices by audit.	Resource Manager QC	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
7	**Polychaetes community complex** Distinguishing species: Prionospio sp., M. palmate, T.flexuosa, M. bidentata, A. alba	Occurs in deeper waters (4-68m), beyond the intertidal *A. nodosum* zone	Conservation of polychaetes community complex and associated coarse sediment areas (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19).	B	1	5	5	L	As above for seagrass *(Table 2(2))*.						
8	***Polychaetes and oligochaete species (Estuarine mud)***	Estuarine mud occur in close proximity to intertidal reef areas, e.g. River Sneem and River Blackwater.	Page 13, NPWS, 2013A.	B	2	5	10	M	A code of practice will be in place to ensure that harvesters do not enter into estuarine mud areas during low tide. Access by boats to rocky shores located beyond these areas must be undertaken at high tide or when the tide has begun to recede. (see Appendix 4).	Unauthorized navigation at low tide to reach harvest sites in estuarine mud areas.	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs & SIFs, etc. • Check Incident reports.	Resource Manager QC	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (b) Review communication system. (c) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
9	***Intertidal mobile sand community complex***	Predominantly in areas such as Derrynane Bay, Rossdohan, Leaghillaun	Conservation of habitat required (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19).	B	1	5	5	L	As above for seagrass *(Table 2(2))*.						
10	**Shingle (pebbles and gravel)** Associated communities: Talitrid amphipods	Present in a number of areas in the inner reaches of Kenmare Bay, mainly the southern shore.	Maintenance of shingle habitats (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19).	B P	1 1	5 5	5 5	L L	Hand harvest techniques employed in shingle areas will ensure that *A. nodosum* is severed between 200-300mm (8-12 inches) above point of contact with underlying substrate (see Appendix 4).	Non-conformance during in-take of raw material (i.e. contamination with excessive levels of sand, shingle, shingle, stones, pebbles or holdfasts, etc).	• Visual inspection of harvested weed via Goods Received Notes (GRNs) and production logsheets, etc.. • Inspection of GRNs, SIFs and production logsheets, etc.	Resource Manager, production operators QC	Each batch of harvested seaweed. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: •Presence of rocks/stones: -reductions in weed price •A Non-conformance Report will be filed and sent to management where deemed necessary (see Appendix 3 for Non-conformance Report Form (NCR). Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio.,Chem.,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
11	**Reef:** *Associated communities include: A.nodosum, Fucus sp., L. hyperborea, L. digitata, A. digitatum, M. senile, E. fucorum, M. fimbriata, P. canaliculata, F. spiralis, L. saccharina, S. polyschides, C. celata, H. panicea, A. lefevrei, P. saxicola* **NOTE:** *A. nodosum and associated communities were assessed separately in, see Table 4 below.*,	**Intertidal reef:**Extensively on both shores of the Kenmare River and along the mainland and islands at the western extreme of the site. Substrate: rock walls, flat, sloping bedrock, boulder fields, cobbles and areas of vertical rock walls, e.g. west of Raheercarrig on the northern shore and west of Leaghillaun on the southern shore. ***Laminaria* dominated reef:** Throughout site from the inner reaches of Kenmare Bay to the western boundaries of the site. Recorded at the southern extreme of the site in Dursey Sound. between 4m and 22m.	Maintenance of the favourable conservation condition of reef (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19, and targets 1-3 of Objective 2, NPWS 2013A, pg. 20).	B P	2 2	5 5	10 10	M M	Hand harvest techniques employed along rocky shores will ensure that *A. nodosum* is severed between 200-300mm (8-12 inches) above point of contact with underlying substrate (see Appendix 4).	Non-conformance during in-take of raw material (i.e. contamination with stones,, pebbles or holdfasts).	• Visual inspection of harvested weed via Goods Received Notes (GRNs) and production logsheets, etc.. • Inspection of GRNs and production logsheets, etc.	Resource Manager, production operators QC	Each batch of harvested seaweed. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: • Presence of rocks/stones: -reductions in weed price • A Non-conformance Report will be filed and sent to management where deemed necessary (see Appendix 3 for Non-conformance Report Form (NCR). Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting.
				P	2	5	10	M	Harvester boats will be small. Training will be provided, if necessary, to advise the harvesters of the risks involved.	Non-compliance with boating code of practice.	• Inspection of boat practices by audit.	QC	Annual	Harvester is provided with training if necessary.	
12	**Sea Caves** (submerged or partially submerged)	Several areas including: Lamb's Head, Coomatloukane East, Coolmatloukane West, Reeneargh, Dog's Bay to Kilcatherine Point, Cod's Head, Garnish Point and Crow Head, Dursey Island.	Conservation of sea caves and associated habitat (Ref: Target 1, 2 of Objective 3, NPWS, 2013A, page 21).	B	1	5	5	L	Harvest will not occur in these areas.	Unauthorized harvest of seaweed in the vicinity of seacaves.	As above for seagrass *(Table 2(2))*.				

Kenmare River SAC

No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
13	**Harbour seals: General population**	Occupy aquatic and terrestrial habitats in Kenmare River SAC, including intertidal shorelines.	Human activities should occur at levels that do not adversely affect the harbour seal population (Ref: Targets 1-5, of Objective 4, NPWS, 2013A, page 22 & 23).	B	2	5	10	M	• There will be no activities which caus of Ariel disturbance or deterioration water quality or food source. • No activities at breeding or moultir haul out sites during sensitive times year. • Boats will be operated using metho which have least effects on harbo seal (See Appendix 4 for Code Practise).	• Unauthorized harvest at haul out sites at sensitive times of year or harvesting without knowledge or training in best practices to avoid harbour seal disturbance (Code of Practice). • Unauthorized harvest at breeding or moulting haul out sites out sites at sensitive times of year.	• Inspection of training records. • Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs & SIFs, etc.	Resource Manager QC	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to. (b) Review communication system. (c) Harvester is provided with training, if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
14	**Harbour seal: effects on Species range due restriction by artificial barriers to site use**	Occupy aquatic and terrestrial habitats in Kenmare River SAC, including intertidal shorelines. Present during all aspects of life cycle incl. breeding (approx. May-July), moulting (approx. August-September) and phases of non-breeding foraging and rest].	Species range should not be restricted by artificial barriers to site use (Ref: Target 2 of Objective 4, NPWS, 2013A, page 22).	P	n/a	5	n/a	n/a	Hand harvesting activities will not include artificial barriers to site use.	n/a	n/a	n/a	n/a	n/a	n/a
15	**Harbour seal: Breeding sites.**	Vulnerable to disturbances between during May-July (annual breeding season).	Breeding sites should be conserved in a natural condition (Ref: Target 2 of Objective 3, NPWS, 2013A, page 22).	B	2	5	10	M	• No harvest at sites between May-July. • Boats operated using methods which have least effects on harbour seals. • See BioAtlantis code of practise for protection of the harbour seal for details (Appendix 4).	Unauthorized harvest at breeding sites between May-July.	As above in Table 2 (13), i.e. harbour seals (general)..				
16	**Harbour seal: Moulting sites.**	Vulnerable to disturbances between during Aug-Sept (moulting season).	Moult-out sites should be conserved in a natural condition (Ref: Target 3 of Objective 4, NPWS, 2013A, page 22).	B	2	5	10	M	• No harvest at sites between Aug-Sept. • Boats operated using methods whic have least effects on harbour seals. • See BioAtlantis code of practise for protection of the harbour seal for details (Appendix 4).	Unauthorized harvest at moulting sites between Aug-Sept.	As above in Table 2 (13), i.e. harbour seals (general).				

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
17	**Harbour seal: Resting sites.**	Vulnerable to disturbances between during Oct-April (resting season).	Resting Haul-out sites should be maintained in a natural condition (Ref: Target 4 of Objective 4, NPWS, 2013A, page 22.	B	2	5	10	M	• Harvest will only take place at restir sites when sites are unoccupied. Th will be verified by harvesters usir binoculars. • Boats operated using methods wi least effects on harbour seals. • See BioAtlantis code of practise f protection of the harbour seal for details (Appendix 4).	Non-compliance with the Code of Practice (Appendix 4).	As above in Table 2 (13), i.e. harbour seals (general).. In addition: Assessing how harvesters approach sites during audits.	As above in Table 2 (13), i.e. harbour seals (general)..			
18	**Perennial vegetation of stony banks**	Found at or above the mean high water spring tide mark on shingle beaches. Examples include Rossdahan Island and Pallas harbour.	Perennial vegetation of stony banks are maintained in favourable condition (ref: Obj. 1, NPWS, 2013B, pg. 8).	B P	1 1	5 5	5 5	L L	Harvest will not occur in these areas. Loading and transport will be by means of existing piers and road networks.	Unauthorized transport in these areas.	As above for seagrass *(Table 2(2))*.				
19	**Saltmarsh habitat (Atlantic salt meadows and Mediterranean salt meadows)**	Restricted to the area between mid neap tide level and high water spring tide level. Four main subsites: West Cove, Tahilla, Dinish, Dereen House.	Conservation condition of salt marsh habitats be maintained (ref: Objectives 1 & 2, NPWS, 2013B, pg. 12).	B P	1 1	5 5	5 5	L L	Harvest will not occur in these habitats. Loading and transport will be by means of existing piers, quays, harbours and road networks.	Unauthorized harvest in these areas.	As above for seagrass *(Table 2(2))*.				
20	**Sand dune habitat:** •Shifting dunes along the shoreline with *A arenaria* (white dune, 2120); •Fixed coastal dunes with herbaceous vegetation (2130);	Several sites, in particular Derrynane which supports a wide range of dune habitats.	Maintain favourable conservation condition of sand dune habitats (ref: Objective 3, NPWS, 2013B, pg. 21).	B P	1 1	5 5	5 5	L L	Harvest will not occur in these areas. Loading and transport will be by means of existing piers, quays, harbours and road networks.	Unauthorized transport in these areas.	As above for seagrass *(Table 2(2))*.				
21	**Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)**	Occur along coastline from Lambs Head to Dursey Island.	Restore favourable conservation condition of vegetated sea cliff habitats (ref: Objective 4, NPWS, 2013B, pg.27)	B	1	5	5	L	Harvest will not occur in these areas. Loading and transport will be by means of existing piers, quays, harbours and road networks.	Unauthorized transport in these areas.	As above for seagrass *(Table 2(2))*.				
22	**Otter (Lutra Lutra)**	Previously confirmed at several sites, including 2 sites between N71 bridge	Restore favourable conservation	B	1	5	5	L	•Prevent disturbance or interactions with otters by following the Code of	•Not adhering to the code of practice for	• Inspection of training	Resource Manager	Routinely during harvest	Depending on the nature, source & extent of non-conformance, take	Operations meeting/

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
		at Kenmare Old and Roughty Bridge and at the mouth of the River Roughty, Sneem, Tahilla, Lauragh, a site in the vicinity of Ardgroom, a site between Fay and Kilcatherine Point, Travara, Allihies, A site between Lambs head and Dursey Island, a site between west Rath, Abbey Island and Derrynane.	conditions						Practice in Appendix 4. • Freshwater riparian environments must be avoided at all times, including Lough Inchiquin, Glan Lough, the River Sheen, River Finnihy, River Blackwater, River Sneem, and Roughty River • There will be no activities which adversely affect the *A. nodosum* biotope and in turn, potential food supply of the otter. See "BioAtlantis Code of Practise" for details (Appendix 4).	preventing disturbance or other impacts to otters (Appendix 4). • Harvesting without knowledge or training in best practices to avoid otter disturbance (Code of Practice). • Accessing marine riparian areas beyond foreshore. Existing route ways must be used. • Activity in freshwater riparian environments. • As per no. 1, Table 4 *(A. nodosum)*	records. • Inspection of GRNs & SIFs, etc. • As per no. 1, Table 4 *(A. nodosum)*	QC • As per no. 1, Table 4	periods. Quarterly audit As per no. 1, Table 4	the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training, if necessary. As per no. 1, Table 4	Harvest Meeting. Annual Review of compliance requirements.
23	**Birds; 124 species assessed:** Arctic Tern, Balearic Shearwater, Barn Owl, Barn Swallow, Barnacle Goose, Bar-tailed Godwit, Black Guillemot, Black-headed Gull , Black-legged Kittiwake, Black-tailed Godwit, Black-throated Diver, Brent Goose, Chiffchaff, Chough, Common Eider, Common Guillemot, Common Gull , Common Kestrel, Common Linnet, Common Sandpiper, Common Scoter, Common Starling, Common Swift, Common Tern, Coot, Cormorant, Corn Crake, Curlew, Curlew Sandpiper, Dipper, Dunlin, Eurasian Tree Sparrow, European Greenfinch, European Shag, European Turtle Dove, Fulmar, Gadwall, Gannet, Glaucous Gull, Goldcrest, Golden Plover, Goldeneye, Goosander, Great Black-backed Gull ,	Widespread throughout Bay and at certain sites.	Several Species listed on Annex I of E.U. Birds Directive. Kenmare River SAC is not an SPA. However, potential hazards which could impacts on birds have been assessed (See Appendix 6 for details).	B	1	5	5	L	• There will be no activities which cause deterioration to the *A. nodosum* biotope and in turn, to food supply of relevant bird species. • Appendix 6 provides a risk assessment for 124 birds. Specific mitigation measures were developed for n=29 species including but not limited to: Arctic Tern *(Sterna paradisaea),* Bar-tailed Godwit *(Limosa lapponica),* Black-headed Gull *(Larus ridibundus),* Black-tailed Godwit *(Limosa limosa),* Brent Goose *(Branta bernicla hrota),* Common gull *(Larus canus),* Common Sandpiper *(Actitis hypoleucos),* Common Tern *(Sterna hirundo),* Cormorant	• Harvesting without knowledge or training in best practices to avoid bird disturbance (Code of Practice) • No-compliance with the Code of Practice (Appendix 4), with respect to prevention of disturbance events, etc. • Inappropriate attendance at breeding and wintering sites as outlined in Appendix 6 and the Code	• Inspection of training records. • Record harvest location and pick-up points on GRNs, etc • Inspection of GRNs, etc.	Resource Manager QC	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to. (b) Review communication system. (c) Harvester is provided with training, if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
	Great Crested Grebe, Great Northern Diver, Great Skua, Green Sandpiper, Greenshank, Grey Heron, Grey Plover, Grey Wagtail, Hen Harrier, Herring Gull, Hooded Crow, House Martin, House Sparrow, Iceland Gull, Jay, Kingfisher, Lapwing, Lesser black-backed Gull, Little egret, Little Grebe, Little Gull, Little Plover, Little Stint, Little Tern, Long eared owl, Mallard, Manx Shearwater, Meadow Pipit, Mediterranean Gull, Merlin, Moorhen, Mute Swan, Northern Goshawk, Oystercatcher, Peregrine, Pochard, Puffin, Purple Sandpiper, Raven, Razorbill, Red breasted merganser, Red Grouse, Red Knot, Redshank, Red-throated Diver, Redwing, Ring Ouzel, Ring-billed Gull, Ringed Plover, Rock Pipit, Roseate Tern, Sand Martin, Sanderling, Sandwich Tern, Scaup, Shelduck, Short-eared Owl, Shoveller, Skylark, Smew, Snipe, Sparrowhawk, Spotted Flycatcher, Stock Dove, Stonechat, Storm Petrel, Teal, Tufted Duck, Turnstone, Twite, Velvet Scoter, Wheatear, Whinchat, White Tailed Sea Eagle, Whooper Swan, Wigeon, Willow Warbler, Wood Pigeon, Woodcock and Yellowhammer.								*(Phalacrocorax carbo),* Dunlin *(Calidris alpine),* Goldeneye *(Bucephala clangula),* Great Black-backed Gull *(Larus marinus),* Green Sandpiper *(Tringa ochropus),* Greenshank *(Tringa nebularia),*Little Tern *(Sterna albifrons),* Manx Shearwater *(Puffinus puffinus),* Mediterranean Gull *(Larus melanocephalus),* Oystercatcher *(Haematopus ostralegus),* Red Knot *(Calidris canutus),* Redshank *(Tringa tetanus),* Ringed Plover *(Charadrius hiaticula),* Rock Pipit *(Anthus petrosus),* Roseate Tern *(Sterna dougallii),* Sandwich Tern *(Sterna sandvicensis),* Scaup *(Anas marila),* Shelduck *(Tadorna tadorna),* Storm Petrel *(Hydrobates pelagicus),* Turnstone *(Arenaria interpres)* and White Tailed Sea Eagle *(Haliaeetus albicilla).* Control measures are in place for bird breeding and wintering sites (Appendix 4 and 6).	of Practice (Appendix 4).				
24	**Other Cetaceans:** **Whales in Irish Waters:** •Common and Regular Species: Minke Whale *(Balaenoptera acutorostrata),* Fin Whale *(Balaenoptera physalus),* Humpback Whale (Megaptera novaeangliae), Long-finned Pilot Whale *(Globicephala melas),* Killer Whale / Orca *(Orcinus orca).* •Occasional or Rare Species: Sei Whale *(Balaenoptera borealis),* Sperm Whale *(Physeter macrocephalus),* Northern Bottlenose Whale *(Hyperoodon ampullatus),* Blue Whale *(Balaenoptera musculus),* Cuvier's Beaked Whale *(Ziphius cavirostris),* Sowerby's Beaked Whale *(Mesoplodon bidens),* True's Beaked Whale *(Mesoplodon mirus),* Gervais' Beaked Whale *(M. europaeus),* Blainville's	May occur throughout the bay at various locations.	EU Habitats Directive	B	1	5	5	L	Mitigation not required. However, the following is in the Code of Practice: • **Harbour Porpoise, Grey seal, Dolphins & other cetaceans:** To prevent disturbance the following is required: - Harvesters to be trained to identify presence of marine mammals such as Harbour Porpoise, Grey seals, Dolphins and other cetaceans, as part of the general environmental awareness training. - Harvesters must adhere to measures to prevent disturbance of marine	• Harvesting without knowledge or training on identifying presence of marine mammals, measures to prevent disturbance, and steps to record disturbance events.	• Inspection of training records.	Resource Manager	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to. (b) Review communication system. (c) Harvester is provided with training, if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
	Beaked Whale *(M. densirostris)*. **Dolphins in Irish Waters:** •Common and Regular Species: Common Dolphin *(Delphinus delphis)*, Bottlenose Dolphin *(Tursiops truncatus)* – both resident and offshore populations, Risso's Dolphin *(Grampus griseus)*, White-beaked Dolphin *(Lagenorhynchus albirostris)*, Atlantic White-sided Dolphin *(Lagenorhynchus acutus)*. •Occasional or Rare Species: Striped Dolphin *(Stenella coeruleoalba)*, Fraser's Dolphin *(Lagenodelphis hosei)*, Rough-toothed Dolphin *(Steno bredanensis)*. **Porpoises in Irish Waters:** Harbour Porpoise *(Phocoena phocoena)* – widespread and commonly seen cetacean. **Grey Seal *(Halichoerus grypus)*.**								mammals, and steps to record disturbance events (e.g. section 5.4. of Code of Practice). • **Training:** Harvesters will be provided with training, where necessary, regarding habitat recognition and measures to prevent impacts on marine and coastal habitats and species, including those outlined in the Code of Practice.						

Table 3 Impact on general species & habitats of Kenmare River SAC.

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)									CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix							Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)								
1	**Fish & Fisheries species:** Rivers Roughty, Finnihy and Sheen are important sites for salmon and trout. Other commercial fisheries species are also present within the SAC.	Post smolt and adult sea trout and salmon may feed within the Kenmare River SAC area.	• Salmon are Annex II species listed under the EU habitats Directive. • Other commercial fisheries species.	B	1	5	5	L	No harvest activities will take place in important areas of Rivers Roughty, Finnihy and Sheen. There will be no activities which cause deterioration to quality of the environment of trout or salmon. A wider range of measures are outlined in Appendix 4.	As below for *Table 4 (1a; A. nodosum)*					
2	**West Cove, Tahilla, Dinish Island, Dirreen House areas.**	Salt Marsh areas	Conservation condition of salt marsh habitats to be maintained (ref: Objectives 1 & 2, NPWS, 2013B, pg. 12).	B P	1 1	5 5	5 5	L L	Harvest will not occur in Salt Marsh habitats. Loading and transport will be by means of existing piers, quays, harbours and road networks.	As above for Saltmarsh habitat (Atlantic salt meadows and Mediterranean salt meadows; Table 2(19)).					
3	**Derrynane area.**	• Sand dunes. • Salt Marshes • Woodlands • Birds	Conservation condition of salt marsh habitats be maintained (ref: Objectives 1 & 2, NPWS, 2013B, pg. 12). Maintain favourable conservation condition of sand dune habitats (ref: Objective 3, NPWS, 2013B, pg. 21) While Kenmare River SAC is not an SPA, several Species listed on Annex I of E.U. Birds Directive.	B P	1 1	5 5	5 5	L L	Harvest will not occur in sand dunes or marsh habitat. Loading and transport will be by means of existing piers, quays, harbours and road networks. Conform with the code of practice for not disturbing bird species (Appendix 4)	• As above for Saltmarsh habitat (Table 2 (19)). • As above for Sand Dune habitat (Table 2 (20)). • As above for birds (Table 2(23)). • Additionally, the Code of Practice includes site specific and species specific measures for breeding and wintering birds at Derrynane Bay and Rocky Islands near Derrynane Bay.					
4	**Iveragh Peninsula SPA (site code: 004154)**	• Iveragh Peninsula SPA	Several objectives specified by NPWS.	0	0	0	0	na	• Not applicable. Harvest will not take place in this area.						
5	**Deenish Island and Scariff Island SPA (site code:004175)**	• Deenish Island and Scariff Island SPA	Several objectives specified by NPWS.	0	0	0	0	na	• Not applicable. Harvest will not take place in this area.						

Kenmare River SAC															
No	**RISK ASSESSMENT SUMMARY** (see Section 4 of this document for further details)									**CONTROL MEASURES** (if applicable)	**MONITORING**				**CORRECTIVE ACTIONS**	
	Species/ Habitats	**Distribution, extent & location**	**Compliance requirements:** (in accordance with EU Dir. 92/43/EEC & NPWS)	**Decision matrix**							**Action Limit / non-conformance**	**Analytical Procedure**	**By**	**Monitoring Schedule (Frequency)**	**Corrective Action**	**Verification**
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)								
6	**Kenmare Islands pNHA (site code: 000363)**	• Throughout the SAC	Kenmare Islands pNHA comprises a range of islands throughout the bay which are of relevance to a number of harbour seal and bird species.	B	2	5	10	M	• As for Harbour seals (table 2 (15) above). • As for birds (table 2 (23) above).						
7	**Lehid Harbour pNHA (site code: 0001364)**	• **Lehid Harbour**	None specified. The site is of relevance due to the presence of a mixed woodland containing both native and exotic tree species. A number of bird species also utilize the area.	B	1	5	5	L	• As for birds (table 2 (23) above).						
8	**Eyeries Island pNHA (site code: 1051)**	• **Eyeries Island**	None specified. The site is of relevance to Common and/or Arctic terns.	B	1	5	5	L	• As for birds (table 2 (23) above).						
9	**Spanish Island pNHA (site code:. 001378)**	• **Spanish Island**	None specified. The site is of relevance to breeding terns.	B	1	5	5	L	• As for birds (table 2 (23) above).						
10	**Rossdohan Island pNHA (site code: 001375)**	• **Rossdohan Island**	None specified. The site is of relevance harbour seals and Arctic Tern and Black-Headed Gull.	B	2	5	10	M	• As for Harbour seals (table 2 (15) above). • As for birds (table 2 (23) above).						
11	**Roughty River Estuary pNHA (site code: 0002092)**	• **Roughty River Estuary**	None specified. The site is of relevance harbour seals and bird species.	B	2	5	10	M	• As for Harbour seals (table 2 (15) above). • As for birds (table 2 (23) above).						
12	**Old Domestic Building, Dromore Wood SAC (site code: 000353)**	• **Old Domestic Building, Dromore Wood SAC**	Several objectives specified by NPWS.	0	0	0	0	na	• Not applicable. Harvest will not take place in this area.						
13	**Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342)**	• **Cloonee and Inchiquin Loughs, Uragh**	Several objectives specified by NPWS.	0	0	0	0	na	• Not applicable. Harvest will not take place in this area.						

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)									CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix							Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)								
		Wood SAC														
14	**Drongawn Lough SAC (site code: 002187)**	• **Drongawn Lough SAC**	To maintain the favourable conservation condition of Coastal lagoons in Drongawn Lough SAC (NPWS, 2014D).	B	1	5	5	L	• Harvest must not take place along the fringes of Drongawn Lough SAC.	Unauthorized harvest in protected areas.	• Record harvest location and pick-up points on GRNs, etc • Inspection of GRNs & SIFs, etc	Resource Manager QC	Routinely during harvest periods. Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Ensure that management instructions are adhered to. (b) Review communication system. (c) Harvester is provided with training, if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
15	**Glanmore Bog SAC (site code: 001879)**	• **Glanmore Bog SAC**	Several objectives specified by NPWS.	0	0	0	0	na	• Not applicable. Harvest will not take place in this area.							
16	**Cleanderry Wood SAC (site code: 001043)**	• **Cleanderry Wood SAC**	Several objectives specified by NPWS.	0	0	0	0	na	• Not applicable. Harvest will not take place in this area.							
17	**Mucksna Wood SAC (site name: 001371)**	• **Mucksna Wood SAC**	Several objectives specified by NPWS.	0	0	0	0	na	• Not applicable. Harvest will not take place in this area.							

Table 4: Impact on the *Ascophyllum nodosum* Biotope and species therein.

Kenmare River SAC														
No	**RISK ASSESSMENT SUMMARY** (see Section 4 of this document for further details)								**CONTROL MEASURES** (if applicable)	**MONITORING**				**CORRECTIVE ACTIONS**	
	Intertidal reef community complex and species within the *A. nodosum* biotope.	**Distribution, extent & location**	**Compliance requirements:** (in accordance with EU Dir. 92/43/EEC & NPWS)	**Decision matrix**						**Action Limit / non-conformance**	**Analytical Procedure**	**By**	**Monitoring Schedule (Frequency)**	**Corrective Action**	**Verification**
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
1	***A. nodosum***	*A. nodosum* grows in abundance intertidally on sheltered, primarily rocky shores along the coast at islands.	To conserve the natural condition of intertidal reef community complex. ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	2	5	10	M	*A. nodosum* will be harvested in a sustainable manner (see Appendix 4 for Code of Practice). This prevents: • Severe reductions in canopy coverage, thus ensuring sufficient habitat for active feeding stages and reproductive purposes of *Animalia*. • It also prevents harvest of non-target species such as *Fucus sp.*, an additional habitat for understory species.	Non-conformance at any stage of harvest or management.	1)Harvest activities will be assessed for compliance at all levels including: • Planning & Scheduling of harvest activities. • Hand-Harvesting training records. • Goods received notes (GRNs) , etc. • Site Inspection Forms (SIF) , etc. 2)Monitoring the mass of *A. nodosum* resource harvested. 3)Monitoring levels of holdfast material	Resource Manager QC	Routinely during harvest periods & via: Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
2	***Fucus (Fucus vesiculosis, Fucus serratus, Fucus spiralis)***	Occurs near or alongside *A. nodosum*.	To conserve the natural condition of intertidal reef community complex. ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	2	5	10	M	As above for *A. nodosum.*						
3	***Pelvetia canaliculata***	Occurs on the upper shore near *A. nodosum*	To conserve the natural condition of intertidal reef community complex. ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	1	5	5	L	As above for *A. nodosum.*						
4	**Red algae:** *Polysiphonia lanosa (Linnaeus) Tandy*	An epiphyte of *A. nodosum*.	None	B	2	2	4	L	As above for *A. nodosum.*						

Kenmare River SAC															
No	**RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)**								**CONTROL MEASURES** (if applicable)	**MONITORING**				**CORRECTIVE ACTIONS**	
	Intertidal reef community complex and species within the *A. nodosum* biotope.	**Distribution, extent & location**	**Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)**	**Decision matrix**						**Action Limit / non-conformance**	**Analytical Procedure**	**By**	**Monitoring Schedule (Frequency)**	**Corrective Action**	**Verification**
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
5	**Red algae** *Mastocarpus stellatus (Stackhouse) Guiry, Palmaria palmata, Porphyra umbilicalis, Lomentaria articulata* (Hudson) *Lyngbye* and *Membranoptera alata (Hudson) Stackhouse*).	Located in close proximity to or beneath the *A. nodosum* canopy.	To conserve the natural condition of intertidal reef community complex. ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	1	5	5	L	As above for *A. nodosum.*						
6	***Laminaria* spp.**	In some cases, Laminaria may occur in proximity to intertidal *A. nodosum*; however, *Laminaria* is generally found in exposed areas where *A. nodosum* does not grow.	To conserve the natural condition of intertidal reef community complex. ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	1	5	5	L	Harvesting will be limited to *A. nodosum* within the intertidal zone. *Laminaria* will not be harvested. The code of practice ensures that appropriate navigation methods are used when accessing the foreshore, thus preventing damage to *Laminaria* and its substrate at low tide.	As above for *A. nodosum.*					
7	***Himanthalia sp.***	Occurs on semi-exposed coasts.	To conserve the natural condition of intertidal reef community complex. ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	1	5	5	L	Harvesting will be limited to *A. nodosum* within the intertidal zone. *Himanthalia* sp. will not be harvested. The code of practice ensures that appropriate navigation methods are used when accessing the foreshore, thus preventing damage to *Himanthalia* sp. and its substrate at low tide.	As above for *A. nodosum.*					
8	***Littorina littorea* (‘common periwinkle’).**	Snails which graze some epiphytes from the *A. nodosum* surface.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1,	B	2	5	10	M	*A. nodosum* will be harvested sustainably. The Code of Practice (appendix 4) ensures that:	Non-conformance at any stage of harvest or	1)Harvest activities will be assessed for compliance at all levels including:	Resource Manager QC	Routinely during harvest periods & via	Depending on the nature, source & extent of non-conformance, take the following steps:	Operations meeting/ Harvest Meeting.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Intertidal reef community complex and species within the *A. nodosum* biotope.	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
			NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.						• Severe reductions in canopy will not occur, thus ensuring sufficient habitat for active feeding stages and reproductive purposes of periwinkles. • *A. nodosum* mortality will not occur at levels which otherwise could lead to reductions in habitat for *Animalia*. • By-catch: *Animalia* observed post-harvest will be returned to the water, where possible. • Other habitats: provide training to harvesters, where necessary, to avoid *Fucus vesiculosis* and F. serratus, which are additional habitats for periwinkles.	management.	• Hand-Harvesting training records. • Goods received notes (GRNs), etc. • Site Inspection Forms (SIFs), etc. 2)Monitoring: • Levels of holdfast. • Harvest technique at sites		Quarterly audit Annual audit	(a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Annual Review of compliance requirements.
9	***Littorina obtusata* ('flat periwinkle').**	Snails which graze some epiphytes from *A. nodosum* surface.	None	B	2	5	10	M	As above for *Littorina littorea*. In *addition*, harvesters will be taught to avoid fronds with visible *Littorina obtusata* egg masses.	As above for *Littorina littorea*.					
10	***Littorina saxatilis* (rough periwinkle)**	Found within bedrock crevices, beneath stones or empty barnacle shells (upper eulittoral zone to littoral fringe of intertidal zone). Grazes on microalgae covering rocks.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	1	5	5	L	As above for *Littorina littorea*.	As above for *Littorina littorea*.					
11	***Melarhaphe neritoides (formerly Littorina neritoides; the 'small***	• Lives inside old barnacles or high on rocky shores in cracks & crevices, typically outside the *A.*	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1,	B	1	5	5	L	As above for *Littorina littorea*.	As above for *Littorina littorea*.					

Kenmare River SAC														
No	**RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)**								**CONTROL MEASURES** (if applicable)	**MONITORING**			**CORRECTIVE ACTIONS**	
	Intertidal reef community complex and species within the *A. nodosum* biotope.	**Distribution, extent & location**	**Compliance requirements:** (in accordance with EU Dir. 92/43/EEC & NPWS)	**Decision matrix** Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		**Action Limit / non-conformance**	**Analytical Procedure**	**By**	**Monitoring Schedule (Frequency)**	**Corrective Action**	**Verification**
	periwinkle')	*nodosum* zone. Often co-occurs with *L. saxatilis*. • Grazes on lichens and detritus on rocks at high tide.	NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.												
12	***Gibbula cinerarea* (the Grey Top Shell)**	Lives in Eulittoral zone. Not exclusively associated with *A. nodosum*. Feeds on detritus and microalgae.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B P	1 1	5 5	5 5	L L	As above for *Littorina littorea*. Additionally, harvesters will be provided with training where necessary, to identify and avoid physical impacts with clusters of *G. cinerarea* on or beneath boulders at low tide.	As above for *Littorina littorea*.					
13	***Nucella lapillus* (Dog Welk)**	• Occurs from mid to lower shore on exposed and sheltered rocky shores. Not exclusively associated with *A. nodosum*. • Carnivorous and feeds on barnacles and mussels. Does not graze on fucoid species.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B P	1 1	5 5	5 5	L L	As above for *Littorina littorea*. Additionally, harvesters will be provided with training where necessary, to identify and avoid physical impacts with clusters of *N. lapillus* on or beneath boulders at low tide.	As above for *Littorina littorea*.					
14	***Patella Vulgata* and *Patella ulyssiponensis* (Patellid limpets)**	Throughout the *A. nodosum* biotope.	None	B	2	5	10	M	*A. nodosum* will be harvested in a sustainable manner (see Appendix 4 for Code of Practice). A system is in place which ensures that: •Severe reductions in canopy coverage will not occur, thus ensuring sufficient habitat for *Animalia* such as limpets. •*A. nodosum* mortality will not occur at levels which otherwise could lead to	Non-conformance at any stage of harvest or management.	1)Harvest activities will be assessed for compliance at all levels including: • Hand-Harvesting training records. • Goods received notes (GRNs), etc. 2)Monitoring: • Levels of holdfast. • Harvest technique at sites.	Resource Manager QC	Routinely during harvest periods & via Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Intertidal reef community complex and species within the *A. nodosum* biotope.	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med., H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
									reductions in habitat for *Animalia*. • By-catch: *Animalia* observed post-harvest will be returned to the water, where possible.						
15	**Barnacles** • *Elminius modestus.* • *Semibalanus balanoides.* • *Chthamalus stellatus.*	Throughout the *A. nodosum* biotope.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	2	5	10	M	As above for *A. nodosum.*						
16	**Anemone** *(Actinia equine).*	Species distribution is not limited to the *A. nodosum* zone.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	1	5	5	L	As above for *A. nodosum.*						
17	**Lichens** *(Xanthoria parietina, Verrucaria maura, Ochrolechia parella, Ramalina sp., Anaptychia runcinata* and *Lecanora atra).*	Generally found in areas outside the *A. nodosum* zone on upper portions of rocky shores, splash zone, silicaeous rock on inland and coastal areas, on trees and other inland areas.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	1	5	5	L	As above for *A. nodosum.*						
18	**Hydroid** (*Dynamena pumila Linnaeus*).	May be found on tips of *A. nodosum*.	None	B	3	2	6	L	As above for *A. nodosum.*						
19	**Sponges** *(e.g., Ophlitaspongia, Halichondria sp.* and *Hymeniacidon sp.).*	Can occur on steep surfaces and under boulders in areas of strong tidal currents.	To conserve the natural condition of intertidal reef community complex. Ref: Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20.	B	2	5	10	M	As above for *A. nodosum.*						

Kenmare River SAC															
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Intertidal reef community complex and species within the *A. nodosum* biotope.	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
20	**Sea squirts** *(e.g. Dendrodoa grossularia van Beneden* and *Ascidiella scabra O.F. Müller)*	Can occur at the lower shore.	None	B	1	2	2	L	As above for *A. nodosum.*						
21	**Other mobile species:** (Phylum *Arthropoda (Amphipods, isopods crabs), Phylum Platyhelminthes), Phylum Annelida, Phylum Foraminifera, Phylum Nematoda)*	Can occur amongst the seaweed.	None	B	2	2	4	L	• Harvesters will work to ensure that co-harvesting of other species does not occur. • By-catch: Animalia observed post-harvest will be returned to the water, where possible.	Non-conformance at any stage of harvest or management.	Harvest activities will be assessed for compliance at all levels. This will include assessment of hand-harvesting training records and harvesting technique at sites.	Resource Manager QC	Routinely during harvest periods & via Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
22	**Ephemeral green algae** (e.g. *Cladophora rupestris (Linnaeus) Kützing*, *Ulva sp. Linnaeus* and *Enteromorpha* sp. Link)	Can occur at low densities in *A. nodosum* biotope.	None	B	1	3	3	L	As above for *A. nodosum.*						

3.4. The Spatial extent of harvesting: Ensuring continuous disturbance levels do not exceed an area of 15%.

Key measures of conservation status in SACs include area, range, structure and function and future Prospects. As hand harvesting of *A. nodosum* does not give rise to permanent damage to the shore, it does not interact with the parameters of Area or Range. However, targeted removal of species has potential to result in alterations to Structure & Function. NPWS recommend that continuous disturbance of each community type should not exceed an approximate area of 15%. To measure the potential impact on structure and function in Kenmare River, BioAtlantis requested marine community type datasets for Kenmare River SAC. The shapefile was provided by courtesy of NPWS in ESRI format (08/02/2016). Using GIS software, engineering personnel at BioAtlantis calculated (a) the total area (m^2) in Kenmare River SAC of each marine community type and, (b) the area affected by harvest activities/annum (m^2 and percentage). Table 5 contains a list of each marine community type in the Kenmare River SAC and the area affected by hand harvest activities.

The area of intertidal reef community complex to be impacted by hand harvesting of *A. nodosum* is 4.05% respectively per annum. The potential spatial overlap between harvest areas and Muddy fine sands dominated by polychaetes & *A. filiformis* community complex is also very low, at 0.017% per annum; as environmentally safe navigation techniques will be employed to prevent interactions with this community complex, the area affected per annum is likely to be zero (see measures outlined in the Code of Practice, Appendix 4). These figures falls below the 15% limit for structure and function, thereby complying with the EU Commission's requirements. Adherence with these limits is ensured as harvesting site locations and activities will be planned and recorded.

The percentage of Intertidal reef community complex and Fine to medium sand with crustaceans and polychaetes community complex, which are Marine Community Types of the Annex I habitat, Large shallow Inlets and Bays [1160], that will be impacted each year is also very low. The overall area of Large shallow inlets and bays [1160] in Kenmare River SAC is 39322.3 hectares (https://eunis.eea.europa.eu/sites/IE0002158). The percentage of Intertidal reef community complex to be impacted annually is 0.07% of this area, while percentage of Muddy fine sands dominated by polychaetes & *A. filiformis* community complex potentially impacted annually is 0.009%. The 'Code of Practice' for *A. nodosum* harvest activities in Kenmare River SAC has been updated to ensure that management work within these 15% limits (see Appendix 4). For further details on action limits, analytical procedures, monitoring and corrective actions, see Table 8 and Section 4 of this document.

To adhere with the EU Commission, also it is require that the operations by BioAtlantis do not interact with other existing and planned activities, to levels which would increase interactions beyond the stated 15% limit. These activities include aquaculture, recreation, tourism, sport, growth and development activities, other harvesting of seaweed or invertebrates, etc. BioAtlantis have assessed these potential interactions in detail in Section 3.6 of this document. A number of potential interactions were identified and mitigation measures have been developed to ensure that cumulative and in-combination effects do not occur. This ensures that BioAtlantis work within the 15% limit set by NPWS and in turn, comply with the EU Commission. A summary of the extent to which in combination effects potentially interact with marine community types, Annex I and II

habitats and species, and their mitigation, is provided in Tables 6 and 7. For a full, in depth assessment of cumulative and in-combination effects, please consult Appendix 7.

Table 5: List of marine habitat types and the area affected by hand harvest activities in Kenmare River SAC.

No.	Marine community types	Total Area in Kenmare River SAC		Maximum Annual area affected by hand harvest activities			Area of Large Shallow Inlets & Bays [1160] affected/annum
		m^2	Ha	m^2	Ha	%	%
1	Zostera Community	1451621	145.2	0	0	0%	0%
2	Shingle	14239	1.4	0	0	0%	0%
3	Maerl Dominated community	2523260	252.3	0	0	0%	0%
4	*Laminaria*-dominated community complex	36782752	3678.3	0	0	0%	0%
5	Intertidal reef community complex	6802856	680.3	275652.4	27.57	4.05%	0.07%
6	Intertidal mobile sand community complex	636507	63.7	0	0	0%	0%
7	Muddy fine sands dominated by polychaetes & *A. filiformis* community complex.	209321835	20932.2	36232.04	3.62	0.017%	0.009%
8	Fine to medium sand with crustaceans & polychaetes community complex.	19953464.32	1995.3	0	0	0%	0%
9	Coarse sediment dominated by polychaetes community complex.	83342197	8334.2	0	0	0%	0%
10	*Pachycerianthus multiplicatus* community	75554.2	7.5	0	0	0%	0%
11	Subtidal reef with echinoderms and faunal turf community complex	48375228.1	4837.4	0	0	0%	0%

* *A. nodosum* cannot be harvested in *Laminaria*, Maerl, Zostera or other subtidal areas.

- **Intertidal reef community complex:** Analysis of the shapefiles indicated a potential spatial overlap between the intertidal zone of the proposed harvest areas and 20.26% (137.83 hectares) of the Intertidal reef community complex. This corresponds to a maximum potential annual area affected of 4.05% of the habitat (27.57 hectares). A range of measures are outlined in the Code of Practice to ensure the sustainability of activities in these areas, and prevention of any potential impacts.
- **Muddy fine sands dominated by polychaetes & *A. filiformis* community complex:** The majority of this muddy fine sand complex is located in subtidal waters where *A. nodosum* does not grow. However, analysis of the shapefiles indicated a potential spatial overlap between the intertidal zone of the proposed harvest areas and approximately 0.087% (18.12 hectares) of this complex, corresponding to a maximum potential annual area affected of 0.017% (3.62 hectares) of the habitat. However, as outlined in the Code of Practice, harvesting will not take place in muddy fine sand areas and harvesters will follow "Environmentally safe navigation" approaches when travelling to harvest zones, thus avoiding impacts and preventing disturbance to soft substratum areas and their associated communities and species. These mitigation measures prevents any potential impacts on this muddy fine sand complex.
- **Laminaria-dominated community complex:** Analysis of the shapefiles indicated a potential spatial overlap between the intertidal zone of the proposed harvest areas and approximately 1.06% (38.83 hectares) of the

Laminaria-dominated community complex, corresponding to a maximum potential annual area affected of 0.21% (7.77 hectares) of the habitat. However, the maximum annual area of the complex affected by hand harvest activities will be zero percent, as (a) harvesting will be restricted to the *A. nodosum* zone in highly sheltered areas where *Laminaria* spp. does not grow and (b) measures are in place to ensure that harvesters will not harvest *Laminaria* spp. (see Code of Practice).

- **Other habitats:** The spatial overlap between intertidal zone of the proposed harvest areas and other areas in the table are zero percent. Subject to mitigation measures in the code of the practice, these areas will be unaffected by harvesting activities.

3.5. Broad, holistic examination of the nature, extent and impact of harvesting.

3.5.1. Introduction

This section builds on findings from Section 3.3 (direct and indirect impacts), by providing holistic examination of the nature, extent and impact of hand harvesting in Kenmare Bay. This is required to examine the potential effects of hand harvesting in a broader context and if necessary, provide further mitigation where significant risks are identified. The scope of this examination includes:

- The spatial extent of harvesting techniques and activities:
  - Managing expansive and prolonged operations.
  - Managing personnel and exploitation levels.
- The potential interaction effects of seaweed harvesting:
  - Targeted removal of species.
  - Non-targeted removal of species.
  - Disturbance and displacement of species and habitats.
  - Changes in community structure.
  - Changes in hydrodynamics and water quality.
  - Disturbance of marine fauna.
  - Coastal habitats.

