

National Parks & Wildlife Service

River Moy SAC  
(Site code 002298)



**Raised Bog Restoration Plan**

Version 2

March 2023

# Contents

<b>1</b>	<b>INTRODUCTION .....</b>	<b>1</b>
1.1	PURPOSE OF THE RESTORATION PLAN.....	1
1.2	RIVER MOY SAC .....	1
1.3	SITE-SPECIFIC CONSERVATION OBJECTIVES .....	2
<b>2</b>	<b>RESTORATION MEASURES AT RIVER MOY SAC .....</b>	<b>3</b>
2.1	INTRODUCTION .....	3
2.2	BLOCKING OF HIGH BOG DRAINS .....	3
2.3	BLOCKING OF DRAINS ON CUTOVER BOG .....	4
2.4	CONTOUR BUNDING .....	6
2.5	CELL BUNDING .....	7
2.6	REMOVAL OF FORESTRY/TREE CLEARANCE .....	8
2.7	GENERAL SITE MANAGEMENT .....	8
<b>3</b>	<b>DRAINAGE MANAGEMENT PLAN .....</b>	<b>9</b>
<b>4</b>	<b>COMMUNITY BENEFITS .....</b>	<b>9</b>
<b>5</b>	<b>RESTORATION PLAN IMPLEMENTATION .....</b>	<b>10</b>
5.1	PREPARATORY .....	10
5.2	PROGRESS TO DATE .....	11
5.2.1	<i>Hydrological characterisation .....</i>	<i>11</i>
5.2.2	<i>Review of restoration proposed measures in line with best practice at time of implementation .....</i>	<i>11</i>
5.2.3	<i>Detailed ecological surveys .....</i>	<i>11</i>
5.2.4	<i>Landownership Investigations.....</i>	<i>13</i>
5.2.5	<i>Stakeholder consultation and community engagement .....</i>	<i>13</i>
5.2.6	<i>Compensation/land acquisition .....</i>	<i>13</i>
5.2.7	<i>Appropriate Assessment Screening.....</i>	<i>13</i>
5.2.8	<i>Compilation of tender/construction documents and Health &amp; Safety file .....</i>	<i>13</i>
5.2.9	<i>Surveying setting/out of the works .....</i>	<i>14</i>
5.2.10	<i>Construction of restoration measures .....</i>	<i>15</i>
5.2.11	<i>Post-works inspections and preparation of as built survey information. ....</i>	<i>15</i>
5.2.12	<i>Update of restoration plan to outline works completed and remaining works required in future. 15</i>	
<b>6</b>	<b>REFERENCES .....</b>	<b>0</b>
<b>7</b>	<b>GLOSSARY &amp; ACRONYMS .....</b>	<b>1</b>

## Maps:

Map 1.1 - River Moy SAC Boundary at Cloongoonagh Bog .....	16
Map 1.2 - River Moy SAC Boundary at Derrynabrock, Tawnaghbeg, Gowlaun and Kilgarrieff Bogs .....	17
Map 2.1 - River Moy SAC (Cloongoonagh Bog) Restoration Proposals .....	18
Map 2.2 - River Moy SAC (Derrynabrock, Tawnaghbeg, Gowlaun and Kilgarrieff Bogs) Restoration Proposals .....	19

# 1 Introduction

## 1.1 Purpose of the Restoration Plan

This restoration plan has been developed by National Parks and Wildlife Service (NPWS) of the Department of Housing, Local Government and Heritage to set out proposals for restoration of raised bog and associated habitats at River Moy (Cloongoonagh Bog, Derrynabrock Bog, Tawnaghbeg Bog, Kilgarraiff Bog and Gowlaun Bog) Special Area of Conservation (SAC) (002298). This plan identifies technically feasible restoration measures for the various zones of the bog including the high bog, cutover bog and surrounding margins and provides details of progress on implementation of their restoration plans.

The restoration measures set out will enable nature conservation targets for Active Raised Bog (ARB) at this SAC to be met. Although the focus of the restoration plan is on ARB habitat, it is anticipated that restoration measures will also benefit other peatland habitats and can contribute to socio-economic benefits for the local community, improvements to biodiversity and reduced carbon emissions. Monitoring of this restoration plan will be undertaken to ensure that the intended restoration measures are successfully contributing to the achievement of the site-specific targets for ARB at River Moy SAC.

### Action 1.1: Develop restoration plan further in partnership with stakeholders.

This plan will be developed further in conjunction with stakeholders to ensure that restoration is carried out in such a way that the conservation requirements of the site can be met, whilst minimising any impacts on adjacent land and maximising benefits to the local community. The plan will develop and change over time through input from stakeholders and will be considered a living document. The primary aim of this restoration plan is to ensure site-specific conservation objectives for Ardgrigue Bog SAC can be met.

Section 2 of the restoration plan sets out the restoration measures that have been proposed for the various raised bogs within River Moy SAC. Section 3 outlines how a drainage management plan for the various raised bogs within River Moy SAC has been developed as part of this restoration plan. Section 4 describes potential for community benefits to be explored through the plan and Section 5 outlines progress with implementation of the plan.

Map 1.1 and 1.2 outlines the location and extent of the five raised bogs within River Moy SAC. Map 2.1 and 2.2 illustrates the restoration measures that have been implemented to date as well as any proposed/outstanding restoration measures to be implemented at the various raised bogs within River Moy SAC.

This document provides an outline of the restoration plan but is supported by detailed datasets that are available on the NPWS Restoration Maps Viewer. This map viewer provides NPWS with an up-to-date view of all restoration plan details and supporting information including status of landowner investigations, landowner consent, progress with construction and details of proposed and remaining restoration measures.

## 1.2 River Moy SAC

The River Moy (SAC) system drains a catchment area of 805 square kilometers. Most of the SAC is in Co. Mayo, though parts are located in west Sligo and north Roscommon. Apart from the River Moy itself, other rivers included within the site are the Deel, Bar Deela, Castlehill, Addergoole, Clydagh and Manulla on the west side, and the Glenree, Yellow, Strade, Gweeston, Trimogue, Sonnagh, Mullaghanoe, Owengarve, Eighnagh and Owenaher on the east side. The underlying geology is Carboniferous Limestone for the most part, though Carboniferous Sandstone is present at the

extreme west of the site, with Dalradian Quartzites and schists at the south-west. Within the River Moy SAC, the raised bog habitat for which the SAC has been selected occurs at five locations, namely Cloongoonagh Bog in the west and the bog cluster including Derrynabrock Bog, Tawnaghbeg Bog, Kilgariff Bog, Gowlaun Bog in the east.

The SAC has been selected for six Annex I habitats and five Annex II species. This draft plan has been developed to address restoration measures for peatland habitats only. The peatland habitats for which the SAC has been selected are:

- [7110] Active raised bogs\*
- [7120] Degraded raised bogs still capable of natural regeneration
- [7150] Depressions on peat substrates of the *Rhynchosporion*
- [7230] Alkaline fens

\*Priority habitats

This restoration plan has been developed to address restoration measures for these peatland habitats.

Non-active raised bog habitat is present where the hydrology of the uncut bogs has been affected by peat cutting and other land use activities in the surrounding area, such as afforestation and associated drainage, and also the Moy arterial drainage scheme. Species typical of the ARB habitat may still be present but the relative abundances differ. A typical example of the degraded habitat, where drying has occurred at the edge of the high bog, contains an abundance and more uniform cover of *Calluna vulgaris*, *Carex panicea*, *Trichophorum germanicum* and sometimes *Myrica gale*. Occurring in association with the uncut high bog are areas of wet regenerating cutover bog with species such as *Eriophorum angustifolium*, bog mosses and sundew. Natural regeneration with peat-forming capability will be possible over time with some restorative measures.

### **1.3 Site-specific conservation objectives**

Detailed site-specific conservation objectives (SSCOs) aim to define the conditions necessary to maintain or achieve the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.

