

Appropriate Assessment Screening Report  
for  
Habitat Restoration and Sustainable Access on  
Errigal Mountain,  
Co. Donegal



To support the Appropriate Assessment process in line with the requirements of Article 6(3) of the EU Habitats Directive

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## Contents

1	Introduction .....	4
1.1	Terms of reference .....	4
1.2	Context and stages of an Appropriate Assessment process .....	4
2	Methodology.....	5
2.1	Consultation .....	6
3	Overview of the project and the receiving environment .....	7
3.1	Brief description of the project.....	7
3.2	Brief description of the receiving environment.....	9
3.3	Identification of designated sites.....	10
4	Assessment of impacts.....	13
4.1	Identifying potential effect pathways .....	13
4.2	Assessment of significance .....	15
4.3	Cumulative impacts.....	22
4.4	Recommendations .....	22
5	Conclusion and Screening Statement .....	23
5.1	Determination of whether a project or plan is directly connected with or necessary to the conservation management of any European sites .....	23
5.2	Appraising likely significant effects of the proposed project on relevant European sites	24

## Appendices

Appendix 1a: Site location of proposed path and repair and restoration work.

Appendix 1b: Map showing existing routes, used and damaged areas.

Appendix 1c: Map showing path sections of the proposed Sustainable Access Route, extent of Habitat Restoration Plan and areas to source boulders.

Appendix 2a: Main types of habitats found on Errigal Mountain following EU Habitats Directive classification.

Appendix 2b: Main types of habitats found on Errigal Mountain following Irish (Fossitt) classification.

Appendix 2c: Condition assessment of habitats (carried out in 2017).

Appendix 3a: Location of project vis-a-vis European sites within 1, 5 & 15 km radius.

Appendix 3b: Streams in the vicinity of proposed path.

Appendix 3c: Conservation objectives of Freshwater Pearl Mussel within the Cloghernagore Bog and Glenveagh National Park SAC.

Appendix 3d: Location of indicative lake habitats potentially containing oligotrophic waters.

Appendix 4: Plate of photos taken throughout 2018.

Appendix 5: Conservation objectives.

# **1 Introduction**

## **1.1 Terms of reference**

This document has been prepared by Dr Florence Renou-Wilson of Earthy Matters Environmental Consultants on behalf of Donegal County Council, in order to determine the potential impacts, if any, of the proposed path works at Errigal mountain, Co. Donegal on any relevant Natura 2000 sites (hereafter ‘European sites’).

This document is a Screening Report for Appropriate Assessment and is in line with the requirement of Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC). As such, this report provides information required in order to establish whether or not the proposed development is likely to have a significant impact on any European site known in the vicinity as in the context of their conservation objectives and specifically on the habitats and species for which the conservation site has been designated.

## **1.2 Context and stages of an Appropriate Assessment process**

Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (hereafter ‘the Habitats Directive’) and EC Directive 2009/147/EC on the Conservation of Wild Birds (the “Birds Directive”) requires that, any plan or project not directly connected with or necessary to the management of a European site, but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subject to an Appropriate Assessment of its implications for the site in view of the site's conservation objectives. The requirements of the EC directives set out above are enforced in Ireland through the European Communities (Birds and Natural Habitats Regulations 2011). The possibility of there being a significant effect on a European site will generate the need for an Appropriate Assessment to be carried out by the competent authority for the purposes of Article 6(3). Accordingly, a screening for Appropriate Assessment in respect of an application for consent for proposed development must be carried out by the competent authority (in this case, the Local Authority) in order to assess, in view of best scientific knowledge, if the proposed project, individually or in combination with another plan or project is likely to have a significant effect on any European site.

A Stage Two Appropriate Assessment is required if it cannot be excluded, on the basis of objective information, that a proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site. The Screening (Stage One) operates merely to determine whether an Appropriate Assessment (Stage Two) must be undertaken on the implications of the plan or project for the conservation objectives of relevant European sites.

This document comprises the following information gather as part of the screening exercise:

- determination whether the project is directly connected with or necessary to the management of the site
- description of the project
- identification of European sites potentially affected
- identification and description of individual and cumulative impacts likely to result from the project
- assessment of the significance of the impacts identified above on site integrity, and conclude with a statement of Appropriate Assessment screening (as per Irish guidance); altogether, it will enable the competent authority (i.e. Donegal County Council) to perform a Stage One Screening for Appropriate Assessment.

## **2 Methodology**

This report includes an impact assessment and testing required under the provisions of Article 6(3) by means of the first stage of Appropriate Assessment. In this context, a review of the potential, residual (indirect and direct) and cumulative impacts, as well as mitigation measures has been undertaken. It is based on an analysis of existing ecological information including documented information about the designated and non-designated areas involved as well as a walk-over site assessment during many site visits undertaken by the author over the course of 2018 to assess the ecological interest of the proposed path as well as assess the status of the habitats within the area proposed for restoration.

A number of guidance documents on the Appropriate Assessment process have been referred to during the preparation of this report. These include:

- NPWS (2009), Revised February 2010. Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities (NPWS, 2009, Revised February 2010);
- The European Communities (2002) Assessment of plans and projects significantly affecting European sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC;
- The European Communities (2000) Managing Natura 2000: the provisions of Article 6 of the ‘Habitats Directive’ 92/43/EC.

Information relied upon included the following information sources, which include maps and ecological data:

- Ordnance Survey of Ireland mapping and aerial photography available from [www.osi.ie](http://www.osi.ie)
- Online data available on European sites as held by the National Parks and Wildlife Service (NPWS) from [www.npws.ie](http://www.npws.ie)
- Information on the location and operation of the potential development supplied by the client in the form of their own safety statements, maps and related materials
- Information on the status of EU protected habitats and species in Ireland (National Parks & Wildlife Service)
- Flora (Protection) Order, 2015 (S.I. No. 356 of 2015) map viewer <http://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e>

In addition, the following planning and policy documents relevant to this site were consulted with respect to considering cumulative effects with other plans and projects:

- National Biodiversity Plan 2011-2016
- Strategic Environmental Assessment of the Donegal County Development Plan
- Donegal County Development Plan 2018-2024

## **2.1 Consultation**

The National Parks and Wildlife Service (Dave Duggan, NPWS Divisional Manager) and Inland Fisheries (Brendan Maguire) were consulted and their comments integrated into this report.

## 3 Overview of the project and the receiving environment

### 3.1 Brief description of the project

Errigal Mountain (751m) is located in the heart of Derryveagh Mountains in north-west Donegal, near Dunlewey (see site location in Appendix 1a). Errigal Mountain is facing challenges associated with increased visitor numbers and unregulated access, which have led to multiple degraded access routes (see map showing existing routes, used and damaged areas in Appendix 1b). The Errigal Mountain Path Study (2015) recommended a programme of physical works to include the development of a single line path, capable of withstanding the pressure of visitors, to be complimented by restoration of damaged habitats. With the reality of continued demand for access on Errigal, the proposal of one single line access route would ensure sustainability in the longer term and allow the eroded areas to regenerate.

Donegal County Council, with the support of the Errigal stakeholder committee (ASCENT project), proposes to carry out repair and restoration work on the damaged south-eastern slopes of Errigal mountain and establish a sustainable access route to the summit via a single path following an existing access route (see site proposed route in Appendix 1c).

The project comprises two distinct components:

- 1) The proposed path works as described in the accompanying drawings and report entitled “Errigal Path Detailed Design” (Dougie Baird, Kland LTDJan 2019).
- 2) The restoration works as described in the accompanying report entitled “*Repair and Habitat Restoration for Sustainable Access on Errigal Mountain*” (Earthy Matters Environmental Consultant, Jan 2019).

For the purpose of this assessment, a summary of the main works associated with both components are presented below:

#### **Proposed sustainable access path:**

-Construction of an upland path (total length of 1740 m) of variable width not exceeding a final path width of 2 m, starting at the car park, following the stream side route to the half cairn and continuing on to the main ridge to the summit. The path will integrate with its surroundings using carefully selected materials from on-site or at a pre-approved nearby locations (NPWS consent) (see Method Statement in Detailed Design Report and Appendix 1c).

-Natural aggregate of similar origin as present on-site, will be graded and compacted to form an irregular walking surface, interspersed with boulders acquired from various sources from near the proposed route, to 'anchor' the path on slopes. On steeper ground (above 10 degrees or 20 % gradient) boulder steps (known as pitching) will be used to create a stable route. The width may vary and should include areas where people can pass and walk side-by-side on occasion.

-Path edges will be irregular and the surrounding area will be less attractive to walkers as it will be re-wetted. Drainage features will be subtly incorporated into the path to ensure that water cannot cause damage to the path. Any imported materials will be carefully selected to match those found on site. Artificial binders (such as cement or bitumen) or drainage pipes will not be used.

-Where the path crosses large areas of wet flushes, it is proposed to bridge these areas with a robust boardwalk (recycled plastic). This will happen in two locations where heavy runoff from eroding blanket bog hags brings a large quantity of water through a gully.

-At higher elevations, above the line of peat formation, the route will require minor light touch works using the exposed "Rib" on shallow, shattered bedrock, only to offer a narrower unconstructed route and effective alignment to avoid any new developing paths.

-At the top of the 'Rib' the route will require stone pitching supported by revetment to provide a highly robust steep path that users will follow in order to allow the surrounding areas to naturally regenerate and stabilise.

-The exposed ridge to the summit is flat ground and will not require formal construction but will converge walkers to a single line to help stabilise erosion, narrow the corridor of use and allow natural regeneration on the sensitive habitat on the north side of the ridge.

### **Repair and Restoration of Habitats:**

-A successful repair and restoration plan can only be achieved by providing a sustainable access path (proposed stream route), which will in effect remove all activities in the most damaged area (existing routes west of the stream).

-The path has been specifically designed to encompass already eroded areas and to protect sensitive micro-habitats associated with the type of ecosystems found on the mountain. An ecologist will provide on-site guidance at these specific areas.

-In consultation with NPWS, it is proposed that a chestnut paled fencing will be temporarily installed at judicious locations along the eastern part of the stream in order to restrict passage over the stream to further restrain stray walkers.

-In consultation with NPWS, it is also proposed to erect signage and interpretive panels to inform the walkers of the importance of keeping on the new path.

-While the removal of the trampling pressure by walkers will help the natural regeneration of the less degraded part of the existing routes, some patches or sections along the 'old route' on the western side of the stream have suffered extreme degradation whereby all vegetation has been removed and the peat mass is now compacted and hydrologically isolated. It is proposed to first monitor geo-referenced quadrats within these severely damaged sections over the course of two years following path construction. Initially, peat sods may be strategically placed to dam eroded gullies that are carrying fine sediments from the sub-peat mineral soil. Further planting with heather may be recommended in the bare peat hags to assist the colonisation of vegetation by removing the wind erosion effect. No further management will be implemented until a further assessment of recovery is carried out. It should be noted that there will be no use of artificial or natural fertiliser under any circumstances.

### **3.2 Brief description of the receiving environment**

Errigal Mountain is comprised of many different habitats. A map of habitats following the EU Habitats Classification and the Irish (Fossitt) classification can be found in Appendix 2a and 2b. However, the status of these habitats is mostly degraded within the path of the most popular access routes. The worst 'compromised' habitat are found on the western access route (see Appendix 2c map of condition assessment of the major routes showing 'compromised' habitat vs 'recoverable' habitat).

The proposed works are to take place within a confined area starting from the car park and following the eastern side of the Cronaniv burn before reaching a very rugged and robust route ascending to the large cairn. From there, the path uses the currently most popular and most damaged line where it ascends steeply to the summit ridge and then traverses on a flat ridge eventually reaching the summit at 751 m OD. The impact of the proposed project focuses on the habitats that will be directly affected by the construction of the path and the repair / restoration works, as well as indirectly due to the reduced trampling activities on the most popular and currently most degraded areas.

The lower slopes near the car park and where the path is proposed, comprise the most heavily degraded habitat which consists of a mosaic of heath and blanket bog habitat with bare patches where the peat is exposed (see Appendix 4: Plate of photos). The path route has been designed to coincide with the degraded but most robust habitats (shallow peat depth), which are located on the eastern side of the burn. The area affected by the path works can be divided into general zones corresponding to the main habitat types and status condition found on Errigal Mountain, namely: 1) heavily degraded bare peat; 2) degraded mosaic of wet heath and blanket bog; 3) montane heath, 4) quartzite scree and exposed rocks and 5) path at the summit bordered by Alpine and Boreal heath. Images of each habitat can be found in Appendix 4.

### **3.3 Identification of designated sites**

Using the database and GIS system held online at [www.npws.ie](http://www.npws.ie), it was determined that the proposed project is located within two designated sites namely Cloghernagore Bog and Glenveagh National Park Special Area of Conservation (SAC) (Site Code 002047) and Derryveagh and Glendowan Mountains Special Protection area (SPA) (Site code 004039). There is one other site within the 5 km radius, namely Fawnboy bog/Lough Nacung SAC. Table 1 below lists all European sites within a 15 km radius, with approximate distance and direction from the central point of the proposed path. Appendix 3a displays the map showing all European sites vis-à-vis proposed project.