For further details on action limits, analytical procedures, monitoring and corrective actions for each risk identified, see Table 8 and Section 4 of this document.

3.5.2. The spatial extent of harvesting techniques and activities

(a) Management of expansive and prolonged operations

BioAtlantis will employ a site-specific management approach to managing harvest activities in the Kenmare SAC, throughout the entire year. This ensures that activities take place at appropriate locations and at appropriate times. Specifically, this allows for robust mitigation measures to be employed to ensure that sites designated as unavailable for harvest at a particular time due to presence of sensitive seal and bird species, are not visited (see 'Code of Practice', Appendix 4). Thus, while the total area of coastline in Kenmare Bay is quite large, the approach of selecting environmentally-appropriate sites, effectively narrows the focus to a small number of discrete locations at any given time. The use of a boat ensures ease of access to the sites. This brings full traceability to the process, as the quality of harvest from each location is monitored and biomass will be weighed on collection or pick up and a Goods Received Note (GRN) will be issued. The benefits of this technique is that harvester's times is no longer spent hauling seaweed ashore and coastal damage that could be caused by bringing in large quantities of seaweed ashore at inappropriate locations is avoided. Alternatively, harvesters may tow the floating bags/nets from the harvest site directly to the pick-up points. In some cases, certain individuals with existing seaweed harvesting rights may prefer to land seaweed at pick up points. The seaweed will be weighed by BioAtlantis at pick up points and/or on delivery to the processing facility. The site ID or GPS location of the harvest area will be recorded.

A second GRN will also be completed on receipt of the harvested seaweed at BioAtlantis' factory in Tralee. The Resource Manager will inspect sites post-harvest to confirm that harvesters are operating as required (recorded on the SIF). For details on action limits, analytical procedures monitoring and corrective actions for risk associated with management or expansive and prolonged operations, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

(b) Numbers of personnel and exploitation levels

An individual harvester will occupy an area corresponding to approximately 0.4 acres per day, for up to 5 hours. Approximately 2 tonnes of *A. nodosum* biomass may be cut in a given day by an individual harvester. Approximately 10-20 harvesters will be employed and allocated in appropriate numbers to harvest zones of varying size. No more than 20% of *A. nodosum* biomass per site will be harvested per annum. Thus, the low number of people over a wide area reduces the potential for anthropogenic impacts (e.g. intensity of trampling) on the biotope. Given that the BioAtlantis plan will target specific areas at certain times of the year, the low levels of trampling events will be largely episodic in nature. It is unlikely therefore, that any significant change in the structure of *A. nodosum* assemblages will occur. Furthermore, as BioAtlantis will implement a strict policy against holdfast removal, the incidence of *A. nodosum* mortality will be reduced considerably (see 'Code of Practice', Appendix 4). As such, the harvest level of 20% will represent a relatively constant figure and will not be exacerbated due to significant levels of *A. nodosum* mortality due to partial or complete holdfast removal (see

below for more details). For further details on action limits, analytical procedures, monitoring and corrective actions for risk associated with numbers of personnel and exploitation levels, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

3.5.3. The potential interaction effects of seaweed harvesting

(a) Targeted removal of species

See Section 3.3.6, "Impact on the *Ascophyllum nodosum* biotope and species therein", for assessment of potential impact of targeted removal of *A.* species. For further details on action limits, analytical procedures, monitoring and corrective actions, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

(b) Non-targeted removal of species

Species with potential to be inadvertently co-removed during *A. nodosum* harvesting may include *Fucus sp.*, periwinkles, limpets, amphipods and isopods. The potential impact of hand harvesting on these species is outlined below. For further details on action limits, analytical procedures, monitoring and corrective actions, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

- Fucus

  BioAtlantis Ltd. produce pure extracts of *A. nodosum* and as such, consider *Fucus* as a contaminant material. In addition, by-catch of *Fucus* is not acceptable as this as this could also lead to unnecessarily increases in loss of fucoid canopy. Further loss of fucoid canopy could have negative effects on understory species within the biotope, particular given that many species residing within the *A. nodosum* canopy also graze or seek shelter within *Fucus* canopies. In some cases, *Fucus* can be observed to be closely interspersed alongside *A. nodosum* and in rare cases can even grow directly on *A. nodosum* plants. Harvesters will be provided with sufficient training, where required, to ensure avoidance of *Fucus*. The traditional sickle/knife hand harvest method at low tide allows for sufficient oversight over cutting. BioAtlantis consider a range of levels of *Fucus* exceeding 1-5% as being unacceptable (see 'Code of Practice', Appendix 4).

- Periwinkles & Limpets

  Periwinkles and limpets are important grazing species within the *A. nodosum* biotope and changes in canopy cover may lead to changes in the numbers of these species. *A. nodosum* canopy removal and cutting close to the holdfast is extremely invasive and has been shown to cause: (a) reductions in the numbers of periwinkles (*Littorina obtusata*, Black & Miller (1991) and (b) alterations to limpet density (Davies *et al.,* 2007 and references therein). To avoid alterations in numbers of species within the biotope in general, BioAtlantis will take an approach which prevents cutting less than 200mm (8 inches), and training will be provided to harvesters, where necessary, to leave 8-12 inches of the crop behind.

  Littorina obtusata tends to feed at high tide. At low tide, *L. obtusata* crawls into the algae canopy and remains dormant unless conditions are favourable, such as dampness, etc (Williams *et al.,* 1990). This behaviour protects the organism from desiccation and temperature stress, whilst also preventing against predatory attack. Likewise, *Littorina*

littorea actively feeds at high tide, seeking shelter within the canopy at low tide, in order to trap enough moisture to facilitate gaseous exchange (Karleskint et al. 2009). The technique employed by BioAtlantis will ensure that harvest takes place at low tide when periwinkles are more likely to be dormant or covered by *A. nodosum* fronds. Harvest will not take place during the feeding stage at high tide when periwinkles are out of their shells. Leaving 200-300mm (8-12 inches) of *A. nodosum* behind during harvest and preventing cutting below 200mm (8 inches), will ensure maintenance of the canopy (see Appendix 4, 'Code of Practice' and Appendix 3, Site Inspection Form). Holdfast removal is not acceptable. Since most periwinkles will reside low down within the canopy at low tide, the chances of their inadvertent by-catch is also reduced.

It is important to note that periwinkles do not exclusively feed on *A. nodosum* and also graze and reside in canopies of *Fucus* species, including *Fucus vesiculosis* and *Fucus* serratus. BioAtlantis will not harvest either of these species, thus ensuring that this portion of the periwinkle and limpet habitat is unaffected. BioAtlantis do not consider *Fucus* by-catch to be acceptable and will limit by-catch at <10%. This will be achieved through inspections by the Resource Manager (See Appendix 4, 'Code of Practice').

In terms of reproductive requirements, *L. obtusata* lays white, oval eggs masses containing a large number of eggs, on *Ascophyllum, Fucus vesiculosis* and *F. serratus*. The eggs masses are clearly visible to the naked eye. Eggs may sometimes be laid on the surface of rocks. As part of the training requirements and to mitigate against risks of reducing *L. obtusata* numbers, harvesters will be provided with training, where necessary, on approaches to identifying and avoiding *A. nodosum* plants or fronds which contain substantial eggs masses (see Appendix 4, 'Code of Practise'). In the case of *L. littorea*, eggs are released with the tide. Following development from a free-living form, *L. littorea* settles at the base of the *A. nodosum* canopy. Training will be provided to harvesters, where necessary, on approaches to avoiding disturbance by (a) cutting at low tide, (b) aiming to leave between 200-300mm (8-12 inches) of material behind and (c) under no circumstances cutting less than 200mm above the holdfast. By avoiding *Fucus vesiculosis* and *F. serratus*, harvesters can avoid *L. obtusata* eggs masses growing on these seaweed species. *L. littorea* present at the base of these canopies will likely be unaffected as biomass levels are maintained. As a mitigation measure, *Animalia* by-catch observed post-harvest will be returned to the water, where possible (See Appendix 4, 'Code of Practice').

- Impact on Amphipods and isopods.
  Most amphipods and isopods are relatively inactive at low tide. Harvest at low tide therefore, avoids potential by-catch of species which would otherwise be active in the intertidal zone during high tide. The likelihood of displacement will be low as harvesters will have full view and control of their activities, and will receive training where necessary. Harvesters will work to ensure that co-harvesting of other species does not occur, thus reducing the potential for trapping. As with other species, by-catch observed post-harvest will be returned to the water, where possible (See Appendix 4, 'Code of Practise').
- Other species: Harvesters will work to ensure that co-harvesting of other species does not occur, including mobile, immobile and encrusting species (see Appendix 4 and 5).

(c) Disturbance and displacement of species and habitats

Reef and understory *Animalia* and *Fucus sp.* have been identified as being potentially at risk of disturbance and displacement. This is outlined below. For further details on action limits, analytical procedures, monitoring and corrective actions, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

- Reef

  A. nodosum can grow on almost any solid substrate provided that the coast is very sheltered. In the case in Kenmare River SAC, the coastal *A. nodosum* substrate is a mixture of reef (cobbles and boulders, vertical rock walls, flat and sloping bedrock) and shingle (pebbles and gravel). Kenmare River SAC is a relatively sheltered area, allowing for *A. nodosum* growth even on small substrate. Hand harvesters will have full view of the cutting process and have adequate training, where necessary, to ensure that substrate is not disturbed. Increased removal of *A. nodosum* holdfast as by-catch can also occur due to the presence of underlying friable substrate (ref: paragraph. 3, page 19, Vandermeulen *et al.,* 2013). As removing holdfast material can cause *A. nodosum* mortality, mitigation measures must be put in place to prevent such damage, particularly in areas where small or friable substrate occurs in Kenmare River SAC, such as in single areas.

  The risk of disturbing or displacing substrate during hand harvest with a sickle or knife in Kenmare River SAC will be minimal. BioAtlantis will employ the traditional method of hand cutting which is more appropriate for the areas such as Kenmare River SAC which contains a mixture of larger and smaller, friable substrate. Harvesters will operate at low tide and therefore, have full view of the cutting process, allowing them to take care not to disturb the substrate. In addition, the hand cutting approach avoids holdfast removal and the harvesters have sufficient oversight on the cutting process and co-harvest of holdfast will not occur. In effect, this avoids potential for *A. nodosum* mortality. For these reason, BioAtlantis have chosen the hand harvest method over other methods such as rake cutters. A mitigation measure is also in place to monitor and ensure that substrate is not disturbed to the extent whereby it could enter into the harvested weed or give rise to holdfast in the harvested seaweed (see Appendix 4, 'Code of Practice'). This quality measure will be recorded on the GRN (Appendix 3), along with spot checks at production facilities to ensure such contaminants are absent.

- Understory Animalia and Fucus sp.

  As described in (b) above, the potential for disturbance and displacement of understory *Animalia* such as periwinkles and limpets is reduced, as hand harvest will take place at low tide, when species are less active. Mitigation measures are also in place to ensure that by-catch is returned to the water, where possible. Algae species such as *Fucus* are also unlikely to be disturbed or displaced, as harvesters will receive training, where necessary, to avoid non-*A. nodosum* canopies.

(d) Changes in community structure

The study by Kelly *et al.,* (2001) examined the impact of hand harvesting over an 18 month period. While this study demonstrated recovery of *A. nodosum* biomass and relatively minimal impacts on understory species, the study has some deficiencies, primarily due the study's short duration, focus on macro-invertebrates and a lack of quantitative data in relation to species

prevalence. Therefore, while conclusions can be made regarding the short term impacts of hand harvesting, there is a lack of evidence regarding long term impacts on community structure.

BioAtlantis will build on the findings of Kelly *et al.,* (2001) and continually assess the impact of *A. nodosum* harvesting over the life-time of the licence. The experimental design will involve measurement of (a) rates of re-growth of *A. nodosum* post-harvest, (b) associated biodiversity. An experimental site will be chosen which will allow for comparisons between non-harvested areas and harvested areas. Sections will be taken which are large enough to allow for sufficient numbers of replicates. A range of parameters will be measured including numbers and/or density of *A. nodosum* plants, numbers of *Fucus* plants, and numbers of *Animalia*. Particular focus will be placed on assessing the numbers of key species such as periwinkles and limpets,. Assessments will be performed on an annual basis to allow for monitoring over an extended time-period, preferable between 5-10 years. For further details on the experimental design, see Assessment of Impacts of the Maritime Usage (AIMU) Report (Section 2: Project Description).

This approach will allow BioAtlantis to continually validate and improve the methodology on an ongoing basis and on a long term basis throughout the life-time of the licence. This will ensure that scientific knowledge is increased beyond the timeframe assessed by Kelly *et al.,* 2001. This will be important in ensuring that conservation objectives are met continually into the future. For further details on action limits, analytical procedures, monitoring and corrective actions associated with potential changes in community structure, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

(e) Changes in hydrodynamics and water quality

There are 5 urban waste water treatment plants in the vicinity of Kenmare River SAC, located in Ardgroom, Eyeries, Kenmare, Kilgarvan and Sneem. Waste water treatment plant discharge may give rise to alterations in the levels of nutrients, suspended solids and some elemental components such as aluminium (Marine Institute, 2015). It is known that polluted water can have negative effects on *A. nodosum* performance, epiphyte infestation, colonisation and competition by green algae (Hurd, CL *et al.,* 2014).

Quilliam et al., (2014) have demonstrated that storm cast seaweed enhances waterborne Escherichia coli (E.coli) survival. Specifically, senescing or decomposing seaweed provides a protected environment for faecal-derived bacteria and waterborne E. coli survival. Given that untreated sewage is being discharged into the marine environment via number of sites, it is possible that senescing seaweed may therefore represent a significant hazard to humans and the environment.

As a mitigation measure, BioAtlantis will not harvest within 50m of sewage outfalls or other sources of pollution (see Appendix 4, 'Code of Practice'). This will ensure that stressed *A. nodosum* growth is not exacerbated further by harvest activities. Moreover, BioAtlantis will not harvest senescing or decomposing seaweed.

A. nodosum is adapted to growing in highly sheltered environs and as such, has difficulty remaining attached to hard substrate in less sheltered waters. Therefore, *A. nodosum* is unlikely to exert a substantial influence on hydrodynamics. Harvest activities will not reduce height of *A.*

nodosum below 200mm (8 inches) and harvesters will receive training, where necessary, to cut between 200-300mm (8-12 inches). Therefore, dramatic changes in biomass levels within the intertidal zone are unlikely to occur. For further details on action limits, analytical procedures, monitoring and corrective actions associated with potential changes in hydrodynamics, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

(f) Potential disturbance of marine fauna.

The technique employed during *A. nodosum* harvest, requires cutting at heights well above the holdfast, thus avoiding any fauna present at the base of the canopy. Harvest at low tide also prevents any immediate effects on marine fauna which are exclusively active around the area during high tide. By ensuring maintenance of sufficient canopy, marine fauna can still utilize the *A. nodosum* environment at high tide. Moreover, the long term effects of harvesting is minimized as sufficient levels of photosynthetic tissue is left behind which will allow for faster *A. nodosum* recovery post-harvest. Moreover, limiting the harvest to 20% of the available biomass per site per annum will ensure that sufficient biotope coverage remains. For further details on action limits, analytical procedures, monitoring and corrective actions associated with potential disturbance of marine fauna, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

(g) Potential Interactions with coastal habitats:

- Introduction

  As a canopy forming species, *A. nodosum* is well recognised as an important structuring species, modifying the physical environment through a range of biotic interactions (Gollety *et al.,* 2008 and references therein). *A. nodosum* contributes to the organic deposition throughout the littoral zone and marine environment. However, the rocky shoreline by its very nature is not a closed system and organic matter will tend to transfer from the area into the wider marine environment. It should be noted that *A. nodosum* is very low in protein content and its contribution to nitrogen levels in the ecosystem are minimal. However, as a primary producer located close to the back shore, it is essential that the potential impact of any loss of *A. nodosum* on nearby costal habitats is examined. From an assessment of scientific literature, there are two coastal habitats which have potential to be impacted indirectly by hand harvest activities, namely salt marsh and sand dune habitats. This is described as below. For further details on action limits, analytical procedures, monitoring and corrective actions associated with potential interactions with coastal habitats, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

- Salt Marsh Habitats

  Kenmare River SAC is characterised by the presence of Atlantic Salt Meadows, Mediterranean Salt Meadows habitats at several locations throughout the SAC, primarily occurring over peat (NPWS 2013B). Salt marsh habitats can 'fringe' the intertidal zone of muddy or sandy coasts of estuaries and protected shores. Salt marsh habitats host a wide range of plant primary producers. Loose fronds of *Ascophyllum* and *Fucus* occur at the lower part of the intertidal belt (Valiela L, 1995). Exposed peat areas of salt marshes can contain

dwarf ecotypes of *Fucus* spp. and *Ascophyllum* spp. (i.e. turf fucoids, NPWS 2013B and McCorry & Ryle, 2009). Transitional zones between salt marshes and woodland can contain wet heath/ wet grassland (Molinia caerulea; NPWS 2013B).

Salt Marsh fucoids (or ecads) such as *Fucus* spp. and *Ascophyllum nodosum Scorpiodes* play important roles in sediment deposition and accumulation at salt marsh habitats (Tyrrell MC *et al.,* 2015 and references therein). *Ascophyllum nodosum Scorpiodes* represents a free living, dwarf form of *A. nodosum*. It may arise due to deposition of *A. nodosum* fragments on sheltered areas such as salt marshes. Factors that determine this morphological expression may include: physical, abiotic factors such as temperature and light-intensity during winter and spring months and/or salinity (Brinkhuis BH & Jones RF, 1976 and references therein). Some studies indicate an obligate occurrence of *A. nodosum* with plant species at salt marsh habitats (e.g. cord grass; Callaway, R. M. 2007 and references therein). There is evidence that removal of *Ascophyllum nodosum Scorpiodes* may give rise to reduced biomass of marsh plant such as cordgrass (*S. alterniflora;* Gerard *et al.,* in 1999*).* Further research by O'Connor *et al.,* (2011) found no effects of macroalgal removal on cordgrass abundance. It has recently found that while *Ascophyllum nodosum* ecads and *Fucus* spp. ecads directly and substantially contribute to salt marsh sediment elevation gain, they may also inhibit colonizing of salt marsh habitats by plant species (Tyrrell MC *et al.,* 2015).

In order to ensure that *A. nodosum* harvest does not negatively impact on the salt marsh habitats in Kenmare River SAC in general, a mitigation measure is in place to ensure that harvesters will avoid harvesting *A. nodosum* and *Fucus* at the fringes of salt marshes (see Code of Practice, Appendix 4). This ensures that important roles of fucoid species in terms of sediment deposition and accumulation in salt marsh areas are maintained.

- Sand dune habitats

  Accumulation of organic matter is important for the formation of coastal habitats such as sand dunes and for species which grow throughout these habitats. Some studies indicate that roots of *Ammophila brevilgulata* do not respond well to dead and decaying organic matter and in fact, the extension of roots of seedlings may be inhibited by the presence of decaying plant matter. However, further studies demonstrated that under experimental conditions, the addition of *A. nodosum* organic drift litter material was associated with increased *Ammophila* leaf length compared to other types of debris. This may be associated with the stimulation of growth due to a C:N ratio of 15:1 in algae (Maun, 2009). *A. nodosum* organic drift litter may therefore contribute somewhat to the formation and integrity of sand dune habitats. As the proposed operations require physical harvest of *A. nodosum* material, there is the potential for indirect effects on sand dune habitats, which could arise due to inappropriate techniques being applied or extensive harvesting occurring. Strict mitigation measures are in place to ensure that the potential for overharvesting which could have potential indirect impacts on sand dunes, is avoided (Appendix 4). This involves a management system with a high level of oversight to ensure that the methodologies employed will not result in extensive biomass removal.

3.6. Cumulative and in Combination Impacts

3.6.1. Introduction

Kenmare River SAC is characterised by a wide range of marine activities including aquaculture, fishing, tourism, sport and leisure interests, along with a number of other stakeholders. It is important therefore, to assess the potential for in combination effects to emerge as result of interactions between hand harvesting and other operations in the area. In the case of Kenmare River SAC, it is required that continuous disturbance does not exceed an approximate area of 15% and that marine community types are not impacted. The section provides an overview of potential interactions with existing and planned operations in Kenmare Bay. This is based on an in depth analysis provided in Appendix 7 covering the extent of these operations. In the case of Kenmare River SAC, each significant risk has been mitigated against to ensure the limit of disturbance of 15% is not exceeded. Table 6 & 7 (a) summarize the findings of the analysis in Appendix 7 and outline the extent of such effects with respect to marine community types, Annex I and II species and habitats and the use of mitigation measures to ensure the limit of 15% is not exceeded in Kenmare River SAC. For further details on action limits, analytical procedures, monitoring and corrective actions associated with potential in cumulative and in combination, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4). Areas covered by the current assessment are listed below:

- **Existing Operations:**
  - Unlicensed, traditional and casual harvesting of seaweed.
  - Recreation, tourism, sport, growth and development
  - Aquaculture.
  - Harvesting of invertebrates
- **Planned Operations:**
  - Unlicensed, traditional and casual harvesting of seaweed.
  - Recreation, tourism, sport, growth and development
  - Aquaculture.
  - Harvesting of invertebrates
- **Vector potential of harvest activities:** the introduction/spread of invasive species.
- **Conclusions of potential in-combination effects**

3.6.2. Existing Operations: Potential cumulative, in-combination effects and interactions

It is possible that other activities, existing operations or planned operations, which are not part of the BioAtlantis plan to hand harvest *A. nodosum*, may contribute to increasing overall interactions with structure and function in Kenmare River SAC. It is therefore essential to assess these factors to ensure that activities are within the 15% limit for the planned harvesting, as outlined in Section 1 of this document. To assess these effects, data was taken from online resources, literature and information in the public domain to measure the extent of existing activities (see Appendix 7). Tourism and recreation companies typically advertise their services online. Information relating to aquaculture activities is also available online and in literature published and available in the public domain. Information on other harvesting activities or harvesting of invertebrates was obtained through the public domain, word-of-mouth or as 'common knowledge'. A detailed assessment of potential in combination effects is provided in Appendix 7 to this application, along with all relevant cited references. Risk and mitigation measures which were identified for each type of existing operation are described below.

(a) Existing seaweed harvesting activities.

Risks

- There is no record of any commercial-scale harvesting of *A. nodosum* currently taking place at present in Kenmare River SAC. However, small-scale local harvesting for personal use in gardens, organic farming etc, may take place (e.g. unlicensed, traditional or casual harvesting of seaweed). While this likely occurs at low levels and with very low numbers of people involved, it may potentially take place in proximately to harbour seal haul out sites or sites relevant to birdlife. Therefore, harvesting has potential to cause disturbance to harbour seals and birds at sensitive sites, particularly if it occurs combination with existing activities. Otters may also be sensitive to the presence of vessels in the water or people on the shore.
- There are at least one small company in Kenmare who utilize seaweed in their products. It is unclear whether or not seaweed is harvested from the SAC or the species involved.
- Some artisan foods containing seaweeds are sold locally. It is unclear whether or not seaweed is harvested from the SAC or the species involved.
- Some hotels, health spas and others provide seaweed baths and related services, raw materials of which may potentially be sourced from Kenmare River SAC.
- "Seaweed Discovery Tours and Workshops" take place in Caherdaniel. The Kenmare Food Carnival has previously included seaweed foraging activities in the past.
- Appurtenant rights to harvest seaweed may be present on some property folios.

Mitigation measures

To ensure compliance with Kenmare River SAC's conservation objectives and prevent in combination or cumulative effects, the following applies:

- **Small scale harvesting:** Harvesting activities must not impact on other people who harvest small volumes of seaweed, edible seaweeds or invertebrates for their own personal use, e.g. dillisk, carrageenan, limpets, mussels, clams, periwinkles and scallops or seaweed for own personal use in gardens, artisan foods/drink and food festivals.

- **Tourism, sport, recreation and excursion activities:**
  - As a general policy, hand harvesters will avoid sites where tourism, sport, recreation and excursion activities are observed to be taking place. This will be determined on a case-by-case basis.
  - BioAtlantis will not harvest in Caherdaniel at any time of the year due proximity with Iveragh Peninsula SPA [004154] which also avoids in combination effects with seaweed tourism excursions in the area.
- **Harbour seals, birds and otters:** Hand harvest will not take place at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects. Harvesters will work to prevent any disturbance or interaction with Otters in the water or on the shore by following the Code of Practice (Appendix 4).
- **Burdens and appurtenant rights to harvest seaweed:** BioAtlantis will not harvest in areas where there are existing appurtenant rights or burdens in relation to the harvesting, gathering or removal of seaweed from the shore, without first obtaining permission from the owner of such rights.
- **Profit-à-Prendre rights:** Where Profit-à-Prendre rights to harvest seaweed are successfully registered with the PRAI, the harvesting plan will be adjusted to ensure that those individuals can continue to harvest *A. nodosum*. It is envisaged that a clause may be inserted into the licence issued to allow the harvesting of *A. nodosum*, stating that if a Profit-à-Prendre right holder provides sufficient proof to their right, the licensee would be prohibited from harvesting in that area, without first obtaining permission from the owner of such rights.
- **Maritime areas in State ownership:** Harvesting will not take place in privately owned maritime areas without prior consent on the property owners.
- **Commercial harvesting:**
  - If unlicensed large-scale commercial harvesting is observed to occur, this will be recorded and advice will be sought from the relevant authorities on how to proceed. BioAtlantis will not harvest in such areas until *A. nodosum* has regenerated and will work to ensure that any harvesting is limited to 20% of the total available biomass per site per annum and continuous disturbance of each community type does not exceed the required limit.
  - Any commercial user having small requirements of approximately 1 Tonne per annum (e.g. hotels, health Spas) will be identified and BioAtlantis will work to prevent in combination effects.
- **Traditional and casual harvesting:**

  In terms of traditional harvesting activities, BioAtlantis aim to utilize and improve the existing system and will contract those with experience in the traditional hand cutting methodology. BioAtlantis will contract responsible, traditional hand harvesters who will work within the BioAtlantis system. This will ensure that traditional hand harvest activities are incorporated seamlessly into a fully licensed system, thus protecting traditional methods, the harvesters themselves and the environment, in tandem. BioAtlantis aim to get the best from the traditional approach but provide improvements which ensure better working conditions and compliance with the SAC objectives.
- **Harvest plan:** The BioAtlantis harvest plan will be continually updated to ensure that sites recently harvested are not subjected to further harvest until enough time has passed to ensure sufficient regrowth.

- **Resource Database:** For the effective management of this area BioAtlantis will create a database of the islands and coastal areas. This database will be used to:
  - Determine sites which require a fallowing period to allow for adequate recovery from recent activities.
  - Determine rotation requirements (i.e. extrapolation and calculation of the duration or fallowing period required prior to a particular area being fit for re-harvest).
  - Prevent harvest activities that would lead to a decline in yield.
  - Record the details of each harvest, how much, by whom & when.

(b) Recreation, Tourism, Sport, Growth and Development

For full details of potential cumulative and in-combination effects and interactions, please consult the in depth assessment provided in Appendix 7. Significant risks identified in Appendix 7 and associated mitigation measures are listed below. All mitigation measures listed below are included in the Code of Practice for harvesting in Kenmare River SAC (Appendix 4).

Risks

Kenmare River SAC is a very busy destination for recreation, tourism and sport-related activities. In line with this culture, there is considerable levels of growth and development projects ongoing in the area. There are also several important recreation, tourism and sport bases present. In most cases, the potential risks associated with such activities and hand harvesting are deemed insignificant (See Appendix 7). However, potential risks have been identified which include potential impacts on Annex II species and potential for increased anthropogenic disturbances at certain sites along the intertidal zone. Risks identified are described below. Mitigation measures are indicated below and are included in the Code of Practice for hand harvest activities (see Appendix 4):

- Annex I & I species: Marine-based activities may cause disturbance to harbour seals, otters and birds at sensitive sites. In the SAC, there are two types of activities which may impact on harbour seals, otters and birds: (i) direct visits to sites containing or pursuit of wildlife (e.g. wildlife cruises, trips to visit seal colonies) and (ii) activities which may inadvertently give rise to contact with wildlife (e.g. fishing, angling, canoeing, dinghy sailing, kayaking, windsurfing etc.). Otters may also be sensitive to the presence of vessels in the water or people on the shore.
- Anthropogenic effects:
  - Kenmare River SAC is very popular for recreation, tourism and sport-related activities. During peak tourist season, there is an increased potential for in combination effects associated with increased anthropogenic disturbances, in general. Important sites where in combination anthropogenic effects may occur include Dirreencallaugh, Sneem, Parknasilla, Derrynane, Eyeries and Dromquinna.
  - There are several small bases throughout the bay, used for commercial recreation, tourism and sport activities, including such as Dinghy, Kayaks, etc. In some cases, transference of equipment from bases into the water may give rise to small patches which contain reduced density of intertidal seaweed, thus raising the potential for in combination effects.

Mitigation Measures

Mitigation measures have been developed for each significant risk identified in Appendix 7. They are listed as follows and included in the “Code of Practice” for sustainable hand harvesting of *A. nodosum* (see Appendix 4):

- As a general policy, hand harvesters will avoid sites where tourism, sport, recreation and excursion activities are observed to be taking place. This will be determined on a case-by-case basis.
- Harvest will not occur at Dirreencallaugh, Sneem, Parknasilla, Derrynane, Eyeries or Dromquinna between July-August. This prevents any in combination effects associated with increased anthropogenic disturbances which may occur during summer due to increased numbers of tourists in the area. In addition, harvesting will not occur in Derrynane at any time as this is part of the Iveragh Peninsula SPA [004154].
- As a general policy, hand harvesters will maintain distance from other boats or vessels, such as power boats, cruise boats, kayaks, rib boats, row boats, rib boats when travelling to sites, thus preventing any in combination effects.
- Harvesters will work to ensure that angler's space is respected at all times.
- Harvesters and operators of boats must keep well clear of boats during training, racing, etc.
- Harvesters and operators of boats must observe "power gives way to sail" conventions when appropriate.
- Hand harvesters will not work within 50m of bases where equipment or vessels are manually introduced in the water.
- Harvesters will not enter into estuarine mud areas at low tide, thus preventing in combination effects with activities such as bait digging.
- Hand harvesting will not take place at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects.
- Hand harvest will not occur at harbour seal breeding or moulting sites located in proximity to Rossdohan, Sneem, Parknasilla, Sherkey Island, Templenoe, Tahilla Cove, Dawros, Ormonds View, Dromquinna, Ardgroom, Kilmackillogue Harbour or Dinish Island between May-Sept, thus preventing in combination disturbance effects.
- Harvesters will work to prevent any disturbance or interaction with otters in the water or on the shore by following the Code of Practice (Appendix 4). This includes recreation, sports and tourism-related areas such as Parknasilla and other areas where otters are known to be found.
- Harvesters will work to ensure the following at Kilmakillogue harbour:
  - No harvest at this site during cormorant breeding season (April- July).
  - Keep distance from colonies of black-headed gull during breeding season (March-Sept).
  - Avoid approaching, chasing, scaring or putting birds to flight at any time.
- Harvesters will work to ensure the following at Ardgroom harbour between March-Sept:
  - Keep distance from colonies of black-headed gull.
  - Avoid approaching, chasing, scaring or putting birds to flight at any time.
- Derrynane Bay:
  - Harvest will not take place at the Iveragh Peninsula SPA [004154] at any time. This ensures no impacts on other birds reported to occur in this area, including Bar-Tailed Godwit and Great Black-backed Gull.
  - To prevent impacts on the Oystercatcher in Derrynane, open sandy coasts, beaches, dunes and salt marsh areas will be avoided all year round.
  - To prevent impacts on the Ringed Plover, exposed sandy beach areas will be avoided all year round.
  - Rocky islands near Derrynane Bay (Breeding sites) will also be avoided all year round to prevent any disturbance to Arctic Tern, Common Tern, Little Tern and Sandwich Tern during breeding season, rocky islands near Derrynane will be avoided between March-Oct.

- Each of the mitigation measures listed above are included in the "Code of Practice" for sustainable hand harvesting of *A. nodosum* in Kenmare River SAC (see Appendix 4).

(c) Aquaculture

There are several companies specializing in Aquaculture in Kenmare River SAC (Marine Institute, 2015). In some cases, aquaculture sites are located in proximity to sites which are sensitive to Annex II species such as harbour seals. There may be risks therefore, that such activities may interact with hand harvesting activities and such affects must be mitigated against. There are also risks that activities associated with hand harvesting could interact with existing impacts attributed to aquaculture in these areas. Recent studies by the Marine Institute (2015, 2019) assessed potential impacts of licensed and planned aquaculture activities on species and habitats in Kenmare River SAC. The study concluded that "with one exception, the current levels of licensed shellfish and finfish culture and proposed applications are considered non-disturbing to harbour seal conservation features". Hand harvesting of *A. nodosum* therefore, would require mitigation to prevent in combination effects with this example. There are potential interactions between hand harvest activities and aquaculture, including (a) direct impact on reef due to removal of species and (b) impacts upon intertidal sediments due to travel across the shore to harvest sites (Marine Institute, 2015, 2019). The study by the Marine Institute concludes that is it unlikely that hand harvest of seaweed and intertidal shellfish culture will overlap in Kenmare River SAC, given that reef is not considered suitable for culture of shellfish. While the risks cited above are unlikely to give rise to in combination effects, BioAtlantis have developed a Code of Practise which work to ensure such risks are mitigated against. For full details of potential cumulative and in-combination effects and interactions, please consult the in depth assessment provided in Appendix 7. Significant risks identified in Appendix 7 and associated mitigation measures are listed below. All mitigation measures listed below are included in the Code of Practice for harvesting in Kenmare River SAC (Appendix 4).

Risks:

- Hand harvest activities may exacerbate existing effects which are potentially associated with licensed aquaculture activities, e.g. disturbance at sites relevant to harbour seals.
- The Marine Institute cannot rule out potential effects of an existing aquaculture site on seal behaviour at a moulting site in Coonger Harbour (Marine Institute, 2015, pg. 90.). There are also existing aquaculture sites that may be in the vicinity of haul out sites (Parknasilla and Killmakillogue Harbour) and bird breeding sites (islands in Killmakillogue Harbour).
- Otters may also be sensitive to the presence of vessels in the water. Overall the risk of such interactions is considered low (Marine Institute, 2015 and 2019).

Mitigation:

- Annex I and I species:
  - Hand harvest will not take place at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects with existing aquaculture activities.
  - Hand harvesting will not take place at moulting haulout sites in Coongar Harbour during harbour seal moulting season.
  - Ensure caution when operating near or approaching areas where existing aquaculture sites may be in relatively close proximity to harbour seal breeding, moulting sites and resting sites

(islands near Parknasilla, islands and coastal zones in Coongar Habour, islands in Killmakillogue Harbour), bird breeding sites (islands in Killmakillogue Harbour) and bird wintering sites. This will ensure that harbour seals and birds are unaffected.

- Harvesters will work to prevent any disturbance or interaction with Otters in the water or on the shore by following the Code of Practice (Appendix 4).

- Intertidal habitats:
  - The Code of practice for environmentally safe navigation must be followed to ensure no in combination effects which would damage soft substratum areas.
  - Ensure no in combination effects on access/navigation routes to aquaculture sites over intertidal habitats, thus preventing and/or minimizing habitat disturbance. Do not impede workboat, tractor or other access to aquaculture sites along defined access routes, including but not limited to those associated with routes via Bunaw Pier, Bunaw (Kilmackillogue Pier), areas near Kilmackillogue Pier, Blackwater Pier and Oysterbed Pier, roadway access points at Templenoe (upper Kenmare Bay), access along the foreshore over intertidal habitats (e.g. near Templenoe, via public roads such as R571), areas with existing rights of way and other locations including those near the Beara Peninsula, Sneem (e.g. slipway), Coulagh Bay, Travara, Eyeries, Kilcatherine Point, Ardgroom Harbour, Cleandra (landing pier), Coongar Harbour, Pallas Pier, inner Kenmare Bay, outer Kenmare Bay and private laneways or routes or pick up points.
- Other:
  - Ensure no impacts on aquaculture users who may be licensed to harvest or grow seaweed.
  - Ensure that no aspects of *A. nodosum* harvesting gives rise to any physical interaction or contact with aquaculture production units, their structures or anchors.
- These mitigation measures are included in the "Code of Practice" for sustainable hand harvesting of *A. nodosum* in Kenmare River SAC (see Appendix 4).

(d) Harvesting of invertebrates

Risks:

- There is at least one commercial user of periwinkles in Kenmare. Periwinkle harvesting in Kenmare River SAC may cause some reductions in periwinkle population numbers due to their removal. There is potential for in-combination effects on periwinkles associated with *A. nodosum* hand harvesting as *A. nodosum* represents an important habitat for these species.
- There is a risk that hand harvesting may impact on slow moving invertebrates in general given that bags or nets are used along the intertidal zone.

Mitigation:

- Harvesting of *A. nodosum*: Harvesters will be taught to leave between 8-12 inches of the crop behind. This standard will be monitored by the Resource Manager. This approach avoids:
  (a) Extensive removal of *A. nodosum* canopy coverage and damage to the ecosystem,
  (b) avoids interactions with or by-catch of dormant or resting periwinkles positioned at the base of the *A. nodosum* canopy, and
  (c) Ensures that on development into free-living forms, *L. littorea* species are able to settle and establish within the intact canopy.

- *L. obtusata* eggs: Harvesters will work to avoid *A. nodosum* plants which contain visible *L. obtusata* egg masses. This is important to prevent harvest of viable eggs, thereby promoting maintenance of population size.
- Do not harvest *Fucus*: *Fucus* content of harvested *A. nodosum* will be limited to no more than 10%, thus preventing removal of an additional canopy source which supports periwinkles and other species.
- Take care not to co-harvest other species. Co-removal of amphipods, isopods, periwinkles or other Animalia identified post-harvest must be collected and returned to the water, where possible.
- Each of the mitigation measures listed above are included in the “Code of Practice” for sustainable hand harvesting of *A. nodosum* in Kenmare River SAC (see Appendix 4).

3.6.3. Planned Operations: Potential cumulative, in-combination effects and interactions.

The potential for in combination effects of planned operations in Kenmare Bay and hand harvesting of *A. nodosum* has been assessed (see Appendix 7). The planned operations have been identified are described below. For further details on action limits, analytical procedures, monitoring and corrective actions associated with potential in cumulative and in combination, please see Table 8 and Section 4 of this document. All control measures have been included in the 'Code of Practice' (Appendix 4).

(a) Harvest activities:

Risks:

- There is currently an application for seaweed harvesting by Sykoni Lowes, in Eskivaude, Allihies, Beara, County Cork (12.7 Ha foreshore area at Blackrock, south of Cod's Head; ref: https://www.gov.ie/en/foreshore-notice/bffaf-sykoni-lowes/). Activities of more than one company in a single area could lead to overharvesting. The area is close to Beara Peninsula SPA (site code 004155). There are no established harbour seal sites in the licence area. Otters may be sensitive to the presence of vessels in the water or people on the shore.

Mitigation:

- BioAtlantis will not harvest in the proposed application area of Sykoni Lowes. This area will be marked as an excluded area on the map. This will ensure that overharvesting will not occur or impacts on sensitive marine mammals will not occur in this area.
- BioAtlantis will not harvest in Beara Peninsula SPA (site code 004155).

(b) Recreation, Tourism, Sport, Growth and Development

Risks:

- The strategy of Kerry County Council is to develop tourism and work with Fáilte Ireland to develop viewing points along the Wild Atlantic Way. Therefore, there is potential for new tourism infrastructure to be developed along the coast in Kenmare. This raises the potential for interactions with harvesting which could lead to increased anthropogenic disturbances or disturbance of harbour seals during breeding or moulting season or bird wintering and breeding at sensitive times of the year. Otters may also be sensitive to the presence of vessels in the water or people on the shore.
- Kerry County Council have plans to develop food tourism in Kerry, known as "Taste Kerry". There is potential for such activities to include edible seaweeds. Kerry County Council also aims to assist tourist events through Community Support Fund local festivals throughout the county. Such activities may potentially involve seaweed. In previous years for example, the "Kenmare Food Carnival" has included foraging for edible seaweed as an activity. When such events occur, there is potential for increases in anthropogenic disturbances to occur in combination with seaweed harvesting. Activities may also take place close to sites of relevance to harbour seals during breeding or moulting season or bird wintering and breeding at sensitive times of the year.

Mitigation:

- Harvesting activities must not impact on other people who harvest low levels of seaweed for their own personal use in gardens, artisan foods/drink, food festivals etc.
- As a general policy, hand harvesters will avoid sites where tourism, sport and recreation activities are observed to be taking place. This will be determined on a case-by-case basis.
- Hand harvest will not take place at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects
- Harvesters will work to prevent any disturbance or interaction with Otters in the water or on the shore by following the Code of Practice (Appendix 4).
- Each of the mitigation measures listed above are included in the "Code of Practice" for sustainable hand harvesting of *A. nodosum* in Kenmare River SAC (see Appendix 4).

(c) Aquaculture and fisheries activities:

Risks:

- Hand harvest activities may exacerbate existing effects which are potentially associated with licensed aquaculture activities, e.g. disturbance at sites relevant to harbour seals. Otters may also be sensitive to the presence of vessels or people on the shore. Overall the risk of such interactions is considered low (Marine Institute, 2015, 2019). In additional there are a number of applications for oyster and mussels related aquaculture at Killmakilloge and Ardgroom Harbour and near Killaha East and Coongar (Marine Institute, 2015, pg.21). Notably, there are breeding and moulting harbour seal sites at Killmakilloge and Ardgroom Harbour and potentially near Killaha East.

Mitigation:

As above for "existing" aquaculture activities in Kenmare River SAC. In addition:

- Hand harvest will not take place at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects with any planned aquaculture activities. This includes planned aquaculture sites at Coonger Harbour, Killmakilloge and Ardgroom Harbour and near Killaha East.
- Ensure caution when operating near or approaching areas where planned aquaculture sites may be in relatively close proximity to harbour seal breeding, moulting and resting sites (Ship Rock, site near Pointafadda, south of Garinish Island, islands in Killmakillogue Harbour) bird breeding sites (islands in Killmakillogue Harbour) and bird wintering sites. This will ensure that harbour seals and birds are unaffected (Code of Practice, appendix 4).
- These mitigation measures are included in the "Code of Practice" for sustainable hand harvesting of *A. nodosum* in Kenmare River SAC (see Appendix 4).

(d) Harvesting of Invertebrates

No planned operations identified. Mitigation not required.