A conservation objective has been set for River Moy SAC for ARB habitat using attributes and targets based on parameters set out in the Habitats Directive. In summary, one of the key targets is to restore the area of ARB to 132.4 ha. The area of ARB was reported as 45.3 ha during the latest monitoring survey (Cloongoonagh Bog, Kilgariff Bog and Gowlaun Bog surveyed in 1999, Tawnaghbeg Bog and Derrynabrock Bog both surveyed in 2012) and it has been determined that there is potential for 82.1 ha of Degraded Raised Bog (DRB) to be restored to ARB on the high bog following restoration measures. There is also long-term potential for 5 ha of bog peat-forming habitats (BPFH) to develop if restoration measures are undertaken on cutover areas. Several targets have been set for other attributes relating to the quality and condition of ARB habitat, including a target to restore adequate transitional areas to support/protect the active raised bog and the ecosystem services it provides. The restoration measures proposed by this restoration plan aim to achieve these targets. Further information on the SSCO's can be found in the River Moy SAC conservation objectives document (NPWS, 2015a) and the conservation objectives supporting document – raised bog habitats (NPWS, 2015b).

## 2 Restoration measures at River Moy SAC

### 2.1 Introduction

Hydrological processes are key drivers of raised bog ecology, as raised bogs are predominately fed by precipitation. For ARB to develop or be maintained, mean water levels need to be near or at the bog's surface for most of the year. Seasonal fluctuations should not exceed 20cm below ground surface, and water levels in the peat should be within 10cm of the surface, except for very short periods of time (Kelly & Schouten 2002). Gentle slopes that limit intermittent lateral losses of water (through surface run-off) and encourage sustained water-logging are the most favourable to achieve these conditions. These conditions may be maintained on steeper slopes in areas of focused flow (flushes) (Mackin et al., 2017a; Regan et al., 2020). However, it will not be possible to raise the water level to high enough levels across the entire high bog surface, particularly approaching marginal areas, to enable ARB to develop. Even in high bog areas that do not have potential for ARB to form, water levels should be raised as necessary to support habitat for the areas where ARB can occur.

The main aim of restoration on raised bogs is to maintain or improve the quality of existing areas of ARB or improve the hydrological conditions that will allow ARB to develop in areas with suitable topographic conditions (gentle slopes and/or areas of focused flow). This requires measures to be implemented on both the high bog and cutover areas. Measures implemented on selected areas of cutover will also help to minimise the impact that drainage and cutting has had on the hydrological integrity of the high bog and support a diversity of other transitional wetland habitats (e.g. wet woodland and fen), as well as the species they sustain. Once restored, these transitional cutover zones may provide further ecosystem services through flood attenuation and water supply maintenance and purification, increased carbon sequestration and improvements to the site's overall biodiversity value.

The main restoration measures that may be considered for improving hydrological conditions on raised bogs include:

- Drain blocking (includes drains on both high bog and the margins)
- Removal of forestry/tree clearance
- Installation of marginal dams
- High bog excavation/re-profiling
- Inoculation with *Sphagnum* species
- Bunding on high bog or cutover bog

Further details on each of these measures can be found in Irish Wildlife Manual No. 99 'Best practice in raised bog restoration in Ireland' (Mackin et al., 2017b). Additional measures may be considered in particular instances where there are specific problems that are causing damage to an SAC. The most relevant restoration measures for the various raised bogs within River Moy SAC are outlined in Section 2.2 – 2.7 below.

### 2.2 Blocking of high bog drains

Blocking high bog drains slows the flow of water off the surface of the bog and increases the water table in the peat. Drain blocking is a proven and effective restoration measure on Irish raised bogs with minimal maintenance requirements. The approach has been demonstrated at a number of raised bogs in Ireland with very positive results evident in less than 10 years (**Figure 2.1**) as outlined by Fernandez *et al.* (2014).

Sometimes, there are concerns from local communities living close to raised bogs that drain blocking



on the high bog will result in, or exacerbate, flooding. Blocking high bog drains, in fact, slows the flow of water off the bog potentially reducing the frequency and magnitude of flood events by restoring the hydrological function of the bog. To address these concerns NPWS have developed a drainage management plan for the various raised bogs within River Moy SAC, with further details of this plan outlined within section 3.



**Figure 2.1 Example of a peat dam to block a typical high bog drain**

**Action 2.1: Block high bog drains within the various raised bogs within River Moy SAC.**

There are functional drains on the high bog of all five raised bogs within the River Moy SAC. It is proposed that all unblocked drains on the high bog of Cloongoonagh Bog, Derrynabrock Bog, Tawnaghbeg Bog, Kilgarrieff Bog and Gowlaun Bog are blocked with peat dams. Details of the locations of unblocked drains on the high bog can be found in Map 2.1 and 2.2.

### ***2.3 Blocking of drains on cutover bog***

Blocking of cutover drains slows the flow of water off the cutover areas and increases the water table in the surrounding peat. This can help to reduce the rate of infiltration through the high bog and can lead to conditions that allow peat to form on the cutover (**Figure 2.2**).

Drain blocking on cutover areas has been carried out at a number of raised bogs in Ireland to date resulting in the development of peat-forming vegetation on cutover areas. As with blocking of high bog drains, there are sometimes concerns from local communities living close to raised bogs that drain blocking on cutover bog will result in, or exacerbate, flooding. Blocking drains on cutover bog can slow the rate at which water is lost from the bog therefore potentially reducing the frequency

and magnitude of downstream flood events. This restoration measure is primarily focused on former spread-grounds and only in very rare occasions, where it is absolutely essential, includes agricultural land. Drains in these areas will only be blocked in agreement with landowners and where there is a suitable hydrological barrier such as a functional drain to prevent impacts outside of the restoration area.



**Figure 2.2** Water table at the surface of cutover bog following successful drain blocking resulting in *Sphagnum* development less than 10 years after drain blocking (this was previously an area of bare peat)

**Action 2.2: Block drains on selected cutover areas within the various raised bogs within River Moy SAC.**

There are several cutover areas surrounding the bog where blocking of drains may reduce ongoing subsidence of the high bog. In some areas this will also lead to the development of peat forming habitats. It is proposed that these drains are blocked, primarily with peat dams, with some plastic reinforcements where necessary to prevent erosion. The required conditions are for the water table to be maintained at or close to the surface, therefore large areas of standing water or deep pools are not desired. Details of the locations on the cutover where it is proposed to block drains can be found in Map 2.1 and 2.2.



## 2.4 Contour bunding

Contour bunds on the high bog aims to reduce the rate of lateral flow through the upper layers of the peat. In contrast to some other bunding techniques, contour bunding is not intended as a means of impounding surface water. This method involves excavating a trench 1.5-2.0m deep, re-compacting peat into the trench and building a slightly raised bund 25-30cm above the current ground surface. In addition, these bunds have 5m long 'finger bunds' constructed using the same technique at approximately 25m spacing to prevent flow along the bund which may lead to erosion. After 1-2 years it is anticipated that the bund will have subsided close to current ground level and therefore will not appear as a prominent feature on the bog surface.



**Figure 2.3 Example of contour bund constructed at Knockacoller Bog SAC, Co. Laois**

Contour bunds are most effective where there is cracking or slumping in the upper layers of the peat as the re-compacted trench assists in sealing up these cracks and slows the flow rate through the peat, supporting a higher water table behind the bund. The key issue with this technique is that the extent of the impact extending back into the bog depends on the hydraulic gradient (which is closely correlated to surface slope). As a result, the extent of impact from such bunds is likely to be extremely limited where the surface slope at the margins is steep. This method is best suited to sites with a relatively gentle slope towards the margins or as a means of effectively blocking a dense network of shallow surface drains on the high bog. Ground conditions will play an important factor in whether the bund can be constructed in such circumstances, therefore this method is most effective on drier sites where machines can operate safely and effectively.

