SCREENING FOR APPROPRIATE ASSESSMENT

Sustainable Hand Harvesting of *Ascophyllum nodosum* at Clew Bay, Co. Mayo

21-02-24

ecofact
Environmental Consultants

[redacted]

EXECUTIVE SUMMARY

Project Name	Proposed Sustainable Hand Harvesting of *Ascophyllum nodosum* at Clew Bay, Co. Mayo
Project Description	BioAtlantis plan to undertake sustainable hand harvesting of *A. nodosum*, by contracting 16 full-time hand harvesters, to harvest up to a maximum of 11,018 tonnes per annum across various sites in Clew Bay.
Potentially Affected Natura 2000 Sites	Clew Bay SAC
Pathways for Significant Effects (Yes/No)	Yes
Source(s) of Potential Impacts	Hand Harvesting Activities
Pathway(s) for Potential Impacts	Proximity to qualifying interests
Receptor(s) for Potential Impacts	Mudflats and sandflats not covered by seawater at low tide; Large shallow inlets and Bays; Atlantic salt meadows; Otter; Harbour Seal
Pre-assessment Screening	Hand harvesting activities will take place within the range of qualifying interests of this SAC. There is the potential for direct disturbance impacts, from harvesters and boats, as well as habitat fragmentation from harvesting, and water quality issues that may arise from boats or activities themselves. Potential pathway for significant impacts has been identified. Mitigation will be required to offset potential significant effects. Mitigation cannot be provided in a screening for appropriate assessment report.
Mitigation Required (Yes/No)	Yes
Stage 2 (AA) is required (Yes/No) ***If Yes – a Natura Impact Statement must be prepared***	Yes

TABLE OF CONTENTS

Date	Revision	Status	Author	Reviewed By
21-02-24	1.3	Final	GW/WOC	WOC

1. INTRODUCTION

Ecofact Environmental Consultants Ltd. have been commissioned to carry out a Screening for Appropriate Assessment (AA) of proposed hand-harvesting of the seaweed *Ascophyllum nodosum* in a sustainable manner from Clew Bay, Co. Mayo. This screening assesses whether there is the possibility of significant effects on a Natura 2000 sites and, consequently, whether an NIS is required for the project.

Appropriate Assessment is required under Article 6 of the Habitats Directive (92/43/EEC), in instances where a plan or project may give rise to significant effects upon a Natura 2000 site. Natura 2000 sites are those identified as sites of European Community importance designated under the Habitats Directive (1992) (SACs) or the Birds Directive (2009) (SPAs). Screening is a pre-assessment procedure which considers whether an assessment (i.e. appropriate assessment) is required or not.

1.1 Legislation

Part XAB of the 2000 Act and SI. No 477 of 2011 transpose into Irish law, Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (the Birds Directive) and Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the Habitats Directive). The 1997 Regulations were updated in 1998 by The European Communities (Natural Habitats) (Amendment) Regulations 1998 (S.I. No. 233/1998) to include the updated Council Directive 97/62/EC. The 1997 regulations were again updated in 2005, by The European Communities (Natural Habitats) (Amendment) Regulations 2005 (S.I. No. 378/2005). This amendment served to consolidate the main nature conservation legislation enacted in Ireland, meaning The Wildlife Act 1976, The Wildlife (Amendment) Act 2000, The European Communities (Natural Habitats) Regulations 1997, The European Communities (Natural Habitats) (Amendment) Regulations 1998, and to draw direct reference upon Council Directive (2009/147/EC) on the conservation of wild birds – '*The Birds Directive'*.

These Directives require Ireland to establish protected sites as part of a European wide network of sites (known in Ireland as European sites) for habitats and species that are of international importance for conservation. In Ireland, European sites include Special Areas of Conservation (SACs, including candidate SACs) and Special Protection Areas (SPAs). The Birds Directive (2009/147/EC) seeks to protect birds of special importance by the designation of Special Protection Areas (SPAs) whereas the Habitats Directive does the same for habitats and other species groups with Special Areas of Conservation (SACs). It is the responsibility of each member state to designate SPAs and SACs, both of which will form part of Natura 2000, a network of protected areas throughout the European Community.

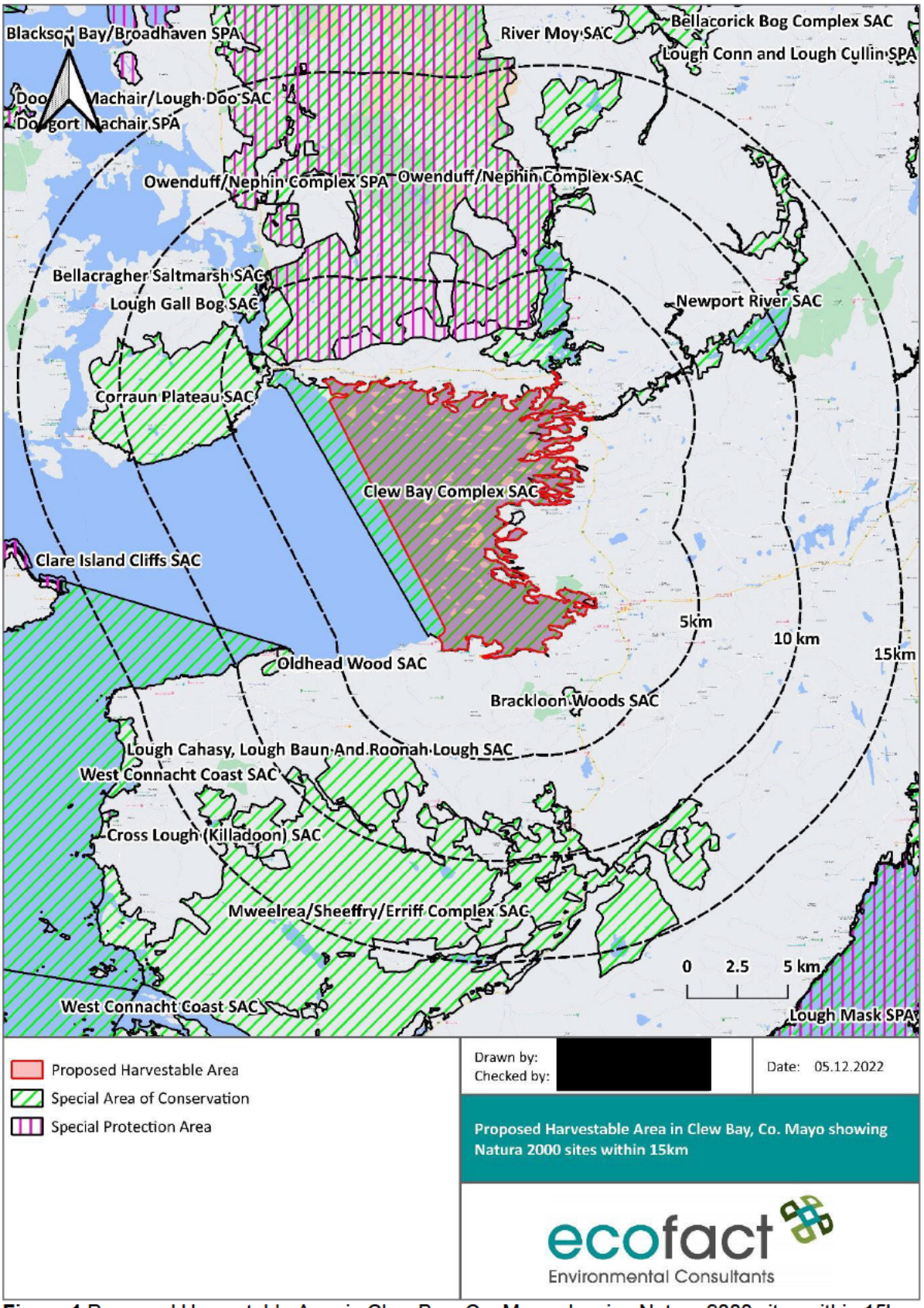

Figure 1 Proposed Harvestable Area in Clew Bay, Co. Mayo showing Natura 2000 sites within 15km.

2. METHODOLOGY

2.1 Screening for Appropriate Assessment

The current Screening for Appropriate Assessment follows this guidance as relevant:

- DoEHLG, (2010). *'Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities'*
- Office of the Planning Regulator, (2021). '*Appropriate Assessment Screening for Development Management*.'
- European Commission, (2001). '*Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.'*
- European Commission, (2007). '*Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission."*
- European Commission, (2018). '*Managing Natura 2000 Sites. The Provisions of Article 6 of the Habitats Directive 92/43/EEC.'*

The European Commission guidance (2001) prescribes a staged process and the need for each stage being dependent on the outcomes of the preceding stage. These stages are: (1) Screening for Appropriate Assessment; (2) Appropriate Assessment; (3) Assessment of Alternative Solutions and (4) Imperative Reasons of Overriding Public Interest test, and compensatory measures (EC, 2001).

According to DoEHLG (2010), Stage 1 Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) of the EU Habitats Directive: (1) Whether a plan or project is directly connected to or necessary for the management of the site, and; (2) Whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a Natura 2000 site in view of its conservation objectives.

A project or plan may only pass at the Screening stage if there is no reasonable scientific doubt remaining as to the absence of impacts on the Natura 2000 network. DoEHLG (2010) states that any Natura 2000 site within a likely zone of impact should be considered, with a distance of 15km recommended, but this is evaluated on a case-by-case basis with reference to the nature, size and location of the project, sensitivities of receptors and potential for in-combination effects. The threshold at the first stage is a very low one (as per Finlay Geoghegan J. in Kelly -v- An Bord Pleanála 2013/802 JR). Screening must be approached on a precautionary basis with the safeguards set out in Article 6(3) and (4) of the Habitats Directive triggered not by certainty - but by the possibility of significant effects.

DoEHLG (2010) outlines that there are 3 potential outcomes of a Screening for Appropriate Assessment, as outlined in Table 1 below.

Table 1 DoEHLG (2010) potential findings and outcomes for Screening for Appropriate Assessment.

Finding	Outcome
Project is directly connected to or necessary for the management of a designated site	Stage 2 (AA) is not required
No potential for significant effects	Stage 2 (AA) is not required
Potential for significant effects identified, or potential for impacts is uncertain	Stage 2 (AA) is required and a Natura Impact Statement will be prepared

2.2 Desk Study

A desktop study was undertaken to identify the extent and scope of the potentially affected designated Natura 2000 sites within the current study area. A full bibliography of information sources reviewed is provided in the reference section. Information sources reviewed include:

- National Parks and Wildlife Service (NPWS) site synopses
- NPWS Conservation Objectives and Natura 2000 Forms
- Protected species data on NPWS/National Biodiversity Data Centre (NBDC) online databases
- Environmental Sensitivity Mapping (ESM) Tool
- Environmental Protection Agency (EPA) mapping tools (including AAGeoTool)
- Catchments.ie
- Online aerial imagery (Bing, Google Satellite).