3.6.4. Vector potential of harvest activities in the spread of invasive species.

Risks:

Non-indigenous species previously reported in Kenmare Bay: Crustaceans: *Caprella mutica,* Molluscs: *Crepidula fornicate,* Seaweed: *Sargassum muticum*, Bryozoans: *Schizoporella errata:*

- ***Caprella mutica:*** Primarily a fouling organism that may associated with fish farms, aquaculture sites/structures, hulls or ships, recreational boats and artificial man-made objects, structures and materials. It has been reported to occur in inner Kenmare River SAC (ref: BIM and Dutch Shellfish Importers - Shellfish Associated Species Inventory (SASI) Surveys, 2018 to 2022). Spreads on hulls and potentially by rafting on drifting material including drifting algae. This application does not involve the harvesting of drift weed or free-drifting macroalgae. Measures are required avoid co-harvesting non-*A. nodosum* material and prevent inadvertent by-catch of other algae or dead, drifting material/algae, thus reducing the potential for interactions.
- ***Crepidula fornicata*:** There were accounts of specimens of *C. fornicata* in Kenmare (Killmakillogue) in the 1960s, however none were found in subsequent searches. The population may have been transient or may have been purged/died out due to the 1962/63 winter and frosts (ref: O'Rourke E and O'Flynn C, 2014).
- ***Sargassum muticum*:** An invasive seaweed that grows in semi-exposed areas, primarily in rock pools. This species is mainly reported in exposed or semi-exposed areas where *A. nodosum* does not grow. Reported sightings of *S. muticum* include: Loughaun Point, near Collorus Point (at 4 meters, interspersed with other algae such as Ulva, Saccharina latissimi, Chorda filum and a variety red and brown algae), Bull Point (Eyries), Castlecove / White strand Beach, West Cove, Rath Slip, (Caherdaniel), Rath Strand (Caherdaniel), Derrynane and one report of occurrence within inner Kenmare Bay (ref: https://biodiversityireland.ie/). As *S. muticum* does not thrive in highly sheltered areas within the *A. nodosum* zone, the likelihood of occurring post-harvest is very low. Measures are required to prevent harvesting of other non-*A. nodosum* material or other algae species such as *S. muticum*, should they occur, thus reducing the potential for interactions.
- ***Schizoporella errata:*** There has been a single reported occurrence of S. errata in Kenmare Bay (ref: https://biodiversityireland.ie/). S. errata fouls freely available hard substratum. This may include boat hulls, artificial underwater structures, piers, harbours and other coastal structures (ref: Global Invasive Species Database, 2024). Measures are required to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units) in the bay, thus reducing any potential spread of this species.

The probability of these species being spread by harvesting, harvester boats or nets/bags is reduced, as the Code of Practice has been developed to ensure that appropriate precautionary measures are in place, including measures to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units).

Other species not currently reported as present in Kenmare, but potentially requiring mitigation:

- ***Bonamia ostreae:*** Parasitic to the oyster *Ostrea edulis* (direct transmission). It has not been identified in Kenmare Bay. Measures are required to avoid non-*A. nodosum* habitats, thus reducing the potential for future interactions.

- ***Botrylloides violaceus:*** Associated with hard natural and artificial substrates, pontoons, shellfish beds, marine floating structures (e.g. those used for mussel culture), ropes and hulls and boats in marinas. Mainly found in submerged habitats. Can be found in habitats containing *Didemnum vexillum*. It has not been identified in Kenmare Bay. Measures are required to prevent interactions with aquaculture activities in the bay, thus reducing the future potential spread of this species.
- ***Crassostrea gigas:*** It has not been identified in Kenmare Bay. M Measures are required to prevent interactions with aquaculture activities in the bay, thus reducing the potential future spread of this species.
- ***Didemnum vexillum:*** an invasive species, can smother marine life. It has not been identified in Kenmare Bay. It has been reported in Malahide Marina, Carlingford Marina, Strangford Lough, Westport Bay, Galway Bay. It may be spread by boats and has also been reported to be associated with aquaculture units such as oyster bags on trestle installations. Measures are required to prevent interactions with aquaculture activities in the bay, thus reducing any potential future spread of this species.
- ***Perophora japonica:*** Can occur on artificial substrata in harbours and marinas and under boulders and stones on the lower shore in sheltered, silty areas. It has not been identified in Kenmare Bay. Colonies were identified at Annagh Island in southern Clew Bay on the lower shore under boulders & on Fucus serratus (ref: Minchin D et al., 2016). As measures are already in place to prevent disturbance to rocky substratum, the likelihood of potential future interactions with P. japonica are very low. Measures are required to prevent harvesting of other species such as F. serratus, thus reducing the potential for future interactions to occur.
- ***Spartina anglica:*** Some species of cordgrass are considered as invasive species in Ireland. *S. anglica* species of cordgrass is relatively new having formed by hybridization of S. alterniflora and S. maritima approximately 100 years ago (Stokes K, O'Neill K, McDonald RA (2006)). It has not been identified in Kenmare Bay. However, the target is that this species should remain absent sent from Kenmare River SAC (NPWS 2013B).
- ***Styela clava*****:** Club tunicate, leathery tunicate, fouls ship hulls and aquaculture infrastructure. Can be found in shallow water on hard surfaces, occurs in warm sheltered waters, docks and harbour installations (ref: https://invasives.ie/ and https://www.marlin.ac.uk/). It does not occur in Kenmare River SAC. However, it has been reported in Dun Laoghaire Marina; North Channel, Cork Harbour; Marloge Marina, Cork Harbour; Crosshaven Pier, Cork harbour, Clew Bay; Roaring Water Bay longlines; Whiddy Island, Bantry Bay; Dingle Marina; Fenit Marina; Mulroy Bay; Glenarm Marina; Larne Lough; Carrickfergus Marina, Belfast Lough. While *S. clava* can occur in sheltered areas, it is a low tidal to subtidal species; therefore the potential overlap with *A. nodosum* is likely to be very low.

The probability of these species being introduced or spread by harvesting, harvester boats or nets/bags is low, as they are not currently identified as present in Kenmare Bay. The Code of Practice has also been developed to ensure that appropriate precautionary measures are in place to prevent the spread of invasive species into the future, including measures to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units).

Mitigation:

To ensure that harvest activities to not act as a vector and lead to the spread of the invasive species, such as, *Bonamia ostreae, Botrylloides violaceus, Caprella mutica, Crassostrea gigas, Crepidula fornicate, Didemnum vexillum, Perophora japonica, Sargassum muticum, Spartina anglica, Schizoporella errata* and *Styela clava,* BioAtlantis will ensure the following:

- Boats will be painted once a year with appropriate anti-fouling paint.
- Harvesting will be limited to the *A. nodosum* zone.
- The harvesters boats will not leave Kenmare River SAC. In the rare case that they do leave Kenmare River SAC, harvesters are required to implement a cleaning measure on land which will involve cleaning with appropriate cleaning agents or using other suitable methods.
- All bags/nets must be cleaned with appropriate cleaning agents or other suitable methods on delivery to production facilities and returned to harvesters in a clean condition.
- Nets/bags used in Kenmare River SAC will not be used to collect seaweed outside this SAC.
- Harvesting will be limited to the *A. nodosum* zone and will not take place in subtidal areas, exposed or semi-exposed sites.
- Harvesters must keep distance from aquaculture units to prevent the spread of any species that may be associated with artificial structures.
- Harvesters will prevent disturbance to rocky substratum, will avoid co-harvesting non-*A. nodosum* material and will ensure that inadvertent by-catch of other Animalia, algae or dead, drifting material/algae will be prevented and minimized.

3.6.5. Holistic examination, cumulative & in-combination effects and continuous disturbance levels.

Tables 6 and 7 summarise the potential in combination and cumulative effects of harvesting on marine community types, Annex I and II species & habitats. The numbers of operations impacting on each area are indicated, as determined in Appendix 7. The use of mitigation to ensure that areas continually affected by harvest does not exceed 15%, is indicated. Figures of 0% are assigned for areas where *A. nodosum* does not grow or areas specifically avoided due to their sensitive nature.

Table 6: Potential in-combination & cumulative effects with marine community types in Kenmare River SAC

Key: "*No. risks", refers to the no. of different types of risks identified in the assessment in Appendix 7. Individual risks & mitigation measures are summarised in section 3.6.2.

Marine community types	Total Area in Kenmare River SAC		Area affected by harvest activities/ annum			Area of Large Shallow Inlets & Bays [1160] affected/ annum	Potential in-combination effects				Do mitigation measures prevent in-combination effects? (Y/N)
							Existing Operations		Planned Operations		
	m^2	Ha	m^2	Ha	(%)	(%)	Type	No. of risks	Type	No. of risks	
Zostera Community.	1451621	145.2	0	0	0%	0	0	0	0	0	n/a
Shingle.	14239	1.4	0	0	0%	0	0	0	0	0	n/a
Maerl Dominated community.	2523260	252.3	0	0	0%	0	0	0	0	0	n/a
Laminaria-dominated community complex.	36782752	3678.3	0	0	0%	0	0	0	0	0	n/a
Intertidal reef community complex.	6802856	680.3	275652.4	27.57	4.05%	0.07%	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	2 2 0 1	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	2 1 0 0	Yes. For list of risks and mitigation measures, see: • Section 3.6.2 and 3.6.3. • Appendix 4.
Intertidal mobile sand community complex.	636507	63.7	0	0	0%	0%	0	0	0	0	n/a
Muddy fine sands dominated by polychaetes and Amphiura filiformis community complex.	209321835	20932.2	36232.04	3.62	0.017%	0.009%	0	0	0	0	n/a
Fine to medium sand with crustaceans and polychaetes community complex.	19953464.32	1995.3	0	0	0%	0%	0	0	0	0	n/a
Coarse sediment dominated by polychaetes community complex.	83342197	8334.2	0	0	0%	0%	0	0	0	0	n/a
Pachycerianthus multiplicatus community	75554.2	7.5	0	0	0%	0%	0	0	0	0	n/a

Marine community types	Total Area in Kenmare River SAC		Area affected by harvest activities/ annum			Area of Large Shallow Inlets & Bays [1160] affected/ annum	Potential in-combination effects				Do mitigation measures prevent in-combination effects? (Y/N)
							Existing Operations		Planned Operations		
	m^2	Ha	m^2	Ha	(%)	(%)	Type	No. of risks	Type	No. of risks	
Subtidal reef with echinoderms and faunal turf community complex	48375228.1	4837.4	0	0	0%	0%	0	0	0	0	n/a

Table 7: Potential in-combination and cumulative effects with Annex II Species & birds.

Key: "*No. risks", refers to the no. of different types of risks identified in the assessment in Appendix 7. Individual risks and mitigation measures are summarised in section 3.6.2.

(a) Summary of interactions with Annex I & II Species in Kenmare River SAC

Key: "*No. risks", refers to the number of different types of risks identified in Appendix 7. See Section 2(b) & 2(c) of this Appendix 7 for a summary of risks and mitigation measures. See Section 3 of Appendix 7 for detailed assessment of all potential interactions, in combination effects and cumulative effects.

Species	Potential in-combination effects identified				Mitigation measures
	Existing Operations		Planned Operations		Do measures prevent in-combination effects? (Y/N)
	Type	No. of risks	Type	No. of risks	
Harbour seals	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	2 1 1 0	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	2 0 1 0	Yes. For a list of risks and mitigation measures, see: • Section 3.6.2 and 3.6.3. • Appendix 4, "Codes of Practice".
Protected bird species	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	2 1 1 0	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	2 0 1 0	Yes. For a list of risks and mitigation measures, see: • Section 3.6.2 and 3.6.3. • Appendix 4, "Codes of Practice".
Otter	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	2 1 1 0	• Recreation & Tourism • Seaweed harvest activities • Aquaculture • Invertebrate harvesting	1 1 1 0	Yes. For a list of risks and mitigation measures, see: • Section 3.6.2 and 3.6.3. • Appendix 4, "Codes of Practice".

Table 8: Broad examination of impacts of harvesting, potential in combination effects and continuous disturbance.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
1	**Continuous disturbance limit for marine community types (<15%)**	• Zostera complex • Maerl Dominated complex • *P. multiplicatus* complex • Intertidal mobile sand complex • Muddy fine sands complex • Fine to medium sand complex • Coarse sediment complex • Shingle complex • Reef • *Laminaria*	Continuous disturbance of each community type should not exceed an approximate area of 15% (NPWS 2013A, pg. 16)	B/P B/P B/P B/P B/P B/P B/P B/P B/P B/P	1 1 1 1 1 1 1 1 2 1	5 5 5 5 5 5 5 5 5 5	5 5 5 5 5 5 5 5 10 5	L L L L L L L L M L	Hand harvesting can only take place within the licence area to ensure that the marine community type areas affected by harvest activities/ annum does not exceed 15%. Maximum areas potentially affected per annum are well below the 15% limit for structure and function measures used for assessing conservation status. Maximum Annual areas affected: •Intertidal reef community complex: 4.05% per annum. •Muddy fine sands dominated by polychaetes and *A. filiformis* community complex: 0.017% (area affected per annum is likely to be zero, as environmentally safe navigation techniques will be employed to prevent interactions with this community complex). Area of Large Shallow Inlets & Bays [1160] affected/annum •Intertidal reef community complex: 0.07% per annum. •Muddy fine sands dominated by polychaetes and *A. filiformis* community complex: 0.009% per annum.	• Any activities taking place outside the licensed area.	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs. • Site Inspection Form (SIF) etc.	Resource Manager QC	Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management are aware of the non-conformance. (c) Review communication system.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements
2	**The spatial extent of harvesting techniques and activities:** Management of expansive and prolonged operations.	Entire SAC	Protection of Kenmare River SAC.	B	2	5	10	M	• Activities are planned in advance. • Site-specific management approach: Harvest locations, pick-up points, quantities, quality measures & personnel involved are recorded on a daily basis. See "Code of Practise"	• Any unplanned activities taking place without approval by BioAtlantis. • Any activity at inappropriate sites. • GRNs or SIFs, etc, not been filled out correctly	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs and SIFs, etc. cross checking the appropriateness of	Resource Manager QC	Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
									for details (Appendix 4).		locations.			(c) Review communication system. (d) Harvester is provided with training if necessary.	
3	**The spatial extent of harvesting techniques and activities:** Number of personnel and exploitation levels.	Entire SAC	Protection of Kenmare River SAC.	B	2	5	10	M	• Activities are planned in advance. • Site-specific management approach: Harvest locations, pick-up points, quantities, quality measures & personnel involved are recorded on a daily basis. See "Code of Practise" for details (Appendix 4).	• Any unplanned activities taking place without approval by BioAtlantis. • Any activity at inappropriate sites. • Too many people on-site. • Excessive harvest levels • GRNs, etc not been filled out correctly	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs, etc, cross checking the appropriateness of locations.	Resource Manager QC	Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements
4	**The potential interaction effects of seaweed harvesting:** Targeted removal of species (*A. nodosum*)	Intertidal zone	Protection of Kenmare River SAC.	B	2	5	10	M	*As per Table 4 (Ascophyllum nodosum)*						
5	**The potential interaction effects of seaweed harvesting:** Non-Targeted removal of species (e.g. *Fucus*, periwinkles, limpets, amphipods, isopods)	Intertidal zone	Protection of Kenmare River SAC.	B P	2 2	5 5	10 10	M M	*A. nodosum* will be harvested in a sustainable manner (see Appendix 4 for Code of Practice). A system is in place which ensures that: •Harvest of *Fucus sp.* above limit is not accepted. •Severe reductions in canopy coverage will not occur, thus ensuring sufficient habitat for active feeding stages and reproductive purposes of *Animalia* such as periwinkles. •*A. nodosum* mortality will not occur at levels which otherwise could lead to reductions in habitat for *Animalia*. •By-catch: *Animalia* observed post-harbours will be returned to	Non-conformance at any stage of harvest or management.	1) Harvest activities will be assessed for compliance at all levels including: • Hand-Harvesting training records. • Goods received notes (GRNs), etc. • Site Inspection Forms (SIFs), etc.. 2) Monitoring: • Mass of harvest. • Presence of *Fucus sp.* • Presence of holdfast. • Harvest technique at sites • Types of nets used	Resource Manager QC	Routinely during harvest periods & via quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix: Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)		Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
									the water, where possible.						
6	**Disturbance and displacement of species and habitats:** Reef	Intertidal zone	Protection of Kenmare River SAC.	B P	2 2	5 5	10 10	M M	*As per Table 4 (Ascophyllum nodosum)*						
7	**Disturbance and displacement of species & habitats:** Amphipods & isopods	Intertidal zone	Protection of Kenmare River SAC.	B P	2 2	5 5	10 10	M M	*As per 5 above*						
8	**Changes in community structure** (long term impacts in *A. nodosum* community structure as a whole)	Intertidal zone	Protection of Kenmare River SAC.	B	2	5	10	M	The Code of Practice (Appendix 4) requires that BioAtlantis assess the impact of *A. nodosum* harvesting over the life-time of the licence. Key features: • Measurement of rates of re-growth of *A. nodosum* and biodiversity.Experimental site: non-harvested Vs. harvested areas comparison. • Parameters measured: • *A. nodosum* biomass, *Fucus* plants, *Animalia*. • Species assessed: periwinkles, limpets, barnacles, red algae, green algae or other relevant species. • Assessments performed annually.	Annual assessment not being assessed according to plan.	• Assessment of annual scientific report, datasets and statistical analysis for quality and completeness. • Assessment of validity of any deviations from experimental design or measurements.	Scientific personnel	Annually	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that instructions by qualified scientific personnel, statisticians and other personnel are being adhered to.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
9	**Changes in hydrodynamics and water quality** (exacerbation of impacts of pollution and reduction in water quality; alterations to	Entire SAC	Protection of Kenmare River SAC.	B	1	5	5	L	• Hand harvest techniques employed along rocky shores will ensure that *A. nodosum* is severed between 200-300mm (8-12 inches) above point of contact with underlying substrate and that no more than 20% of the total available biomass from a	• *A. nodosum* harvest levels exceed agreed levels. • Harvesting in areas within 50m of sewage outfalls. • Monitoring quality of harvested seaweed.	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs, etc. • Site Inspection Forms (SIFs), etc.	Resource Manager QC	Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
	hydrodynamics)								site is harvested per annum. (see Appendix 4). • Harvest cannot occur within 50m of sewage outfalls • Senescing or decomposing seaweed will not be harvested.					(c) Review communication system. (d) Harvester is provided with training if necessary.	
10	**Potential disturbance of marine fauna.**	Intertidal zone	Protection of Kenmare River SAC.	B	1	5	5	L	• The code or practice (Appendix 4) requires: ➢ Harvest at low tide. ➢ Harvest sustainably. ➢ Use of suitable nets. ➢ Return by-catch, where possible.	• Harvest is not being performed sustainably according to the code of practice.	• Assess GRNs, etc. • Assess training records • Assess practices on-site (Site Inspection Forms, SIFs), etc.	QC	Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements
11	**Potential interactions with coastal habitats.** • Perennial vegetation of stony banks • Salt Marsh habitats • Sand dune habitats • Vegetated Sea Cliffs	Entire SAC	Protection of coastal habitats	B	1 1 1 na	5 5 5 na	5 5 5 na	L L L na	According to the Code of Practise (Appendix 4): • Avoid harvesting at the fringes of salt marshes. • Overharvesting cannot occur at levels which could reduce organic drift to levels which could impact on sand dune formation and other habitats.	• Harvest is not being performed sustainably according to the code of practice.	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs, etc.. • Assess practices on-site (Site Inspection Forms, SIFs), etc.	Resource Manager QC	Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements
12	**In combination effects with other harvesting activities** e.g. • Small-scale local harvesting for personal use, • Small companies using seaweed in cosmetic products, • Artisan foods containing seaweeds. • Hotels, health Spas seaweed baths, • "Seaweed Discovery	• Entire SAC	Protection of Kenmare River SAC.	B	1	5	5	L	• If unlicensed large-scale commercial harvesting is observed to occur, this will be recorded and advice will be sought from the relevant authorities on how to proceed. BioAtlantis will not harvest in such areas until *A. nodosum* has regenerated and will work to ensure that any harvesting is limited to 20% of the total available biomass per site per	• Quantities being removed exceed 1 tonne. • Other unlicensed companies continue their activities. • Harvesters not following the harvesting plan.	• Incidents are recorded on the Incident report Form (Appendix 3). This form is brought to the attention of BioAtlantis Management. • Record harvest location and pick-up	Resource Manager QC	Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b)Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary. (e) Seek advice will from the relevant	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
	Tours & Workshops" in Caherdaniel.								annum and continuous disturbance of each community type does not exceed the required limit. • Approach any commercial user having small requirements of ~1 tonnes per annum (e.g. hotels, health Spas), and assess potential for in-combination effects. • No harvest in Caherdaniel between July-Aug, thus avoiding interaction with seaweed tourism excursions during peak tourist season. • Do not harvest in areas where there are existing appurtenant rights or burdens in relation to the harvesting, gathering or removal of seaweed from the shore, without first obtaining permission from the person to which those rights belong. • Where Profit-à-Prendre rights to harvest seaweed are successfully registered with the PRAI, the harvesting plan must be adjusted to ensure that those individuals can continue to harvest *A. nodosum.*		points on GRN, etc. • Inspection of GRNS and SIFs, etc.			authorities on how to proceed.	
13	**In combination effects with Recreation, tourism, sport, growth and development** (Impacts on harbour seal and bird sites,	• Sensitive harbour seal and birds sites • Intertidal zone	Protection of Kenmare River SAC, in particular harbour seals, otters and protected bird species.	B P	2 2	5 5	10 10	M M	The Code of Practice (Appendix 4) requires: • No harvest at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year. • Ensure no disturbance or interaction with Otters in water or on shore.	• Non-compliance with code of practice in relation to harbour seals, birds and otters. • Unauthorized harvest at protected sites at sensitive times of year. • Unauthorized harvest at Dirreencallaugh,	• Record harvest location and pick-up points on GRNs, etc • Inspection of GRNs and SIFs, etc.	Resource Manager QC	Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
	anthropogenic disturbance).								• 50m avoidance of bases where equipment or vessels are manually introduced to water. • Avoidance of Dirreencallaugh, Sneem, Parknasilla, Derrynane, Eyeries or Dromquinna during peak tourist season. • As a general policy, hand harvesters will avoid sites where tourism, sport and recreation activities are observed to be taking place. This will be determined on a case-by-case basis. This includes seaweed foraging related tourism and food carnivals. • A range of other measures are outlined in the Code of Practice.	Sneem, Parknasilla, Derrynane, Eyeries or Dromquinna at peak tourist season.				(c) Review communication system. (d) Harvester is provided with training if necessary.	
14	**In combination effects with aquaculture activities** (impacts on harbour seals, birds, otters).	• Throughout SAC	Protection of Kenmare River SAC, in particular harbour seals, otters and protected bird species.	B	2	5	10	M	The Code of Practice (Appendix 4) requires: • No harvest at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year. This includes planned and existing aquaculture sites, e.g.oyster and mussels related aquaculture at Coongar Harbour, Killmakilloge and Ardgroom Harbour and potentially near Killaha East. • Ensure no disturbance or interaction with Otters in water or on shore. • Ensure adherence to environmentally safe navigation practices to prevent impacts on sensitive substratum areas (see Code of Practice). • Prevention of impacts on navigation routes or physical	• Non-compliance with code of practice in relation to harbour seals, birds and otters. • Unauthorized harvest at protected sites at sensitive times of year. • Harvesters do not maintain sufficient distance from aquaculture units.	• Record harvest location and pick-up points on GRNs, etc. • Inspection of GRNs and SIFs, etc. • Incident report forms	Resource Manager QC	Quarterly audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
									interaction with aquaculture units. • A range of other measures are outlined in the Code of Practice.						
15	**In combination effects with harvesting of invertebrates** (periwinkles, other invertebrates).	Intertidal zone	Protection of Kenmare River SAC,	B	2	5	10	M	The Code of Practice (Appendix 4) requires: • Sustainable harvesting to ensure maintenance of sufficient canopy coverage for periwinkles. • Avoidance of fronds with visible periwinkle eggs masses • Avoidance of *Fucus*, another habitats for periwinkles. • Environmentally safe navigation when operating mudflats and sandflat areas. • Ensure adherence to environmentally safe navigation practices to prevent impacts on sensitive substratum areas (see Code of Practice). • Use of harvesting methods that prevent co-harvesting of other species. • Return of inadvertent by-catch, where possible.	Harvest is not being performed sustainably according to the code of practice.	• Record harvest location and pick-up points on GRNs, etc • Inspection of GRNs and SIFs, etc. • Inspection of training records. • Incident report forms • On-site inspections	Resource Manager QC	Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training if necessary.	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.
16	**Invasive species** (spread of *Didemnum vexillum, Styela clava, S. anglica)*.	• Entire SAC	Protection of Kenmare River SAC	B	1	5	5	L	The Code of Practice (Appendix 4) requires: • Boats used to tow nets/bags will not leave Kenmare River SAC. In the rare case that they do leave Kenmare River SAC, harvesters are required to implement a cleaning measure on land which will involve cleaning with appropriate cleaning agents	Harvesters not adhering to cleaning procedures when leaving Kenmare River SAC. Nets/bags not being cleaned in production facilities. Unauthorized navigation.	• Check cleaning records in production facilities. • On-site inspections. • Incident report forms	Resource Manager QC	Quarterly audit Annual audit	Depending on the nature, source & extent of non-conformance, take the following steps: (a) Report non-conformance using Non-conformance Report Form (NCR, see Appendix 3). (b) Ensure that management instructions are being adhered to. (c) Review communication system. (d) Harvester is provided with training	Operations meeting/ Harvest Meeting. Annual Review of compliance requirements.

Kenmare River SAC														
No	RISK ASSESSMENT SUMMARY (see Section 4 of this document for further details)								CONTROL MEASURES (if applicable)	MONITORING				CORRECTIVE ACTIONS	
	Species/ Habitats	Distribution, extent & location	Compliance requirements: (in accordance with EU Dir. 92/43/EEC & NPWS)	Decision matrix						Action Limit / non-conformance	Analytical Procedure	By	Monitoring Schedule (Frequency)	Corrective Action	Verification
				Hazard (Bio,Chem,Phy)	Probability	Severity	Risk	Hazard level (L=Low, M=Med, H=High)							
									or using other suitable methods. • Nets used in Kenmare Bay will not be used to collect seaweed outside this SAC. • All nets/bags must be cleaned with appropriate cleaning agents or using other suitable methods on delivery to production facilities and returned to harvesters in a clean condition. • Harvesting will be limited to the *A. nodosum* zone and will not take place in subtidal areas, exposed or semi-exposed sites. • Harvesters will keep distance from aquaculture units to prevent the spread of any species that may be associated with artificial structures.					if necessary.	

3.6.6. The conservation status of marine Annex I habitats in Kenmare River SAC.

A national conservation assessment indicates that Large shallow inlets and bays [1160] in Ireland is classified as 'unfavourable-bad' (Scally et al., 2020). The 'area' conservation attribute is classified as 'favourable', while 'structure & functions' and 'future prospects' are considered as 'unfavourable-bad' and 'unfavourable-inadequate' respectively. For Kenmare River SAC, Large shallow inlets and bays [1160] is categorized as 'favourable' in terms of Area, 'unfavourable-bad' for two attributes: 'future prospects' and 'overall site assessment' and 'unfavourable-inadequate' for 'structure & functions'. In their report, Scally et al., (2020) assessed the status of community distribution in Large shallow inlets and bays in Kenmare River SAC. Their study included an assessment of the following Sediment Marine Community Types: (a) Intertidal mobile sand community complex, (b) Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex, (c) Fine to medium sand with crustaceans and polychaetes community complex and (d) Coarse sediment dominated by polychaetes community complex. The study also included The following Reef Marine Community Types: (a) Intertidal reef community complex, (b) Laminaria-dominated community complex and (c) Subtidal reef with echinoderms and faunal turf community complex. The main explanation for the failure of Large shallow inlets and bays [1160] to achieve Favourable conservation status is the significant change recorded in the Area and Structure & functions of keystone communities which are characterized by sensitive indicator species. In Kenmare River SAC, minor increases in the habitat for the sensitive indicator species, *Pachycerianthus multiplicatus,* was recorded. However, these increases are considered to be the result of increased survey effort rather than an increase in species distribution (Scally et al., 2020).

The conservation status of Reef in Kenmare River SAC (where *A. nodosum* harvesting will primarily take place) has been assessed as 'favourable' in terms of area, structure & functions, future prospects and the overall site assessment. Reef Marine Community Types sampled within Kenmare River SAC which led to the 'favourable' status designation include: (i) Intertidal reef community complex, (ii) Laminaria-dominated community complex and (iii) Subtidal reef with echinoderms and faunal turf community complex (Scally et al., 2020). The conservation assessment undertaken for habitats (a) Reefs [1170] and (b) Submerged or partially submerged sea caves [8330] concludes that both habitats are 'favourable' in terms of area, structure & functions, future prospects and the overall site assessment. At a national level, the conservation status of Reef in Ireland has been assessed as 'Favourable' in terms of Area, Structure and function, future prospects. This includes both inshore and offshore reef areas (Scally et al., 2020).

As outlined in Section 4 of this document, measures are in place to ensure that the conservation status of Annex I habitats in Kenmare River SAC are maintained, encompassing the following major categories where relevant:
(1) Sandbanks which are slightly covered by sea water all the time [1110]

(2) Estuaries [1130]
(3) Mudflats and sandflats not covered by seawater at low tide [1140]
(4) Reefs [1170]
(5) Submerged or partially submerged sea caves [8330].
(6) Large shallow inlets and bays [1160]

Harvesting will not take place in areas categorized as unfavourable. While Estuaries [1130] are considered as 'favourable' at national level in terms areas, mitigation measures are in place to ensure that harvesting does not negatively impact on these areas. Mudflats and sandflats not covered by seawater at low tide [1140] are considered as being in Unfavourable-Inadequate condition on a national level. Harvesting will not take place in this habitat and measures are in place to ensure mudflats and sandflats are unaffected when travelling to and from sites (see Appendix 4 and 5). While 'submerged or partially submerged sea caves' [8330] and 'Sandbanks which are slightly covered by sea water all the time [1110]' are in favourable condition, harvesting will not take place in these areas.

In Kenmare River SAC, Large shallow inlets and bays [1160] is a broad category with 6 attributes encompassing 11 habitats/community types: (a) Zostera dominated communities, (b) Maërl dominated communities, (c) *Pachycerianthusn multiplicatus* community, (d) Intertidal mobile sand community complex; (e) Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex; (f) Fine to medium sand with crustaceans and polychaetes community complex; (g) Coarse sediment dominated by polychaetes community complex; (h) Shingle; (i) Intertidal reef community complex; (j) Subtidal reef with echinoderms and faunal turf community complex (k) *Laminaria*-dominated community complex. *A. nodosum* harvesting will not take place in areas where *Pachycerianthus multiplicatus* grows (depth range: 10 - 130 m). In addition, *A. nodosum* harvesting will not take place in soft substratum areas (intertidal and subtidal mud/sandy mud areas) and mitigation measures are in place to ensure they are unaffected during travel to and from harvesting sites. Other measures are in place to ensure that these habitats/community types are unaffected by harvesting (Section 4 of this document).

Reef represents a subcategory of Large shallow inlets and bays [1160] whilst also forming a stand-alone Annex 1 habitat category (Reef [1170]). According to Scally et al. (2020), Reef [1170] in Ireland and in Kenmare River SAC is categorized as being in a 'favourable conservation' condition. This includes intertidal and subtidal reef areas. *A. nodosum* harvesting will take place in intertidal reef areas, subject to close compliance with mitigation measures listed in Appendix 4 of this application. This will ensure that Reef [1170] is maintained in favourable conservation condition in terms of area, structure and function and future prospects.

The percentage of Intertidal reef community complex and Muddy fine sands dominated by polychaetes & *A. filiformis* community complex, which are Marine Community Types of the Annex I habitat, Large shallow Inlets and Bays [1160], that will be impacted each year is very low. The overall area of Large shallow inlets and bays [1160] in Kenmare River SAC is 39322.3 hectares (https://eunis.eea.europa.eu/sites/IE0002158). The percentage of Intertidal reef community complex to be impacted annually is 0.07% of this area, while percentage of

Muddy fine sands dominated by polychaetes & *A. filiformis* community complex potentially impacted annually is 0.009%. The spatial overlap with shingle habitat is 0%. The evidence from the literature suggests that the potential for effects to arise as a result of sustainable hand harvesting of *A. nodosum*, are limited. For example, Kelly et al., 2001, shows that *A. nodosum* regenerates 11 to 17 months post harvesting. Kelly et al., 2001, also demonstrates that there are no impacts of harvesting on overall biodiversity, mobile epifauna and fish 11 to 17 months post-harvesting. A study by Lauzon-Guay et al., 2023, shows that harvest of *A. nodosum* (at sites with a 20 + year history of commercial harvesting) does not have long-term impact on the morphology of the algae or on the abundance of its main inhabitants. Therefore, it is considered unlikely that sustainable hand harvesting of *Ascophyllum nodosum* would give rise to any no further effects on Large Shallow Inlets and Bays [1160] in Kenmare River SAC. However, mitigation measures are in place to ensure that no further effects occur, particularly areas where harvesting will take place such as reef areas.

3.6.7. Potential pressures on the marine environment.

An independent expert group recently issued a report which identified a range of potential pressures in Ireland's marine environment resulting from human activities (See Marine Protected Area Advisory Group, 2020 and references therein). Based on the information provided in this report, an additional analysis was undertaken (Section 4 of this document) to identify and mitigate against any potential effects of *A. nodosum* harvesting on the marine environment. The potential for interactions, in combination effects and cumulative effects (due to *A. nodosum* harvesting and other human activities), were also assessed and mitigation measures put in place where required (see Appendix 7).

3.6.8. Ensuring recovery of harvested areas.

The potential for cumulative and in combination impacts are outlined in this application. This includes impacts associated with planned and existing activities such as seaweed harvesting. The proposed harvest levels in this application are considered sustainable and measures are in place to ensure that sites have recovered before harvesting takes place again.

In terms of fallowing periods, data will be entered in the harvesting database. BioAtlantis will harvest a maximum of 20% of the total available *A. nodosum* biomass per site per annum to ensure sustainability. The figure of 20% refers to the percentage of the total available biomass harvested per site per annum (the Maximum Annual Harvest). This is outlined in Section 2.3.3, of the Assessment of Impacts of the Maritime Usage (AIMU) Report, under "Planning & scheduling of harvesting activities". If quota is exceeded, the Resource Manager will issue a Non-Conformance Report (NRC) to BioAtlantis management. Harvesters will be provided with training if necessary.

There will be no impact on the biodiversity in the area, due to hand harvesting activities. Provided that harvesting programmes are designed to allow for sufficient periods of regeneration, hand-harvesting of *A. nodosum* has an almost negligible impact on levels of cover and biodiversity. *A. nodosum* has been hand-harvested at low tide in Ireland for

decades, with studies showing no impact on overall biodiversity, mobile epifauna and fish (Kelly et al., 2001). Environmental impact assessments in the west of Ireland have demonstrated almost complete recovery of *A. nodosum* cover 11 to 17 months post-harvest (Kelly L. *et al.,* 2001). A study by Lauzon-Guay et al., 2023, shows that harvest of *A. nodosum* (at sites with a 20 + year history of commercial harvesting) does not have long-term impact on the morphology of the algae or on the abundance of its main inhabitants. BioAtlantis will incorporate known rates of *A. nodosum* growth and recovery in the west of Ireland into a broader system of harvesting, based primarily with sustainability in mind. Central to this approach will be a harvesting methodology which is minimally invasive and ensures rapid recovery and re-growth of *A. nodosum* post-harvest.

As *A. nodosum* biomass can potentially recover within 11 to 17 months (Kelly et al., 2002), it may be possible therefore to harvest year on year in certain locations; however this is subject to recovery being achieved. As outlined in this application, measures will be put in place to ensure that harvesting does not take place if a site has not recovered from the previous year, thus preventing cumulative effects from occurring. BioAtlantis will be required to verify that each site has fully recovered prior to re-harvesting. This will be done via on-site assessments and updating the plan as necessary with the results of this analysis. Cumulative effects will therefore be very limited

As outlined in this application, harvesting will not take place in areas with existing appurtenant rights/burdens in relation to seaweed, without first obtaining permission from the person to whom those rights belong. Where Profit-à-Prendre harvesting rights are successfully registered with the Property Registration Authority of Ireland (PRAI), the harvesting plans must be adjusted to ensure that those individuals can continue to harvest *A. nodosum*. It is envisaged that a clause may be inserted into the licence issued to allow the harvesting of *A. nodosum*, stating that if a Profit-à-Prendre right holder provides sufficient proof to their right, the licensee would be prohibited from harvesting in that area, without first obtaining permission from the owner of such rights. If unlicensed large-scale commercial harvesting is observed to occur, this will be recorded and advice will be sought from the relevant authorities on how to proceed. The Resource Manager will routinely inspect sites post-harvest to ensure compliance of harvesters with sustainable hand harvest methods. Harvest will be recorded using BioAtlantis Compliance and Record Forms. The measures outlined above ensure the recovery of harvest areas and prevention of cumulative impacts with unlicensed harvesting, particularly in relation to appurtenant rights/burdens and Profit-à-Prendre rights.

This application is compatible with biodiversity policies, as harvesting will be undertaken sustainably and with ecological monitoring. BioAtlantis will implement a sustainable approach which requires that 200-300mm (8-12 inches) of *A. nodosum* material is left behind post-harvest. This approach will be minimally destructive to *A. nodosum* and other species within this biotope, thus allowing for shorter recovery periods post-harvest. Moreover, harvest will not exceed 20% of the available harvestable *A. nodosum* per site per annum, thus ensuring sustainability of harvesting year-on-year, and minimizing any potential impacts on this SAC. The harvesting system is based on good environmental practices and

management principals and is designed to prevent any significant effects on marine biodiversity.

BioAtlantis will also monitor potential changes in community structure to assess the potential impact of *A. nodosum* harvesting over the life-time of the licence. A pre-harvesting survey of an unharvested site will be undertaken to assess post-harvest recovery over the life-time of the licence. Parameters by which recovery will be assessed include: rates of re-growth of *A. nodosum*, biomass (Kg/m2) and numbers and/or density of *A. nodosum* plants per area. These measures ensure that recovery will be assessed over the lifetime of the license.

Control Measures: Measures are in place to ensure that hand harvesting activities are sustainable, do not directly or indirectly negatively impact on biodiversity, and that no cumulative or in-combination effects arise. In particular, the Code of Practice (Appendix 4) states the following:

When cutting *A. nodosum*, ensure that a minimum of 200mm (8 inches) of material is left behind. This limit will be inspected by the Resource Manager as it is essential in order to:
Avoid overharvesting or extensive removal of *A. nodosum* canopy coverage, which could otherwise lead to changes in community structure or biodiversity stasis or could impact the ecosystem in general, e.g. animals resident in the intertidal zone, coastal habitats, etc.

3.6.8. Conclusions of potential in-combination effects assessment

Table 6 and 7 summarise the type and number of potential in-combination effects which could arise through hand harvesting *A. nodosum*. As indicated, each type of potential interaction has been mitigated against in order to ensure that such interactions will not occur. On this basis, we conclude that sensitive areas of Kenmare River SAC will remain unchanged and continual disturbance will not exceed 15% required by NPWS. Risks and mitigation measures are described in the sections above and were initially identified as outlined in Appendix 7. Mitigation measures have been incorporated in the BioAtlantis “Code of Practice” (see Appendix 4). For further details on action limits, analytical procedures, monitoring and corrective actions associated with potential in cumulative and in combination effects, please see Table 8 and Section 4 of this document.

Action limits, analytical procedures, monitoring and corrective actions associated with potential in cumulative and in combination effects are outlined in please see Table 8 and Section 4 of this document.

4. Risk Analysis:

Overview: The section describes the scoring, decisions and results obtained during the risk analysis of *A. nodosum* harvesting in Kenmare River SAC. The sustainable hand harvesting system was developed on this basis.

Site Name: Kenmare River SAC (Cite Code: 2158).

Activity under assessment: Harvesting *A. nodosum*. Assessors: BioAtlantis Ltd.

Scope of current assessment:

a) Marine & Coastal species & habitats (as protected under Annex I & II of EU Habitats Directive 92/43/EEC).
b) Species & habitats of general interest.
c) *Ascophyllum nodosum* biotope and species therein.
d) Continuous disturbance
e) Broad, holistic examination of the nature, extent and impact of hand harvesting.
f) Existing Operations: potential in-combination effects and interactions.
g) Planned Operations: potential in-combination effects and interactions.
h) Invasive species

NOTE:

- For a summary of the findings of this risk analysis, please consult the tables Section 3 of this document.
- For more detailed analysis of risks associated with protected bird species, please consult Appendix 6.
- For more detailed analysis of risks associated with existing and planned operations, please consult Appendix 7.

Methodology employed:

The system outlined on the following page was used in determining which hazard(s) require control measures. Identification of control measures was based on a 5x5 risk analysis matrix. Risk scores are calculated on basis of probability of hazard occurring multiplied by severity by which the respective hazard imposes on the species/habitat under assessment. High risk hazards (i.e. ≥15) automatically require a Natura Impact Statement (NIS). In the event of moderate risks being identified, it was deemed necessary to assess whether or not an NIS was required, through working with independent environmental consultants.

Likelihood of Hazard Occurring:

1. Highly Improbable
2. Probable - annually
3. Infrequent - 2-3 times/year
4. Occasional - monthly
5. Frequent – weekly

Severity of Consequences:

1. Low
2. Low to moderate
3. Moderate
4. Moderate to high
5. High

Risk Rating = Probability x Severity

PROBABILITY \ SEVERITY	5	4	3	2	1
5	25	20	15	10	5
4	20	16	12	8	4
3	15	12	9	6	3
2	10	8	6	4	2
1	5	4	3	2	1

Risk Ratings are grouped into three categories

15 – 25: High risk, requiring mitigation measure;
8 - 12: Moderate risk, establish control procedures;
1 - 6: Low risk, establish control measures if appropriate.

Figure 1: Risk Calculation

Figure 2: Decision Tree

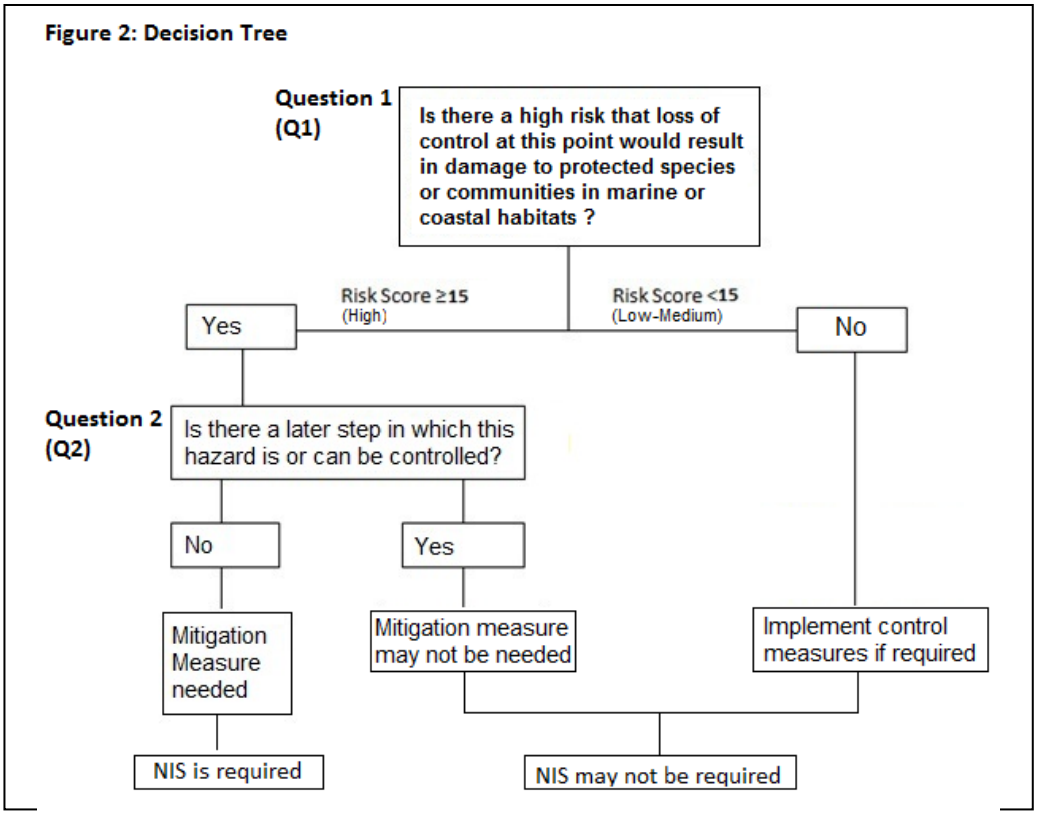

Figure 2 : Decision Tree

(a) Marine & Coastal species & habitats.