### **Action 2.3: Assess the feasibility of contour bunding on the high bog at the various bogs in River Moy SAC**

Contour bunding has not been proposed for the various bogs at River Moy SAC. The potential for this measure should be explored through the current restoration plan review process. However, it is notable that the site is a western raised bog with steeper surface slopes than Midland bogs and



therefore may not be suited to this measure. Proposals should be informed by monitoring the response from this measure at other restoration sites.

## 2.5 Cell bunding

Cell bunding involves the creation of individual cells, consisting of a cutoff walls extending into the peat substrate and protruding above the ground surface to create a water table close to or slightly above the ground surface (maximum depth typically 10-20cm). The approach permits the interception of laterally flowing groundwater by low permeability cutoff walls, while the surface bunds prevent lateral discharge of surface water; this also encourages recharge to the underlying water table, helping contribute to the water balance, while also maintaining an elevated water table in those areas up gradient of standing water. Due to topographic variable the depth of water will also vary significant resulting in significant ecological diversity across the bunded area.

Cell bunds are typically constructed by excavating a trench 1.0-1.5m deep, recompact the excavated peat into the trench and constructing a bund 0.5-0.6m high above the ground surface (Figure 2.3). Water level control structures (pipes or overflow weirs) are incorporated into these cells as a means to regulate water levels and evenly distribute water across the site.



**Figure 2.4 Example of existing cell bund constructed at Cloncrow Bog NHA**

### **Action 2.4: Assess the feasibility of cell bunding at the various bogs at River Moy SAC**

Cell bunding has not yet been proposed for the various bogs at River Moy SAC; however, there is a current ongoing review of the restoration plan to determine the potential for implementing enhanced measures. The potential for this measure is being explored through this review. Some

cutover areas appear to have suitable conditions to allow implementation of this measure. Proposals should be informed by monitoring the response from this measure at other restoration sites.

## 2.6 Removal of forestry/tree clearance

In the past numerous raised bogs were planted with conifers. This has resulted in significant impacts on the hydrological function of these bogs. Both site preparation works, such as drainage and use of fertilisers, dries out and alters the natural bog vegetation, while the presence of growing trees lowers the water table further due to increased rates of interception and evapotranspiration. Felling of forestry is typically combined with other restoration measures including drain blocking, and when both are applied to a suitable area they can be extremely effective in raising water levels in the peat.

Felling of forestry as well as removal of trees growing sporadically is a proven restoration measure and has been used by Coillte at numerous raised bogs both on high bog and cutover, particularly as part of a number of LIFE funded restoration projects (**Figure 2.**).

**a) Bog surface prior to forestry removal and drain blocking**



**b) Bog surface after forestry removal and drain blocking**



**Figure 2.5 Example of the impact of felling forestry on a raised bog to restore more natural hydrological conditions**

### **Action 2.5: Clear 28.2 ha of forestry within the River Moy SAC.**

There are coniferous forestry plantations on the high bog and cutover at Derrynabrock Bog, Tawnaghbeg Bog, Kilgarraiff Bog and Gowlaun Bog. It is not considered necessary to fell all of these as some are unlikely to be having a significant impact on the hydrology of the high bog. It is proposed that forests considered to be having an impact on the hydrology of the high bog will be felled. Details of the locations of forestry proposed for felling can be found in Map 3.2.

## 2.7 General site management

In addition to the proposed measures, it is important that the restoration plan contributes to improving general site management. This includes considering issues such as:

- Fire prevention and response
- Management of littering/fly-tipping



Burning of the high bog can result in significant damage to a raised bog by removing peat-forming vegetation which reduces the capacity of the peat to retain water. This causes much more rapid surface run-off and therefore can result in more widespread drying out and increased peak flows in surrounding streams. There is evidence that Cloongoonagh Bog, Tawnaghbeg Bog and Kilgarriff Bog has been damaged through burning based on recent aerial images.

Issues such as littering and fly-tipping are also common problems on raised bogs. Depending on the nature of the material dumped this can lead to pollution in surrounding areas.

**Action 2.6: Prepare a fire prevention and control plan for the various raised bogs within River Moy SAC in consultation with local stakeholders.**

It is proposed that a fire prevention plan is developed for River Moy SAC to identify past occurrences of fires, the likely causes and develop an effective plan to prevent fires in future as well as an appropriate response should a fire occur in the future. Issues such as fire prevention and management of littering/fly-tipping also need to be addressed as part of a wider strategy of raising public awareness on the importance of these habitats.

### **3 Drainage Management Plan**

One issue that can cause concerns, particularly for local stakeholders, relates to whether restoration may result in increased flooding in the surrounding area. In many instances bog restoration has the opposite effect by returning more natural hydrological conditions whereby flow is attenuated and reaches the surrounding watercourses more slowly than when drains were present. This is evident at bogs such as Killyconny Bog SAC (000006) where extensive restoration has been carried out on cutover bog and there have been no adverse impacts on adjoining agricultural land.

Nonetheless, many individuals may remain unconvinced on these issues until several years after restoration has taken place. Therefore, in order to provide reassurance, an integrated drainage management plan for the bog and its surroundings has been developed as part of this restoration plan. The drainage management plan will be intended to support the conservation objectives for River Moy SAC by ensuring that the drainage network can be maintained without impacting on the conservation objectives. The plan assess instances existing impediments to the effective management of the drainage network (e.g. undersized culverts or channels) and provides recommendations in relation to remedial works and maintenance works going forward. Implementation of such measures will ensure that the risk of flooding will be significantly reduced.

**Action 3.1: Implemented the actions of the Drainage Management Plan for the various raised bogs within the River Moy SAC in conjunction with local stakeholders.**

Implementing this plan will require input from local stakeholders to ensure that required actions can be implemented.

### **4 Community Benefits**

Through consultation with the local community and other stakeholders it will be possible to develop ideas for maximising socio-economic benefits for the local community through restoration. These might include building or improving existing facilities, where appropriate (i.e., tracks, board walks, bog bridges), encouraging the creation of small tourism enterprises, promoting the benefits to human health and well-being and enhancing the value of the site as an educational resource. There are many cases where local communities, including local businesses, are actively involved in or supporting the conservation and restoration of raised bogs across the country. Examples of this are found at Abbeyleix Bog (Co. Laois), Carrownagappul Bog SAC (Co. Galway), Girley Bog Natural Heritage Area (NHA) (Co. Meath), Lodge Bog (Co. Kildare) and Scohaboy Bog NHA (Co. Tipperary).

Cloongoonagh Bog, Derrynabrock Bog, Tawnaghbeg Bog, Kilgarriff Bog and Gowlaun Bog each offers



significant potential for recreation and amenity; there are many tracks and roadways around each of these bogs. There is significant potential for investment in upgrading, expanding and maintaining these tracks as access routes for amenity and recreation subject to local community desire to explore these options. Any proposed amenity facilities will need to be implemented in a way that does not impact on the site-specific conservation objectives for the site and should consider the provision of such resources in the nearby area.

Apart from immediate economic benefits, the restoration of raised bogs can provide many other benefits to the wider community, such as provision of clean water, flood attenuation and water flow regulation, preservation of archaeological artefacts and other sources of historical knowledge and, not least, helping Ireland reduce its national greenhouse gas emissions and, therefore, helping to combat climate change.

**Action 4.1: Optimise the community benefits of the restoration plan.**

As the restoration plan is further developed and implemented, opportunities to improve the recreation and amenity value of the bog and surrounding areas and promote local initiatives, while protecting and enhancing its natural values, will be explored by and with the local community. Promoting community involvement in the long-term management of the site both during and after restoration measures are carried out, will be encouraged.