Table 1: List of all European sites within 15 km of the proposed project:

Site Code	Site Name	Distance from the site	Qualifying features
002047	Cloghernagore Bog and Glenveagh National Park SAC	Within	<ul style="list-style-type: none"> <li>➤ <i>Margaritifera margaritifera</i></li> <li>➤ <i>Salmo salar</i> (only in fresh water)</li> <li>➤ <i>Lutra lutra</i></li> <li>➤ <i>Trichomanes speciosum</i></li> <li>➤ Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)</li> <li>➤ Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and <i>allitricho-Batrachion</i> vegetation</li> <li>➤ Northern Atlantic wet heaths with <i>Erica tetralix</i></li> <li>➤ European dry heaths</li> <li>➤ Alpine and Boreal heaths</li> <li>➤ Molinia meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinia caeruleae</i>)</li> <li>➤ Blanket bogs (* if active only)</li> <li>➤ Depressions on peat substrates of the Rhynchosporion</li> <li>➤ Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles</li> </ul>
004039	Derryveagh and and Glendowan Mountains SPA (includes Lough Barra Bog, a Ramsar site 10km south)	Within	<ul style="list-style-type: none"> <li>➤ <i>Gavia arctica</i> [breeding ]</li> <li>➤ <i>Falco columbarius</i> [breeding ]</li> <li>➤ <i>Falco peregrinus</i> [breeding ]</li> <li>➤ <i>Pluvialis apricaria</i> [breeding ]</li> <li>➤ <i>Calidris alpina schinzii</i> [breeding ]</li> </ul>
000140	Fawnboy bog/Lough Nacung SAC	1.6 km south-west	<ul style="list-style-type: none"> <li>➤ <i>Margaritifera margaritifera</i></li> <li>➤ Northern Atlantic wet heaths with <i>Erica tetralix</i></li> <li>➤ Blanket bogs (* if active only)</li> <li>➤ Depressions on peat substrates of the Rhynchosporion</li> </ul>
001179	Muckish Mountain SAC	8.2 km north-east	<ul style="list-style-type: none"> <li>➤ Alpine and Boreal heaths</li> <li>➤ Siliceous rocky slopes with chasmophytic vegetation</li> </ul>
001090	Ballyness Bay SAC	10 km north	<ul style="list-style-type: none"> <li>➤ Snail <i>Vertigo geyeri</i></li> <li>➤ Estuaries</li> <li>➤ Mudflats and sandflats not covered by seawater at low tide</li> <li>➤ Embryonic shifting dunes</li> <li>➤ Shifting dunes along the shoreline with (white dunes)</li> <li>➤ Fixed coastal dunes with herbaceous vegetation (grey dunes)</li> <li>➤ Humid dune slacks</li> </ul>

002176	Leannan River SAC	10.5 km south-east	<ul style="list-style-type: none"> <li>➤ Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>)</li> <li>➤ Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletalia uniflorae</i> and/or</li> <li>➤ Isoeto-Nanojuncetea</li> <li>➤ Freshwater Pearl Mussel <i>Margaritifera margaritifera</i></li> <li>➤ Salmon <i>Salmo salar</i></li> <li>➤ Otter <i>Lutra lutra</i></li> </ul>
001141	Gweedore Bay and Islands SAC	10.8 km west	<ul style="list-style-type: none"> <li>➤ Coastal lagoons [1150]</li> <li>➤ Reefs [1170]</li> <li>➤ Perennial vegetation of stony banks [1220]</li> <li>➤ Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) [1330]</li> <li>➤ Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]</li> <li>➤ Embryonic shifting dunes [2110]</li> <li>➤ Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]</li> <li>➤ Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]</li> <li>➤ Decalcified fixed dunes with <i>Empetrum nigrum</i> [2140]</li> <li>➤ Atlantic decalcified fixed dunes (<i>Calluno-Ulicetea</i>) [2150]</li> <li>➤ Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) [2170]</li> <li>➤ Humid dune slacks [2190]</li> <li>➤ Machairs (* in Ireland) [21A0]</li> <li>➤ Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletalia uniflorae</i> and/or <i>Isoeto-Nanojuncetea</i> [3130]</li> <li>➤ European dry heaths [4030]</li> <li>➤ Alpine and Boreal heaths [4060]</li> <li>➤ <i>Juniperus communis</i> formations on heaths or calcareous grasslands [5130]</li> <li>➤ <i>Euphydrias aurinia</i> (Marsh Fritillary) [1065]</li> <li>➤ <i>Lutra lutra</i> (Otter) [1355]</li> <li>➤ <i>Petalophyllum ralfsii</i> (Petalwort) [1395]</li> <li>➤ <i>Najas flexilis</i> (Slender Naiad) [1833]</li> </ul>
0041149	Falcarragh to Meenlaragh SPA	11.2 km north	<ul style="list-style-type: none"> <li>➤ <i>Crex crex</i> [breeding]</li> </ul>

Having considered the potential ecological impacts through source-receptor-pathway connectivity (e.g. hydrological link) and given the nature of the proposed project, it was deemed that the zone of influence for such project would be limited to a radius of 10 km. Therefore, due to the distance of the source and the type of receptors, the following are not considered further in this assessment; Ballyness, Leanan River, Gweedore Bay and Islands SAC, and Falcarragh to Meenlaragh SPA. In addition, given the physical obstacle presented by the location of the qualifying interests of Muckish SAC (habitats present on the mountain itself), no effect pathway is possible and, therefore, the project would not impact the integrity of this SAC; it can thus be screened out.

## **4 Assessment of impacts**

### **4.1 Identifying potential effect pathways**

Only those features of the development that have the potential to impact on the features and conservation objectives of the identified European sites are considered. The following issues were examined in relation to the potential impacts of the project (either alone or cumulative): Given the nature of the proposed project and the range of qualifying habitats associated with European sites listed above, the following potential effect pathways include:

1. Direct habitat loss and / or damage affecting designated habitat
2. Habitat deterioration through changes in hydrology and water quality
3. Pollution events during construction
4. Disturbance of qualifying features during construction
5. Disturbance of qualifying features during operation (long-term use of the path)

Table 2 outlines the conservation objectives of the aforementioned European sites that require screening. Table 2 also briefly describes the identified threats and pressures of each European site as outlined by NPWS (see various references for each European site).

Table 2: List of European Sites identified for screening together with their conservation objectives as well as threats and pressures as outlined by NPWS (see References for individual reports).

Cloghernagore Bog and Glenveagh National Park SAC (002047)	
Conservation objectives	Identified threats and pressures
To restore the favourable conservation conditions of Wet heath, Dry heath, Alpine Boreal heath and Blanket bog, amongst others in Cloghernagore Bog and Glenveagh National Park SAC	The primary threats are from forestry (outside the site) and peat extraction both in and outside the site. Other pressures include invasive non-native species ( <i>Rhododendron ponticum</i> is currently managed within the Park), and over-grazing by sheep and deer. Erosion and burning also have a negative impact on the site.
Derryveagh and and Glendowan Mountains SPA (004039)	
Conservation objectives	Identified threats and pressures
To maintain or restore the favourable conservation condition of Red-throated Diver, Merlin, Peregrine, Golden Plover and Dunlin within this SPA.	The primary threats are essentially similar to Cloghernagore Bog, and Glenveagh National Park SAC, as they overlap: invasive non-native species, over-grazing and peat extraction. In addition, while roads/tracks and walking have been identified as having negative impacts, management activities that include path making and interpretive centres/signs have had a positive impact.
Fawnboy bog/Lough Nacung SAC (00140)	
Conservation objectives	Identified threats and pressures
To maintain or restore the favourable conservation condition of Freshwater pearl mussel, Wet heath, Blanket bogs and Depressions of <i>Rhynchosporion</i>	The primary threats come from commercial activities, peat extraction and forestry and modification of the river flow at the River Clady; dispersed habitation is also increasing habitats encroachment.

## 4.2 Assessment of significance

This section considers the list of potential impacts identified above and demonstrates whether the development will have any adverse effects on the integrity of the aforementioned European sites. Receptor/pathway and likelihood of impact is presented for each qualifying interest in Table 3.

Table 3: Screening analysis to identify SAC / SPA qualifying features and “Likely Significant Effects” (LSE) of impacts upon each European site, based on current project proposals.

Cloghernagore Bog and Glenveagh National Park SAC (002047)			
Qualifying interest or feature	Receptor/pathway	Analysis of likelihood of impact	LSE
Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]	Proposed works will take place within the SAC where this habitat is found, albeit in a degraded state (also in an intimate mosaic with blanket bog)	<ul style="list-style-type: none"> <li>➤ No map currently exists for the extent of this habitat within the SAC but the habitat comprises 10 % of the whole SAC and good examples have been found on the south-eastern slopes of Errigal. At least four wet heath vegetation communities have been recorded in this SAC.</li> <li>➤ The recorded locations of communities are outside the area of works for the path, which has been positioned near the burn for the first part and through heavily degraded heath habitat. While some small areas of wet heath may be present within the working corridor of the path, they are in a highly degraded state and occur in very small patches, and a very small section of this habitat will be removed (&lt;0.1ha) along the proposed path.</li> </ul>	No

		<ul style="list-style-type: none"> <li>➤ The proposed path will permit other good areas of heath located on the western part of the burn to regenerate by removing trampling pressure. As no impact on the hydrology is foreseen due to the project, the hydrological integrity will remain the same.</li> <li>➤ With regards to the relevant threats and pressures posed to the site, the current project proposals do not incorporate any of these categories.</li> </ul>	
Blanket bog (*if active) [7130]	Proposed works will take place within the SAC where this habitat is found, albeit in a degraded state (also in an intimate mosaic with wet heath)	<ul style="list-style-type: none"> <li>➤ No detailed habitat mapping exists for the extent of blanket bog habitat within this SAC. However, the habitat represents the majority (68 %) of the SAC area, covering some 22,607 ha. <b>No active blanket bog</b> occurs in the vicinity of the path and, therefore, no priority habitat will be affected by the proposed project. Blanket bog occurs north-east of the proposed route but is in a highly degraded status; natural erosion gullies have created large areas of hagsgs. This area of blanket bog is avoided by the proposed path, which affects the most degraded part (devoid of vegetation cover) nearer to the stream. Therefore, the route affects a small area of degraded blanket bog (forming a mosaic with wet heath), which is not considered capable of regeneration given the current pressures of walking and surface water flows that have caused severe erosion.</li> <li>➤ The sensitive nature of this area has been considered within the methods chosen to undertake the work; additional control measures will apply where hydrological flow will release sediments (use of sediment booms for example). The amount of peat that will be affected by proposed path construction will be</li> </ul>	No

		<p>minimal and the peat will be carefully disposed in areas ready for regeneration (with re-vegetation if required). For this project, it is considered that any effects will be limited to the working corridor in a small section of the proposed path where degraded bog is located (&lt;0.1ha).</p> <ul style="list-style-type: none"> <li>➤ Precautionary measures are applied in the Method Statement Detailed Design Report outlining the measures to be put in place to avoid impacting a wider area of vegetated blanket bog (hand-tools to be used, as well as the presence of an ecologist on-site to manage and supervise the work in sensitive areas).</li> <li>➤ No additional drainage is proposed for this project and the existing water flows will be directed as per their natural path during the construction of the path. Existing wet areas will be conserved and avoided using suitable techniques. Therefore, there will be no impact on the hydrology of the habitat.</li> <li>➤ Potential pollutants will not be situated within any part of the site.</li> </ul>	
Alpine and Boreal heath [4060]	Proposed works will take place within the SAC where this habitat is found	<ul style="list-style-type: none"> <li>➤ Alpine Boreal heath has not been mapped for this SAC but best examples are found near the summit of Errigal mountain, below the ridge. Overall, the habitat covers an estimated 245ha (1 % of this SAC).</li> <li>➤ The existing path is confined to bare rocks and there will be no encroachment on any of the habitats present in the vicinity, neither will it affect the hydrology that supports this habitat. The use of manual working practices is not considered to impact the viability of this habitat and, therefore, the integrity of this SAC.</li> </ul>	No

European dry heath [4030]	Proposed works will take place within the SAC where this habitat is found	<ul style="list-style-type: none"> <li>➤ Dry heath habitat has not been mapped for this area but the habitat covers 5,744 or 17 % of the SAC. It has been mostly recorded in an area above 300 m in other lower mountain ranges within the SAC. There are likely to be patches of dry heath on the plateau located between Errigal mountain and Mackogh, but they occur in a mosaic with exposed siliceous rocks and siliceous scree and loose rock closer to the ridge. The existing path is bare of vegetation and the working corridor will likely involve a minimum amount of vegetation associated with such habitat. Therefore, the proposed project will not impact on the viability of this habitat within this SAC.</li> </ul>	No
Freshwater Pearl Mussel [1029]	Proposed works will take place within the SAC where this species is found	<ul style="list-style-type: none"> <li>➤ Proposed works will take place outside the Owencarrow and Glaskeelan catchment for which the conservation objectives for <i>Margaritifera margaritifera</i> are to be applied (see Appendix 3c). Conservation objectives for the Clady catchment where the works are proposed are discussed below for SAC 00140.</li> </ul>	No
Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae [3110]	Proposed works will take place outside the catchment of indicative lake habitats	<ul style="list-style-type: none"> <li>➤ The location of indicative lake habitats is presented in Appendix 3d vis-à-vis the proposed path. The closest loughs are located on the other side of Errigal and upstream in the glen; the other side of the road.</li> <li>➤ Potential water pollution impacts are deemed non-significant due to the separation between source and receptor.</li> </ul>	No

Otter [1355] and Salmon [1106]	Proposed works will take place near stream	<ul style="list-style-type: none"> <li>➤ Both species are likely to occur or utilise areas within rivers located further downstream of the proposed development. There are many tributaries to those rivers. The stream ‘Cronaniv burn’ is one of the further tributaries and will not be impacted directly. Likewise, the method statement (detailed in Detailed Design Report) will prevent release of any silt or pollutants into the tributary and therefore there will be no significant impact on Qualifying Interest species.</li> </ul>	No
Derryveagh and and Glendowan Mountains SPA (004039)			
Qualifying interest or feature	Receptor/pathway	Analysis of likelihood of impact	LSE
Red-throated Diver, Merlin, Peregrine, Golden Plover and Dunlin	Breeding	<ul style="list-style-type: none"> <li>➤ This SAC is one of only a few locations where Red-throated Diver breed in Ireland and the birds also use a number of lakes within the site for feeding. The extensive bog and heath habitats provide an excellent foraging habitat for both Peregrine and Merlin. Peregrine nest on the crags and cliffs, whilst Merlin nest in the heather or in old crows’ nests in trees. This SAC is very important for breeding Golden Plover and Dunlin.</li> <li>➤ The presence of existing paths means that this particular area of the proposed path is not suitable for breeding in the first instance.</li> <li>➤ The size of the proposed path vis-a-vis this large SAC, in addition to the fact that it uses an existing route to the summit, indicates that any potential impacts are non-significant.</li> </ul>	No