(1) Permanent habitat area

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species	Non-conformance with harvest procedures leading to inadvertent removal of habitats, (e.g. excessive removal of sand, shingle, stones, pebbles, rock, debris, holdfasts).	2	5	A	no	n/a	yes	• Harvesters are provided with training, where necessary, to ensure that no removal of permanent habitat occurs, i.e. ➢ No removal of excessive levels of sand, shingle, stone, pebbles, gravel, etc. ➢ No removal of *A. nodosum* holdfasts that could carry sand, shingle, stone. • Resource Manager will inspect the harvest on collection or during the washing bagging operation on the collection boat (if deemed applicable for the area). If excessive sand, shingle or debris etc is observed, the harvester will be provided with training. • Checks will be recorded on the Goods Received Notes (GRNs, See Appendix 3), or other formats by electronic or other means and/or at production facilities. • Production Operators will also inspect incoming harvested seaweed on production logsheets. The following will apply: ➢ If excessive levels of sand, shingle or debris is present in harvested weed: -Removal by sand filter and decanter and clarifier. -Harvester provided with training, where necessary. ➢ If stones or rocks are present: Harvester provided with training, where necessary. Non-conformance is reported, particularly in the serious event of *A. nodosum* holdfasts being present.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. (Anon, 1992) <u>Kenmare SAC:</u> Target 1 of Objective 1, NPWS, 2013A, page 17.

Chemical: Synthetic and naturally occurring substances, cleaning residues, oil/grease, fuel, etc.	Fuel oil leak from harvest recovery/collection boat caused by engine malfunction, fuel line rupture, etc. Non-conformance with procedures for storing and cleaning of boat.	1	3	A	no	n/a	yes	Routine maintenance of boat engine, etc Harvesters will be provided with training, where necessary, to ensure cleaning takes place in a manner which does not lead to wash off of cleaning agents into the environment, e.g. use of designated washing bays where available.	
Physical: Heat, cold, noise, vibration. Mechanical hazards, ionising radiation (e.g. X-rays) and non-ionising radiation (e.g. microwaves), solar radiation. Presence of foreign matter (rubber, plastic, sand, stones, glass, metal, organic material)	Debris from the boat may inadvertently be deposited into the environment. This may have negative consequences when trapped between seaweed and rocks or when present alongside senescing or decomposing seaweed.	1	3	A	no	n/a	yes	Appropriate removal of rubbish, debris or other foreign matter when ashore.	

Hazard	Probability	Severity	Reason for Decision
Biological	**2**		Likelihood of sand and rocks being removed along with harvested *A. nodosum* is low. Given that such materials may damage production equipment and end product, harvesters will be required to ensure such materials are not included in the bags/nets. The collection of bags/nets at high tide or as high tide approaches also reduces the likelihood of excessive levels of sand or other material being removed from the foreshore. In addition, *A. nodosum* will be harvested no less than 200mm above the holdfast. This reduces the likelihood of holdfasts being removed, which could otherwise, inadvertently lead to removal of attached pebbles or stones (see Appendix 4 for Code of Practise).
		5	In accordance with EU Dir. 92/43/EEC & NPWS, areas must be maintained at favourable conservation conditions to ensure stability of the permanent habitat area (Ref: Target 1 of Obj. 1, NPWS, 2013A, pg. 17). Removal of habitat may contravene this directive (e.g. removal of excessive levels of sand or rock).
Chemical	**1**		It is highly improbable that a chemical hazard will occur given that no chemicals will be carried on board of boats, except for standard cleaning and hygiene equipment.
		3	Severity associated with chemical hazards coming in contact with the permanent habitat of Kenmare River SAC could be significant, particularly to marine life which are sensitive to chemical toxins and could contravene Target 1 of Objective 1, NPWS, 2013A, page 17.
Physical / Biological	**1**		It is highly improbable that debris will inadvertently be deposited into the environment, as harvesters will be provided with training, where necessary, in general hygiene best practises and means of disposing of general and mechanical waste associated with boats. This application does not give rise to pressures due to noise, underwater noise and vibration.
		3	Litter in the form of drinks containers, lids, lighters and plastic bags have been reported at two sites at the inner reaches of Kenmare River SAC (Coastwatch, 2015). Severity associated with physical waste is potentially significant as it could lead to damage to the permanent habitat area. A report by

			An Taisce, on behalf of Irish Business Against Litter (IBAL), highlighted other marine areas whereby "much of the water-based litter was trapped in the seaweed and in the rock" (reported by ref: Connolly E, 2018). Similar findings have been reported in subsequent surveys and reports (IBAL coastal survey, 2021; An Taisce, 2019). Litter is also reported along Irish coasts as present in the vicinity of the tideline, splashzone and seaweed (Coastwatch, 2019). Given that seaweeds and plastic debris can potentially influence the survival of faecal indicator organisms (Quilliam et al., 2014), it is possible that plastic in combination with the storm cast seaweed may give rise to biological hazards in the form of increased levels of pathogenic bacteria. The association of seaweed flies in the presence of decaying seaweed beds may also facilitate environmental survival and transmission of pathogens such as *E. coli* (Swinscoe, 2018).

(2) Zostera Seagrass (and associated communities).

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required. .
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Regulatory Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species (i.e. Zostera Seagrass and associated communities).	Unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS Kenmare SAC: Targets 2-3 of Obj.1, NPWS, 2013A, pg:17,18
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is highly improbable that the distribution, abundance, diversity or area occupied by Zostera Seagrass (and associated communities) will be altered due to harvesting of *A. nodosum* given that: (a) these areas and communities occur at depths ≥2m and exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested and (b) the mud, muddy sand to coarse sand substrate supporting Zostera growth are insufficient to support *A. nodosum* and thus, will not be affected by harvest activities.
		5	EU Dir. 92/43/EEC & NPWS, requires maintenance of the extent and conservation of the high quality of Zostera Seagrass and associated communities (Ref: Targets 2-3 of Objective 1, NPWS, 2013A, pages 17, 18). Harvest activities in these areas could significantly damage these areas.
Chemical /Physical			n/a
			n/a

(3) Maerl Dominated communities

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species (i.e. Maerl Dominated communities)	Unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS Kenmare SAC: Targets 2 & 4 of Obj.1, NPWS, 2013A, pg:17,18
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is highly improbable that the distribution, abundance, diversity or area occupied by maerl and associated communities will be altered due to harvesting of *A. nodosum* given that: (a) these areas and communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested and typically occurs at depths of ~5m and (b) the coarse, mixed, sandy mud and muddy sand sediment substrates which support maerl growth are insufficient to support *A. nodosum* and thus, will not be targeted for harvest activities.
		5	EU Dir. 92/43/EEC & NPWS, requires maintenance of the extent and conservation of the high quality of maerl dominated communities (Ref: Targets 2 &4 of Objective 1, NPWS, 2013A, pages 17, 18). Harvest activities in these areas could significantly damage maerl and associated communities
Chemical /Physical			n/a
			n/a

(4) *Pachycerianthus multiplicatus* community complex

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of or damage to beds of the tubicolous anemone *Pachycerianthus multiplicatus* (Fireworks Anemone), and associated species (e.g. *Cerianthus Llyodii* and *Peachia cylindrical)*	Unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Targets 2 & 5 of Obj.1, NPWS, 2013A, pg:17,18
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is highly improbable that the distribution, abundance, diversity or area occupied by *Pachycerianthus multiplicatus* and associated communities will be altered due to harvesting of *A. nodosum* given that: (a) these areas and communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested and typically occur at depths of ~15m and (b) the muddy sand sediment substrates which support *Pachycerianthus multiplicatus* growth are insufficient to support *A. nodosum* and thus, will not be targeted for harvest activities.
		5	EU Dir. 92/43/EEC & NPWS, requires maintenance of the extent and conservation of the high quality of the *Pachycerianthus multiplicatus* and associated community (Ref: Targets 2 & 5 of Objective 1, NPWS, 2013A, pages 17, 18). Harvest activities in these areas could significantly damage *Pachycerianthus multiplicatus* and associated communities.
Chemical /Physical			n/a
			n/a

(5) Polychaetes & *Amhiura filiformis* community complex (Muddy fine sand areas)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species or damage to associated substrate (i.e. muddy fine sand areas with *Polychaetes & Amhiura filiformis* community complex)	Unauthorized access to intertidal zone beyond muddy fine sand areas, during times of substrate exposure or vulnerability to damage by boats, e.g. low tide.	2	5	A	no	n/a	yes	• Ensure implementation of code of practice to ensure that: harvesters do not navigate to rocky shorelines beyond muddy fine sand areas, during periods of time when mud/sand is exposed or vulnerable to damage by boats (e.g. low tide; see Appendix 4). Particularly relevant at inner, north-east reaches of the site, Collorus to Bunaw, Ardgroom Harbour and parts of Sneem and Parknasilla. Access by boat to rocky shores located beyond these areas must be undertaken at high tide or when the tide has begun to recede.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Target 6 of Objective 1, NPWS, 2013A, page 19).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**2**		It is unlikely that the distribution, abundance, diversity or area of muddy fine sands dominated by *Polychaetes & Amhiura filiformis* community complex, will be significantly altered due to harvesting of *A. nodosum* given that: (a) the majority of this community complex predominates in deeper waters throughout the site, ranging from depths of 0m to 84m, and thus will be largely unaffected by activities, (b) the muddy fine sand areas containing these communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested, (c) muddy fine sand areas are insufficient to support growth of *A. nodosum* and thus, will not be targeted for harvest activities and (d) accessing rocky shorelines that lie beyond muddy fine sand areas at low tide in particular, is very difficult and will generally be avoided.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of the muddy fine sand areas with *Polychaetes & Amhiura filiformis* community complex (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19). Harvest activities in these areas could significantly damage these community complexes.
Chemical /Physical			n/a
			n/a

(6) Crustaceans and polychaetes community complex (fine-medium sand)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species or damage to associated substrate (i.e. Crustaceans and polychaetes community complex; fine-medium sand)	Unauthorized access to intertidal zone beyond these protected areas during times of substrate exposure or vulnerability to damage by boats, e.g. low tide.	1	5	A	no	n/a	yes	• Ensure implementation of Code of Practice to ensure that boat contact with coastal areas is minimal, thus ensuring no damage is inflicted to either boats or the underlying habitat. Harvesters are required to approach the shore at slow pace so as to minimize contact with fine-medium sand which may occur in proximity to the intertidal *A. nodosum* zone during periods of time when substrate is exposed (e.g. low tide). Particularly relevant in areas where fine-medium sand occur in close proximity to intertidal reef areas, e.g. the complex mosaics of substrate in close proximity to (1) an area in Kilmackillogue Harbour located between Collorus Pt. and Laughaunacreen near Bunaw and (2) an area in the vicinity of Cove Harbour and Castlecove, (3) North Allihies to Coomeen and (4) just west of Garnish Island. The complex mosaic in Derrynane will be avoided all year round as this is part of the Iveragh Peninsula SPA [004154].	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Target 6 of Objective 1, NPWS, 2013A, page 19).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		The probability of Crustaceans and polychaetes community complex and their habitat (clean, fine sand area) being altered due to harvest activities are relatively low given that: (a) a large proportion of this community complex predominates in deeper waters (0-42m), most often beyond the *Laminaria* zone and beyond the intertidal zone, and thus will be largely unaffected by activities. (b) the fine medium sand areas containing exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested,. (c) fine-medium sand areas are insufficient to support growth of *A. nodosum* and thus, will not be targeted for harvest activities. (d) accessing rocky shorelines that lie beyond fine-medium sand areas at low tide in particular, is very difficult and will generally be avoided.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of polychaetes community complex and associated fine-medium sand areas (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19). Harvest activities in these areas could significantly damage these community complexes.

Chemical /Physical			n/a
			n/a

(7) Polychaetes community complex (coarse sediment)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Damage to or removal of habitat required by *Polychaetes* community complex in coarse sediment areas	Unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	• Harvest will not occur in these areas.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Target 6 of Objective 1, NPWS, 2013A, page 19).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		The probability of *Polychaetes* community complex and their habitat (coarse sediment areas) being altered due to harvest activities is low given that: (a) this community complex occurs in deeper waters (4-68m), beyond the intertidal *A. nodosum* zone. (b) *A. nodosum* does not grow on this sediment, and therefore will not be subjected to harvest activities. (c) this habitat exhibits little overlap with the rocky shorelines where *A. nodosum* grows.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of polychaetes community complex and associated coarse sediment areas (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19). Harvest activities in these areas could significantly damage these community complexes and/or their habitat.
Chemical : none identified			n/a
			n/a
Physical:			n/a
			n/a

(8) Polychaetes and oligochaete species (Estuarine mud)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species or damage to associated substrate (i.e. Polychaetes and oligochaete in Estuarine mud).	Unauthorized access to intertidal zone beyond these protected areas during times of substrate exposure or vulnerability to damage by boats, e.g. low tide.	2	5	A	no	n/a	yes	• Ensure implementation of Code of Practice to ensure that harvesters do not to navigate at low tide to rocky shorelines located beyond estuarine mud areas during periods of time when substrate is exposed or vulnerable to damage by boats (e.g. low tide; see Appendix 4). Particularly relevant in areas where estuarine mud occur in close proximity to intertidal reef areas, e.g. River Sneem and River Blackwater. Access by boat to rocky shores located beyond these areas must be undertaken at high tide or when the tide has begun to recede.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: (page 13, NPWS, 2013A).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**2**		The probability of Polychaetes and oligochaete and their habitat (estuarine mud) being altered due to harvest activities are relatively low given that estuarine mud is largely insufficient to support growth of *A. nodosum* and thus, will not be targeted directly for harvest activities.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important component of Kenmare River SAC.

Chemical /Physical			n/a
			n/a

(9) Intertidal mobile sand community complex

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species or damage to associated substrate.	Unauthorized access to sandy beaches.	1	5	A	no	n/a	yes	• According to the Code of Practice, harvesting will not occur on clean, sandy beaches, thus preventing any impact on this habitat.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: (page 19, NPWS, 2013A).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		*A. nodosum* does not grow in clean fine sand areas such Derrynane Bay, Rossdohan, Leaghillaun.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of this habitats (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19). Harvest activities in these areas could significantly damage these community complexes and/or their habitat.

Chemical /Physical			n/a
			n/a

(10) Shingle (pebbles and gravel)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species (i.e. Shingle (pebbles and gravel)	• Potential removal of small quantities of stones, pebbles, gravel, rocks, etc. • Small, stony, friable substrate may occur in some locations.	1	5	A	no	n/a	yes	A system is in place which ensures that: • Hand harvest techniques employed in the vicinity of shingle areas will ensure that *A. nodosum* is severed above point of contact with underlying substrate. See "Code of Practise" for details (Appendix 4). • Levels of disturbance or displacement that could give rise to presence of shingle, friable substrate and/or associated holdfast material, will be monitored and recorded via 'Goods received Notes' (GRN), or other formats by electronic or other means and/or at production facilities. • Sites will be inspected post-harvest to check the sustainability of the methods employed and the harvest locations using the Site Inspection Form, SIF (Appendix 3) or other suitable format by electronic or other means.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Target 6 of Objective 1, NPWS, 2013A, page 19).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Disruption or disturbance of shingle.	• Impact by boats • Disturbance or displacement may occur with inappropriate technique, lack of training or oversight	1	5	A	no	n/a	yes	• A code of practice will be implemented to ensure that harvesters employ good boating practices, particularly when landing on shores (See Appendix 4). • Training provided to harvesters, where necessary, to ensure that reef or shingle is not disturbed or displaced. • Levels of disturbance or displacement that could give rise to presence of such material in the harvested seaweed, will be monitored and recorded via 'Goods received Notes' (GRN), or other formats by electronic or other means and/or also at production facilities. • Sites will be inspected post-harvest to check the sustainability of the methods employed and the harvest locations using the Site Inspection Form, SIF (Appendix 3) or other suitable format by electronic or other means.	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is unlikely that the distribution, abundance, diversity or area of shingle will be altered due to harvesting of *A. nodosum* given that shingle is considered contaminant material and will not be removed during harvest. While Talitrid amphipods feed on dead algae which accumulates in these areas, dead algae will not be harvested, thus it is unlikely that these species will be affected. Impacts on shingle are unlikely considering that the area

			of shingle affected by harvest activities represents 0% of the total shingle community type in the SAC (see Section (d) 8 below, 'continuous disturbance' for details).
		5	EU Dir. 92/43/EEC & NPWS, requires the maintenance of shingle habitats (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19). Harvest activities in these areas could significantly damage these community complexes.
Chemical /Physical	**1**		It is unlikely that shingle areas will be damaged due to harvesting of *A. nodosum* given that harvesters will be using small boats to land on coastal areas and islands. Care will be taken in order to ensure that contact with shingle and reef is minimal, therefore avoiding any damage being inflicted on boats. It is unlikely that significant levels of disturbance or displacement of shingle will occur. This is due to the fact that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate. Impacts on shingle are unlikely considering that the area of shingle affected by harvest activities represents 0% of the total shingle community type in the SAC (see Section (d) 8 below, 'continuous disturbance' for details).
		5	EU Dir. 92/43/EEC & NPWS, requires maintenance of shingle habitats and species therein (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19. Harvest activities in these areas could significantly damage these community complexes.

(11) Reef

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
• Removal of habitat (i.e. reef) • Removal of habitat with or without holdfast material • Removal of community complexes: intertidal reef, subtidal reef, *Laminaria*-dominated.	• Potential removal of small quantities of stones, rocks, etc. • Small, stony, friable substrate may occur in some locations. • Non-targeted removal of community types associated with these areas	2	5	A	no	n/a	yes	A system is in place which ensures that: • Hand harvest techniques employed along rocky shores will ensure that *A. nodosum* is severed above point of contact with underlying substrate (see Appendix 4). See "Code of Practise" for details (Appendix 4). • Levels of disturbance or displacement that could give rise to presence of reef and/or associated holdfast material, will be monitored and recorded via 'Goods received Notes' (GRN), or other formats by electronic or other means and/or at production facilities. • Sites will be inspected post-harvest to check the sustainability of the methods employed and the harvest locations using the Site Inspection Form (SIF, Appendix 3), or other suitable format by electronic or other means. • Cutting of seaweed will be limited to reef in the intertidal zone and will not include subtidal reef.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. <u>Kenmare SAC:</u> Maintenance of reef habitats and species therein: Target 6 of Objective 1, NPWS, 2013A, page 19, and targets 1-3 of objective 2, NPWS 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Disruption or disturbance of reef.	• Impact by boats • Disturbance or displacement may occur with inappropriate technique, lack of training or oversight	2	5	A	no	n/a	yes	• A code of practice will be implemented to ensure that harvesters employ good boating practices, particularly when landing on shores (See Appendix 4). • Harvesters will be provided with training, where necessary, to ensure that reef is not disturbed or displaced. • Levels of disturbance or displacement that could give rise to presence of such material in the harvested seaweed, will be monitored and recorded via 'Goods received Notes' (GRN), or other formats by electronic or other means and/or at production facilities.	

Hazard	Probability	Severity	Reason for Decision
Biological	**2**		It is unlikely that distribution, abundance, diversity or area of reef in Kenmare River SAC will be altered due to harvesting of *A. nodosum* for the following reasons: • While *Ascophyllum nodosum* may be harvested in from rocky shores which contain reef as underlying substrate, the hand harvesting technique used ensures that *A. nodosum* vegetative growth is severed well above the point of contact with reef. Contact with reef would also lead to damage to the harvesters sickle/blade, thus, reef will always be avoided. It is unlikely that significant levels of disturbance or displacement would occur, to levels which would lead to co-removal of reef with or without holdfast material. This is due to the fact that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate. • Subtidal and *Laminaria* dominated reef will not be subject to harvesting. This community occurs in deeper waters (15-50m). There will be no removal of Subtidal reef with Echinoderms and faunal turf community complex *(Caryophyllia smithii, Corynactis viridis, Aslia lefevre, Dysidea fragilis, Echinus esculentus, Pomatoceros triqueter, Marthasterias glacialis, Encrusting bryozoans, Parasmittina trispinosa, Alcyonium digitatum, Holothuria forskali, Antedon bifida, Luidia ciliaris, Calliostoma zizphinum, Asterias rubens, Tunicates, Cliona celata, Erect bryozoans, Coralline red algae, Encrusting sponges)*. • *Laminaria*-dominated community complex occurs in deeper waters (4-22m) largely beyond the intertidal *A. nodosum* zone. There will be no removal of *Laminaria*-dominated community complexes (*Laminaria hyperborea*, *Bonnemaisonia asparagoides, Coralline red algae, Dictyota dichotoma, Delessaria sanguine, Cryptopleura ramose, Brongniartella byssoides, Plocamium cartilagineum, Membranipora membranacea, Cliona celata).*
		5	EU Dir. 92/43/EEC & NPWS, requires the maintenance of the favourable conservation condition of reef (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19, and targets 1-3 of Objective 2, NPWS 2013A, pg. 20)
Chemical:			
			n/a
Physical:	**2**		It is unlikely that reef will be damaged due to harvesting of *A. nodosum* given that: (a) harvesters will be using small boats to land on islands and coastal areas. Care will be taken in order to ensure that contact with reef is minimal, therefore avoiding any damage being inflicted on boats. (b) The harvest collection boat (if deemed applicable to the area) will be fitted with a depth can device to ensure that contact with the reef is avoided as it will damage both the reef and the boat. It is unlikely that significant levels of disturbance or displacement of reef will occur. This is due to the fact that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate.
		5	EU Dir. 92/43/EEC & NPWS, requires the maintenance of the favourable conservation condition of reef (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19, and targets 1-3 of Objective 2, NPWS 2013A, pg. 20)

(12) Sea Caves (submerged or partially submerged)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of cave habitat or human activities that would influence community structure of seacaves.	Unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	• Harvest will not occur in these areas.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Target 1, 2 of Objective 3, NPWS, 2013A, page 21).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		The probability of sea caves and their habitat being altered due to harvest activities is relatively low given that: (a) Intertidal *A. nodosum* zone is largely confined to unexposed, sheltered areas and will rarely occur in the vicinity of seacaves. (b) There will be no activities which will negatively affect key resources to sea caves, including water quality.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of sea caves and associated habitat (Ref: Target 1, 2 of Objective 3, NPWS, 2013A, page 21). Any activity which would negatively impact on sea caves would contravene this directive.
Chemical : none identified			n/a
			n/a
Physical:			n/a
			n/a

(13) Harbour seals: General population.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Human activities Presence of humans and/or their activities can alter the behaviour of harbour seals (e.g. 'flushing out' and entering the water, man-made energy (Ariel or underwater noise), deterioration of resources such as water quality or food source	Unauthorized presence of harvesters at haul out sites or activities known to cause seals to 'flush out' and enter the water.	2	5	A	no	n/a	yes	BioAtlantis will issue the "Code of Practice" for the Protection of the Harbour Seal (Appendix 4), to ensure that harvesters: • Have full knowledge of the sites in Kenmare River SAC known to be relevant to the harbour seal. • Full knowledge of harbour seal sites which have been excluded from this application. • Understand the steps required to ensure that all contact with seals is prevented from day to day. • Understand best practises for dealing with contact with seals should it occur and methods of reporting such incidents should they arise. • In rare cases where contact occurs, harvesting will cease immediately and harvesters will move to new location. • Harvesters follow clearly defined routes according to pre-planned schedules. • Engines will run at a constant rate in areas important to the harbour seal during sensitive times of the year, e.g. haul out sites and not enter within 100m of these sites at sensitive times of the season. • Avoid stalling or slowing down unnecessarily en route to harvest locations or pick up points (pier, etc). See Appendix4 for details of the "BioAtlantis Code of Practice" for the Protection of the Harbour Seal along with site-specific measures and general measures. For details on action limits, analytical procedures monitoring and corrective actions, see Table 2.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Targets 1-5, of Objective 4, NPWS, 2013A, page 22 & 23).

Hazard	**Probability**	**Severity**	**Reason for Decision**
Human Activities	**2**		Contact with harbour seals at haul out sites will be minimal as (a) harvest will not be permitted at sensitive times of the year for 13 out of the 26 established haul out sites, (b) for the other 13 sites occupied all year round by harbour seals, harvest will only take place between October to April, during which time harvesters will be required to confirm absence of seals at resting sites prior to harvesting, and (c) boats will also operate in a manner known to least affect seal behaviour (see Appendix 4 for details). This application does not give rise to pressures due to noise, underwater noise and vibration.
		5	EU Dir. 92/43/EEC & NPWS, requires that human activities should occur at levels that do not adversely affect the harbour seal population (Ref: Targets 1-5, of Objective 4, NPWS, 2013A, page 22 & 23). Seals are very sensitive to the presence of humans and activities in boats, which can lead to alterations in important behavioural activities such as 'flushing out' into water or leaving haul out sites.

(14) Harbour seals: species range

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Species range should not be restricted by artificial barriers to site use (Ref: Target 1 of Objective 4, NPWS, 2013A, page 22).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Restriction of the harbour seal species range.	Presence of artificial barriers.	n/a	5	n/a	n/a	n/a	n/a	Physical barriers which could block access to harbour seals and site of importance to their species will not be installed in Kenmare River SAC.	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:			n/a
			n/a
Chemical:			n/a
			n/a
Physical:	**n/a**		It is highly improbable that hand harvest of *A. nodosum* will restrict or affect the species range of harbour seals in Kenmare River SAC due to the use of artificial physical barriers and no such barriers will be used in operations.
		5	EU Dir. 92/43/EEC & NPWS, requires that human activities should not involve the use of artificial barriers to site use, which could affect the range of the harbour seal species (Ref: Target 2 of Objective 4, NPWS, 2013A, page 22). Restrictions on the range of harbour seals could have significantly negative effects on this protected species which would contravene EU Law.

(15) Harbour seals (Breeding sites)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Presence of humans and/or their activities can alter the behaviour of harbour seals (e.g. 'flushing out' and entering the water).	Unauthorized presence of harvesters in areas important to the harbour seal during breeding (between May-July)	2	5	A	no	n/a	yes	• No harvest at breeding sites between May-July. • Boats operated using methods which have least effects on harbour seals. See "BioAtlantis Code of Practice" for protection of the harbour sea" for details (Appendix 4)	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Breeding sites should be conserved in a natural condition (Ref: Target 2 of Objective 3, NPWS, 2013A, page 22)
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Noise (This application does not give rise to pressures due to noise, underwater noise and vibration).	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		As above in table A10 (i.e. Harbour seals: General population.)
		5	EU Dir. 92/43/EEC & NPWS, requires that breeding sites should be conserved in a natural condition (Ref: Target 2 of Objective 3, NPWS, 2013A, page 22). Human contact is a known risk factor which can negatively impact upon harbour seal breeding and associated activities.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(16) Harbour seals (Moulting sites)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Presence of humans and/or their activities can alter the behaviour of harbour seals (e.g. 'flushing out' and enter the water).	Unauthorized presence of harvesters in areas important to the harbour seal during moulting (between Aug-Sept)	2	5	A	no	n/a	yes	• No harvest at moulting sites between Aug-Sept. • Boats operated using methods which have least effects on harbour seals. See "BioAtlantis Code of Practise" for protection of the harbour seal for details (Appendix 4).	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Moult out sites should be conserved in a natural condition (Ref: Target 3 of Objective 4, NPWS, 2013A, page 22)
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		As above in table A10 (i.e. Harbour seals: General population.)
		5	EU Dir. 92/43/EEC & NPWS, requires that Moult-out sites should be conserved in a natural condition (Ref: Target 3 of Objective 4, NPWS, 2013A, page 22). Human contact is a known risk factor which can negatively impact upon harbour seal behaviour during times of moult.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(17) Harbour seals (Resting sites)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Presence of humans and/or their activities can alter the behaviour of harbour seals (e.g. 'flushing out' and enter the water).	Landing at resting sites between Nov-April when harbour seals are present.	2	5	A	no	n/a	yes	• Harvest will only take place at resting sites when sites are unoccupied. • Boats operated using methods which have least effects on harbour seals. See "BioAtlantis Code of Practise" for protection of the harbour seal for details (Appendix 4).	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: Resting Haul-out sites should be conserved in a natural condition (Ref: Target 4 of Objective 4, NPWS, 2013A, page 22)
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		As above in table A10 (i.e. Harbour seals: General population.)
		5	EU Dir. 92/43/EEC & NPWS, requires that Resting Haul-out sites should be maintained in a natural condition (Ref: Target 4 of Objective 4, NPWS, 2013A, page 22). Harbour seal spend much of their time scanning their surrounding area during times of rest. Human contact can have negative impacts upon harbour seal resting behaviour, and can lead to seals leaving the area.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(18) Perennial vegetation of stony banks

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species (i.e. Perennial veg. of stony banks).	Removal of habitat due to harvest and/or storage of material in these areas.	1	5	A	no	n/a	yes	Harvest, storage and transport activities will not take place in these locations. Harvest must occur along rocky shorelines followed by immediate collection and transfer from nets/bags to the boat or towing of nets/bags from harvest sites for pick up via existing pier and road networks. In some cases, certain individuals with existing seaweed harvesting rights may prefer to land seaweed at pick up points.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: To maintain the favourable conservation condition (ref: Objective 1, NPWS, 2013B, pg. 8).
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Disruption and damage to vegetation found at or above the mean high water spring tide mark on shingle beaches.	Unauthorized transport in these areas.	1	5	A	no	n/a	yes	• Training: Harvesters will be provided with training, where necessary, to ensure that all transport activities take place using existing piers and roadways. • Location of harvest and pick-up points will be recorded on GRNs (See Appendix 3), or other formats by electronic or other means and/or at production facilities. • Inspection of GRNs, and Site Inspection Forms (SIFs) and/or other data/sources/formats by QC at BioAtlantis.	

Hazard	**Prob-ability**	**Severity**	**Reason for Decision**
Biological	**1**		It is highly improbable that Perennial vegetation of stony banks in will be affected due to harvesting of *A. nodosum* given that: (a) piers, quays, harbours and established routeways will be required pick up the load - use of banks for this purpose will not occur, (b) *A. nodosum* does not grow in these locations, and therefore will not be subject to harvest activities, (c) contamination with other materials may result in damage production equipment and end product and (d) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species such as perennial vegetation.
		5	EU Dir. 92/43/EEC & NPWS, requires that Perennial vegetation of stony banks are maintained in favourable condition (ref: Obj. 1, NPWS, 2013B, pg. 8). Any activities which would lead to removal of biological material could significantly damage these areas and would contravene this directive.
Chemical:			n/a
			n/a
Physical:	**1**		The probability of physically impacting upon Perennial vegetation of stony banks is exceptionally low given that: (a) *A. nodosum* does not grow in these environs and thus will not be subjected to harvest activities and, (b) Harvesters will be provided with training, where necessary, to ensure that all transport activities will take place using established piers and roadways. Transport cannot occur in these areas.
		5	Severity associated with disruption and damage to this environment is potentially significant as it could lead to damage to the permanent habitat area.

(19) Saltmarsh habitat (Atlantic salt meadows and Mediterranean salt meadows)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species	Removal of habitat due to harvest and/or storage of material in these areas.	1	5	A	no	n/a	yes	• In order to ensure that *A. nodosum* harvest does not negatively impact on salt marsh (Atlantic & Mediterranean Salt Meadows) habitat in general, harvesters will avoid saltmarsh habitat and ensure caution when operating at sites near Castlecove, Sneem, Reennagross, Doon Pt., Derreenacallaha, Derrynid, Reennaveagh, Laughragh Lower, Derreen House, Dinish, Tahilla and West Cove. • Harvesters will avoid harvesting *A. nodosum* and *Fucus* at the fringes of salt marshes. • Harvest of *A. nodosum* cannot take place along the fringes of Drongawn Lough SAC.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. <u>Kenmare SAC:</u> To maintain the favourable conservation condition (ref: Objective 2, NPWS, 2013B, pg. 12)
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Disruption and damage to stands of vegetation which occur along sheltered coasts.	Unauthorized transport in these areas.	1	5	A	no	n/a	yes	• Training: Harvesters will be provided with training, where necessary, to ensure that all transport activities take place using existing piers and roadways. • Locations of harvest and pick-up points will recorded on GRNs (See Appendix 3), or other formats by electronic or other means and/or at production facilities. • Inspection of GRNs and/or other data/sources formats by QC personnel at BioAtlantis HQ	

Hazard	**Prob-ability**	**Sever-ity**	**Reason for Decision**
Biological:	**1**		It is highly improbable that saltmarsh habitat will be affected due to harvesting of *A. nodosum* given that: (a) established piers will be required for upload/pick-up - use of Atlantic and Mediterranean salt meadow areas for this purpose will not occur, (b) *Ascophyllum nodosum* does not grow at high density in these locations, and therefore will not be subject to harvest activities, (c) harvest will mainly occur along rocky shorelines rather than in the areas of mud or sand substrate which is required salt marsh environs & associated species (d) contamination will other material may result in damage production equipment and end product and (e) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species characteristic of Atlantic and Mediterranean salt meadows.
		5	EU Dir. 92/43/EEC & NPWS, requires that the favourable conservation condition of salt marsh habitats be maintained (ref: Objectives 1 & 2, NPWS, 2013B, pg. 12). Any activities which would lead to removal of biological material could significantly damage these areas and would contravene this

			objective.
Chemical:			n/a
			n/a
Physical:	**1**		It is highly improbable that ASM and MSM in Kenmare River SAC will be altered due harvesting of *A. nodosum* given that: (a) *A. nodosum* does not grow at high density on intertidal sandy mud substrate in these environs and thus will not be subjected to harvest activities and (b) Harvesters will be provided with training, where necessary, to ensure that all transport activities will take place using established piers and roadways. Transport cannot occur in these areas.
		5	Severity associated with disruption and damage to salt marsh habitats is potentially significant as it could lead to damage to the permanent habitat area.

(20) Sand dune habitats

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species (i.e. Sand dune habitats)	Removal of habitat due to harvest and/or storage of material in these areas.	1	5	A	no	n/a	yes	Harvest , storage and transport activities will not occur in these locations. Harvest must occur along rocky followed by immediate collection and transfer from nets/bags to boat or towing of nets/bags from harvest sites to pick up points. In some cases, certain individuals with existing seaweed harvesting rights may prefer to land seaweed at pick up points.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: To maintain the favourable conservation condition. (ref: Objective 3, NPWS, 2013B, pg. 21).
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Disruption and damage to: · Shifting dunes along the shoreline with *Ammophila arenaria* (white dune, 2120); · Fixed coastal dunes with herbaceous vegetation (2130);	Unauthorized transport in these areas.	1	5	A	no	n/a	yes	• Training:Harvesters will be provided with training, where necessary, to ensure that all transport activities take place using existing piers and roadways. • Location of harvest and pick-up points will be recorded on GRNs (See Appendix 3), or other formats by electronic or other means and/or at production facilities. • Inspection of GRNs and/or other data sources/formats by QC at BioAtlantis.	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is highly improbable that sand dune habitats or species therein will be affected due to harvesting of *A. nodosum* given that: (a) Loading and transport activities will occur exclusively using established piers and road networks, (b) *Ascophyllum nodosum* does not grow in these locations, and therefore will not be subject to harvest activities, (c) contamination with other material may result in damage to production equipment/end product and (d) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species in sand dune habitats.
		5	EU Dir. 92/43/EEC & NPWS, requires the favourable conservation condition of sand dune habitats be maintained (ref: Objective 3, NPWS, 2013B, pg. 21). Any activities which would lead to removal of biological material could significantly damage these areas, thus contravening these objectives.
Chemical:			n/a
			n/a
Physical:	**1**		It is highly improbable that sand will be physically damaged due to harvesting of *A. nodosum* given that: (a) *A. nodosum* does not grow on in these environs and thus will not be subjected to harvest activities and (b) harvesters will be provided with training, where necessary, to ensure that all transport activities will take place using established piers and roadways. Transport cannot occur in these areas.
		5	Severity associated with disruption and damage to sand dune habitats is potentially significant as it could lead to damage to the permanent habitat area.

(21) Vegetated sea cliffs of the Atlantic and Baltic coasts (1230)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Removal of habitat of rare & endangered species	Removal of habitat due to harvest and/or storage of material in these areas.	1	5	A	no	n/a	yes	Harvest, storage and transport activities will not occur in these locations. Harvest must occur along rocky shorelines followed by transfer of bags/nets to piers via boat.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: To maintain the favourable conservation condition. (ref: Objective 4, NPWS, 2013B, pg. 27).
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical:	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is highly improbable that sea cliffs and associated habitats or species therein will be affected due to harvesting of *A. nodosum* given that: (a) Loading and transport activities will occur exclusively using established piers and road networks, (b) *Ascophyllum nodosum* does not grow in these locations, and therefore will not be subject to harvest activities, (c) contamination with other material may result in damage to production equipment/end product and (d) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species in sand dune habitats.
		5	EU Dir. 92/43/EEC & NPWS, requires the favourable conservation condition of vegetated sea cliff habitats be restored (ref: Objective 4, NPWS, 2013B, pg. 27). Any activities which would lead to removal of biological material could significantly damage these areas, thus contravening these objectives.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(22) Otter *(Lutra lutra)*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required. *probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Negative impacts: • Distribution of positive survey sites • Extent of terrestrial habitat • Extent of marine habitat • Extent of freshwater (river) habitat. • Extent of freshwater (lake/lagoon) habitat. • Number of couching sites and holts • Decline in fish biomass • Increase in barriers to connectivity	• Damage to freshwater habitats • Damage to marine habitats. • Damage to fish resources. • Blocking access to sites	1	5	A	no	n/a	yes	• Avoiding excessive *A. nodosum* removal will prevent potential negative effects on other species along the food chain, e.g. fish & otters. Harvest will not exceed 20% of the total available biomass per site per annum. • To minimize disturbance or interaction with otters, ensure the following: - All activities are maintained within the intertidal *A. nodosum* zone. Avoid linear habitats located beyond the intertidal zone or marine riparian areas beyond the foreshore. Only use existing routes. - Never interfere with couching sites, holts, access paths/routes, that may be present near coastal areas, agricultural fencing, roads, slipways, access points or other areas.Avoid large trees near coastal areas as they can represent important otter breeding and resting sites. Avoid undisturbed areas (e.g. impenetrable scrub/reeds) which are refuges for otters. Do not behave in an obtrusive or noisy manner around otters. Never interfere with, deliberately approach or disturb otters/otter cubs that are resting, sleeping, hunting, feeding or foraging in water or on shore during daytime, dawn or dusk. Ensure caution during periods of breeding, rearing and hibernation. - If migrating/commuting otters are encountered in water, do not obstruct their movement. Slow down boat and give sufficient space to pass without “boxing” them in, blocking narrow channels or acting as a barrier to commuting or connectivity. If encountered on the shore, allow otters free access and ample opportunity to escape to the water/land. Do not behave in manner causing them to move away or flee human disturbance. • To prevent impacts on the dietary and other requirements of otter, the following measures apply: - Follow pre-planned schedules and harvest in areas defined by BioAtlantis. Harvesting is limited to 20% of the total available *A. nodosum* biomass per site per annum, to allow for sufficient regrowth. - Harvesting cannot take place beyond the *A. nodosum* zone, as these habitats represent the broader habitat range of the otter’s prey during adult and early life stages, including: flowing and static freshwater areas (rivers, streams, canals, lakes, reservoirs, ponds), deep water subtidal areas (>30m), shallow subtidal areas (<30m), exposed areas, estuarine mud areas, brackish waters, subtidal gravel/coarse bottom substratum, intertidal soft bottom (sand/mud), lagoons, maerl, rock pools, saltmarsh habitats, seagrass, subtidal soft bottom (sand/mud) and exposed waters in the vicinity of rocky cliffs. - Avoid exposed & non-sheltered areas (i.e. otter’s broader habitat range, hunting ground and foraging area). - Avoid co-harvesting non-*A. nodosum* material. Ensure that inadvertent by-catch of other algae, dead/senescing algae, amphipods, isopods or other Animalia or material is prevented and minimized. - Do not remove the *A. nodosum* holdfast and take care not to disturb rocky/crevice substratum. - Avoid all freshwater aquatic linear habitat and riparian environments inc. lakes and rivers and other areas. - Harvesting cannot occur in fresh water habitats. This prevents potential impacts on salmon, trout and European eel, in turn preventing any impacts on otter. • Harvesters will adhere to the above, particularly at sites where otter presence is known (see Appendix 9).	EU Dir. 92/43/ EEC The Wildlife Acts, 1976 and 2000 (Rep. of Ireland)

Chemical/physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	Prob-ability	Sever-ity	Reason for Decision
Biolog-ical:	**1**		• In brief, it is unlikely that harvesters will cause significant disturbance to otters as: - Hand harvesting of *A. nodosum* will occur in the intertidal zone with no activities in freshwater habitats. - Hand harvesters will not engage in activities which would block sites of relevance to otters, including holt sites. - There will be no barriers to block access to otters to and from and between sites. - Harvesting is unlikely to result in entrapment or direct physical injury otters. - It is highly improbable that otter food supply will be depleted due to harvest activities as harvest will take place in a sustainable manner. • Nevertheless, it is important to put mitigation measures in place to avoid any potential interactions in general and at a number of key locations. For instance, otters are particularly sensitive during the period of breeding, rearing, hibernation and migration. Therefore it is important to prevent interactions a sites where their presence has been confirmed such those described by Baily and Rochford, 2006 and Reid *et al.,* 2013. Otters are associated with a wide variety of habitats including land habitats, flowing freshwater (i.e. rivers, streams and canals), static freshwater (lakes, reservoirs, ponds), brackish water habitats, estuarine areas, exposed shores, semi-exposed shores, sheltered shores, rocky areas, boggy areas, tidal mudflats, sandflats, lagoons, saltmarsh habitats and sand dune habitats. The distribution of the otter has previously been examined in Kenmare Bay and surrounding areas. The species is identified as occurring in a range of habitats within the complex. This includes freshwater, marine, aquatic and terrestrial areas, and within both sheltered and exposed coastal locations that extend towards the outer reaches of the bay. In coastal areas of the west of Ireland, the otter's diet is highly variable, consisting of a range of fish species, crustaceans and molluscs, amphibians, invertebrates and birds. Given the variable nature of the otter's prey species, the potential impact of sustainable hand harvesting of *A. nodosum* on the otter's dietary requirements is very low. While some components of the otter's prey species can occur within the intertidal zone, they are also known to be associated with a wide range of non- *A. nodosum* habitats during adult and early life stages, including: freshwater areas (rivers, streams, canals, lakes, reservoirs, ponds), deep water marine areas (>30m), shallow subtidal water marine areas (<30m), exposed areas, estuarine mud areas, brackish waters, subtidal gravel/coarse bottom substratum, intertidal soft bottom, lagoons, maerl, rock pools, saltmarsh, seagrass, subtidal soft bottom and exposed waters in the vicinity of rocky cliffs. The spatial overlap between these habitats and *A. nodosum* harvesting is extremely low and in many cases is absent. Therefore, it is highly unlikely that the dietary requirements of otter will be affected by sustainable *A. nodosum* harvesting. • Kelly et al., (2001), indicate that hand harvesting is not associated with reductions in fish numbers within the *A. nodosum* biotope. In terms of potential direct effects on otters, assessments indicate that there are no significant relationships between the percentage occurrence of otters and human disturbance in SACs in Ireland (Bailey and Rochford 2006). Moreover, there are no differences in the occurrence of otters between sites within and outside of SACs. Hand harvesting of *A. nodosum* will occur in the intertidal zone with no activities in freshwater habitats. Hand harvesters will not engage in activities which would block sites of relevance to otters, including holt sites. There will be no barriers to block access to otters to and from and between sites. Based on the information above, it is concluded that it is highly unlikely that the otter's food supply will be affected due to sustainable *A. nodosum* harvesting activities.
		5	Otters are listed as a protected species under EU directives. Any activities which would negatively impact and contribute to the decline of this species would be severe. Otters are deemed to be in decline in many parts of Europe with risks including roads, fishing nets and lobster pots (NPWS, 2007). Organochlorine pesticides are widely accepted as having severely reduced otter population sizes in the UK (Jones and Jones, 2004).
Chemical/ Physical			n/a
			n/a

(23) Birds

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Negative impacts on habitats relevant to species of bird and their behaviour	This may occur due to: • Excess removal of *A. nodosum* habitat, which constitutes part of the habitat of some bird species in Kenmare River SAC. • Potential impact on algae as secondary food source. • Human disturbance at nesting colonies can lead to abandonment of nest or chicks. • Human presence may lead to trampling of nests. • Disturbance leading to flight events. See Appendix 6 for detailed risk assessment of bird species in Kenmare River SAC.	1	5	A	no	n/a	yes	Appendix 6 provides a risk assessment for 124 bird species (based on data from The Irish Wetland Bird Survey (I-WeBS) and a range of other sources). Specific mitigation measures were developed for n=29 species including but not limited to: Arctic Tern *(Sterna paradisaea),* Bar-tailed Godwit *(Limosa lapponica),* Black-headed Gull *(Larus ridibundus),* Black-tailed Godwit *(Limosa limosa),* Brent Goose *(Branta bernicla hrota),* Common gull *(Larus canus),* Common Sandpiper *(Actitis hypoleucos),* Common Tern *(Sterna hirundo),* Cormorant *(Phalacrocorax carbo),* Dunlin *(Calidris alpine),* Goldeneye *(Bucephala clangula),* Great Black-backed Gull *(Larus marinus),* Green Sandpiper *(Tringa ochropus),* Greenshank *(Tringa nebularia),*Little Tern *(Sterna albifrons),* Manx Shearwater *(Puffinus puffinus),* Mediterranean Gull *(Larus melanocephalus),* Oystercatcher *(Haematopus ostralegus),* Red Knot *(Calidris canutus),* Redshank *(Tringa tetanus),* Ringed Plover *(Charadrius hiaticula),* Rock Pipit *(Anthus petrosus),* Roseate Tern *(Sterna dougallii),* Sandwich Tern *(Sterna sandvicensis),* Scaup *(Anas marila),* Shelduck *(Tadorna tadorna),* Storm Petrel *(Hydrobates pelagicus),* Turnstone *(Arenaria interpres)* and White Tailed Sea Eagle *(Haliaeetus albicilla).* The "Code of Practice" in Appendix 4 outlines mitigation measures to prevent impacts on bird species in terms of disturbance events and nesting requirements and important wintering and breeding sites where mitigation measures will apply at sensitive times of year. BioAtlantis Ltd. will manage harvesting in a sustainable manner to ensure that excessive removal of *A. nodosum* does not occur and is limited to 20% of the total available biomass per site per annum (see Table C1, "*A. nodosum*", in the next section for details).	Annex I of the E.U Birds Directive
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is unlikely that species of bird will be affected by harvest activities in Kenmare River SAC given the following: • Harvest of *A. nodosum*: this will be undertaken sustainably and will not exceed 20% of the available biomass per site per annum, thus ensuring maintenance of the *A. nodosum* habitat. Therefore, the probability of affecting fish and in turn bird species in Kenmare Bay, is considerably reduced.