## **5 Restoration Plan Implementation**

### **5.1 Preparatory**

Prior to implementation of the restoration plan several preparatory actions are required before construction of restoration measures can commence. A summary of these preparatory actions is outlined below:

- Hydrological characterisation – collation of existing hydrological data, hydrological surveys, instrumentation with monitoring data (where necessary);
- Review of proposed restoration measures in line with best practice at the time of implementation (including exploring opportunities to implement enhanced measures);
- Detailed ecological surveys (primarily comprising surveys of cutover areas, but where necessary also includes high bog areas e.g., if ecotopes have not been surveyed in many years);
- Landownership Investigations (investigations into ownership, turbary rights etc.);
- Stakeholder consultation and community engagement (meeting with stakeholders to outline restoration plans and consider any concerns raised by the local community);
- Compensation/land acquisition (compensation or acquisition of lands required to implement the required restoration measures on private lands);
- Appropriate Assessment Screening;
- Compilation of tender/construction documents including preparation of health and safety file;
- Surveying and setting out of the works;
- Implementation of restoration measures (including construction supervision and contract administration);
- Post-works inspections and preparation of as-built survey information;

- Update of restoration plan to outline works completed and remaining works required in future.

## **5.2 Progress to date**

In recent months significant progress has been made with preparatory actions ahead of implementation of the proposed restoration plan at River Moy SAC. A summary of progress to date is outlined below:

### **5.2.1 Hydrological characterisation**

#### **Status – Ongoing**

Detailed hydrological characterisation of River Moy SAC commenced in 2023 and is currently ongoing. This comprises detailed surveys of the high bog and cutover to collect data to enable the restoration plan to be refined, as well as identifying opportunities for enhanced restoration measures comprising bunding on the high bog and the cutover.

### **5.2.2 Review of restoration proposed measures in line with best practice at time of implementation**

#### **Status – Ongoing**

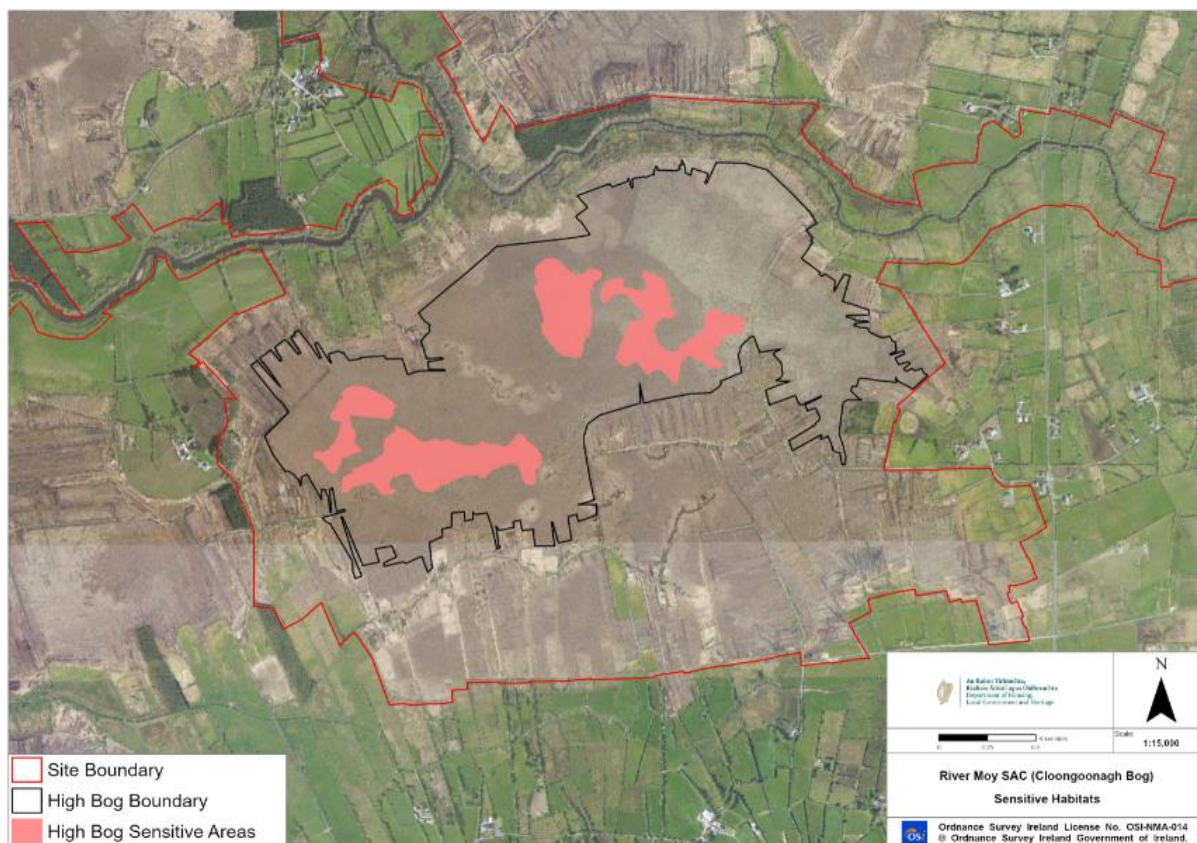
In tandem with detailed hydrological characterisation of River Moy in 2023, a comprehensive review of proposed restoration measures is currently being undertaken. Preliminary analysis suggests potential to implement significant cell bunding measures across some sections cutover bog.

### **5.2.3 Detailed ecological surveys**

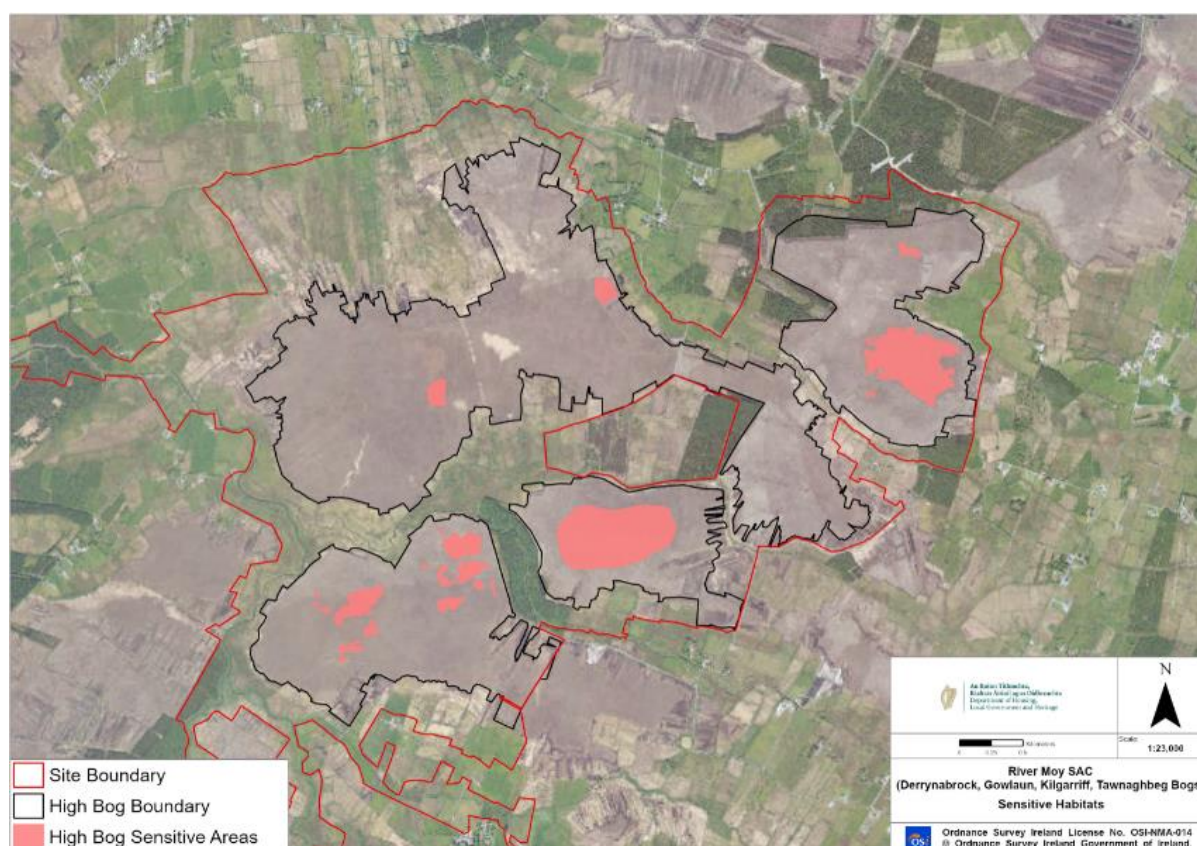
#### **Status – Ongoing**

The most recent ecotope surveys of the bogs within River Moy SAC were completed in 2012, although some sites were last surveyed in 1999 (an up to date ecotope survey of the SAC is planned for 2023). The latest estimated area of active raised bog (7110) is 45.3 ha.