3. DESCRIPTION OF PROJECT

Clew Bay has in excess of 90 islands and 100km of coastline that contain harvestable quantities of A. nodosum. Given the ecological sensitivities identified within the Clew Bay area, harvesting must be carried out in a manner which does not negatively affect the biological environs. Utilising sustainable hand-harvesting technique and extraction (Kelly et al., 2001; Guiry & Morrison, 2013) and incorporating their use within a best practise approach, BioAtlantis have developed a sustainable model of seaweed harvesting in Clew Bay. Subject to obtaining a licence to harvest in Clew Bay, BioAtlantis will contract up to 16 full-time hand harvesters from the region, to harvest up to a maximum of 11,018 tonnes per annum. BioAtlantis will recruit harvesters with previous experience or whose families have farms or fishing interests in the area and will work with the harvesters to apply sustainable methods of harvesting, collection and conservation of the resource. In their proposal, BioAtlantis will explore the applicability of purchasing a boat for the area to collect the harvested *A. nodosum*, whilst also providing the option for harvesters to tow the floating bags/nets directly to pick-up points. In some cases, 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.

BioAtlantis will employ a site-specific management approach throughout the expanse of the Clew Bay SAC and 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. Thus, while the total area of coastline in Clew 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 collection boat (if applicable to the area) also ensures ease of access to sites in use. It also brings full traceability to the process, as quality of harvest for each location will be monitored and biomass will be weighed on the boat or pick-up point prior to issuing the harvesters with a Goods Received Note (GRN). This technique also frees up harvesters to spend less time, money and effort on hauling cut seaweed ashore, whilst avoiding the otherwise negative consequences associated with bringing cut seaweed ashore at inappropriate locations. Alternatively, harvesters may tow the floating bags/nets from the harvest site directly to the pick-up points. In some cases, 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. Hand-harvested *A. nodosum* will be transported to production facilities in Tralee, Co. Kerry for further processing.

3.1 Operational Phase

The BioAtlantis proposal for sustainable hand-harvesting of *A. nodosum* from Clew Bay will include an area extending from Rosmurrevagh point on the north of Clew Bay to Leckanvy Pier in the south, including the islands within the Bay. Through use of data obtained from the field studies and evaluation by BioAtlantis Ltd. (BioAtlantis, 2024 and associated appendices) and Hession *et al*. (1998) and maps and aerial photographs of the region, it is calculated that the current maximum yield of *A. nodosum* from Clew Bay to be of the order of 64,759 tonnes. BioAtlantis' original application estimated that there is a maximum annual sustainable harvest of ~12,900 Tonnes in Clew Bay. This figure was updated following assessments of the resource by UCD in 2016 and with the removal of areas from the harvesting plan where existing appurtenant seaweed harvesting rights were identified. The revised estimated annual sustainable harvest is 11,018 Tonnes, based on harvesting a maximum of 20% of the total available *A. nodosum* biomass per site per annum (BioAtlantis, 2024 and associated appendices). BioAtlantis will employ a site-specific management approach to the Clew Bay Complex 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. BioAtlantis Ltd. will employ a Resource Manager or Project Manager to operate on site, preferably with relevant environmental qualifications, a marine ecology background and/or experience in the fishing / marine resources industry. This individual will be responsible for managing activities within the harvesting area and in ensuring sustainability of these activities. They will report directly to the company CEO, and work as part of the resource management team. The person tasked with assessing recovery post-harvesting will have a marine ecology background. Thus, while the total area of coastline in Clew 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 collection boat (if deemed applicable to the area) 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 is weighed on collection and recorded on a Goods Received Note (GRN; or other method), with sites also inspected post-harvest to ensure the sustainability of the methods employed (Site Inspection Form, SIF or other method). The benefits of this approach 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, 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. Information recorded via GRN, SIF, etc., may alternatively be provided in other suitable formats by electronic or other means on site and/or at production facilities.

A key requirement in implementing and securing a functioning system for sustainably hand harvesting *A. nodosum*, are effective control measures, reporting and monitoring systems. These are set out in the Code of Practice document and form a key framework for managing and ensuring that the system is being adhered to in a precise, correct, seamless and traceable manner. A key component to ensuring that the systems are being adhered to, and at the levels set out in the Code of Practice, will be a strong and robust auditing system. BioAtlantis will conduct quarterly and annual audits covering the areas below:

(a) Quarterly Audit:

- Audit Part A: Records, Forms & Documents

  Step 1: Forms: receipt of training & verification of understanding

  Step 2: Completed Training Certs (obtained through training above.) Step 3: Records, forms & documents (general)

- Audit Part B: Quality Assessment (documentation)
    - Step 1. GRNs (Clew Bay), or other format/method.
    - Step 2. Production Logsheets (Production Facilities).
    - Step 3. Incident Reports
    - Step 4. Non-conformance Reports
    - Step 5. Software Systems
    - Step 6: Site Inspection forms or other format/method.

(b) Annual Audit (on-site):

- Step 1. Site Quality (inspection of harvested sites)
- Step 2. Harvest methods (inspection of techniques)
- Step 3. Delivery and collection methods (e.g. Collection boat, if deemed applicable to the area).

For more information on the auditing system and its contents, please consult Addendum 7 (Clew Bay Audit Forms – Appendix 8) of the main BioAtlantis licence application document. All control measures, action limits/non-conformance, analytical procedures, monitoring schedule, (frequency), corrective actions and verification are detailed in the licence application main text document. In addition, the harvesting system will be reviewed annually to assess and verify the control measures and determine areas in need of improvement.

3.1.1 Overview of Proposed Operational Phase

In carrying out the operational stage of the proposal, harvest will be recorded using BioAtlantis Compliance and Record Forms (see Addendum 4 in the current NIS). BioAtlantis has developed a management plan set out in the 'Code of Practice for *A. nodosum* harvest activities in Clew Bay Complex SAC – Appendix 4',included as Addendum 5 in the current NIS. This includes the development of a database, to take account of the study area of Clew Bay including over 90 islands and 100km of coastline that contain harvestable quantities of *A. nodosum*. This database will be used to:

(a) Determine and manage sites which require a fallowing period to allow for adequate recovery from recent activities;
(b) Determine and manage rotation requirements (i.e. extrapolation and calculation of the duration or fallowing period required prior to a particular area being fit for re-harvest);
(c) Prevent harvest activities that would lead to a decline in yield;
(d) Record the details of each harvest, how much, by whom and when.

Moreover, this database represents a central, working component of the BioAtlantis best practice guidelines for harvesting *A. nodosum*, requiring:

(a) Development of pre-harvest plans in advance of harvest activities;
(b) A cap of 20% on the level of available biomass which can be harvested from a given site per annum;
(c) Limitations of a 200-300mm (8-12 inches) cutting height of *A. nodosum* stipe / frond.

Table 1 below sets out the islands and shore-line areas identified as being within the proposed harvesting area for the BioAtlantis project, with *A. nodosum* densities and coverage included. There are four main types of activities associated with the operational phase include:

Operation/Activity No. 1: Management & implementation;
Operation/Activity No. 2: Monitoring, recording & reporting;
Operation/Activity No. 3: Verification & analysis.
Operation/Activity No. 4: Long term assessment of biomass and community structure

All operations/activities are described in detail in the Code of Practice prepared by BioAtlantis, included

in the Licence Application (BioAtlantis, 2024 and associated appendices) and presented in Addendum5 of this NIS. When planning future harvests some Islands will be marked as unavailable for certain times of the year, in order to ensure that known seal breeding, moulting and resting and bird breeding and wintering sites are avoided. The resource manager will be responsible for ensuring that these sites are avoided. The list of restricted sites is set out in the Code of Practice (Addendum 5); this will be updated to reflect ongoing consultation and data available from NPWS into the future; taking account of time of year and the presence of Common seals and breeding and wintering bird populations.

BioAtlantis will be required to verify that each site has fully recovered prior to re-harvesting. This will be done by visiting each site and performing an assessment of the growth and density of *A. nodosum* on each and updating the production plan as necessary with the results of this analysis.

3.1.2 Management and implementation during operations

Management and implementation components include activities relating to:

1. *Planning and scheduling of harvesting activities*: In the initial stages, it is necessary to establish details of when each area was last harvested. This will be done by working closely with the existing local harvesters, and through analysis of derived datasets, the dates and quantities of the most recent harvests for each island and coastal zone can be established. This data can then be used to derive when a region will be next available for harvest. The nominal recovery time is generally accepted to be 3-5 years from a complete harvest; a maximum harvest of 20% of the total available biomass of seaweed is permitted per site per annum to ensure sustainability.
2. *Numbers of personnel to be managed and harvest rates:* Approximately 16 full time people, or 32 part-time, will be contracted to work for an average of 230 days/year, harvesting approximately 3.5 tonnes per day (rate of ~10.4Kg/M^2). The amounts harvested will be recorded to ensure adherence to licensing limits. The area harvested will be 26,923m^2 per day per 16 harvesters. This reflects a harvest rate of 20% of *A. nodosum* biomass per site per annum. This corresponds to an area occupied of 1,683m^2 per person/day or 0.4acres per person per day, for approximately 6-8 hours per day. Approximately 2-4 harvesters are permitted on small-medium sized sites. Medium to large islands may require between 4-6, while larger islands will likely require approximately 6-10 harvesters. Thus, 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. It is unlikely therefore, that any significant change in the structure of *A. nodosum* assemblages will occur. Furthermore, as a policy against holdfast removal will be implemented, the incidence of *A. nodosum* mortality will be reduced considerably (see 'Code of Practice', Addendum 5). As such, the harvest level of 20% of the total available biomass represents a relatively constant figure and will not be exacerbated due to significant levels of A. *nodosum* mortality due to partial or complete holdfast removal.
3. *Exploitation Levels*: As a policy against holdfast removal will be implemented, *A. nodosum* mortality and whole plant removal will therefore be prevented. Hence, the harvest rate figure of 20% of the total available biomass will remain largely constant and will not be breached due to increased mortality

rates.