			• Diet and foraging behaviour: While some species of birds use the *A. nodosum* zone as a habitat for feeding, reproduction or sheltering purposes, none are exclusively dependent on the *A. nodosum* biotope (reviewed by Kelly L. *et al.,* 2001). • Substrate: many species utilize are which do not support *A. nodosum* growth (e.g. sandy beaches, sand dune and/or salt marsh habitats. Therefore, these areas will be avoided (see Appendix 6 for details). • Low number of harvesters: The low number of harvesters over such a large area reduces the likelihood of contact with breeding and wintering birds. • Significant disturbance due to hand harvesting is unlikely, given (a) the low number of boats and people involved and (b) the bird species assessed are not limited to the intertidal *A. nodosum* zone where harvest activities will occur. • Harvest will not take place at breeding and wintering sites at sensitive times of the year, where applicable. • Nesting and breeding requirements: harvesting will take place within the *A. nodosum* zone, thus ensuring that nesting and breeding requirements inland, or in areas near the foreshore are not affected. • There is no significant risk of harvest activities impacting on food source or habitat. The bird species assessed are not reliant on *A. nodosum* for feeding requirements or habitat type. • There is no evidence for strong bottom-up forcing of *A. nodosum* harvesting on birds' site visitation (Johnston, Elliot M., *et al.* 2024. Estuarine, Coastal and Shelf Science). Nevertheless, it is important to put mitigation measures in place to avoid any interactions at specific locations and with respect to breeding or wintering requirements. See Appendix 6 for details of the distribution, requirements and control measures for avian species of interest in Kenmare River SAC. See Appendix 4 for Code of Practice.
		5	A number of protected species listed on Annex I of the E.U Birds Dir. occur in Kenmare River SAC (see Appendix 6 for details).
Chemical/physical:			n/a
			n/a

(24) Other Cetaceans

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected species	Activities which could cause disturbance.	1	5	A	no	n/a	yes	Mitigation not required. However, the following is included in the Code of Practice: • **Harbour Porpoise, Grey seals, Dolphins and other cetaceans:** To prevent disturbance, the following is required: - Harvesters to be trained to identify presence of marine mammals such as Harbour Porpoise, Grey seals, Dolphins and other cetaceans, as part of the general environmental awareness training. - Harvesters must adhere to measures to prevent disturbance of marine mammals, and steps to record disturbance events (e.g. section 5.4. of Code of Practice). • **Training:** Harvesters will be provided with training, where necessary, regarding habitat recognition and measures to prevent impacts on marine and coastal habitats and species, including those outlined in the Code of Practice.	EU Habitats Directive
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		It is unlikely that species of cetaceans will be affected by harvest activities in Kenmare River SAC given the following: **Common dolphin *(Delphinus delphis):*** Hand harvesting of *A. nodosum* is unlikely to affect the Common Dolphin. Hand harvesting of *A. nodosum* occurs in the intertidal zone and has no spatial overlap with the Common Dolphin, which is pelagic and generally occurs well out at sea and in waters of the continental shelf. The dietary requirements of Common Dolphin are broad and include a range of fish and invertebrate species that occur in subtidal waters, none of which are reliant on or form obligate relationships with *A. nodosum* during early-life, juvenile, larvae, nursery or spawning stages or require *A. nodosum* for fulfilling feeding functions. There are no physical, chemical or biological hazards associated with *A. nodosum* harvesting that could impact on the Common Dolphin. In combination or cumulative effects are unlikely to occur. **Bottlenose dolphin *(Tursiops truncatus):*** Hand harvesting of *A. nodosum* is unlikely to affect the Bottlenose Dolphin. Hand harvesting of *A. nodosum* occurs in the intertidal zone and has no spatial overlap with the Bottlenose Dolphin which generally occurs in inshore waters, deep coastal waters and shallow waters. The dietary requirements of Bottlenose Dolphin are broad and include a range of fish and invertebrate species that occur in subtidal waters, none of which are reliant on or form obligate relationships with *A. nodosum* during early-life, juvenile, larvae, nursery or spawning stages or require *A. nodosum* for fulfilling feeding functions. There are no physical, chemical or biological hazards associated with *A. nodosum* harvesting that could impact on the Bottlenose Dolphin. In combination or cumulative effects are unlikely to occur.

			Harbour Porpoise *(Phocoena Phocoena):* Hand harvesting of *A. nodosum* is unlikely to affect *Phocoena Phocoena*. Hand harvesting of *A. nodosum* occurs in the intertidal zone and has no spatial overlap with this species, which generally inhabits deeper subtidal waters. The dietary requirements of *P. Phocoena* are broad and include herring, sprat and sand eels; its prey species are not reliant on or form obligate relationships with *A. nodosum* during early-life, juvenile, larvae, nursery or spawning stages, or require *A. nodosum* for fulfilling feeding functions. There are no physical, chemical or biological hazards associated with *A. nodosum* harvesting that could impact on *Phocoena Phocoena*. In combination or cumulative effects are unlikely to occur. **Grey Seal *(Halichoerus grypus):*** Hand harvesting of *A. nodosum* is unlikely to affect *H. grypus*. The dietary requirements of *H. grypus* are broad and are not reliant on or form obligate relationships with *A. nodosum* during early-life, juvenile, larvae, nursery or spawning stages, or require *A. nodosum* for fulfilling feeding functions. The hand harvesting of *A. nodosum* is a low-impact activity in the intertidal zone, which does not affect subtidal habitats, offshore or in deeper waters, where grey seal prey predominantly occur. Therefore, grey seals are unlikely to be adversely impacted by the hand harvesting of *A. nodosum*. Hand harvesting is a low impact activity which is unlikely to give rise to significant noise generation. Other cetacean species (including those listed below) are also unlikely to be affected by hand-harvesting activities due to the low-impact nature of these activities, the subtidal habitat of the cetaceans, and the fact that their prey species neither rely on nor form obligate relationships with *A. nodosum* during their early life stages (larvae, juveniles, nursery, or spawning), nor require *A. nodosum* to fulfill their feeding functions. The list of whale, dolphin and porpoise cetacean species that may potentially occur in Irish waters are listed below: **Whales in Irish Waters:** • **Common and Regular Species:** Minke Whale (*Balaenoptera acutorostrata*), Fin Whale (*Balaenoptera physalus*), Humpback Whale (*Megaptera novaeangliae*), Long-finned Pilot Whale (*Globicephala melas*), Killer Whale / Orca (*Orcinus orca*) • **Occasional or Rare Species:** Sei Whale (*Balaenoptera borealis*), Sperm Whale (*Physeter macrocephalus*), Northern Bottlenose Whale (*Hyperoodon ampullatus*), Blue Whale (*Balaenoptera musculus*), Cuvier's Beaked Whale (*Ziphius cavirostris*), Sowerby's Beaked Whale (*Mesoplodon bidens*), True's Beaked Whale (*Mesoplodon mirus*), Gervais' Beaked Whale (*Mesoplodon europaeus*), Blainville's Beaked Whale (*Mesoplodon densirostris*). **Dolphins in Irish Waters:** • **Common and Regular Species:** Common Dolphin (*Delphinus delphis*), Bottlenose Dolphin (*Tursiops truncatus*) – both resident and offshore populations, Risso's Dolphin (*Grampus griseus*), White-beaked Dolphin (*Lagenorhynchus albirostris*), Atlantic White-sided Dolphin (*Lagenorhynchus acutus*) • **Occasional or Rare Species:** Striped Dolphin (*Stenella coeruleoalba*), Fraser's Dolphin (*Lagenodelphis hosei*), Rough-toothed Dolphin (*Steno bredanensis*). **Porpoises in Irish Waters:** Harbour Porpoise (*Phocoena phocoena*) – widespread and commonly seen cetacean.
		5	A number of species above are protected.
Chemical/physical:			n/a
			n/a

(b) Species & habitats of general interest.

(1) Fish species

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		*P**	*S**	*A/UA*	Q1	Q2	Control Measures? Y/N		
Biological: • Removal of zones important for feeding, reproduction and/or sheltering of fish species such as trout and salmon. • Impeding or capturing salmon or trout smolts or post smolt adults.	Excess removal of habitat in the form of *A. nodosum* due to overharvesting of resources	1	5	A	no	n/a	yes	• BioAtlantis Ltd. will manage harvesting activities in a sustainable manner to ensure that excessive removal of *A. nodosum* does not occur and is limited to 20% of the total available biomass per site per annum (see Table C1, "*A. nodosum*", in the next section for details), which in turn, prevents any potential negative effects on species further along the food chain, e.g. fish, birds, otters. In addition, no activities will take place in important areas of River Roughty, River Finnihy and River Sheen, thus preventing any impact during important life-cycle stages. • There are several sites of relevance to fisheries and sea angling in Kenmare River SAC. Harvesters will work to ensure that the space of fishermen and sea angler's is respected at all times. • Ensure that the space of recreational/shore anglers is respected, particularly when competitions and festivals take place, particularly during summer months. • Ensure that seaweed harvesting only takes place in the intertidal *A. nodosum* zone and not in subtidal areas of relevance to fisheries activities such as potting (lobster, crab, shrimp, whelk, nephrops), dredging (e.g. scallop, native oyster, cockle), trammel net fishing for bait, otter trawl, tangle net (crayfish), gillnet, Mid-water trawl. Activities in subtidal waters that are permitted include site visits, inspections, surveys, collection of harvested seaweed, transport and transfer to pick up points. • Avoid interactions with non-*A. nodosum* habitats which represent the broader habitat range of fish, shellfish, invertebrates and fisheries species during adult and early-life stages, including: deep water areas, seagrass, estuarine mud areas, saltmarsh, lagoons, maerl, subtidal gravel/coarse bottom, subtidal soft bottom areas, intertidal soft bottom areas & exposed shores. • Avoid soft substratum areas where bait digging for ragworm/lugworm is observed to be taking place.	None specified by NPWS. Salmon are Annex II species listed under the EU habitats Directive.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Prob-ability**	**Severity**	**Reason for Decision**
Biological	**1**		In the absence of appropriate systems of management, monitoring and verification, there is increased likelihood of excess removal of *A. nodosum* which in turn, may impact upon species of fish who use these zones for feeding, reproduction and/or sheltering. However, it is highly improbable that fish numbers will be affected by harvest activities in Kenmare River SAC, given that: (a) Harvest of *A. nodosum* will be undertaken sustainably and will not exceed 20% of the total available biomass per site per annum thus ensuring maintenance

of the *A. nodosum* habitat.
(b) River Roughty, River Finnihy and River Sheen are important sites for fish such as salmon and will be excluded from all harvest-related activities.
(c) There will be no activities which impede or capture salmon or trout smolts or post smolt adults. Thus, smolt & post smolt abundance will be unaffected.
(d) Spawn, fry and mature salmon or trout will be unaffected as river areas are not subject to harvesting activities.
(e) Fish will not be captured or physically impeded by hand harvesting.
(f) Water quality will not be affected by harvest activities.
(c) Studies indicate that hand harvest of *A. nodosum* does not significantly affect fish and large mobile epifauna (Kelly et al., 2001).

It is highly improbable that fish numbers will be affected by harvest activities in Kenmare Bay given that the spatial overlap between *A. nodosum* harvesting and fisheries activities is relatively low and absent in many cases (see below):

Type	**Description/extent/location of fisheries activity**
Potting for shrimp	Occurs throughout the mid to inner regions of the bay, limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Potting for prawns	Mainly located in proximity to the inner reaches of the bay and the outer regions along the norther and southern waters of the bay; limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Potting for crab and lobster	Occurs throughout the mid to inner regions of the bay, limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Tangle netting for crayfish	Limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Gill netting for mixed fish	Limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Trammel net fishing for bait	Limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Otter trawl - demersal	Limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Mid-water trawling for pelagic fish	Limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Hook & line fishing for mackerel & Pollack	Limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Dredge -scallop	Limited to subtidal areas/community types where *A. nodosum* does not grow (there is no spatial overlap with intertidal reef community complex).
Hand gathering of periwinkles.	Periwinkle fishing takes place in a number locations along the bay including sites near Ormonds Island, Tuosist Castle, Loughaunacreen, Glanlough, Eyeries and Cove Harbour.
Long line	Coulagh Bay (subtidal area; there is no spatial overlap with intertidal reef community complex).

			Seines	Outer reaches of Kenmare River SAC (subtidal area; there is no spatial overlap with intertidal reef community complex).	
		5	Rivers Roughty, Finnihy and Sheen are important sites for salmon and trout. Salmon are Annex II species listed under the EU habitats Directive. Post smolt and adult sea trout and salmon may feed within the Kenmare River area and along with some other species, and may utilize *A. nodosum* canopies intermittently.		
Chemical:			n/a		
			n/a		
Physical:			n/a		
			n/a		

(2) West Cove, Tahilla, Dinish Island, Dirreen House area (Salt Marsh habitats)

As per point A (19) above, measures are in place to ensure that salt marsh habitats are unaffected, particularly in sites such as West Cove, Tahilla, Dinish Island, Dirreen House area, which support a wide range of salt marsh habitats.

(3) Derrynane Area (sand dunes, saltmarsh, woodland and bird species)

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Y/N		
Biological: • Removal of habitat of rare & endangered species (i.e. Sand dune habitats, salt marsh, woodland areas). • Negative impacts on habitats relevant to bird species and their behaviour.	• Removal of habitat due to harvest and/or storage of material in these areas. • Excess removal of *A. nodosum* habitat, which constitutes part of the habitat of some bird species in Kenmare SAC. • Potential impact on algae as secondary food source. • Human disturbance at nesting colonies can lead to abandonment of nest or chicks. • Human presence may lead to trampling of nests. • Disturbance leading to flight events. See Appendix 6 for bird species assessment.	1	5	A	no	n/a	yes	➢ Harvest will not take place at the Iveragh Peninsula SPA [004154] at any time. This ensures no impacts on birds reported to occur in this area including Bar-Tailed Godwit, Oystercatcher, Ringed Plover and Great Black-backed Gull. ➢ Rocky islands near Derrynane Bay (Breeding sites) will also be avoided all year round which prevents any disturbance to Artic Tern, Common Tern, Little Tern and Sandwich Tern which are reported to occur in this area. The "Code of Practice" in Appendix 4 outlines these mitigation measures	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS. Kenmare SAC: To maintain the favourable conservation condition (ref: Objective 2, NPWS, 2013B, pg. 12) Kenmare SAC: To maintain the favourable conservation condition. (ref: Objective 3, NPWS, 2013B, pg. 21). Annex I of the E.U Birds Directive
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Disruption and damage to: · Shifting dunes (white dune, 2120); · Fixed coastal dunes (2130); · Salt Marsh Habitats · Woodland areas	Unauthorized transport in these areas.	1	5	A	no	n/a	yes	• Harvest will not take place at the Iveragh Peninsula SPA [004154] at any time.	

Hazard	Probability	Severity	Reason for Decision
Biological	**1**		See points A19 (salt marsh), 20 (sand dunes) and 23 (birds) above. Additionally, there is no risk on woodland areas inland, as harvest activities will not take places in these environs.
		5	• EU Dir. 92/43/EEC & NPWS, requires that the favourable conservation condition of salt marsh habitats be maintained (ref: Objectives 1 & 2, NPWS, 2013B, pg. 12). Any activities which would lead to removal of biological material could significantly damage these areas and would contravene this objective. • EU Dir. 92/43/EEC & NPWS, requires the favourable conservation condition of sand dune habitats be maintained (ref: Objective 3, NPWS, 2013B, pg. 21). Any activities which would lead to removal of biological material could significantly damage these areas, thus contravening these objectives. • A number of protected species listed on Annex I of the E.U Birds Dir. occur in Kenmare River SAC (see Appendix 6 for details).
Chemical:			n/a
			n/a
Physical:	**1**		See points A19 (salt marsh) and 20 (sand dunes) above. Additionally, there is no risk on woodland areas inland, as harvest activities will not take places in these environs.
		5	• Severity associated with disruption and damage to coastal habitats is potentially significant as it could lead to damage to the permanent habitat area.

(4) Iveragh Peninsula SPA (site code: 004154)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected bird species.	Unauthorized activity in these protected areas.	0	5	A	no	n/a	yes	• Harvest will not take place in this SPA.	Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: Fulmar, Peregrine, Kittiwake, Guillemot, Chough (NPWS, 2015B).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**0**		Harvest activities will not take place in this area.
		5	Activities could impact on the SPA conservation requirements.
Chemical /Physical			n/a
			n/a

(5) Deenish Island and Scariff Island SPA (site code:004175)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected bird species.	Unauthorized activity in these protected areas.	0	5	A	no	n/a	yes	• Harvest will not take place in this SPA.	Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA: Fulmar, Manx Shearwater, Storm Petrel, Lesser Black-backed Gull, Arctic Tern. NPWS (2016E).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**0**		Harvest activities will not take place in this area.
		5	Severity of impacting on species would be deemed high.
Chemical /Physical			n/a
			n/a

(6) Kenmare Islands pNHA (site code: 000363)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected bird and harbour seals.	Activities at sensitive times of the year or activities which lead to disturbance.	2	5	A	no	n/a	yes	• As described in section A above, the Code of Practice ensures that harbour seals and protected bird species are not impacted by harvest activities (see appendix 4 for details). This includes a number of site specific and species specific mitigation measures.	None specified
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**2**		Kenmare Islands pNHA comprises a range of islands throughout the bay which are of relevance to a number of harbour seal and bird species (see Appendix 6). There is potential therefore that activities could lead to disturbance events (see section A above for details).
		5	Severity of impacting on species would be deemed high.
Chemical /Physical			n/a
			n/a

(7) Lehid Harbour pNHA (site code: 0001364)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected birds.	Activities at sensitive times of the year or activities which lead to disturbance.	1	5	A	no	n/a	yes	• As described in section A above, the Code of Practice ensures that protected bird species are not impacted by harvest activities (see appendix 4 and 6 for details). This includes a number of site specific and species specific mitigation measures.	None specified
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Lehid harbour pNHA is of relevance due to the presence of a mixed woodland containing both native and exotic tree species (NPWS, 2009H). Activities will not take place inland beyond the intertidal zone, therefore impact on woodland will not occur. A number of bird species also utilize the area (see Appendix 6). There is potential therefore that activities could lead to disturbance events (see section A above for details).
		5	Severity of impacting on species would be deemed very high.
Chemical /Physical			n/a
			n/a

(8) Eyeries Island pNHA (site code: 1051)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected birds (common and/or Arctic terns).	Activities at sensitive times of the year or activities which lead to disturbance.	1	5	A	no	n/a	yes	• As described in section A above, the Code of Practice ensures that protected bird species are not impacted by harvest activities (see Appendix 4 and 6 for details). This includes a number of site specific and species specific mitigation measures.	None specified
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Eyeries Island pNHA is of relevance to common and/or Arctic terns (see Appendix 6). There is potential therefore that activities could lead to disturbance events (see section A above for details).
		5	Severity of impacting on species would be deemed high.
Chemical /Physical			n/a
			n/a

(9) Spanish Island pNHA (site code:. 001378)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected birds (breeding terns).	Activities at sensitive times of the year or activities which lead to disturbance.	1	5	A	no	n/a	yes	• As described in section A above, the Code of Practice ensures that protected bird species are not impacted by harvest activities (see appendix 4 and 6 for details). This includes a number of site specific and species specific mitigation measures.	None specified
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Spanish Island pNHA is of relevance to breeding terns (see Appendix 6). There is potential therefore that activities could lead to disturbance events (see section A above for details).
		5	Severity of impacting on species would be deemed high.
Chemical /Physical			n/a
			n/a

(10) Rossdohan Island pNHA (site code: 001375)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected birds and harbour seals (Arctic Tern and Black-Headed Gull).	Activities at sensitive times of the year or activities which lead to disturbance.	2	5	A	no	n/a	yes	• As described in section A above, the Code of Practice ensures that protected bird species and harbour seals are not impacted by harvest activities (see Appendix 4 and 6 for details). This includes a number of site specific and species specific mitigation measures.	None specified
Chemical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**2**		Rossdohan Island pNHA is of relevance to harbour seals, Arctic Tern and Black-Headed Gull (NPWS, 2009A). There is potential therefore that activities could lead to disturbance events (see section A above for details).
		5	Severity of impacting on species would be deemed high.
Chemical /Physical			n/a
			n/a

(11) Roughty River Estuary pNHA (site code: 0002092)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected birds and harbour seals	Activities at sensitive times of the year or activities which lead to disturbance.	2	5	A	no	n/a	yes	• As described in section A above, the Code of Practice ensures that protected bird species and harbour seals are not impacted by harvest activities (see appendix 4 and 6 for details). This includes a number of site specific and species specific mitigation measures.	None specified
Chemical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**2**		Roughty River Estuary pNHA is of relevance to a number of bird species and harbour seals (NPWS, 2009F). There is potential therefore that activities could lead to disturbance events (see section A above for details).
		5	Severity of impacting on species would be deemed high.
Chemical /Physical			n/a
			n/a

(12) Old Domestic Building, Dromore Wood SAC (Site Code 000353)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on biological requirements of lesser horseshoe bat.	Unauthorized activity in these protected areas.	0	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	<u>Kenmare SAC:</u> To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II Lesser Horseshoe Bat (Rhinolophus hipposideros; NPWS, 2013G).
Chemical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**0**		Harvest activities will not take place inland. Harvest will not impact on diet of horseshoe bat (insects).
		5	Activity that would lead to removal of woodland would be detrimental.
Chemical /Physical			n/a
			n/a

(13) Cloonee and Inchiquin Loughs, Uragh Wood SAC (site code: 001342)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected species or habitats.	Unauthorized activity in these protected areas.	0	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	<u>Kenmare SAC:</u> To maintain or restore the favourable conservation condition of the following: [3110] Oligotrophic Waters containing very few minerals [4010] Wet Heath [4030] Dry Heath [8220] Siliceous Rocky Slopes [91A0] Old Oak Woodlands [1024] Kerry Slug (Geomalacus maculosus) [1303] Lesser Horseshoe Bat (Rhinolophus hipposideros) [1421] Killarney Fern (Trichomanes speciosum) [1833] Slender Naiad (Najas flexilis) NPWS (2016A).
Chemical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified.	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**0**		Harvest activities will not take place inland.
		5	Activity that would lead to impact on these species or their habitats would be detrimental.
Chemical /Physical			n/a
			n/a

(14) Drongawn Lough SAC (site code: 002187)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Direct impact on the habitat and species therein.	Unauthorized activity along the fringes of the lagoon.	1	5	A	no	n/a	yes	• Harvest must not take place along the fringes of Drongawn Lough SAC.	<u>Kenmare SAC:</u> To maintain the favourable conservation condition of Coastal lagoons in Drongawn Lough SAC (NPWS (2014D).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		This area is highly sheltered and may contain *A. nodosum* near the fringes of the lagoon. However, density is unlikely to be sufficiently high and harvest activities will not take place in these areas.
		5	Harvesting at the fringes of this lagoon may negatively impact on the SAC.
Chemical /Physical			n/a
			n/a

(15) Glanmore Bog SAC (site code: 001879)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on protected species or habitats.	Unauthorized activity in these protected areas.	0	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	<u>Kenmare SAC:</u> To maintain or restore the favourable conservation condition of the following: ➢ 3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) ➢ 3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation ➢ 4010 Northern Atlantic wet heaths with Erica tetralix ➢ 6230 Species-rich Nardus grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) ➢ 7130 Blanket bogs (if active bog) (NPWS, 2016B).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**0**		Harvest activities will not take place inland.
		5	Activity that would lead to impact on these species or their habitats would be detrimental.
Chemical /Physical			n/a
			n/a

(16) Cleanderry Wood SAC (site code: 001043)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on woodland species and habitat.	Unauthorized activity in these protected areas.	0	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	Kenmare SAC: To maintain or restore the favourable conservation condition of the following: 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles 1421 Killarney Fern (Trichomanes speciosum) (NPWS, 2013H).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**0**		Harvest activities will not take place in wooded areas.
		5	Activity that would lead to removal of woodland would be detrimental.
Chemical /Physical			n/a
			n/a

(17) Mucksna Wood SAC (site name: 001371)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Impact on woodland species and habitat.	Unauthorized activity in these protected areas.	0	5	A	no	n/a	yes	• Harvest of *A. nodosum* in these areas will not take place.	Kenmare SAC: To maintain or restore the favourable conservation condition of the following: 91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles. (NPWS 2016D).
Chemical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none identified	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**0**		Harvest activities will not take place in wooded areas.
		5	Activity that would lead to removal of woodland would be detrimental.
Chemical /Physical			n/a
			n/a

(c) Intertidal reef & species within the A. nodosum biotope.

(1) *A. nodosum* seaweed.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	**Control Measures? Yes / No**		
Biological: Excess removal of *A. nodosum* habitat. • Removal of holdfast material and potential *A. nodosum* mortality. • Canopy is cut too short	Mismanagement and/or lack of oversight of activities relating to hand harvest of *A. nodosum*. • Inappropriate technique • Lack of training • Lack of oversight	2	5	A	no	n/a	yes	BioAtlantis will manage activities in a sustainable manner to ensure that excessive removal of *A. nodosum* does not occur and is limited to 20% of total available biomass per site/annum. The technique involves cutting ≥200mm above the holdfast. Key aspects of the system includes: • **A system is in place which ensures:** ➢ Training harvesters to cut between 200-300mm (8-12 inches) above the holdfast, thus ensuring sufficient canopy coverage. Ensuring sufficient canopy coverage prevents potential impacts due to light stress, heat stress or desiccation and prevents potential impacts on biodiversity, species within the biotope or species utilizing or present at the base of the canopy. It also ensures maintenance of habitat for use by other species at high tide. ➢ Training of harvesters to ensure holdfast is not removed. ➢ Check for presence of holdfast via GRN, or other formats by electronic or other means and/or at production facilities. ➢ Sites are inspected post-harvest to check the sustainability of methods employed and harvest locations using the SIF (Appendix 3) or other suitable format by electronic or other means. • **Training:** Harvesters will be provided with training, where necessary, to ensure competence in skills required to harvest *A. nodosum* in an environmentally friendly and sustainable manner. • **Protocols and schedules:** Activities carried out according to clearly defined protocols to ensure that (a) no damage to the environment or underlying growth substrate, and (b) re-growth and re-generation of the vegetation post-harvest is sufficiently facilitated. Standard protocols and methods will include: ➢ Site determination: identification of areas suitable for harvest, e.g. areas predominated by short *A. nodosum* fronds will not be harvested. ➢ Harvest Methods: Use of sickle/knife to cut 200-300mm above frond base, without damaging holdfast or underlying substrate. ➢ Method for bagging of cut weed, communicating with HQ, Incident reporting **Responsibility:** Oversight, planning and teaching provided by BioAtlantis staff along with regularly auditing to assess for compliance with procedures and for potential areas of improvement.	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. Ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19 • Target 3, Objective 2, NPWS, 2013A, pg. 20

Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	Probability	Severity	Reason for Decision
Biological:	**2**		In the absence of oversight, the probability that excessive removal of *A. nodosum* habitat may occur is potentially increased. To ensure that excessive removal does not occur, BioAtlantis will put a system in place which ensures that harvest activities are monitored, recorded, controlled and limited to 20% of the total available biomass per site per annum. Therefore, the risk of over-harvesting is low. It is unlikely that significant levels of *A. nodosum* mortality will arise as harvesters will work when the tide is out, thereby having full view of the harvesting process and actively working to ensure holdfast removal does not occur. This process also requires harvesters to target cutting between 200-300mm (8-12 inches) above the holdfast.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of Intertidal reef community complex (Target 6 of objective 1, pg. 17- 19, NPWS, 2013B). Unregulated over-harvesting and inappropriate harvest methodologies could increase *A. nodosum* mortality to levels beyond background levels. Significant levels of *A. nodosum* mortality are unlikely to acceptable in an SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(2) *Fucus (Fucus vesiculosis, Fucus serratus, Fucus spiralis)*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *Fucus*	Overharvesting of *A. nodosum* and/or inadvertent harvest of nearby species of *Fucus*.	2	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		Increases in the density of *Fucus* species may occur due to hand harvesting of *A. nodosum* (Kelly *et al.,* 2001).However, the probability of inadvertent harvest of these fucoid species is low, given that: • Harvest will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base. • *Fucus* is considered a contaminant and will be recorded as such in the GRN, or other formats by electronic or other means and/or at production facilities.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of Intertidal reef community complex (Target 6 of objective 1, pg. 17- 19, NPWS, 2013B). These species play an important role in the intertidal community and support many of the same fauna as *A. nodosum*.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(3) *Pelvetia canaliculata*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *Pelvetia canaliculata*	Overharvesting of *A. nodosum* and/or inadvertent harvest of nearby *Pelvetia canaliculata*	1	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		*Pelvetia canaliculata* typically occurs on the upper shore. Kelly et al., (2001) found no impacts of hand harvesting *A. nodosum* on *Pelvetia canaliculata*. The probability of inadvertent harvest of this species is very low, given that harvest will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of Intertidal reef community complex (Target 6 of objective 1, pg. 17- 19, NPWS, 2013B). Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(4): Red algae *(e.g. Polysiphonia lanosa (Linnaeus) Tandy)*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Role of *Polysiphonia lanosa (Linnaeus)* Tandy within the *A. nodosum* canopy:
In brief, *Polysiphonia lanosa (Linnaeus)* Tandy is a hemiparasitic species, predominantly using *Ascophyllum nodosum* as a host and more rarely, *Fucus vesiculosis* (Guiry, M.D. & Guiry, G.M. 2013B). This species is present throughout the north Atlantic in areas occupied by *A. nodosum* (Kelly *et al.,* 2001).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of habitat important to epiphytes of *A. nodosum*, e.g. red algae, *Polysiphonia lanosa (Linnaeus) Tandy*	Overharvesting of *A. nodosum*	2	2	A	no	n/a	yes	As above in Table C1 (*A. nodosum*).	None specified by NPWS or EU regulations.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		As above in Section C1 (*A. nodosum*).
		2	As these species are not protected under EU regulations the severity associated overharvesting of *A. nodosum* is reduced to reside within the range of 1-4. However, a low-moderate severity score of 2 was assigned given the role of these species within the *A. nodosum* canopy and their presence on *A. nodosum* (Kelly *et al.,* 2001; see below for details). A higher score of 3-5 is unjustified. This is due to the fact that spores from these species are highly successful in colonizing *A. nodosum,* and given the sustainable nature of the harvest system, effects are unlikely to be detrimental to the population.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(5): Red algae *(M. stellatus Guiry, P. palmata, P. umbilicalis, L. articulata Lyngbye, O. pinnatifida).*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of Red algae: • *Mastocarpus stellatus (Stackhouse) Guiry,* • *Palmaria palmata,* • *Porphyra umbilicalis* • *Lomentaria articulata (Hudson) Lyngbye* • Pepper dulse *(Osmundea pinnatifida)*	Overharvesting of *A. nodosum*	1	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		It is unlikely that Red algae, *Mastocarpus stellatus, Palmaria palmata, Porphyra umbilicalis* will be altered due harvesting of *A. nodosum* given that: (a) The relatively rare occurrence of these species within the *A. nodosum* canopy. (b) Harvest of *A. nodosum* will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base, generally above the contact level with these species. (c) *Mastocarpus stellatus (Stackhouse) Guiry* mainly occurs on exposed shores outside the A. nodosum zone. It may also be found on shore with less exposed shores under fucoid species (Kim SK, 2015. The species was identified to be present at low level beneath the *A. nodosum* canopies in the west of Ireland (Kelly L. *et al.,* 2001). (d) *Palmaria palmata* grows on littoral and sublittoral zones to a depth of 20 m in areas which are sheltered or moderately exposed (Hill JM. 2008), typically outside the *A. nodosum* zone. The species can grow epilithically on rocks of epiphytically on *Fucus* or *Laminaria* (Hill JM. 2008). (e) *Porphyra umbilicalis* mainly occurs where spray wets the upper shore, also occurring up to 15m above the high tide level on coasts which are wave exposed (Cole KM and Robert S, 1990 and references therein), typically outside the *A. nodosum* zone. (f) *Lomentaria articulata (Hudson) Lyngbye* generally grows to ~ 4 inches, substantially less than the 8 inch cutting limit for *A. nodosum* harvesting. Found in middle & lower shore growing on rocks, in pools, shady places or under seaweed. Can occur in deeper waters of ~18 m (Pizzolla PF 2008A). (g) Pepper dulse *(Osmundea pinnatifida).* Occurs intertidally on middle and lower rocky shores, pools and on rocks, often with a greenish-yellow turf like appearance. Grows to ~3.5 inches (Pizzolla PF, 2003), substantially less than the 8 inch cutting limit for *A. nodosum* harvesting..
		5	Severity is potential impacts is high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(6): *Laminaria spp. (Laminaria digitata, Laminaria hyperborea)*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *Laminaria digitata* or *Laminaria hyperborea*	• Inadvertent harvesting of *Laminaria digitata* growing in proximity to the intertidal zone. • Inadvertent harvesting of *Laminaria hyperborea* in deeper waters outside the intertidal zone. • Damage to *Laminaria* beds by boats en route to foreshore.	1	5	A	no	n/a	yes	Harvesting will be limited to *A. nodosum* within the intertidal zone (As above in Section C1. The code of practice ensures that appropriate navigation methods are used when accessing the foreshore, thus preventing damage to *Laminaria* and its substrate at low tide.	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		It is unlikely that *Laminaria spp.* will be altered due harvesting of *A. nodosum* given the following: • *Laminaria* spp. is generally found in exposed areas where *A. nodosum* does not grow. • While *Laminaria digitata* can occur in close proximity to the intertidal *A. nodosum* reef in certain areas throughout Kenmare SAC, this species will not be targeted for harvesting. • *Laminaria hyperborea* occurs in deeper waters at depths of between 4m and 22m, outside the *A. nodosum* zone.
		5	Severity is potential impacts is high, as these species are listed by NPWS as an important part of the intertidal and subtidal reef complexes in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(7): *Himanthalia sp.*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density or distribution of *Himanthalia sp.*	• Inadvertent harvesting of *Himanthalia sp.* • Damage to *Himanthalia sp.* beds by boats en route to foreshore.	1	5	A	no	n/a	yes	Harvesting will be limited to *A. nodosum* within the intertidal zone (As above in Section C1). *Himanthalia* will not be harvested. The code of practice ensures that appropriate navigation methods are used when accessing the foreshore.	<u>Kenmare SAC:</u> To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		This species will not be targeted for harvesting, thus the probability of affecting its density or distribution of very low. In addition, *Himanthalia sp.* occurs on exposed to moderately exposed lower eulittoral bedrock, where *A. nodosum* is rarely found (Tillin HM & Budd G, 2016).
		5	Severity is potential impacts is high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(8): *Littorina littorea* (common periwinkle)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *L. littorea* or removal of habitat important to *L. littorea*.	• Overharvesting of *A. nodosum* • Inappropriate technique • Lack of training	2	5	A	no	n/a	yes	• **As above in Section C1 (*A. nodosum*).** • **Additionally:** ➢ Canopy damage: Harvesters will avoid periwinkle disturbance by: (a) cutting at low tide, (b) aiming to leave between 200-300mm (8-12 inches) of material behind and (c) under no circumstances cutting less than 200mm above the holdfast. (d) avoiding holdfast removal ➢ Other habitats: Harvesters will be provided with training, where necessary, to avoid *Fucus vesiculosis* and *F. serratus*, which are additional habitats for periwinkles. ➢ By-catch: *Animalia* observed post-harvest will be returned to the water, where possible.	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		The study by Kelly *et al.,* (2001) did not identify any significant impacts of hand harvesting on *L. littorea*. The likelihood of hand harvesting impacting on *L. littorea* is considered low for the following reasons: • **Removal of habitat:** The risk of excess removal of habitat is reduced, as hand harvesting system is designed to be minimally invasive and prevents overharvesting. • **Non-targeted removal:** *Littorina littorea* actively feeds at high tide, seeking shelter within the canopy at low tide (Karleskint *et al.,* 2009). The technique employed by BioAtlantis ensures that harvest takes place at low tide when periwinkles are more likely to be dormant or covered by *A. nodosum* fronds. Harvest will not take place during the feeding stage at high tide when periwinkles are out of their shells. Hence, the probability of removal of periwinkles as non-target species is reduced considerably.