In addition to the high bog survey, a cutover habitat survey has been carried out 2023 in accordance with Irish Wildlife Manual No. 128 'The Habitats of Cutover Raised Bog' (Smith & Crowley, 2020). This survey involved detailed mapping of the various vegetation communities occurring on the cutover bog and classified these in terms of sensitivity to damage from restoration activities. While field surveys are currently complete, GIS processing and reporting are in progress. This mapping together with mapping of the high bog ensures the restoration plan takes into account the existing sensitive habitats present on site to minimise potential impacts.



**Figure 5.2 Sensitive habitats mapped at Cloongoonagh Bog (River Moy SAC)**



**Figure 5.2.1 Sensitive habitats mapped at Derrynabrack, Gowlaun, Kilgarrieff and Tawnaghbeg Bogs (River Moy SAC)**



#### 5.2.4 Landownership Investigations

##### Status – Ongoing

Comprehensive landownership investigations have commenced at River Moy SAC. Ongoing investigations have identified that there is a mixture of public and private ownership, with some areas of unregistered land. In addition, there are some areas where private individuals hold turbary rights. These investigations will identify individuals to be consulted at the next stage in the restoration plan implementation process.

#### 5.2.5 Stakeholder consultation and community engagement

##### Status – Not commenced

Comprehensive stakeholder consultation and community engagement will commence at River Moy SAC when adequate progress has been made with landowner investigations. This will include meeting with private individuals owning the freehold or having a turbary right at the bog.

#### 5.2.6 Compensation/land acquisition

##### Status – Not commenced

Compensation will be offered to all landowners and turbary right holders within the bog once landowner investigations are complete.

#### 5.2.7 Appropriate Assessment Screening

##### Status – Ongoing

A draft Appropriate Assessment Screening report has been prepared to consider the potential for significant effects on any European Sites from the implementation of the restoration plan at River Moy SAC. As the bog has been selected as a Special Area of Conservation for the presence of raised bog habitats, the proposal to allow restoration measures to take place in River Moy **is directly connected with and necessary to the management of this site as a European site**. The proposed restoration measures are essential to support the reestablishment of appropriate hydrological conditions within the SAC to enable nature conservation targets for Active Raised Bog (ARB) at this SAC to be met.

However, given there are several other qualifying interests of the site and following a precautionary approach, screening for Appropriate Assessment is currently being undertaken to assess, in view of best scientific knowledge and in view of the conservation objectives of those European sites considered, whether or not the project, individually or in combination with other plans or projects, is likely to have a significant effect on any European site. This assessment will be complete when all restoration plan measures are finalised.

#### 5.2.8 Compilation of tender/construction documents and Health & Safety file

##### Status – Not commenced

A work package comprising details of restoration measures will be compiled together with detailed specifications for the proposed measures. In addition, a health and safety file will be compiled to ensure the works could be carried out in accordance with the Safety, Health and Welfare at Work (Construction) Regulations. Generally, this work involves the following activities:

- Identify hazards arising from the design of the various schemes.

- Eliminate these hazards, or where not practicable to do so, reduce the risk of these hazards.

### 5.2.9 Surveying setting/out of the works

#### Status – Not commenced

The surveying and staking out of drains and dams can be difficult due to the nature of the bog environment. Vegetation and soft ground conditions can make identification of features and surveying of same difficult and potentially dangerous. The setting out of the works is generally done using bamboo stakes to mark the locations of the restoration measures that are to be constructed such as the dams or bunds. This activity provides an additional opportunity to review the restoration measures in detail on the ground and where necessary minor modifications can be made (e.g., adjusting the placement of particular dams due to dense vegetation coverage or alignment of bunds due to ground conditions). This ensure that the risk of damage to the raised bog is minimized as inadequate planning can increase the risk of machines entering unsuitable areas.



Figure 5.1 Example of setting out dams on an area of high bog

#### **5.2.10 Construction of restoration measures**

##### **Status – Not commenced**

Construction of restoration measures has not yet commenced, however, it is anticipated that works will commence in 2024.

#### **5.2.11 Post-works inspections and preparation of as built survey information.**

##### **Status – Not commenced**

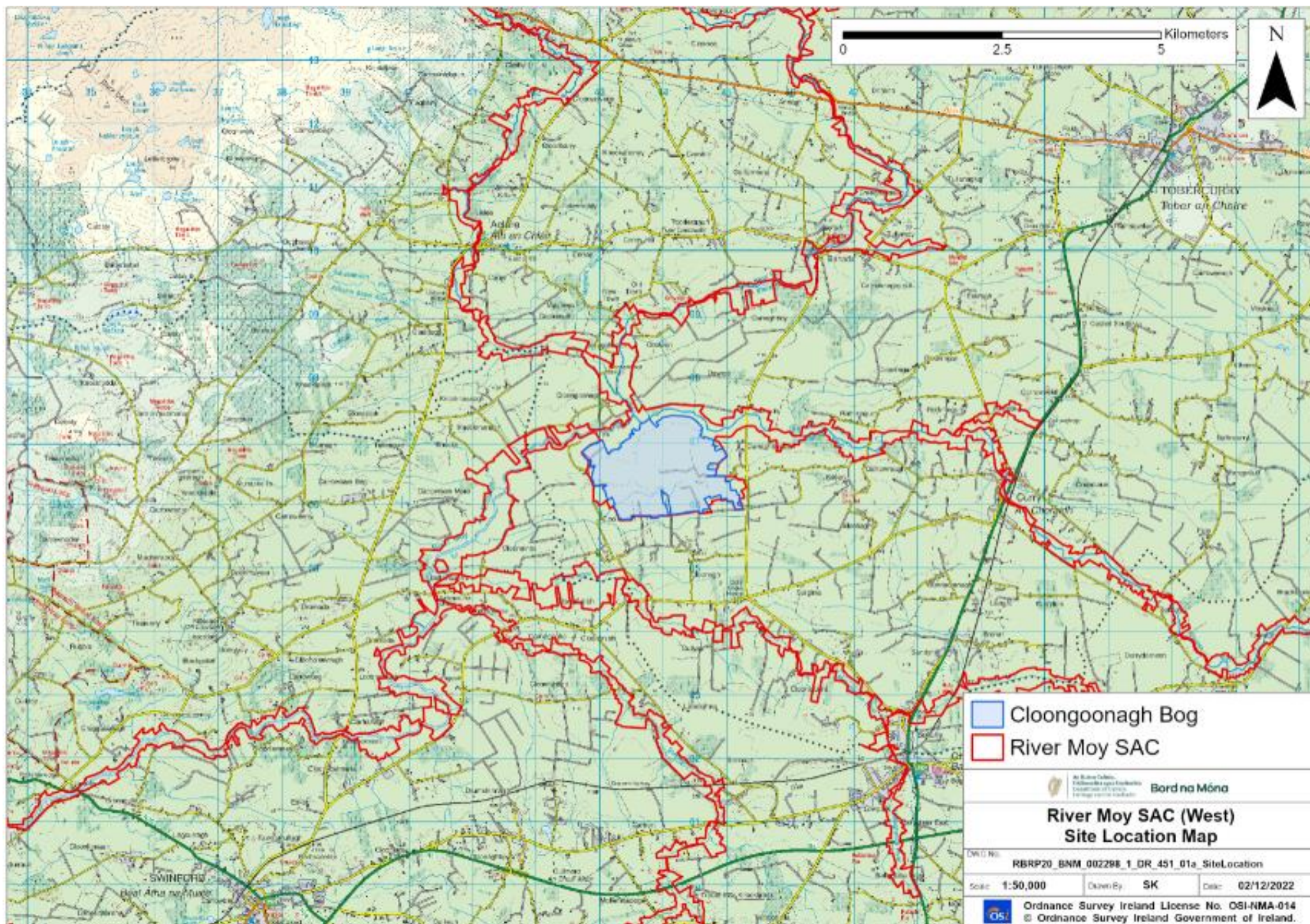
Following completion of restoration works a post-works inspection will be carried out. These inspections will include detailed aerial surveys of the bog to collect high-resolution ortho-imagery and oblique images to ensure a detailed as-built drawing can be prepared.