		<ul style="list-style-type: none"> <li>➤ With regards to the relevant threats and pressures posed to the site, the proposed project does not incorporate any of the mentioned categories of pressures identified other than ‘walking’. However, the proposed works for the path is constrained to existing degraded habitats and will concentrate walkers on a single line rather than create braids that degrade habitats further out. Associated regeneration of habitats as a bi-product of the path creation will improve the functionality of the habitats used by the birds in question. Interpretive signs have also been found to have a positive impact on the conservation objectives of this SAC. Overall, the functionality of the habitats in supporting the breeding of these species will be retained in the long-term and the integrity of this SPA will also be sustained.</li> </ul>	
Fawnboy bog/Lough Nacung SAC (00140)			
Qualifying interest or feature	Receptor/pathway	Analysis of likelihood of impact	LSE
Freshwater pearl mussel, Wet heath, Blanket bogs and Depressions of the <i>Rhynchosporion</i>	The proposal is located in the uplands and headwaters of the SAC; some limited scope for transport of sediment or pollutants from works exists	<ul style="list-style-type: none"> <li>➤ The proposed project is located c.1.6 km from the closest boundary of this SAC, which lies downhill from the mountain and, as such, terrestrial habitats are unlikely to be affected by direct disturbance.</li> <li>➤ A hydrological pathway has been identified since the proposed path works will be located near ‘Cronaniv burn’, which consists of many streams flowing from the mountain, under the R251 road and down into Devlin River. However, these are all ‘not at risk’ (see Appendix 3b) under the River Waterbodies Risk</li> </ul>	No

		<p>assessment. The water flows eventually into Dunlewey Lough and then Lough Nacung and eventually reaches the River Clady, which supports a population of Freshwater pearl mussel (<i>Margaritifera margaritifera</i>). However, their current location within the River Clady has been reviewed from the latest NPWS GIS files and it was deemed that they are located beyond the range where a likely significant effect could reasonably be predicted as a result of sediment deposition from small scale works. The risk of pollution events is unlikely to occur beyond the initial waterbody system, which is separated from the River Clady by two large loughs.</p> <p>➤ The fact that the proposed path will be hand built with no large machinery being used on site and specifically designed methods for such sensitive environment as well as supervision will reduce significantly the erosion of peat sediments and their transport into waterbodies.</p>	
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In addition, rare species can occur within these habitats and rare mosses and liverworts have been recorded within the vicinity of the project. Therefore, care should be taken not to disturb these species that usually occur within hepatic mats (*Calluna vulgaris*-*Herbertus aduncus* community). From the Flora (Protection) Order (updated January 2018), the following four mosses have been identified in the vicinity of the project: *Adelanthus lindenbergianus*, *Scapania nimbosa*, *Bazzania pearsonii* and *Oedipodium griffithianum*. Their locations have been recorded (see Appendix 3e) and the working corridor will remain outside their vicinity. The moss *Oedipodium griffithianum* (located on the summit of Errigal mountain) is growing on a very steep rocky northeast-facing slope below the summit; the route is located just above. Supervision by a suitable ecologist, together with appropriate methods at this location will be employed to avoid any disturbance to this population.

In conclusion, this analysis demonstrated that the proposed project will not pose significant threat to the integrity of **Fawnboy bog/Lough Nacung SAC**, and **Derryveagh and Glendowan Mountains SPA** and their conservation objectives (Appendix 5) will remain the same as before the project. While a minimal area of degraded mosaic habitats (comprised of heaths and blanket bog) may be affected by the construction of the proposed path, the project will not affect any priority habitat and will conversely aid in the regeneration of significant areas of habitats for which the **Cloghernagore Bog and Glenveagh National Park SAC** has been designated.

#### **4.3 Cumulative impacts**

An investigation into likely sources of effects arising from the cumulative impacts or in combination with other plans or projects was carried out by searching the Donegal County council e-planning database of proposed, conditional and accepted planning applications for the last 5 years. There were no proposed developments within the listed applications that would impact / cause cumulative effects with the proposed development, based on information available at the time of writing.

#### **4.4 Recommendations**

Only the methods described in the aforementioned ‘detailed path’ report are to be applied together with the following further recommendations:

1. An ecologist and /or NPWS staff should be present at the start of the project to instruct the contractor and inform the personnel so that they should familiarise themselves with areas of ecological importance, particularly where sensitive areas or the rare species are located in the vicinity of the working corridors.
2. The working corridor should be clearly marked so that no damage to any of the surrounding habitats will occur.
3. No motorised vehicles will be utilised and no refuelling and maintenance of vehicles must occur on site to eliminate the potential risk of contamination of nearby habitats and watercourses.
4. Minimum excavation should be carried out. Excavated peat will be disposed in suitable areas and revegetated as soon as possible.
5. Sourcing of large boulders from approved areas must be finalised with NPWS (with consent fully agreed prior removal).
6. Signage describing the natural value of the surrounding habitats should be erected at appropriate locations to alert walkers and the general public of the importance of the area from a nature conservation perspective (i.e. only the path should be used).

## **5 Conclusion and Screening Statement**

### **5.1 Determination of whether a project or plan is directly connected with or necessary to the conservation management of any European sites**

The first component of this project, namely the proposed path construction works is not directly connected with the conservation management of any European site. The proposed path does not form part of the activities to manage the site for conservation but does not impede the achievement of those objectives and, in fact, it will positively support achieving these same objectives.

While the component of the proposed project involving the construction of a 'path' will likely result in a positive effect on the conservation status of the aforementioned habitats and, therefore, contribute to the conservation objective of the above designated European Sites, it is considered to be a bi-product and not a direct management of any European Sites.

The second component of this project, namely the Repair and Habitat Restoration works, which will be carried out in conjunction with the path construction works, will be implemented in close conjunction with the NPWS in order to restore the habitats for which the Cloghernagore

Bog and Glenveagh National Park SAC has been designated. In conjunction with the sustainable access path, it is expected that a synergy will be achieved by concentrating the pressure onto this new path while removing negative impacts on important habitats and, therefore, help their recovery. Without a clear, sturdy and clean path, walkers will continue using other routes and continue to damage a large extent of heath and bog habitats. This component of the project is directly connected to the nature conservation management of the designated European site namely **Cloghernagore Bog and Glenveagh National Park SAC (2047)**. As per Guidance (NPWS, 2009), it would be exempt from further consideration within the Appropriate Assessment process. The impacts of the Repair and Habitat Restoration plan have nonetheless been screened here in this report since they are to be carried out in conjunction with the construction of the path.

## **5.2 Appraising likely significant effects of the proposed project on relevant European sites**

This screening process eliminated the risk of likely significant effects on the two SAC **Cloghernagore Bog and Glenveagh National Park SAC** and **Fawnboy bog/Lough Nacung SAC**, and **the Derryveagh and Glendowan Mountains SPA** identified within the zone of influence of the proposed project.

An analysis of the project proposal and its potential to interact with or impact upon the relevant SAC and SPA qualifying interests is provided in Table 2. Based upon this analysis (using currently available information), **it is considered that the proposed path construction works and associated Repair and Restoration Works will not incur any likely significant effect on any European sites** located within a 15 km radius. Therefore, a **Stage 2 Appropriate Assessment is not required for this project.**

## References

NPWS (2017) Conservation Objectives: Cloghernagore Bog and Glenveagh National Park SAC 002047. Conservation objectives supporting document – blanket bogs and associated habitats. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

NPWS (2013) The status of EU protected habitats and species in Ireland. Vol. 2. Habitat assessments. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

FPO Bryophytes, online map DAHG. Available at:  
<http://dahg.maps.arcgis.com/apps/webappviewer/index.html?id=71f8df33693f48edbb70369d7fb26b7e>

Site synopsis of the identified European Sites can be found here:

<https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY004039.pdf>

<https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY002047.pdf>

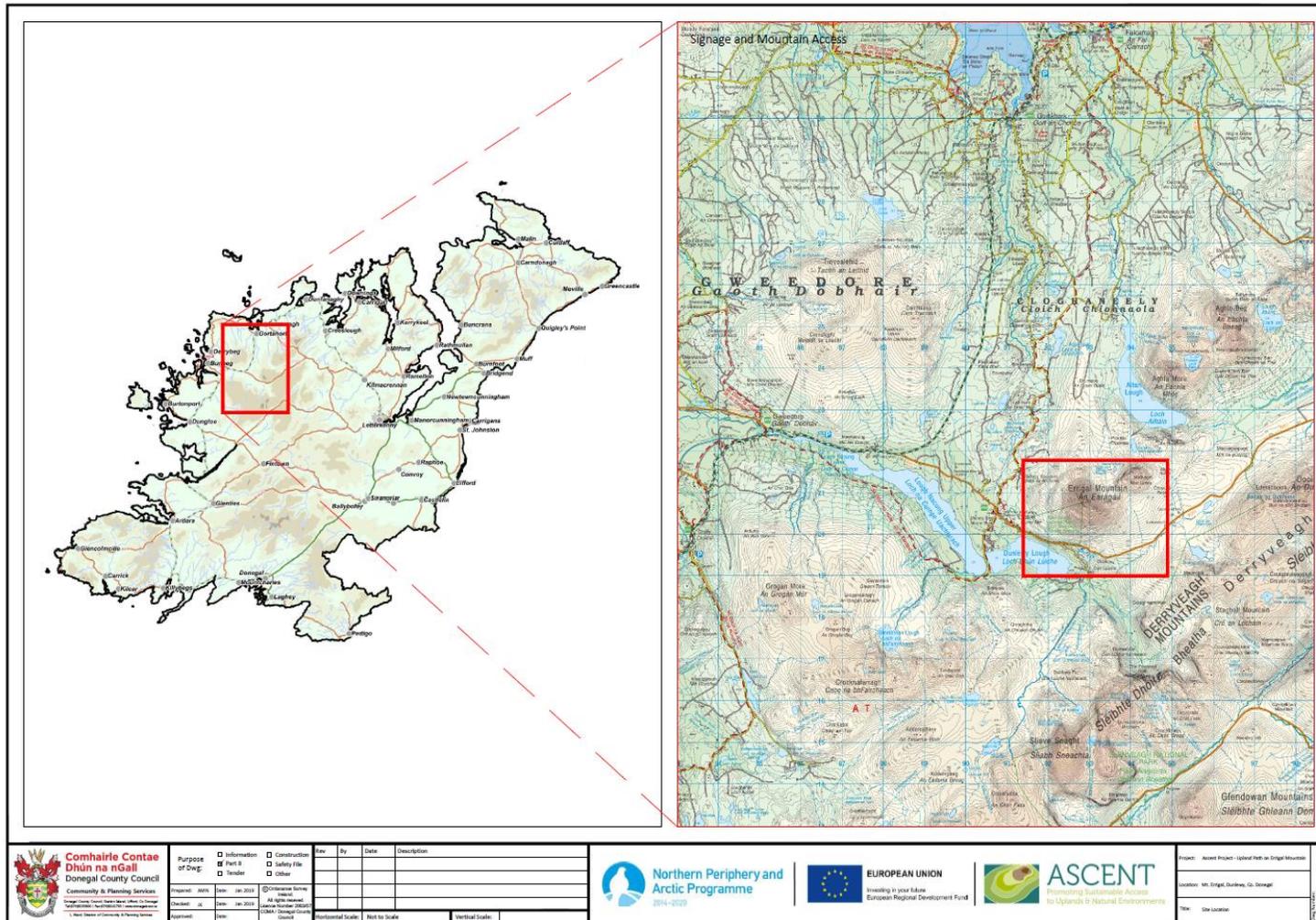
<https://www.npws.ie/sites/default/files/protected-sites/synopsis/SY000140.pdf>

Natura 2000 Standard Data Form IE 0002047 Cloghernagore Bog and GLENveagh National Park SAC (2017-09)

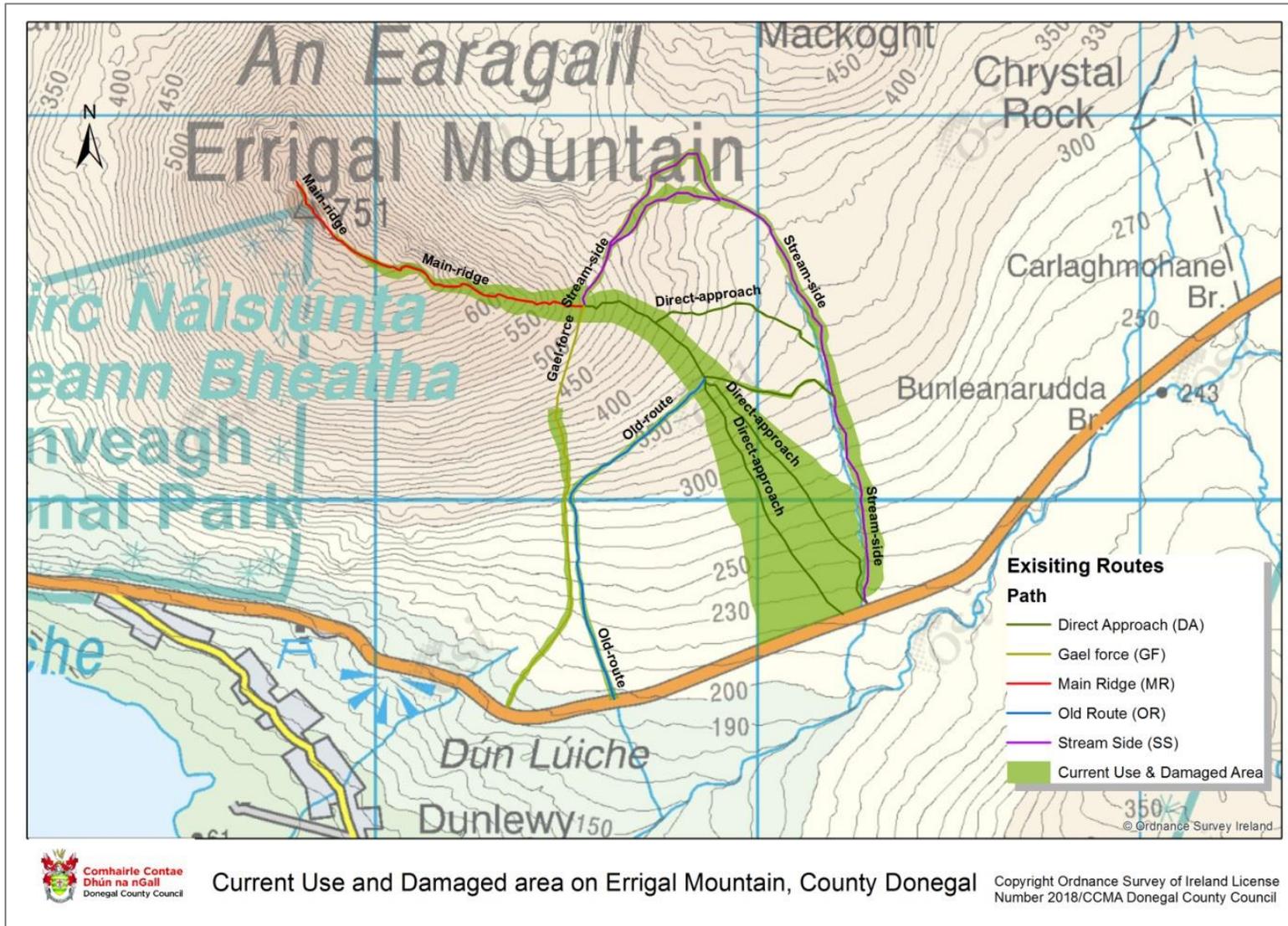
Natura 2000 Standard Data Form IE 0004039 Derryveagh and Glendowan Mountains SPA (2017-09)