			• **Reproduction:** *L. littorea* eggs are released with the tide. Following development from a free-living form, *L. littorea* settles at the base of the *A. nodosum* canopy. Severe reductions in canopy could affect settlement of free-living form, *L. littorea*. The risk for negatively affecting reproductive requirements is reduced as the harvesting system ensures that overharvesting of the canopy does not occur. • **Anthropogenic effects:** *L. littorea* is relatively inactive at low tide at the base of fucoid canopies, thus reducing the likelihood of direct anthropogenic impacts. • **Other niches:** As periwinkles reside within other fucoid biotopes besides *A. nodosum* (e.g. *Fucus vesiculosis),* the likelihood of harvesting reducing or having a detrimental effects the overall periwinkle population of intertidal reef community complexes in Kenmare River SAC is considered low.
		5	Severity of potential impacts is high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(9): *Littorina obtusata* (flat periwinkles)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of winkles or removal of habitat important to periwinkles.	• Overharvesting of *A. nodosum* • Inappropriate technique • Lack of training	2	5	A	no	n/a	yes	• **As above in for *Littorina littoria*.** • **Additionally:** ➢ Reproduction: Harvesters will be provided with training, where necessary, to identify and avoid *A. nodosum* plants or fronds which contain visible *L. obtusata* eggs masses.	None specified by NPWS or EU regulations.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		While Kelly et al (2001) show that reductions in numbers were observed in winter months, harvesting did not have an impact on the size distribution of *Littorina obtusata*. Notably, this species of periwinkle is not listed as present in the Kenmare SAC intertidal reef community complex (ref: NPWS, 2013A). Should *L. obtusata* be present in Kenmare River SAC, the likelihood of hand harvesting impacting on this species is considered low for the following reasons: • **Removal of habitat:** The risk of excess removal of habitat is reduced, as the hand harvesting system is designed to be minimally invasive and prevents overharvesting. • **Non-targeted removal:** *Littorina obtusata* tends to feed at high tide. At low tide, *L. obtusata* crawls into the algae canopy and remains dormant unless conditions are favourable, such as dampness, etc (Williams *et al.,* 1990). The technique employed by BioAtlantis ensure that harvest takes place at low tide when periwinkles are more likely to be dormant or covered by *A. nodosum* fronds. Harvest will not take place during the feeding stage at high tide when periwinkles are out of their shells. Hence, the probability of removal of periwinkles as non-target species is reduced considerably. • **Reproduction:** *L. obtusata* lays white, oval eggs masses containing a large number of eggs on *Ascophyllum, Fucus vesiculosis* and *F. serratus*. The eggs masses are clearly visible to the naked eye. Hand harvesting could lead to reductions in eggs numbers by removing frond containing

			egg masses. In The risk for negatively affecting reproductive requirements is reduced as the harvesting system requires avoidance of egg masses and ensure that overharvesting of the canopy does not occur. • **Anthropogenic effects:** periwinkles relatively inactive at low tide at the base of the fucoid canopies, thus reducing the likelihood of direct anthropogenic impacts. • **Other niches:** As periwinkles reside within other fucoid biotopes besides *A. nodosum* (e.g. *Fucus vesiculosis*), the likelihood of harvesting reducing or having a detrimental effects the overall periwinkle population of intertidal reef community complexes in Kenmare River SAC is considered low.
		5	While this species of periwinkle is not listed as present in the Kenmare SAC intertidal reef community complex (ref: NPWS, 2013A, pg. 10), it is treated with the same level of importance in this application.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(10): *Littorina saxatilis* (rough periwinkle)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *L. saxatilis* and/or habitat important to *L. saxatilis*.	Overharvesting of *A. nodosum*	1	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*) and C8 *(L. littorea).*	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		The study by Kelly *et al.,* (2001) did not identify any significant impacts of hand harvesting on *L. saxatilis*. The likelihood of hand harvesting impacting on *L. saxatilis* is considered very low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs and is relatively inactive at low tide when harvesting occurs. • **Removal of habitat:** *L. saxatilis* is found within bedrock crevices, beneath stones or in empty barnacle shells, occurring from the upper eulittoral zone to the littoral fringe of the intertidal zone. It can occur in a range of habitats including firm mud banks, salt marshes or submerged attached to Zostera or Fucus (Ballerstedt, S. 2007). *L. saxatilis* is quite tolerant to desiccation. *L. saxatilis* is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting. • **Non-targeted removal:** *Littorina saxatilis*: grazes on microalgae covering rocks. The species has a short feeding period generally around high tide when food substrate is wet (Sokolova IM and Pörtner H, 2003) and references therein), retiring to its refuge microhabitat at low tide (Little and Kitching, 1996). Hand harvesting occurs at low tide when *L. saxatilis* is more likely to be dormant, thus reducing the probability of by-catch. • **Reproduction:** Reproduction involves separate sexes, with internal fertilization. Some sub-species lay eggs within crevices of rocks, with young emerging into the rocks, post hatch. Reproduction in other subspecies is ovoviviparous, and young emerge from the female on the rock substrate (Anon, 2016A). The likelihood of negatively affecting reproductive requirements is low as the system ensures that overharvesting of the canopy does not occur and that other relevant habitats are unaffected. • **Anthropogenic:** *L. saxatilis* is relatively inactive at low tide, thus reducing the likelihood of direct anthropogenic impacts.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(11): *Melarhaphe neritoides* (small periwinkle, formerly *Littorina neritoides*)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *M. neritoides* and/or habitat important to *M. neritoides.*	Overharvesting of *A. nodosum*	1	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*) and C8 *(L. littorea).*	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Kelly *et al.,* (2001) did not identify *M. neritoides* in their study. The likelihood of hand harvesting impacting on *M. neritoides* is considered very low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs and is relatively inactive at low tide when harvesting occurs. • **Removal of habitat:** *M. neritoides* lives inside old barnacles or high on rocky shores in cracks & crevices, typically outside the *A. nodosum* zone. *M. neritoides* often co-occurs with *L. saxatilis*. M. neritoides is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting. • **Non-targeted removal:** Similar to *L. saxatilis*, *M. neritoides* retires to its refuge microhabitat at low tide, emerging to graze on lichens and detritus on rocks at high tide (pg. 94 and 95, Little and Kitching, 1996). Hand harvesting occurs at low tide when *M. neritoides* is more likely to be dormant, thus reducing the probability of by-catch. • **Reproduction:** Separate males and females, releases floating (pelagic) egg capsules at high tide from which free living offspring hatch. The likelihood of negatively affecting reproductive requirements is low as the harvesting system is minimally invasive. • **Anthropogenic:** *M. neritoides* is relatively inactive at low tide, thus reducing the likelihood of direct anthropogenic impacts.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(12): *Gibbula cineraria* (the Grey Top Shell)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *G. cineraria* and/or habitat important to *G. cineraria.*	Overharvesting of *A. nodosum*	1	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*) and C8 *(L. littorea).*	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Physical impacts with rocks.	Physical impacts with *G. cineraria* on rocks during daytime.	1	5	A	no	n/a	yes	Anthropogenic impacts: Harvesters will be provided with training, where necessary, to identify and avoid physical impacts with clusters of *G. cineraria* on or beneath boulders.	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Kelly *et al.,* (2001) did not identify any significant impacts of harvesting on *G. cineraria*. The likelihood of hand harvesting impacting on *G. cineraria* is considered low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs. While the likelihood is quite low, anthropogenic impacts may occur due to its propensity for activity during the day, irrespective of tide: • **Removal of habitat:** *G. cineraria* lives throughout the Eulittoral zone. *G. cineraria* is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting. • **Non-targeted removal:** *G. cineraria* feeds on detritus and microalgae. The likelihood of by-catch due to harvesting is relatively low, as *G. cineraria* generally does not graze directly on fucoid species. • **Reproduction:** Spawning and fertilization occur in the sea. The likelihood of negatively affecting reproductive requirements is low as the harvesting system is minimally invasive.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:	**1**		**Anthropogenic:** *G. cineraria* is observed on the tops of rocks during daytime, retreating during darkness. The diurnal migration mechanism controlling this process is independent of tides (pg. 96, Little and Kitching, 1996). The activity of *G. cineraria* on the foreshore during daytime raises the potential for anthropogenic impacts during harvesting, e.g. physical impact with *G. cineraria* present on the surface of boulders.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.

(13): *Nucella lapillus* (Dog Welk)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *Nucella lapillus* and/or habitat important to *Nucella lapillus*	Overharvesting of *A. nodosum.*	1	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*) and C8 *(L. littorea).*	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Physical impacts with rocks.	Physical impacts with *N. lapillus* on rocks during daytime.	1	5	A	no	n/a	yes	Anthropogenic impacts: Harvesters will be provided with training, where necessary, to identify and avoid physical impacts with *N. lapillus* present on exposed boulders.	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Kelly *et al.,* (2001) did not identify any significant of harvesting on *N. lapillus*. The likelihood of hand harvesting impacting on *N. lapillus* is considered low, as the species is not exclusively reliant with *A. nodosum* for dietary or reproductive needs. While the likelihood is low, anthropogenic impacts may occur due to its propensity for activity during the day, irrespective of tide: • **Removal of habitat:** *N. lapillus* occurs from the mid shore downwards on both exposed and sheltered rocky shores. *N. lapillus* is not exclusively associated with *A. nodosum*, which reduces the likelihood of impacts due to harvesting. • **Non-targeted removal:** *N. lapillus* is carnivorous and feeds on barnacles and mussels. *N. lapillus* bores holes into the shells of target prey using a modified tooted radula with secretion of shell softening agents (Anon, 2016A). Paralyzing chemicals and digestive enzymes are secreted into the shell, which can then be ingested via the welks extendable proboscis. The likelihood of by-catch due to harvesting is relatively low, as *N. lapillus* does not graze on fucoid species. • **Reproduction:** Reproduction involves separate sexes, with internal fertilization. Eggs are laid in rock crevices. The likelihood of negatively affecting reproductive requirements is low as the harvesting system is minimally invasive and will not expose rock crevices.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:	**1**		**Anthropogenic:** *N. lapillus* can be active at low tide, thus increasing the likelihood of anthropogenic impacts during harvesting, e.g. physical impact with *N. lapillus* present on the surface of boulders, etc.
		5	Severity of potential impacts is high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.

(14): *Patella vulgata* and *Patella ulyssiponensis* (Patellid limpets)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of *Patella vulgata* and *Patella ulyssiponensis* (Patellid limpets)	Overharvesting of *A. nodosum*	2	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*). Additionally: ➢ Canopy damage: Harvesters will avoid limpet disturbance by: (a) cutting at low tide, (b) aiming to leave between 200-300mm (8-12 inches) of material behind (c) under no circumstances cutting less than 200mm above the holdfast. (d) avoiding holdfast removal ➢ By-catch: *Animalia* observed post-harvest will be returned to the water, where possible.	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		**Removal of habitat:** While Kelly *et al.,* (2001) demonstrate that harvesting can alter limpet density and size, the likelihood is reduced as the hand harvesting system is designed to be minimally invasive and prevents overharvesting.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(15): Barnacles

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of barnacles or habitat important to Barnacles • *Elminius modestus* • *Semibalanus balanoides* • *Chthamalus stellatus*	Overharvesting of *A. nodosum*	2	5	UA	yes	No	yes	As above in Section C1 (*A. nodosum*).	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		Boaden and Dring, 1980 reported a reduction in barnacle numbers due to *A. nodosum* harvest when *A. nodosum* was cut at low levels between 10-15cm (4-6 inches) above the holdfast. These effects were not reported by Kelly *et al.,* 2001. As outlined Section C1 above, there is a low likelihood of excess removal of *A. nodosum* through hand harvesting. This reduces the potential for negative effects on barnacle numbers.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(16): Anemone *(e.g. Actinia equine).*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of Actinia equina, or habitat important to species such as *Actinia equina*.	Overharvesting of *A. nodosum.*	1	5	UA	yes	No	yes	As above in Section C1 (*A. nodosum*).	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		There is a low likelihood that harvesting would impact on species such as *Actinia equina*, as this species is not limited to the *A. nodosum* zone.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(17): Lichens

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of Lichens *(Xanthoria parietina, Verrucaria maura, Ochrolechia parella, Ramalina sp., Anaptychia runcinata* and *Lecanora atra).*	• Overharvesting of *A. nodosum.* • Damage to lichen substrate.	1	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		There is a very low likelihood that harvesting would impact on species of lichen, as these species are generally found in areas outside the *A. nodosum* zone: • While *Xanthoria parietina, Verrucaria Maur* are common on rocky coasts on the upper limit of the intertidal, these occur frequency on exposed coasts where *A. nodosum* is not found. • While *Ramalina sp.: (e.g. R. siliquosa)* grows on the upper portions of rocky sea shores, these species are rare within the *A. nodosum* biotope. *Ochrolechia parella:* found on silicaeous rock inland and in coastal areas, also grows on trees. Thus this species is not limited to the *A. nodosum* zone. • *Anaptychia runcinata* occurs inland and on hard coastal rock. Hence this species is not limited to the *A. nodosum* zone. • *Lecanora atra:* occurs on siliceous rocks at the splash zone and beyond. Therefore, this species is not limited to the *A. nodosum* zone.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(18): Hydroid

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of Hydroid *(Dynamena pumila Linnaeus)* or habitat important to these species.	Overharvesting of *A. nodosum*	3	2	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	None specified by NPWS or EU regulations.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**3**		As outlined Section C1 above, there is a low likelihood of excess removal of *A. nodosum* through hand harvesting. There is no evidence from the study by Kelly *et al.,* (2001) that hand harvesting of *A. nodosum* in the west of Ireland is associated with alterations to density of hydroid species. However, their presence on the tips of *A. nodosum* increases the probability of altering their density.
		2	As these species are not protected under EU regulations the severity associated overharvesting of *A. nodosum* is reduced to reside within the range of 1-4. A low-moderate severity score of 2 was assigned given their presence and potential growth on tips of *A. nodosum* (Kelly *et al.,* 2001; see below for details). A higher score of 3-5 is unjustified as Dynamena pumila Linnaeus species grows on other fucoid biotopes such as *Fucus serratus*. Hence , the overharvesting of *A. nodosum* should it occur, would not represent a detrimental threat to these populations.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(19): Sponges

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of Sponges *(e.g., Ophlitaspongia, Halichondria sp.* and *Hymeniacidon sp.)*	Overharvesting of *A. nodosum*	2	5	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	Kenmare SAC: To conserve the natural condition of intertidal reef community complex. ref: • Target 6 of Objective 1, NPWS, 2013A, pg.19. • Target 3, Objective 2, NPWS, 2013A, pg. 20.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		While Boaden and Dring (1980) identified changes in density of *Hymeniacidon* and *Halichondria* species due to harvest of *A. nodosum,* the harvest methodology involved cutting between 10-15cm (4-6 inches). As outlined Section C1 above, there is a low likelihood of excess removal of *A. nodosum* through hand harvesting. This reduces the potential for negative effects on species of sponge.
		5	Severity of potential impacts is rated high, as these species are listed by NPWS as an important part of the intertidal reef complex in Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(20): Sea squirts

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of Sea squirts *(e.g. Dendrodoa grossularia van Beneden* and *Ascidiella scabra O.F. Müller).*	Overharvesting of *A. nodosum*	1	2	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	None specified by NPWS or EU regulations.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		Kelly *et al.,* 2001, demonstrate that *Ascidiella* occur at low levels in the *A. nodosum* zone of along parts of the west of Ireland.
		2	Since seasquirts such as *Ascidiella* are not protected under EU regulations, the severity associated with overharvesting of *A. nodosum* is reduced to reside within the range of 1-4. A low-moderate severity score of 2 was assigned.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(21): Other Mobile species

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

In the study by Kelly *et al.,* 19 mobile animals were identified. However, in some cases, numbers were insufficient to allow for robust statistical analysis of the potential impact of hand harvesting of *A. nodosum*. Harvesting of *A. nodosum* did not have any significant effects on fish and other large mobile epifauna.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Potential Alteration to density of or habitat important for Mobile species (Phylum Arthropoda (*Amphipods, isopods crabs*), Phylum Platyhelminthes, Phylum Annelida, Phylum Foraminifera, Phylum Nematoda.	• Overharvesting of *A. nodosum.* • Non-return of by-catch	2	2	A	no	n/a	yes	As above in Section C1 (*A. nodosum*). By-catch: *Animalia* observed post-harvest will be returned to the water, where possible.	None specified by NPWS or EU regulations.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		The probability of overharvesting *A. nodosum* is outlined in Section C1 above. A higher score of 3-5 was unjustified as most amphipods & isopods are relatively inactive at low tide. Harvest at low tide therefore, avoids potential by-catch of species which would otherwise be active in the intertidal zone during high tide. The likelihood of displacement will be low and harvesters will have full view and control of their activities. Harvesters will work to ensure that co-harvesting of other species does not occur, thus reducing the potential for trapping. As with other species, by-catch observed post-harvest will be returned to the water, where possible (See Appendix 4, 'Code of Practise').
		2	These species are not protected in EU or Irish Law thus, the severity score is assigned between 1-4.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(22): Ephemeral green algae

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Alteration to density of Ephemeral green algae (e.g. *Cladophora rupestris (Linnaeus) Kützing, Ulva sp. Linnaeus* and *Enteromorpha sp. Link;*	Overharvesting of *A. nodosum*	1	3	A	no	n/a	yes	As above in Section C1 (*A. nodosum*).	None specified by NPWS or EU regulations.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**1**		It is unlikely that ephemeral green algae (e.g. *Cladophora rupestris (Linnaeus) Kützing, Ulva sp. Linnaeus* and *Enteromorpha sp. Link)* will be altered due harvesting of *A. nodosum* given that: (i) Kelly L. *et al.,* 2001, found that hand harvesting had no significant impact on ephemeral green algae over time. (j) These species are not exclusively depends on the intertidal zone where *A. nodosum* grows and are not directly dependent on *A. nodosum* canopy. (k) These species are very distinctive in appearance and will not be confused with *A. nodosum*. (l) Harvest of *A. nodosum* will be limited to larger vegetative growth of *A. nodosum* fronds, approx. 200-300mm above the base, generally above the contact level with these species. (m) *Cladophora rupestris* grows up to 20 cm in height (Budd GC, 2007), just less than the 8 inch cutting limit for *A. nodosum* harvesting. Found in rock pools, rocks surfaces, crevices or as undergrowth to macroalgae throughout the shore. (n) *Ulva sp. Linnaeus* grows up to 30cm in length, spreading across substrates as a broad, crumpled, translucent, membranous fronds. It occurs in a range of intertidal habitats and brackish habitats, also occurring in estuaries (Pizzolla PF, 2008B). (o) *Enteromorpha sp. Link;* (e.g. *Ulva intestinalis*), can grow to ~30cm and occurs in a range of habitats throughout the shore, including rocks, mud, sand and in rock pools. Can also occur in brackish water in the splash zone (Budd GC and Pizzolla, PF, 2008). (p) Other species of seaweed will be considered as contaminants during intake of harvested *A. nodosum*, and this will be recorded as such on the GRN, or other formats by electronic or other means and/or at production facilities..

		3	As these species are not protected under EU regulations the severity associated with overharvesting of *A. nodosum* is reduced to reside within the range of 1-4. A moderate severity score of 3 was assigned given the important role of Ephemeral green algae in this zone. While occurring at low densities in *A. nodosum* biotope, alterations to ephemeral algae may lead to further alterations in herbivorous littorinid fauna (Kelly et al., 2001 and references therein). In turn, this has potential to decrease re-establishment of the fucoid canopies at the germling stage. However, vegetative reproduction rather than sexual reproduction is considered the most important mechanism in which the density of the *A. nodosum* population is maintained, most notably by generating shoot growth and subsequent increases in biomass for years thereafter.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(d) Continuous Disturbance:

In accordance with EU Law, NPWS recommend that continuous disturbance of each community type should not exceed an approximate area of 15%. To measure the potential impact on structure and function in Kenmare River SAC, BioAtlantis were provided with the marine community type datasets shapefile from NPWS in ESRI format. Engineering personnel at BioAtlantis calculated (a) the Total Area (m^2) in Kenmare River SAC of each Annex I Habitat, (b) the Area affected by harvest activities/annum (m^2 and percentage).

(1) Zostera Community

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological/Physical: Continuous disturbance of Zostera Community exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Zostera Community type.	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of Zostera Community will exceed an approximate area of 15%. Calculations performed using shape file data from NPWS indicate that the Zostera Community area affected by harvest activities/annum represents 0% of the total zostera community type in the SAC (see below). The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, Zostera Community.
		5	Continuous disturbance greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m^2	**Ha**	**m^2**	**Ha**	**%**	**%**
1	Zostera Community	1451621	145.2	0	0	0%	0

(2) Maerl Dominated community

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of Maerl Dominated community exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Maerl Dominated community type	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of Maerl Dominated community will exceed an approximate area of 15%. Calculations performed using shape file data from NPWS indicate that the Maerl Dominated community area affected by harvest activities/annum represents 0% of the total Maerl Dominated community type in the SAC (see below). The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, Maerl dominated Community.
		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Maerl Dominated community	2523260	252.3	0	0	0%	0

(3) *Laminaria-dominated community complex*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of *Laminaria*-dominated community complex exceeds an approximate area of 15%.	Harvest activity taking place on >15% of *Laminaria* dominated community type	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of *Laminaria* dominated community will exceed an approximate area of 15%. Calculations performed using shape file data from NPWS indicate that the *Laminaria* dominated community area affected by harvest activities/annum represents 0% of the total *Laminaria* dominated community in the SAC (see below). The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, *Laminaria*-dominated community complex.
		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	*Laminaria* dominated community complex	36782752	3678.3	0	0	0%	0

(4) Intertidal mobile sand community complex

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of Intertidal mobile sand community complex exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Intertidal mobile sand community complex.	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of this community will exceed an approximate area of 15%. Calculations performed using shapefile data from NPWS indicate that the area of this community type affected by harvest activities/annum represents 0% of the total Intertidal mobile sand community complex type in the SAC (see below). The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, Intertidal mobile sand community complex.
		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Intertidal mobile sand community complex	636507	63.7	0	0	0%	0%

(5) Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex.	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of this community will exceed an approximate area of 15%. Calculations performed using shapefile data from NPWS indicate that the area of this community type affected by harvest activities/annum represents 0.009% of the total Muddy fine sands dominated by polychaetes and *Amphiura filiformis* community complex in the SAC (see below). However, as outlined in the Code of Practice, harvesting will not take place in muddy fine sand areas and harvesters will follow "Environmentally safe navigation" approaches when travelling to harvest zones, thus avoiding impacts and preventing disturbance to soft substratum areas and their associated communities and species. These mitigation measures prevents any potential impacts on this muddy fine sand complex.

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Muddy fine sands dominated by polychaetes & *A. filiformis* community complex.	209321835	20932.2	36232.04	3.62	0.017%	0.009%

		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

(6) Fine to medium sand with crustaceans and polychaetes community complex.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of Fine to medium sand with crustaceans and polychaetes community complex, exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Fine to medium sand with crustaceans and polychaetes community complex.	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of this community will exceed an approximate area of 15%. Calculations performed using shapefile data from NPWS indicate that the area of this community type affected by harvest activities/annum represents 0% of the total Fine to medium sand with crustaceans and polychaetes community complex in the SAC (see below).

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Fine to medium sand with crustaceans & polychaetes community complex.	19953464.32	1995.3	0	0	0%	0%

		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

(7) Coarse sediment dominated by polychaetes community complex

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of Coarse sediment dominated by polychaetes community complex, exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Coarse sediment dominated by polychaetes community complex	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of this community will exceed an approximate area of 15%. Calculations performed using shapefile data from NPWS indicate that the area of this community type affected by harvest activities/annum represents 0% of the total Coarse sediment dominated by polychaetes community complex in the SAC (see below). The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, Coarse sediment dominated by polychaetes community complex.
		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Coarse sediment dominated by polychaetes community complex.	83342197	8334.2	0	0	0%	0%

(8) Shingle

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of shingle exceeds an approximate area of 15%.	Harvest activity taking place on >15% of shingle community type	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4). Mitigation measures outlined in Section (a) 10 must be adhered to.	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a low probability that continuous disturbance of shingle will exceed an approximate area of 15%. Calculations performed using shape file data from NPWS indicate that the shingle area affected by harvest activities/annum represents 0% of the total shingle community type in the SAC (see below). The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, Shingle. However, as it is possible that shingle may occur in proximity to harvest areas in certain locations, mitigation measures outlined in Section (a) 10 and in the Code of Practice, in relation to shingle, must be adhered to.
		5	Continuous disturbance of shingle over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Shingle	14239	1.4	0	0	0%	0

(9) Intertidal reef community complex

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of intertidal reef community complex exceeds an approximate area of 15%.	Harvest activity taking place on >15% of reef communities.	2	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4). Mitigation measures outlined in Section (a) 11 must be adhered to.	<u>Kenmare SAC:</u> Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**2**		There is a low probability that continuous disturbance of intertidal reef community complex will exceed an approximate area of 15%. Calculations performed using shape file data from NPWS indicate that the reef area affected by harvest activities/annum represents 4.05% of the total reef communities in the SAC (see below). Mitigation measures outlined in Section (a) 11 and in the Code of Practice, in relation to reef, must be adhered to.
		5	Continuous disturbance of reef over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Intertidal reef community complex	6802856	680.3	275652.4	27.57	4.05%	0.07%

(10) *Pachycerianthus multiplicatus* community

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of Pachycerianthus multiplicatus community complex exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Pachycerianthus multiplicatus community complex.	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical:	**1**		There is a very low probability that continuous disturbance of this community will exceed an approximate area of 15%, as the species is subtidal and will not be subjected to harvesting. The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, *Pachycerianthus multiplicatus* community complex.
		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Pachycerianthus multiplicatus community complex	75554.2	7.5	0	0	0%	0%

(11) Subtidal reef with echinoderms and faunal turf community complex

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Continuous disturbance of Subtidal reef with echinoderms and faunal turf community complex exceeds an approximate area of 15%.	Harvest activity taking place on >15% of Subtidal reef with echinoderms and faunal turf community complex.	1	5	A	no	n/a	yes	Management are aware of obligations for ensuring disturbance does not exceed approx. 15% of the area. This requirement is listed in the "Code of Practise" (Appendix 4).	Kenmare SAC: Disturbance of each community type should not exceed an approximate area of 15%. Ref: NPWS, 2013A, pg. 16.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological / physical:	**1**		There is a very low probability that continuous disturbance of this community will exceed an approximate area of 15%, as the species/habitat is subtidal and will not be subjected to harvesting. The figure of 0% is assigned to areas where *A. nodosum* does not grow or where BioAtlantis have specifically avoided in this application due to the sensitive nature of some of these areas, in this case, Subtidal reef with echinoderms and faunal turf community complex (*A. nodosum* is intertidal in distribution and does not grow subtidally, thus *A. nodosum* cannot be harvested in these areas).
		5	Continuous disturbance over an approx. area greater than 15% per annum would represent unfavourable conservation status for Kenmare River SAC.
Chemical:			n/a
			n/a

No.	**Marine community types**	**Total Area in Kenmare River SAC**		**Maximum Annual area affected by hand harvest activities**			**Area of Large Shallow Inlets & Bays [1160] affected/annum**
		m²	**Ha**	**m²**	**Ha**	**%**	**%**
1	Subtidal reef with echinoderms and faunal turf community complex	48375228.1	4837.4	0	0	0%	0%

(e) Broad, holistic examination of the nature, extent and impact of harvesting.

(1): The spatial extent of harvesting techniques and activities.

(i) Management of expansive and prolonged operations

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Harvest activities are mis-managed, with low traceability or oversight.	It is difficult to manage, harvest activities over such as large area.	2	5	A	no	n/a	yes	A system is in place which ensures that: • Activities are planned in advance. • Site-specific management approach: Harvest locations, pick-up points, quantities, quality measures & personnel involved are recorded on a daily basis. A full-time Resource Manager is responsible and the system will be regularly monitored and assessed via quarterly and annual audits. • See "Code of Practise" for details (Appendix 4).	Ensuring protection of Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		There is a low probability of mismanagement. This is because the BioAtlantis harvesting system ensures full control over all aspects of the harvesting activities. It has been designed to be automated and with full oversight and traceability from point of harvest to production. The system also ensures robust follow-up, with corrective actions and measures being issued where applicable, in the event that non-conformances or incidents occur. A higher score of 3-5 was unjustified as BioAtlantis have a proven track record in implementing and managing high quality systems (e.g. GMP+), which require high levels of traceability, oversight and responsibility.
		5	Without full control over harvest activities, it would not be possible to verify that the systems for protecting the SAC are being adhered to.
Chemical/ Physical			n/a
			n/a

(ii) Numbers of personnel and exploitation levels

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: • Mismanagement of personnel. • Overexploitation • Increased anthropogenic impacts	• Poor management • Lack of oversight • To many people in site	2	5	A	no	n/a	yes	A system is in place which ensures that: • Activities are planned in advance. • Site-specific management approach: Harvest locations, pick-up points, quantities, quality measures & personnel involved are recorded on a daily basis. A full-time Resource Manager is responsible and the system will be regularly monitored and assessed via quarterly and annual audits. • See "Code of Practice" for details (Appendix 4).	Ensuring protection of Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological:	**2**		• There is a low probability of mismanagement of personnel or overexploitation. This is because the BioAtlantis system requires full control over where harvesters work and the quantities of harvest involved via the GRN, or other formats by electronic or other means and/or at production facilities. The full time Resource Manager must inspect and verify on the Site Inspection Form that no more than 20% of the total available biomass per site per annum is harvested, thus monitoring potential for overharvesting on a regular basis. • Increased anthropogenic impacts due to increases numbers of harvesters is unlikely. Approximately 2-4 harvesters will work on small-medium sized sites. Medium to large islands/sites may require between 4-6, while larger islands/sites will likely require approximately 6-10 harvesters. The low number of people over a wide area reduces the potential for anthropogenic impacts (e.g. intensity of trampling) on the biotope. In fact, given that the BioAtlantis plan targets specific areas at specific times of the year, the low levels of trampling events will also be largely episodic in nature.
		5	Mismanagement and overexploitation could damage the SAC.
Chemical:			n/a
			n/a
Physical:			n/a

(2): The potential interaction effects of seaweed harvesting

(i) Targeted removal of species

See C1 above for analysis of targeted removal of *A. nodosum*

(ii) Non-Targeted removal of species

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological/ physical: Removal of: • *Fucus* • Periwinkles & limpets • Amphipods & isopods	• Inappropriate technique • Lack of training • Lack of oversight	2	5	A	Yes	Yes	yes	A system is in place which ensures that: • *Fucus* sp. will not be targeted for harvesting. • Severe reductions in canopy coverage will not occur, thus ensuring sufficient habitat for active feeding stages and reproductive purposes of *Animalia*. • *A. nodosum* mortality does not occur. Otherwise, reductions in habitat for *Animalia* could occur. • Harvesters will work to ensure that co-harvesting of other species does not occur (including mobile, immobile and encrusting species). • By-catch: *Animalia* observed post-harvest will be returned to the water, where possible. ❖ For more information on the above, see section C8-C14 (gastropods), C2 (Fucus) and C21 (Amphipods and isopods). ❖ All control measures are listed in the "Code of Practise" for details (Appendix 4).	Ensuring protection of Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological /physical:	**2**		The likelihood of hand harvesting directly affecting non-target species is reduced as systems are in place to ensure that harvesting takes place at low tide when most *Animalia* (e.g. periwinkles, amphipods and isopods, etc) are dormant or inactive and located low down in the canopy, thereby preventing their by-catch. Additionally, systems are in place to ensure than sufficient canopy remains post-harvest and that holdfasts are not removed, thus ensuring the viability of the biotope for non-target species. *Fucus*, an additional habitat of some *Animalia*, will not be targeted for harvesting, thus preventing further by-catch related impacts and preventing further reductions in total habitat.
		5	Many of these species are mentioned in NPWS conservation objectives for Kenmare River SAC.
Chemical:			n/a

			n/a

(3): Disturbance and displacement of species and habitats:

(i) Reef:

See Section A11 above

(ii) Amphipods and isopods:

See section E2(ii) and Section C21 above.

(4): Changes in community structure:

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Long term impacts on *A. nodosum* community structure as a whole	While short term impacts of *A. nodosum* hand harvesting on community structure have been found to be relatively minimal (Kelly *et al.,* 2001), such studies are limited by their short duration.	2	5	A	no	n/a	yes	• BioAtlantis will assess the impact of *A. nodosum* harvesting over the life-time of the licence. The experimental design will involve measurement of: (a) rates of re-growth of *A. nodosum* post-harvest, and (b) associated biodiversity. • An experimental site will be chosen for non-harvested Vs. harvested area comparisons • Sections will be large enough to allow for sufficient numbers of replicates. • A range of parameters will be measured including: • numbers of *A. nodosum* plants, numbers of *Fucus* plants, numbers of *Animalia*. • Species assessed may include periwinkles, limpets, barnacles, red algae, ephemeral green algae. • Assessments performed regularly, ideally covering a 5-10 year period. The plan above is included in the "Code of Practise" for details (Appendix 4), as a means of ensuring that BioAtlantis continually validate and improve the methodology on an ongoing basis and on a long term basis throughout the life-time of the licence. This will ensure that scientific knowledge is increased beyond the timeframe assessed by Kelly *et al.,* 2001. This will be important in ensuring that conservation objectives are met continually into the future.	Ensuring protection of Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**2**		The study by Kelly *et al.,* (2001) demonstrated limited impacts of hand harvesting in the short term. However, long terms impacts of hand harvesting are unknown, as harvesting by its nature may vary in intensity and severity due to factors such as: unregulated harvesting, over-harvesting, inappropriate techniques. This could give rise to significant changes in the ecosystem (e.g. invasion of *Fucus* and associated impacts). In the absence of unregulated harvesting or over-harvesting, other natural factors such as slow changes over time in abundance and type of *Animalia* species could also occur. The probability of long term impacts on the community structure is reduced, as the BioAtlantis harvesting system has been developed to ensure that over-harvesting and inappropriate techniques are not used in Kenmare River SAC. This ensures that some of the biggest threats to community structure are avoided. A probability of 3-5 is unjustified as the proposed system is minimally invasive and therefore less likely to cause long term impacts.
		5	A high severity rating is assigned, as significant changes to community structure could have negative consequences on the intertidal zone.
Chemical/ Physical:			n/a
			n/a

(5): Changes in hydrodynamics and water quality:

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Exacerbation of impacts of pollution and reductions in water quality	Harvesting in areas near sewage outfalls.	1	5	A	no	n/a	yes	BioAtlantis will not harvest in areas near sewage outfalls or other sources of pollution. Moreover, senescing or decomposing seaweed will not be harvested. See "Code of Practise" for details (Appendix 4).	Ensuring protection of Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Alteration to hydrodynamics	Excessive removal of *A. nodosum*	1	5	A	no	n/a	yes	The harvest system is designed with sustainability at the forefront and dramatic alterations to biomass levels will not occur. Harvest activities will not reduce height of *A. nodosum* below 200mm (8 inches). See "Code of Practise" for details (Appendix 4).	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Polluted water can have negative impacts on *A. nodosum* performance, epiphyte infestation, colonisation and competition by green algae. However, harvest activities will not give rise to significant increase in pollution (see Section A1 above). Senescing or decomposing seaweed can also potentially increase faecal born E. coli survival in coastal areas. The probability of exacerbating existing impacts of pollution are low, as hand harvesting in proximity to sewage outfalls, etc, will not occur and senescing or decomposing seaweed will not be harvested. Transitional water quality of the following are unlikely to be affected, as measures are in place to ensure that pollution does not occur and that environmentally safe navigation methods are employed to prevent impacts on estuarine substratum: Kenmare River Estuary, Blackwater Estuary, Sneem Estuary, Kenmare River, Kilmackillogue Harbour, Ardgroom Harbour. Likewise, coastal water of Kenmare River SAC is also unlikely to be affected.
		5	A high severity rating is assigned, as alterations to water quality could have significant impacts on the SAC in broad terms.
Chemical:			n/a
			n/a
Physical:	**1**		It is unlikely that *A. nodosum* harvesting will impact on overall hydrodynamics in the complex. *A. nodosum* is adapted to growing in highly sheltered environs and as such, has difficulty remaining attached to hard substrate in less sheltered waters. Therefore, *A. nodosum* is likely to exert a minor influence on hydrodynamics. The harvesting system is designed to ensure that dramatic changes in biomass levels within the intertidal zone will not occur.
		5	Alterations to hydrodynamics could potentially have significant impacts on other Annex I and II habitats in the complex.

(6): Potential disturbance of Marine Fauna:

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Physical disturbance of marine fauna	• Inappropriate technique. • Lack of training • Lack of oversight.	1	5	A	no	n/a	yes	The "Code of Practise" (Appendix 4) will be implemented which ensures that marine fauna are unaffected, i.e.: • Harvest at low tide, • Harvest sustainably, • Return by-catch, where possible.	Ensuring protection of Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical:	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		The technique employed during *A. nodosum* harvest requires cutting at heights well above the holdfast, thus avoiding any fauna present at the base of the canopy. Harvest at low tide also prevents any immediate effects on marine fauna which are otherwise exclusively active around the area during high tide. By ensuring maintenance of sufficient canopy, marine fauna can still utilize the *A. nodosum* environment at high tide. Moreover, the long term effects of harvesting is minimized as sufficient photosynthetic tissue left behind which will allow for faster *A. nodosum* recovery post-harvest. Moreover, limiting the harvest to 20% of the total available biomass will ensure that sufficient biotope coverage remains.
		5	A number of marine fauna are protected under EU Law.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(7): Potential interactions with coastal habitats:

A. nodosum contributes to the organic deposition throughout the littoral zone and marine environment. The rocky shoreline by its very nature is not a closed system and organic matter will tend to transfer from the area into the wider marine environment. As a primary producer located close to the back shore, the potential impact of any loss of *A. nodosum* on nearby coastal habitats must be examined. From an assessment the scientific literature, there is potential for impacts on Perennial vegetation of stony banks, Salt Marsh & Sand dune habitats. No potential impacts are identified for other coastal habitats such as vegetated sea cliffs. The hazard assessment is provided below.

(i) Perennial vegetation of stony banks

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Reductions in natural circulation of sediment and organic matter.	Over harvesting of *A. nodosum* to levels which significantly reduce total organic drift litter in Kenmare River SAC.	1	5	A	no	n/a	yes	The management system requires that over-harvesting, which could have potential indirect impacts on organic matter levels and in turn potentially perennial vegetation of stony banks, will not occur. See "Code of Practise" (Appendix 4) for details.	Kenmare SAC: To maintained in favourable condition (ref: Obj. 1, NPWS, 2013B, pg. 8).
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Prob-ability**	**Sever-ity**	**Reason for Decision**
Biological:	**1**		*A. nodosum* organic drift litter may contribute to attributes such as physical structure of perennial vegetation of stony banks. As the hand harvesting system ensures that over-harvesting does not take place and that *A. nodosum* mortality is mitigated against, the likelihood of over harvesting of *A. nodosum* to levels which significantly reduce total organic drift litter in Kenmare River SAC, is low.
		5	EU Dir. 92/43/EEC & NPWS, requires that Perennial vegetation of stony banks are maintained in favourable condition (ref: Obj. 1, NPWS, 2013B, pg. 8). Any activities which would lead to removal of biological material could significantly damage these areas and would contravene this directive.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(ii) Salt Marsh habitats

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Reduced levels of saltmarsh vegetation due to harvesting.	• Direct physical impacts on saltmarsh habitat. • Harvesting *A. nodosum* along the fringes of salt marsh habitats.	1	5	A	no	n/a	yes	• In order to ensure that *A. nodosum* harvest does not negatively impact on salt marsh (Atlantic & Mediterranean Salt Meadows) habitat in general, harvesters will avoid saltmarsh habitat and ensure caution when operating at sites near Castlecove, Sneem, Reennagross, Doon Pt., Derreenacallaha, Derrynid, Reennaveagh, Laughragh Lower, Derreen House, Dinish, Tahilla and West Cove. • Harvesters will avoid harvesting *A. nodosum* and *Fucus* at the fringes of salt marshes. • Harvest of *A. nodosum* cannot take place along the fringes of Drongawn Lough SAC. (see "Code of Practise" (Appendix 4).	Kenmare SAC: To maintain the favourable conservation condition (ref: Objective 2, NPWS, 2013B, pg. 12)
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: Alterations in salt marsh sedimentation dynamics.	• Direct physical impacts on saltmarsh habitat. • Harvesting *A. nodosum* along the fringes of salt marsh habitats.	1	5	A	no	n/a	yes	As above and in Appendix 4.	

Hazard	**Prob-ability**	**Sever-ity**	**Reason for Decision**
Biological:	**1**		It is highly improbable that saltmarsh habitat will be affected due to harvesting of *A. nodosum* given that: (a) established piers will be required to receive harvested seaweed- use of Atlantic and Mediterranean salt meadow areas for this purpose will not occur, (b) *A. nodosum* does not grow at high density in these locations, and therefore will not be subject to harvest activities, (c) harvest will mainly occur along rocky shorelines rather than in the areas of mud or sand substrate which is required salt marsh environs & associated species (d) contamination will other material may result in damage production equipment and end product and (e) harvested weed will not be stored in these locations. This ensures no inadvertent co-removal of protected species characteristic of Atlantic and Mediterranean salt meadows.
		5	EU Dir. 92/43/EEC & NPWS, requires that the favourable conservation condition of salt marsh habitats be maintained (ref: Objective 2, NPWS, 2013B,

			pg. 12). Any activities which would lead to removal of biological material could significantly damage these areas and would contravene this objective.
Chemical:			n/a
			n/a
Physical:	**1**		Harvesting *A. nodosum* and other seaweeds along the fringes of salt marsh habitats (Atlantic Salt Meadows, Mediterranean Salt Meadows) could alter salt marsh sedimentation dynamics. Harvesters will avoid saltmarsh habitat and ensure caution when operating near these sites.
		5	EU Dir. 92/43/EEC & NPWS, requires that the favourable conservation condition of salt marsh habitats be maintained (ref: Objective 2, NPWS, 2013B, pg. 12). Any activities which would lead to removal of biological material could significantly damage these areas and would contravene this objective.

(iii) Sand dune habitats

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Reduction in organic drift litter levels to an extent which would negatively affect *Ammophila* plant growth, and in turn, sand dune formation and integrity.	Over harvesting of *A. nodosum* to levels which significantly reduce total organic drift litter in Kenmare River SAC.	1	5	A	no	n/a	yes	The management system requires that over-harvesting, which could have potential indirect impacts on organic matter levels and in turn potentially sand dunes, will not occur. See "Code of Practise" (Appendix 4) for details.	Kenmare SAC: To maintain the favourable conservation condition (ref: Objective 3, NPWS, 2013B, pg. 21).
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		Some studies indicate that *A. nodosum* organic drift litter material can increase Ammophila leaf length potentially due to a C:N ratio of 15:1 in algae (Maun, 2009). As such, *A. nodosum* organic drift litter may contribute to the formation and integrity of sand dune habitats. As the hand harvesting system ensures that over-harvesting does not take place and that *A. nodosum* mortality is mitigated against, the likelihood of over harvesting of *A. nodosum* to levels which significantly reduce total organic drift litter in Kenmare River SAC, is low.
		5	EU Dir. 92/43/EEC & NPWS, requires the favourable conservation condition of sand dune habitats be maintained (ref: Objective 3, NPWS, 2013B, pg. 21). Any activities which would lead to removal of biological material could significantly damage these areas, thus contravening these objectives.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(iv) Vegetated Sea Cliffs

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	Kenmare SAC: To maintain the favourable conservation condition. (ref: Objective 4, NPWS, 2013B, pg. 27).
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological			n/a
			n/a
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(f) Existing Operations: potential in-combination effects and interactions.

(1): Unlicensed, traditional and casual harvesting of seaweed.

For a detailed analysis of risks associated with other harvest activities, please see Appendix 7 to this application.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Negative impacts on: • Protected Fauna: ➢ Annex II harbour seals, otters & protected bird species • Annex I habitats: ➢ Intertidal zone	Interactions with existing harvesting activities: • Small-scale local harvesting for personal use in gardens, organic farming etc. • 2 small companies using seaweed in their products. • Artisan foods containing seaweeds. • Hotels, health Spas seaweed baths, etc. • "Seaweed Discovery Tours & Workshops". • Appurtenant rights to harvest seaweed may be present on some property folios.	1	5	A	no	n/a	yes	• Harvesting activities must not impact on other people who harvest small volumes of seaweed, edible seaweeds or invertebrates for their own personal use, e.g. dillisk, carrageenan, limpets, mussels, clams, periwinkles and scallops or seaweed for own personal use in gardens, artisan foods/drink and food festivals. • BioAtlantis will employ or contract existing local harvesters, where possible. • The harvest plan will be continually updated to ensure sites recently harvested are not further harvested until enough time has passed to ensure sufficient re-growth. • Any commercial user having small requirements of ~1 Tonne per annum (e.g. hotels, health Spas) will be identified and BioAtlantis will work to prevent in combination effects. • Harvest will not take place at seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects. • Harvesters will work to prevent any disturbance or interaction with otters in the water or on the shore by following the Code of Practice (Appendix 4). • Hand harvesters will avoid sites where tourism, sport & recreation activities are observed to take place (e.g. seaweed foraging days). This will be determined on a case-by-case basis. • No harvest in Caherdaniel at any time of the year due proximity with Iveragh Peninsula SPA [004154], hence preventing impacts on the SPA and avoiding in combination effects with seaweed tourism excursions in the area during peak tourist season in July and August. • Harvesting cannot occur in areas where there are existing appurtenant rights or burdens in relation to the harvesting, gathering or removal of seaweed from the shore, without first obtaining permission from the person to whom those rights belong. • Where Profit-à-Prendre rights are successfully registered with the PRAI, harvesting plans will be adjusted to ensure those individuals can continue to harvest *A. nodosum*. • Harvesting will not take place in privately owned maritime areas without prior consent on the property owners. The above measures are included in the "Code of Practise" (Appendix 4). Appendix 7 provides a detailed analysis of risks associated with other harvest activities.	Protecting Kenmare River SAC.

Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	Probability	Severity	Reason for Decision
Biological	**1**		There is a very low risk of interactions or in combination effects with commercial-scale harvesting of *A. nodosum* as no such activity is underway in Kenmare River SAC. There is a low risk of interactions with existing small scale hand harvesting activities, mainly limited to Seaweed Discovery Tours and Workshops, seaweed foraging tourism, small scale personal use for gardens, crops, foods, events, etc. There are small companies potentially using seaweed in hotels health SPAs, therapy, cosmetics. However, levels of *A. nodosum* sourced from Kenmare River SAC for these activities, if any, are likely to be relatively low. Other commercial, large-scale, unlicensed harvesting activities (should they be observed to occur) will be recorded and advice will be sought from the relevant authorities on how to proceed. Small scale harvesting of <1 tonnes will have very minimal impacts (if any) and does not significantly increase the probability of significant in combination effects with the BioAtlantis plan. Harvesting will not take place in areas where there are existing appurtenant rights or burdens in relation to the harvesting, gathering or removal of seaweed from the shore (without first obtaining permission from the person to whom those rights belong), thus lowering the likelihood of harvesting at inappropriate locations. Likewise, harvesting plans will be revised in the event of Profit-à-Prendre rights to harvest seaweed being successfully registered with PRAI.
		5	In combination effects due to presence of more than one large-scale harvesting operator within the same area, could be detrimental to the integrity of Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(2): Recreation, tourism, sport, growth and development.

For a detailed analysis of risks associated with recreation and tourism, please see Appendix 7 to this application.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological/ Physical: Negative impacts on: Protected Fauna: ➢ Annex II harbour seals, otters & protected bird species Annex I habitats: ➢ Intertidal zone	This may occur due to cumulative and in combination impacts associated with interactions of harvesting with recreation and tourism-related activities: ➢ In vicinity of seal and bird sites or otters. ➢ Involving transfer of equipment across the intertidal zone ➢ At specific locations during peak tourist season	2	5	A	no	n/a	yes	• **Activities in vicinity of seal and bird sites:** Harvest will not take place at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects. • **Disturbance of otters:** Harvesters will work to prevent disturbance or interaction with Otters in water or on shore by following the Code of Practice. This includes recreation, sports & tourism-related areas, e.g. Parknasilla where otters are reported. • **Activities involving transfer of equipment across the intertidal zone:** Hand harvesters will not work within 50m of bases where equipment/vessels are manually introduced to water. This ensures that no in combination effects occur. • **Activities at Dirreencallaugh, Sneem, Parknasilla, Derrynane, Eyeries or Dromquinna during peak tourist season:** Harvest will not occur at these sites between July-August. This prevents any in combination effects associated with increased anthropogenic disturbances which may occur during summer due to increased numbers of tourists in the area. Harvest will not occur in Derrynane as this is part of the Iveragh Peninsula SPA [004154]. These measures are included in the "Code of Practise" (Appendix 4). For a detailed analysis of risks associated with recreation & tourism, please see Appendix 7.	Protecting Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical	**2**		There is a risk of cumulative and in combination impacts due to interactions between existing recreation and tourism activities. However, the likelihood of such hazards occurring are reduced significantly as BioAtlantis have measures in place to (a) avoid seal/bird sites at sensitive times, (b) prevent interactions or disturbance to otters, (c) avoid Dirreencallaugh, Sneem, Parknasilla, Derrynane, Eyeries or Dromquinna between (July-August) and (d) avoid sites near active tourism bases.
		5	In combination effects with recreation and tourism activities could be detrimental to the integrity of the Kenmare River.
Chemical:			n/a
			n/a

(3): Aquaculture.

For a detailed of risks associated with aquaculture, see Appendix 7 of application. KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required. *probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**	**Decision Tree**					**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P* S* A/UA	Q1	Q2	Control Measures? Yes / No				
Biological/physical : Negative impacts on: • Protected Fauna: ➢ Annex II harbour seals, otters & protected bird species • Direct impact on reef. • Water quality.	Exacerbation of effects by existing aquaculture: ➢ At sites located in vicinity of seal and bird sites could cause disturbance. ➢ Direct impact on reef due to removal of species. ➢ Direct impact on soft substratum areas. ➢ Activities that could affect (a) physical, chemical and microbiological parameters of relevance and (b) pollution reduction programmes for designated waters in Kenmare River SAC.	2	5	A	no	n/a	yes	• The BioAtlantis harvesting systems requires that breeding and moulting harbour seals, otters and breeding and wintering bird species are not disturbed. See "BioAtlantis Code of Practise" for protection of harbour seals, otters and bird species for more details (Appendix 4). • Harvest cannot take place at breeding, resting or moulting sites at sensitive times. This includes breeding, resting or moulting sites which may be in close proximity to existing and planned aquaculture sites in Coongar Harbour, Kilmackillogue and Ardgroom Harbour and near Killaha East. • Caution is required when approaching/operating near areas where planned and existing aquaculture sites are in relative proximity to seal sites and bird breeding/wintering sites (e.g. islands near Parknasilla such as Ship Rock, islands and coastal zones on Coongar Harbour, including site near Pointafadda in Coongar Harbour, islands in Kilmakillogue Harbour and south of Garinish Island) and bird breeding sites (e.g. islands in Kilmakillogue Harbour) and bird wintering sites. • The requirements for environmentally safe navigation must be followed to ensure no in combination effects which could damage substratum where aquaculture sites are located, such as reef or soft substratum areas. • Ensure caution when travelling in the vicinity of defined aquaculture navigation routes. Do not impede workboat or tractor access to aquaculture sites along access routes, including but not limited to those associated with routes via Bunaw Pier, Bunaw (Kilmackillogue Pier), areas near Kilmackillogue Pier, Blackwater Pier and Oysterbed Pier, roadway access points at Templenoe (upper Kenmare Bay), access along the foreshore over intertidal habitats (e.g. near Templenoe, via public roads such as R571), areas with existing rights of way and other locations including those near the Beara Peninsula, Sneem (e.g. slipway), Coulagh Bay, Travara, Eyeries, Kilcatherine Point, Ardgroom Harbour, Cleandra (landing pier), Coongar Harbour, Pallas Pier, inner Kenmare Bay, outer Kenmare Bay and private laneways or routes or pick up points. • Do not interfere with aquaculture users licensed to harvest or grow seaweed. • Ensure that no aspects of harvesting give rise to any physical interaction or contact with aquaculture production units, their structures or anchors. • See section A1 above for measures to prevent pollution.	Protecting Kenmare River SAC.

Chemical: • Water quality.	Activities that could affect (a) physical, chemical and microbiological parameters of relevance and (b) pollution reduction programmes for designated waters in Kenmare River SAC.	1	4	A	no	n/a	n/a	No measures required. See section A1 above for measures to prevent pollution.	
Physical: • Water quality.	Activities that could affect (a) physical, chemical and microbiological parameters of relevance and (b) pollution reduction programmes for designated waters in Kenmare River SAC.	1	4	A	no	n/a	n/a		

Hazard	Probability	Severity	Reason for Decision
Biological	**2**		Contact with moulting and breeding harbour seal and breeding and wintering bird species will be minimal, as measures are in place to ensure that interactions to not occur. A study by the Marine Institute (2015, 2019) assessed potential impacts of licensed aquaculture activities on species and habitats in Kenmare River SAC and made the following conclusions: • Existing aquaculture activities are non-disturbing to harbour seals species or otter species. • Unlikely that hand harvest of seaweed and existing aquaculture will interact in Kenmare River SAC, the likely overlap between these activities is considered small as reef is not suitable habitat for shellfish culture. Furthermore, low levels of shellfish culture method overlap with reef habitat in Kenmare River SAC. *A. nodosum* harvesting will not give rise to negative effects on physical, chemical and microbiological parameters of relevance or pollution reduction programs for designated waters in Kenmare River SAC.
		5	• In combination effects with protected Annex II harbour seals, otters & protected bird species or Annex I habitats could have negative effects on the conservation status of Kenmare River SAC. • Shellfish Water Directive (European Communities (Quality of Shellfish Waters) Regulations 2006 (SI No 268 of 2006)), aims: ➢ To protect or improve shellfish waters to support shellfish life and growth. ➢ To protect the aquatic habitat of bivalve and gastropod molluscs, including oysters, mussels, cockles, scallops and clams.
Chemical:	**1**		*A. nodosum* harvesting will not give rise to negative effects on physical, chemical and microbiological parameters of relevance or pollution reduction

			programs for designated waters in Kenmare River SAC.
		4	• Shellfish Water Directive (European Communities (Quality of Shellfish Waters) Regulations 2006 (SI No 268 of 2006)), aims: ➢ To protect or improve shellfish waters to support shellfish life and growth. ➢ To protect the aquatic habitat of bivalve and gastropod molluscs, including oysters, mussels, cockles, scallops and clams.
Physical:	**1**		*A. nodosum* harvesting will not give rise to negative effects on physical, chemical and microbiological parameters of relevance or pollution reduction programs for designated waters in Kenmare River SAC.
		4	• Shellfish Water Directive (European Communities (Quality of Shellfish Waters) Regulations 2006 (SI No 268 of 2006)), aims: ➢ To protect or improve shellfish waters to support shellfish life and growth. ➢ To protect the aquatic habitat of bivalve and gastropod molluscs, including oysters, mussels, cockles, scallops and clams.

(4): Harvesting of invertebrates.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological/physical : Negative impacts on: • Periwinkle populations • Other invertebrates	Exacerbation of effects by existing harvesting of invertebrates: ➢ Periwinkles, and other invertebrates	2	5	A	no	n/a	yes	**Periwinkles:** • Harvesters will leave between 8-12 inches of the crop behind. This approach avoids: ➢ Extensive removal of *A. nodosum* canopy coverage and damage to the ecosystem and ➢ Interactions with or by-catch of dormant/ resting winkles positioned at the base of the *A. nodosum* canopy ➢ Ensures that developing free-living forms of *L. littorea* are able to settle and establish within intact canopies. • *L. obtusata* eggs: Harvesters will work to avoid *A. nodosum* plants which contain visible *L. obtusata* egg masses. This is important to prevent harvest of viable eggs, thereby promoting maintenance of population size. • Do not harvest *Fucus*: *Fucus* content of harvested *A. nodosum* will be limited to ≤10%, thus preventing removal of an additional canopy source which supports periwinkles and other species. • By-catch: co-removal of periwinkles identified as by-catch will returned to the water, where possible. **Other invertebrates:** • Harvesters will work to ensure that co-harvesting of other species does not occur (including mobile, immobile and encrusting species). • Inadvertent co-removal of Animalia identified post-harvest will be collected and returned to the water, where possible. The above measures are included in the "BioAtlantis Code of Practise" (Appendix 4).	Protecting Kenmare River SAC.
Chemical: none	n/a	na	na	na	na	na	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical	**2**		**Periwinkles:** Hand gathering occurs within the intertidal zone by at least one company. Risks associated with periwinkle harvesting, may potentially include reductions in periwinkle population numbers due to the removal and anthropogenic disturbances caused by trampling. While there is potential for in-combination effects associated with *A. nodosum* hand harvest activities and existing periwinkle harvest activities, the standards and measures developed as part of the Codes of Practice (Appendix 4) reduce the likelihood. The Code of Practice also ensures sustainable methods of harvesting are employed, ensuring *A. nodosum* habitat is maintained. **Other invertebrates:** Other invertebrates may be removed from the SAC, many of which are limited to deeper water, thus removing any risk of in-combination effects associated with hand harvesting activities. However, there is a low risk that harvesting may impact on slow moving invertebrates in general given that nets/bags are used along the intertidal zone. The likelihood of such impacts occurring is low as nets/bags will take up a small area and harvesters will be required to ensure that co-harvesting other species does not occur. The likelihood of by-catch is low and harvesters will have full view and control of their activities.
		5	Periwinkles are part of the intertidal reef community complex and mentioned in NPWS conservation objectives for Kenmare River SAC (Target 6 of Objective 1, NPWS, 2013A, pg.19. Target 3, Objective 2, NPWS, 2013A, pg. 20. Harvest activities in these areas may impact on these community complexes and/or their habitat.
Chemical:			n/a
			n/a

(g) Planned Operations: potential in-combination effects and interactions.

(1): Harvest activities.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment** *P* S* A/UA*			**Decision Tree** Q1	Q2	Control Measures? Yes / No	**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
Biological: Negative impacts on: • Protected Fauna: ➢ Annex II harbour seals, otters & protected bird species • Annex I habitats: ➢ Intertidal zone • Overharvesting of *A. nodosum.*	Interactions with planned hand harvesting activities.	1	5	A	no	n/a	yes	BioAtlantis will not harvest in the proposed application area of Sykoni Lowes in Eskivaude, Allihies, Beara, County Cork. This area will be marked as an excluded area on the map. This will ensure that overharvesting will not occur. The above measures are included in the "Code of Practise" (Appendix 4).	Protecting Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological	**1**		There is potential for interactions with plans of Sykoni Lowes to harvest *A. nodosum* in Eskivaude, Allihies, Beara, County Cork. An application has been submitted to the Dept. of Environment covering a foreshore area (12.7 Ha) at Blackrock, south of Cod's Head, Bear, Co. Cork (in Kenmare River SAC). This includes a range of seaweed species including *A. nodosum*. **Irish National Grid Coordinates of the area** No East West 1 55620 47220 2 55586 46970 3 55732 46839 4 59995 46921 **Harvest targets between April-July** **Kg** *Fucus Serratus* 4 *Laminaria hyperborea* 5 *Saccharina latissima* 0.75 *Himanthalia elongata* 10 *Palmaria palmata* 0.20 *Ascophyllum nodosum* 1.5 *Enteromorpha intestinalis* 0.5 Total 21.95 Ref: Lowes, S. (2015). Department of Housing, Local Government and Heritage, https://www.gov.ie/en/foreshore-notice/bffaf-sykoni-lowes/
		5	Activities of more than one company in a single area could lead to overharvesting and thus damage the integrity of Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(2): Recreation, tourism, sport, growth and development.

For a detailed analysis of risks associated with planned recreation and tourism, please see Appendix 7. KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required. *probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological/ Physical: • Anthropogenic disturbances • Disturbance to harbour seals, otters, birds.	Kerry County Council plan to: • Invest in new tourism infrastructure, raising potential for increased anthropogenic disturbances or disturbance of harbour seals, birds or otters. • Develop food tourism in Kerry, which may potentially include edible seaweeds. In previous years the "Kenmare Food Carnival" included foraging for edible seaweed as an activity. When such events occur, there is potential for increases in anthropogenic disturbances to occur or disturbance to harbour seals birds or otters.	2	5	A	no	n/a	yes	• As a general policy, hand harvesters will avoid sites where tourism, sport and recreation activities are observed to be taking place. This will be determined on a case-by-case basis. • Harvesters will not work within 50m of bases where equipment or boats are introduced in the water. This ensures that no in combination effects occur. • Hand harvest will not take place at harbour seal breeding and moulting sites or bird wintering and breeding at sensitive times of the year, thus preventing any in combination effects • Harvesters will work to prevent any disturbance or interaction with Otters in the water or on the shore by following the Code of Practice (Appendix 4). • Each of the mitigation measures listed above are included in the "Code of Practice" for sustainable hand harvesting of *A. nodosum* in Kenmare River SAC (see Appendix 4). Measures are included in the "BioAtlantis Code of Practise" (Appendix 4). For a detailed analysis of risks associated with planned recreation and tourism, please see Appendix 7 to this application.	Protecting Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Prob-ability**	**Severity**	**Reason for Decision**
Biological /physical	**2**		• In the Budget For the Financial year ending 31st December 2016 (Incorporating Report on the Capital Programme 2016-2018), it is stated that the strategy of Kerry County Council is to develop tourism in the Wild Atlantic Way and work with Fáilte Ireland to develop viewing points along the Wild Atlantic Way (ref: KCC, 2016). Therefore, there is potential for new tourism infrastructure to be developed along the coast in Kenmare. This raises the potential for

			interactions with harvesting which could lead to increased anthropogenic disturbances or disturbance of harbour seals during breeding or moulting season or bird wintering and breeding at sensitive times of the year. Otters may also be sensitive to the presence of boats in the water or people on the shore. The Co. Kerry Covid-19 economic recovery plan also outlines the importance of enhancing Kerry's natural and built tourism assets including - the Wild Atlantic Way, Reeks District, Cappanalea, OEC, Kerry International Dark Sky Reserve, LIVE Project, upgrade of Bray, Head Discovery Point, and designated, Heritage Towns (KCC, 2021A). Actions and goals in relation to the Wild Atlantic way are also mentioned in the Kerry Local Economic and Community Plan 2016-2021/22 (KCC, 2021/22B). In their Budget, Kerry County Council outline their plans to develop food tourism in Kerry, known as "Taste Kerry" (ref: KCC, 2016).There is potential for such activities to include edible seaweeds. The budget also states that Kerry County Council aim to assist tourist events through Community Support Fund local festivals throughout the county. Such activities may potentially involve seaweed. In previous years for example, the "Kenmare Food Carnival" has included foraging for edible seaweed as an activity. When such events occur, there is potential for increases in anthropogenic disturbances to occur in combination with seaweed harvesting. Activities may also take place close to sites of relevance to harbour seals during breeding or moulting season or bird wintering and breeding at sensitive times of the year. Tourism development, leisure and recreation are also included in KCC's budget for the financial year ending December 31st 2021 (KCC, 2021C).
		5	In combination effects with recreation and tourism activities could impact on conservation objectives for Kenmare River SAC..
Chemical: none			n/a
			n/a

(3): Aquaculture.

For a detailed analysis of risks associated with aquaculture, please see Appendix 7 to this application.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.

*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Negative impacts on: • Protected Fauna: ➢ Annex II harbour seals sites in the vicinity of planned aquaculture sites.	There is currently a licence application for oyster and mussels related aquaculture at Coongar Harbour, Killmakilloge and Ardgroom Harbour and potentially near Killaha East (ref: Marine Institute 2015). Hand harvesting could interact to impact on harbour seals.	2	5	A	no	n/a	yes	• See F(3) above) • The BioAtlantis harvesting systems requires seasonal avoidance of protected seal and bird sites See "BioAtlantis Code of Practise" for protection of harbour seals and bird species for more details (Appendix 4).	Protecting Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	**Proba bility**	**Sever ity**	**Reason for Decision**
Biological	**2**		Hand harvest activities may exacerbate existing effects attributed to licensed aquaculture activities, e.g. disturbance at sites relevant to harbour seals. Otters may also be sensitive to the presence of boats or people on the shore. Overall the risk of such interactions is considered low (Marine Institute, 2015). However, the Marine Institute cannot rule out potential effects of proposed aquaculture on seal behaviour at a breeding and moulting site in Coonger Harbour (Marine Institute, 2015, pg. 90,). In additional there are a number of applications for oyster and mussels related aquaculture at Killmakilloge and Ardgroom Harbour and near Killaha East (Marine Institute, 2015, pg.21). Further details are provided in the Marine Institute's appropriate assessment of aquaculture and fisheries risk assessment in Kenmare River SAC (ref: Marine Institute, 2019). Notably, there are breeding and moulting harbour seal sites at Killmakilloge and Ardgroom Harbour and potentially near Killaha East. The risk of in combination effects with hand harvesting are reduced as the BioAtlantis harvesting systems requires avoidance of breeding and moulting harbour seals.
		5	In combination effects with protected Annex II harbour seals could have negative effects on the conservation status of Kenmare River SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(4): Harvesting of invertebrates.

No planned operations identified.

(h) Invasive species

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Biological: Spread of *Didemnum vexillum, Styela clava, etc.*	Due to harvest activities functioning as a vector, e.g. adherence of species to underside of boats.	1	5	A	no	na	yes	• The main collection boat (if deemed applicable to the area), will be painted once a year with appropriate anti-fouling paint. • Harvesting will be limited to the *A. nodosum* zone. • The harvesters boats will not leave Kenmare River SAC. In the rare case that they do leave Kenmare River SAC, harvesters are required to implement a cleaning measure on land which will involve cleaning with appropriate cleaning agents or using other suitable methods. • Bags/Nets used in Kenmare River SAC will not be used to collect seaweed outside this SAC. • All nets/bags must be cleaned with appropriate cleaning agents or using other suitable methods on delivery to production facilities and returned to harvesters in a clean condition. • Harvesting will be limited to the *A. nodosum* zone and will not take place in subtidal areas, exposed or semi-exposed sites. • Harvesters will keep distance from aquaculture units to prevent the spread of any species that may be associated with artificial structures. • Harvesters will prevent disturbance to rocky substratum, will avoid co-harvesting non-*A. nodosum* material and will ensure that inadvertent by-catch of other *Animalia*, algae or dead, drifting material/algae will be prevented and minimized.	Protecting Kenmare River SAC.
Chemical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	
Physical: none	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	

Hazard	Probability	Severity	Reason for Decision
Biological	**1**		**Non-indigenous species previously reported in Kenmare Bay: Crustaceans:** *Caprella mutica,* **Molluscs:** *Crepidula fornicate,* **Seaweed:** *Sargassum muticum*, **Bryozoans:** *Schizoporella errata:* • ***Caprella mutica:*** Primarily a fouling organism that may associated with fish farms, aquaculture sites/structures, hulls or ships, recreational boats and artificial man-made objects, structures and materials. It has been reported to occur in inner Kenmare River SAC (ref: BIM and Dutch Shellfish Importers - Shellfish Associated Species Inventory (SASI) Surveys, 2018 to 2022). Spreads on hulls and potentially by rafting on drifting material including drifting algae. This application does not involve the harvesting of drift weed or free-drifting macroalgae. Measures are also in place to avoid co-harvesting non-*A. nodosum* material and prevent inadvertent by-catch of other algae or dead, drifting material/algae, thus reducing the potential for interactions. • ***Crepidula fornicata*:** There were accounts of specimens of *C. fornicata* in Kenmare (Killmakillogue) in the 1960s, however none were found in subsequent searches. The population may have been transient or may have been purged/died out due to the 1962/63 winter and frosts (ref: O'Rourke E and O'Flynn C, 2014). • ***Sargassum muticum*:** An invasive seaweed that grows in semi-exposed areas, primarily in rock pools. This species is mainly reported in exposed or semi-exposed areas where *A. nodosum* does not grow. Reported sightings of *S. muticum* include: Loughaun Point, near Collorus Point (at 4 meters, interspersed with other algae such as Ulva, Saccharina latissimi, Chorda filum and a variety red and brown algae), Bull Point (Eyries), Castlecove / White strand Beach, West Cove, Rath Slip, (Caherdaniel), Rath Strand (Caherdaniel), Derrynane and one report of occurrence within inner Kenmare Bay (ref: https://biodiversityireland.ie/). As *S. muticum* does not thrive in highly sheltered areas within the *A. nodosum* zone, the likelihood of occurring post-harvest is very low. Measures are also in place to prevent harvesting of other non-*A. nodosum* material or other algae species such as *S. muticum*, should they occur, thus reducing the potential for interactions. • ***Schizoporella errata:*** There has been a single reported occurrence of S. errata in Kenmare Bay (ref: https://biodiversityireland.ie/). S. errata fouls freely available hard substratum. This may include boat hulls, artificial underwater structures, piers, harbours and other coastal structures (ref: Global Invasive Species Database, 2024). Measures are in place in this application to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units) in the bay, thus reducing any potential spread of this species. The probability of these species being spread by harvesting, harvester boats or nets/bags is reduced, as the Code of Practice has been developed to ensure that appropriate precautionary measures are in place, including measures to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units). **Other species not currently reported as present in Kenmare, but potentially requiring mitigation:** • ***Bonamia ostreae:*** Parasitic to the oyster *Ostrea edulis* (direct transmission). It has not been identified in Kenmare Bay. Measures are in place in this application to avoid non-*A. nodosum* habitats, thus reducing the potential for future interactions. • ***Botrylloides violaceus:*** Associated with hard natural and artificial substrates, pontoons, shellfish beds, marine floating structures (e.g. those used for mussel culture), ropes and hulls and boats in marinas. Mainly found in submerged habitats. Can be found in habitats containing *Didemnum vexillum*. It has not been identified in Kenmare Bay. Measures are in place in this application to prevent interactions with aquaculture activities in the bay, thus reducing the future potential spread of this species. • ***Crassostrea gigas:*** It has not been identified in Kenmare Bay. Measures are in place in this application to prevent interactions with aquaculture activities in the bay, thus reducing the potential future spread of this species. • ***Didemnum vexillum:*** an invasive species, can smother marine life. It has not been identified in Kenmare Bay. It has been reported in Malahide Marina,

Carlingford Marina, Strangford Lough, Westport Bay, Galway Bay. It may be spread by boats and has also been reported to be associated with aquaculture units such as oyster bags on trestle installations. Measures are in place in this application to prevent interactions with aquaculture activities in the bay, thus reducing any potential future spread of this species.

- ***Perophora japonica:*** Can occur on artificial substrata in harbours and marinas and under boulders and stones on the lower shore in sheltered, silty areas. It has not been identified in Kenmare Bay. Colonies were identified at Annagh Island in southern Clew Bay on the lower shore under boulders & on Fucus serratus (ref: Minchin D et al., 2016). As measures are already in place to prevent disturbance to rocky substratum, the likelihood of potential future interactions with P. japonica are very low. Measures are also in place to prevent harvesting of other species such as F. serratus, thus reducing the potential for future interactions to occur.
- ***Spartina anglica:*** Some species of cordgrass are considered as invasive species in Ireland. *S. anglica* species of cordgrass is relatively new having formed by hybridization of S. alterniflora and S. maritima approximately 100 years ago (Stokes K, O'Neill K, McDonald RA (2006)). It has not been identified in Kenmare Bay. However, the target is that this species should remain absent sent from Kenmare River SAC (NPWS 2013B).
- ***Styela clava*:** Club tunicate, leathery tunicate, fouls ship hulls and aquaculture infrastructure. Can be found in shallow water on hard surfaces, occurs in warm sheltered waters, docks and harbour installations (ref: https://invasives.ie/ and https://www.marlin.ac.uk/). It does not occur in Kenmare River SAC. However, it has been reported in Dun Laoghaire Marina; North Channel, Cork Harbour; Marloge Marina, Cork Harbour; Crosshaven Pier, Cork harbour, Clew Bay; Roaring Water Bay longlines; Whiddy Island, Bantry Bay; Dingle Marina; Fenit Marina; Mulroy Bay; Glenarm Marina; Larne Lough; Carrickfergus Marina, Belfast Lough. While *S. clava* can occur in sheltered areas, it is a low tidal to subtidal species; therefore the potential overlap with *A. nodosum* is likely to be very low.

The probability of these species being introduced or spread by harvesting, harvester boats or nets/bags is low, as they are not currently identified as present in Kenmare Bay. The Code of Practice has also been developed to ensure that appropriate precautionary measures are in place to prevent the spread of invasive species into the future, including measures to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units).

Other non-indigenous species/marine pathogens of relevance, not reported as present in Kenmare Bay:

- **Annelida:** Marenzellaria viridis,
- **Bryozoans:** *Schizoporella cf. japonica, Smittoidea prolifica,*
- **Chordata:** Neogobius *melanostomus, Pseudorasbora parva,*
- **Comb Jellyfish:** *Mnemiopsis leidyi,*
- **Crustaceans:** *Amphibialanus amphitrite, Balanus trigonus, Eriocheir sinensis, Hemigrapsus sanguineus, Hemigrapsus takanoi, Dikerogammarus haemobaphes, Dikerogammarus villosus, Hemigrapsus sanguineus, Hemigrapsus takanoi, Hesperibalanus fallax,*
- **Ctenophora:** *Mnemiopsis leidyi,*
- **Dermocystida:** *Sphaerothecum destruens,*
- **Dinoflagellates:** *Alexandrium catenella, Alexandrium tamarense,*
- **Endomyxa:** *Marteilia refringens,*
- **Molluscs:** *Ensis leei, Ocinebrellus inornatus, Rapana venosa, Urolsalpinx cinerea, Corbicula fluminalis, Corbicula fluninea, Dreissena bugensis, Ocenebra inornate,*
- **Negarnaviricota:** *Infectious haematopoietic necrosis virus, Infectious salmon anaemia virus,*
- **Ochrophyta:** *Heterosigma akashiwo,*
- **Peploviricota:** *Ostreid herpesvirus 1-microvariant,*

- **Platyhelminthes:** *Gyrodactylus salaris,*
- **Porifera:** *Celtodoryx ciocalyptoides,*
- **Pseudomonadota:** *Vibrio cholorae,*
- **Seaweed:** *Caulacanthus okamurae, Grateloupia turuturu, Undaria pinnatifida, Laminaria ochroleuca,*
- **Tunicata:** *Corella eumyota*.

The probability of these species being introduced or spread by harvesting, harvester boats or nets/bags is reduced, as they are not currently identified as present in Kenmare Bay. The Code of Practice has also been developed to ensure that appropriate precautionary measures are in place to prevent the spread of invasive species into the future, including measures to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units).

Potential future invasive alien species/marine pathogens: There is a risk that up to 28 invasive alien species could potentially arrive, establish, spread and cause impacts to biodiversity in Ireland's marine waters (Lucy et al., 2020):

- *Alexandrium catenella,*
- *Asterias amurensis* (Flatbottom seastar; Japanese seastar).
- *Callinectes sapidus*(Blue crab),
- *Caulacanthus okamurae* ("pom-pom weed"),
- *Celtodoryx ciocalyptoides,*
- *Chattonella cf. verruculosa,*
- *Echinogammarus ischnus* (Bald urchin shrimp),
- *Ensis leei* (American razor-clam),
- *Hemigrapsus penicillatus* (Shore crab),
- *Hemigrapsus sanguineus* (Asian shore crab),
- *Hemigrapsus takanoi* (Brush-clawed shore crab),
- *Hesperibalanus fallax* (acorn barnacle),
- Homarus americanus (American lobster),
- Marteilia refringens (Aber disease; Digestive gland disease; Marteiliosis),
- *Mnemiopsis leidyi* (Warty comb-jelly; Sea Walnut),
- *Mytilopsis leucophaeata* (Conrad's false mussel),
- *Ocenebra inornate* (Japanese sting winkle),
- *Palaemon macrodactylus* (Oriental shrimp),
- *Paralithodes camtschaticus* (Red king crab),
- *Rangia cuneata* (Gulf wedge clam),
- *Rapana venosa* (Veined rapa whelk),
- *Rhithropanopeus harrisii* (Dwarf crab),
- *Rhopilema nomadica* (Nomad jellyfish),

Pathway of arrival (categories and sub categories) of potential future invasive alien species include (Lucy et al., 2020):

			• Escape (Live food and live baits, Aquaculture), • Transport-contaminant on animals (Aquaculture, e.g. oysters), • Transport-stowaway (Ballast water, Ship hull transport, Ballast water/Ship hulls, Hull fouling and/or ballast water, Ship hull transport), • Transport-stowaway/contaminant (Ballast water/Aquaculture (oysters), • Transport-stowaway/Escape (Ballast water/Aquaculture (oysters)), • Unaided spread (Natural via currents). The probability of these species being introduced or spread by harvesting, harvester boats or nets/bags is extremely low, as (a) they are not currently identified as present in Kenmare River SAC and (b) harvesting will not impact on potential pathways of arrival listed above. The Code of Practice has also been developed to ensure that appropriate precautionary measures are in place to prevent the spread of invasive species into the future, including measures to prevent fouling of boats and to prevent interactions with artificial structures (such as aquaculture units). **Information sources are outlined below:** • https://bim.ie/invasivespecies • https://invasives.ie/ • www.biodiversityireland.ie • National Invasive Species Database • BIM and Dutch Shellfish Importers - Shellfish Associated Species Inventory (SASI) Surveys, 2018 – 2022 • https://www.marlin.ac.uk/ • Global Invasive Species Database (2024) Species profile: *Schizoporella errata*. http://www.iucngisd.org/gisd/speciesname/Schizoporella+errata, 29-04-2024. • Lucy FE, Davis E, Anderson R, Booy O, Bradley K, Britton JR, Byrne C, Caffrey JM, Coughlan NE, Crane K, Cuthbert RN. Horizon scan of invasive alien species for the island of Ireland. Management of Biological Invasions. 2020;11(2):155-77. • Minchin D *et al.,* 2016. The most nothern records of the exotic ascidian Perophora japonica Oka, 1927 (Ascidiacea: Perophoridae) in the north-east Atlantic. BioInvasions records 5, no. 3 (2016): 139-142.). • Minchin D. Risk assessment of non-indigenous marine species, Ireland: including those expected in inland waters. The Centre for Environmental Data and Recording (CEDaR), Department of Natural Sciences, National Museums, Northern Ireland (NMNI) and the Department of Arts, Heritage and the Gaeltacht, Ireland. 2014;64:16. • O'Rourke E and O'Flynn C, 2014. Risk Assessment of *C. fornicata*. A joint project by Inland Fisheries Ireland and the National Biodiversity Data Centre to inform risk assessments of non-native species for the European Communities (Birds and Natural Habitats) Regulations 2011, supported by the National Parks and Wildlife Service. • Schoenrock KM, O'Callaghan T, O'Callaghan R, Krueger-Hadfield SA. First record of *Laminaria ochroleuca* Bachelot de la Pylaie in Ireland in Béal an Mhuirthead, County Mayo. Marine Biodiversity Records. 2019 Dec;12(1):1-8.
		5	Spread of invasive species in Kenmare River SAC could negatively impact on the conservation objectives for this SAC.
Chemical:			n/a
			n/a
Physical:			n/a
			n/a

(i) The conservation status of marine Annex I habitats in Kenmare River SAC.

(1) Sandbanks which are slightly covered by sea water all the time [1110]

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on: • Area. • Structure and function. • Future prospects.	Damage to sublittoral soft sediment communities with a limited range of species and sediment types (e.g. potentially due to installation of physical structures or dredging; ref: Scally et al., 2020).	1	3	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. In relation to sandbanks slightly covered by sea water all the time, harvesting will not occur in these areas.	EU regulations.

Hazard	**Proba bility**	**Sever ity**	**Reason for Decision**
Biological/ physical/ chemical	**1**		*A. nodosum* harvesting has no spatial overlap with this habitat. This habitat is mainly found along the east coast of Ireland but also occurs in the Shannon Estuary and off the Donegal coast. It is not listed as a protected habitat in Kenmare River SAC. Potential threats may include: Wind energy infrastructure in the vicinity of the habitat and benthic dredging from commercial fishing vessels (Scally et al., 2020).
		3	As this habitat is not protected under EU regulations in Kenmare River SAC the severity associated with impacts is reduced to reside within the range of 1-4. Conservation assessments show that this habitat is in favourable condition nationwide in terms of (a) area, (b) structure and function and (c) future prospects (Scally et al., 2020).

(2) Estuaries [1130]

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures ? Yes / No		
Impacts on: • Area. • Structure and function. • Future prospects.	Damage associated with increased sediment input and/or sediment mobilization (e.g. may be caused by factors related to agriculture, maintenance dredging, urbanization; ref: Scally et al., 2020).	2	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** • Measures are in place to ensure that hand harvesting does not impact on estuary habitat, either directly or indirectly, and that no cumulative or in combination effects occur. In particular, harvesting will be limited to the *A. nodosum* zone. • Adherence to environmentally safe navigation techniques is required to prevent disturbance of soft substratum areas. Harvesting can take place within the *A. nodosum* zone at suitable sites located within estuary areas, subject to adherence to the code of practice in relation to environmentally safe navigation, thus ensuring sea-floor and water column integrity. • Estuarine areas containing soft mud or marsh at the mouths of rivers will be avoided between Sept-April to avoid impacts on breeding or wintering bird species. Caution must be ensured if in the vicinity of these areas between May-Aug. • Additional measures in relation to estuarine areas are outlined as follows: ➢ Part (a) (8) of this document: Polychaetes and oligochaete species (Estuarine mud). ➢ Part (b) (11) of this document: Roughty River Estuary pNHA (site code: 0002092). ➢ Code of Practice (Appendix 4).	EU regulations.

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical/ chemical	**2**		As estuaries [1130] are not listed as a protected habitat in Kenmare River SAC, interactions with protected forms of these habitats will not occur. The spatial overlap between the *A. nodosum* zone and estuarine waters is generally low and in many cases is absent. *A. nodosum* also grows at lower levels in muddy estuarine areas. In addition, measures are in place to ensure that hand harvesting does not impact on estuary habitat. Estuarine areas will be avoided in general, particularly between Sept-April to avoid impacts on breeding or wintering bird species. As outlined in Part (a) (8) of this document, the probability of Polychaetes and oligochaete and their habitat (estuarine mud) being altered due to harvest activities are relatively low given that estuarine mud is largely insufficient to support growth of *A. nodosum* and thus, will not be targeted directly for harvest

			activities. As outlined in Part (b) (11) of this document, Roughty River Estuary pNHA is of relevance to a number of bird species and harbour seals (NPWS, 2009F). There is potential therefore that activities could lead to disturbance events (see section A above for details). Sea-floor and Water Column Integrity of the following are unlikely to be affected, as measures are in place to ensure environmentally safe navigation methods are employed to prevent impacts on estuarine substratum: Kenmare River Estuary, Blackwater K Estuary, Sneem Estuary, Kenmare River, Kilmackillogue Harbour, Ardgroom Harbour.
		5	The conservation status of estuaries is deemed 'Unfavourable-Inadequate' at a number of sites in Ireland: (Lough Swilly SAC, Dundalk Bay SAC and Lower River Shannon SAC; (Scally et al., 2020). As Estuaries [1130] is not protected under EU regulations in Kenmare River SAC the severity associated with impacts is considered low (range of 1-4). Overall severity is increased to 5 given the conservation objectives of Polychaetes and oligochaete and their habitat (estuarine mud; ref: page 13, NPWS, 2013A) and Roughty River Estuary pNHA which is of relevance to a number of bird species and harbour seals.

(3) Mudflats and sandflats not covered by seawater at low tide [1140]

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures ? Yes / No		
Impacts on: • Area, • Structure and function • Future prospects	**General:** Damage caused by increase in alien invasive species on *Zostera noltei* beds *(e.g. Spartina anglica),* change in sediment composition, increased sediment loads from activities upstream of rivers, discharge of untreated effluent and intensive agriculture causing disruption of sandy mud habitat in intertidal areas (Scally et al., 2020). ***A. nodosum* harvesting:** Use of boats during low tide to access rocky shorelines which lie beyond mudflat or sandflats.	1	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. In relation to mudflats and sandflats, harvesting will not occur in these areas. Harvesters will ensure that access by boat to rocky shores located beyond these areas is undertaken at high tide or when the tide has begun to recede (see Appendix 4)	EU regulations.

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical/ chemical	**1**		As mudflats and sandflats not covered by seawater at low tide [1140] is not listed as a protected habitat in Kenmare River SAC, interactions with protected forms of these habitats will not occur. However, The probability of mudflats and sandflats in Kenmare River SAC being altered due to harvest activities due to harvesting is relatively low given that: (a) this substrate is not suitable for *A. nodosum* growth and will not be targeted for harvest activities. (b) mudflats and sandflats generally exhibit little overlap with rocky shorelines. (c) accessing rocky shorelines lie beyond mudflats and sandflats at low tide in particular, is very difficult and would be avoided by harvesters. (d) harvesting has no impact on sedimentation rates. (e) mitigation measures are in place to prevent the spread of invasive species. While *Z. noltei* beds may be susceptible to increases in *S. anglica*; neither species are not reported to occur in Kenmare River SAC .
		5	The overall conservation status of Mudflats and sandflats not covered by seawater at low tide in Ireland has been assessed as Unfavourable-Inadequate; 3 sites (Castlemaine Harbour SAC, Dundalk Bay SAC and Lower River Shannon SAC) were assessed as Unfavourable-Inadequate, with the remaining 18 sites assessed as Favourable (Scally et al., 2020). Severity is considered high as harvest activities in these areas have the potential to significantly damage this habitat.

(4) Reefs [1170]

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2). NOTE: The *A. nodosum* biotope is assessed in Section C of this Appendix.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on: • Area, • Structure and function • Future prospects	**Pressures on reef may arise as follows (ref: Scally et al., 2020):** • **General:** Physical impacts on geogenic reef. • **Intertidal reef habitat:** Increase in invasive alien species and effects on intertidal marine algae potentially associated with harvesting. • **Sublittoral reef habitats:** examples of pressures include loss of fishing gear and the use of tangle nets and potentially the harvesting of macroalgae. • **Biogenic reefs:** Intertidal: honeycomb worm *(Sabellaria spinulosa), Mytilus edulis;* Subtidal: polychaete worm *(Serpula vermicularis).* ***A. nodosum* harvesting:** • Removal of habitat (i.e. reef): Potential removal of small quantities of stones, rocks, etc. • Removal with or without holdfast material: e.g. Small, stony, friable substrate. • Disruption or disturbance of reef: Impact by boats or disturbance or displacement may occur with inappropriate technique, lack of training or oversight.	2	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. When operating within the intertidal zone where *A. nodosum* is present (sheltered reef and shingle substratum areas), harvesters will ensure adherence to all aspects this Code of Practice. This will ensure that the habitat area is maintained and that structure and function is maintained or improved. It also ensures that future prospects and conservation status of reef and shingle areas are maintained or enhanced, whilst also preventing in combination effects with existing and planned activities. Key aspects of the Code of Practice and the harvesting system include but are not limited to the following: • Hand harvest techniques employed along rocky shores will ensure that *A. nodosum* is severed above point of contact with underlying substrate (see Appendix 4). • Levels of disturbance/displacement that could give rise to presence of reef and/or associated holdfast material, will be monitored and recorded via GRN, or other formats by electronic or other means and/or at production facilities. • A code of practice will be implemented to ensure that harvesters employ good boating practices, particularly when landing on shores (See Appendix 4). • Harvesters will be provided with training, where necessary, to ensure that reef is not disturbed or displaced. • Ensure that there are no physical interactions with biogenic reef in the rare event that it is encountered on the shore (e.g. honeycomb structures or mussels).	EU Dir. 92/43/ EEC & NPWS Kenmare SAC: Maintenance of reef habitats and species therein: Target 6 of Objective 1, NPWS, 2013A, page 19, and targets 1-3 of objective 2, NPWS 2013A, pg. 20.