4. Once the re-harvesting date for each island is established, this information will be used to plan the next seasons harvesting. BioAtlantis will be required to verify that each site has fully recovered prior to re-harvesting. This will be done by visiting each site and performing an assessment of the growth and density of *A. nodosum* on each, and updating the production plan as necessary with the results of this analysis;
5. *Data recording and analysis*: In their proposal, BioAtlantis will explore the applicability of purchasing a boat for the area to collect the *harvested A. nodosum,* piloted by the resource manager or other suitably trained employee. The seaweed collected from each point will be weighed and the details of the harvest recorded, at each collection point. The person or transport company in receipt of the harvested seaweed will complete a 'Goods Received Note' to record the harvest from each site. This also includes measurement of amount and quality of the harvested seaweed. Bag/nets will be weighted on the boat or at the pick-up point. Alternatively, where harvesters tow the floating bags/nets containing *A. nodosum* from the harvest site directly to the pick-up points. In some cases, 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.
6. The Resource Manager will inspect sites post-harvest to ensure the standards with respect to the sustainability of the methods employed (Site Inspection Form, SIF or other method). A second check will be completed on receipt of the harvested seaweed at BioAtlantis' factory in Tralee, with details recorded on a GRN or other method. Details from the GRNs will be uploaded into the main database. The quality of the supplied *A. nodosum* will be assessed by the quality control and/or production team and details of any deviations from the specified requirements recorded on the harvest record. Computerised data will be maintained of all harvest records and non-conformances;
7. *Access and Navigation at harvest sites*: The harvesters shall use their own boats to navigate to and from the island sites. In the case of coastal sites, the harvesters shall be responsible for access to and from the sites via existing access routes. The size of the shore area covered by an individual bag or net will be approximately $2m^2$ to $8m^2$. Harvest will occur at islands and shorelines as described in the harvest management plan. Floating nets or bags will then be picked up at each location in which harvest took place. Alternatively, harvesters may tow the floating nets or bags from the harvest site directly to the pick-up points.

   Final pick-up points will be at established piers and harbours, particularly in Westport and Newport. Access to the northern coastal area will be via the roads at Knockmanus road, Roskeen south Road, Carrowsallagh Rd, Keeloges Rd, and via boat. Access to the Milcum harvesting site will be via the Teevmore Road. The coast roads on Knockeeragh and Rosclave provide good access to the harvesting sites in this area. The harvesting site at Rosanrubble can be accessed by boat and from the road to Rosanrubble Point. The harvesting area between Bleanrosdooaun Strand and Monkelly can be accessed by road to Roslaher, Rostoohy Pier, Moyna Strand, Ardkeen Quay, Roscahil Rd, Rosmindle Rd, Castleaffy, Rosmoney, Rusheen, Carrowcally, Bawn Strand, &

Monkelly Strand. BioAtlantis will explore the applicability of purchasing a boat for the area, that will be approved by the Marine survey office (MSO) for use on the open waters of Clew Bay and used to collect the harvested *A. nodosum* from the designated sites; alternatively, harvesters may tow the floating bags/nets from the harvest site directly to the pick-up points. The harvesters will be made aware that all harvested *A. nodosum* must be collected by BioAtlantis for weighing and processing, and the seaweed will only be collected from the sites or pick up points identified on the harvesting schedule or at sites which are approved by BioAtlantis. In some cases, 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.

8. *Communication*: The number of harvesters involved in harvesting the requirements of BioAtlantis will be below ten initially, rising to sixteen over time. Communication of the harvesting plan will be done in advance each month/quarter via email or post. This will include information on sites that are to be harvested and the quantity and dates for each harvest site. Sites will be identified on a map and the anticipated quantities for each site indicated. Communications with the harvesters during harvesting activities will be either via a mobile phone or 2 way radios, as deemed appropriate and will be managed by BioAtlantis and the BioAtlantis Resource Manager;
9. *Hand-harvest methodology*: 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. Activities will be carried out in accordance with a clearly defined protocol which will prevent any damage to the environment or underlying growth substrate, whilst also facilitating sufficient re- growth and re-generation of the vegetation post-harvest. The 'Code of Practice for *A. nodosum* harvest activities in Clew Bay Complex SAC' is set out in the Licence Application (BioAtlantis, 2024) and is included in Addendum 3 of the current report;
10. *Health and safety measures*: All harvesters will be provided with appropriate and certified Health & Safety Training. BioAtlantis will run regular training days for the harvesters, where necessary. The seaweed collection boat (if deemed applicable to the area) will be equipped with all necessary safety equipment as required by the marine survey office.

Table 1 Harvesting locations and quantity estimates within the Clew Bay study area.

Island No.	Name / Area	Harvesting Zone ID*	Total Harvestable Area (m^2)	Typical Density (Kg / m^2)	Coverage § %	Harvest levels (Tonne)† Available Seaweed	Maximum Annual Harvest
	Bartraw - Westport	CZ 1.1	61074	0	46%	0.0 T	0.0 T
		CZ 1.2	83288	0.7	100%	58.3 T	11.7 T
		CZ 1.3	57560	0.7	98%	39.4 T	7.9 T
		CZ 1.4	46890	0.7	100%	32.8 T	6.6 T
		CZ 1.5	59466	0.7	70%	29.3 T	5.9 T
		CZ 1.6	32360	1.25	100%	40.4 T	8.1 T
		CZ 1.7	47684	0.7	100%	33.4 T	6.7 T
		CZ 1.8	77259	0	54%	0.0 T	0.0 T
		CZ 1.9	7961	0.7	100%	5.6 T	1.1 T
		CZ 1.10	5559	1.25	100%	6.9 T	1.4 T
		CZ 1.11	11271	1.25	100%	14.1 T	2.8 T

Island No.	Name / Area	Harvesting Zone ID*	Total Harvestable Area (m^2)	Typical Density (Kg / m^2)	Coverage § %	Harvest levels (Tonne)† Available Seaweed	Maximum Annual Harvest
		CZ 1.12	4254	1.25	100%	5.3 T	1.1 T
		CZ 1.13	136927	10.5	94%	1354.0 T	270.8 T
		CZ 1.14	76090	10.5	94%	751.9 T	150.4 T
		CZ 1.15	37232	0.5	100%	18.6 T	3.7 T
		CZ 1.16	35400	0.5	100%	17.7 T	3.5 T
		CZ 1.17	35419	0.5	100%	17.7 T	3.5 T
		CZ 1.18	6633	0.5	100%	3.3 T	0.7 T
	Westport - Rosmoney	CZ 2.1	38658	0	82%	0.0 T	0.0 T
		CZ 2.2	5199	0	100%	0.0 T	0.0 T
		CZ 2.3	8889	0	100%	0.0 T	0.0 T
		CZ 2.4	35324	0	94%	0.0 T	0.0 T
		CZ 2.5	74945	0.55	98%	40.4 T	8.1 T
		CZ 2.6	30076	0.8	100%	24.1 T	4.8 T
		CZ 2.7	7831	0	57%	0.0 T	0.0 T
		CZ 2.8	6710	0	100%	0.0 T	0.0 T
		CZ 2.9	125537	0.8	100%	100.4 T	20.1 T
		CZ 2.10	109815	0.8	97%	85.0 T	17.0 T
		CZ 2.11	9303	0	100%	0.0 T	0.0 T
		CZ 2.12	27612	0	91%	0.0 T	0.0 T
		CZ 2.13	328	0	100%	0.0 T	0.0 T
		CZ 2.14	22527	0	100%	0.0 T	0.0 T
		CZ 2.15	3842	0	94%	0.0 T	0.0 T
		CZ 2.16	6082	0	100%	0.0 T	0.0 T
		CZ 2.17	3636	0	0%	0.0 T	0.0 T
	Rosmoney - Moyna Strand	CZ 3.1	18865	0	50%	0.0 T	0.0 T
		CZ 3.2	40641	4.35	100%	176.8 T	35.4 T
		CZ 3.3	97095	4.35	100%	422.4 T	84.5 T
		CZ 3.4	12914	4.35	100%	56.2 T	11.2 T
		CZ 3.5	9650	4.35	100%	42.0 T	8.4 T
		CZ 3.6	78317	4.35	95%	323.9 T	64.8 T
		CZ 3.7	117114	4.35	100%	509.4 T	101.9 T
		CZ 3.8	8398	4.35	100%	36.5 T	7.3 T
	Rostoohy Pt - Newport	CZ 4.1	84464	4.35	92%	339.0 T	67.8 T
		CZ 4.2	27181	4.35	100%	118.2 T	23.6 T
		CZ 4.3	150517	4.35	100%	654.8 T	131.0 T
		CZ 4.4	38351	4.35	99%	164.9 T	33.0 T
		CZ 4.5	26354	0	96%	0.0 T	0.0 T
		CZ 4.6	6397	0	83%	0.0 T	0.0 T
		CZ 4.7	5572	0	100%	0.0 T	0.0 T
		CZ 4.8	6703	0	100%	0.0 T	0.0 T
		CZ 4.9	9671	0	100%	0.0 T	0.0 T
		CZ 4.10	24594	0	64%	0.0 T	0.0 T
		CZ 4.11	117165	0.85	81%	80.2 T	16.0 T
		CZ 4.12	77555	0.85	100%	65.9 T	13.2 T
		CZ 4.13	278265	0.85	79%	187.7 T	37.5 T
		CZ 4.14	110969	0.85	100%	94.3 T	18.9 T
	Newport - Mallaranny Pier	CZ 5.1	61157	0	100%	0.0 T	0.0 T
		CZ 5.2	58948	3.5	79%	163.3 T	32.7 T
		CZ 5.3	105121	3.5	84%	310.9 T	62.2 T
		CZ 5.4	258002	3.5	92%	833.8 T	166.8 T
		CZ 5.5	82278	3.5	83%	240.2 T	48.0 T
		CZ 5.6	41272	3.5	100%	144.5 T	28.9 T
		CZ 5.7	145329	3.5	89%	454.2 T	90.8 T
		CZ 5.8	84126	3.5	100%	294.4 T	58.9 T
		CZ 5.9	8260	3.5	100%	28.9 T	5.8 T
		CZ 5.10	17114	3.5	100%	59.9 T	12.0 T
		CZ 5.11	4451	3.5	100%	15.6 T	3.1 T
		CZ 5.12	1689	3.5	100%	5.9 T	1.2 T
		CZ 5.13	29666	3.5	100%	103.8 T	20.8 T