Natura 2000 Standard Data Form IE0000140 Fawnboy Bog/Lough Nacung SAC (2017-09)

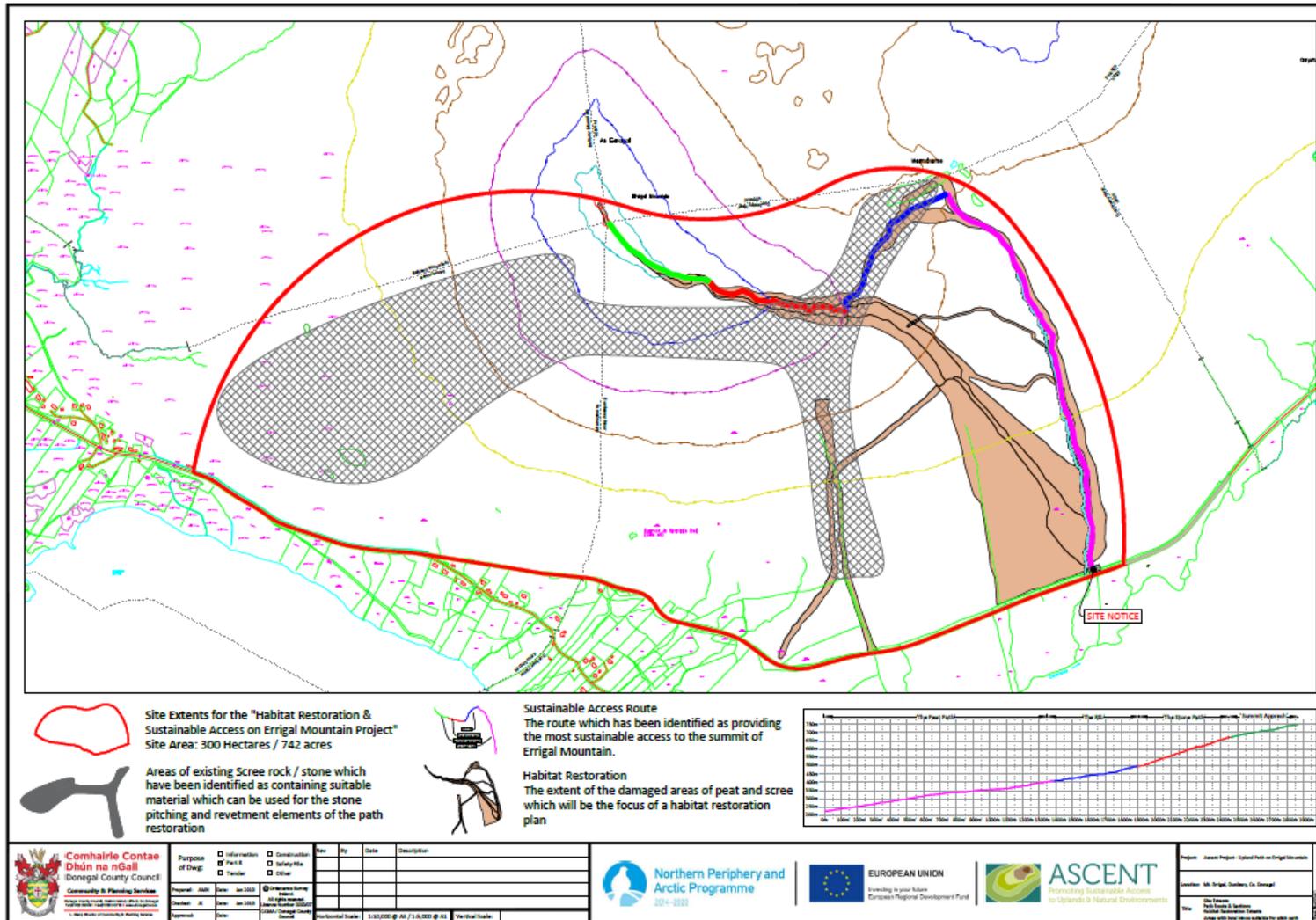
Appendix 1a: Site location of proposed path and repair and restoration work.



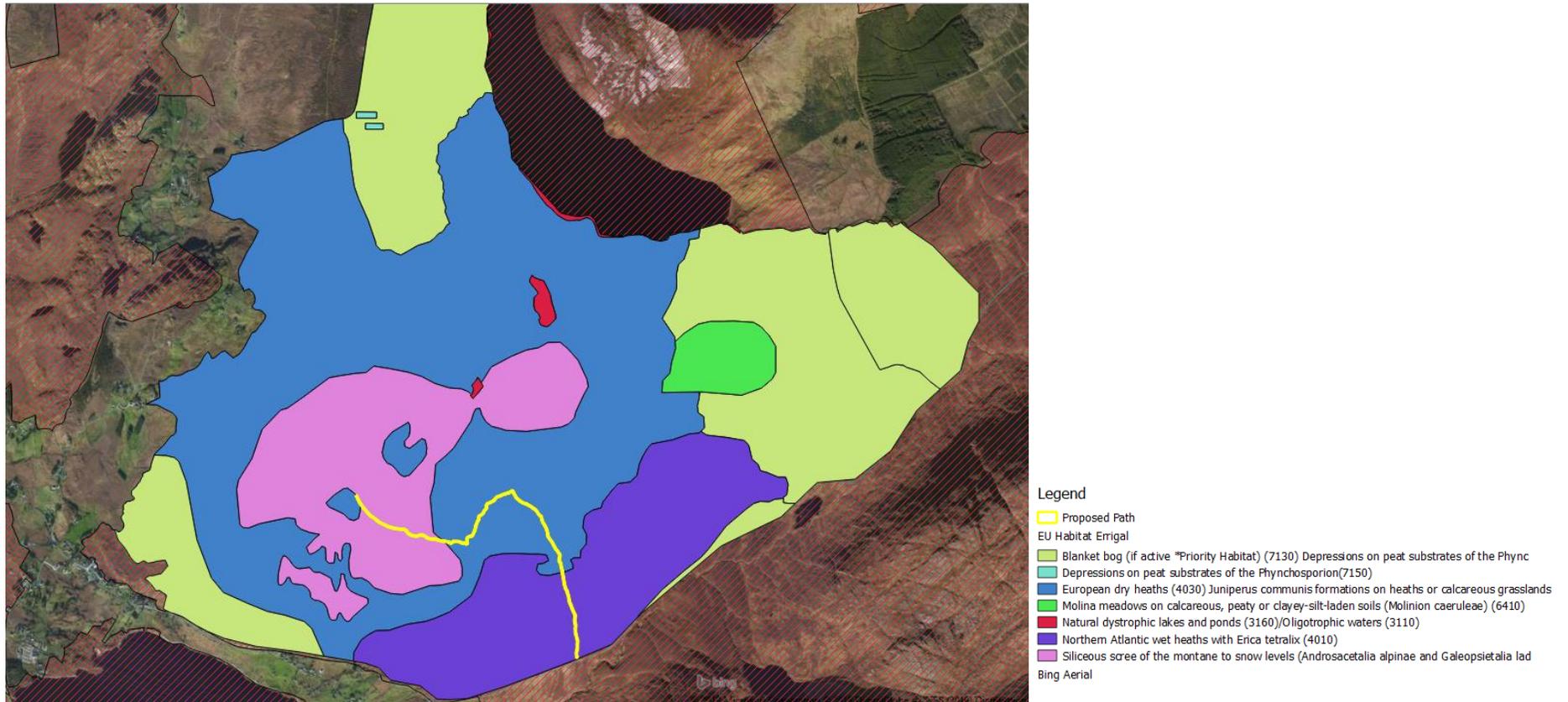
Appendix 1b: Map showing existing routes, used and damaged areas. The proposed route follows the ‘Stream side’ route.



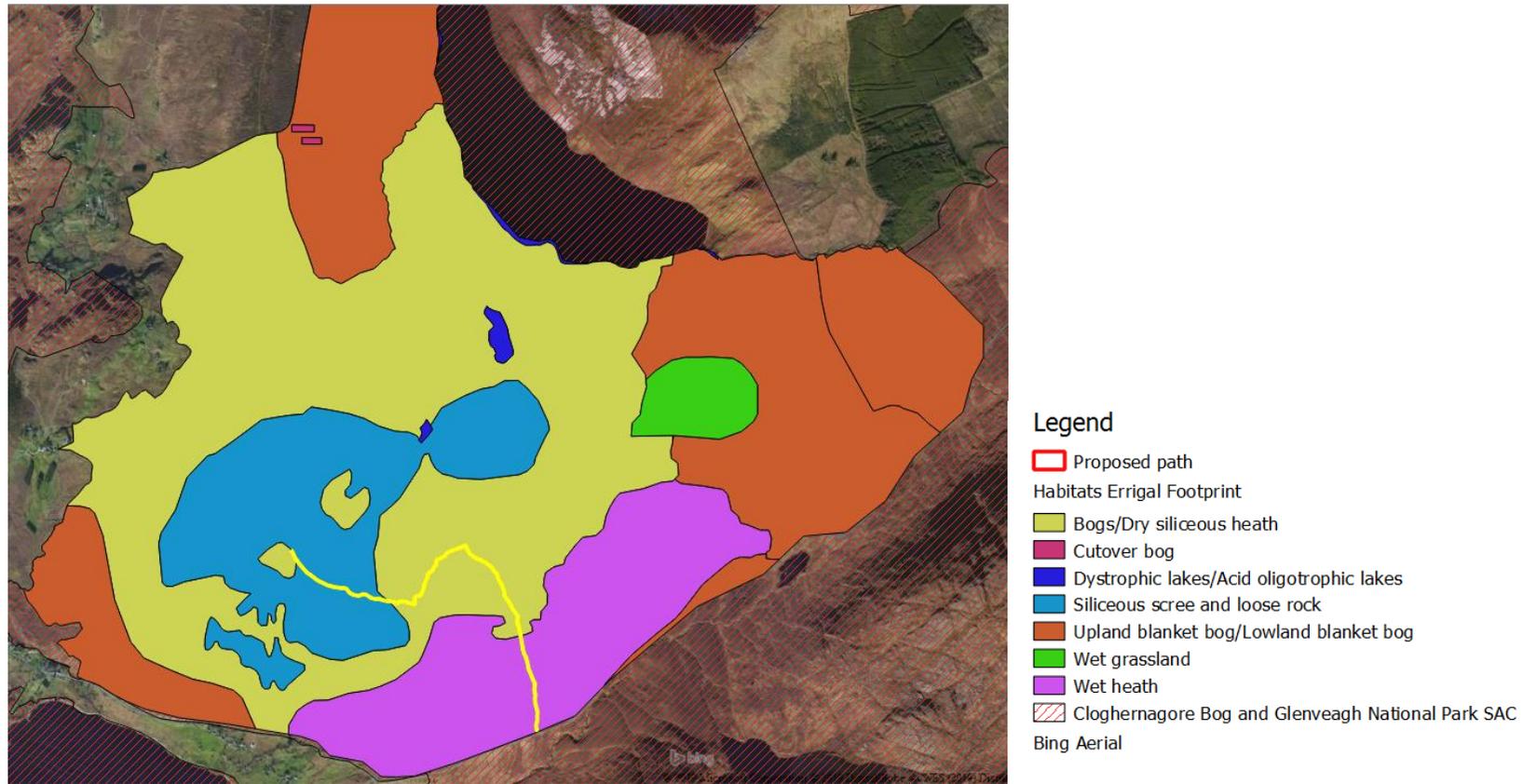
**Appendix 1c: Map showing path sections of the proposed Sustainable Access Route, extent of Habitat Restoration Plan and areas to source boulders.**



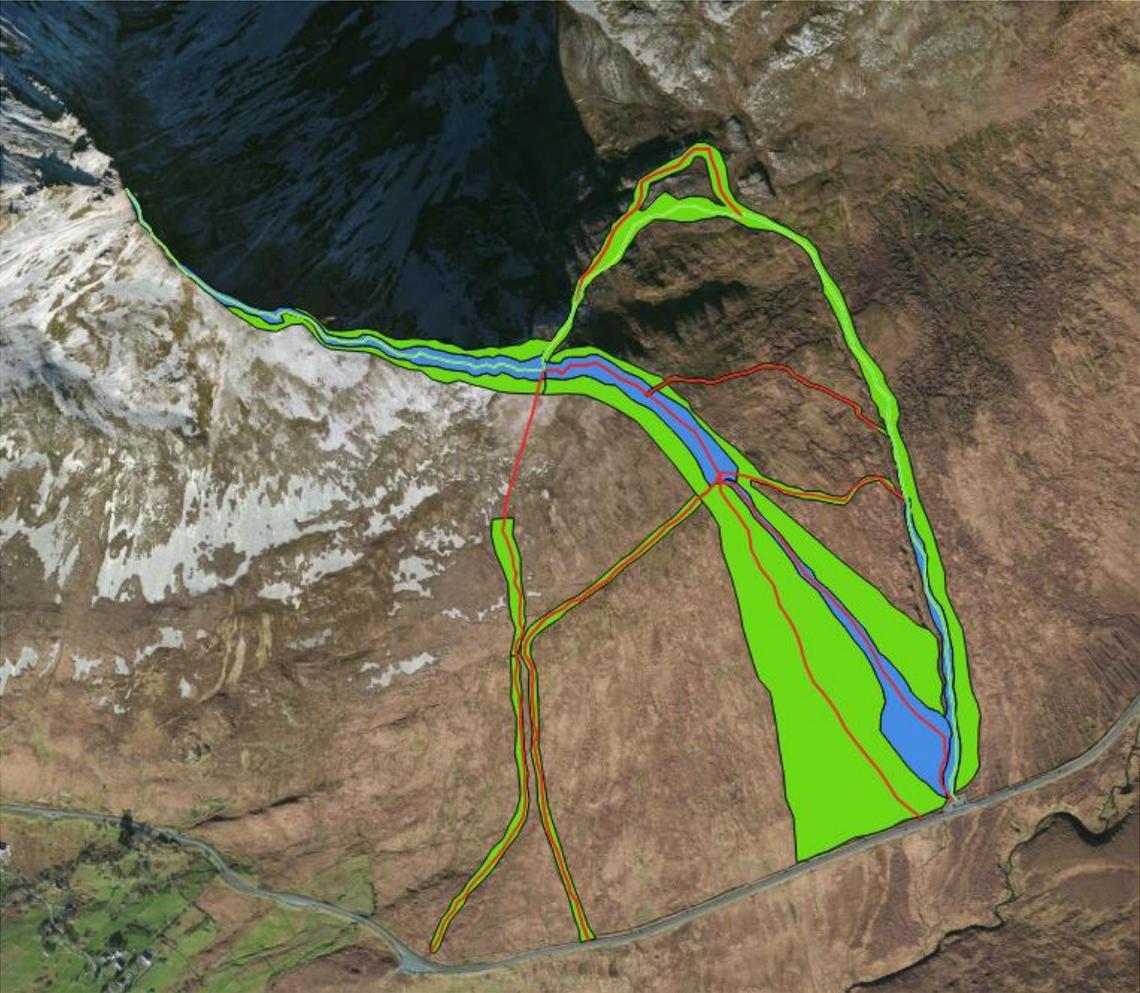
Appendix 2a: Main types of habitats found on Errigal Mountain following EU Habitats Directive classification.