Hazard	**Probability**	**Severity**	**Reason for Decision**

Biological / physical/ chemical	**2**		It is unlikely that the Area, Structure & function and Future prospects of Reef [1170] will be altered due to harvest activities given that: • ***A. nodosum* harvesting:** ➢ It is unlikely that distribution, abundance, diversity or area of reef will be altered due to harvesting. While *A. nodosum* may be harvested from rocky shores which contain reef as underlying substrate, the hand harvesting technique used ensures that *A. nodosum* vegetative growth is severed well above the point of contact with reef. Contact with reef would also lead to damage to the harvester's sickle/blade, thus, reef will always be avoided. ➢ It is unlikely that significant levels of disturbance or displacement would occur, to levels which would lead to co-removal of reef with or without holdfast material. This is due to the fact that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate. ➢ It is unlikely that reef will be damaged due to harvesting of *A. nodosum* given that: (a) harvesters will be using small boats to land on islands and coastal areas. Care will be taken in order to ensure that contact with reef is minimal, therefore avoiding any damage being inflicted on boats and (b) the collection boat (if deemed applicable to the area) will be fitted with a depth can device to ensure that contact with the reef is avoided as it will damage both the reef and the boat. ➢ Measures are in place to prevent impacts of harvesting and impacts on any associated species. See above and section A (11) and C (1 to 22). • **Intertidal reef habitat:** ➢ **Increase in invasive alien species:** Mitigation measures are in place to prevent the spread of invasive species. See Section H above. ➢ **Effects of harvesting intertidal marine algae:** See above. In addition, measures are in place to prevent impacts of *A. nodosum* harvesting and impacts on any associated species. See above and section A (11) and C (1 to 22). • **Sublittoral reef habitats:** Harvesting in subtidal areas will not take place. • **Geogenic reef:** Geogenic reef is unlikely to be vulnerable to change in Area due to the hard rock substrates from which they are formed. Other than minor alteration of the rock face due to the effects of natural erosion, habitat loss is highly unlikely (ref: Scally et al., 2020). It is unlikely that *A. nodosum* harvesting will impact on overall hydrodynamics as *A. nodosum* is adapted to growing in highly sheltered environs and as such, has difficulty remaining attached to hard substrate in less sheltered waters. Therefore, *A. nodosum* is likely to exert only a minor influence on hydrodynamics. The harvesting system is designed to ensure that dramatic changes in biomass levels within the intertidal zone will not occur. • **Biogenic reefs:** ➢ Honeycomb worm *(Sabellaria spinulosa):* It is unlikely that *Sabellaria* sp. will be affected due to harvesting as it mainly occurs in sublittoral zones in areas with moderate exposure, typically outside the *A. nodosum* zone. *S. spinulosa* is rare in Ireland and is not reported in Kenmare River SAC. ➢ Polychaete worm *(Serpula vermicularis)* has a broad depth range, occurring between the intertidal zone to depths of 100 m. This species is reported to occur subtidally at Scariff and Deenish Islands and at the entrance Kilmackillogue Harbour (ref: Mitchell S and Crapper J (2010), Holt & Morrow (1995), Morrow & Davies (1995)). Given the subtidal occurrence of this species in Kenmare River SAC, it is highly unlikely that impacts would arise due to harvesting *A. nodosum* in the intertidal zone. In addition, harvesting will not take place at Scariff and Deenish Islands. ➢ *M. edulis:* occurs in exposed & non-exposed areas, in a range of non-*A. nodosum* habitats. As such, it is unlikely to be impacted by harvesting.
		5	EU Dir. 92/43/EEC & NPWS, requires the maintenance of reef in a natural condition (Ref: Target 6 of Objective 1, NPWS, 2013A, page 19, and targets 1-3 of objective 2, NPWS 2013A, pg. 20).The overall conservation status of Reef in Ireland has been assessed as Favourable in terms of Area, Structure and function, future prospects. This includes both inshore and offshore reef areas (Scally et al., 2020). The conservation status of Reef in Kenmare River SAC has been assessed as favourable in terms of area, structure & functions, future prospects and the overall site assessment. Reef Marine Community Types sampled within Kenmare River SAC which led to the 'favourable' status designation include: (i) Intertidal reef community complex, (ii) *Laminaria*-dominated community complex and (iii) Subtidal reef with echinoderms and faunal turf community complex (Scally et al., 2020).

(5) Submerged or partially submerged sea caves [8330].

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on: • Area, • Structure and function • Future prospects	• Alteration of the rock face due to natural erosion and loss of area (Scally et al., 2020). • Removal of cave habitat or human activities that would influence community structure of seacaves. • Unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. In relation to submerged or partially submerged areas, harvesting will not occur in these areas.	EU Directives.

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical/ chemical	**1**		Sea caves in Ireland are formed from hard rock. Other than minor alteration of the rock face due to the effects of natural erosion, loss of area is highly improbable. The inaccessible nature of sea caves makes them less vulnerable to anthropogenic impacts (Scally et al., 2020). The overall conservation status of submerged or partially submerged sea caves in Ireland has been assessed as Favourable in terms of Area, Structure and function, future prospects (Scally et al., 2020). The probability of the Area, Structure and function or Future prospects of sea caves and their habitat being altered due to harvest activities is low given that: (a) Intertidal *A. nodosum* zone is largely confined to unexposed, sheltered areas and will not occur in the vicinity of seacaves. (b) There will be no activities which will negatively affect key resources to sea caves, including water quality.
		5	EU Dir. 92/43/EEC & NPWS, requires the conservation of sea caves and associated habitat (Ref: Target 1, 2 of Objective 3, NPWS, 2013A, page 21). Any activity which would negatively impact on sea caves would contravene this directive. The overall conservation status of submerged or partially submerged sea caves in Ireland has been assessed as Favourable in terms of Area, Structure and function, future prospects (Scally et al., 2020).

(6) Large shallow inlets and bays [1160]

Target 1: Permanent habitat area.

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).
NOTE: The *A. nodosum* biotope has been assessed in Section C of this Appendix.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on habitat area	Non-conformance with harvest procedures leading to inadvertent removal of habitats, e.g. excessive removal of sand, shingle, stones, pebbles, rock, debris, holdfasts). See Part (a) (1) of this document for more details.	2	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. Addition measures are outlined below in relation to permanent habitat area. • Harvesters will be provided with training, where necessary, to ensure that no removal of permanent habitat occurs, i.e. ➢ No removal of excessive levels of sand, shingle, stone, pebble, gravel, etc. ➢ No removal of *A. nodosum* holdfasts that could carry sand, shingle, stone, etc. • Resource Manager will inspect the harvest on collection or during the washing bagging operation on the collection boat, if deemed applicable for the area. If excessive sand, shingle or debris is observed, the harvesters will be provided with training, where necessary. • Checks will be recorded on the Goods Received Notes (GRNs, Appendix 3), or other formats by electronic or other means and/or at production facilities. • Production Operators will also inspect incoming harvested seaweed on production logsheets. The following will apply: ➢ If excessive levels of sand, shingle or debris etc is present in harvested weed: -Removal by sand filter and decanter and clarifier. - Harvesters provided with training, where necessary. If stones or rocks are present: -Harvesters provided with training, where necessary. • Non-conformance is reported, particularly in the serious event of *A. nodosum* holdfasts being present. See Part (a) (1) of this document for more details.	EU Directives.

Hazard	Probability	Severity	Reason for Decision
Biological/ physical/ chemical	**2**		The likelihood of impacting on habitat area is very low and substratum will not be removed or altered. In addition, the sustainable hand harvest method employed ensures regeneration of *A. nodosum* post harvesting. The likelihood of sand and rocks being removed along with harvested *A. nodosum* is low. Given that sand and rocks may damage production equipment and end product, harvesters will be required to ensure such materials are not included in the bags/nets. The collection of floating bags/nets at high tide or as high tide approaches also reduces the likelihood of excessive levels of sand or other material being removed from the foreshore. This system ensures settlement to the seabed of any rarely occurring sand or other foreshore material that may be attached to the bottom or sides of the bag or in the netting. In addition, *A. nodosum* will be harvested no less than 200mm above the holdfast. This reduces the likelihood of holdfasts being removed, which could otherwise, inadvertently lead to removal of attached pebbles or stones (see Appendix 4 for Code of Practise). See Part (a) (1) of this document for more details.
		5	• The national conservation assessment indicates that shallow inlets and bays [1160] in Ireland are classified as 'unfavourable-bad' (Scally et al., 2020). The 'area' conservation attribute is classified as 'favourable', while 'structure & functions' and 'future prospects' are considered as 'unfavourable-bad' and 'unfavourable-inadequate' respectively. Kenmare River SAC is categorized 'favourable' in terms of Area, 'unfavourable-bad' for two attributes: 'future prospects' and 'overall site assessment' and 'unfavourable-inadequate' for 'structure & functions'. The main explanation for the failure of Large shallow inlets and bays [1160] to achieve Favourable conservation status is the significant change recorded in the *Area* and *Structure & functions* of keystone communities which are characterized by sensitive indicator species. In Kenmare River SAC, minor increases in the habitat for *Pachycerianthus multiplicatus* were recorded. However these increases are considered to be the result of increased survey effort rather than an increase in species distribution. No significant increase in the extent of the area of other keystone species was recorded (Scally et al., 2020). • The overall conservation status of Reef in Ireland has been assessed as Favourable. The conservation status of Reef in Kenmare River SAC (where *A. nodosum* harvesting will primarily take place) has been assessed as 'favourable' in terms of area, structure & functions, future prospects and the overall site assessment. Reef Marine Community Types sampled within Kenmare River SAC which led to the 'favourable' status designation include: (i) Intertidal reef community complex, (ii) *Laminaria*-dominated community complex and (iii) Subtidal reef with echinoderms and faunal turf community complex (Scally et al., 2020). • In accordance with EU Dir. 92/43/EEC & NPWS, areas must be maintained at favourable conservation conditions to ensure stability of the permanent habitat area (Ref: Target 1 of Objective 1, NPWS, 2013A, page 17).

Target 2: Community extent (*Zostera*, maërl and *Pachycerianthus multiplicatus* and associated communities)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required. *probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2). NOTE: The *A. nodosum* biotope has been assessed in Section C of this document.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on Community extent	Removal of habitat of rare & endangered species (i.e. *Zostera* Seagrass and associated communities; Maerl Dominated communities), potentially due to unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. In relation to *Zostera,* maerl and *Pachycerianthus multiplicatus*, harvest of *A. nodosum* will not take place in these areas and measures are in place to ensure appropriate navigation methods are used when accessing the foreshore, thus preventing any potential impacts.	EU Directives.

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical/ chemical	**1**		It is highly improbable that the distribution, abundance, diversity or area occupied by *Zostera* Seagrass (and associated communities) will be altered due to harvesting of *A. nodosum* given that: (a) these areas and communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested and (b) the sandy substrate supporting *Zostera* growth are insufficient to support *A. nodosum* and thus, will not be affected by harvest activities. It is highly improbable that the distribution, abundance, diversity or area occupied by maerl and associated communities will be altered due to harvesting of *A. nodosum* given that: (a) these areas and communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested and (b) the coarse, mixed, sandy mud and muddy sand sediment substrates which support maerl growth are insufficient to support *A. nodosum* and thus, will not be targeted for harvest activities. It is highly improbable that the distribution, abundance, diversity or area occupied by *Pachycerianthus multiplicatus* and associated communities will be altered due to harvesting of *A. nodosum* given that: (a) these areas and communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested and typically occurs at depths of ~15m and (b) the muddy sand sediment substrates which support *Pachycerianthus multiplicatus* growth are insufficient to support *A. nodosum* and thus, will not be targeted for harvest activities.
		5	• The national conservation assessment indicates that shallow inlets and bays [1160] in Ireland are classified as 'unfavourable-bad' (Scally et al., 2020). The 'area' conservation attribute is classified as 'favourable', while 'structure & functions' and 'future prospects' are considered as 'unfavourable-bad' and 'unfavourable-inadequate' respectively. Kenmare River SAC is categorized 'favourable' in terms of Area, 'unfavourable-bad' for two attributes: 'future prospects' and 'overall site assessment' and 'unfavourable-inadequate' for 'structure & functions'. The main

			explanation for the failure of Large shallow inlets and bays [1160] to achieve Favourable conservation status is the significant change recorded in the *Area* and *Structure & functions* of keystone communities which are characterized by sensitive indicator species. In Kenmare River SAC, minor increases in the habitat for *Pachycerianthus multiplicatus* were recorded. However these increases are considered to be the result of increased survey effort rather than an increase in species distribution. No significant increase in the extent of the area of other keystone species was recorded (Scally et al., 2020). • The conservation status of Reef in Kenmare River SAC (where *A. nodosum* harvesting will primarily take place) has been assessed as 'favourable' in terms of area, structure & functions, future prospects and the overall site assessment. Reef Marine Community Types sampled within Kenmare River SAC which led to the 'favourable' status designation include: (i) Intertidal reef community complex, (ii) *Laminaria*-dominated community complex and (iii) Subtidal reef with echinoderms and faunal turf community complex (Scally et al., 2020). • EU Dir. 92/43/EEC & NPWS, requires the maintenance of the natural extent of Zostera Seagrass and associated communities and maerl and associated communities (Ref: Targets 2-3 of Obj.1, NPWS, 2013A, pg:17,18). Harvest activities in these areas could significantly damage these areas and associated communities. • EU Dir. 92/43/EEC & NPWS, requires the maintenance of the natural extent of maerl and associated communities (Ref: Targets 2 & 4 of Obj.1, NPWS, 2013A, pg:17,18). Harvest activities in these areas could significantly damage maerl and associated communities. • In accordance with EU Dir. 92/43/EEC & NPWS, areas must be maintained at favourable conservation conditions to ensure stability of the permanent habitat area (Ref: Target 1 of Objective 1, NPWS, 2013A, page 17).

Target 3: Community structure: Zostera density

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).
NOTE: The *A. nodosum* biotope has been assessed in Section C of this Appendix.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on *Zostera* shoot density (shoots per m2)	Removal of habitat of rare & endangered species (i.e. Zostera seagrass and associated communities), potentially due to unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. In relation to *Zostera*, harvest of *A. nodosum* will not take place in these areas.	EU Dir. 92/43/ EEC (Anon, 1992) & NPWS Kenmare SAC: Targets 2-3 of Obj.1, NPWS, 2013A, pg:17,18

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical/ chemical	**1**		As above for target 2
		5	As above for target 2

Target 4: Community Structure *(Pachycerianthus multiplicatus)*

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).
NOTE: The *A. nodosum* biotope has been assessed in Section C of this Appendix.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on community structure (maerl)	Removal of habitat of or damage to beds of the tubicolous anemone *Pachycerianthus multiplicatus* (Fireworks Anemone), and associated species (e.g. *Cerianthus Llyodii* and *Peachia cylindrical).*	1	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. In relation to *Pachycerianthus multiplicatus*, harvest of *A. nodosum* will not take place in these areas.	EU Dir. 92/43/ EEC & NPWS Targets 2 & 5 of Obj.1, NPWS, 2013A, pg:17,18

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical/ chemical	**1**		As above for target 2
		5	As above for target 2

Target 5: Community Structure (Maerl)

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).
NOTE: The *A. nodosum* biotope has been assessed in Section C of this Appendix.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on community structure (maerl)	Removal of habitat of rare & endangered species (i.e. Maerl Dominated communities), potentially due to unauthorized harvest in these protected areas.	1	5	A	no	n/a	yes	**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. In relation to maerl, harvest of *A. nodosum* will not take place in these areas.	EU Dir. 92/43/ EEC & NPWS Targets 2 & 4 of Obj.1, NPWS, 2013A, pg:17,18

Hazard	**Probability**	**Severity**	**Reason for Decision**
Biological/ physical/ chemical	**1**		As above for target 2
		5	As above for target 2

Target 5: Community distribution

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).
NOTE: The *A. nodosum* biotope has been assessed in Section C of this Appendix.

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk Assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Impacts on community distribution:								**The conservation status of marine Annex I habitats:** The Code of Practice (Appendix 4) provides a range of measures that will be undertaken to ensure that the conservation status of marine Annex I habitats is maintained or improved. Addition measures are outlined below. **Intertidal mobile sand community complex*:*** According to the Code of Practice, harvesting will not occur on clean, sandy beaches, thus preventing any impact on this habitat. **Muddy fine sands dominated by polychaetes and Amphiura filiformis community complex*:*** Ensure implementation of code of practice to ensure that: harvesters do not navigate to rocky shorelines beyond muddy fine sand areas, during periods of time when mud/sand is exposed or vulnerable to damage by boats (e.g. low tide; see Appendix 4). Particularly relevant at inner, north-east reaches of the site, Collorus to Bunaw, Ardgroom Harbour and parts of Sneem and Parknasilla. Access by boat to rocky shores located beyond these areas must be undertaken at high tide or when the tide has begun to recede. **Fine to medium sand with crustaceans and polychaetes community complex:** Ensure implementation of Code of Practice to ensure that boat contact with coastal areas is minimal, thus ensuring no damage is inflicted to	EU Dir. 92/43/ EEC & NPWS
Intertidal mobile sand community complex*:* Intertidal mobile sand community complex: Removal of habitat of rare & endangered species or damage to associated substrate.	Unauthorized access to sandy beaches.	1	5	A	No	n/a	Yes		
Muddy fine sands dominated by polychaetes and Amphiura filiformis community complex: Removal of habitat of rare & endangered species or damage to associated substrate	Unauthorized access to intertidal zone beyond muddy fine sand areas, during times of substrate exposure or vulnerability to damage by boats, e.g. low tide.	1	5	A	No	n/a	Yes		

Fine to medium sand with crustaceans and polychaetes community complex: Removal of habitat of rare & endangered species or damage to associated substrate (i.e. Crustaceans and polychaetes community complex; fine-medium sand)	Unauthorized access to intertidal zone beyond these protected areas during times of substrate exposure or vulnerability to damage by boats, e.g. low tide.	1	5	A	No	n/a	Yes	either the boat or the underlying habitat. Harvesters are required to approach the shore at slow pace so as to minimize contact with fine-medium sand which may occur in proximity to the intertidal *A. nodosum* zone during periods of time when substrate is exposed (e.g. low tide). Particularly relevant in areas where fine-medium sand occur in close proximity to intertidal reef areas, e.g. the complex mosaics of substrate in close proximity to (1) an area in Kilmackillogue Harbour located between Collorus Pt. and Laughaunacreen near Bunaw and (2) an area in the vicinity of Cove Harbour and Castlecove, (3) North Allihies to Coomeen and (4) just west of Garnish Island. The complex mosaic in Derrynane will be avoided all year round as this is part of the Iveragh Peninsula SPA [004154]. **Coarse sediment dominated by polychaetes community complex:** Harvest will not occur in these areas. **Shingle:** • A system is in place which ensures that: ➢ Hand harvest techniques which may be potentially employed near shingle areas, will involve the severing of *A. nodosum* above the point of contact with underlying substrate. ➢ Levels of disturbance or displacement that could give rise to presence of shingle, friable substrate and/or associated holdfast material in the harvested seaweed, will be monitored and recorded via 'Goods received Notes' (GRN), or other formats by electronic or other means and/or at production facilities. ➢ A code of practice will be implemented to ensure that harvesters employ good boating practices, particularly when landing on shores. ➢ Harvesters will be provided with training, where necessary, to ensure that reef or shingle is not disturbed or displaced. ➢ Levels of disturbance or displacement that could give rise to excessive presence of such material in the harvested seaweed, will be monitored	
Coarse sediment dominated by polychaetes community complex: Damage to or removal of habitat required by *Polychaetes* community complex in coarse sediment areas	Unauthorized harvest in these protected areas.	1	5	A	No	n/a	Yes		
Shingle: Removal of habitat of rare & endangered species (i.e. Shingle (pebbles and gravel); Disruption or disturbance of shingle.	• Potential removal of small quantities of stones, rocks, etc. Small, stony, friable substrate. • Impact by boats • Disturbance or displacement may occur with inappropriate technique, lack of training or oversight	1	5	A	No	n/a	Yes		

Intertidal reef community complex: As per Section 1 (a)(11), 1(c) and Section (i) (4), of this Appendix.	As per Section 1 (a)(11), 1(c) and Section (i) (4), of this Appendix.	2	5	A	No	n/a	Yes	and recorded via 'Good received Notes' (GRN), or other formats by electronic or other means and/or at production facilities. ➢ Sites will be inspected post-harvest to check the sustainability of the methods employed and the harvest locations using the Site Inspection Form (SIF, Appendix 3), or other suitable format by electronic or other means. See "Code of Practise" for details (Appendix 4). **Intertidal reef community complex:** Control measures as per Section 1 (a)(11), 1(c) and Section (i) (4), of this Appendix, in relation to reef, *A. nodosum* and species associated with this biotope.	
Subtidal reef with echinoderms and faunal turf community complex: Removal of habitat, etc.	Harvesting in subtidal areas.	1	5	A	No	n/a	Yes	• **Subtidal reef with echinoderms and faunal turf community complex:** Harvest will not take place in subtidal areas. The code of practice ensures that appropriate navigation methods are used when accessing the foreshore.	
***Laminaria*-dominated community complex:** Alteration to density of *Laminaria digitata, Laminaria hyperborea or associated species.*	• Inadvertent harvesting of *Laminaria digitata* growing in proximity to the intertidal zone. • Inadvertent harvesting of *Laminaria hyperborea* in deeper waters outside the intertidal zone. • Damage to *Laminaria* beds by boats en route to foreshore.	1	5	A	No	n/a	Yes	• ***Laminaria*-dominated community complex:** Harvest will not take place in subtidal areas. The code of practice ensures that appropriate navigation methods are used when accessing the foreshore, thus preventing damage to *Laminaria* and its substrate at low tide.	

Hazard	Probability	Severity	Reason for Decision
Biological/ physical/ chemical	**1**		**Intertidal mobile sand community complex:** The probability of Intertidal mobile sand community complex being altered due to harvest activities in is relatively low given that *A. nodosum* does not grow in on sand substratum e.g. clean fine sand areas such Derrynane Bay, Rossdohan, Leaghillaun. **Muddy fine sands dominated by *Polychaetes* and *Amphiura filiformis* community complex;** It is unlikely that the distribution, abundance, diversity or area of muddy fine sands dominated by *Polychaetes & Amhiura filiformis* community complex, will be significantly altered due to harvesting of *A. nodosum* given that: (a) the majority of this community complex predominates in deeper waters throughout the site, ranging from depths of 0m to 84m, and

			thus will be largely unaffected by activities, (b) the muddy fine sand areas containing these communities exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested, (c) muddy fine sand areas are insufficient to support growth of *A. nodosum* and thus, will not be targeted for harvest activities and (d) accessing rocky shorelines that lie beyond muddy fine sand areas at low tide in particular, is very difficult and will generally be avoided. **Fine to medium sand with crustaceans and polychaetes community complex** The probability of Crustaceans and polychaetes community complex and their habitat (clean, fine sand area) being altered due to harvest activities are relatively low given that: (a) a large proportion of this community complex predominates in deeper waters (0-42m), most often beyond the *Laminaria* zone and beyond the intertidal zone, and thus will be largely unaffected by activities. (b) the fine medium sand areas containing exhibit little overlap with the rocky shorelines in which *A. nodosum* will be harvested,. (c) fine-medium sand areas are insufficient to support growth of *A. nodosum* and thus, will not be targeted for harvest activities. (d) accessing rocky shorelines that lie beyond fine-medium sand areas at low tide in particular, is very difficult and will generally be avoided. **Coarse sediment dominated by polychaetes community complex** The probability of *Polychaetes* community complex and their habitat (coarse sediment areas) being altered due to harvest activities is low given that: (a) this community complex occurs in deeper waters (4-68m), beyond the intertidal *A. nodosum* zone. (b) *A. nodosum* does not grow on this sediment, and therefore will not be subjected to harvest activities. (c) this habitat exhibits little overlap with the rocky shorelines where *A. nodosum* grows. **Shingle:** • It is unlikely that distribution, abundance, diversity or area of shingle will be altered due to harvesting of *A. nodosum* given that shingle is considered contaminant material and measures are in place to prevent its potential removal during harvest. • It is unlikely that shingle areas will be damaged due to harvesting of *A. nodosum* given that harvesters will be using small boats to land on islands and coastal areas. Care will be taken in order to ensure that contact with shingle and reef is minimal, therefore avoiding any damage being inflicted on boats. • It is unlikely that significant levels of disturbance or displacement of shingle will occur. This is due to the fact that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate. **Intertidal reef community complex:** • It is unlikely that distribution, abundance, diversity or area of reef and intertidal reef community complex will be altered due to harvesting of *A. nodosum.* While *A. nodosum* may be harvested in from rocky shores which contain reef as underlying substrate, the hand harvesting technique used ensures that *A. nodosum* vegetative growth is severed well above the point of contact with reef. Contact

			with reef would also lead to damage to the harvesters sickle/blade, thus, reef will always be avoided. • It is unlikely that significant levels of disturbance or displacement would occur, to levels which would lead to co-removal of reef with or without holdfast material. This is due to the fact that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate. • It is unlikely that reef will be damaged due to harvesting of *A. nodosum* given that: (a) harvesters will be using small boats to land on islands and coastal areas. Care will be taken in order to ensure that contact with reef is minimal, therefore avoiding any damage being inflicted on boats. (b) The harvest collection boat, if deemed applicable for the area, will be fitted with a depth can device to ensure that contact with the reef is avoided as it will damage both the reef and the boat. • Measures are in place in Appendix 4 to prevent impacts on species associated with reef and *A. nodosum.* **Subtidal reef with echinoderms and faunal turf community complex:** It is unlikely that **Subtidal reef with echinoderms and faunal turf community complex** will be altered due harvesting of *A. nodosum* given subtidal reef does not support *A. nodosum* growth and will not be targeted for harvesting. ***Laminaria*-dominated community complex:** It is unlikely that *Laminaria spp.* and associated species will be altered due harvesting of *A. nodosum* given the following: • *Laminaria* spp. is generally found in exposed areas where *A. nodosum* does not grow. • While *Laminaria digitata* can occur in close proximity to the intertidal *A. nodosum* reef areas throughout Kenmare SAC, this species will not be targeted for harvesting. • *Laminaria hyperborea* occurs in deeper waters at depths of between 4m and 22m, outside the *A. nodosum* zone.
		5	• **EU Dir. 92/43/EEC and NPWS conservation requirements:** The following communities should be maintained in a natural condition: Intertidal mobile sand community complex; Muddy fine sands dominated by polychaetes and Amphiura filiformis community complex; Fine to medium sand with crustaceans and polychaetes community complex; Coarse sediment dominated by polychaetes community complex; Shingle; Intertidal reef community complex; Subtidal reef with echinoderms and faunal turf community complex; *Laminaria*-dominated community complex (Ref: NPWS, 2013A). • **National assessment:** The national conservation assessment indicates that shallow inlets and bays [1160] in Ireland are classified as 'unfavourable-bad' (Scally et al., 2020). The 'area' conservation attribute is classified as 'favourable', while 'structure & functions' and 'future prospects' are considered as 'unfavourable-bad' and 'unfavourable-inadequate' respectively. • **Kenmare River SAC:** Scally et al., (2020) assessed status of community distribution in Large shallow inlets and bays in Kenmare River SAC. In their study, the following Sediment Marine Community Type/habitats were sampled: Intertidal mobile sand community complex; Muddy fine sands dominated by polychaetes and Amphiura filiformis community complex; Fine to medium sand with crustaceans and polychaetes community complex; Coarse sediment dominated by polychaetes community complex. The following Reef Marine Community Types/habitats were sampled: Intertidal reef community complex; *Laminaria*-dominated community complex; Subtidal reef with echinoderms and faunal turf community complex. For Large shallow inlets and bays [1160], Kenmare River SAC is categorized 'favourable' in terms of Area, 'unfavourable-bad' for two attributes: 'future prospects' and 'overall site assessment' and 'unfavourable-inadequate' for 'structure & functions'. The main explanation for the failure of Large shallow inlets and bays [1160] to achieve Favourable conservation status is the significant change recorded in the *Area* and *Structure & functions* of keystone

			communities which are characterized by sensitive indicator species. In Kenmare River SAC, minor increases in the habitat for *Pachycerianthus multiplicatus* were recorded. However these increases are considered to be the result of increased survey effort rather than an increase in species distribution. No significant increase in the extent of the area of other keystone species was recorded (Scally et al., 2020). • **Reef:** The overall conservation status of Reef in Ireland has been assessed as Favourable in terms of Area, Structure and function, future prospects. This includes both inshore and offshore reef areas (Scally et al., 2020). The conservation status of Reef in Kenmare River SAC (where *A. nodosum* harvesting will primarily take place) has been assessed as 'favourable' in terms of area, structure & functions, future prospects and the overall site assessment. Reef Marine Community Types sampled within Kenmare River SAC which led to the 'favourable' status designation include: (i) Intertidal reef community complex, (ii) *Laminaria*-dominated community complex and (iii) Subtidal reef with echinoderms and faunal turf community complex (Scally et al., 2020).

(j) Potential pressures on the marine environment.

(1) Hydrological

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Requirements**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Y / N		
Hydrological pressures/hazards:								The harvest system is designed with sustainability at the forefront and dramatic alterations to biomass levels will not occur. Harvest activities will not reduce height of *A. nodosum* below 200mm (8 inches). See "Code of Practise" for details (Appendix 4).	None specified.
Ocean acidification	No potential effects of *A.nodosum* harvesting.	0	5	A	no	n/a	No		
Sea level rise		0	5	A	no	n/a	No		
Increased UV		0	5	A	no	n/a	No		
Emergence regime changes (tidal level)		0	5	A	no	n/a	No		
Salinity change		0	5	A	no	n/a	No		
Temperature changes		0	5	A	no	n/a	No		
Water flow (tidal current) changes	Over-harvesting.	1	5	A	no	n/a	yes		
Wave exposure changes		1	5	A	no	n/a	yes		
Deoxygenation		1	5	A	no	n/a	yes		

Hazard/ Pressure	**Prob-ability**	**Severity**	**Reason for Decision**
Hydro-logical	**0 to 1**		• Seaweed harvesting is not considered as an activity that gives rise to the following hydrological pressures: ocean acidification, sea level rise, increased UV, emergence regime changes (tidal level), salinity change, temperature changes (ref: Marine Protected Area Advisory Group, 2020 and references therein). • It is highly unlikely that *A. nodosum* harvesting will impact on water flow (tidal current) changes or wave exposure changes. *A. nodosum* is adapted to growing in highly sheltered environs and as such, has difficulty remaining attached to hard substrate in less sheltered waters. Therefore, the potential influence of *A. nodosum* on hydrodynamics, water flow and wave exposure (if any) is likely to be minor. As the harvesting system is designed to ensure that dramatic changes in biomass levels within the intertidal zone will not occur, the likelihood of such effects arising is further reduced. • Dissolved oxygen enters water via two mechanisms: (a) entry directly from the air leading to aeration of water; e.g. either through slow diffusion of air across water surfaces or from quick mixing via wind, waves and other related factors and (b) as a by-product of photosynthesis. The contribution of seaweed to oxygenation via photosynthesis is relatively minor. In particular, marine macrophytes account for low levels of global net primary production (NPP) of carbon per annum (<1%) compared to other sources, e.g. the combined category of land sources (e.g. land plants, forestry, crops) and marine phytoplankton together account for 99% of global NPP of carbon per annum (Field *et al.,* 1998). NPP is the total amount of carbon fixed in the process of photosynthesis (the conversion of carbon dioxide, water and light energy into glucose and oxygen) by plants in an ecosystem [Gross Primary Production] minus respiration. As hand harvesting of *A. nodosum* (a renewable resource) will be undertaken in a sustainable manner to allow regeneration of the resource, net primary production of carbon and production of oxygen as a by-product of photosynthesis will not be significantly affected.
		5	Alterations to hydrodynamics, water flow (tidal current) changes, wave exposure changes and deoxygenation could potentially have impacts on Kenmare River SAC and its conservation requirements.

(2) Chemical

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Yes / No		
Chemical pressures/hazards:					no	n/a		• BioAtlantis will not harvest in areas near sewage outfalls or other sources of pollution. • The management system requires that over-harvesting does not occur. • Routine maintenance of boat engine, etc. • Harvesters will be provided with training, where necessary, to ensure cleaning takes place in a manner which does not lead to wash off of cleaning agents into the environment, e.g. use of designated washing bays where available. See "Code of Practise" (Appendix 4) for details.	None specified.
Nutrient enrichment	• Harvesting near sewage outfalls. • Over-harvesting.	1	5	A	no	n/a	Yes		
Organic enrichment	• Harvesting near sewage outfalls. • Over-harvesting.	1	5	A	no	n/a	Yes		
Radionuclide contamination	• No potential effects of harvesting.	0	5	A	no	n/a	n/a		
Synthetic compound contamination	• Fuel oil leak from harvest recovery/collection boat caused by engine malfunction, fuel line rupture, etc. • Non-conformance with procedures for storing and cleaning of boats.	1	5	A	no	n/a	Yes		
Non-synthetic compound contamination	• Harvesting near sewage outfalls	1	5	A	no	n/a	Yes		

Hazard/ Pressure	**Probability**	**Severity**	**Reason for Decision**
Chemical	**0-1**		• Seaweed harvesting is not considered an activity that gives rise to radionuclide contamination or synthetic compound contamination (ref: Marine Protected Area Advisory Group, 2020 and references therein). • BioAtlantis Ltd. will manage harvesting in a sustainable manner to ensure that excessive removal of *A. nodosum* does not occur and is limited to 20% of the total available biomass per site per annum and that *A. nodosum* mortality is mitigated against. This reduces the likelihood of any potential effects occurring in terms of nutrient and organic enrichment and ensures that substantial levels of unharvested *A. nodosum* remain in situ post-harvesting. • It is highly unlikely that *A. nodosum* harvesting will give rise to chemical pressures such as nutrient loading, nutrient enrichment, organic enrichment or non-synthetic compounds contamination. In particular, harvest activities will not give rise to significant increases in pollution (see Section A1 above). It has been suggested that seaweeds may reduce the impact of anthropogenic mediated nutrient-enrichment or eutrophication in

Hazard/ Pressure	Probability	Severity	Reason for Decision
			marine waters and in turn, the removal of seaweed may potentially exacerbate the impacts of pollution. However, *A. nodosum* is low in protein content and its capacity absorb nitrogen and nutrients is minimal. Polluted water can also have negative impacts on *A. nodosum* performance, epiphyte infestation, colonisation and competition by green algae. As such, *A. nodosum* is a species that is susceptible to the effects of pollution. The likelihood of exacerbating existing impacts of pollution are also low as hand harvesting in proximity to sewage outfalls, etc, will not occur. • It is highly unlikely that nutrient cycling in marine and coastal areas will be affected by sustainable harvesting, as *A. nodosum* is typically low in nutrient content and has a low capacity to absorb nitrogen. The sustainable nature of the harvesting plan ensures that the likelihood and magnitude of any effects are low. • It is highly unlikely that harvesting of *A. nodosum* will have any impacts on the level of detritus, drift litter, dissolved organic matter (DOM), organic enrichment or secondary production in sandy beach locations or other areas. *A. nodosum* is mainly restricted to sheltered rocky/shingle substratum areas and rarely accumulates at high levels in sandy beach locations or other exposed coastal areas. Furthermore, as the plan requires harvesting to take place on a sustainable basis in terms of the nature, scale, intensity and duration of the activity, the likelihood or magnitude of any effects are low. As the hand harvesting system ensures that over-harvesting does not take place and that *A. nodosum* mortality is mitigated against, the likelihood of over harvesting of *A. nodosum* to levels which significantly reduce total organic drift litter, detritus or organic matter in Kenmare River SAC, is low. • Contamination with non-synthetic compounds will not occur due to harvesting, as the harvesting plan ensures appropriate removal of any rubbish, debris, waste or other foreign matter when at port.
		5	A high severity rating is assigned, as alterations to water quality due to chemical pressures/hazards could have significant impacts on the SAC in broad terms.

(3) Physical

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required.
*probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Y/		
Physical pressures/hazards:								As per Sections A (10) and A (11), a system is in place to ensure: • Hand harvest techniques employed along rocky shores and shingle areas will ensure that *A. nodosum* is severed above point of contact with underlying substrate. Sites will be inspected post-harvest to check the sustainability of the methods employed and the harvest locations using the Site Inspection Form (SIF, Appendix 3) or other suitable format by electronic or other means. • Levels of disturbance or displacement of substratum that could give rise to presence of reef, shingle, friable substrate and/or associated holdfast material, will be monitored and recorded via 'Goods received Notes' (GRN), or other formats by electronic or other means and/or at production facilities. • Harvesters will employ good boating practices, particularly when landing on shores. • Harvesters will be provided with training, where necessary, to ensure that reef and shingle is not disturbed or displaced. • Levels of disturbance or displacement that could give rise to presence of substratum material in the harvested seaweed, will be monitored and recorded via 'GRN. or other formats by electronic or other means and/or at production facilities.	None specified.
Habitat structure changes - removal of substratum (extraction)	•Removal of habitat (i.e. reef, Shingle, pebbles and gravel): Potential removal of small quantities of stones, rocks, etc. •Removal with or without holdfast material: Small, stony, friable substrate. •Disruption or disturbance of reef or shingle: Impact by boats, disturbance or displacement may occur with inappropriate technique, lack of training or oversight.	2	5	A	no	n/a	Yes		
Disturbance of the substrate		2	5	A	no	n/a	Yes		
Physical change to seabed or sediment type	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Physical loss (to land or freshwater habitat)	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Barrier to species movement	No potential effects of harvesting.	na	5	A	no	n/a	No	Not required as this proposal does not include artificial barriers. However, the Code of Practice does include measures aimed at preventing barriers to commuting or connectivity of Annex II species.	

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Y/		
Changes in suspended solids (water clarity)	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Death or injury by collision	• H&S not adhered to. • Physical contact with or disturbance to Annex II species and Annex I habitats.	1 2	5 5	A A	no no	n/a n/a	Yes Yes	• Ensure that all necessary H&S equipment is maintained. Adherence to H&S practices will be checked by the Resource Manager and noted in the site Inspection Form, if applicable. • Ensure suitable use of bags/nets and implement steps to minimize co-harvesting other species or by-catch of other *Animalia*. • Follow measures to prevent interactions or disturbance with Annex II species in the water (harbour seals and otters) and other marine mammals. • Ensure adherence to environmentally safe navigation requirements to prevent impacts on Annex I habitats. See Appendix 4 for details.	
Electromagnetic changes	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Light pollution	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Introduction of other substances (solid, liquid, gas)	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Litter	Debris from the boat may inadvertently be deposited into the environment.	1	3	A	no	n/a	Yes	Appropriate removal of rubbish, debris or other foreign matter when at port.	
Smothering and siltation rate changes	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Noise pollution	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Vibration	No potential effects of harvesting.	0	5	A	no	n/a	No	N/A	
Visual disturbance	No potential effects of harvesting.	2	5	A	no	n/a	Yes	See Sections A13-17, A22 and A23 of this document for measures to prevent disturbance of Annex I species (otter and harbour seals) and birds and Appendix 4 for the associated Code of Practice.	

Hazard/ Pressure	Prob-ability	Severity	Reason for Decision
Physical	**0-2**		• Seaweed harvesting is not considered as an activity that gives rise to any of the following: Physical changes to seabed or sediment type, physical loss (to land or freshwater habitat), changes in suspended solids (water clarity), electromagnetic changes, introduction of other substances (solid, liquid or gas), smothering and siltation rate changes and vibration (ref: Marine Protected Area Advisory Group, 2020). • Habitat structure changes - removal of substratum (extraction); Disturbance of the substrate: ➢ It is unlikely that distribution, abundance, diversity or area of shingle will be altered due to harvesting of *A. nodosum* given that shingle is considered contaminant material and measures are in place to prevent its potential removal during harvest . ➢ It is unlikely that shingle areas will be damaged due to harvesting given that harvesters will be using small boats to land on islands and coastal areas. Care will be taken in order to ensure that contact between boats and shingle is minimal, therefore avoiding any damage being inflicted on boats. ➢ It is unlikely that distribution, abundance, diversity or area of reef will be altered due to harvesting. While *A. nodosum* may be harvested from rocky shores which contain reef as underlying substrate, the hand harvesting technique used ensures that *A. nodosum* vegetative growth is severed well above the point of contact with reef. Contact with reef would also lead to damage to the harvesters sickle/blade, thus, reef will always be avoided. ➢ It is unlikely that significant levels of disturbance or displacement would occur, to levels which would lead to co-removal of reef with or without holdfast material, given that the harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to ensure substrate is not disturbed. Reef is also considered a contaminant material and will not be removed during harvesting ➢ It is unlikely that reef areas will be damaged due to harvesting of *A. nodosum* given that harvesters will be using small boats to land on islands and coastal areas. Care will be taken in order to ensure that contact with reef is minimal, therefore avoiding any damage being inflicted on boats. ➢ It is unlikely that significant levels of disturbance or displacement of reef or shingle will occur given that the hand harvest methodology involves working at low tide and harvesters have full view of the cutting process, allowing them to take care not to disturb the substrate. • Death or injury by collision: The likelihood of death of injury by collision is highly unlikely as measures are in place to ensure H&S measures are adhered to. Measures are also in place to protect species of Animalia and other species should they be encountered, including Harbour seals and Otters and to ensure that inadvertent by-catch of other algae, amphipods, isopods or other Animalia is prevented and minimized. Measures are also in place to protect Annex I habitats and species therein are by employing environmentally safe navigation techniques (See Appendix 4). • While light is listed as a potential pressure associated with harvesting (MPA Advisory Group, 2020), this pressure does not arise in this proposal. Moreover, measures are in place requiring that harvesters cut between 200-300mm (8-12 inches) above the holdfast, thus ensuring sufficient canopy coverage. Ensuring sufficient canopy coverage prevents potential impacts due to light stress, heat stress or desiccation and prevents potential impacts on biodiversity, species within the biotope or species utilizing or present at the base of the canopy. It also ensures maintenance of habitat for use by other species at high tide. • The likelihood of litter occurring due to harvesting is highly unlikely as the necessary measures are in place to ensure proper disposal of any litter. • While noise is listed as a potential pressure associated with harvesting (MPA Advisory Group, 2020), this pressure does not arise in this proposal. However, measures are in place in the Code of Practice to ensure that noise is kept to a minimum (e.g. revving engines or shouting must be avoided). • The Code of Practice is designed to prevent visual disturbance-related impacts on sensitive marine mammalian and avian species (Annex II species (Harbour seals & Otters) or breeding or wintering bird species). Therefore, the likelihood of visual disturbances giving rise to disturbance events is low. • The likelihood of giving rise to landscape and visual disturbance is very low as (a) hand harvesting of seaweed is not novel and has a long established tradition along the west coast of Ireland (b) harvesting will take place on a sustainable basis and (c) measures are in place to prevent interactions between harvesting and recreation and tourism-related activities.

Hazard/ Pressure	Prob-ability	Severity	Reason for Decision
		3-5	A medium to high rating, as physical pressures may potentially impact on the SAC in broad terms. Regulations include: (a) EU Dir. 92/43/EEC & NPWS, requires maintenance of shingle habitats and species therein and maintenance of reef in natural condition (NPWS,2013A), (b) EU Dir. 92/43/EEC & NPWS, requires that activities should not adversely affect harbour seals (NPWS, 2013A) and (c) otters are protected under EU directives. Requirements in relation to Ireland's Maritime area and relevant policies for marine sectors or activities listed in the National Marine Planning Framework (NMPF), are outlined in Ireland's Marine Spatial Planning Portal (2022).

(4) Biological

KEY: P=Probability. S=Severity. UA=Unacceptable Risk (Risk>15), NIS and mitigation required. A= Risk may be acceptable (Risk<15), NIS may be required. *probability and severity determined based on risk assessment matrix (Fig. 1) and decision tree (Fig. 2).

Hazard *(What can go wrong)*	**Cause** *(Why did it go wrong?)*	**Risk assessment**			**Decision Tree**			**Control Measure** *(What can I do about it?)*	**Compliance Require-ments**
		P*	***S****	***A/UA***	Q1	Q2	Control Measures? Y/N		
Biological pressures/hazards:								See Section H of this document. See Section E(2)(ii) of this document. See Section C1 of this document	None specified.
Genetic modification and translocation of indigenous species.	No potential effects of harvesting.	0	5	A	no	n/a	no		
Introduction of microbial pathogens.	No potential effects of harvesting.	0	5	A	no	n/a	no		
Introduction or spread of invasive non-indigenous species (INIS).	See Section H of this document.	1	5	A	no	n/a	yes		
Removal of non-target species.	See Section E(2)(ii) of this document.	3	3	A	no	n/a	yes		
Removal of target species.	See Section C1 of this document	2	5	A	no	n/a	yes		

Hazard/ Pressure	Probability	Severity	Reason for Decision
Biological	**0-3**		Seaweed harvesting is not considered as an activity that gives rise to any of the following: Genetic modification and translocation of indigenous species, introduction of microbial pathogens. (ref: Marine Protected Area Advisory Group, 2020). The likelihood of occurrence of the other biological pressures listed above are relatively low (see Sections H, E(2)(ii) and C1 of this document for details).
		3-5	Medium to high severity scores are assigned, as biological pressures may have the potential to significantly impact on the SAC in broad terms. See Sections H, E(2)(ii) and C1 of this document for details. Requirements in relation to Ireland's Maritime area and relevant policies for marine sectors or activities listed in the National Marine Planning Framework (NMPF), are outlined in Ireland's Marine Spatial Planning Portal (2022).

(5) Other Marine-related Activities

See Section 3(c) of Appendix 7.

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