Island No.	Name / Area	Harvesting Zone ID*	Total Harvestable Area (m^2)	Typical Density (Kg / m^2)	Coverage § %	Harvest levels (Tonne)† Available Seaweed	Maximum Annual Harvest
		CZ 5.14	3900	1.75	100%	6.8 T	1.4 T
		CZ 5.15	30450	1.75	100%	53.3 T	10.7 T
		CZ 5.16	11735	1.75	100%	20.5 T	4.1 T
		CZ 5.17	47890	1.75	79%	65.8 T	13.2 T
1	Forillan, Illanavrick	IS 11.1	40653	6	100%	243.9 T	48.8 T
		IS 11.2	13763	10	100%	137.6 T	27.5 T
2	Kid Isd East		3966	14	100%	55.5 T	11.1 T
3	Roslynagh		7990	0	0%	0.0 T	0.0 T
4	Illannambraher		57901	19	96%	1053.2 T	210.6 T
5	Inishdasky		14818	18	100%	266.7 T	53.3 T
6	Inishquirk		25206	15	82%	308.9 T	61.8 T
7	Inishtubrid		45540	18	100%	819.7 T	163.9 T
8	Inishlim		13308	16	100%	212.9 T	42.6 T
9	Beetle Isd North		41752	18	100%	75.1 T	15.0 T
	Inishbobunnan						
10			566589	16	27%	246.1 T	49.2 T
10	Inishgowla						
10	Beetle Isd South						
11	InishKeel	IS 11.1	16036	12.5	100%	200.5 T	40.1 T
		IS 11.2	2083	16.75	100%	34.9 T	7.0 T
		IS 11.3	300	17.5	100%	5.3 T	1.1 T
		IS 11.4	5876	17.5	100%	102.8 T	20.6 T
12	Black Rock		24348	2.5	100%	60.9 T	12.2 T
13	Moynish More		0	0	0%	0.0 T	0.0 T
14	Moynish Beg		0	0	0%	0.0 T	0.0 T
15	Inisherkin		53097	18	41%	387.7 T	77.5 T
16	Inishnacross		46888	18.5	61%	525.0 T	105.0 T
17	Inishilra		36300	18	78%	507.0 T	101.4 T
18	Inishcooa		70929	12	57%	486.2 T	97.2 T
19	Roeillaun		77113	5	100%	385.6 T	77.1 T
20	Inishdeashbeag		62555	0	100%	0.0 T	0.0 T
	Inishdeashmore						
21	Inishcorky		17912	18.75	100%	335.8 T	67.2 T
22	Inishcarrick		34846	19	60%	397.3 T	79.5 T
23	Inishcoragh		24041	15	100%	360.6 T	72.1 T
24	Muckinish		33800	19.25	100%	650.6 T	130.1 T
25	Inishdaweel		22175	20	77%	342.8 T	68.6 T
26	Rabbit Isd		52391	8	58%	242.1 T	48.4 T
27	Illanascrraw		10411	18	100%	187.4 T	37.5 T
28	Freaghillanluggagh		23358	20	100%	467.2 T	93.4 T
29	Inishkee		16398	19	100%	311.6 T	62.3 T
30			15889	18	100%	286.0 T	57.2 T
31	Freaghillan West		20456	19	50%	194.8 T	39.0 T
32	Innishcannon		8656	16	100%	138.5 T	27.7 T
33	Carricklahan		0	0	0%	0.0 T	0.0 T
34	Carrickachorra		0	0	0%	0.0 T	0.0 T
35	Illanmaw		74045	0	66%	0.0 T	0.0 T
36	Freaghillan East		6422	18	100%	115.6 T	23.1 T
37			1476	16	100%	23.6 T	4.7 T
38	Inishcuill West		82042	20.75	79%	1348.2 T	269.6 T
39	Mauherillan		14262	16.75	91%	217.5 T	43.5 T
40	Inishfesh		54236	18	70%	685.8 T	137.2 T
41	Inishmolt		23618	18	100%	425.1 T	85.0 T
42	Inishloy		36182	18.5	100%	669.4 T	133.9 T
43	Inishdaff		70875	20.5	100%	1452.9 T	290.6 T
44	Inishbollog		13201	20.75	100%	273.9 T	54.8 T
45	Inishlaughil		55888	0	100%	0.0 T	0.0 T
46	Inishgowla		67983	16	22%	243.7 T	48.7 T

Island No.	Name / Area	Harvesting Zone ID*	Total Harvestable Area (m^2)	Typical Density (Kg / m^2)	Coverage § %	Harvest levels (Tonne)† Available Seaweed	Maximum Annual Harvest
47	Inishoo		23072	0	13%	0.0 T	0.0 T
48	InishTurk	IS 48.1	56134	21	100%	1178.8 T	235.8 T
		IS 48.2	10755	21	100%	225.9 T	45.2 T
49	Illannaconney		17437	15	77%	201.6 T	40.3 T
50	Inishakillew	IS 50.1	69800	21.75	100%	1518.1 T	303.6 T
		IS 50.2	18583	21.75	100%	404.2 T	80.8 T
51	Trawbaun		256815	19.5	89%	4468.7 T	893.7 T
	Carrigeenglass North						
	Moneybeg						
	Inishcottle						
52	Calf Island		30778	19.75	81%	490.3 T	98.1 T
53	Inishbee, Derrinish & Dernish West		200836	17.5	58%	2021.6 T	404.3 T
54	Freaghillan	IS 54.1	27454	19.75	66%	357.1 T	71.4 T
		IS 54.2	55101	20	90%	989.7 T	197.9 T
		IS 54.3	5995	21	100%	125.9 T	25.2 T
55	Clynish		102154	18.5	77%	1463.2 T	292.6 T
56	Ilaunnamona		25370	16	95%	384.3 T	76.9 T
57	Rabbit Island, Island More &Quinnsheen Island	IS 57.1	14757	19.5	100%	287.8 T	57.6 T
		IS 57.2	92903	16	88%	1307.4 T	261.5 T
		IS 57.3	7894	17.5	100%	138.1 T	27.6 T
		IS 57.4	9330	18	100%	167.9 T	33.6 T
58	Collan More, Carrigeenglass South & Collan Beg	IS 58.1	501217	16.75	100%	8395.4 T	1679.1 T
		IS 58.2	55220	18.75	100%	1035.4 T	207.1 T
		IS 58.3	29858	19.5	100%	582.2 T	116.4 T
59	Inishgort		64954	15.5	57%	571.7 T	114.3 T
60	Inishlyre		121285	5	57%	347.3 T	69.5 T
61	Illanataggart & Crovinish		442259	14	99%	6133.0 T	1226.6 T
62	Ininhgowla South + Carrickwee		183389	15	100%	2750.8 T	550.2 T
63	Forilan		30569	9.75	100%	298.0 T	59.6 T
64	Carrickawart	IS 64.1	26696	16	100%	427.1 T	85.4 T
64		IS 64.2	1276	14.25	100%	18.2 T	3.6 T
65	Inishlaghan		32314	14.5	83%	388.4 T	77.7 T
66	Dorinish More & Dornish Beag		27107	12.5	100%	338.8 T	67.8 T
67	Inishimmel		0	0	0%	0.0 T	0.0 T
68	Inishleauge		54366	8	77%	334.3 T	66.9 T
69	Inishdaugh		22949	6.5	72%	108.0 T	21.6 T
70	Inishraher		81224	14.7	85%	1014.1 T	202.8 T
71	Inisheeney		53625	16	85%	725.4 T	145.1 T
72	Finnaun Island		0	0	0%	0.0 T	0.0 T
73	Corillan	IS 73.1	6787	6.5	100%	44.1 T	8.8 T
		IS 73.2	1016	6.5	100%	6.6 T	1.3 T
		IS 73.3	1737	6.5	100%	11.3 T	2.3 T
		IS 73.4	3001	6.5	100%	19.5 T	3.9 T
74	Carricknamore	IS 74.1	2436	6.75	100%	16.4 T	3.3 T
		IS 74.2	1393	6.75	100%	9.4 T	1.9 T
		IS 74.3	2640	6.75	100%	17.8 T	3.6 T
75		IS 75.1	0	6.75	100%	43.8 T	0.0 T
		IS 75.2	0	6.75	100%	7.5 T	0.0 T
		IS 75.3	0	6.75	100%	36.9 T	0.0 T
	Stony Island	IS 75.4	0	0	100%	0.0 T	0.0 T
		IS 75.5	0	5	100%	29.1 T	0.0 T

Island No.	Name / Area	Harvesting Zone ID*	Total Harvestable Area (m^2)	Typical Density (Kg / m^2)	Coverage § %	Harvest levels (Tonne)† Available Seaweed	Maximum Annual Harvest
		IS 75.6	0	6.5	100%	69.2 T	0.0 T
		IS 75.7	0	6.5	100%	10.7 T	0.0 T
		IS 75.8	0	6.5	100%	61.7 T	0.0 T
76	Green Islands	IS 76.1	0	0	100%	0.0 T	0.0 T
		IS 76.2	0	0	100%	0.0 T	0.0 T
		IS 76.3	0	0	100%	0.0 T	0.0 T
77	Carricknacally		2860	6.5	100%	18.6 T	3.7 T
78	Monkellys Rock		4425	8.75	100%	38.7 T	7.7 T
79	Inishweela		24604	10	97%	238.7 T	47.7 T
80	Illanroe		28522	14	100%	399.3 T	79.9 T
81	Roeillan		16126	15	100%	241.9 T	48.4 T
	Totals						11,018 T**

* Harvesting Zone ID's were assigned by BioAtlantis as part of establishing the management system.

** Revised Total (BioAtlantis, 2024).

† Maximum Annual Harvest (Tonnes) is calculated as 20% of the total available biomass per site. The figure of20% refers to the percentage of the total available *A. nodosum* biomass harvested per site, per annum.

§ Denotes the percentage of coastline which can support *A. nodosum* growth.

3.1.3 Monitoring of the A. nodosum resource

The biomass of *A. nodosum* will be assessed according to standard methods. The general approach to assessing biomass levels is summarized below, and may be subject to change depending on the sites involved, the underlying analytical methodology and the parameters/statistical methods employed:

- Sites located and photographed as required;
- 1m^2 quadrants may provide more robust measures of biomass over a larger area than otherwise smaller 0.25m^2 units used by Kelly *et al*., (2001) and others. Typically, 4 replicates taken per site with a distance of approximately 3 meters between each quadrant, where possible. Where density is deemed relatively homogenous according to visual estimation scales, lower number of replicates may be used;
- Harvest *A. nodosum* from each quadrant and measure wet weight per unit area;
- Record all data in the database and ensure that site is not subjected to further harvest activities until *A. nodosum* density has recovered;
- Statistical analysis: Different regions of Clew Bay will have different rates of *A. nodosum* growth. Therefore, it will be important to calculate the level of variation of *A. nodosum* in as many regions as possible. The datasets will allow for high density mapping of the distribution of the resource within the complex. This will build upon the study by Hession *et al*., (1998) and provide a more detailed analysis of the extent of the resource in the area. Analysis will be performed using geospatial tools and/or by means of One-Way ANOVA, linear regression or similar tests using software such as GraphPad PRISM; Following the assigned fallowing period, repeat the steps outlined above, and where possible, 1m^2 quadrants will be assigned in the same location as previously. Alternatively, replicates may be assigned randomly if required. Harvest *A. nodosum* and record data as described above; Replicate size, type and number and statistical methods may be changed to enhance the accuracy of the assessment.