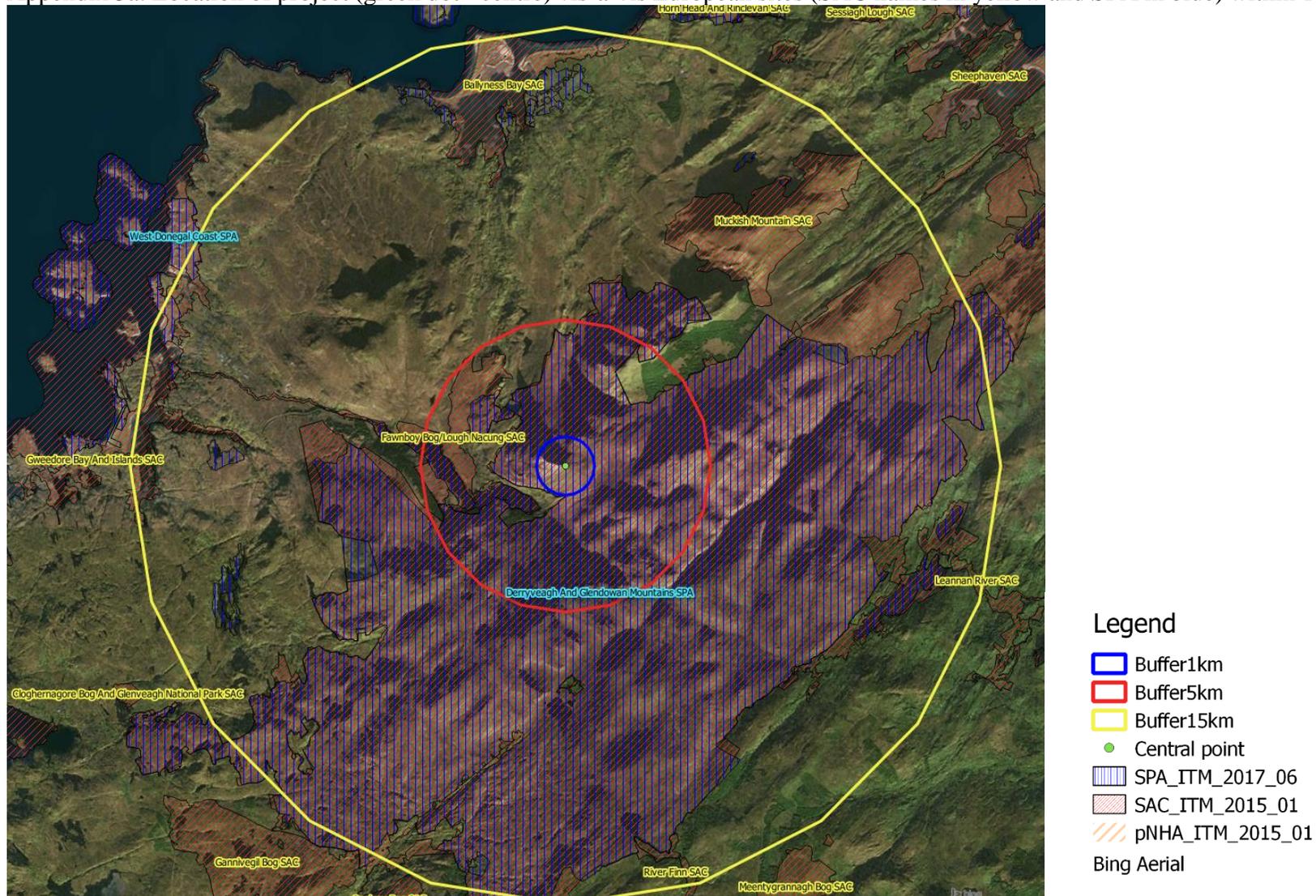
Appendix 2b: Main types of habitats found on Errigal Mountain following Irish (Fossitt) classification.



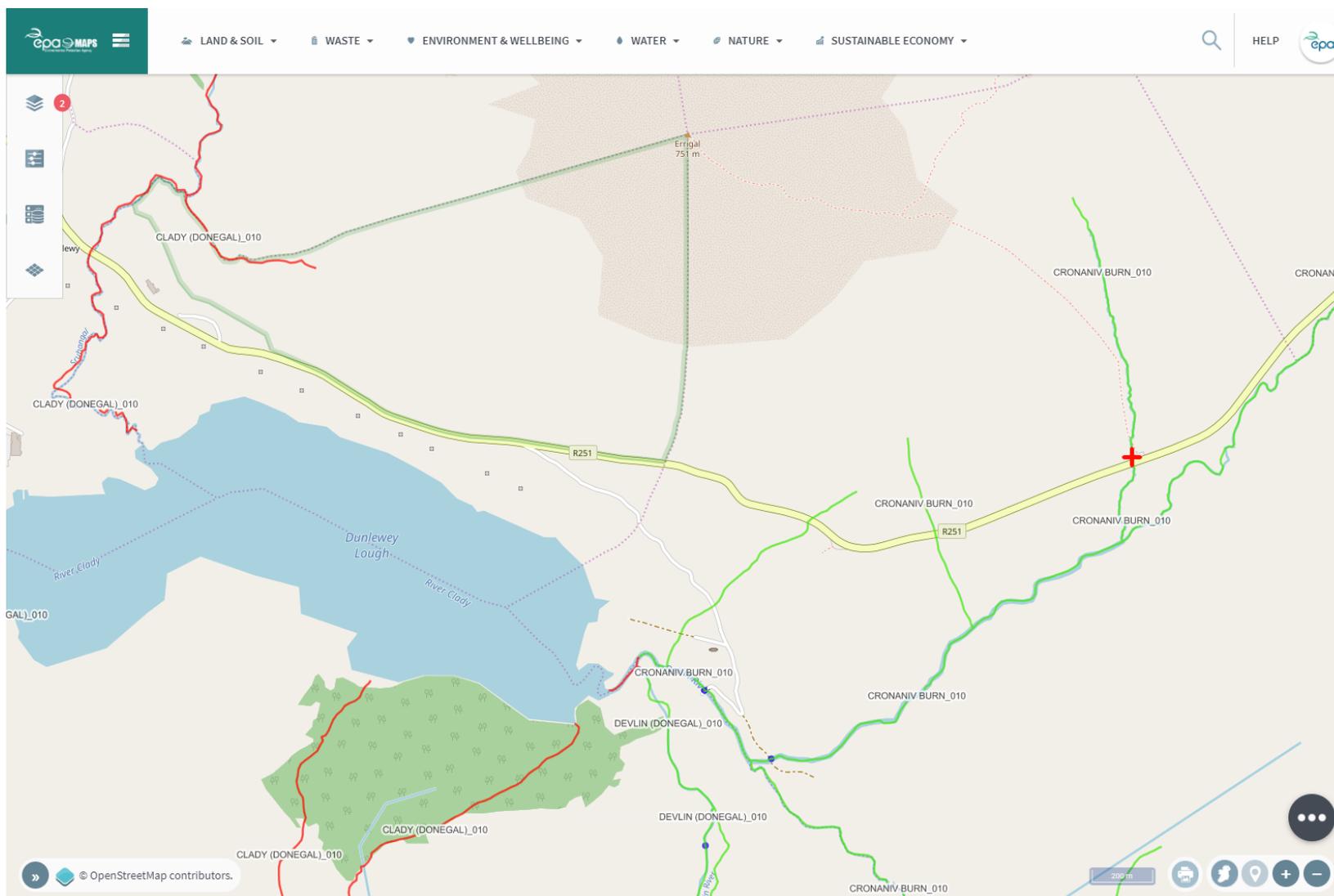
Appendix 2c: Condition assessment of habitats (carried out in 2017).



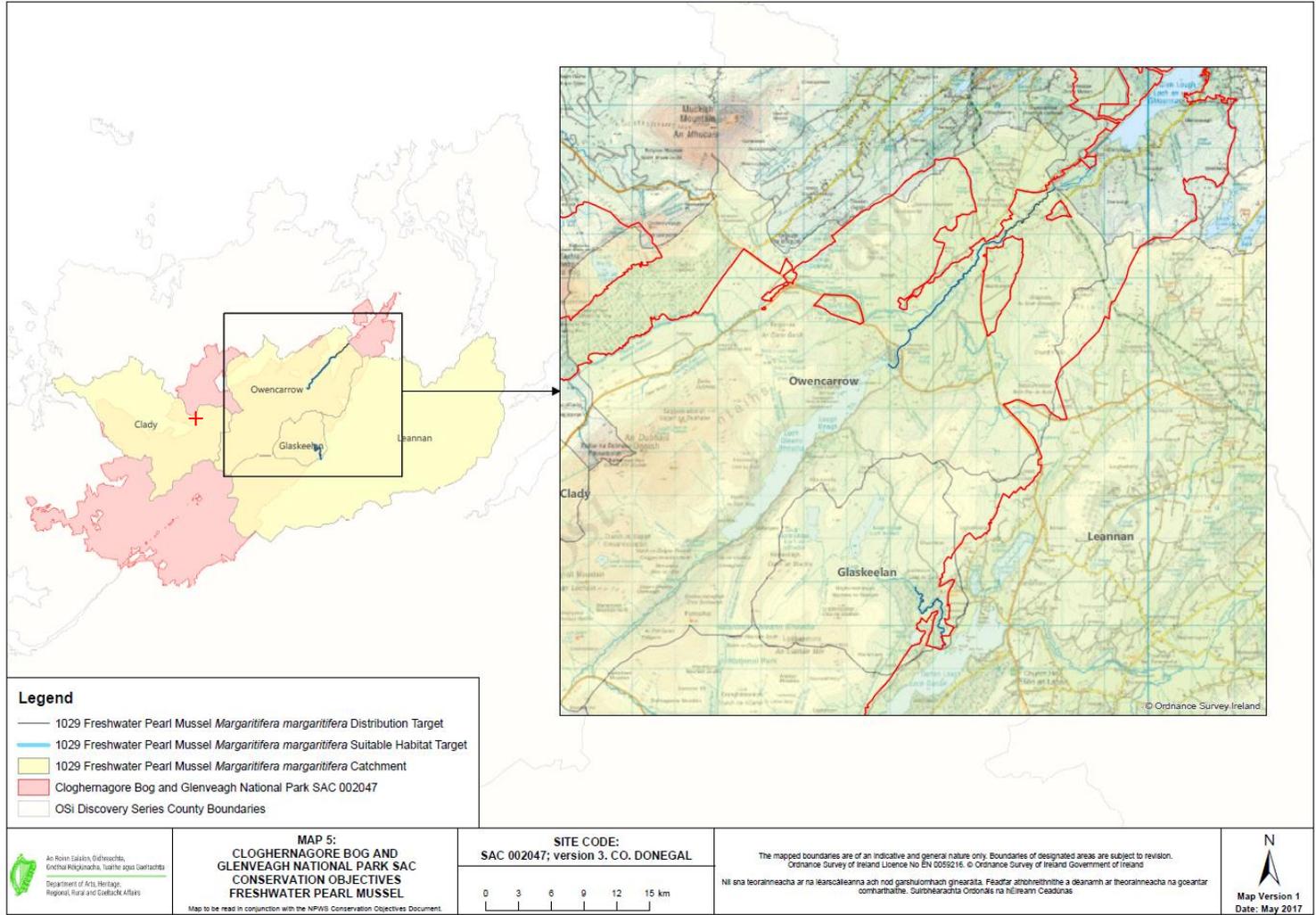
Appendix 3a: Location of project (green dot =centre) vis-a-vis European sites (SAC names in yellow and SPA in blue) within 1, 5 & 15 km radius.