#### **5.2.12 Update of restoration plan to outline works completed and remaining works required in future.**

##### **Status – Ongoing**

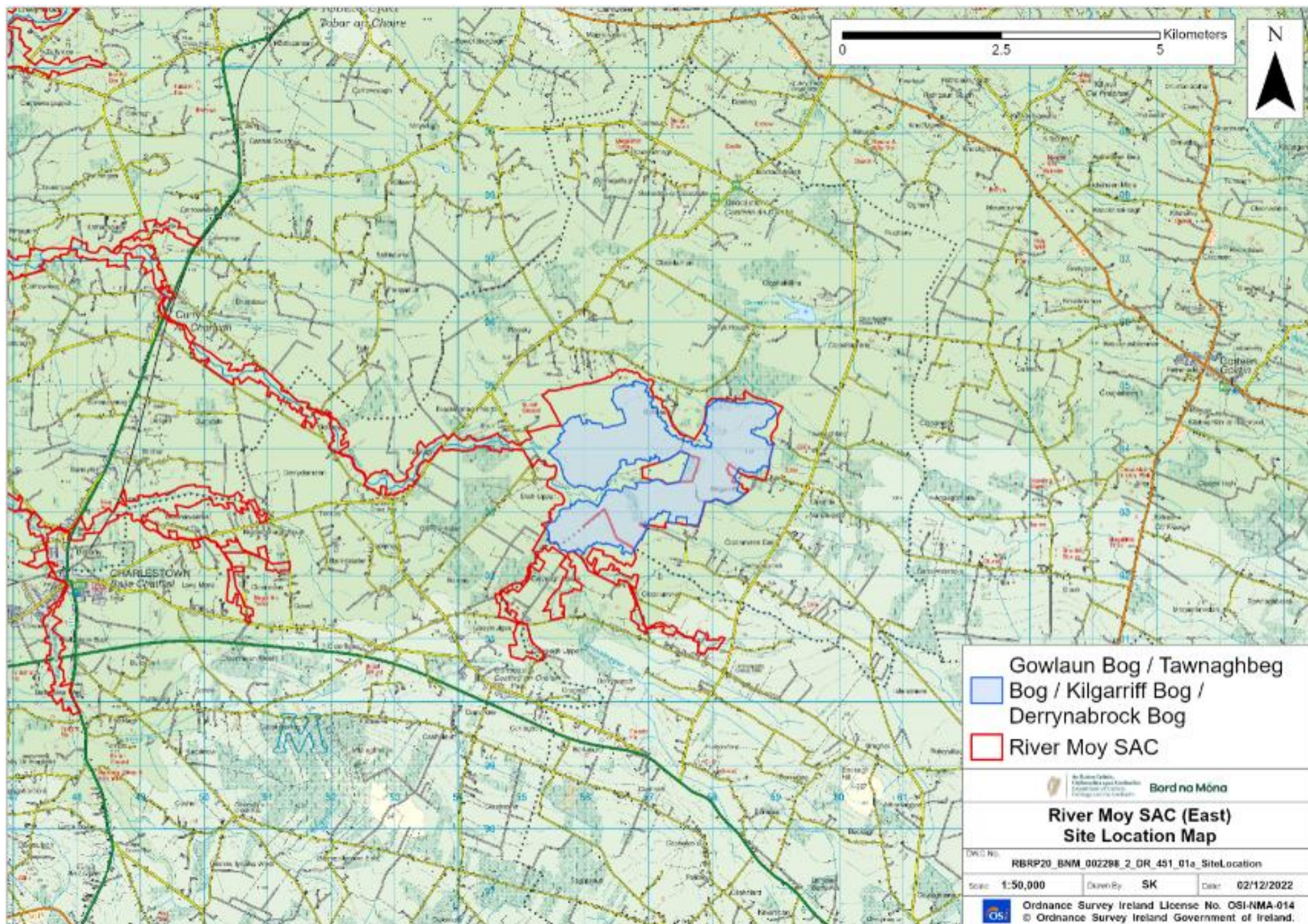
This restoration plan has been updated with the details of the progress in implanting the restoration plan for River Moy SAC. Preparatory work is well underway at this bog and it is anticipated that restoration will commence in 2024, when consent from landowners is received. As this restoration plan is a live document, it is anticipated that restoration measures will be reviewed on an ongoing basis as experience and best-practice evolves nationally and internationally.





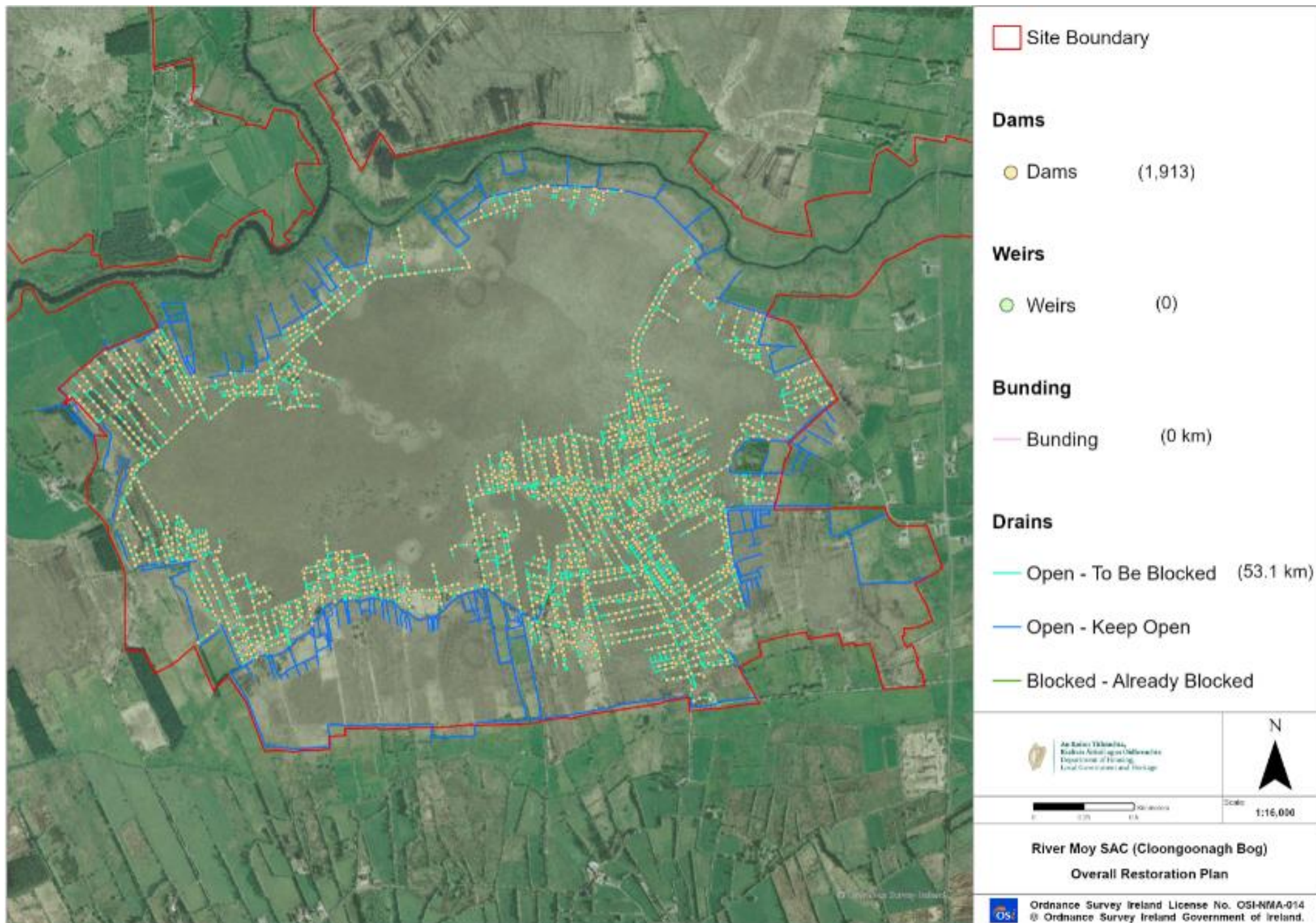
Map 1.1 - River Moy SAC Boundary at Cloongoonagh Bog