Immediately following harvest, *A. nodosum* will be bagged and weighed automatically on the boat or at the pickup point. Details will be recorded on arrival at the pier (via the GRN or other method), thus allowing for accurate recording of the locations and quantities of *A. nodosum* harvested per unit area. The resource manager will be responsible for uploading the data from the GRN forms to the harvest database. The maintenance of the database will be the responsibility of BioAtlantis staff. Other staff (e.g. scientific, production and quality personnel) will have access to the database as required for the correct implementation of their duties.

Locations and periods of harvest must be planned in a manner which ensures that (a) there is no damage incurred to the environs of this SAC region, (b) there is sufficient *A. nodosum* biomass available for harvest and (c) sufficient time has passed to allow for recovery. The most accurate means of ensuring that each of these goals are met is through the statistical analysis of datasets as they emerge. In this way, staff at BioAtlantis will make decisions which are informed by knowledge of the rates of *A. nodosum* re-growth and regeneration. Data relating to biomass levels, re-growth and re-generation will be incorporated into the harvest management database for use in planning harvest periods.

In terms of quality control, BioAtlantis, as a GMP+ certified company, must ensure full traceability to end users of the origin and location of the raw material used in the products manufactures. Therefore, the Quality Control system in BioAtlantis will play a key role in the management and monitoring of work relating to harvest of *A. nodosum* in Clew Bay. In brief, this will involve:

- Assessment of quality control checks on harvesting activities in Clew Bay to ensure conformance with quality and other requirements for the SAC.
- Assessment of quality control checks to ensure recording is conducted appropriately (Goods Received Notes (GRN), Site Inspection Form (SIF) etc., or other methods).
- Implementation of corrective actions where necessary. Liaise with BioAtlantis GMP+ Team on non-conformance issues should they arise;
- Utilisation of this knowledge in the preparation, scheduling and allocation of resources for harvesting;
- Assist in the implementation and training of personnel & contractors involved in hand harvesting activities in the Clew Bay area;
- Liaise with the BioAtlantis R&D Department regarding interpretation of data and on research and development related issues;
- Ensure customers have full traceability from point of harvest to the end product.

The potential for cumulative and in combination impacts are outlined in the application. This includes impacts associated with planned and existing activities such as seaweed harvesting. In terms of fallowing periods, data will be entered in the database as described in the application. The maximum harvest available from each island or coastal zone has been estimated and the nominal recovery time is will be 3-5 years from a complete harvest, or potentially within 11 to 17 months post-harvest given the post-harvest recovery rates reported by Kelly et al., 2001. The quota for each island is a sustainable harvest of 20% of *A. nodosum.* The figure of 20% refers to the percentage of the total available *A. nodosum* biomass harvested per site per annum. 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. 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 the application, measures will be implemented to ensure that harvesting does not take place if a site has not recovered from the previous year. 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*. 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 (see Addendum 4). As outlined in the 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 minimizing or limiting the potential for cumulative effects to occur: *"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".*

A pre-license survey study of Clew Bay was undertaken by UCD and submitted with this application. This study included an assessment of the extent of existing harvesting activities. Key findings from the report are as follows:

- There was evidence of harvesting at 26 out of the 40 sampled sites. The intensity of harvesting varied across these sites.
- Six, eight and twelve sites exhibited evidence of low, moderate and increased levels of harvesting respectively.
- There was no evidence of harvesting at 18 out of 40 sites sampled.

Measures will be in place, as outlined in the application, to prevent cumulative impacts with unlicensed harvesting, particularly in relation to appurtenant rights/burdens and Profit-à-Prendre rights.

A pre-harvesting survey of an unharvested site will be undertaken to assess the recovery of A. nodosum harvesting over the life-time of the licence. This is outlined in Section 1.3.3 of the application (under “Operation/Activity 4: Long term assessment biomass and community structure”) and Section 3.5.3 (under “The potential interaction effects of seaweed harvesting”). 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 (this is outlined in Section 1.3.3 and Section 3.5.3 of the application).

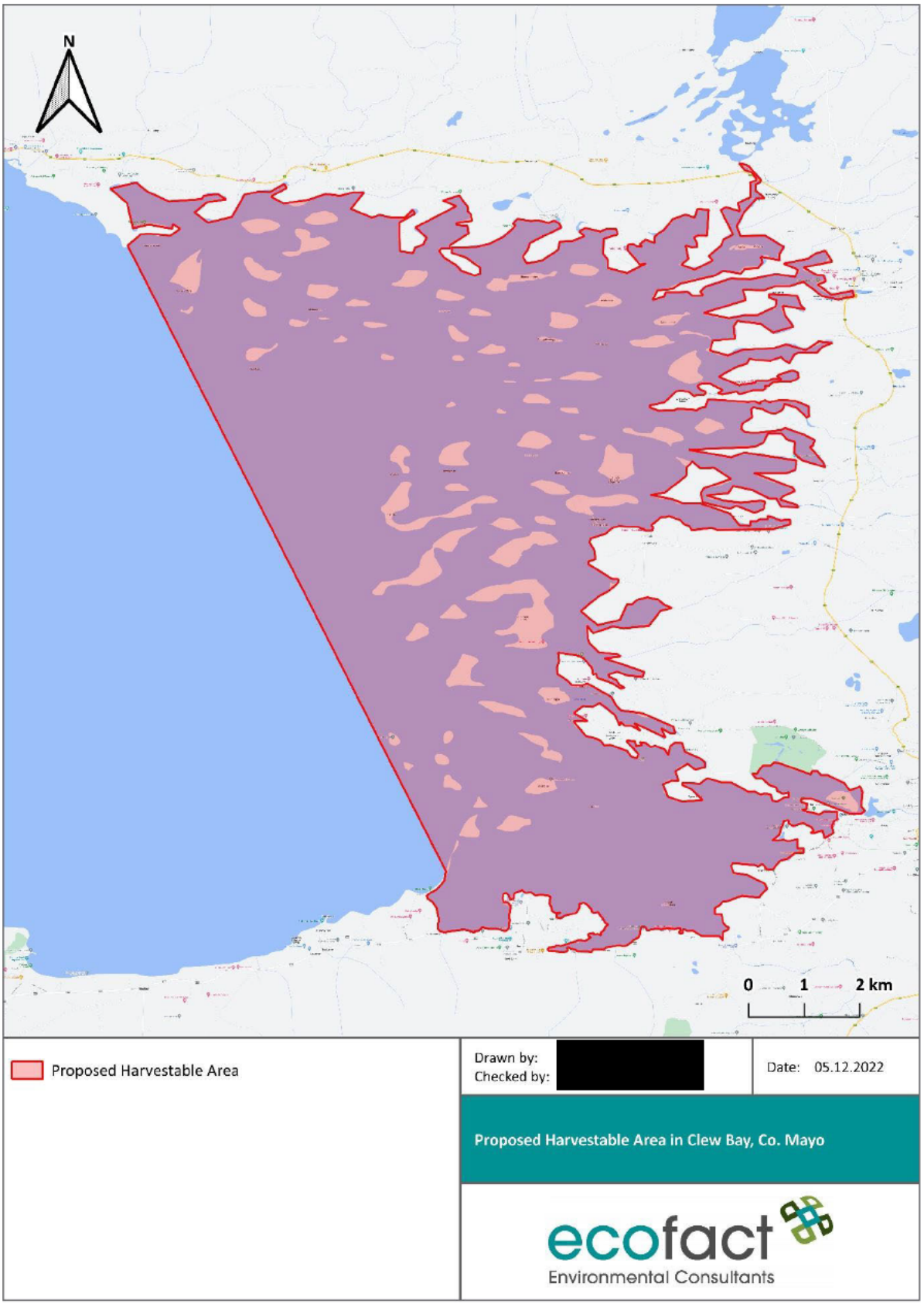

Figure 2 Proposed Harvestable Area in Clew Bay, Co. Mayo.

4. IDENTIFICATION OF RELEVANT NATURA 2000 SITES

The location of the proposed license area in the context of the Natura 2000 network is indicated in Figure 1 above. The SACs and SPAs within 15km of the proposed license area are considered in the current screening and are listed in Table 2. The proposed license site is located within the Clew Bay Complex SAC (001482).

Table 2 Designated Natura 2000 Sites within 15km of the proposed license site.

Natura 2000 Site	Distance (km)
Clew Bay Complex SAC (001482)	0km
Owenduff/Nephin Complex SAC (000534)	1.8km North-west
Corraun Plateau SAC (000485)	1km North-west
Newport River SAC(002144)	1.3km East
Brackloon Woods SAC (000471)	2km South
Mweelrea /Sheeffry / Erriff Complex SAC (001932)	5.5km South
Lough GallBog SAC (000522)	6.5km North-west
Bellacragher Saltmarsh SAC (002005)	7km North-west
Oldhead Wood SAC(000532)	7km West
West Connacht Coast SAC (002998)	8km West
River Moy SAC (002298)	10km North
Owenduff/Nephin Complex SPA (004098)	1.8km North
Clare Island SPA (004136)	15km West

4.1 Clew Bay Complex SAC

Clew Bay is a wide, west-facing bay on the west coast of Co. Mayo. It is open to the westerly swells and winds from the Atlantic, with Clare Island giving only a small amount of protection. This drumlin landscape was formed during the last glacial period when sediments were laid down and smoothed over by advancing ice. The sea has subsequently inundated the area, creating a multitude of islands. The geomorphology of the bay has resulted in a complex series of interlocking bays creating a wide variety of marine and terrestrial habitats. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes): [1140] Tidal Mudflats and Sandflats [1150] Coastal Lagoons* [1160] Large Shallow Inlets and Bays [1210] Annual Vegetation of Drift Lines [1220] Perennial Vegetation of Stony Banks [1330] Atlantic Salt Meadows [2110] Embryonic Shifting Dunes [2120] Marram Dunes (White Dunes) [21A0] Machairs (* in Ireland) [91A0] Old Oak Woodlands [1355] Otter (*Lutra lutra*) [1365] Common (Harbour) Seal (*Phoca vitulina*). The juxtaposition within Clew Bay of a wide variety of habitats, including 10 listed on Annex I of the E.U. Habitats Directive, and the combination of important flora and fauna, including one Red Data Book plant and two animals listed on Annex II of the E.U. Habitats Directive, make this a site of considerable national and international importance.