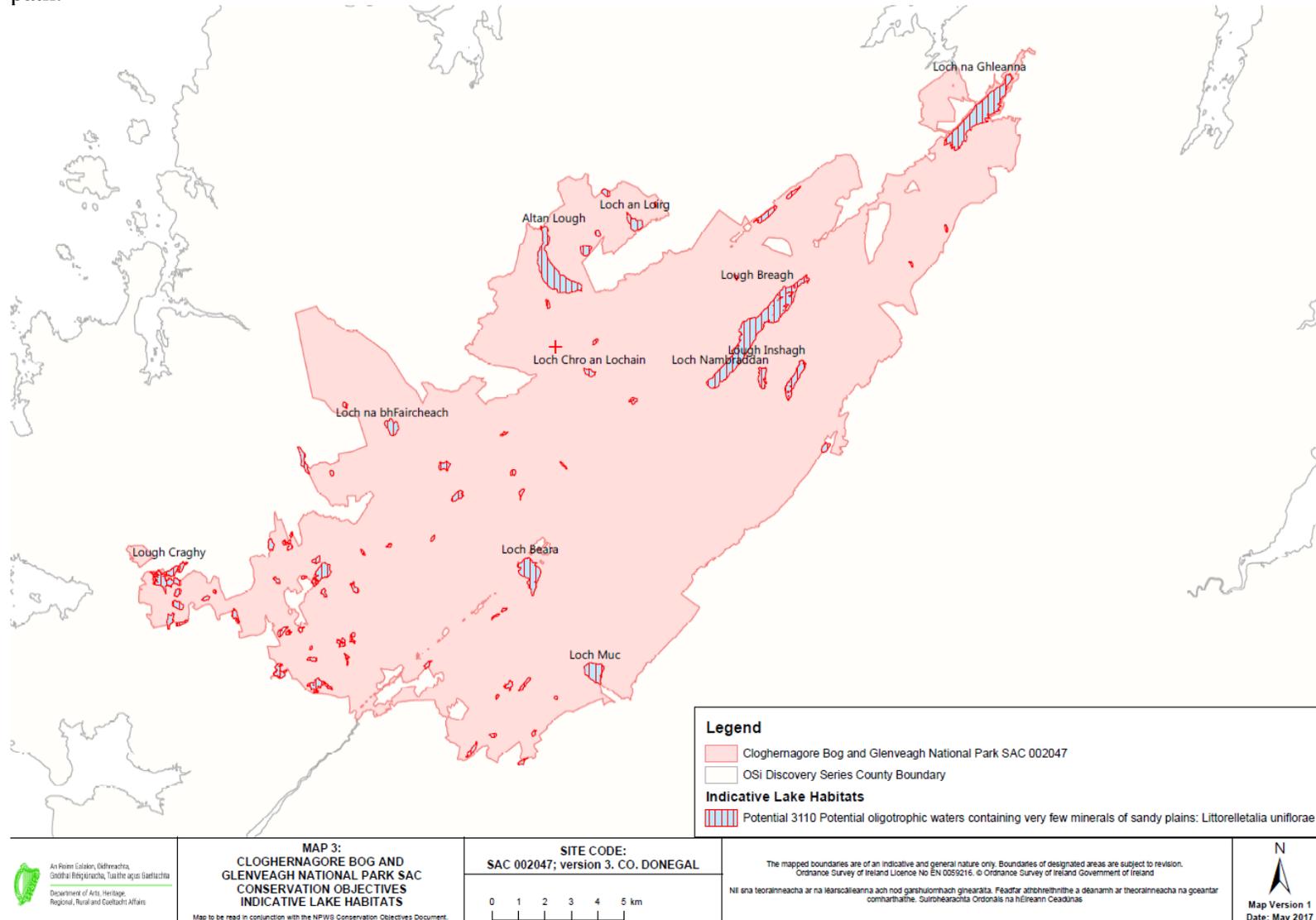
Appendix 3b: Streams in the vicinity of proposed path: green= not at risk; red= at risk (red cross showing start of proposed path).



Appendix 3c: Conservation objectives of Freshwater Pearl Mussel within the Cloghernagore Bog and Glenveagh National Park SAC. Red cross denotes the location of proposed path.



Appendix 3d: Location of indicative lake habitats potentially containing oligotrophic waters (3110). Red cross denotes the location of proposed path.



Appendix 4: Plate of photos taken throughout 2018.

	
<p>Very degraded wet heath habitat near entrance/car park; west of stream. Facing north-east</p>	<p>Very degraded wet heath habitat near entrance/car park; east of stream. Facing west</p>



Very degraded wet heath on the lower slopes (west side of the stream; facing north).



Very degraded wet heath habitat the bank of the stream (west side, facing south).



Very degraded mosaic of wet/dry heath habitat to be used as the footprint of the proposed path (east of stream, facing north).



Less degraded wet/dry heath habitat on higher grounds (east of the stream, facing north)



Degraded mosaic of heath exposing sub-peat boulders to be used as the footprint of the proposed path (east of stream, facing north)



Eroding hags of peat to be contoured by the proposed path (east of stream, facing north)



Area requiring bridging with a boardwalk to retain natural hydrology, which is very dynamic at this location



Existing path through dry heath habitat to be used as the footprint of the proposed path (east of stream, facing north).



Robust habitat of grassy vegetation to be used as the footprint of the proposed path (above stream, facing north)



The proposed path will use existing degraded habitats, thus having a non-significant impact on the conservation or landscape values of the site (east of stream, facing south)



Aerial view of the habitats (degraded mosaic of blanket bog, heath and flush) located on the lower slopes of Errigal vis-à-vis proposed route (drawn in green) (facing east)



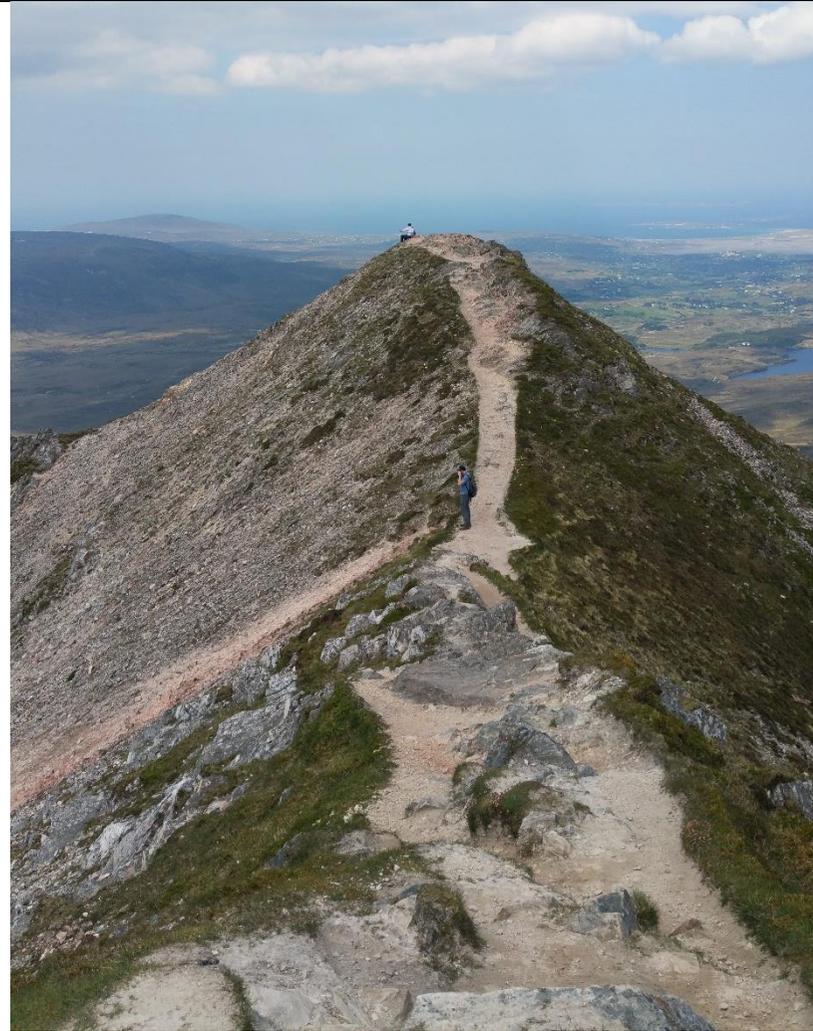
Mosaic of dry heath and exposed rocks form a robust surface to offer a narrower unconstructed route (facing north)



Exposed siliceous rocks and scree requiring 'pitching' on the steepest slope of the climb (facing east)



Eroded path at the summit ridge with Alpine Boreal heath on each side



Summit and last narrow ridge

# National Parks and Wildlife Service

## Conservation Objectives Series

### Cloghernagore Bog and Glenveagh National Park SAC 002047



An Roinn Ealaíon, Oidhreachta,  
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,  
Regional, Rural and Gaeltacht Affairs



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## Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing, and
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

### Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

## Qualifying Interests

\* indicates a priority habitat under the Habitats Directive

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002047	Cloghernagore Bog and Glenveagh National Park SAC
<hr/>	
1029	Freshwater Pearl Mussel <i>Margaritifera margaritifera</i>
1106	Salmon <i>Salmo salar</i>
1355	Otter <i>Lutra lutra</i>
1421	Killarney Fern <i>Trichomanes speciosum</i>
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitriche-Batrachion vegetation
4010	Northern Atlantic wet heaths with (ULFD WHWUDOL[
4030	European dry heaths
4060	Alpine and Boreal heaths
6410	OROLQLD meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)
7130	Blanket bogs (* if active bog)
7150	Depressions on peat substrates of the Rhynchosporion
91A0	Old sessile oak woods with, OH[and %OHFKQXP in the British Isles

**Please note that this SAC overlaps with Derryveagh and Glendowan Mountains SPA (004039) and is adjacent to Fawnboy Bog/Lough Nacung SAC (000140), Gannivegil Bog SAC (000142), West of Ardara/Maas Road SAC (000197), Sheephaven SAC (001190), Leannan River SAC (002176) and River Finn SAC (002301). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.**

**Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]**

**3110 Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)**

**To maintain the favourable conservation condition of Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae) in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:**

<b>Attribute</b>	<b>Measure</b>	<b>Target</b>	<b>Notes</b>
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Lake habitat 3110 is likely to occur in Loughs Barra, Veagh, Altan, Glentornan, Muck, Nambradden, Inshagh and others in Cloghernagore Bog and Glenveagh National Park SAC. In line with Article 17 reporting (NPWS, 2013), all lakes larger than 1ha were mapped as potential 3110 (see map 3). In lakes at higher altitude (above 200m), lake habitat 3160 may occur. Two measures of extent should be used: 1. the area of the lake itself and; 2. the extent of the vegetation communities/zones that typify the habitat. Further information relating to all attributes is provided in the lake habitats supporting document for the purposes of site-specific conservation objectives and Article 17 reporting (O Connor, 2015)
Habitat distribution	Occurrence	No decline, subject to natural processes	As noted above, all lakes larger than 1ha have been mapped as potential 3110 (see map 3)
Typical species	Occurrence	Typical species present, in good condition, and demonstrating typical abundances and distribution	For lists of typical plant species, see the Article 17 habitat assessment for lake habitat 3110 (NPWS, 2013) and O Connor (2015). Lough Veagh was investigated by Heuff (1984) and Free et al. (2006). Free et al. (2006) also studied Lough Barra. Loughs Barra, Glen, Upper Veagh, Nshanida and Keel are Water Framework Directive (WFD) monitoring lakes and regular macrophyte surveys are conducted by the Environmental Protection Agency (EPA)
Vegetation composition: characteristic zonation	Occurrence	All characteristic zones should be present, correctly distributed and in good condition	Further work is necessary to describe the characteristic zonation and other spatial patterns in lake habitat 3110 (see O Connor, 2015)
Vegetation distribution: maximum depth	Metres	Maintain maximum depth of vegetation, subject to natural processes	The maximum depth of vegetation is likely to be specific to the lake shoreline in question. Further work is necessary to develop indicative targets for lake habitat 3110. Maximum depth should naturally be large in the SAC, as many of the lakes are deep and the water should be very clear. Information on vegetation depth may be available for the WFD monitoring lakes in the SAC
Hydrological regime: water level fluctuations	Metres	Maintain appropriate natural hydrological regime necessary to support the habitat	Fluctuations in lake water level are typical in Ireland, but can be amplified by activities such as abstraction and drainage. Increased water level fluctuations can increase wave action, up-root vegetation, increase turbidity, alter the substratum and lead to release of nutrients from the sediment. The hydrological regime of the lakes must be maintained so that the area, distribution and depth of the lake habitat and its constituent/characteristic vegetation zones and communities are not reduced
Lake substratum quality	Various	Maintain appropriate substratum type, extent and chemistry to support the vegetation	Research is required to further characterise the substratum types (particle size and origin) and substratum quality (notably pH, calcium, iron and nutrient concentrations) favoured by each of the five Annex I lake habitats in Ireland. It is likely that lake habitat 3110 is associated with a range of nutrient-poor substrates, from stones, cobble and gravel, through sands, silt, clay and peat. Substratum particle size is likely to vary with depth and along the shoreline within a single lake. Information on

Water quality: transparency	Metres	Maintain appropriate Secchi transparency. There should be no decline in Secchi depth/transparency	Transparency relates to light penetration and, hence, to the depth of colonisation of vegetation. It can be affected by phytoplankton blooms, water colour and turbidity. Specific targets have yet to be established for lake habitat 3110 (O Connor, 2015). Habitat 3110 is associated with very clear water. The OECD fixed boundary system set transparency targets for oligotrophic lakes of $\geq 6\text{m}$ annual mean Secchi disk depth, and $\geq 3\text{m}$ annual minimum Secchi disk depth. Free et al. (2009) found high isoetid abundance in lakes with Secchi depths of more than 3m. High altitude and deep lakes, such as those found in the SAC, are expected to have high transparency. Heuff (1984) recorded transparency of 3m in Lough Veagh
Water quality: nutrients	$\mu\text{g/l P}$ ; $\text{mg/l N}$	Maintain the concentration of nutrients in the water column at sufficiently low levels to support the habitat and its typical species	As a nutrient-poor habitat, oligotrophic and WFD 'high' status targets apply. Where a lake has nutrient concentrations that are lower than these targets, there should be no decline within class, i.e. no upward trend in nutrient concentrations. For lake habitat 3110, annual average total phosphorus (TP) concentration should be $\leq 10\mu\text{g/l TP}$ , average annual total ammonia concentration should be $\leq 0.040\text{mg/l N}$ and annual 95th percentile for total ammonia should be $\leq 0.090\text{mg/l N}$ . See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for nutrient status in the WFD monitoring lakes in the SAC in the 2007-09 and 2010-12 reporting periods
Water quality: phytoplankton biomass	$\mu\text{g/l Chlorophyll } a$	Maintain/restore appropriate water quality to support the habitat, including high chlorophyll <i>a</i> status	Oligotrophic and WFD 'high' status targets apply to lake habitat 3110. Where a lake has a chlorophyll <i>a</i> concentration that is lower than this target, there should be no decline within class, i.e. no upward trend in phytoplankton biomass. The average growing season (March-October) chlorophyll <i>a</i> concentration must be $< 5.8\mu\text{g/l}$ . The annual average chlorophyll <i>a</i> concentration should be $< 2.5\mu\text{g/l}$ and the annual peak chlorophyll <i>a</i> concentration should be $\leq 8.0\mu\text{g/l}$ . See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. See Clabby et al. (2008), McGarrigle et al. (2010) and Bradley et al. (2015) for chlorophyll <i>a</i> status in the WFD monitoring lakes in the SAC during the 2004-06, 2007-09 and 2010-12 reporting periods. Lough Barra failed the high chlorophyll <i>a</i> status target in 2010-12 (Bradley et al., 2015)
Water quality: phytoplankton composition	EPA phytoplankton composition metric	Maintain appropriate water quality to support the habitat, including high phytoplankton composition status	The EPA has developed a phytoplankton composition metric for nutrient enrichment of Irish lakes. As for other water quality indicators, habitat 3110 requires WFD high status. See Bradley et al. (2015) for phytoplankton composition status for the WFD monitoring lakes in the SAC for the 2010-12 reporting period
Water quality: attached algal biomass	Algal cover and EPA phytobenthos metric	Maintain trace/absent attached algal biomass ( $< 5\%$ cover) and high phytobenthos status	Nutrient enrichment can favour epiphytic and epipellic algae that can out-compete the submerged vegetation. The cover abundance of attached algae in lake habitat 3110 should, therefore, be trace/absent ( $< 5\%$ cover). EPA phytobenthos can be used as an indicator of changes in attached algal biomass. As for other water quality indicators, habitat 3110 requires high phytobenthos status. See Bradley et al. (2015) for phytobenthos status for the WFD monitoring lakes in the SAC for the 2010-12 reporting period