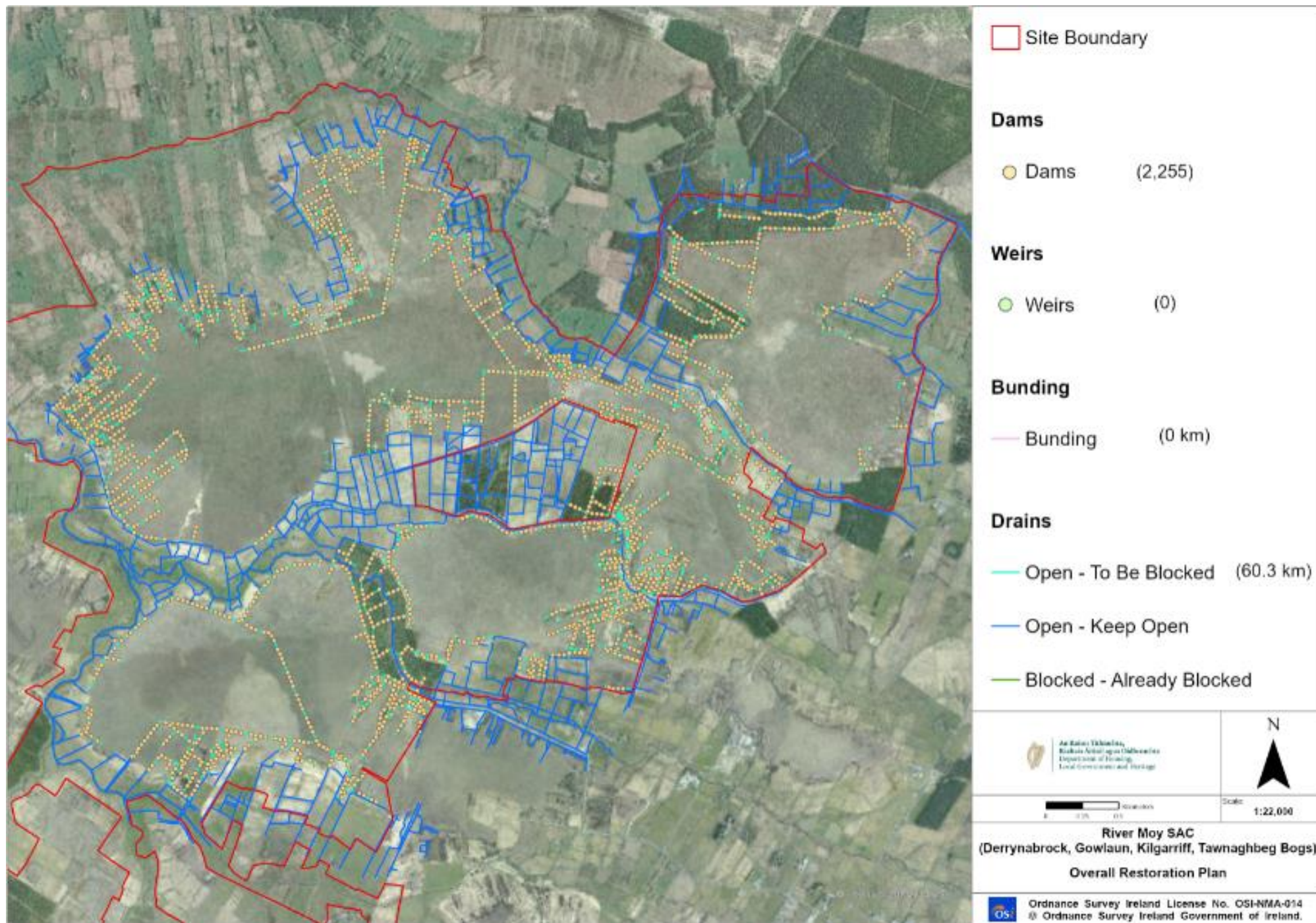
Map 1.2 – River Moy SAC Boundary Cloongoonagh Bog





Map 3.1 - River Moy SAC (Cloongoonagh Bog) Restoration Proposals





Map 4.2 - River Moy SAC (Derrynabrock, Tawnaghbeg, Gowlaun and Kilgarrieff Bogs) Restoration Proposals

## 6 References

- Cross, J. (1990) The Raised Bogs of Ireland, their ecology, status and conservation. Report to the Minister of State at the Department of Finance. The Stationery Office, Dublin.
- Fernandez, F., Connolly K., Crowley W., Denyer J., Duff K. & Smith G. (2014) Raised Bog Monitoring and Assessment Survey 2013. Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.
- Fernandez, F., MacGowan, F., Crowley, W., Farrell, M., Croal, Y., Fanning, M. & McKee M. (2006) Assessment of the impacts of turf cutting on designated raised bogs 2003-06. Unpublished report, National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.
- Kelly, L., Doak, M. & Dromey, M. (1995) Raised Bog Restoration Project: An Investigation into the Conservation and Restoration of Selected Raised Bog Sites in Ireland. Part 1 Summary Reports. National Parks & Wildlife Service, Department of Environment, Heritage and Local Government, Dublin.
- Kelly, L. & Schouten, M.G.C. (2002) Vegetation. In: Schouten, M.G.C. (ed.), Conservation and restoration of raised bogs: geological, hydrological and ecological Studies. Dúchas – The Heritage Service of the Department of the Environment and Local Government, Ireland; Staatsbosbeheer, the Netherlands; Geological Survey of Ireland, Dublin. pp. 110-169.
- Mackin, F., Flynn, R, Barr, A & Fernandez-Valverde, F. (2017b) Use of geographical information system-based hydrological modelling for development of a raised bog conservation and restoration programme. *Ecological Engineering*, 106(Part A); pp. 242-252.
- Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017a) Best practice in raised bog restoration in Ireland. *Irish Wildlife Manuals*, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.
- NPWS (2015a) River Moy SAC (site code 002298) Conservation objectives. National Parks and Wildlife Service, Ireland. ([https://www.npws.ie/sites/default/files/protected-sites/conservation\\_objectives/CO002298.pdf](https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002298.pdf))
- NPWS (2015b) River Moy SAC (site code 002298) Conservation objectives supporting document - raised bog habitats. National Parks and Wildlife Service, Ireland. ([https://www.npws.ie/sites/default/files/publications/pdf/River%20Moy%20SAC%20\(002298\)%20Conservation%20objectives%20supporting%20document%20-%20\[Version%201\].pdf](https://www.npws.ie/sites/default/files/publications/pdf/River%20Moy%20SAC%20(002298)%20Conservation%20objectives%20supporting%20document%20-%20[Version%201].pdf))
- Regan, S., Swenson, M., O'Connor, M. & Gill, L. (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. A report prepared for the Environmental Protection Agency, Ireland.
- Smith, G.F. & Crowley, W. (2020) The habitats of cutover raised bog. Irish Wildlife Manuals, No. 128. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.

## 7 Glossary & Acronyms

ACTIVE RAISED BOG (ARB)	Areas of uncut raised bog where the conditions are right for peat to continue to form, and where species of plants and animals typical to intact bogs can thrive. ARB is listed as a priority habitat in Annex I of the Habitats Directive.
ANNEX I	Annex I of the EU Habitats Directive lists natural habitats types of Community interest whose conservation requires the designation of SACs.
ANNEX II	Annex II of the EU Habitats Directive lists animal and plant species of Community interest whose conservation requires the designation of SACs.
BIODIVERSITY	A general term used to describe all aspects of biological diversity including the number of species present in a given environment, the genetic diversity present within a species and the number of different ecosystems present within a given environment.
BOG WOODLAND	Woodland formed on a wet peaty substrate, with permanently high groundwater level. The water is poor in nutrients (ombrotrophic) and the ground surface has high cover of bog moss species, with active peat accumulation taking place. Bog Woodland is listed as a priority habitat in Annex I of the Habitats Directive. It differs from dry woodland on bog where peat accumulation is not taking place.
BUNDING	An impervious embankment of material (peat or other) that provides a barrier to retain water behind it.
CARBON SEQUESTRATION	The capture and long-term storage of atmospheric carbon dioxide, including that accumulated by a bog or fen.
CATCHMENT	An area of land contributing water that drains to a defined point. The term river catchment refers to the area of land that drains into a particular river system and is synonymous with the term drainage basin or watershed.
CUTOVER	Areas of bog that have been previously cut (by hand or by mechanical means), although not down to the underlying inorganic substrate. Cutover areas normally consist of a mosaic of cut areas, face banks, pools, drainage ditches, uncut areas of peat, scrub, grassland etc.
DEGRADED RAISED BOG (DRB)	The area of high, uncut bog which has been damaged by human activities but which could be restored to active raised bog again through restoration measures within a period of 30 years. It is listed in Annex I of the Habitats Directive.
ECOLOGY	The study of the interactions between organisms, and their physical, chemical and biological environment.
ECOSYSTEM SERVICES	Humankind benefits from a multitude of resources and processes that are supplied by ecosystems. Collectively, these benefits are known as ecosystem services and include products like clean drinking water and processes such as the decomposition of wastes.
EROSION	The processes whereby the materials of the earth's crust are dissolved, or worn away and simultaneously moved from one place to another by natural processes which include weathering, solution, corrosion and transportation.



EVAPOTRANSPIRATION	Water loss to the atmosphere from soil and other surfaces (evaporation) and vegetation (transpiration).
FACEBANK	Areas at the edge of the high bog where peat cutting has taken place. This is an ecotope that is highly degraded and absent of typical <i>Sphagnum</i> species.
FAUNA	Animal life.
FAVOURABLE CONSERVATION CONDITION	This is the condition of a habitat or species considered to be favourable at site level. Favourable conservation condition is defined by site-specific conservation objectives (SSCOs). The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.
FAVOURABLE CONSERVATION STATUS	According to the Habitats Directive the conservation status of a natural habitat will be taken as "favourable" when: its natural range and areas 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.
FLORA	Plant life.
FLOW ATTENUATION	Slowing flow of water out of an area. This is a common method for reducing risk of flood in urban areas whereby diversion channels store water in attenuation ponds. Intact peatlands typically offer natural flow attenuation through slowing flow as a result of higher storage capacity and increased hydraulic roughness, while degraded peatlands are much less effective at attenuating flow as the peat is dried out encouraging overland flow.
HABITAT	Refers to the environment defined by specific abiotic and biotic factors, in which a species lives at any stage of its biological cycle. In general terms it is a species' home.
HABITATS DIRECTIVE	Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
HEAD	Hydrological term which is a measure of the height to which water can raise itself above an arbitrary given level or datum.
HIGH BOG	The area of bog which has not previously been cut.
HYDROLOGICAL PROCESSES	The movement of water through a catchment area including freshwater and seawater inputs, water level changes and drainage mechanisms which are all influenced by the underlying geology.
LAGG	A term used to describe the natural habitat that occurs in the transitional zone between the bog and the mineral soil around a raised bog. Few intact lagg

	zones remain around raised bogs in Ireland as they are typically the first location to be damaged by drainage.
LIDAR	A remote sensing technology that measures vertical surface elevation by illuminating a target with a laser and analysing the reflected light usually obtained using a low-flying aeroplane. This provides detailed information on the surface elevations across an area.
LIFE	An EU financial instrument supporting environmental and nature conservation projects throughout the EU.
MARGINAL DRAIN	Drains on the margins of a raised bog typically on cutover for the purpose of draining spread-grounds to facilitate turf-cutting.
MICROTOPOGRAPHY	Variations in elevation at a relatively small scale. Generally the higher points are no more than a metre higher than the low points, and only a couple of metres across. On a high bog this consists of hummocks, hollows, pools, flats and lawns.
MINEROTROPHIC	Refers to soils and vegetation whose water supply comes mainly from streams or springs. This water has flowed over or through rocks or other minerals, often acquiring dissolved chemicals which raise the nutrient levels and reduce the acidity.
NATURAL HERITAGE AREA (NHA)	These are conservation areas designated for protection under The Wildlife (Amendment) Act 2000. NHAs are considered important for the habitats present or which holds species of plants and animals whose habitat needs protection.
NPWS	National Parks and Wildlife Service.
OMBROTROPHIC	Refers to a type of peatland that receives all of its water and nutrient from precipitation falling directly on its surface.
PIEZOMETER	A piezometer is a device used to measure head. In the case of groundwater a piezometer will provide head at a given point.
PEAT-FORMING HABITAT	These are habitats where peat is actively forming. It includes typical ombrotrophic raised bog vegetation as well as lagg or fen vegetation that indicate that peat is actively forming.
PRIORITY HABITAT	A subset of the habitats listed in Annex I of the EU Habitats Directive. These consist of habitats which are in danger of disappearance and whose natural range mainly falls within the territory of the European Union. These habitats are of the highest conservation status and require measures to ensure that their favourable conservation status is maintained.
RAISED BOG	Rain-fed peatland ecosystems that develop primarily in areas with topographic depressions, where drainage may be impeded by a high groundwater table, or by low permeability of the underlying substrata such as clay. Peat accumulation, over time, elevates the ground surface above surrounding areas to form a raised dome.
RESTORATION ZONE	A specified area within a site where restoration measures have been proposed. Restoration zones have been defined for each raised bog SAC based on factors including hydrological conditions, existing and expected habitats following restoration. This allows restoration measures for each raised bog SAC to be split into manageable units.
SITE-SPECIFIC	

CONSERVATION OBJECTIVE	A site-specific conservation objective aims to define the favourable conservation condition of a habitat or species at site level. The maintenance of habitats and species within sites at favourable condition will contribute to the maintenance of favourable conservation status of those habitats and species at a national level.
SPECIAL AREA OF CONSERVATION	Area designated for the conservation of habitats and/or species under the Habitats Directive.
SPREAD-GROUNDS	Area where turf is spread after cutting to dry out, typically drained cutover bog or agricultural areas adjacent to the high bog.
STATUTORY NATURE RESERVE	A Statutory Nature Reserve is an area of nature conservation interest that has been designated by Ministerial Order under the Wildlife Act, 1976.
SUBSIDENCE	Term referring to the sinking of land resulting from natural activity or human activity. Within peat subsidence occurs due to loss of water for example as a result of drainage.
TILL	Geological term referring to unsorted material deposited by glacial ice and showing no stratification. It is often referred to as boulder clay.
TOPOGRAPHY	The arrangement of the physical features of an area.