5. POTENTIAL FOR EFFECTS

Table 3 Designated Natura 2000 Sites within 15km of the license site, the location of qualifying interests in relation to the license site, potential pathways for impacts and potential for significant impacts.

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
Clew Bay Complex SAC (001482)	Mudflats and sandflats not covered by seawater at low tide [1140]	Located throughout Clew Bay, with largest sections to the north and south of the bay according to the conservation objectives Map 2 (NPWS, 2011).	Yes	Disturbance	Water Quality	Disturbance; Water Quality	Hand harvesting activities will take place within the range of this habitat type. There is therefore the potential for direct disturbance impacts, from harvesters and boats, as well as habitat fragmentation from harvesting, and water quality issues that may arise from Boats or activities themselves. Potential pathway for significant Impacts has been identified. Mitigation will be required to offset Potential significant effects. Mitigation cannot be provided in a screening for appropriate assessment report.

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
	Coastal lagoons [1150]	Furnace Lough is outside of the proposed harvesting area, Claggan lagoon is located to the eastern side of the Bay near the shoreline, according to the conservation objectives map 5 (NPWS, 2011).	No	None	None	None	*Ascophyllum nodosum* does not grow within this habitat type. Therefore, there will be no interactions between the proposed hand harvesting activities and this habitat range in the SAC. No potential pathways for impacts have been identified.
	Large shallow inlets and bays [1160]	The entire area of Clew Bay is designated as this habitat type according to the conservation objectives Map 3 (NPWS, 2011).	Yes	Disturbance	Water Quality	Disturbance; Water Quality	Hand harvesting activities will take place within the range of this habitat type. There is therefore the potential for direct disturbance impacts, from Harvesters and boats, as well as habitat fragmentation from harvesting, and water quality issues that may arise from boats or activities themselves. Potential pathway for significant impacts has been identified. Mitigation will be

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
							required to offset potential significant effects. Mitigation cannot be provided in a screening for appropriate assessment report.
	Annual vegetation of drift lines [1210]	Full area extent unknown; dynamic habitat type present throughout the bay according to the conservation objectives (NPWS, 2011).	No	None	None	None	*Ascophyllum nodosum* does not grow within this habitat type. Therefore, there will be no interactions between the proposed hand harvesting activities and this habitat range in the SAC. No potential pathways for impacts have been identified.
	Perennial vegetation of stony banks [1220]	Full area extent unknown; Clew Bay known to have extensive shingle habitat throughout according to the conservation objectives (NPWS, 2011).	No	None	None	None	
	Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	Present in multiple locations throughout the bay, primarily north and south sides, according to the conservation objectives Map 6 (NPWS, 2011).	Yes	Disturbance	Water Quality	Disturbance; Water Quality	Hand harvesting activities will take place within the range of this habitat type. There is therefore the potential for direct disturbance impacts, from Harvesters and boats, as well as habitat fragmentation from harvesting, and

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
							water quality issues that may arise from boats or activities themselves. Potential pathway for significant impacts has been identified. Mitigation will be required to offset potential significant effects. Mitigation cannot be provided in a screening for appropriate assessment report.
	Embryonic shifting dunes [2110]	Full area extent unknown; Dynamic habitat found in multiple locations throughout the bay (NPWS, 2011).	No	None	None	None	*Ascophyllum nodosum* does not grow within this habitat type. Therefore, there will be no interactions between the proposed hand harvesting activities and this habitat range in the SAC. No potential pathways for impacts have been identified.
	Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	Full area extent unknown; Dynamic habitat found in multiple locations throughout the bay (NPWS, 2011).	No	None	None	None	
	Machairs (* in Ireland) [21A0]	This habitat type is shown to be present on the north-western extent of the bay according to the conservation objectives Map 7 (NPWS, 2011).	No	None	None	None	

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	Not listed in the conservation objectives document (NPWS, 2011). Known to occur in Keeloges Wood in the north-east corner of the bay.	No	None	None	None	
	Lutra lutra (Otter) [1355]	Present throughout the SAC – primarily focused around the coasts and islands according to Map 8 of the conservation objectives (NPWS, 2011)	Yes	Disturbance	Disturbance; Water quality; Food sources	Disturbance; Water Quality; Food sources	Hand harvesting activities will take place within the range of this habitat type. There is therefore the potential for direct disturbance impacts, from Harvesters and Boats, as well as habitat fragmentation from harvesting, and water quality issues that may arise from boats or activities themselves. Potential pathway for significant impacts has been identified. Mitigation will be required to offset potential significant effects. Mitigation cannot be provided in a screening for
	Phoca vitulina (Harbour Seal) [1365]	Habitat present throughout the SAC, with various breeding, moulting and resting sites on islands in the bay according to Map 9 of the conservation objectives (NPWS, 2011)	Yes	Disturbance	Disturbance; Water quality; Food sources	Disturbance; Water Quality; Food sources	

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
							appropriate assessment report.
Owenduff/ Nephin Complex SAC (000534)	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110]	Located c. 1.8km north-west of Clew Bay	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
	Natural dystrophic lakes and ponds [3160]						
	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]						
	Northern Atlantic wet heaths with Erica tetralix [4010]						
	Alpine and Boreal heaths [4060]						
	Juniperus communis formations on heaths or calcareous grasslands [5130]						
	Blanket bogs (* if active bog) [7130]						
	Transition mires and quaking bogs [7140]						
	Salmo salar (Salmon) [1106]						
	Lutra lutra (Otter) [1355]						
	Saxifraga hirculus (Marsh Saxifrage) [1528]						

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
	Hamatocaulis vernicosus (Slender Green Feather-moss) [6216]						
Corraun Plateau SAC (000485)	Northern Atlantic wet heaths with Erica tetralix [4010]	Located 1km north-west of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
	European dry heaths [4030]						
	Alpine and Boreal heaths [4060]						
	Juniperus communis formations on heaths or calcareous grasslands [5130]						
	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110]						
	Siliceous rocky slopes with chasmophytic vegetation [8220]						
Newport River SAC(002144)	Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]	Located 1.3km east of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways
	Salmo salar (Salmon) [1106]						

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
							for significant effects.
Brackloon Woods SAC (000471)	Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	Located c. 2km south of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
Mweelrea / Sheeffry / Erriff Complex SAC (001932)	Coastal lagoons [1150] Annual vegetation of drift lines [1210] Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] Mediterranean salt meadows (Juncetalia maritimi) [1410] Embryonic shifting dunes [2110] Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]	Located c. 5.5km south of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]						
	Atlantic decalcified fixed dunes (Calluno-Ulicetea) [2150]						
	Dunes with Salix repens ssp. argentea (Salicion arenariae) [2170]						
	Humid dune slacks [2190]						
	Machairs (* in Ireland) [21A0]						
	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) [3110]						
	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or Isoeto-Nanojuncetea [3130]						
	Natural dystrophic lakes and ponds [3160]						
	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]						
	Northern Atlatic wet heaths with Erica tetralix [4010]						
	European dry heaths [4030]						

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
	Alpine and Boreal heaths [4060]						
	Juniperus communis formations on heaths or calcareous grasslands [5130]						
	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430]						
	Blanket bogs (* if active bog) [7130]						
	Transition mires and quaking bogs [7140]						
	Depressions on peat substrates of the Rhynchosporion [7150]						
	Petrifying springs with tufa Formation (Cratoneurion) [7220]						
	Alkaline fens [7230]						
	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani) [8110]						
	Calcareous rocky slopes with chasmophytic vegetation [8210]						

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
	Siliceous rocky slopes with chasmophytic vegetation [8220]						
	Vertigo geyeri (Geyer's Whorl Snail) [1013]						
	Vertigo angustior (Narrow-mouthed Whorl Snail) [1014]						
	Margaritifera margaritifera (Freshwater Pearl Mussel) [1029]						
	Salmo salar (Salmon) [1106]						
	Lutra lutra (Otter) [1355]						
	Petalophyllum ralfsii (Petalwort) [1395]						
Lough Gall Bog SAC (000522)	Blanket bogs (* if active bog) [7130]	Located c. 6.5km north-west of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
	Depressions on peat substrates of the Rhynchosporion [7150]						

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
Bellacragher Saltmarsh SAC (002005)	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Located c. 7km north-west of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
Oldhead Wood SAC (000532)	European dry heaths [4030] Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]	Located c. 7km west of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
West Connacht Coast SAC (002998)	*Tursiops truncatus* (Common Bottlenose Dolphin) [1349]	Located c. 8km west of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities.

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
							There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
River Moy SAC (002298)	Lowland hay meadows (*Alopecurus pratensis, Sanguisorba officinalis*) [6510]	Located c. 10km north of Clew Bay at its closest point	No	None	None	None	This SAC is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SAC. There are no potential pathways for significant effects.
	Active raised bogs [7110]						
	Degraded raised bogs still capable of natural regeneration [7120]						
	Depressions on peat substrates of the Rhynchosporion [7150]						
	Alkaline fens [7230]						
	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]						
	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]						
	Austropotamobius pallipes (White-clawed Crayfish) [1092]						
	Petromyzon marinus (Sea Lamprey) [1095]						

Natura 2000 Site	Qualifying Interest	Location in relation to license site	Potential pathway for impacts (Yes/No)	Potential Impact & Source			Pre-assessment Screening
				Direct	Indirect	Cumulative	
	Lampetra planeri (Brook Lamprey) [1096]						
	Salmo salar (Salmon) [1106]						
	Lutra lutra (Otter) [1355]						
Owenduff/ Nephin Complex SPA (004098)	Merlin (*Falco columbarius*) [A098]	Located c. 1.8km north of Clew Bay at its closest point	No	None	None	None	This SPA is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SPA. There are no potential pathways for significant effects.
	Golden Plover (*Pluvialis apricaria*) [A140]						
Clare Island SPA (004136)	Fulmar (*Fulmarus glacialis*) [A009]	Located c. 15km west of Clew Bay at its closest point	No	None	None	None	This SPA is located at a distance from Clew Bay and the proposed hand harvesting activities. There is significant geographical separation between the proposed activities and the qualifying interests of this SPA. There are no potential pathways for significant effects
	Shag (*Phalacrocorax aristotelis*) [A018]						
	Common Gull (*Larus canus*) [A182]						
	Kittiwake (*Rissa tridactyla*) [A188]						
	Guillemot (*Uria aalge*) [A199]						
	Razorbill (*Alca torda*) [A200]						
	Chough (*Pyrrhocorax pyrrhocorax*) [A346]						

6. Potential Significant Impacts

The potential for adverse effects on the qualifying interests and conservation objectives of the Natura 2000 sites potentially affected by the proposed project have been taken into account. Direct, indirect and cumulative impacts arising from the proposal for the sustainable hand- harvesting of *Ascophyllum nodosum* within the intertidal zone of Clew Bay are identified with regard to potential impacts affecting designated Natura 2000 sites as follows:

- disturbance / fragmentation of Annex I habitats;
- disturbance to Annex II species;
- impacts affecting the structure and function of the designated site;
- hydrological changes / water quality impacts.

From the initial screening of Natura 2000 sites within the study area only the Clew Bay Complex SAC is identified with regard to the potential for significant adverse effects, with regard to the conservation objectives of this site. The site synopsis for the Clew Bay Complex SAC is presented in Appendix 1. The main potential risks affecting sensitive ecological receptors, i.e. the qualifying interests of this site are primarily due to human disturbance; trampling and removal of *A. nodosum* material potentially affecting the community structure within the Annex I habitats of the intertidal zone and further human disturbance due to increased activity potentially affecting Annex II species: Otter and Common seal.

6.1 Direct Impacts

The proposal for the sustainable hand-harvesting of *A. nodosum* will require the transport of individual harvesters to the shoreline of Clew Bay and islands by small boat. Harvesters will work within the Bay and islands throughout the year. This work will require access to the shore at low tide from existing access roads and to islands before low tide to allow for harvesting at low tide. Therefore it is unlikely that significant impacts will arise that could affect the mudflats and sandflats habitat, or the Atlantic salt meadows habitat, annual vegetation of drift lines, perennial vegetation of stony banks, embryonic shifting dunes or white dunes.

The entirety of the proposed activities are within the Annex I habitat 'Large shallow inlets and bays [1160]'. These activities do not require the removal or disturbance to the sensitive littoral reef habitat or to Maerl or *Zostera* communities identified as important community biotopes within the Clew Bay [1160] Annex I habitat type. In terms of annex I habitats, the percentage area of Shingle and Reef to be impacted each year is 12.7% and 4.9% respectively. The overall area of Large shallow inlets and bays [1160] in Clew Bay is 10,189 hectares (https://eunis.eea.europa.eu/sites/IE0001482). The percentage of shingle to be impacted annually is 0.23% of this area, while percentage of reef to be impacted annually is 1.31% (this is outlined in the Code of Practice for *A. nodosum* harvest activities in Clew Bay Complex SAC – Appendix 4',included as Addendum 5 in the current NIS). However, as the proposal requires activities within this habitat area, it is considered that there is the potential pathway for impacts on this habitat. Mitigation measures will be required. Mitigation cannot be provided in a Screening for Appropriate Assessment report.

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 *A. nodosum* would give rise to any further effects on Large Shallow Inlets and Bays

[1160] in Clew Bay. However, mitigation measures will be required.

Both the Common seal *Phoca vitulina* and the Otter *Lutra lutra* are listed as Annex II qualifying interests of the Clew Bay Complex SAC. Both species utilise the shoreline of the bay, in addition to the islands within the study area. A number of these islands have been identified as important haul-out, breeding and moulting sites for Common seal. This gives rise to the potential for disturbance impacts affecting both species which may result in direct impacts affecting the availability of habitat and the range of these species within the SAC. It is therefore considered that there is the potential for impacts on both Common seal and Otter. Mitigation measures are required.

6.2 Indirect Impacts

The proposed activities within the Clew Bay Complex will require activities within the intertidal zone of the Annex I habitat 'Large shallow inlets and bays [1160]', the removal of *A. nodosum* biomass is considered to have the potential to give rise to an alteration in the intertidal biotope characterised as intertidal reef habitat; identified as an Annex I habitat within the Annex I [1160] habitat of the Clew Bay Complex SAC as a whole. Annex I habitats identified that may be indirectly affected by the proposed harvesting activities also include for saltmarshes and sand dune habitats due to possible changes in sediment supply. The potential pathway for impacts has been identified and mitigation is required. Mitigation cannot be provided in a Screening for Appropriate Assessment.

Additional indirect impacts may potentially occur due to a reduction in foraging area and displacement of common seal populations within the wider activities area leading to the requirement for further assessment within the context of the current NIS. Potential indirect disturbance arising from both human activity and wider noise impacts affecting both Common seal and Otter within the SAC are identified. This may include impacts relating to foraging and commuting in the wider context of the study area; in addition to indirect impacts affecting breeding success and energy expenditure resulting from disturbance. The potential pathway for impacts has been identified and mitigation is likely to be required. Mitigation cannot be provided in a Screening for Appropriate Assessment report.

6.3 Cumulative Impacts

Completed plans or projects, where they contribute to a potential cumulative effect are considered in that they have resulted in an impact upon the qualifying interests of a designated site and the continuing effect must be assessed in order to identify any pattern of continuing loss of integrity (English Nature, 2001). Potential cumulative impacts affecting species listed as conservation interests of designated Natura 2000 sites are identified with regard to the following:

- Disturbance and displacement effects of increased boat traffic;
- Disturbance and potential displacement due to noise and human disturbance at a background level during operation;
- Indirect effects through loss of, or changes to, habitat and prey species availability arising from an alteration to the intertidal biotope / community due to harvesting of *A. nodosum*.

The location of the proposal within the Clew Bay Complex SAC gives rise to the potential for direct and indirect impacts affecting Common seal and Otter populations listed as qualifying interests of this Natura 2000 site. The potential for disturbance impacts affecting these species are also recognised with regard to existing fishing boat activity, tourism and recreational activity within the Clew Bay area and pre-existing and ongoing seaweed harvesting activities; all of which would have the potential for cumulative and in-combination impacts arising from human disturbance impacts. Mitigation is likely to be required and cannot be provided in a Screening for Appropriate Assessment report.

7. CONCLUSION

Table 4 DoEHLG (2010) potential findings and outcomes for Screening for Appropriate Assessment with conclusions for proposed sustainable harvesting of *A. nodosum* in Clew Bay, Co. Mayo.

Finding	Potential Outcome	Conclusion
Project is directly connected to or necessary for the management of a designated site	Stage 2 (AA) is not required	
No potential for significant effects	Stage 2 (AA) is not required	
Potential for significant effects identified, or potential for impacts is uncertain	Stage 2 (AA) is required and a Natura Impact Statement will be prepared	✓

This screening report, based on the best available scientific information, finds that there is reasonable scientific certainty that the proposed license does pose a risk of significant adverse effects on the Natura 2000 network in view of their conservation objectives. The proposed license does require a Natura Impact Statement (Stage 2 Appropriate Assessment). Therefore it is concluded, in the absence of any consideration of mitigation measures or best-practice measures, that the proposed license may have a significant impact, individually or in combination with other plans or projects, on the Clew Bay SAC. Appropriate Assessment (NIS) is therefore required for the proposed hand harvesting of *A. nodosum* in Clew Bay.

REFERENCES

Bowers-Marriott, B. (1997) Practical Guide to Environmental Impact Assessment: *A Practical Guide.* Published by McGraw-Hill Professional, 1997, 320 pp

DoEHLG (2010) *Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government. https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf

European Commission (2001) *Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. European Commission Environment, Brussels.

http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/natura_2000_assess_en.pdf

European Commission (2007) *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC: Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interests, compensatory measures, overall coherence and opinion of the Commission.* European Commission, Brussels
http://ec.europa.eu/environment/nature/natura2000/management/docs/art6/guidance_art6_4_en.pdf

Guiry MD, Morrison L. *The sustainable harvesting of Ascophyllum nodosum (Fucaceae, Phaeophyceae) in Ireland, with notes on the collection and use of some other brown algae.* Journal of applied phycology. 2013 Dec;25:1823-30. https://link.springer.com/article/10.1007/s10811-013-0027-2

Hession C, Guiry MD, McGarvey S, Joyce D. *Mapping and assessment of the seaweed resources (Ascophyllum nodosum, Laminaria spp.) off the west coast of Ireland.* https://oar.marine.ie/handle/10793/202

Kelly L, Collier L, Costello MJ, Diver M, McGarvey S, Kraan S, Morrissey J, Giury MD. *Impact assessment of hand and mechanical harvesting of Ascophyllum nodosum on regeneration and biodiversity.* https://oar.marine.ie/handle/10793/207

Lauzon-Guay, Jean-Sébastien, Alison I. Feibel, Bryan L. Morse, and Raúl A. Ugarte. Morphology of *Ascophyllum nodosum* in relation to commercial harvesting in New Brunswick, Canada. Journal of Applied Phycology (2023): 1-11. https://link.springer.com/article/10.1007/s10811-023-03028-6

NPWS (2019a). *The Status of EU Protected Habitats and Species in Ireland*. Species Assessments Volume 3. Version 1.0. Unpublished Report, National Parks & Wildlife Service. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol3_Species_Article17.pdf

NPWS (2019b). *The Status of EU Protected Habitats and Species in Ireland*. Habitat Assessments Volume 2. Version 1.1. Unpublished Report, National Parks & Wildlife Service. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf

APPENDIX 1 NPWS SITE SYNOPSES

SITE NAME: CLEW BAY COMPLEX SAC
SITE CODE: 001482

Clew Bay is a wide, west-facing bay on the west coast of Co. Mayo. It is open to the westerly swells and winds from the Atlantic, with Clare Island giving only a small amount of protection. This drumlin landscape was formed during the last glacial period when sediments were laid down and smoothed over by advancing ice. The sea has subsequently inundated the area, creating a multitude of islands. The geomorphology of the bay has resulted in a complex series of interlocking bays creating a wide variety of marine and terrestrial habitats. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes): [1140] Tidal Mudflats and Sandflats [1150] Coastal Lagoons* [1160] Large Shallow Inlets and Bays [1210] Annual Vegetation of Drift Lines [1220] Perennial Vegetation of Stony Banks [1330] Atlantic Salt Meadows [2110] Embryonic Shifting Dunes [2120] Marram Dunes (White Dunes) [21A0] Machairs (* in Ireland) [91A0] Old Oak Woodlands [1355] Otter (Lutra lutra) [1365] Common (Harbour) Seal (Phoca vitulina).

Within the shallow bay, subtidal sediments are characterised by typical bivalve communities in fine sand (Chamelea striatula and Ensis sp.), and by the polychaete worm Euclymene sp. and the bivalve Thyasira flexuosa in muddy sand. The intertidal sediment communities are characterised by polychaetes and bivalves in the mid shore and by the sand mason worm Lanice conchilega in the low shore. In areas where there is maerl debris with small amounts of live maerl, the infaunal community has a mixture of species characteristic of coarse sand (e.g. the bivalves Timoclea ovata, Spisula sp., and the polychaetes Nepthys cirrosa and Glycera lapidum) and medium sand (e.g., the bivalve Ensis sp. and the polychaetes Lanice conchilega, Scoloplos armiger and Sthenelais boa). The bivalves Timoclea ovata, Tapes rhomboides and the polychaetes Branchiomma bombyx and Glycera lapidum are typical of gravels and medium sands, whereas the bivalves Abra alba, Corbula gibba, Thyasira flexuosa and Mysella bidentata and the polychaete Euclymene are characteristic of muddy sands. Beds of live maerl of Lithothamnion corallioides are also present in a number of areas.

Around the edges of the inner part of the bay are shores of mixed boulders, cobbles, gravel with some sand and mud. They have a typical zonation of intertidal communities found on sheltered shores of mixed substratum. The shore at Murisk is unusual as a distinct zone characterised by archiannelids occurs above the sandhopper zone in the upper shore under the boulders and cobbles. This is an unusual habitat. In sheltered areas of shallow water with little sand scour a well-developed community of hydroids, sponges and solitary sea squirts is present. Where the sediments include gravel and mud the species richness in the area can be exceptionally high (180 species). A number of marine species that are rarely recorded are found in Clew Bay: the stalked jellyfish Lucernariopsis cruxmelitensis; the polycheates Anitides rosea, Clymenura clypeata, Pterosyllis formosa and Pionosylis sp. and the snail Clypterea chinensis.

Clew Bay is considered to have the most significant shingle reserves in the country, and has (on the islands) the only examples of incipient gravel barriers in Ireland. Associated with the shingle (and dunes) are good examples of annual vegetation of drift lines. Characteristic species found in these habitats include: Spear-leaved Orache (Atriplex prostrata), Red Fescue (Festuca rubra), Sea Sandwort (Honkenya peploides), Thrift (Armeria maritima), Common Scurvygrass (Cochlearia officinalis), Sea Mayweed (Matricaria maritima) and Sea Campion (Silene vulgaris subsp. maritima).

Lough Furnace is located at the north-eastern corner of Clew Bay. The lough is a good example of a deep, stratified, saline lake lagoon in a very natural state. Salinity levels can vary considerably here depending on rainfall and tides. The lake is one of the very few permanently stratified lakes known in Ireland and Britain. The lake is ringed by Common Reed (Phragmites australis) and Common Club-rush (Scirpus lacustris), with small patches of Great Fen-sedge (Cladium mariscus) and Bottle Sedge (Carex rostrata). Lough Furnace supports a relatively high faunal diversity (41 taxa recorded in a 1996 survey), including a number of important invertebrate species. The relict mysid species Neomysis integer, the isopods Jaera albifrons, J. ischiosetosa and J. nordmanni, and two rare amphipods (Lembos longipes and Leptocheirus pilosus) have all been recorded from the lake. Both Irish species of tasselweed (Ruppia maritima and R. cirrhosa) occur in the lagoon. Eel, Flounder and Mullet also occur in the lake waters. Mallard nest around the lough, while Saint's Island contains nesting Blackheaded Gull.

At the north-western end of Lough Furnace lie two associated lakes, Lough Napransky and Lough Navroony. A stream drains from the latter into the main lake. The area contains flush and quaking-mire vegetation, which is of interest as Irish Heath (Erica erigena) is found there, with bog mosses (Sphagnum spp.), Black Bogrush (Schoenus nigricans), Bog Asphodel (Narthecium ossifragum), Common Cottongrass (Eriophorum angustifolium) and Round-leaved Sundew (Drosera rotundifolia). Bog Orchid (Hammarbya paludosa), a species listed in the Irish Red Data Book and the Flora (Protection) Order, 2015, is also found in this area. Beyond the wet area there is a Hazel (Corylus avellana) dominated woodland growing over abandoned fields. Downy Birch (Betula pubescens), Hawthorn (Crataegus monogyna) and Holly (Ilex aquifolium) are common, with occasional Sessile Oak (Quercus petraea). The ground flora contains such species as Bluebell (Hyacinthoides non-scripta), Sanicle (Sanicula europaea) and Wood-sorrel (Oxalis acetosella).

Keeloges Wood is a medium-sized woodland on the north-east corner of Clew Bay. The woodland lies in a sheltered location between several drumlins and occurs on a shallow, moist, brown-earth soil with an organic-rich A horizon which is occasionally peaty. The soil is gleyed near streams and flushes. The woodland is dominated by Sessile Oak, with Downy Birch and occasional Ash (Fraxinus excelsior). Hazel, Holly and Hawthorn are the principal components of the shrub layer. In moister sites Rusty Willow (Salix cinerea subsp. oleifolia) and Alder (Alnus glutinosa) occur. The woodland is at the more fertile end of the spectrum of oak woodlands and is transitional to Ash woodland. Consequently the field layer is species-rich. Elements of oak woodland, e.g. Hard Fern (Blechnum spicant), Greater Stitchwort (Stellaria holostea), Great Wood-rush (Luzula sylvatica) and Honeysuckle (Lonicera periclymenum), are mixed with elements of Ash woodland, e.g. False Brome (Brachypodium sylvaticum), Lords-and-ladies (Arum maculatum), Enchanter's nightshade (Circaea lutetiana) and Wood Speedwell (Veronica montana), as well as indicators of poorly-drained soil, e.g. Tufted Hair-grass (Deschampsia cespitosa), Meadowsweet (Filipendula ulmaria) and Marsh Hawk's-beard (Crepis paludosa). The epiphyte Lobaria pulmonaria is also present, together with numerous other lichen and bryophyte species (including Usnea spp).

The wood was cut during the second World War so most of the trees are approximately 60 years old, but a few very much larger oaks occur, principally on the shoreline. There is a low but well-developed canopy with a well-developed shrub layer and often luxuriant field layer. There is good regeneration of trees. A most unusual feature is the juxtaposition of oak woodland with saltmarsh where the woodland borders the shoreline. The wood has been well-managed in recent times with occasional filling in of wind-blown coupes with trees derived from seed collected on-site. A stock-proof fence has been maintained along the land boundary. No invasive exotics were encountered during recent survey. The woodland appears on the 1st Edition Ordnance Survey map indicating that it is long-established and possibly ancient. The species-list also supports this contention with at least 14 species present here

which have been found to be significantly more frequent in potentially ancient woodlands. This woodland is of particular significance in view of its location in the extreme north-west of the country where there is very little woodland, its position on the coast, its species-richness, excellent structure and its possible ancient status.

The Rosmurrevagh area in the north of Clew Bay displays a high diversity of habitats, from seashore to dunes, machair and coastal grassland, as well as saltmarsh, bog and fen. The sandy beach on the seaward side grades into dunes of Marram (Ammophila arenaria). Adjacent to this, the saltmarsh vegetation, which is approximately 5 m wide, comprises Thrift, Common Scurvygrass, Common Saltmarsh-grass (Puccinellia maritima) and 'turf fucoids' (diminutive forms of brown algae). These plant species are typical of Atlantic salt meadows. Similar saltmarshes occur scattered around the entire shoreline of the bay.

Next to the saltmarsh at Rosmurrevagh is an area of coastal grassland and machair. The majority of the machair grassland is relatively level and occurs on a fine sand substrate that is free draining. Small patches of damp machair are often found in conjunction with the saltmarsh or low-lying depressions where water from incoming high tides occasionally reaches. Many typical grassland species such as Festuca rubra (Red fescue), Bellis perennis (Daisy), and Plantago lanceolata (Ribwort plantain) are found on the machair. Autumn lady's-tress (Spiranthes spiralis) and Field Gentian (Gentianella campestris) are occasional in the grassland sward. Flushes introduce a species-rich bog/fen type vegetation. Yellow Iris (Iris pseudacorus), Soft Rush (Juncus effusus), Irish Heath, bog mosses, sedges, Water Mint (Mentha aquatica), Bog-myrtle (Myrica gale), Bog Asphodel and Cuckooflower (Cardamine pratensis) are also found.

A further dune system occurs at Bartraw in the south-west of the site. Here Marram and embryonic dunes occur along a shingle ridge which links a small island where dunes also occur. Embryonic dunes, characterised by the presence of Sand Couch (Elymus farctus), also occur on some of the islands in the bay.

Important populations of Otter and Common (Harbour) Seal are found in Clew Bay. A total of 95 Common Seals were recorded ashore within Clew Bay Complex SAC in August 2003 during a national aerial survey for the species. Continued land-based monitoring within the site recorded 121 seals of all ages ashore in August 2009 and 118 in August 2010. The snail species Vertigo geyeri, which is also listed on Annex II of the E.U. Habitats Directive, has been recorded from this site based on a finding of the species at the edge of a lagoon at Rosmoney, as reported in 2005. The Vertigo monitoring survey of 2008-2010 assessed the site as having very little suitable habitat and that this was a natural situation rather than due to loss of habitat. This was the only site for Vertigo geyeri in this SAC and no others have been found.

The Clew Bay Complex supports a good diversity of wintering waterfowl, with nationally important numbers of Red-breasted Merganser (average maximum of 70 in the winters 1995/96-1999/00) and Ringed Plover (average maximum of 142 in the winters 1995/96-1999/00). A population of Barnacle Goose (100-200 birds) frequents the islands during winter. Other species which occur in significant numbers include Great Northern Diver (14), Brent Goose (118), Shelduck (74), Wigeon (112), Teal (127), Mallard (64), Oystercatcher (250), Dunlin (450), Bar-tailed Godwit (73), Curlew (373), Redshank (172), Greenshank (10) and Turnstone (27) (all figures are average maxima for the winters 1995/95-1999/00). Species which breed in important numbers include Cormorant (115 pairs in 1985), Common Tern (20+ pairs in 2000/01), Arctic Tern (100+ pairs in 2000/01) and Little Tern (9 pairs in 2000). The various tern species, as well as Barnacle Goose, Great Northern Diver and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive.

The juxtaposition within Clew Bay of a wide variety of habitats, including 10 listed on Annex I of the E.U. Habitats Directive, and the combination of important flora and fauna, including one Red Data Book plant and two animals listed on Annex II of the E.U. Habitats Directive, make this a site of considerable national and international importance.