Water quality: macrophyte status	EPA macrophyte metric (The Free Index)	Maintain/restore high macrophyte status	Nutrient enrichment can favour more competitive submerged macrophyte species that out-compete the typical and characteristic species for the lake habitat. The EPA monitors macrophyte status for WFD purposes using the 'Free Index'. The target for lake habitat 3110 is high status or an Ecological Quality Ratio (EQR) for lake macrophytes of $\geq 0.90$ , as defined in Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for macrophyte status in the WFD monitoring lakes in the SAC for the 2007-09 and 2010-12 reporting periods. Glen and Keel Loughs failed to reach the high macrophyte status in 2010-12 (Bradley et al., 2015)
Acidification status	pH units; mg/l	Maintain appropriate water and sediment pH, alkalinity and cation concentrations to support the habitat, subject to natural processes	Acidification can impact on species abundance and composition in soft water lake habitats. In Europe, acidification of isoetid lakes can lead to loss of isoetids and dominance by submerged <i>Sphagnum</i> mosses and <i>Juncus bulbosus</i> (Arts, 2002). The specific requirements of lake habitat 3110, in terms of water and sediment pH, alkalinity and cation concentration, have not been determined. For lake habitat 3110, and adopting a precautionary approach based on Arts (2002), minimum pH should not be <5.5 pH units, Maximum pH should be <9.0 pH units, in line with the surface water standards established for soft waters (where water hardness is $\leq 100$ mg/l calcium carbonate). See Schedule Five of the European Communities Environmental Objectives (Surface Waters) Regulations 2009. See McGarrigle et al. (2010) and Bradley et al. (2015) for acidification status for the WFD monitoring lakes in the SAC in the 2007-09 and 2010-12 reporting periods
Water colour	mg/l PtCo	Maintain/restore appropriate water colour to support the habitat	Increased water colour and turbidity decrease light penetration and can reduce the area of available habitat for lake macrophytes, particularly at the lower euphotic depths. The primary source of increased water colour in Ireland is disturbance to peatland. No habitat-specific or national standards for water colour currently exist. Studies have shown median colour concentrations in Irish lakes of 38mg/l PtCo (Free et al., 2000) and 33mg/l PtCo (Free et al., 2006). It is likely that the water colour in all Irish lake habitats would naturally be <50mg/l PtCo. Water colour can be very low (<20mg/l PtCo or even <10mg/l PtCo) in lake habitat 3110, where the peatland in the lake's catchment is intact. Free et al. (2006) reported colour of 45mg/l, 60mg/l, 34mg/l and 42mg/l PtCo in Loughs Barra, Glen, Keel and Veagh, respectively
Dissolved organic carbon (DOC)	mg/l	Maintain/restore appropriate organic carbon levels to support the habitat	Dissolved (and particulate) organic carbon (OC) in the water column is linked to water colour and acidification (organic acids). Increasing DOC in water has been documented across the Northern Hemisphere, including afforested peatland catchments in Ireland. Damage and degradation of peatland, leading to decomposition of peat is likely to be the predominant source of OC in Ireland. OC in water promotes decomposition by fungi and bacteria that, in turn, releases dissolved nutrients. The increased biomass of decomposers can also impact directly on the characteristic lake communities through shading, competition, etc. Damage to peatland may be resulting in increased DOC and colour in lakes within Cloghemagore Bog and Glenveagh National Park SAC

Turbidity	Nephelometric turbidity units/ mg/l SS/ other appropriate units	Maintain appropriate turbidity to support the habitat	Turbidity can significantly affect the quantity and quality of light reaching rooted and attached vegetation and can, therefore, impact on lake habitats. The settlement of higher loads of inorganic or organic material on lake vegetation communities may also have impacts on sensitive, delicate species. Turbidity can increase as a result of re-suspension of material within the lake, higher loads entering the lake, or eutrophication. Turbidity measurement and interpretation is challenging. As a result, it is likely to be difficult to set habitat-specific targets for turbidity in lakes
Fringing habitat: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the natural structure and functioning of habitat 3110	Most lake shorelines have fringing habitats of reedswamp, other swamp, fen, marsh or wet woodland that intergrade with and support the structure and functions of the lake habitat. In Cloghemagore Bog and Glenveagh National Park SAC, lake shorelines are likely to have low-nutrient grassland, swamp, heath, blanket bog and rock communities. Fringing habitats are dependent on the lake, particularly its water levels, and support wetland communities and species of conservation concern. Many of the fringing wetland habitats support higher invertebrate and plant species richness than the lake habitats themselves

**Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC  
[002047]**

**3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation**

To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	The description of habitat 3260 covers upland rivers with bryophytes and macroalgae to lowland depositing rivers with pondweeds and starworts. The selection of this SAC used this broad interpretation. Conservation objectives for habitat 3260 concentrate on the high conservation value sub-types; however, little is known of its distribution or its sub-types in the SAC. There are a large number of upland streams and rivers, as well as associated springs and headwaters. Lowland rivers include the Gweebarra, Cloghernagore, Owencarrow and Calabber. All are likely to be macroalgal and bryophyte dominated. Note: rooted macrophytes should be absent or trace (<5% cover) in freshwater pearl mussel ( <i>Margaritifera margaritifera</i> ) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Glaskeelan and Owencarrow Rivers within this SAC because the mussel requires environmental conditions closer to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes	Further study is needed of Irish sub-types and their conservation value to interpret the broad description of 3260 (European Commission, 2013). As noted above, little is known about the distribution of the habitat and its sub-types in Cloghernagore Bog and Glenveagh National Park SAC. The Vulnerable moss <i>Schistidium agassizii</i> (Lockhart et al., 2012) is found by the Lackagh River. Heuff (1987) surveyed three sites on the Barra/Gweebarra River and noted it as an excellent, oligotrophic system of high conservation interest. The rivers and streams are generally fast-flowing, with cascades and waterfalls, and are likely to be dominated by macroalgae and bryophytes, with limited submerged or emergent higher plants
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	Any high conservation value sub-types in the SAC will be associated with natural hydrology. A natural flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For many of the sub-types of this habitat, high flows are required to maintain the substratum necessary for the characteristic species. Flow variation can be particularly important, with high and flood flows being critical to the hydromorphology. Peatlands also have slow-flowing or ponded streams and rivers, with biotic communities likely to resemble those in associated lakes
Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime	The groundwater contribution to rivers in the SAC is likely to be small, owing to the geology and dominance of blanket peat soils. Even small groundwater contributions, however, can significantly alter the hydrochemistry, particularly where there is basic bedrock and/or subsoils

Substratum composition: particle size range	Millimetres	Maintain appropriate substratum particle size range, quantity and quality, subject to natural processes	Many of the high conservation value sub-types are dominated by coarse substrata, and bedrock, boulders, cobbles and coarse gravels are likely to be common in this SAC. The size and distribution of particles is largely determined by the river flow. The chemical composition (particularly minerals and nutrients) of the substratum is also important. The quality of finer sediment particles is a notable driver for rooted plant communities. Note: increased fine sediment is contributing to the unfavourable status of the freshwater pearl mussel ( <i>Margaritifera margaritifera</i> ) in the Glaskeelan and Owencarrow Rivers. See the freshwater pearl mussel (1029) conservation objective
Water quality	Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat	The specific targets may vary among sub-types. The rivers within Cloghemagore Bog and Glenveagh National Park SAC are considered to be naturally very nutrient-poor and, therefore, to typically require Water Framework Directive high status, in terms of nutrient and oxygenation standards, and EQRs (Ecological Quality Ratios) for macroinvertebrates and phytobenthos
Vegetation composition: typical species	Occurrence	Maintain typical species in good condition, including appropriate distribution and abundance	The sub-types of this habitat are poorly understood and their typical species have not yet been fully defined. The typical species may include higher plants, bryophytes, macroalgae and microalgae, and invertebrates
Floodplain connectivity: area	Hectares	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat and its sub-types	River connectivity with the floodplain is important for the functioning of this habitat. Channels with a naturally functioning floodplain are better able to maintain habitat and water quality (Hatton-Ellis and Grieve, 2003). Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition. High conservation value rivers are intimately connected to floodplain habitats and function as important wildlife corridors, connecting otherwise isolated or fragmented habitats in the wider countryside (Hatton-Ellis and Grieve, 2003; Mainstone et al., 2016)
Fringing habitats: area and condition	Hectares	Maintain the area and condition of marginal fringing habitats that support the typical species and vegetation composition of the habitat and its sub-types	Riparian habitats (including those along lake shores), particularly natural/semi-natural woodlands and wetlands, are an integral part of the structure and functioning of river systems, even where they do not form part of a natural floodplain. Fringing habitats can contribute to the aquatic food web (e.g. allochthonous matter such as leaf fall), provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates, assist in the settlement of fine suspended material, protect banks from erosion and contribute to nutrient cycling. Shade may also be important in suppressing algal growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The rivers and streams in this SAC are likely to be fringed by upland grassland, blanket bog, heath, flush/poor fen and riparian woodland

**Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]**

**4010 Northern Atlantic wet heaths with *Erica tetralix***

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with <i>Erica tetralix</i> has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 3,396ha, covering 10% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs in an intimate mosaic with blanket bog particularly on the lower slopes of hills, where peat is shallower. Good examples of wet heath can be found on the south-eastern slopes of Errigal and in the area around Croangar (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of wet heath vegetation communities have been recorded in this SAC (Douglas et al., 1990; NPWS internal files; R. Hodd, pers. comm.), four of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath ( <i>Erica tetralix</i> ) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of <i>Cladonia</i> and <i>Sphagnum</i> species, <i>Racomitrium lanuginosum</i> and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry ( <i>Empetrum nigrum</i> ) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Pirri-pirri-bur ( <i>Acaena novae-zelandiae</i> ) (R. Hodd, pers. comm.) and rhododendron ( <i>Rhododendron ponticum</i> ) (NPWS internal files) are present within wet heaths in the SAC
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken ( <i>Pteridium aquilinum</i> ) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush ( <i>Juncus effusus</i> ) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry ( <i>Empetrum nigrum</i> ) and bog-myrtle ( <i>Myrica gale</i> ) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The FPO listed and Vulnerable liverworts <i>Scapania ornithopodioides</i> and <i>Bazzania pearsonii</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

## Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

### 4030 European dry heaths

To restore the favourable conservation condition of European dry heaths in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	European dry heaths habitat has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 5,744ha, covering 17% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat typically occurs on slopes above 300m in the SAC. Examples of this habitat can be found at Grogan More, Crocknafarragh, Crookglass, Croaghadoo, Addemymore, Staghall Mountain, Farscallop, Kinnaveagh, Leahanmore, and the area between Dooish and Kingarow (NPWS internal files). Further information can be found within NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of dry heath vegetation communities have been recorded in this SAC (NPWS internal files; R. Hodd, pers. comm.), two of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three, excluding <i>Campylopus</i> and <i>Polytrichum</i> mosses	Attribute and target based on Perrin et al. (2014)
Vegetation composition: number of positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least two	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50% for siliceous dry heath and 50-75% for calcareous dry heath	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: dwarf shrub composition	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of dwarf shrub cover composed collectively of bog-myrtle ( <i>Myrica gale</i> ), creeping willow ( <i>Salix repens</i> ) and western gorse ( <i>Ulex gallii</i> ) is less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). <i>Rhododendron</i> ( <i>Rhododendron ponticum</i> ) is present within dry heaths in the SAC (R. Hodd, pers. comm.)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken ( <i>Pteridium aquilinum</i> ) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush ( <i>Juncus effusus</i> ) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: senescent ling	Percentage cover at a representative number of 2m x 2m monitoring stops	Senescent proportion of ling ( <i>Calluna vulgaris</i> ) cover less than 50%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry ( <i>Empetrum nigrum</i> ) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Vegetation structure: growth phases of ling	Percentage cover in local vicinity of a representative number of monitoring stops	Outside sensitive areas, all growth phases of ling ( <i>Calluna vulgaris</i> ) should occur throughout, with at least 10% of cover in the mature phase	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There are historic records for the FPO listed and Vulnerable small-white orchid ( <i>Pseudorchis albida</i> ) (Wyse Jackson et al., 2016) from the SAC (NPWS internal files), but this species cannot be attributed specifically to dry heaths. The FPO listed and Vulnerable liverworts <i>Scapania omithopodioides</i> , <i>Bazzania pearsonii</i> and <i>Adelanthus lindenbergianus</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

## Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

### 4060 Alpine and Boreal heaths

To restore the favourable conservation condition of Alpine and Boreal heaths in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Alpine and Boreal heaths habitat has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 245ha, covering 1% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat is documented to occur on all the main summits and ridges above 400-500m. The best examples of this habitat are on the higher parts of Errigal, Slieve Snaght, Dooish and Mackoght (Hodd, 2012; NPWS internal files). Further information can be found within Hodd (2012), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	R. Hodd (pers. comm.) noted a variety of Alpine and Boreal heath vegetation communities in this SAC, three of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 66%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrub species at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 10%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Pirri-pirri-bur ( <i>Acaena novae-zelandiae</i> ) occurs in this habitat in the SAC (R. Hodd, pers. comm.)
Vegetation structure: signs of grazing	Percentage of leaves grazed at a representative number of 2m x 2m monitoring stops	Less than 10% collectively of the live leaves of specific graminoids showing signs of grazing	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of specific graminoids

Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids and crowberry ( <i>Empetrum nigrum</i> ) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning within the habitat	Attribute and target based on Perrin et al. (2014)
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Near Threatened alpine clubmoss ( <i>Diphasiastrum alpinum</i> ) (Wyse Jackson et al., 2016) is present in Alpine and Boreal heaths in the SAC (R. Hodd, pers. comm.). The FPO listed and Vulnerable bryophytes <i>Scapania ornithopodioides</i> , <i>Bazzania pearsonii</i> and <i>Adelanthus lindenbergianus</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hodd, pers. comm.)

**Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]**

**6410 Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)**

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	<i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae) have not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC and thus the total area of the qualifying habitat is unknown. <i>Molinia</i> meadows are known to occur in areas that are subjected to occasional flooding in the SAC (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See notes for Habitat area above
Vegetation composition: typical species	Number at a representative number of monitoring stops	At least seven positive indicator species present, including one "high quality" species as listed in O'Neill et al. (2013)	Based on O'Neill et al. (2013), where the list of positive indicator species, including high quality species, is also presented. Note that purple moor-grass ( <i>Molinia caerulea</i> ) is a positive indicator species, but not necessarily an essential component of the habitat. The high quality indicator conglomerate rush ( <i>Juncus conglomeratus</i> ) and the positive indicators purple moor-grass and sharp-flowered rush ( <i>Juncus acutiflorus</i> ) have been recorded from this habitat in the SAC (Weekes, 1990; NPWS internal files)
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Negative indicator species collectively not more than 20% cover, with cover by an individual species not more than 10%	Attribute and target based on O'Neill et al. (2013), where the list of negative indicator species is also presented
Vegetation composition: non-native species	Percentage at a representative number of monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: moss species	Percentage at a representative number of monitoring stops	Hair mosses ( <i>Polytrichum</i> spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation composition: woody species and bracken	Percentage at a representative number of monitoring stops	Cover of woody species and bracken ( <i>Pteridium aquilinum</i> ) not more than 5% cover	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: broadleaf herb: grass ratio	Percentage at a representative number of monitoring stops	Broadleaf herb component of vegetation between 40% and 90%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: sward height	Percentage at a representative number of monitoring stops	At least 30% of sward between 10cm and 80cm tall	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: litter	Percentage at a representative number of monitoring stops	Litter cover not more than 25%	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare ground	Percentage	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2010)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Not more than 10% bare soil	Attribute and target based on O'Neill et al. (2013)
Physical structure: disturbance	Square metres	Area showing signs of serious grazing or other disturbance less than 20m <sup>2</sup>	Attribute and target based on O'Neill et al. (2013)

**Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]**

**7130 Blanket bogs (\* if active bog)**

To restore the favourable conservation condition of Blanket bogs (\* if active bog) in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for Cloghernagore Bog and Glenveagh National Park SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 22,607ha, covering 68% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Cloghernagore Bog and Glenveagh National Park SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	The habitat occurs throughout the SAC. The area around Cloghernagore constitutes the most extensive blanket bog system remaining in the north-west of Ireland (NPWS internal files). Other examples of this habitat are present at Glenveagh Bridge, Cashelnagor, Dunlewy Far, Derrybeg, Calabber Valley, Attinadague, Meenagoppoge, Carrickatimpan, Commeen and Skeagh (Douglas et al., 1990). Further information can be found within Douglas et al. (1990), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	A variety of blanket bog vegetation communities have been recorded in this SAC (NPWS internal files), six of which correspond to communities recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding <i>Sphagnum fallax</i> , at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). <i>Rhododendron (Rhododendron ponticum)</i> and the non-native moss <i>Campylopus introflexus</i> were recorded in this habitat in the SAC (NPWS internal files)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: <i>Sphagnum</i> condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the <i>Sphagnum</i> cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry ( <i>Empetrum nigrum</i> ) and bog-myrtle ( <i>Myrica gale</i> ) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). There are historic records for the FPO listed and Near Threatened bog orchid ( <i>Hammarbya paludosa</i> ) (Wyse Jackson et al., 2016) from the SAC (NPWS internal files), but this species cannot be attributed specifically to blanket bogs. The FPO listed and Vulnerable liverworts <i>Scapania omithopodioides</i> and <i>Bazzania pearsonii</i> (Lockhart et al., 2012) are present within hepatic mats associated with this habitat in the SAC (R. Hoddd, pers. comm.)

## Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]

### 1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	See targets below and see map 5	The conservation objective applies to the Glaskeelan and Owencarrow freshwater pearl mussel ( <i>Margaritifera margaritifera</i> ) populations, which are listed on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (SI No. 296 of 2009). The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems (see further information below). The Glaskeelan, owing to the relatively few pressures in the catchment, is one of eight Irish populations prioritised for conservation action. This SAC covers much of the Glaskeelan and Owencarrow catchments. It also covers upper parts of the Clady catchment, while the Glaskeelan is a sub-catchment of the Leannan (see map 5). Conservation objectives for the Clady and Leannan freshwater pearl mussel populations are detailed for SACs 000140 and 002176, respectively
Distribution: Glaskeelan	Kilometres	Maintain Glaskeelan distribution at 3.17km	As noted above, the Glaskeelan freshwater pearl mussel population is one of eight Irish populations prioritised for conservation action (Moorkens, 2010; NPWS, 2010). Information on the distribution of the freshwater pearl mussel in the Glaskeelan comes from Moorkens (1995, 1996, 2007, 2009). Mussels have been found from just downstream of the national park boundary to the mouth of the river at Gartan Lough; however, most of the population occurs between a 'large rock' at C04873 17424 and the lake. Further survey is required of the stretches from the national park boundary downstream to the 'large rock'. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Glaskeelan system. See NPWS (2010) for further information
Distribution: Owencarrow	Kilometres	Maintain Owencarrow distribution at 7.3km	The distribution of the freshwater pearl mussel is poorly known for the Owencarrow system, but is considered to be from the outflow from Lough Beagh to the New Bridge (N56) (based on records from: Beasley, 1996; Moorkens, 1995, 1996, 2007, 2009). Further survey is required of the distribution, abundance and condition of the species and its habitat in the Owencarrow. The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Owencarrow system. See NPWS (2010) for further information

Population size	Number of adult mussels	Restore populations to at least: 10,000 adult mussels in the Glaskeelan and 10,000 in the Owencarrow	The 2009 population estimate for the Glaskeelan was a maximum of 10,000 (Moorkens, 2009; NPWS, 2010). NPWS (2010) provided a population estimate of 15,000 for the Owencarrow, however Moorkens (2010) considered it more likely to be less than 10,000. Pearl fishing appears to have contributed significantly to the Owencarrow population decline (Beasley, 1996; Moorkens, 2009; NPWS, 2010) and the available mussel habitat is below capacity for mussels (Moorkens, 2009). Further survey of both systems is required to provide more robust population targets. NPWS (2013) assumed the Glaskeelan, like other priority populations, had declined at a rate of 1% per year and the Owencarrow at 3% per year. Moorkens (2017), however, found that one stretch of the Glaskeelan had declined by 82% in 4 years. The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Population structure: recruitment	Percentage per size class	Restore to at least 20% of each population no more than 65mm in length; and at least 5% of each population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. Beasley (1996) conducted age studies of Glaskeelan and Owencarrow mussels. In 2009, the smallest Glaskeelan mussel was 26mm, but it failed both targets with only 6.6% ≤65mm and 1.3% ≤30mm (Moorkens, 2009). No juvenile or young mussels were found in the Glaskeelan in 2012 or 2016 (Moorkens, 2012, 2017). No juveniles or young mussels were found in the Owencarrow in 2009 (Moorkens, 2009; NPWS, 2010). Both populations are unsustainable owing to lack of survival of juvenile mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Glaskeelan was assumed to pass both targets in 2009 and again in 2012, when the absence of baseline data made assessment of changes in live adults difficult (Moorkens, 2009, 2012; NPWS, 2010). In 2016, a severe decline was recorded, with an 82% drop in adults between 2012-16 in one stretch, the highest density was 3 mussels/m <sup>2</sup> and the 8 mussels tested by tongs were found to be 'Stressed'. The Owencarrow failed both targets in 2009, when more dead shells (more than 145) than large, live adults (c.110) were counted (Moorkens, 2009, 2010). The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

Suitable habitat: extent	Kilometres	See targets below	The habitat is a combination of 1) the area of habitat adult and juvenile mussels can occupy; 2) the area of spawning and nursery habitats host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only spawning areas that can regularly contribute juvenile fish to adult mussel habitat should be considered. Availability of mussel and fish habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and nutrient enrichment. Pressures throughout the catchment (map 5) contribute to such impacts. Habitat in the Glaskeelan and Owencarrow is unsuitable for juvenile recruitment (NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems. See below
Suitable habitat: extent - Glaskeelan	Kilometres	Restore suitable habitat in more than 3.17km in the Glaskeelan system and any additional stretches necessary for salmonid spawning	The extent of the mussel habitat in the Glaskeelan, in correspondence with the species' distribution, is considered to be from just downstream of the National Park boundary to the mouth of the river at Gartan Lough (Moorkens, 1995, 1996, 2007, 2009). As noted above, however, further survey is required, particularly of the more upstream stretches, to confirm the habitat extent. Most of the mussel habitat is considered to be under carrying capacity and mussel density is particularly poor in some patches (Moorkens, 2009, 2017; NPWS, 2010). Sedimentation and organic enrichment are the key impacts on the Glaskeelan mussel habitat. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan system
Suitable habitat: extent - Owencarrow	Kilometres	Restore suitable habitat in more than 5.0km in the Owencarrow system and any additional stretches necessary for salmonid spawning	Further survey is required to accurately map the extent of mussel habitat in the Owencarrow system. The habitat polyline is likely to underestimate habitat extent downstream of Owencarrow Bridge and overestimate it above that bridge. Suitable habitat was patchy and limited in extent in the stretches surveyed in 2007 and 2009, and where found was below carrying capacity for mussels (Moorkens, 2007, 2009). Sedimentation and nutrient enrichment are impacting on the condition of the Owencarrow mussel habitat. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Owencarrow system
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	The EQR targets correspond to high ecological status for these two Water Framework Directive (WFD) biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). In 2009, the habitat in both the Glaskeelan and Owencarrow systems failed the macroinvertebrate target, but passed the diatom target (Ní Chatháin, 2009; Williams, 2009; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Percentage	Restore substratum quality - filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)	Both the Glaskeelan and Owencarrow systems failed the macroalgal target in 2009, but (marginally) passed the macrophyte target (NPWS, 2010). Macroalgal cover of 60% and 70% was recorded in the Glaskeelan during macroinvertebrate surveys (Williams, 2009; NPWS, 2010). The macrophyte <i>Potamogeton</i> was more abundant than expected in the Glaskeelan mussel habitat (Moorkens, 2009, 2017; NPWS, 2010). <i>Littorella</i> was also abundant in 2016 (Moorkens, 2017). Bacterial and fungal growth requires further investigation in the Glaskeelan given the loading of organic matter that has entered the river (see Moorkens, 2012). Algal cover varied spatially and temporally in the Owencarrow mussel habitat, but was greatest (60%) at the bridge near the Glenveagh visitor centre (Williams, 2009; NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Substratum quality: sediment	Occurrence	Restore substratum quality - stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Glaskeelan failed the target for the Sub-basin Management Plan, having strong silt plumes (Moorkens, 2009; Williams, 2009; NPWS, 2010). There was a clear relationship between heavy siltation and higher macrophyte cover abundance. It failed again in 2012 (high/increased silt cover (drape) and substantial silt plumes when agitated) and in 2016 (silt infiltration on all transects) (Moorkens, 2012, 2017). The Owencarrow failed the target in 2009, with slight to moderate silt plumes in mussel habitat (Williams, 2009; NPWS, 2010). Sufficient survival of juvenile mussels is being prevented by the poor condition of the river substratum in both systems. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. The Glaskeelan failed the redox target in 2009, with an average loss of 21.3% redox potential at 5cm (range 11-27.5%) (Moorkens, 2009; NPWS, 2010). In 2012, average redox was 30.6% and substratum condition had deteriorated significantly throughout the Glaskeelan (Moorkens, 2012). It failed again in 2016 (average of 24.9%, all readings at lower sites over 20%) (Moorkens, 2017). The Owencarrow failed the target in 2009, with average redox of 24.1% (Moorkens, 2009; NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased so as to cause excessive scour of mussel habitat; 3) low flows do not exacerbate the deposition of fine sediment or growth of algae/macrophytes and 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014). Groundwater inflow to the substratum also contributes to water-cycling and favourable habitat condition. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and thus are essential to completion of the life cycle. 0+ and 1+ fish are typically used, both because of habitat overlaps and the development of immunity with age in fish. Fish presence is considered sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for mussels and a lack of mussel recruitment, while significantly lower densities and biomass of host fish were associated with high juvenile mussel numbers. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. In the Glaskeelan and Owencarrow, neither salmon nor trout were encysted with glochidia in May 2009 (Johnston, 2009; NPWS, 2010)
Fringing habitats: area and condition	Hectares	Maintain the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Fringing habitats aid in the settlement of fine suspended material, protect banks from erosion, contribute to nutrient cycling and to the aquatic food web (e.g. allochthonous matter) and provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Glaskeelan and Owencarrow systems

**Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]**

**1106 Salmon *Salmo salar***

To maintain the favourable conservation condition of Atlantic Salmon in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmon's upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee on Salmon (SSCS) annual model output of CL attainment levels. See SSCS (2016). Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Gweebarra River is currently achieving CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	The target is the threshold value for rivers currently exceeding their conservation limit (CL)
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice ( <i>Lepeophtheirus salmonis</i> )
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

**Conservation Objectives for : Cloghernagore Bog and Glenveagh National Park SAC [002047]**

**1355 Otter *Lutra lutra***

To maintain the favourable conservation condition of Otter in Cloghernagore Bog and Glenveagh National Park SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al., 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 1,130.1ha along river banks/lake shoreline/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along rivers and around water bodies, as identified as critical for otters (NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 490.3km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake) habitat	Hectares	No significant decline. Area mapped and calculated as 745.5ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed