Bord na Móna

Derryarogue Bog

Cutaway Bog Decommissioning and Rehabilitation Plan

2023

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

This licence condition requires Bord na Móna agree with the EPA the measures that will provide for rehabilitation, i.e. stabilisation of Derryarogue Bog upon cessation of peat production and compliments the licence requirement to decommission the site.

Rehabilitation *generally comprises site stabilisation with natural colonisation with or without targeted management.*

Industrial peat production has now fully ceased at Derryarogue Bog.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0504-01, due regard was also given to the Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund and Ireland's National Recovery and Resilience Plan*, Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the Scheme will be supported by Government, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.*

While this document outlines the enhanced rehabilitation measures planned for Derryarogue bog, activities which goes beyond that required by Condition 10 in the Licence, rehabilitation necessary to comply with the 'standard' requirement of Condition 10 (in the absence of the Scheme) is also included, to estimate costs. The inclusion of the 'standard' rehabilitation together with the enhanced rehabilitation in this document allows the Scheme Regulator to distinguish and objectively determine the specific activities (and their associated costs) eligible for support under the Scheme.

Bord na Móna have defined the key rehabilitation outcome at Derryarogue Bog as environmental stabilisation, re-wetting and setting the bog on a trajectory towards development of naturally functioning peatland and wetland habitats.

Any consideration of any other future after-uses for Derryarogue Bog will be conducted in adherence to the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Bord na Móna are planning to develop a potential renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm. This project is currently in the pre-planning stages and is expected to be submitted for planning permission in summer of 2023. The wind farm planning boundary overlaps the Derryarogue Bog PCAS rehabilitation boundary in the south-eastern corner of the southern lobe. This area has been mapped as a constraint in the rehabilitation plan.

Document Control Sheet	
Document Name:	Derryarogue Bog Cutaway Bog Decommissioning and Rehabilitation Plan 2023
Document File Path:	Q:\Ecology Team\EPA draft rehab plans 2017 word docs\Mountdillon ref.504 (Lough Ree)\Derryarogue
Document Status:	Draft

This document comprises:	DCS	TOC	Text (Body)	References	Maps	No. of Appendices
	1	1	40	4	0	12

Rev. 0.1	Author(s):	Checked By:	Approved By:
Name(s):	SC	MMC	MMC
Date:	07/11/2022	09/01/2023	09/01/2023

Rev. 1	Author(s):	Checked By:	Approved By:
Name(s):			
Date:			
Rev. 1.1	**Author(s):**	**Checked By:**	**Approved By:**
Name(s):			
Date:			

Table of Contents

NON-TECHNICAL SUMMARY

- Bord na Móna is planning to rehabilitate part of Derryarogue Bog, located in Co. Longford.
- Industrial peat harvesting has now finished at Derryarogue Bog.
- This is happening as Bord na Móna are obliged to carry out peatland rehabilitation via an IPC License issued by the Environmental Protection Agency. In addition, the Government has agreed to support peatland rehabilitation via the establishment of the Peatland Climate Action Scheme (PCAS). This is funded via the Government and by Bord na Móna.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat (putting a "skin" back onto the peat), and minimising effects to downstream waterbodies. Derryarogue was drained in the past to allow peat production. Better results for water quality improvements, climate action, the reduction of carbon emissions and biodiversity are achieved when the remaining peat is re-wetted. This means drain-blocking and other measures to raise water levels to the surface of the bog and to encourage the natural colonisation of vegetation.
- In general, soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like Bog Cotton will thrive.
- Some small sections with deeper residual peat have the capacity to regrow *Sphagnum* moss again, where there are suitable hydrological conditions. *Sphagnum* is a key species for restoring naturally functioning raised bog conditions.
- Many Bord na Móna bogs cannot be restored back to raised bog in the short-term, as so much peat has been removed and the environmental conditions have been modified. However other peatland habitats with Heather, Bog Cotton, Rushes, Purple Moor-grass, Bog-mosses and scattered trees will develop, and in time a naturalised peatland can be restored.
- The development of a range of habitats in Derryarogue Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new peatland and wetland habitats.
- Derryarogue Bog was utilised for industrial peat production from 1952 until 2019. While milled peat production began at Derryarogue in 1964, industrial sod peat production commenced in 1952 to provide fuel to Unit 1 of Lanesborough Power Station. Initial drainage and removal of the acrotelm began in 1949.
- Part of the former cutaway area currently comprises bare peat with a mosaic of pioneer cutaway habitats already developing across the site. The environmental conditions of Derryarogue mean that wetland habitats (Reedbeds, fen, wet woodland, open water) will develop across the majority of the site in mosaic with Birch woodland developing the drier areas. Derryarogue has a pumped drainage regime.
- Measures proposed for Derryarogue Bog include drain blocking and additional measures required to raise water levels to the surface of the peat (bunding for example). Some fertiliser will be spread on headlands and other areas (a small part of the overall area) to encourage vegetation growth.
- Bord na Móna plan to carry out this work in 2023.
- These rehabilitation measures will be planned by a team consisting of expert ecologists, hydrologists and engineers. It is a guiding principle of Bord na Móna rehabilitation planning that no actions or activities will be undertaken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the bog via the existing outlets.

- It will take some time for vegetation and habitats to fully develop at Derryarogue, and a wetland/peatland ecosystem to be restored. However, it is expected that most of the bog will be developing pioneer habitats after 5-10 years.
- This is a peatland rehabilitation plan. Bord na Móna are planning to develop a potential renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm. The Wind Farm project is currently in the pre-planning stage and is expected to be submitted for planning permission in summer of 2023. In advance of a decision on the Derryadd Wind Farm, it is planned to rehabilitate **part** of Derryarogue Bog in 2023 that is not within the proposed wind farm boundary (see drawing number BNM-DR-24-06-01: Site Location Map and BNM-DR-24-06-05: Enhanced Rehabilitation Measures). The wind farm planning boundary overlaps the Derryarogue Bog PCAS rehabilitation boundary in 2 no. locations which have been mapped as a constraint in the rehabilitation plan. The remaining area of Derryarogue Bog will be rehabilitated as part of the Derryadd Wind Farm development or at a later date. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site.
- Longford County Council and Bord na Móna have developed a greenway or amenity walking/cycling track along the northern headland at Derryarogue Bog. This links two local access roads and to Knappoge Bog. This greenway and amenity track forms part of a wider proposal led by Longford County Council to develop a project called the Mid-Shannon Wilderness Park, which would develop amenity across BnM cutaway bogs. There are further proposals to create additional links and loops south through Derryarogue Bog and connecting to Derryadd Bog as part of an amenity plan for the proposed Derryadd Wind Farm. It is proposed by Bord na Móna that a significant part of this section of the amenity will be delivered as part of the proposed Derryadd Wind Farm Project in Derryarogue Bog.
- This is a peatland rehabilitation plan. This plan does not consider future after-use or development. Bord na Móna continually reviews its land-bank to consider future commercial or industrial developments. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the bog.
- Peatland rehabilitation of this bog will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.

1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon Bog Group (Ref. P0504-01) (see Appendix II for details of the bog areas within this Group). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Derryarogue Bog is located in Co. Longford.

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0504-01:

> "*The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area.*"

It also seeks to outline measures to optimise climate action and other ecosystem services benefits, mainly through hydrological management.

This plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status.
- Main issues and approaches to rehabilitation.
- Consultation to date with interested parties.
- Interaction with other policy and legislative frameworks (Appendix VI).
- The planned rehabilitation goals and outcomes.
- The scope of the rehabilitation plan.
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation.
- Proposed rehabilitation actions.
- Proposed timeframe to implement these measures.
- Budget and Costings.
- Associated aftercare, maintenance, and monitoring.

Note: This plan should be read in conjunction with the accompanying Map book.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). The additional costs of the Scheme will be supported by Government through the Climate Action Fund, and Ireland's National Recovery and Resilience Plan administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. Bord na Móna have previously identified a footprint of 33,000 ha as peatlands suitable for this scheme. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. The Scheme commenced in 2021.

Only the costs associated with the additional, enhanced, and accelerated rehabilitation, i.e. those measures which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the Scheme. Bord na Móna announced the complete cessation of industrial peat production across its estate in January 2021.

It is expected that the Scheme (PCAS) will have benefits accruing from biodiversity provision, water quality and storage attenuation as well as increased carbon storage, reduced carbon emissions and acceleration towards

carbon sequestration. The Scheme will also facilitate monitoring of carbon fluxes (Greenhouse Gases and fluvial carbon) in selected areas (in addition to other established Research programmes), to monitor changes in where the interventions will accelerate the trajectory towards a naturally functioning peatland ecosystem.

It is envisaged that the Rehabilitation Scheme will support activities, interventions, or measures across the Bord na Móna cutaway peatlands which accelerate the original timelines. Selected rehabilitation measures will take account of site environmental conditions, which can vary significantly. These measures potentially include:

- more intensive management of water levels through pump management, drain-blocking and cell bunding,
- re-profiling that will deliver suitable conditions for development of wetlands, fens and bog habitats,
- targeted fertiliser applications,
- seeding of targeted vegetation, and
- proactive inoculation of suitable peatland areas with *Sphagnum.*

These are collectively designed to optimise hydrological conditions (ideally and where possible water-levels <10 cm) for climate action benefits and to accelerate the trajectory of the site towards a naturally functioning ecosystem, and eventually a reduced carbon source/carbon sink again. In some areas of dry cutaway this trajectory will be significantly longer, and it is not feasible in the short-term to re-wet some areas. These areas will develop other habitats. The key to optimising climate action benefits is the restoration of suitable hydrological conditions and more intensive intervention means that the extent of suitable hydrological conditions can be optimised.

These measures are designed to encourage the development of peat-forming habitats, where possible. They are also designed to further slow the movement of water across the site (with the site acting similarly to a constructed wetland), slowing the release of water (improving local water attenuation) and water quality is also expected to improve as the site returns to a naturally functioning peatland ecosystem. It is anticipated that the combination of active enhanced rehabilitation measures and natural colonisation will quickly accelerate environmental stabilisation. Nevertheless, it will still take some time (30-50 years) for naturally functioning wetland and peatland ecosystems to fully re-establish.

The measures will also accelerate the development of new habitats for a range of species under pressure in the wider landscape and will have the potential to develop habitats (e.g. Annex I raised bog, wetlands that support wader water birds of conservation interest) that will contribute towards the delivery of national biodiversity objectives.

Parts of Derryarogue Bog are proposed to be part of this Scheme (PCAS) and this rehabilitation plan outlines the approach to be taken.

1.1 Constraints and Limitations

This document covers the area of **Derryarogue Bog** shown outlined by a black dashed line in the site location map (drawing number BNM-DR-23-06-01).

Industrial peat extraction at Derryarogue Bog permanently ceased in 2019, having commenced in 1952. Currently the cutaway area comprises a mosaic of pioneering cutaway habitats, wetland/open water, birch woodland and

bare peat, in addition to marginal[1] habitats. The former industrial production bog is surrounded by some typical marginal habitats of high local value including Birch woodland (WN7) along with some small parcels of remnant raised bog (PB1) which occurs in the wider area of the Derryarogue PCAS rehabilitation footprint. These parcels of high bog have never been subject to commercial peat extraction but have been subject to domestic turbary/turf cutting.

Only a small area of remnant high bog remains along the eastern margins of the northern lobe (outside but contiguous with the area owned and under the control of Bord na Móna). This remnant raised bog has been used by domestic turf cutters in the past to harvest peat and is almost exhausted, with only a small piece of vegetated remnant raised bog remaining. This area is ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned. It is beyond the scope of this rehabilitation plan to address turf cutting issues on Derryarogue Bog. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

This is a peatland rehabilitation plan. Bord na Móna are planning to develop a potential renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm (see Location | Derryadd Wind Farm). This proposed wind farm project is located within Derryarogue Bog as well as the adjacent Bord na Móna bogs of Derryadd, and Lough Bannow. Derryadd Wind Farm is currently in the pre-planning stage and is expected to be submitted for planning permission in the summer of 2023. In advance of a decision on the Derryadd Wind Farm planning permission, it is planned to rehabilitate **part** of Derryarogue Bog in 2023 that is not constrained by the proposed wind farm infrastructure (see drawing number BNM-DR-24-06-05: Enhanced Rehab Measures and BNM-DR-24-06-20: Standard Rehab Measures). The wind farm associated amenity trail overlaps the Derryarogue Bog PCAS rehabilitation boundary in two locations. These areas have been mapped as a constraint in the rehabilitation plan.

The remaining area at Derryarogue (the proposed wind farm area) will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into the proposed project, **or** will be completed in the event of an unsuccessful planning application. It is expected that Bord na Móna will revise and update the rehabilitation plan for Derryarogue when a decision is made in relation to planning permission for the Wind Farm. Bord na Móna remain fully committed to rehabilitating the whole bog and meeting the conditions of the IPC License. Any consideration of any other future after-uses for Derryarogue Bog will be conducted in adherence to the relevant planning guidelines, and consultation with relevant authorities, and will be considered within the framework of this rehabilitation plan.

There are known rights of way around the margins of Derryarogue Bog. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.

Longford County Council and Bord na Móna have developed a greenway or amenity walking/cycling track along the headland at the northern end of Derryarogue Bog. This amenity track is constrained from the rehabilitation plan. A section originally mapped along the southern boundary of the PCAS extent (the existing rail line corridor)

[1] Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, Birch woodland, cutover bog and raised bog remnants.

is not built. Future sections of further cycling and walking track will developed through the remaining sections of Derryarogue (outside the current PCAS extent) as part of the proposed Derryadd Wind Farm Project (see Location | Derryadd Wind Farm) and may in time link to the above.

A wayleave agreement (relating to a third party grid connection) is also in place in respect of the rail line corridor that forms the southern boundary of the PCAS extent; this will be unaffected by the measures currently proposed.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or archaeological features. There are currently known archaeological features present at Derryarogue Bog, which may constrain PCAS activities.

2. METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders and cognisance of the Scheme (PCAS). The development of this rehabilitation plan considered recently published guidance issued by the EPA in 2020 – '*Guidance on The Process of Preparing and Implementing a Bog Rehabilitation Plan*'.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits (covering the period 2011 to 2022 inclusive) and monitoring and desktop analysis forms the basis for the development of the rehabilitation plan for the bog, along with:

- Experience of 40 years of research on the after-use development and rehabilitation of the Bord na Móna cutaway bogs (Clarke, 2010; Bord na Móna, 2016);
- Significant international engagement during this period with other counties in relation to best practice regarding peatland rehabilitation and after-use through the International Peat Society and the Society for Ecological Restoration (Joosten & Clarke, 2002; Clarke & Rieley, 2010; Gann *et al*., 2019);
- Consultation and engagement with internal and external stakeholders;
- GIS Mapping;
- BNM drainage surveys;
- Bog topography and LIDAR data;
- Previous research studies on site;
- Hydrological modelling; and
- The development of a Methodology Paper outlining the Scheme (PCAS). This rehabilitation includes enhanced measures defined in the Methodology Paper which are designed to exceed the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Derryarogue Bog, in particular, optimising climate action benefits.

2.1 Desk Study

The desk study involved collecting all relevant environmental and ecological data for the study area. The development of the rehabilitation plan also takes account of research, experience and engagement with other peatland restoration and rehabilitation projects and peatland research including Irish, UK, European and International best practice guidance (full citations are in the References Section):

- Anderson *et al*. (2017). An overview of the progress and challenges of peatland restoration in Western Europe.

- Barry, T.A. *et al*. (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.
- Bonn *et al*. (2017). Peatland restoration and ecosystem services- science, policy and practice.
- Carroll *et al*. (2009). *Sphagnum* in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16.
- Clark & Rieley (2010). Strategy for responsible peatland management.
- Eades *et al*. (2003). The Wetland Restoration Manual.
- Farrell & Doyle (2003). Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland.
- Gann *et al*. (2019). International Principles and Standards for the practice of Ecological Restoration.
- Hinde *et al*. (2010). *Sphagnum* re-introduction project: A report on research into the re-introduction of *Sphagnum* mosses to degraded moorland. Moors for the Future Research Report 18.
- Joosten & Clarke (2002). Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making.
- Lindsay (2010). Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change.
- Mackin *et al*. (2017). Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service,
- McBride *et al*. (2011). The Fen Management Handbook (2011), Scottish Natural Heritage.
- McDonagh (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service.
- NPWS (2017a). National Raised Bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht.
- Pschenyckyj et al., (2021), Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity. An Fóram Uisce.
- Quinty & Rochefort (2003). Peatland Restoration Guide, second edition. Canadian *Sphagnum* Peat Moss Association and New Brunswick Department of Natural Resources and Energy.
- Regan*, et. al.* (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin.
- Renou-Wilson *et al*. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency.
- Schouten (2002). 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;
- Thom (2019). Conserving Bogs – Management Handbook.
- Wheeler & Shaw (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction.
- Wittram *et al*. (2015). A Practitioners Guide to Sphagnum Reintroduction. Moors for the Future Partnership.

Additional on-line resources were also incorporated into the desk study, including:

- Mountdillon Integrated Pollution Control Licence;
- Mountdillon Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;

- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- Historic Environment Viewer at https://webgis.archaeology.ie/historicenvironment/
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);
- Water Framework Directive catchments.ie/maps/ Map Viewer (www.catchments.ie);
- OPW Indicative Flood Maps (www.floodmaps.ie);
- CFRAM Preliminary Flood Risk Assessment (PFRA) maps (www.cfram.ie);
- River Basin Management Plan for Ireland 2022-2027
- Bord na Móna Annual Report 2021 and 2022.
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and are contacted during the rehabilitation planning process for their views. See Section 4.

2.3 Field Surveys

Bord na Móna carried out a baseline ecological survey of all of its properties in 2009-2012 and developed habitat maps. As part of this exercise, Derryarogue Bog was surveyed in 2012. Habitat maps were updated in 2017. A survey also took place in February of 2023, in advance of the preparation of this rehabilitation plan. Habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best practice guidance from Smith *et al.* (2011). Map outputs including all habitat maps and target notes were produced using GIS software application packages (ArcGIS). General marginal habitats and other habitats that had not been modified significantly by industrial peat extraction were classified using Fossitt *et al*. (2000). Plant nomenclature for vascular plants follows Stace (2019), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was previously developed for classifying pioneer cutaway habitats as Fossitt categories were deemed not to be detailed enough for cutaway bog (much of cutaway bog could be classified as Cutover Bog - PB4). Much of the pioneer cutaway vegetation is still at an early stage of its development and cannot be assigned to Fossitt Level 3 categories yet.

A detailed ecological survey report for Derryarogue Bog is contained in Appendix II.

3. SITE DESCRIPTION

Derryarogue Bog is located approximately three kilometres to the east of Lanesborough in County Longford. The PCAS extent of Derryarogue Bog is located within two main sections, a south-western (smaller) section (named locally as Cloonbony Bog) and a north-eastern section (Cloonbearla). It is part of the Mountdillon group (Lough Ree sub-group) of bogs. The River Shannon flows close to the western and northern margins of the bog.

The surrounding landscape is dominated by a mosaic of farmland, largely consisting of improved grassland, and other bogs, many owned and managed by Bord na Móna. A long section of rail line to the west of the site connects the Roscommon Bogs of the Mountdillon Bog Group to the ESB Power Station in Lanesborough. The N63 Longford to Roscommon Road is located to the south of Derryarogue bog, with access to the bog provided via local roads off the N63.

A tributary of the River Shannon flows close to the north-western edge of the bog (Kilnacarrow EPA code: 26K64). The Ballynakill_26 (EPA code: 26B22) flows along the north eastern boundary of the site before joining with the River Shannon.

Derryarogue Bog has been in industrial peat production since the 1950's therefore, much of the harvestable peat resource has been removed. The majority of the site has shallow residual peat. Gravel and other sub-soils are exposed in places across the site. Sections of Derryarogue that have come out of peat extraction in the past 20 years have been developing pioneer cutaway habitats (wetlands, Birch scrub and woodland). This has led to a patchy heterogeneous mosaic of pioneer habitats that reflect the peat production history and the underlying environmental conditions. Cloonbony (Derryarogue West) was used for industrial peat extraction until 2019 and there is more exposed bare peat in this section. Derryarogue Bog has a pumped drainage regime with four pumps within the PCAS footprint extent.

Bord na Móna propose to rehabilitate part of Derryarogue Bog in 2023. This includes Cloonbony Bog (Derryarogue West) and a northern section (Cloonbearla), separated from the main bog via a headland and industrial bog railway. See Drawing number BNM-DR-24-06-01: Bog Site Location, included in the accompanying Mapbook[2] , which illustrates the location of Derryarogue Bog in context to the surrounding area.

3.1 Status and Situation

3.1.1 Site history

Derryarogue Bog was used to supply the adjacent Lanesborough and subsequently Lough Ree ESB Power Station. Derryarogue Bog was in industrial peat production from 1952 to 2019. Much of the site was cutaway at various stages prior to 2019 with industrial peat extraction reducing on a phased basis, therefore cutaway habitats have been developing across the site for some time.

Numerous power lines cross the site and are in place to power the surface water drainage pumps that are located across the bog.

3.1.2 Current land-use

Bord na Móna are planning to develop a potential renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm (see Location | Derryadd Wind Farm). This wind farm project is in pre-planning

[2] Cutaway Bog Decommissioning and Rehabilitation Plan – Derryarogue Bog Map Book

stages and is expected to be submitted for planning permission in summer 2023. The wind farm associated amenity trail overlaps the Derryarogue Bog PCAS rehabilitation boundary in two locations which have been mapped as a constraint in the rehabilitation plan.

Longford County Council and Bord na Móna have developed a greenway or amenity walking/cycling track along the headland at the northern end of Derryarogue Bog. This amenity track is constrained from the rehabilitation plan. A section originally mapped along the southern boundary of the PCAS extent (the existing rail line corridor) is not built. Future sections of further cycling and walking track will developed through the remaining sections of Derryarogue (outside the current PCAS extent) as part of the proposed Derryadd Wind Farm Project (see Location | Derryadd Wind Farm) and may in time link to the above.

Several BnM industrial railways occur at the site. It is anticipated that this railway will be decommissioned when peat stocks are removed from neighbouring bogs.

Only a small area of remnant raised bog occurs along the margins of the Derryarogue. This bog remnant has been subject to drainage, associated with domestic turf cutting and the remaining peat is almost exhausted in this area.

3.1.3. Socio-Economic conditions

Bord na Móna has historically been a vital employer for the rural communities in the Irish Midlands. Bord na Móna compiled a report on the role of peat extraction in the midlands historically in which they report that in 1986, by the end of Bord na Móna's Third Development Programme, a total of twenty-three work locations had been established around the country. The company had an average employment of approximately 4,688 in the mid 1980's, with a peak employment of 6,100 during the production season, which placed it among the country's largest commercial employers. The importance of such levels of employment were largely due to its regional concentration in the Midlands and the lack of alternative employment opportunities in these areas at the time.

According to the Energy Crop Socio-Economic Study undertaken by Fitzpatrick Associates in 2011, there were an estimated 1,443 jobs supported by the peat-to-power industry in Ireland at the time, some 81% of which were located in the catchment areas of the three peat-fired generating stations (Lough Ree, West Offaly, and Edenderry Power Stations). These constituted jobs in the plants and in peat extraction, jobs indirectly supported in upstream supply industries and jobs induced through the trickle-down effects of the wages and salaries of those supported directly or indirectly. These job numbers have now declined with the cessation of peat extraction.

In respect of Derryarogue Bog, jobs included in the above study would have included those to facilitate extraction of peat at this site and associated processing and transfer to Lanesborough and subsequently Lough Ree power stations.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through several initiatives, including development and construction of local housing complexes, education bursaries, support of local sporting clubs, the provision of community gain funds, charity programmes and the provision and building of amenity areas.

Employment numbers have now declined following the cessation of peat extraction at this bog. It is anticipated that the scheme (PCAS) will provide some employment for a team of workers at this site for a period of time (> 1 year).

There are approximately 1400 people working in Bord na Móna at present, with approximately 225 roles directly involved in PCAS.

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The underlying geology[3] at Derryarogue Bog comprises Visean Limestones (undifferentiated). Quaternary sediment maps indicate that Derryarogue is primarily underlain by peat, with till derived chiefly from Limestone. The site is underlain with a mix of limestone till and marl/lacustrine clay sub-soils.

3.2.2 *Peat type and depths*

Much of Derryarogue Bog is now cutaway and the majority of the original raised bog has now been removed, with exposed sub-soils in places. Derryarogue is considered to be a shallow peat cutover bog, and in general between 0.5m - 1.5m of residual fen or minerotrophic peat remains. There are also some isolated pockets with residual peat of deeper than 2 m in the south-west of the site (Cloonbony).

3.3 Key Biodiversity Features of Interest

The majority of Derryarogue Bog comprises a mosaic of bare peat along with post-production habitats.

3.3.1 Current habitats

The most common habitats[4] present in the former production areas at Derryarogue include:

- Bare peat (0-50% cover) (BP)
- Pioneer *Juncus effusus* poor fen community (pJeff) with less frequent pioneer *Eriophorum angustifolium* (pEang) or *Carex rostrata* community (pRos) dominated poor fen.
- Willow-dominated scrub (in mosaic with *Juncus effusus* poor fen community) (in those areas that are flooded regularly)
- Permanent pools and lakes (OW) and temporary open water (TOW)
- Emergent *Betula*-dominated community (A) (eBir) and open *Betula*-dominated community (B) (oBir) (on drier higher ground that is not flooded)
- Dry *Calluna* community (dHeath) (mainly in mosaic with Birch scrub)
- Dry pioneer *Molinia caerulea* dominated grassland community (gMol)
- Access routes (Acc)
- Riparian zones (Rip) (with drains and associated habitats such as scrub and Birch woodland)
- Silt ponds (Silt) with *Ulex*-dominated scrub community/Birch scrub and *Molinia caerulea* dominated grassland community (gMol)

The most common habitats found around the margins of the site include:

- Raised bog (PB1)
- Cutover Bog (PB4)

[3] https://www.gsi.ie/en-ie/data-and-maps/Pages/Bedrock.aspx

[4] Codes refer BnM classification of pioneer habitats of production bog

- Scrub (WS1)
- Wet (callows-type) grassland (GS4)
- Birch woodland (WN7)
- Dense Bracken (HD1)
- Improved grassland (GA1) where boundary extends into adjacent fields

See Drawing number BNM-DR-24-06-17 titled **Derryarogue Bog: Current Habitat Map**, included in the accompanying Mapbook, which illustrates the habitats at Derryarogue Bog.

Photos of Habitats at Derryarogue (2023)

Wetland with Phragmites australis reedbed community (pPhrag) in the NW of Derryarogue.

Wetland/open water at the SW corner of the northern lobe of Derryarogue.

Mature Birch woodland (BirWD) in the northern lobe of Derryarogue with pioneer Molinia caerulea-dominated community and bare peat in the foreground.

Bare peat and pioneer vegetation in the SW of the northern lobe.

Photos of Habitats at Derryarogue (2023)	
	
Cutover dominated by bare peat and pioneer vegetation to the south of the southern lobe.	*Cutover dominated by bare peat and pioneer vegetation with Birch woodland (BirWD) in the background, to the east of the southern lobe.*

Table 1: Photos of Habitats at Derryarogue Bog (February 2023).

3.3.2 Species of conservation interest

A number of species of conservation concern utilize the habitats available at Derryarogue Bog. The following is a summary of the records of these species available within both BnM records and those of the National Biodiversity Data Centre, along with records from a previously compiled (2019) Ornithology Chapter in respect of a former application for planning permission (Planning Ref: PA14.303592) in respect of Derryadd Wind Farm[5].

- Multiple mammal species have been recorded on or in close proximity to the bog including Badger (*Meles meles*), Red Fox (*Vulpes vulpes*), West European Hedgehog (*Erinaceus europaeus*), Pine Marten (*Martes martes*), Irish Stoat (*Mustela erminea subsp. hibernica*), Irish Hare (*Lepus timidus subsp. hibernicus*), European Rabbit (*Oryctolagus cuniculus*), European Otter (*Lutra lutra*), Eurasian Red Squirrel (*Sciurus vulgaris*), Eurasian Pygmy Shrew (*Sorex minutus*), and the invasive species American Mink (*Mustela vison*) and Eastern Grey Squirrel (*Sciurus carolinensis*).
- Marsh Fritillary (*Euphydryas aurinia*) butterfly has been recorded on Derryarogue Bog (outside of the PCAS footprint). This species is using calcareous grassland (GS1) in Derryarogue Island – a mineral island located east/south-east of the PCAS rehabilitation footprint.

Derryadd Wind Farm EIAR Bird Records

A review of the 2019 Environmental Impact Assessment Report (EIAR) Ornithology Chapter for the previous Derryadd Wind Farm proposal (Planning Ref. No. ABP-303592-19) was also undertaken. The below paragraphs provide a summary of the bird species of conservation concern recorded during the baseline surveys to inform the above.

Five Red Listed (BoCCI) species were recorded within the boundary of Derryarogue during dedicated bird surveys for the proposed development. These species include; Snipe, Golden Plover, Woodcock, Meadow Pipit and Kestrel. Eight Amber List species (BoCCI) were recorded, including; Black-headed Gull, Lesser Black-backed Gull, Ringed plover, Common Gull, Short Eared Owl, Cormorant, Mallard and Mute Swan. A number of additional Green listed target species recorded included Peregrine Falcon, Buzzard, Sparrowhawk, Little Egret and Grey Heron. Three of these species are also listed on Annex I of the EU Birds Directive, namely; Golden Plover, Peregrine Falcon and Little Egret.

Surveys in the wider Derryadd Wind Farm study area (Derryadd, Lough Bannow), outside the boundary of Derryarogue bog also recorded additional Red Listed (BoCCI) species including Curlew, Redshank, Herring gull, Grey wagtail, Lapwing and Wigeon. The results of the breeding bird surveys (2015, 2016 and 2017) undertaken in the wider wind farm study area also recorded several additional Red List species (BoCCI), including; Woodcock, Curlew, Lapwing and Quail. A number of species recorded during the winter months in the wind farm study area are listed on Annex I of the EU Birds Directive, namely; Golden Plover, Greenland White-fronted goose, Hen Harrier, Kingfisher, Merlin and Peregrine Falcon. Golden Plover, Hen Harrier, Merlin and Peregrine Falcon were also recorded during breeding season surveys along with Common Tern and Little Egret.

It should be noted that much of the wildfowl, wader and gull observations recorded as part of the ornithological study were associated with the River Shannon and associated wet grasslands to the north of the area.

[5] Tobin, 2019, Derryadd Wind Farm Environmental Impact Assessment Report (EIAR), Volume II, EIAR Main Report.

BNM Ecology Survey Records

During the most recent ecological survey in February 2023 the following bird species of conservation interest were recorded at Derryarogue; red listed species Snipe (*Gallinago gallinago*), Golden Plover (*Pluvialis apricaria*), Lapwing (*Vanellus vanellus*), and Woodcock (*Scolopax rusticola*). In addition, Annex I species Hen Harrier (*Circus cyaneus*), Whooper Swan (*Cygnus cygnus*) Little Egret (*Egretta garzetta*) was also recorded utilising the bog.

3.3.3 Invasive species

The invasive species American Mink (*Mustela vison*) has previously been recorded from Derryarogue Bog. There are no other BNM records for high impact invasive species recorded from the bog.

A broad range of common garden escapes are occasionally present around the margins of Bord na Móna bogs, and although spatial overlap with the PCAS is expected to be limited, these are, where necessary, to be treated in line with best practice during PCAS activities.

3.4 Statutory Nature Conservation Designations

There are a number of European Sites in close proximity (i.e. within a 5km radius at minimum) to Derryarogue Bog.

Lough Ree SAC (site code: 000440) lies approximately 1.5 km south-west of Derryarogue Bog. The qualifying interests of Lough Ree SAC include Natural eutrophic lakes with *Magnopotamion or Hydrocharition* - type vegetation [3150] Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites) [6210], Active raised bogs [7110], Degraded raised bogs still capable of natural regeneration [7120], Alkaline fens [7230], Limestone pavements [8240], Bog woodland [91D0], Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae*) [91E0] and *Lutra lutra* (Otter) [1355].

Lough Ree SPA (Site code: 004064) lies approximately 1.5 km south-west of Derryarogue Bog and overlaps Lough Ree SAC. This SPA is designated for a variety of waterfowl and waders and wetland habitat [A999]. Lough Ree is also designed at a pNHA (site code: 000440).

Lough Forbes Complex SAC (site code: 001818) lies 4.6 km north-east of Derryarogue Bog. This EU site is designated for Natural eutrophic lakes [3150], Active raised bogs [7110], Degraded raised bogs still capable of natural regeneration [7120], Depressions on peat substrates of the *Rhynchosporion* [7150] and Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0].

Ballykenny-Fisherstown Bog SPA (site code: 004101) lies 4.6 km north-east of Derryarogue Bog and overlaps Lough Forbes Complex SAC. This SPA is designated for Greenland White-fronted Goose (*Anser albifrons flavirostris*) [A395].

A number of NHA's (Natural Heritage Areas) and pNHA's (Proposed Natural Heritage Areas) also occur within 5km of Derryarogue Bog including:

- Lough Bannow pNHA (Site code: 000449) lies 146.9 m south
- Lough Ree pNHA (site code: 000440) lies 1.5 km south-west
- Royal Canal pNHA (site code: 002103) lies 2.7 km east
- Lough Forbes Complex pNHA (site code: 001818) lies 4.6 km north-east

- Cordara Turlough pNHA (site code: 001821) lies 5.5 km south

3.4.1 Other Nature Conservation Designations

The Ramsar Convention entered into force in Ireland on 15th March 1985. Ireland currently has 45 sites/wetlands designated as Wetlands of International Importance (Ramsar Sites). These cover a surface area of 66,994ha.

There are no Ramsar sites in close proximity to Derryarogue Bog.

3.5 Hydrology and Hydrogeology

Derryarogue Bog lies in the Shannon (Upper) catchment (Catchment ID: 26C), the Shannon (Upper) sub-catchment (Catchment ID: 26C), as defined by the EPA under the Water Framework Directive (WFD).

There are several drains/channelised streams around the margins of the site that drain the site. Ballynakill (EPA Code: 26B22) flows northerly along the eastern bog boundary. The Kilnacarrow Stream (EPA Code: 26K64), flows in a northerly direction along the western boundary of the bog.

Derryarogue Bog has a pumped drainage regime. There are four pumps located on site.

Hydrological modelling (BNM-DR-24-06-09: Depression analysis) indicates that parts of the bog are in a natural basin with significant potential for re-wetting, with the assumption that all drains would be blocked. It is likely that a portion of the basins in target areas will re-wet with deeper water, creating a mosaic of wetland habitats, when drains are blocked.

Regional hydrological data suggest that Derryarogue (North) receives average precipitation of 959mm/yr (1981-2010), with an estimated annual effective precipitation rate of 552.1mm/yr based on GSI data. The GSI also estimate a recharge rate of 22.1mm/year. This is considered to be an underestimate for the elevated mounds of limestone till, where a more likely estimate of recharge would be 60mm/year. In contrast, the low-lying topographic basins with shallow peat (<1.5m) are expected to receive groundwater inputs, estimated to be up to 50mm/year. Therefore, the available precipitation that may become runoff (assuming no change in storage) is estimated to range from 492.1mm/yr – 602.1mm, which equates to an annual runoff rate of c. 4,921m^3/ha – 6,021m^3/ha. This highlights that the low-lying topographic basins will retain adequate water throughout the year, with the level of outfalls being the main control on water levels. However, the small sections of the bog that are elevated, steeply sloping and underlain by limestone till will be extremely difficult to rewet and are likely to remain dry.

GSI data indicates that Derryarogue Bog is entirely underlain by visean limestones (undifferentiated), which is classified as a regionally important aquifer - karstified (conduit).

Geological Survey of Ireland (GSI) mapping identifies several karst features (enclosed depressions) approximately 1.6km east of the bog. No data exists concerning depth to bedrock, however, there is a small area of bedrock in close proximity to the bog.

An aquifer is an underground body of water-bearing rock or unconsolidated materials (gravel or sand) from which groundwater can be extracted in useful amounts. GSIs Aquifer classes are divided into three main groups based on their resource potential, and further subdivided based on the type of openings through which groundwater flows. There are nine aquifer categories in total. Locally important aquifers are capable of supplying locally important abstractions (e.g. smaller public water supplies, group schemes), or good yields (100-400 m3/d). This data gives an indication of sub-surface deposits (bedrock and unconsolidated materials) in terms of their groundwater resource potential and dominant groundwater flow type.

Regionally important aquifers are those in which the network of fractures, fissures and joints, through which groundwater flows, is well connected and widely dispersed, resulting in a relatively even distribution of highly permeable zones. There is good aquifer storage and groundwater flow paths can be up to several kilometres in length. There is likely to be substantial groundwater discharge to surface waters ('baseflow') and large (>2,000 m3/d), dependable springs may be associated with these aquifers.

The entirety of the bog is located in an area mapped by GSI as of low groundwater vulnerability (GSI Mapviewer). Groundwater vulnerability for the area surrounding Derryarogue Bog is generally of low/moderate vulnerability. Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability maps are based on the type and thicknesses of subsoils (sands, gravels, glacial tills (or boulder clays), peat, lake and alluvial silts and clays), and the presence of karst features. Groundwater is most at risk where the subsoils are absent or thin and, in areas of karstic limestone, where surface streams sink underground at swallow holes. These data indicate there is generally low risk of any groundwater contamination occurring at this site. Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

3.6 Emissions to surface-water and watercourses

Drainage is an important feature of industrial peat production and there were extensive field drains maintained throughout bog areas to facilitate industrial peat production annually, each of which eventually drains into a terminal silt pond that allows for settlement of suspended solids before entering the main river systems. In accordance with the existing Integrated Pollution Control licence, all drainage water from boglands in a licensed area is discharged via an appropriately designed silt pond treatment arrangement as required in Condition 6.6. of the licence. Industrial peat production has now permanently ceased at Derryarogue Bog.

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed.

Derryarogue Bog has eight treated surface water outlets from previously active peat extraction catchments, which discharge to the River Shannon direct (IE_SH_26S021600 SHANNON (Upper)_100) and the Ballynakill River (IE_SH_26B220790 BALLYNAKILL_010). The River Shannon was listed as being under pressure from peat extraction in the 2nd cycle of the River Basin Management Plan for Ireland and is indicated as remaining so in the third cycle which is currently in preparation.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the accompanying structures map along with water quality map. See Drawing number BNM-DR-24-06-02: Structures and Sampling, along with Drawing number BNM-DR-24-06-WQ01: Water Quality Map included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Derryarogue Bog.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the

National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

The main emission limit value (ELV) associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 1.42mg/l and COD 100mg/l.

From an analysis of any results over number of years of the IPC licence environmental monitoring of some of the discharges from this bog, these indicate that results were under the Emission Limit Value for Suspended Solids, broadly under the trigger level for Ammonia and under the trigger level for COD, excepting an occasion in 2016.

Ammonia averaged 0.560mg/l and ranged from 0.025 to 0.766 mg/l with Suspended Solids ranging from 2 to 12 mg/l and averaging 4.91 mg/l.

Table 3.1. Decommissioning and Rehabilitation Programme Water Quality Monitoring.

Bog	SW	Monitoring	pH	SS	TS	Ammonia	TP	COD	Colour
Derryarogue	SW-35	Q2 21	8	2	310	0.046	0.05	45	135
Derryarogue	SW-36	Q2 21	7.7	11	389	0.766	0.06	53	240
Derryarogue	SW-37	Q2 21	6.6	2	165	0.43	0.05	80	434
Derryarogue	SW-38	Q2 21	7.3	2	164	0.042	0.05	70	322
Derryarogue	SW-39	Q2 21	No Flow						
Derryarogue	SW-40	Q2 21	7.4	2	242	0.025	0.05	64	228
Derryarogue	SW-41	Q2 21	5.7	3	101	0.251	0.05	84	398
Derryarogue	SW-41A	Q2 21	6.5	2	131	0.592	0.05	72	281
Derryarogue	SW-42	Q2 21	7.4	2	173	0.042	0.05	54	243
Derryarogue	SW-43	Q2 21	No Flow						
Derryarogue	SW-47	Q2 21	7.7	2	279	0.073	0.11	63	240
Derryarogue	SW-35	Q4 18	7.4	5	398	0.35	0.05	58	281
Derryarogue	SW-36	Q4 18	7.1	5	210	0.39	0.05	77	260
Derryarogue	SW-37	Q4 18	7.2	5	338	0.57	0.05	63	164
Derryarogue	SW-38	Q4 18	7.6	5	490	1.1	0.05	62	96
Derryarogue	SW-39	Q4 18	7.4	5	242	1	0.05	78	241
Derryarogue	SW-40	Q4 18	5.7	5	286	0.77	0.05	54	173
Derryarogue	SW-41	Q4 18	7	5	364	0.69	0.05	51	107
Derryarogue	SW-41A	Q4 18	0.05	12	410	1.5	0.05	77	157
Derryarogue	SW-42	Q4 18	7.2	5	240	0.11	0.05	91	281
Derryarogue	SW-43	Q4 18	7.6	5	425	0.1	0.05	79	157
Derryarogue	SW-47	Q4 18	No Flow						
Derryarogue	SW-35	Q3 16	6.7	6	150	0.07	0.46	115	301
Derryarogue	SW-36	Q4 16	7.5	12	420	2.9	0.01	58	45
Derryarogue	SW-40	Q2 15	No Flow						
Derryarogue	SW-41	Q2 15	No Flow						
Derryarogue	SW-41A	Q2 15	No Flow						
Derryarogue	SW-42	Q2 15	7.6	5	240	0.14	0.14	60	100
Derryarogue	SW-43	Q2 15	8	5	387	0.2	0.05	24	95
Derryarogue	SW-47	Q3 15	7.3	5	164	1.3	0.05	63	236

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need

for further silt control measures. This site is already vegetated in some areas. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al.*, 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al.*, 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Derryarogue has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of downstream water bodies.

Decommissioning and Rehabilitation Programme Water Quality Monitoring.

The licence obligation of quarterly sampling regime on a selected number of ponds to be sampled over a 3 year cycle would not be sufficient to be able to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation programme, so this sampling regime will occur on a monthly basis.

To assist in monitoring surface water quality from this bog, it was agreed to increase the existing licence monitoring requirements of the IPC Licence, to sampling for the same parameters every month.

This new sampling programme commenced in November 2020 and is enabling a baseline to be established, with sampling to progress during the scheduled works, and for a period of up to 2 years post rehabilitation. Depending on the period required to confirm that the main two parameters, suspended solids and ammonia as remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration, the monitoring programme and intensity will be periodically reviewed and amended.

Initial monthly results are included in Appendix XIII for Derryarogue bog. These results cover the period from November 2020 to December 2022 and are from the surface water outlet from the sections of bog to be rehabilitated in 2023. Peat extraction ceased in this bog in 2020 and as expected some of the key water quality parameters that can impact water quality from peat extraction activities, remain on a relatively static trajectory, with suspended solids indicating a very slight upward trend during the, but well below any limits of concern. During this period ammonia had a mixed trend across the site with some slight upward trend for SW35, downward trend for SW 36 and results did not indicate any significant increase or decrease for SW37 during the 24 months of sampling, with all other parameters fluctuated slightly, most likely influenced by normal weather patterns, including rainfall.

Monthly ammonia concentrations from both bogs from November 2020 to November 2022 had a range of 0.005 to 1.17 mg/l with an average of 0.182 mg/l. Results for suspended solids for the same period indicate a range of 2 to 8mg/l with an average of 2.57 mg/l.

In the preparation of this monitoring programme, Bord na Mona have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their monitoring programme and these are included in the Water Quality Map.

This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.

Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD.

These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.

The parameters to include as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.

Success criteria:

The key water quality success criteria associated with this enhanced rehabilitation are as follow:

- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that any At Risk classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

As the monthly monitoring program at Derryarogue Bog continues in 2023 and during the rehabilitation works planned for 2023, with data from the 2022 monitoring program, further trending will be produced to verify any ongoing trends.

In the preparation of this monitoring programme, Bord na Móna have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2022 monitoring programme and these are included in the Water Quality Map.

This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.

This enhanced monitoring programme will aim to include a minimum of 70% of a bog's drainage catchments, whatever number of surface water outlets these include.

Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.

The parameters to be included as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. This site is largely bare peat. Re-wetted peat also aids the primary objective of stabilizing peat, as when peat is re-wetted it is not vulnerable to wind erosion. Re-wetted peat and the development of wet peatland habitats can also act as sinks for silt and mobile peat, and increases additional retention time for solids, and the peatland vegetation can quickly stabilise this material within blocked drains on site (by acting like constructed wetlands).

Water quality of water discharges from restored peatlands normally improves as a result of bog restoration measures and the restoration of natural peatland processes (Bonn *et al.*, 20017). Bog restoration is also expected to improve water attenuation of the site as the drains are blocked, slowing water movement and water release from the site. Restored peatlands help slow the release of water and aid the natural regulation of floods downstream (Minayeva *et al*., 2017). The National River Basin Management Plan (NRBMP) 2018-2021 (DHPCLG, 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). The NRBMP outlines how key actions such as the Bord na Móna peatland rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Derryarogue Bog has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key water receptors; tributaries of the River Shannon and the Upper Shannon Catchment.

3.7 Fugitive Emissions to air

None.

The bog is no longer in industrial peat production. Rehabilitation of the cutaway peatland will seek to re-wet the dry peat where possible and re-vegetate all areas (whether wet or dry). Collectively, ceasing industrial peat production, re-wetting and re-vegetating will minimise any risk of emission to air from dust.

3.8 Carbon emissions

Irish peatlands are a huge carbon store, containing more than 75% of the national soil organic carbon (Renou-Wilson *et al.* 2012). Peatland drainage and extraction transforms a natural peatland which acts as a modest carbon sink (taking in 0.1 to 1.1 t of carbon as CO2-C /ha/yr) into a cutaway ecosystem which is a large source of carbon dioxide (releasing 1.3 to 2.2 t of carbon as CO2-C /ha/yr) based on Tier 1 Emission factors (Evans *et al*. 2017). Renou-Wilson *et al.* (2018) reported losses of between 0.81 – 1.51 CO2-C /ha/yr from drained peatlands located in Ireland.

Re-wetting of dry peatlands will increase methane emissions (Gunther *et al*. 2020) as a consequence of the anoxic conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates. Tanneberger *et al.* (2021) describes how peatland management has to choose between CO2 emissions from drained peatlands or increased methane (CH4) emissions from rewetted industrial peatlands. However, when radiative effects and atmospheric lifetimes of both GHG gases are considered and modelled, postponing rewetting increases the long-term warming effect of continued CO2 emissions (Gunther *et al*. 2020). This means the increase in methane due to rewetting of dry peatlands is still negated by the CO2 emissions reductions. Further, Wilson *et al.* (2022) confirmed the benefit of rapid rewetting to achieve strong carbon reductions and potentially altering the warming dynamics from warming to cooling depending upon the climate scenario.

It is expected that Derryarogue Bog will become a reduced carbon source following rehabilitation. The potential of any cutaway site to develop as a carbon sink in the longer-term depends on the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Much of this bog is expected to develop wetland habitats on shallow peat with open water, reed swamp and fen habitats with alkaline emission factors and a smaller proportion will develop as regenerating wet deep peat vegetation on deep peat areas. Birch woodland is expected to develop on the drier mounds and along peripheral headlands.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

The majority of Derryarogue Bog can be rated as **Local Importance; lower value to Local Importance; higher value.** Bare peat and other intensively managed areas are assessed as **local importance (lower value)**. Marginal habitats including wetland, woodland, scrub, pioneer cutaway habitats and bog remnant may act as a refuge and as ecological corridors for wildlife and are therefore deemed to be **locally important (higher value)**.

4. CONSULTATION

4.1 Consultation to date

Consultation seeks to engage an audience of relevant stakeholders at both a national and local level. National stakeholders have been identified from varied bog restoration and rehabilitation efforts undertaken by Bord na Móna over the past 40 years, with particular emphasis on engagement with stakeholders during their Biodiversity Action Plan programme, since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit.

There has been ongoing consultation about the proposed wind farm development, rehabilitation, biodiversity and other general issues at Derryarogue Bog in relation to the proposed Derryadd Wind Farm (Bord na Móna Wind Farm | Derryadd Wind Farm). Specific consultation relating to the wind farm development and associated amenity development is not listed here, although there has been detailed consultation with stakeholders in relation to these issues and overlap with rehabilitation and biodiversity.

There has been ongoing consultation about rehabilitation, biodiversity and other general issues over the years about Mountdillon bog group, including Derryarogue Bog, with various stakeholders in relation to:

- General consultation with range of stakeholders at annual Bord na Móna Biodiversity Action Plan review days 2010-2018.
- Longford Wetland Wilderness (general proposal led by Longford County Council and other stakeholders. This has had several iterations. See Lough Ree and Mid Shannon, Spirit Level 2017. A feasibility study for Longford County Council).
- Feehan, J. (2004) A Long-Lived Wilderness; the future of the north midlands peatland network UCD/NWWPC.
- Lauder, A. & O'Toole L. (2017). Concept development for a landscape-scale Wetland Wilderness Park in the Mid Shannon Region. A report funded by the Heritage Council's Heritage Grant Scheme.
- Foss, P.J., Crushell, P. & Gallagher, M.C. (2017). Counties Longford &Roscommon Wetland Study. Report prepared for Longford and Roscommon County Councils.
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Sub-committee on Shannon Flooding Work Programme and Measures (OPW, Waterways Ireland, ESB, LA's, Fisheries Ireland, NPWs etc.).
- Greenway development at Derryarogue (Longford County Council).

To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Derryarogue Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will been sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Derryarogue Bog or the programme in general (see Appendix XI).

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Derryarogue Bog Rehabilitation Plan will contain a review of the consultation. To inform the current Plan, both national and local stakeholders, including neighbours whose land adjoins Derryarogue Bog and local representatives of national bodies (such as Regional National Parks and Wildlife Service staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any

identified local interest groups will be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified invited to submit their comments or observations in relation to the proposed rehabilitation at Derryarogue Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Derryarogue Bog Rehabilitation Plan will contain a review of the consultation.

4.2 Issues raised by Consultees

N/A Yet as consultation has not commenced.

4.3 Bord na Móna response to issues raised during consultation

N/A Yet as consultation has not commenced.

5. REHABILITATION GOALS AND OUTCOMES

The rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving waterbodies that have been classified as *At Risk* from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Optimising hydrological conditions for **climate action benefits as part of PCAS**.
- Optimising hydrological conditions for the development of reed swamp and fen on shallow more alkaline peat and other subsoils, or *Sphagnum*-rich regenerating wet deep peat vegetation communities on deep residual peat, where present.
- Supporting ongoing and potential future renewable energy, amenity, and other land-uses. Integrating rehabilitation measures with current amenity infrastructure on site. It is not proposed to carry out any rehabilitation actions to change or negatively affect any infrastructure.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

The rehabilitation goals and outcomes take account of the following issues.

- It will take some time for stable naturally functioning habitats to fully develop at Derryarogue Bog. This will happen over a longer timeframe than the implementation of this rehabilitation plan.
- Re-wetting residual peat will initially maintain and enhance the carbon storage capacity of the bog. There is scientific consensus that restoration of hydrology in damaged bog can improve carbon storage, water storage and attenuation and help support biodiversity both on the site and in the catchment (See Section 3.8). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source. In time, the site has the capacity to develop in part as a carbon sink. PCAS is expected to deliver significant contributions to Ireland's climate action.
- It is not expected that the site has the potential to develop active raised bog (ARB) analogous to the priority EU Habitats Directive Annex I habitat within the foreseeable future (c.50 years). Furthermore, the majority of the bog is shallow peat and only a small proportion of the bog has potential to develop *Sphagnum*-rich habitats in this timeframe. Nevertheless, re-wetting across the entire bog, as part of the Scheme, will improve habitat conditions of the whole bog. Other peatland habitats will develop in a wider mosaic that reflects underlying conditions.
- Rehabilitating former industrial peat production bog will also in the longer-term support other ecosystem services such as such the development of new habitat to support biodiversity and local attenuation of water flows from the bog.
- WFD status in receiving water bodies can be affected by peatlands and peat extraction but is also affected by other sources such as agriculture. In addition, receiving water bodies that are assessed as At Risk from peatlands and from peat extraction are likely to have several contributary sources of impacts (private

peat extraction and Bord na Mona). Reducing pressures due to former peat extraction activities at Derryarogue Bog will contribute to stabilising or improving water quality status of receiving water bodies in general. Ultimately, improving the WFD status of the receiving water body will depend on reducing pressure from a range of different sources, including peatlands in general (private and Bord na Mona).

- Bord na Móna are also planning rehabilitation measures in some nearby bogs (e.g. Derryadd East, Derryshannoge) in 2023, and rehabilitation has taken place in several surrounding bogs in 2021/2022, including Begnagh, Clooneeny, Knappoge, Derrycashel and Derraghan bogs. There are expected to be cumulative water quality and other ecosystem service benefits to receiving water bodies from rehabilitating more than one bog in the same catchment.
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features. An Archaeological Impact Assessment (AIA) is to be carried out under the PCAS scheme.

6. SCOPE OF REHABILITATION

The principal scope of this enhanced rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Derryarogue Bog within the PCAS rehabilitation footprint (i.e. Cloonbony to the west and Cloonbearla to the NE).
- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area.
- The Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This scheme is designed to enhance the ecosystem services of Derryarogue Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilization is achieved (meaning IPC obligations are met) and, in addition, significant other ecosystem service benefits particularly for climate action will be accrued.
- The local environmental conditions of Derryarogue Bog mean that wetland creation along with some deep peat measures is the most suitable rehabilitation approach for this site. Derryarogue Bog has a pumped drainage regime and has small patches of residual deep peat along with larger areas of shallow cutaway and shallow cutaway areas that are already developing as wetland and Birch woodland.
- Bord na Móna have defined the key goal and outcome of rehabilitation at Derryarogue as **environmental stabilisation** of the site via **optimising climate action benefits, where possible**. The re-wetting of residual peat in the area recently out of peat extraction will be optimised, **setting the site on a trajectory towards the development of wetlands/Reed Swamp and fen on shallow more alkaline peat and other subsoils, and the development of peat-forming communities on residual deep peat, where possible.**
- The proposed Derryadd Wind Farm Project at Derryarogue Bog is a temporal constraint on the scope of rehabilitation. Phase 1 of the proposed rehabilitation will be completed in 2023 and the remaining area will be rehabilitated at a later date following conclusion of the planning and consequently construction of the wind farm, pending outcome of the planning process. See below.
- Rehabilitation of Derryarogue Bog will support multiple national strategies of climate action, biodiversity action and other key environmental strategies such was the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.

6.1 Key constraints

- **Bog conditions.** Rehabilitation outcomes of sites are constrained by the environmental characteristics of these particular areas. For example, there is potential for raised bog restoration at some sites where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other sites, most of the peat mass has been removed, the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status, etc.) and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland).
- The majority of Derryarogue is cutaway and has a pumped drainage system, meaning that wetland habitats are the most compatible habitat that can be developed in response to re-wetting. There are small areas of residual deeper peat remaining in the SW of Cloonbony.
- **Potential land-use.** Bord na Móna are planning to develop a potential renewable energy project at Derryarogue Bog as part of the proposed Derryadd Wind Farm. This wind farm project is in pre-planning

and is expected to be submitted for planning permission in 2023. In advance of a decision on the Derryadd Wind Farm planning permission, it is planned to rehabilitate **part** of Derryarogue Bog in 2023 that is not constrained by the proposed wind farm infrastructure. The PCAS rehabilitation footprint does not overlap wind generation infrastructure.

- The remaining area at Derryarogue (the proposed wind farm area) will be rehabilitated **either** in association with the proposed Derryadd Wind Farm Project, with peatland rehabilitation integrated into the proposed project, **or** will be completed in the event of an unsuccessful planning application. It is expected that Bord na Móna **will revise and update** the rehabilitation plan for Derryarogue when a decision is made in relation to the wind farm planning application. Bord na Móna remain fully committed to rehabilitating the whole bog and meeting the conditions of the IPC license. Phasing rehabilitation in this way has the potential to support additional climate action measures (integrating renewable energy).
- See Derryarogue Bog: Mapbook, which outlines the proposed cutaway footprint to be rehabilitated with PCAS enhanced rehabilitation measures (drawing number BNM-DR-24-06-05: Enhanced Rehab Measures and BNM-DR-24-06-20: Standard Rehab Measures).
- At this stage, it is not anticipated that any future potential land-use in the east side of the site will impact on the proposed rehabilitation in the western side of the site, as there is a natural hydrological break (the mineral island and the local access road).
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care has to be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.
- **Archaeology**. There are archaeological features present at Derryarogue Bog, which may similarly constrain PCAS activities. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. The rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future. Any newly discovered archaeology may require rehabilitation measures to be reviewed and adapted. An Archaeological Impact Assessment (Appendix XII) will be carried out to mitigate against any impact on archaeology that may be found at Derryarogue Bog. In the worst-case scenario works affecting the surface and sub-surface of the bog might disturb previously unknown archaeological deposits or artefacts without preservation by record taking place. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it will be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **Public Rights of Way**. There are known rights of way at Derryarogue Bog. Where a public right of way or similar burden exists on Bord na Móna property, consideration will be given to ensuring that this remain intact where possible. In some instances, depending upon previous land uses and management, alternative solutions may be required. These will be explored in consultation with local communities and statutory bodies during the consultation work associated with the decommissioning and rehabilitation work described here.
- **Turf-cutting.** A small area of remnant of high bog along the eastern margins, will not be subject to rehabilitation measures. This is largely due to turf cutting, and the small area that this parcel of land covers and the limited effectiveness of rehabilitation measures in this area. This area is ecologically and hydrologically linked to the area owned by Bord na Móna where rehabilitation is planned.

- Bord na Móna propose to develop a Wind Farm (Derryadd Wind Farm) on part of Derryarogue Bog (outside of the PCAS footprint). The proposed Derryadd Wind Farm also includes the adjacent bogs of Derryadd and Lough Bannow. Further details of this proposed development can be obtained at https://www.derryaddwindfarm.ie/.

6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project.
- It is expected that weather conditions will be within normal limits over the rehabilitation plan timeframe. Long periods of wet weather have the capacity to significantly affect ground conditions and constrain drain blocking and other ground activities.

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- Areas subject to turf cutting are excluded.
- The proposed Derryadd Wind Farm amenity track footprint is excluded from the PCAS footprint where they overlap.
- The longer-term development of stable naturally functioning habitats at Derryarogue Bog. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation and to respond to any needs.
- This plan is not intended to be an after-use or future land-use plan for Derryarogue Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.

7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what critical success factors are needed to achieve successful rehabilitation. All criteria used to indicate successful rehabilitation will be measured to validate the achievement of the rehabilitation goals and outcomes and validate the completion of the rehabilitation.

The key objective of this enhanced rehabilitation plan is **environmental stabilisation** and the stabilisation of any emissions from the site that related to the former industrial peat extraction activities.

Rehabilitation is generally defined by Bord na Móna as:

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation; and
- mitigation of key emissions (e.g. potential run-off of suspended solids).

In addition, Bord na Móna wish to optimise climate action and other ecosystem service benefits via enhanced rehabilitation measures.

7.1 Criteria for successful rehabilitation to meet EPA IPC licence conditions:

- Rewetting of residual peat in the former area of industrial peat production to offset potential silt run off and to encourage and accelerate development of vegetation cover via natural colonisation and reducing the area of bare exposed peat. See Table 7.1 for a summary of the criteria for successful rehabilitation and associated monitoring. The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed.
- That there is a stabilizing/improving concentration of suspended solids and ammonia in discharges from Bord na Móna sites, associated with the measures undertaken to stabilize the peat surface by the blocking of the internal drainage system and the maximized rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are At Risk from peatlands and peat extraction. The success criteria will be that the *At Risk* classification will see improvements in the associated pressures from this peatland or if remaining *At Risk*, that there is an improving trajectory in the pressure from this peatland.

With regard to predicting and estimating likely trends that might materialize or could be considered as a target, monitoring of surface water ammonia emissions from Longfordpass bog in Littleton over 3 years, post cessation of peat extraction with ongoing rehabilitation, were considered. These are indicating a downward trend in Ammonia concentrations (Figure 7.1).

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 4 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

As the monthly monitoring program at Derryarogue Bog continues in 2022/2023 during the rehabilitation measures planned for 2023, and data from the 2022 monitoring program is compiled, further analysis will be completed to identify any ongoing trends.

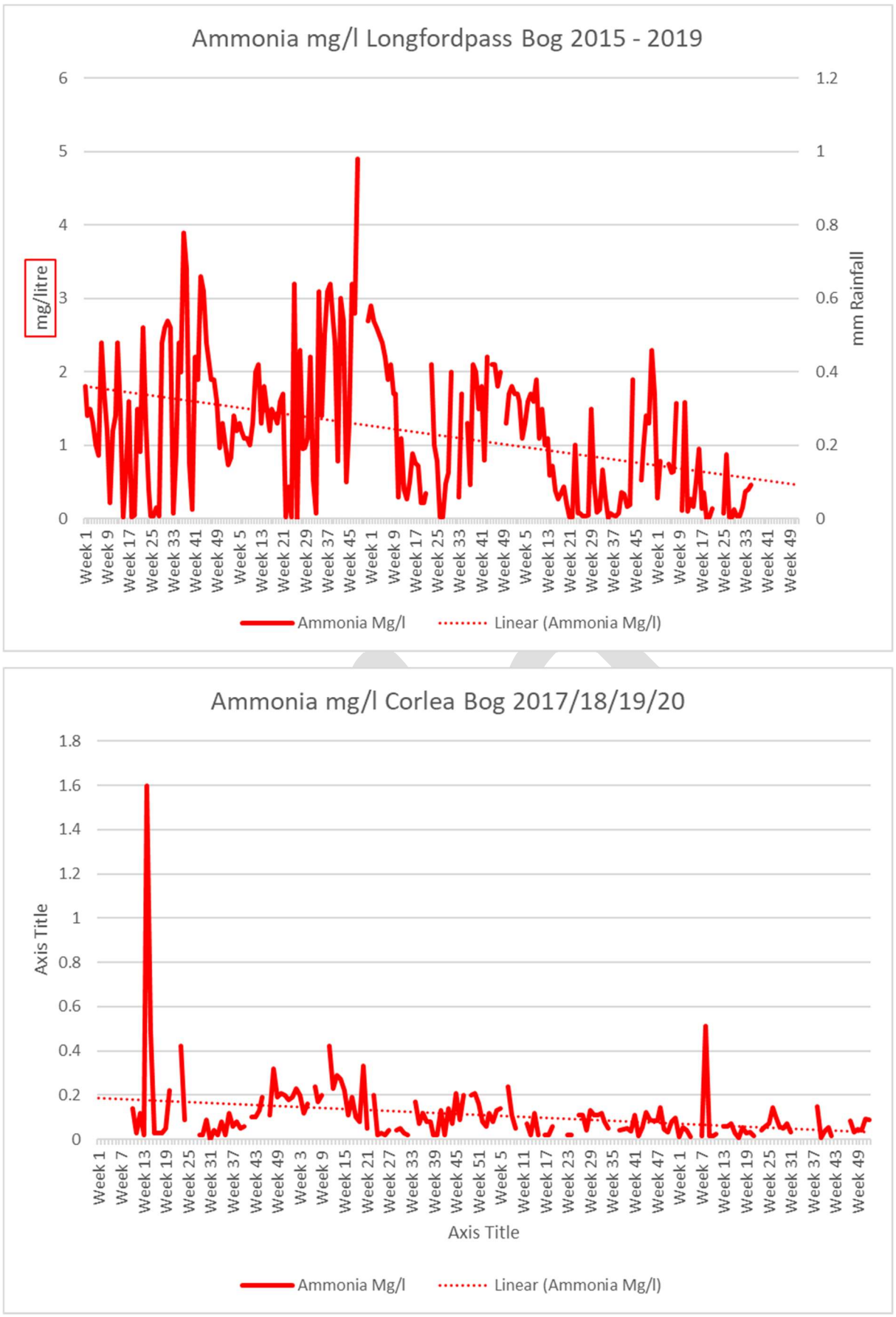


Figure 7.1. Ammonia levels over the period 2015-2019 at Longfordpass and the period 2017-2020 at Corlea.

Additional criteria for successful rehabilitation to optimise climate action and other ecosystem service benefits:

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising and maximising residual peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the bog towards becoming a reduced carbon source/carbon sink. This will be measured through habitat mapping and the development of cutaway bog condition assessment. This cutaway bog condition assessment will include assessment of environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels (similar to ecotope mapping). Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Reduction in carbon emissions. This will be estimated via a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including *Sphagnum*-rich regenerating wet deep peat vegetation communities, wetland, fen, reed swamp, heath, scrub, poor fen, and birch woodland, where conditions are suitable. Some of these habitats have already in part established as pioneer vegetation/wetlands. It will take some time for stable naturally functioning habitats to fully develop at Derryarogue Bog. This will be demonstrated and measured via aerial photography, habitat mapping and cutaway/habitat condition assessment. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Improvement in biodiversity and ecosystem services. This will be demonstrated by metrics outlined in Section 9.1 that can be used to measure changes in ecosystem services (e.g. water quality parameters, development of pioneer habitats, breeding bird monitoring). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.

Table 7-1 Summary of Success criteria, targets, how various success criteria will be measured and expected timeframes.

Criteria type	Criteria	Target	Measured by	Expected Timeframe
IPC validation	Rewetting in the former area of industrial peat production	Delivery of rehabilitation measures Reduction in bare peat.	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	2023-2025
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters associated with this bog	Water quality monitoring for a period after rehabilitation has been completed	2022-2024
IPC validation	Reducing pressure from peat production on the local water body catchment (WFD)	Where this section of the water body, that this bog drains to, has not been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body, confirms that its classification remains at not being at risk from peat extraction associated with activities at this bog.	EPA WFD monitoring programme	WFD schedule
Climate action verification	Optimising the extent of suitable hydrological conditions to optimise climate action	Optimal extent of suitable hydrological conditions	Aerial photography and Habitat mapping to map extent of suitable hydrological conditions. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and	2023-2025

Criteria type	Criteria	Target	Measured by	Expected Timeframe
			compared against this baseline.	
Climate action verification	Reduction in carbon emissions.	Reduction in carbon emissions	Carbon emissions – estimated using a bog condition assessment and appropriate carbon emission factors.	2023-2025
Climate action verification	Setting the site on a trajectory towards establishment of a mosaic of compatible habitats	Establishment of compatible cutaway habitats	Habitat map, Cutaway bog condition map Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.	2023-2025

Meeting climate action verification criteria and monitoring of these criteria after the scheme has been completed is dependent on support from the Climate Action Fund or other sources of funding. Note that monitoring and verification of the overall scheme will be stratified – not all these criteria will be measured at each individual site. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.

7.2. Critical success factors needed to achieve successful rehabilitation as outlined in the plan

The achievement of successful rehabilitation as outlined in the plan requires:

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.

- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best practice applied internationally in peatland management. Measures proposed in this plan have already been shown to be affective at other sites. Bord na Móna will apply a flexible and adaptable approach to the more innovative rehabilitation measures proposed in this plan**.** If measures are not initially effective, Bord na Móna will review any requirement for additional practical rehabilitation.
- **Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.** The development of naturally functioning semi-natural habitats on degraded bog takes time. It may take 30-50 years for active raised bog vegetation to re-develop on suitable cutaway that was previously bare peat. However, Bord na Móna experience has demonstrated the effectiveness of these type of measures for re-wetting bog and creating carbon sinks (Renou-Wilson *et al*. 2018).
- Rehabilitation measures have been designed to accelerate and work with natural colonisation and other natural processes. Bord na Móna experience of rehabilitation has shown that re-wetting improves conditions for natural colonisation and that natural colonisation is accelerated where the environmental conditions are most suitable. Rehabilitation measures have been designed to modify the conditions of areas within sites where conditions are less suitable for natural colonisation (modifying hydrology, topography, nutrient status or availability of potential seed sources).
- **Monitoring to be robust and effective.** Rehabilitation Monitoring will be established to validate the success of rehabilitation as required by Condition 10 of the IPC Licence and to verify the benefits of the proposed enhanced measures to optimise climate action. This will focus on a collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services.

8. REHABILITATION ACTIONS AND TIME FRAME

Peatland rehabilitation requires detailed planning and the use of data from desktop surveys and field surveys. This data in association with topographical and hydrological modelling will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Hydrological modelling indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

A number of illustrative figures have been produced to inform Rehab Planning and Design, including Aerial Photography, Peat Depths, LiDar Surface Maps, and Depression Analysis modelling; these are included in the accompanying Mapbook as the drawings referenced below:

BNM-DR-24-06-21 titled **Derryarogue Bog: Aerial Imagery 2020**

BNM-DR-24-06-04 titled **Derryarogue Bog: PeatDepths**

BNM-DR-24-06-03 titled **Derryarogue Bog: LiDAR Map**

BNM-DR-24-06-09 titled **Derryarogue Bog: Depression Analysis**

The rehabilitation actions themselves will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in drawing titled **BNM-DR-24-06-05 Derryarogue Bog: Rehabilitation Measures** in the accompanying Mapbook (note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.)

These enhanced measures for Derryarogue will include (see Table 8.1):

- Re-assessment of the pumping regime and removing pumps if this desired and has no significant external impact. A significant part of the site has already developed a mosaic of wetland habitats with deeper water. Hydrological modelling will look to optimise water levels. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal flooding regime will develop, with water-levels fluctuating in association with levels in the adjacent River Shannon.
- Intensive drain blocking and construction of berms in shallow peat areas/modelled depressions to create/promote the spread of wetland habitats,
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels,
- Re-alignment of piped drainage.
- Deep Peat measures including field re-profiling, resulting in bunded areas suitable for *Sphagnum* inoculation, on deeper peat;
- Targeted fertiliser applications to accelerate vegetation establishment on areas of **bare peat** on headlands and high fields, and within certain areas of dry cutaway. Areas where vegetation has established do not need fertiliser application.

- Initial hydrological modelling indicates that a small part of the site will develop a mosaic of wetland habitats with the potential for some deeper water. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some small sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage.

Table 8.1: Types of and areas for enhanced rehabilitation measures at Derryarogue Bog. Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

Type	Rehab Code	Enhanced Rehabilitation Measure	Extent (Ha)
Deep Peat	DPT3	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows.	5.40
	DPT4	Berms and field re-profiling (45x60m cell), blocking outfalls and managing overflows & drainage channels for excess water & *Sphagnum* inoculation.	7.42
Dry Cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	32.61
	DCT2	Regular drain blocking (3/100m), modifying outfalls and managing water levels with overflow pipes and targeted fertiliser treatment.	86.73
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway, modifying outfalls and managing water levels with overflow pipes	17.94
	WLT2	Turn off or reduce pumping to re-wet cutaway, modifying outfalls and managing water levels with overflow pipes and Targeted blocking of outfalls within a site.	16.97
	WLT3	Turn off or reduce pumping to re-wet cutaway, modifying outfalls and managing water levels with overflow pipes and Targeted modifying of outfalls within a site, constructing larger berms to re-wet cutaway transplanting Reeds and other rhizomes.	7.38
	WLT4	More intensive drain blocking (max 7/100 m), modifying outfalls and managing overflows, transplanting Reeds and other rhizomes.	117.76
Marginal land	MLT1	No work required.	22.27
Silt ponds	Silt pond	Silt ponds.	0.90
Constraint	Constraint	Other Constraints (Turf cutting, Amenity).	7.73
Archaeology	Arch	Togher	1.41
Total			329.55

8.1 Completed and ongoing

- A significant part of the site has already re-vegetating, with significant cover of pioneer vegetation developing a mosaic of typical cutaway peatland and wetland habitats. Natural re-colonisation of the cutaway so far has been quite effective. Bare peat areas within the cutaway parts of the site are shrinking as vegetation develops and consolidates.

8.2 Short-term planning actions (0-1 years)

- Seek formal approval of the enhanced plan, noting the alternative standard plan should funding from the Scheme not materialise from the EPA.
- Agree an *ex ante* budget of eligible costs (based on the approved enhanced plan) with the Scheme regulator.
- Develop a detailed site plan with engineering drawings outlining how the various rehabilitation methodologies (The Scheme PCAS) will be applied to Derryarogue Bog. This will take account of peat depths, topography, drainage, and hydrological modelling. (See map for an indicative view of the application of different rehabilitation methodologies).
- A drainage management assessment of the proposed enhanced rehabilitation measures will be carried out and any issues identified resolved and the rehabilitation plan adapted.
- A review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation will be carried out. The results of this assessment will be incorporated into the rehabilitation plan to minimise known archaeological disturbance, where possible.
- A review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements is to be carried out.
- A review of remaining milled peat stocks is to be carried out.
- An ecological appraisal of the potential impacts of the planned rehabilitation on the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) is to be carried out. The scheduling of rehabilitation operations will be adapted, where required.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment of the Rehabilitation Plan.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

8.3 Short-term practical actions (0-2 years)

- Carry out proposed measures as per the detailed site plan. This will include a combination of bunding and drain blocking on deep peat, and fertiliser application targeting bare peat areas of headlands, high fields and other areas (where required) in addition to wetland creation and management prescriptions. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined.
- While natural colonisation is expected to commence almost immediately once peat production ceases, Phase 2 actions will be carried out in targeted areas to accelerate re-vegetation and colonisation of target species. Phase 2 actions may include seeding of targeted vegetation and inoculation of *Sphagnum*.
- Silt ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent potential run-off of suspended solids from the site during the rehabilitation phase.
- Submit an *ex post* report to the Scheme regulator to verify the eligible measures to be carried out in year 1 of the Scheme, and an *ex ante* estimate for year 2 of the Scheme; and so on for each year of the Scheme.

8.4 Long-term (>3 years)

- Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- Delivery of a monitoring, aftercare and maintenance programme (See section 10.2 below).
- Decommissioning of silt-ponds will be assessed and carried out, where required.
- Reporting to the EPA will continue until the IPC License is surrendered.

8.5 Timeframe

- **2022-2023**: Short-term planning actions.
- **2023-2024**: Short-term practical actions.
- **2024-2025**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **2025**: Decommission silt-ponds, if necessary.

8.6 Budget and costing

Bord na Móna (BnM) appreciates the Minister's intention to support Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. *However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.*

The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna, 2022). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.

At this time, a 'standard' rehabilitation provision (sufficient to discharge the requirement of Condition 10 in the licence) has been be allocated to the site based on the area of different cutaway types across the site (See Appendix I).

9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

This programme for monitoring, aftercare and maintenance has been designed to meet the Conditions of the IPC Licence. This is defined as:

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- In order to assist in monitoring surface water quality from this bog, it is planned to increase the existing licence monitoring requirements to sampling for the same parameters to every month during the scheduled activities and for a period up to two years post rehabilitation, depending on the period required to confirm that the main two parameters, suspended solids and ammonia are remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration.
- Enhanced water quality monitoring will aim to include up to 70% of a bogs drainage catchments.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD and DOC.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime, but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation. In addition, DOC will be included as a parameter to try and identify any changes in carbon in the surface water.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of

rehabilitation measures but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.

- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment process and planning procedures.

Additional monitoring measures are also proposed to monitor ecosystem service benefits that have been derived by enhanced rehabilitation. These proposed monitoring measures will be funded by the proposed Climate Action Fund Scheme or additional other funding. Monitoring of climate action and other ecosystem service benefits will be designed to take account of the requirements of monitoring benefits of the overall Scheme and will be stratified; that is not all monitoring will be carried out in each site. These are defined as:

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment. This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels. It is proposed that sites can be monitored against this baseline in the future.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al.*, 2015) and are constantly being refined with more and more research. BnM is actively supporting research into GHG fluxes in different rehabilitated peatland habitats. This means that potential GHG emissions can be estimated from the site, as the site continues along its trajectory towards a naturally functioning peatland ecosystem.

9.2 Rehabilitation plan validation and licence surrender – report as required under condition 10.4

IPC License Condition 10.4. *A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment.*

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites EPA, 2012, when:

- The planned rehabilitation has been completed.
- The key criteria for successful rehabilitation have been achieved and key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

10. REFERENCES

Atherton, I, Bosanquet, SDS & Lawley, M (2010). Mosses and liverworts of Britain and Ireland - a field guide. British Bryological Society.

Anderson, R., Farrell, C., Graf, M., Muller, F., Calvar, E., Frankard, P., Caporn, S., Anderson, P. (2017). An overview of the progress and challenges of peatland restoration in Western Europe. Restoration Ecology, Issue 2 Pages 271-282.

Barry, T.A. *et al.* (1973). A survey of cutover peats and underlying mineral soils. Soil Survey Bulletin No. 30. Dublin, Bord na Móna and An Foras Taluntais.

Bord na Móna 2014. Blocking Drains in Irish raised bogs. The Bord na Móna Raised Bog Restoration Project. Cris, R. Buckmaster, S. Bain, C. Reed, M. (Eds) (2014) Global Peatland Restoration demonstrating SUCCESS. IUCN UK National Committee Peatland Programme, Edinburgh. http://www.iucn-uk-peatlandprogramme.org/sites/www.iucn-uk-peatlandprogramme.org/files/IUCNGlobalSuccessApril2014.pdf

Bord na Móna. 2016. Bord na Móna Biodiversity Action Plan 2016-2021. Brosna Press, Ferbane. http://www.bordnamona.ie/wp-content/uploads/2016/04/Biodiversity-Action-Plan-2016-2021.pdf.

Bord na Móna (2022). Bord na Móna Annual Report 2022. Publications - Newsroom | Bord na Móna (bordnamona.ie)

Bord na Móna (2022). *Methodology Paper for the Enhanced Decommissioning, Rehabilitation and Restoration on Bord na Móna Peatlands – Preliminary Study Nov 2022 Version 19.* Bord na Móna. Available online at : https://www.bnmpcas.ie/supporting-material/

Bonn, A., Allott, T., Evans, M., Joosten, H. & Stoneman, R. (2017) Peatland restoration and ecosystem Services-science, policy and practice. Cambridge University Press.

Carroll, J., Anderson, P., Caporn, S., Eades, P., O'Reilly C. & Bonn, A. 2009. Sphagnum in the Peak District. Current Status and Potential for Restoration. Moors for the Future Report No 16. Moors for the Future Partnership.

Clark, D. and Rieley, J. 2010. Strategy for responsible peatland management. International Peat Society, Finland.

Clark, D. (2010). Brown Gold. A history of Bord na Móna and the Irish peat industry. Gill Books.

Cross, J.R. (2006). The Potential Natural Vegetation of Ireland. Biology and Environment: Proceeding of the Royal Irish Academy, Vol. 106B, No. 2, 65-116 (2006).

Department of Communications, Climate Action and Environment 2019. National Climate Action Plan 2019. https://www.dccae.gov.ie/en-ie/climate-action/publications/Pages/Climate-Action-Plan.aspx

Department of Housing, Planning, Community and Local Government 2017. Public consultation on the River Basin Management Plan for Ireland. Department of Housing, Planning, Community and Local Government. https://www.housing.gov.ie/sites/default/files/public-consultation/files/draft_river_basin_management_plan_1.pdf

Department of Arts, Heritage and the Gaeltaght 2015. National Peatland Strategy. Department of Arts, Heritage and the Gaeltacht.

http://www.npws.ie/sites/default/files/general/Final%20National%20Peatlands%20Strategy.pdf

Eades, P., Bardsley, L., Giles, N. & Crofts, A. (2003). The Wetland Restoration Manual. The Wildlife Trusts, Newark.

Environment Agency (2013). The Knotweed code of practice. Managing Japanese Knotweed on development sites. Environment Agency, Bristol, UK. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/536762/LIT_2695.pdf

European Commission (2013). Interpretation manual of European Union Habitats. European Commission DG Environment Nature ENV B.3.

EPA (2019). http://gis.epa.ie/Envision. EPA Envision Map Viewer. (Last Viewed: 31/12/2019).

EPA (2020). Guidance on the process of preparing and implementing a bog rehabilitation plan. http://www.epa.ie/pubs/reports/enforcement/guidanceontheprocessofpreparingandimplementingabogrehabilitationplan.html.

Farrell, C. A. and Doyle, G. J. 2003. Rehabilitation of Industrial Cutaway Atlantic Blanket Bog, NW Mayo, Ireland. Wetlands Ecology and Management, 11, 21-35.

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.

Fossitt, J. (2000). A guide to habitats in Ireland. Kilkenny. The Heritage Council.

Gann, G.D., McDonald, T., Walder, B., Aronson, J., Nelson, C.R., Jonson, J., Hallett, ,J.G., Eisenberg, C., Guariguata, M.R., Liu, J., Hua,F., Echeverría, C., Gonzales, E., Shaw, N., Decleer, K. & Dixon, K.W. (2019). International Principles and Standards for the practice of Ecological Restoration. Restoration Ecology 27(S1): S1–S46.

Grand-Clement, E., Anderson, K., Smith D., Angus, M., Luscombe D.J., Gatis, N., Bray L.S., Brazier R.E. (2015). New approaches to the restoration of shallow marginal peatlands Journal of Environmental Management 161.

Hinde, S., Rosenburgh, A., Wright, N., Buckler, M. and Caporn, S. 2010. Sphagnum re-introduction project: A report on research into the re-introduction of Sphagnum mosses to degraded moorland. Moors for the Future Research Report 18. Moors For The Future Partnership.

Holden, J., Walker, J., Evans, M.G., Worrall, F., Bonn, A., 2008. In: DEFRA (Ed.), A Compendium of Peat Restoration and Management Projects.

Joosten, H. and Clarke, D. 2002. Wise Use of mires and peatlands – Background and Principles including a framework for Decision-making. I.M.C.G. – I.P.S., Jyväskylä, Finland.

Lindsay, R., 2010. Peatbogs and Carbon: a Critical Synthesis to Inform Policy Development in Oceanic Peat Bog Conservation and Restoration in the Context of Climate Change (Report to RSPB Scotland, Edinburgh).

Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017) 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.

McBride, A., Diack, I., Droy, N., Hamill, B., Jones, P., Schutten, J., Skinner, A. and Street, M. 2011. The Fen Management Handbook, (2011), Scottish Natural Heritage, Perth.

Minayeva, T. *et al.* (2017). Towards ecosystem-based restoration of peatland biodiversity. Mires and Peat, Volume 19 (2017), Article 01, 1–36, http://www.mires-and-peat.net

McDonagh, E. (1996). Drain blocking by machines on Raised Bogs. Unpublished report for National Parks and Wildlife Service. https://www.npws.ie/sites/default/files/publications/pdf/McDonagh_1996_Drain_Blocking_Raised_Bogs.pdf.

NPWS. (2014). Review of the raised bog Natural Heritage Area network. Department of Arts, Heritage and the Gaeltacht.

NPWS. (2017a). National Raised bog Special Areas of Conservation management plan. Department of Arts, Heritage and the Gaeltacht. https://www.npws.ie/sites/default/files/files/FOR%20UPLOAD%20Plan(WEB_English)_05_02_18%20(1).pdf

NPWS. (2017b). Actions for biodiversity 2017-2021. Ireland's 3rd national biodiversity plan. Department of Arts, Heritage and the Gaeltacht. https://www.npws.ie/sites/default/files/publications/pdf/National%20Biodiversity%20Action%20Plan%20English.pdf

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill. https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf

NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes (Revision 2). National Roads Authority.

NRA (2010). Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. National Roads Authority.https://www.tii.ie/technical-services/environment/construction/Management-of-Noxious-Weeds-and-Non-Native-Invasive-Plant-Species-on-National-Road-Schemes.pdf.

Pschenyckyj, C., Riondata, E., Wilson, D., Flood, K., O'Driscoll, C., Renou-Wilson, F. (2021). Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity, Report produced for An Fóram Uisce, Online, Available at: https://thewaterforum.ie/app/uploads/2021/04/Peatlands_Full_Report_Final_March2021b.pdf, Accessed 17.08.2021

Quinty, F. and L. Rochefort, 2003. Peatland Restoration Guide, second edition. Canadian Sphagnum Peat Moss Association and New Brunswick Department of Natural Resources and Energy. Québec, Québec.

Regan, S., Swenson, M., O'Connor, M. & Gill, L. (2020). Ecohydrology, Greenhouse Gas Dynamics and Restoration Guidelines for Degraded Raised Bogs. EPA RESEARCH PROGRAMME 2014–2020. Report No.342. (2014-NC-MS-2). EPA Research Report. Prepared for the Environmental Protection Agency by Trinity College Dublin. www.epa.ie.

Renou-Wilson F., Bolger T., Bullock C., Convery F., Curry J. P., Ward S., Wilson D. & Müller C. (2011). BOGLAND - Sustainable Management of Peatlands in Ireland. STRIVE Report No 75 prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.

Renou-Wilson, F., Wilson, D., Rigney, D., Byrne, K., Farrell, C. and Müller C. (2018). Network Monitoring Rewetted and Restored Peatlands/Organic Soils for Climate and Biodiversity Benefits (NEROS). Report No. 238. Report prepared for the Environmental Protection Agency. Johnstown Castle, Co. Wexford.

Schouten, M.G.C. 2002. 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.

Smith, G., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011). Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council.

Stace, C. A. (1997). New Flora of the British Isles. Cambridge: Cambridge University Press.

Thom, T., Hanlon, A., Lindsay, R., Richards, J., Stoneman R. & Brooks, S. (2019). Conserving Bogs – Management Handbook. https://www.iucn-uk-peatlandprogramme.org/sites/default/files/header-images/Conserving%20Bogs%20the%20management%20handbook.pdf

Wilson, D., Renou-Wilson, F., Farrell, C., Bullock, C. and Muller, C. (2012). Carbon Restore – the potential of restored Irish peatlands for carbon uptake and storage; CCRP Report. EPA Wexford.

Wilson, D., Dixon, S.D., Artz, R.R., Smith, T.E.L., Evans, C.D., Owen, H.J.F., Archer, E., & Renou-Wilson, F. (2015). Derivation of greenhouse gas emission factors for peatlands managed for extraction in the Republic of Ireland and the UK. Biogeosciences Discuss., 12, 7491–7535.

Wheeler, B. D., & Shaw, S. C. (1995). Restoration of Damaged Peatlands – with Particular Reference to Lowland Raised Bogs Affected by Peat Extraction. London: HMSO.

Wittram, B. W., Roberts, G., Buckler, M., King, L., & Walker, J. S. (2015). A Practitioners Guide to Sphagnum Reintroduction. Edale: Moors for the Future Partnership.

APPENDIX I: A STANDARD PEATLAND REHABILITATION PLAN TO MEET CONDITIONS OF THE IPC LICENCE

In the event that the Scheme (PCAS) is not supported by additional funding, Bord na Móna is still obligated to carry out peatland rehabilitation to meet the conditions of the IPC Licence. Under its EPA licences and following cessation of peat extraction, BnM is mandated to 'decommission' its operations by removing materials 'that may result in environmental pollution' and establish that 'rehabilitation' measures have environmentally stabilised peat production areas.

This proposed standard peatland rehabilitation plan is outlined here to **estimate potential costs**. Bord na Móna will still be expected to cover the costs that would have accrued from standard decommissioning and rehabilitation activities, as part of its original obligations. The existing costs associated with both the removal of potentially polluting materials and the environmental stabilisation of the peatlands resides with Bord na Móna. However, the expenditure necessary to deliver the additional and enhanced decommissioning, rehabilitation and restoration and the benefits that flow from these measures and interventions/improvements will be eligible for funding by government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

The same process as outlined in Section 2 will be followed.

Scope of rehabilitation

The principal scope of this rehabilitation plan is to rehabilitate the bog. This is defined by:

- The area of Derryarogue Bog.
- EPA IPC Licence - Ref. P0504-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. Derryarogue Bog is part of the Mount Dillon (Lough Ree) Bog Group.
- The current condition of Derryarogue Bog.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. Boundary drains around Derryarogue Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Land-use.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Derryarogue Bog is environmental stabilisation of the site via wetland creation. This is defined as:

- Carrying out drain blocking to re-wet peat and slow runoff.
- Stabilising potential emissions from the site (e.g. suspended solids).
- Environmental stabilisation.

The outcome is setting the site on a trajectory towards establishment of natural habitats.

Criteria for successful rehabilitation:

- Rewetting of residual peat and shallow cutaway in the former area of industrial peat production to offset potential silt run off and to encourage development of vegetation cover via natural colonisation and reducing the area of bare exposed peat.
- That there is a stabilising/improving concentration of suspended solids and ammonia associated with the measures undertaken to stabilise the peat surface by the blocking of the internal drainage system and the maximised rewetting of the peat surface. This will be demonstrated by developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be measured via water quality monitoring (suspended solids and ammonia).
- Receiving water bodies have been classified under the River Basin Management Plan and this classification includes waters that are 'At Risk' from peatlands and peat extraction. The success criteria will be that the 'At Risk' classification will see improvements in the associated pressures from this peatland or if remaining At Risk, that there is an improving trajectory in the pressure from this peatland.

Rehabilitation targets

- Demonstrating the delivery of the rehabilitation through site visits and through updated aerial photography (indicating presence of peat blockages and re-wetting). This will be demonstrated by a post rehab aerial survey.
- Stabilising potential emissions from the site (e.g. suspended solids). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia) towards what would be typical of a re-wetted cutaway bog. This will be demonstrated by water quality monitoring results.

Rehabilitation measures:

- Blocking field drains in drier sections of the former industrial production area using a dozer to create regular peat blockages (three blockages per 100 m) along each field drain.
- Re-alignment of piped drainage; and management of water levels to create/enhance existing wetlands.
- No measures are planned for the majority of surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

- 2023-2024. 1st phase of rehabilitation. Field drain blocking.
- 2025. 2nd phase. Further realignment of piped drainage and other re-wetting measures dependent on success of 1st phase re-wetting, as determined by ongoing monitoring of water levels and re-vegetation.
- Other enhancement measures such as fertiliser treatment will be carried out, if needed. These will be determined by ongoing monitoring.
- 2025-2026. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- 2025-2026. Decommission silt-ponds, if necessary.

Table AP-1. Rehabilitation measures and target area.

Type	Code	Description	Area (Ha)
Deep peat	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	13.01
Dry cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	125.5
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	161.31
Marginal Land	MLT1	No work required	23.02
Other	Silt Pond	Silt ponds	0.90
Other	Constraint	Rights of Ways, Turf Cutting, Amenity, Archaeology	5.81
Total			**329.5**

See Drawing number BNM-DR-24-06-20 titled Derryarogue Bog: Standard Rehab Measures included in the accompanying Mapbook which illustrates the standard rehab measures to be applied.

Monitoring, after-care and maintenance

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, assess the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to additional rehabilitation.
- Water quality monitoring will be established.
- Monitoring results will be maintained, trended and reported on each year as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, which will be available in April each year at www.epa.ie.
- The parameters to be included (as per condition 6.2 of the IPC Licence) include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and COD.
- This sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime.
- Where other uses are proposed for the site, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the required assessment and planning procedures.

Validation and IPC Licence surrender

Reporting to the EPA will continue until the IPC License is surrendered. The bog will be included in the full licence surrender process as per the Guidance to Licensees on Surrender, Cessation and Closure of Licensed Sites (EPA, 2012) when:

- The planned rehabilitation has been completed;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

APPENDIX II: BOG GROUP CONTEXT

The Mount Dillon Bog Group IPC Licensed area is made up of two sub-groups (Lough Ree- the Mount Dillon Energy Peat Group) and Mostrim) and the bog units within the group have been in industrial peat production for several decades. There are 28 defined bog units covering a total area of 11,322 ha. Of the 28 units, 23 mainly straddle the River Shannon within counties Roscommon and Longford, with five sites partially in County Westmeath to the east. Each bog area further comprises a range of habitats from bare milled peat former production areas to re-colonising cutaway to workshops areas and transport infrastructure. Industrial peat extraction from these sites mainly supplied ESB power stations at Lanesborough (LRP) or for horticultural peat products.

Industrial peat extraction in the Mount Dillon Bog Group ceased in 2019. Peat stockpiles which were harvested within the Bog Group prior to 2019 continued to be delivered to Lough Ree Power Station until its closure in 2020. All remaining peat stocks across the Mount Dillon Bog Group will be removed by 2023. Intensive decommissioning and rehabilitation for the Mount Dillon Bog Group started in 2020/2021.

One bog site, Cloonmore, was never used for industrial peat production and several bogs in the Mostrim group have been drained but never fully developed and still retain typical high bog characteristics. These include Clonwhelan, Glenlough and a section of Mostrim. These sites have been zoned for biodiversity and a high bog drain blocking will be used to re-wet the high bog and encourage restoration of the raised bog habitat. Several sites (Glenlough, Mostrim, Clonwhelan and Clynan) were assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS 2014).

The rehabilitation plan for the Mount Dillon Bog Group encompasses all areas involved in industrial peat production including former industrial production areas and associated facilities. It also includes rehabilitation measures for those bogs that were initially drained but not fully developed.

A breakdown of the component bog areas for the Mount Dillon Bog Group IPC License Ref. PO-504-01-01 is outlined in Table Ap-2.

Industrial peat production history varies across the Mount Dillon bog group, so there is a wide range of peat depths at present. Bogs close to Lanesborough tend to have shallower peat depths or have been cutaway, while some bogs on the periphery of the group tend to have deeper peat reserves. Several sites such as Mount Dillion and Derrycashel have been mostly cutaway to the fen peat layers or in some cases to expose the underlying gravel/sub-soil. Several bogs in the Mostrim group have only been partially developed or have had no industrial peat production, and have relatively deep peat depths.

Table Ap-2: Mount Dillon Bog Group names, area and indicative status (Mount Dillon Energy Peat sub-group)

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Begnagh	265	Cutover Bog Industrial peat production commenced at Begnagh Bog in 1977 and ceased in 2020. Deep peat reserves remain on much of the former production area. Begnagh is considered a deep peat cutover bog.	Begnagh Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Some areas of cutaway on site are developing pioneer cutaway vegetation communities.	2020	Finalised 2022 Rehab started in 2022

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Clooneeny	358	Cutover Bog Industrial peat production commenced at Clooneeny Bog in 1985 and ceased in 2020. Deep peat reserves remain on much of the former production area. Clooneeny is considered a deep peat cutover bog.	Clooneeny Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power Most of the former production area on site is bare peat. Some areas of cutaway on site are developing pioneer cutaway vegetation communities.	2020	Finalised 2022 Rehab started in 2022
Cloonmore	102	N/A	Never developed for industrial peat production; scattered plots.	N/A	N/A
Cloonshannagh	494	Cutover Bog Industrial peat production commenced at Cloonshannagh Bog in 1985 and ceased in 2020. Deep peat reserves remain across the former production area. Cloonshannagh is considered a deep peat cutover bog.	Cloonshannagh Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power Restoration work has been carried out on a 38ha section of high bog within Cloonshannagh Bog. Some of the former production area on site is developing pioneer cutaway vegetation communities, the remainder of the site is bare peat.	2020	Draft 2017
Cloonshannagh Rail Link	28	Cloonshannagh rail link is a link between sites.	N/A	N/A	N/A
Corlea	163	Cutaway Bog Industrial peat production commenced at Corlea Bog in 1960 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Corlea is considered a shallow peat cutaway bog.	The former production area at Corlea has already extensively colonised. Pioneer wetland and scrub development has occurred over much of the site. Some wetland and rehabilitation management was undertaken between 2016-2018. Part of site leased to local community development group to develop amenity walkway in association with Longford County Council.	2018	To be finalised 2023
Derraghan	289	Cutover Bog Industrial peat production commenced at Derraghan Bog in the 1940's and ceased in 2020. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derraghan is considered a shallow peat cutover bog.	Derraghan Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Much of the former production area at Derraghan has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities.	2020	Plan Finalised 2021 Rehab commenced 2022
Derryadd	653	Cutover Bog Industrial peat production commenced at Derryadd Bog in 1964 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd is considered a shallow peat cutover bog.	Much of the former production area at Derryadd has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities Derryadd Bog will form part of the footprint of the proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Derryadd Bog is proposed for the Derryadd Wind Farm project	2019	Draft 2017
Derryadd2	328	Cutover Bog Industrial peat production commenced at Derryadd 2 Bog in 1960 and ceased in 2020. Long-	Much of the former production area at Derryadd 2 has been out of peat production for some time. These areas have already	2020	To be finalised 2023

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
		term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryadd 2 is considered a shallow peat cutover bog.	extensively colonised with pioneer wetland and scrub vegetation communities		
Derryarogue (excluding the current PCAS extent)	895	Cutover Bog Industrial peat production commenced at Derryarogue Bog in 1952 and ceased in 2019. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derryarogue is considered a shallow peat cutover bog.	Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland, cutaway and scrub vegetation communities. Derryarogue Bog will form part of the footprint of the proposed Derryadd Wind Farm project (in pre-planning). An amenity walkway through part of Derryarogue is proposed for the Derryadd Wind Farm project	2019	To be finalised 2023
Derrycashel	388	Cutover Bog Industrial peat production commenced at Derrycashel Bog in 1951 and ceased in 2018. Long-term peat extraction has reduced peat reserves on this bog. Most of the former production area has shallow peat reserves. Some pockets of deep peat remain. Derrycashel is considered a shallow peat cutover bog.	Derrycashel Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Much of the former production area at Derryarogue has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities. Some wetland and rehabilitation management was undertaken (c.60ha) between 2014-2015.	2018	Finalised 2021 Rehab started in 2021
Derrycolumb	454	Cutover Bog Industrial peat production commenced at Derrycolumb Bog in the 1980's and ceased in 2019. Most of the former production area still has deep peat reserves. Derrycolumb is considered a deep peat cutover bog.	Derrycolumb Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power Much of the former production area at Derrycolumb has been out of production for some time. These areas have already extensively colonised with pioneer wetland and scrub vegetation communities.	2018	Finalised 2021 Rehab started in 2021
Derrymoylin	356	Cutover Bog Industrial peat production commenced at Derrymoylin Bog in 1985 and ceased in 2020. Long-term peat extraction has reduced peat reserves on this bog. Derrymoylin is considered a shallow peat cutover bog.	Derrymoylin Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Most of the former production area on site is bare peat.	2020	Draft 2021
Derryshannoge	452	Cutover Bog Industrial peat production commenced at Derryshannoge Bog in 1985 and ceased in 2020. Deep peat reserves remain across most of the site. Derryshannoge is considered a deep peat cutover bog.	Derryshannoge Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Derryshannoge has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised 2023
Edera	281	Cutover Bog Development for industrial peat production commenced at Edera Bog in 1990's. Active extraction from Edera began in 2003 and	Edera Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. The majority of Edera Bog former production area is bare peat.	2020	Finalised 2021 Rehab started in 2021

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
		ceased in 2018. Edera is considered a deep peat cutover bog.			
Erenagh	93	Cutover Bog Development for industrial peat production commenced at Erenagh Bog in 1970's. Erenagh is considered a deep peat cutover bog.	Erenagh Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Erenagh has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities.	2020	Draft 2017
Granaghan	212	Cutover Bog Development for industrial peat production commenced at Granaghan Bog in 1980's. Long-term peat extraction has reduced peat reserves on this bog but deep peat reserves remain on site. Granaghan is considered a deep peat cutover bog.	Granaghan Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power. The majority of Granaghan Bog former production area is bare peat.	2020	To be finalised 2023
Killashee	110	Cutover Bog Development for industrial peat production commenced at Killashee Bog in 1985. Killashee is considered a deep peat cutover bog.	Killashee Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat for Lough Ree Power. The majority of Killashee Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2020	To be finalised 2023
Knappoge	313	Cutaway Bog Peat Production at Knappoge bog commenced in 1963, and finished in 2018. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Knappoge is considered a shallow peat cutaway bog.	Knappoge Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. The majority of Knappoge Bog former production area is bare peat. Some areas have colonised with pioneer cutaway and scrub vegetation communities.	2018	Finalised 2021 Rehab started in 2022
Lough Bannow	739	Cutaway Bog Peat Production at Lough Bannow bog commenced in 1964 and finished in 2019. Peat depths on the former production area are generally shallow. There are some pockets of deeper peat. Lough Bannow is considered a shallow peat cutaway bog.	Much of the former production area at Lough Bannow has been out of production for some time. These areas have already extensively colonised with pioneer cutaway and scrub vegetation communities. A small (35ha) conifer plantation was established in 1980's. Lough Bannow will form part of the footprint of proposed Derryadd Wind Farm Project (in pre-planning). An amenity walkway through part of Lough Bannow is proposed for the Derryadd Wind Farm project	2019	Draft 2017
Moher	483	Cutover Bog Peat Production at Moher bog commenced in the 1960'S, and finished in 2020. Peat depths on the former production area remain relatively deep. Moher is considered a deep peat cutover bog.	Moher Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Moher has been out of production for some time. These areas have already extensively colonised	2020	Draft 2021

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
			with pioneer cutaway and scrub vegetation communities.		
Mount Dillon	592	Cutaway Bog Peat Production at Mount Dillon bog commenced in the 1940'S, and finished in 2020. Peat depths on the former production largely shallow and the peat is considered cutaway. Some deep peat remains on the west of the site. Mount Dillon is considered a shallow peat cutaway bog.	Mount Dillon Bog formerly supplied a range of commercial functions including; fuel peat for Lough Ree Power. Much of the former production area at Mount Dillon has been out of production for some time. These areas have already extensively colonised with pioneer cutaway, wetland and scrub vegetation communities.	2020	Draft 2017

APPENDIX III: ECOLOGICAL SURVEY REPORT

Note: this report covers the whole of Derryarogue including the area proposed as part of the present renewable energy development. There may be references to receptors or habitats not present within the current PCAS extent. See Section 3.3. for Biodiversity features of Interest within the PCAS extent. 'Derryarogue mineral island' is not within the current PCAS extent.

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value.

Bog Name:	**Derryarogue**	**Area (ha):**	458ha
Works Name:	Mount Dillon	**County:**	Longford
Recorder(s):	BnM Ecology Section	**Survey/ monitoring Date(s):**	11th October 2012

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (Codes refer BnM classification of pioneer habitats of production bog)
- Pioneer Soft Rush-dominated poor fen (pJeff) with less frequent Bog Cotton (pEang) or Bottle Sedge (pRos) -dominated poor fen.
- Willow-dominated scrub (eWill) (in mosaic with pJeff) (in those areas that are flooded regularly)
- Open water (OW) (permanent) and Temporary open water (TOW)
- Birch-dominated scrub (eBir, oBir) (on drier higher ground that is not flooded))
- Pioneer dry heath (dHeath) (mainly in mosaic with Birch scrub)
- Dry pioneer Purple Moorgrass-dominated grassland (gMol)
- Access routes (Acc)
- Riparian zones (Rip) (with drains and associated habitats such as scrub and Birch woodland)
- Silt ponds (Silt) with Gorse/Birch scrub and Purple Moorgrass-dominated grassland (gMol)

The most common habitats found around the margins of the site include:

- Raised bog (PB1) (Codes refer to Heritage Council habitat classification, Fossitt 2000)
- Cutover Bog (PB4)
- Scrub (WS1)
- Wet (callows-type) grassland (GS4)
- Birch woodland (WN7)
- Dense Bracken (HD1)
- Improved grassland (GA1) around the boundary where the GIS boundary extends into adjacent fields

Description of site

Derryarogue Bog is located approximately three kilometres to the east of Lanesborough in County Longford. This bog is located within two main section, a western (smaller) section and an eastern section in which the majority of the site is located. A mineral island is located on the site and this area was previously surveyed and is described in the Derryarogue Mineral Island ecological survey. A long section of rail line to the west of the site connects the Roscommon Bogs with the Power Station in Lanesborough. A rail bridge across the River Shannon is also part of the site.

The peat that is harvested from Derryarogue is used as fuel peat in the adjacent Lough Ree Power Station. Large areas of Derryarogue are still in active industrial peat production; however large areas of the site are cutaway and have developed a range of cutaway habitats. Numerous power lines cross the site and are in place to power to the pumps that are scattered across the site. Derryarogue Bog has been in industrial peat production since 1964.

The northern section of the site is separated from the rest of the site by a rail line that crosses the site in an east west direction. Production is still active in the area, however a range of pioneer habitats have developed in areas that have not been in industrial peat production for a number of years. Habitats that have developed on the older cutaway habitats include closed Birch scrub that was primarily made up of Birch and Willow with Oak and Pine becoming established also. These habitats are at least twenty years old and were located on higher ground. Younger pioneer habitats include gCal, pTrig, eBir and pPhrag. Large areas of exposed gravel are also common across this section of the site. A grey clay type sub-soil is located under this section of the site and it is clearly visible in the field drains. The western side of this section appears to be lower lying than the rest of the section and many of the field drains contained pioneer reed-beds (pPhrag). A flood defence berm was constructed in 2011 along the south western edge of this section in order to prevent flood water from the River Shannon entering the site.

The main section of the site is very varied in terms of habitats that are located there. This area also contains the mineral Island that is dealt with in a separate report. Large areas within this section are cutaway. Gravel protrudes from the ground in various locations even in some of the areas that are still in industrial peat production. Pioneer habitats include Birch scrub (eBir, oBir and cBir). The centre of this section of the site appears to be considerably lower than the surrounding areas, surprisingly areas of open water are rare; however this is likely to be a result of the constant pumping of the site.

Two areas of wetland are developing within this section of the site and are mainly comprised of small areas of open water, and a mix of species such as Reed-mace, Soft Rush, Club Rush, Bulbous Rush, Marsh Arrow Grass and Mint. Charaphytes were also present to the open water. These areas appeared to have been developing for a number of years and although they are small they were becoming diverse and provided habitat for Mallard and Snipe. These wetland areas had a quaking feel to them and it would be expected that they would expand across the site once the pumps were turned off.

Other habitats on the site include dry heath (on elevated areas), scrub and areas of pioneer poor fen. A large area of bare peat was located at the western edge of this section and industrial peat production was on going in this area. Industrial peat production in the majority of the section however was confined to individual fields that were scattered throughout.

The eastern section of the site was largely in industrial peat production; however areas of cutaway of varying ages were also present. The areas of cutaway were becoming colonised with pioneer poor fen and scrub. The areas of scrub along the eastern edge were quite well developed and were approaching mature Birch woodland.

During the spring of 2012 a honey project was started on the site. Ten bee hives were located on the mineral island. These hives were managed by *Hyland Honey*. This project finished in 2013.

Derryarogue Mineral Island

This site is known as Derryarogue Island and is part of Derryarogue Bog and the Mount Dillon Group of bogs. It is located in Co. Longford to the north-east of Lanesborough and Lough Ree. The River Shannon flows 2 km west of the site. Derryarogue island is a typical 'mineral island' or mound of glacial material and bedrock that protrudes from the surrounding bog (now cutaway and production bog) landscape. There are many examples of these types of small glacial mounds surrounded by bog in this area. The habitats found on these mounds are in contrast to the surrounding bog as they are strongly influenced by the calcareous bedrock and calcareous glacial deposits or sub-soil that underlay the site. Many of these areas are managed as farmland and Derryarogue Island is also mapped as farmland on the 2nd edition OSI 6 inch map, prior to the development of the BnM production bog.

The island is surrounded by typical habitats developing on production and production-related bog. These include bare peat fields of the still-active production bog to the south of the site and the developing Birch scrub and dry heath that surrounds the majority of the remainder of the site. There is also frequent cover of other typical habitats found in the transitional zone between cutaway and

mineral soil such as Bracken and several grassland communities (gMol, gDa-An). The main part of the island is dominated by scrub and grassland. These habitats are criss-crossed with travel-paths, where there is exposed soil and some rutting where the ground is wet.

The scrub is dominated by Blackthorn and is thick and impenetrable, although there are frequent young and maturing Ash trees developing within the scrub. Other species present include Hawthorn, Elder, Privet, Rowan, Honeysuckle, Bramble, Ivy, Male Fern and Soft Shield Fern. The ground cover is generally quite poor and dominated by Ivy. Some of the Blackthorn-scrub transitions to a band of Gorse or to a Bramble thicket. There are also locations around the margins where there is transition to Birch and Willow scrub. Alder is also present on the site towards the southern end where there has been some clearance in the past for electric lines. A small area to the south of the site was classified as woodland as it was dominated by mature Ash. However, this habitat was surrounded by a band of scrub and Brambles, making it difficult to survey.

There are several different grassland communities present on the site. The vegetation types vary according to hydrology and other environmental factors such as soil depth, amount of peat etc. The main grassland type is a dry calcareous grassland community. This is dominated by species such as Glaucous Sedge, Yellow Sedge, Sweet Vernal-grass, Red Fescue and Bird's-foot Trefoil. Other species present include Knapweed, Perennial Rye-grass, Quaking Grass, False Oat-grass, Yorkshire Fog, Dandelion, Long-leaved Plantain, Broad-leaved Plantain, Nettle, Red Clover, Hawkbit sp., Ox-eye Daisy, Primrose, Creeping Thistle, Timothy, Mouse-ear, Yarrow, Wild Carrot, Ladies-Bedstraw, Purging Flax, Yellow-wort, Mouse-ear Hawkweed, Daisy, White Clover, Milkwort, Common Spotted Orchid and Marsh Hellaborine. Several Dog Rose plants appear in this habitat and single Gorse, Blackthorn and some Hawthorn also appear within the grassland.

The dry grassland frequently grades into damper grassland, sometimes over short distances, which is also significantly influenced by the calcareous-rich soils but is likely to be more prevalent of peaty soils. This community contains frequent Yellow Sedge, Carnation Sedge, Star Sedge and Purple Moorgrass. This community contains species including Common Sedge, Green-ribbed Sedge, Flea Sedge, Hard Rush, Compact Rush, Heath Grass, Knotted Pearlwort, Common Sorrel, Marsh Bedstraw, Bog Thistle, Common Century, Common Chickweed, Self Heal, Mash Horsetail, Crested Dogstail, Devil's-Bit, Rough Meadow-grass, Marsh Valerian, Silverweed, Jointed Rush, Marsh Thistle, Creeping Buttercup, Meadowsweet and Curled Dock. *Calliergonella cuspidata* is frequently found within this grassland type as well as extensive low hummocks of some brown moss species such as *Campylium stellatum*. One small area close to the edge of the scrub contained a small patch of Bladder Sedge. Species more typical of drier areas also appear in this community and vice-versa.

There are some areas where the drainage is impeded to a greater extent and these areas contain frequent Soft Rush and Hard Rush. Other species present included Water Plantain, Spike-rush sp., Water Forget-me-not, Bulbous Rush and Floating Sweet-grass. Some of the travel paths contained wet grassland vegetation that was dominated by Rush species.

Small springs or damp hollows are found in the largest open grassland area in the centre of the site and along some of the old travel patches around the margins of the site. Most of these did not have any standing water at the time of the survey (after an exceptionally dry May-June period), although they were all damp. Several others contained, probably from heavy rainfall the previous evening. There was no sign of running water, which could be associated with springs. Calcareous-rich groundwater seepage into these shallow hollows with a high water-table could create the same habitats. The hollows were generally 1-5 m in diameter and > 0.5 m deep. The vegetation cover within the hollows was variable, with some hollows being dominated by exposed whitish mud and others dominated by brown mosses. Typical moss species associated with these hollows included brown mosses such as *Scorpidium scorpoides, Drepanocladus* spp. and *Campylium stellatum, as well as Calliergonella cuspidata*. The majority of the hollows had some development of tufa, generally a calcareous coating on plant material and mosses within the hollow. The tufa was not very well developed. Other species found in these hollows included Yellow Sedge, Silverweed, Marsh Arrowgrass, Lesser Spearwort, Spike-Rush sp., Mint, Jointed Rush, Creeping Bent and Brookweed. The species assemblage varied from hollow to hollow. Several of these hollows seemed to have been created by heavy machinery creating ruts in the travel paths that were subsequently colonised by typical species. The tufa spring indicator moss species, *Palustriella commutata* was searched for but was not recorded.

The meadow type grassland community is a tussocky type of grassland dominated by Cocksfoot, Tufted Hairgrass, Tall Fescue, Yorkshire Fog Purple Moor-grass and Sweet Vernal-grass. This vegetation type occurs on deeper soils and is less diverse than the former two communities. Bramble and Bracken both spread into this grassland type in places. Tussocky Purple Moorgrass and Meadowsweet dominates in one area close to the margins along with Tufted Hairgrass.

There are several places around the main part of the site where there is a little more peat and a dry heath type vegetation develops. This is dominated by Heather and also contains species such as Cross-leaved Heath, Purple Moorgrass, Multi-flowered Woodrush, Tormentil, Slender St John's-wort, and Common Twayblade.

A small area to the south of the site within a small hollow is developing rich fen like vegetation, adjacent to a small area with mature Willow. A small area is dominated by Greater Tussock Sedge and there are also several tussocks of Tufted Sedge. Surrounding vegetation contains Common Bog-cotton, Bottle Sedge, Cuckoo Flower, Water Horsetail, *Calliergonella cuspidata, Scorpidium scorpoides*, *Campylium stellatum,* Birch, Eared Willow, Lesser Spearwort, Common Spotted orchid, Angelica, Purple Moor-grass and Devil's-Bit. This very small area also has some Reedmace. This area is likely to have a fluctuating water table with the possibility of flooding during the winter.

The margins of the site generally contain transitional type grassland communities that are similar to pioneer cutaway grassland communities. The main community is dominated by Purple Moorgrass (gMol) and this has developed along some of the old travel paths.

Designated areas on site (cSAC, NHA, pNHA, SPA other)

None

Adjacent habitats and land-use

Adjacent habitats include wet grassland (GS4), improved agricultural grassland (GA1), raised bog (PB1), scrub (WS1), Birch woodland (WD7), conifer plantation along with active and inactive cutover bog (PB4).

Watercourses (major water features on/off site)

- The Derrygeel Stream flows through the site, this stream is a tributary of the Lough Bannow River that in turn flows into the River Shannon above Lanesborough.
- Another tributary of the Derrygeel Stream flows along the western boundary of the site.

Peat type and sub-soils

The site is underlain with a mix of gravel and marl. The site contains a significant amount of "red" or "Sphagnum" peat.

Fauna biodiversity

Birds

Several bird species were noted on the site during the survey.

- Mallard (24)
- Raven
- Snipe
- Whooper Swan (6)
- Other more common species included Blackbird, Grey Crow, Meadow Pipit, Pheasant, Robin and Long tailed Tit.

Mammals

Signs of several mammal species were noted on the site during the survey.

- Badger
- Fox
- Mink

Other species

Frog

Fish in the watercourses

APPENDIX IV: ENVIRONMENTAL CONTROL MEASURES TO BE APPLIED TO BOG REHABILITATION

- Bog restoration/rehabilitation measures will be restricted to within the footprint of the proposed rehabilitation area.
- The proposed rehabilitation will have due regard to noise limits and hours of operation (i.e. dusk and dawn) to minimise any potential disturbance on resident and local fauna that utilise the site and immediate environs.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- Silt ponds will be inspected and maintained as per the IPC Licence.
- During periods of heavy precipitation and run-off, activities will be halted.
- Measures will be carried out using a suitably sized machine and in all circumstances, excavation depths and volumes will be minimised where possible.
- All machines will be regularly checked and maintained prior to arrival at the site to prevent hydrocarbon leakage.
- Hoses and valves will be checked regularly for signs of wear and will be closed and securely locked when not in use.
- Fuelling and lubrication of equipment shall only be carried out in designated areas away from surface water drainage features and ecologically sensitive areas.
- Waste oils and hydraulic fluids will be collected in leak-proof containers and removed from the site for disposal or re-cycling.
- Vehicles will never be left unattended during refuelling.
- No direct discharges to waters will be made. No washings from vehicles, plant or equipment will be carried out on site.
- All plant refuelling will take place using mobile fuel bowsers. Only dedicated trained and competent personnel will carry out refuelling operations.
- Mobile storage such as fuel bowsers will be bunded to 110% capacity to prevent spills. Tanks for bowsers and generators shall be double skinned. When not in use, all valves and fuel trigger guns from fuel storage containers will be locked. All pumps using fuel or containing oil will be locally and securely bunded where there is the possibility of discharge to waters.
- Potential impacts caused by spillages etc. during rehabilitation will be reduced by keeping spill kits and other appropriate equipment on-site.
- Site activities will be carried out in accordance with 'best practice'. In order to ensure compliance and implementation of 'best practice', these measures will be communicated to relevant Bord na Móna staff and updated as required.

APPENDIX V: BIOSECURITY

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site. Section 49 of the European Communities (Birds and Natural Habitats) Regulations 2011 prohibits the introduction and dispersal of invasive alien species (particularly plant species) listed on Part 1 (third column) of the 'Third Schedule'.

This section aims to reduce the risk from, and impacts of, invasive species and protecting biodiversity on lands under Bord na Móna ownership. Rehabilitation and decommissioning in the bog will have due regard to the relevant biosecurity measures outlined below:

- Records of problematic invasive species within the various bog units will be marked out with signs to highlight areas of infestation to personnel.
- All plant machinery will be restricted from disturbing known colonies of invasive species.
- All plant machinery will avoid unnecessary crossings to adjoining lands.
- Good site hygiene will be employed to prevent the introduction and spread of problematic invasive alien plant species (i.e. Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), Himalayan Knotweed (*Persicaria wallichii*), etc.) by thoroughly washing vehicles prior to entering the area.

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013).

In addition to the above, Best Practice measures around the prevention and spread of Crayfish plague[6] will be adhered with throughout all rehabilitation measures and activities.

[6] https://www.biodiversityireland.ie/projects/invasive-species/crayfish-plague/

APPENDIX VI: POLICY AND REGULATORY FRAMEWORK

Bord na Móna Plc is a publicly owned company, originally established in 1934 to develop some of Ireland's extensive peat resources for the purposes of economic development and to support energy security. In the decades since its establishment the company has employed tens of thousands of people in its fuel, energy, and horticultural growing media businesses. For much of its history the company's support of important national policy aims has been enabled and encouraged in a variety of ways by Government.

Today, Bord na Móna is undertaking a number of highly significant actions in support of climate policy. These actions involve a radical transformation and decarbonisation of nearly the entire Bord na Móna business. This transformation will be driven by unlocking the full potential of our land and creating significant value for Ireland and the Midlands in particular.

Bord na Móna is an integral part of the economic, social, and environmental fabric of Ireland and Irish life. As a key employer in the Midlands, the company is conscious that its obligations go beyond purely commercial and environmental – there is also a social responsibility to employees and the communities served by Bord na Móna. It is the company's role and absolute priority to ensure that its long-term strategy delivers on all of these important areas in a robust and balanced way.

There are a wide range of policies, plans, legislation and land designations that inform the development of this Bord na Móna peatland rehabilitation plan. Bord na Móna have also developed and operate various policies and strategies that also inform the development of this rehabilitation plan.

1 EPA IPC Licence

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Mount Dillon bog group (Ref. PO-504-01). As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the boglands within the licensed area. The bog is part of the Mount Dillon group. This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

Bord na Móna (BnM) understand that it is the Minister's (DECC) intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the Scheme (PCAS) will deliver benefits across climate action (GHG mitigation through reduced carbon emissions and acceleration towards carbon sequestration), enrich the State's natural capital, increase eco-system services, strengthen biodiversity, improve water quality and storage attenuation as well as developing the amenity potential of the peatlands.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration, under the Scheme (PCAS), and supported by the Climate Action Fund and Ireland's National Recovery and Resilience Plan across a footprint of 33,000 ha. This scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and measures supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the additional costs associated with the additional

and enhanced rehabilitation, i.e., those activities which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

The proposed enhanced rehabilitation detailed in this document, are predicated on the understanding that the element of the activities, over and above the 'standard' rehabilitation necessary to comply with pre-existing Condition 10 IPC Licence requirements, will be deemed eligible costs by the Scheme regulator and funded by the Climate Action Fund and Ireland's National Recovery and Resilience Plan.

For the avoidance of doubt, should the Scheme and the associated statutory obligation on Bord na Móna not materialise, Bord na Móna will not carry out the enhanced decommissioning, rehabilitation and restoration measures described in this plan. Bord na Móna will instead plan to complete an adapted standard decommissioning and rehabilitation measures required under Condition 10 and outlined in Appendix I.

3 National Climate Policy

The National Policy Position establishes the fundamental national objective of achieving a transition to a competitive, low carbon, climate-resilient and environmentally sustainable economy by 2050. It sets out:

- the context for the objective;
- clarifies the level of GHG mitigation ambition envisaged; and
- establishes the process to pursue and achieve the overall objective.

The evolution of climate policy in Ireland will be an iterative process based on the adoption by government of a series of national plans over the period to 2050. GHG mitigation and adaptation to the impacts of climate change are to be addressed in parallel national plans – respectively through the National Climate Action Plan. The plans will be continually updated, as well as being reviewed on a structured basis at appropriate intervals and, at a minimum, every five years. This will include early identification and ongoing updating of possible transition pathways to 2050 to inform sectoral strategic choices.

Bord na Móna is following a decarbonisation programme aimed at reducing the carbon emissions from its activities. Industrial peat production has now ceased, and several other decarbonisation measures are being implemented. The company aims to further develop renewable energy and resource recovery markets with a key objective of reducing the carbon intensity of all products. In addition, the carbon emission mitigation benefits associated with the post-peat extraction rehabilitated peatland following re-wetting, revegetation and colonisation of significant areas with native woodland will make a significant contribution to achieving the State's carbon emission reduction targets.

4 National Peatlands Strategy

The National Peatlands Strategy (2015) contains a comprehensive list of actions, necessary to ensure that Ireland's peatlands are preserved, nurtured and become living assets within the communities that live beside them. It sets out a cross-governmental approach to managing issues that relate to peatlands, including compliance with EU environmental law, climate change, forestry, flood control, energy, nature conservation, planning, and agriculture. The Strategy has been developed in partnership between relevant Government Departments/State bodies and key stakeholders through the Peatlands Council.

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits

can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

In line with a National Peatlands Strategy recommendation, a Peatlands Strategy Implementation Group (PSIG), was established, assisted in the finalisation of the Strategy, is overseeing subsequent implementation and will report to Government on an annual basis on the implementation of the actions and principles contained within the Strategy.

Bord na Móna is a key stakeholder in the National Peatlands Strategy and the Peatlands Strategy Implementation Group. The strategy recognises the potential for some Bord na Móna sites to be restored and to contribute to the national SAC and NHA network of protected raised bog sites. The strategy (agreed in 2015) also recognises the various different values of cutaway bog and developed six key principles (with Bord na Móna) for the after-use of cutaway bog.

- Bord na Móna will continue to assess and evaluate the potential of the company's land bank, using a land use review system. The assessment will help prepare a set of evidence-based management plans for the various areas of peatland. These plans will also inform its cutaway bog rehabilitation.
- The policy of Bord na Móna is not to open up any undrained new bogs for peat production.
- Lands identified by Bord na Móna as having high biodiversity value and/or priority habitats will be reserved for these purposes as the principal future land use.
- Generally, Bord na Móna cutaway bogs that flood naturally will be permitted to flood unless there is a clear environmental and/or economic case to maintain pumped drainage.
- In deciding on the most appropriate afteruse of cutaway peatlands, consideration shall be given to encouraging, where possible, the return to a natural functioning peatland ecosystem.
- This will require re-wetting of the cutaway peatlands which may lead in time to the restoration of the peatland ecosystem.
- Environmentally, socially and economically viable options should be analysed to plan the future use of industrial cutaway peatlands, in conjunction with limiting factors as outlined in Bord na Móna's Strategic Framework for the Future Use of Peatlands.

The National Peatlands Strategy highlights the importance and value of developing peatland rehabilitation plans for Bord na Móna cutaway sites and implementing this peatland rehabilitation. Some of these principles have now been superseded by the company's decision to cease industrial peat extraction. The National Peatlands Strategy is currently being reviewed by Government.

5 Draft National River Basin Management Plan 2022-2027 (Water Framework Directive)

The National River Basin Management Plan (Department of Housing, Planning, Community and Local Government 2017) is the key national plan for Ireland to achieve the objectives of the Water Framework Directive (WFD). In broad terms, the objectives of the WFD are (1) to prevent the deterioration of water bodies and to protect, enhance and restore them with the aim of achieving at least good status and (2) to achieve compliance with the requirements for designated protected areas.

The NRBMP 2018-2021 outlined how peat extraction can be a potentially significant pressure on various water quality parameters. Peatland rehabilitation of Bord na Móna cutaway (in addition to other measures) was part

of the WFD (2018-2021) programme of measures. The NRBMP 2018-2021 takes account of the fact that Bord na Móna was in the process of phasing out the extraction of peat for energy production, that it set a target to rehabilitate 9,000 ha of cutaway bogs (covering 25 peatlands) by 2021 (in 2018) and will look to implement best-available mitigation measures to further reduce water quality impacts caused by peat extraction while the phasing-out process is taking place. This NRBMP 2018-2021 rehabilitation target was superseded by the acceleration of the Bord na Móna de-carbonisation programme and the Scheme **(PCAS)**.

The development of site rehabilitation plans and the delivery of peatland rehabilitation by Bord na Móna was expected to have a positive impact on water quality and will help the NRBMP 2018-2021 deliver its objectives in relation to the Water Framework Directive and is one of the five key principle actions.

The draft NWBMP 2022-2027 describes how the number of waterbodies impacted by peat, industry and forestry have decreased by 10, 10 and 5 waterbodies, respectively since the second cycle. Impacts on water quality and river habitat arising from peat and peat extraction and associated drainage include the release of ammonium and fine-grained suspended sediments, and physical alteration of aquatic habitats. Drainage of peatlands also results in changes to the hydromorphological condition of rivers.

The draft NWBMP 2022-2027 outlines how maintaining and restoring Irish bogs will lead to a decrease in waterborne carbon leaching to levels comparable with intact bogs as well as reducing losses of peat silt and ammonia. Vegetation on the surface of the peat can also slow the flow of water over the land surface. Based on the EPA's most recent reports, peat extraction and drainage is impacting on 106 water bodies across the country, with peat the single pressure on 28 of these water bodies. However, compared to the data in the second-cycle plan, the number of water bodies impacted by peat has decreased.

The cessation of industrial peat extraction by Bord na Móna in 2021 was expected to have a significant positive impact on water quality of receiving water courses by reducing the impact of peat extraction as a key pressure on particular water courses. This is now being supported by the results and conclusions of the draft NWBMP 2022-2027.

6 National Biodiversity Action Plan 2016-2021

The National Biodiversity Action Plan 2016-2022 has a vision that biodiversity and ecosystems in Ireland are conserved and restored, delivering benefits essential for all sectors of society and that Ireland contributes to efforts to halt the loss of biodiversity and the degradation of ecosystems in the EU and globally. Ireland's 2nd National Biodiversity Action Plan outlines the main policies, strategies, actions and targets in relation to biodiversity. This plan has several Bord na Móna specific objectives and actions including implementing the BnM Biodiversity Action Plan 2016-2021 and overlaps with both the National Peatlands Strategy and the National Raised Bog Special Areas of Conservation Management Plan 2017-2022.

The delivery of rehabilitation via PCAS is expected to significantly contribute in the future to actions and targets of the National Biodiversity Action Plan 2016-2021, particularly in relation to peatland restoration and creation of new habitats such as wetlands and woodlands.

7 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas

(NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

8 National Raised Bog Special Area of Conservation Management Plan 2017-2022.

The National Raised Bog Special Area of Conservation Management Plan 2017-2022 sets out a roadmap for the long-term management, restoration and conservation of protected raised bogs in Ireland. The Plan strikes an appropriate balance between the need to conserve and restore Ireland's raised bog network as part of Ireland's commitments towards the EU Habitats Directive, and the needs of stakeholders and gives recognition to the important role that communities have to play in the conservation and restoration of raised bogs. The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 is part of the measures being implemented in response to the on-going infringement action against Ireland in relation to the implementation of the EU Habitats Directive, with regard to the regulation of turf cutting on the Special Areas of Conservation (SACs). The then Minister for Arts, Heritage and the Gaeltacht, also published a **Review of Raised Bog Natural Heritage Area Network** in 2014.

Bord na Móna has played a key role in the development of the National Raised Bog Special Area of Conservation Management Plan 2017-2022 and the Review of the Raised Bog Natural Heritage Area Network. Several Bord na Móna sites were assessed by the National Parks and Wildlife Service as part of the above Plan and Review and there is an expectation that several Bord na Móna sites will be designated as SACs and NHAs in the future. This will reinforce the network of protected raised bog sites and replace in part sites that will be de-designated as they have been deemed to be significantly damaged and are deemed to have no raised bog restoration prospects. PCAS is expected to restore several sites that will contribute to The National Raised Bog Special Areas of Conservation (SACs) Management Plan 2017-2022 targets in relation to the restoration of raised bog habitat.

Bord na Móna has also responded to the needs of the NRBMP and provided several sites to the government for the relocation of turf-cutters from SACs. This is part of a suite of ongoing bog conservation measures in the NRBMP to manage turf-cutting in protected sites. Bord na Móna and the National Parks and Wildlife Service continues to engage regarding the ongoing relocation of turf-cutters from protected raised bog sites.

9 All-Ireland Pollinator Plan 2021-2025

The All-Ireland Pollinator Plan 2021-2025 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. A Bord na Móna specific action in this plan includes the adoption of pollinator-friendly management within the Bord na Móna network of sites. One action to help achieve this objective is habitat rehabilitation and restoration, where possible, of pollinator-friendly habitats, including peatland habitats.

10 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure

that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

11 National Archaeology Code of Practice

Bord na Móna operates under an agreed Code of Practice regarding archaeology with the Department of Arts, Heritage and the Gaeltacht and the National Museum of Ireland which provides a framework to enable the Company to progress peat extraction whilst carrying out archaeological mitigation. (https://www.archaeology.ie/sites/default/files/media/publications/cop-bord-na-mona-en.pdf

The Code replaced a set of Principles agreed with the Department of Arts, Heritage and the Gaeltacht in the 1990s. Under the Code Bord na Móna, the Minister and Director work together to ensure that appropriate archaeological mitigation is carried out in advance of peat extraction.

- BNM must ensure that any monuments or archaeological objects discovered during peat extraction are protected in an appropriate manner by following the Archaeological Protection Procedures.
- BNM must ensure that any newly discovered monuments on Bord na Móna lands are reported in a timely manner to the National Monuments Service of the Department of Arts, Heritage and the Gaeltacht.
- BNM must ensure that any archaeological objects discovered on Bord na Móna lands are reported immediately to the Duty Officer of the National Museum of Ireland.
- Bord na Móna will adhere to the Archaeology Code of Practice relating to management of any archaeological finds that may arise during cutaway peatland rehabilitation and decommissioning.

12 Bord na Móna Biodiversity Action Plan 2016-2021

Rehabilitation of industrial peatlands is a key objective of the Bord na Móna Biodiversity Action Plan 2016-2021. This action plan outlines the main objectives and actions around biodiversity on Bord na Móna lands. The Bord na Móna Biodiversity Action Plan also outlines key International and European policy in relation to biodiversity. This includes the **United Nations Convention on Biodiversity 2011-2020 (CBD)** and **European Biodiversity Strategy to 2020**. Further details of these policies and Bord na Móna s responses can be found in the Bord na Móna Biodiversity Action Plan (Bord na Móna, 2016). Both policy documents highlight targets such as reducing pressure on biodiversity, promoting sustainability, habitat restoration and benefits of ecosystem services.

One example of a key CBD target is:

- *"Restore at least 15% of degraded areas through conservation and restoration activities."*

The EUs headline target for progress by 2020 is to:

- *"halt the loss of biodiversity and the degradation of ecosystems in the EU by 2020, restore them as far as feasible, while stepping up the EU contribution to averting global biodiversity loss."*

This rehabilitation plan is aligned to the CBD target and the EU Biodiversity Strategy target and will help Ireland meet its commitment to these international Biodiversity polices.

13 Bord na Móna commitments

Bord na Móna made the commitment in 2009 not to develop any new peatland sites for industrial peat production. The company has continued to work with different stakeholders.

The company announced that industrial peat production would be cut by over 50 percent in 2019 and would entirely cease over most of its lands by the mid-2020s. Rehabilitation measures would continue to be carried out with the focus on re-wetting and rehabilitation of cutover and cutaway areas in line with national policies (such as the National Peatland Strategy, the National Biodiversity Action Plan, the Climate Action Plan 2019, the Water Framework Directive, etc.) and rehabilitation guidelines set down by the Environmental Protection Agency. To date, 15,000 hectares of cutaway and cutover bog have been rehabilitated using this approach with 5,000 hectares in active rehabilitation.

In line with Bord na Móna's accelerated decarbonisation programme, the company made a further commitment to a significantly larger rehabilitation target. This was reflected in our plans to rehabilitate a further 20,000 hectares of cutaway and cutover bog to wetland and woodland mosaics by 2025. In addition, we planned to restore a further 1,000 hectares of raised bog habitat by 2025.

The above commitments have now been followed by the decision by the company to cease industrial peat extraction and rehabilitate a target of 33,000 ha between 2021-2025.

These commitments outline the importance of peatland rehabilitation to Bord na Móna. The company will continue to demonstrate environmental responsibility and continue to deliver on these commitments in relation to peatland rehabilitation and in relation to the future management of these lands to maximise their benefits, particularly their ecosystem service benefits, along with the sustainable development of a portion of the land bank for other uses, such as renewable energy.

14 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2020 (Draft)

The general after-use strategy of Bord na Móna is outlined in the Bord na Móna Strategic Framework for Future-Use of Cutaway Bogs 2020 (draft document). This document outlines how Bord na Móna's cutover peatland estate is complex in nature with great variability in terms of peat depths, peat types, drainage, subsoil condition and environmental value. Thus, future options require consideration on a site-specific basis, also bearing in mind the considerable internal variation within bogs. The development of the land-bank will also take account of national needs, while also taking account of the various national legislation, policies and plans related to the management of peatlands. In general, Bord na Móna will seek to balance and optimise commercial, social, and environmental value of these sites, and develop integrated land-uses, while taking account of the need for sustainability and their biodiversity value.

Any consideration of other future after-uses for Bord na Móna land such as development or other mixed uses will be conducted following the relevant planning guidelines and consultation with relevant authorities and will be considered within the framework of this peatland rehabilitation plan.

APPENDIX VII: DECOMMISSIONING

1. Condition 10 Decommissioning

Decommissioning is a requirement of the applicable Integrated Pollution Control Licence issued by the Environmental Protection Agency. This condition 10.1 requires the following:

10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:

10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

The main success criteria pertaining to successfully complying with this condition is ensuring that no environmental liability remains from this infrastructure and material and that the bog can be deemed suitable for surrender of the licence under section 95 of the EPA Acts. This is achieved by Bord na Móna identifying and quantifying any mechanical and infrastructural resources that were installed in the bog to enable the development and production operation at the site. This list is then refined to identify any items that would be deemed as possibly resulting in environmental pollution, should they not be removed.

Typically, these items/infrastructures would be any remaining, unconsolidated plant, equipment and attachments, waste materials, unused raw materials such as land drainage pipes, remaining peat stockpiles, stock pile covering, pumps, septic tanks and fuel tanks.

In relation to this bog, the list and tasks would be as follows:

Item	Description	Derryarogue Decommissioning Plan
1	Clean-up of remaining or unconsolidated waste or materials located in Bogs, Yards, Buildings and Offices	Clean-up of Bog
2	Cleaning Silt Ponds	Cleaning Silt Ponds
3	Decommissioning Peat Stockpiles	Peat Stockpile Management
4	Decommissioning or Removal of Buildings and Compounds	Decommissioning or Removal of Buildings and Compounds
5	Decommissioning Fuel Tanks and associated facilities	Where relevant
6	Decommissioning and Removal of Bog Pump Sites	Where relevant
7	Decommissioning or Removal of Septic Tanks	Where relevant

In addition, condition 7 of the licence requires these now defined waste items to be disposed of or recovered as follows:

7.1 Disposal or recovery of waste shall take place only as specified in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* of this licence and in accordance with the appropriate National and European legislation and protocols. No other waste shall be disposed of/recovered either on-site or off-site without prior notice to, and prior written agreement of, the Agency.

7.2 Waste sent off-site for recovery or disposal shall only be conveyed to a waste contractor, as agreed by the Agency, and only transported from the site of the activity to the site of recovery/disposal in a manner which will not adversely affect the environment.

7.3 A full record, which shall be open to inspection by authorized persons of the Agency at all times, shall be kept by the licensee on matters relating to the waste management operations and practices at this site. This record shall as a minimum contain details of the following:

7.3.1 The names of the agent and transporter of the waste.

7.3.2 The name of the persons responsible for the ultimate disposal/recovery of the

waste.

7.3.3 The ultimate destination of the waste.

7.3.4 Written confirmation of the acceptance and disposal/recovery of any hazardous waste consignments sent off-site.

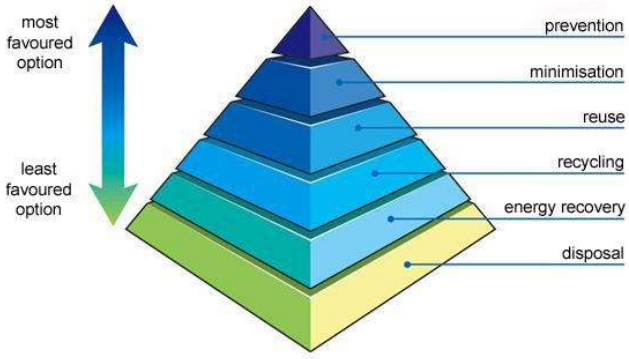
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

7.3.6 Details of any rejected consignments.

A copy of this Waste Management record shall be submitted to the Agency as part of the AER for the site.

As required by the licence, these waste items will be removed for recycling or disposal, using external contractors with the required waste collection permits, approved under 7.2, with waste records maintained as required under 7.3.

Where possible, Bord na Móna will utilize the appropriate waste hierarchy to identify waste that can reused or recycled ahead of disposal.



The validation of the success of condition 10.1 is carried out through an Independent Closure Audit (ICA), followed by and EPA Exit Audit (EA) and the eventual partial or full surrender of the licence.

2. Enhanced Decommissioning.

The remaining infrastructure does not constitute a risk to the environment and would not be a requirement of condition 10 of the licence. The removal of these are deemed as enhanced measures. These may enhance the future after use of the bog for amenity value, security against access for illegal and unsocial activities and general State and community benefit. In relation to this bog, this would include the infrastructure defined below:

Item	Enhanced Decommissioning Type	Derryarogue Decommissioning Plan
1	Removal of Railway Lines	Removal of Railway Lines
2	Decommissioning Bridges and Underpasses	Where Applicable
3	Decommissioning Railway Level Crossing	Where Applicable
4	Restricting Access (bogs and silt ponds)	Restricting Access to Bog
5	Removal of High Voltage Power Lines	Where Applicable

APPENDIX VIII: GLOSSARY

Cutaway Bog: A Bord na Móna site generally becomes cutaway when it is economically unviable to continue industrial peat extraction or when the majority of peat has been removed.

Deep peat cutover bog. Deep peat cutover bog is defined as former raised bogs that have been in industrial peat production, where production has ceased but the residual peat depth is typically in excess of 2m. *Sphagnum* mosses are key species of raised bogs and the majority of the peat mass is formed from these mosses. *Sphagnum* species and other raised bog species are a key part of raised bog habitat function and prefer more acidic, nutrient poor, water-logged conditions. Typical raised bog *Sphagnum* mosses and other bog species do not thrive with the more typical alkaline water chemistry of cutaway bog but do grow well in these more acidic conditions where peat has been re-wetted. There is potential to re-develop *Sphagnum*-rich plant communities in these conditions if the peat can be re-wetted. This brings the opportunity of re-developing *Sphagnum*-rich vegetation communities that are considered Carbon sinks or peat-forming habitats and restoring the carbon sequestration function of these sites.

Dry cutaway bog: Cutaway bog is categorised as dry cutaway where it is not practical or feasible to re-wet these areas completely. It is inevitable that some areas of cutaway will remain relatively dry due to the heterogenous topography of the cutaway, as well as requirements for continued drainage on site for identified after-uses, or off site in relation to neighbouring lands or other infrastructure. Ridges and mounds of glacial deposits can become exposed during peat extraction and form a heterogenous topographical mosaic separated by basins. Dry cutaway may have very thin or no residual peat where ridges and mounds have been exposed. The exposed sub-soils are a mix of glacial gravels, muds and tills that can be quite free-draining. Dry cutaway may also have deeper residual peat, but in a location (i.e. at the margin) where the peat cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

Enhanced decommissioning: This is defined as decommissioning carried out under the Scheme, which is proposed to be externally funded.

Enhanced rehabilitation: This is defined as rehabilitation carried out under Scheme, which is proposed to be externally funded. It is proposed by Government that Bord na Móna be obligated to carry out enhanced decommissioning, rehabilitation and restoration on peatlands. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. Interventions and activities supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered. However, only the costs associated with the additional, enhanced and accelerated measures, i.e., those interventions which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support under the Scheme.

Environmental stabilisation: The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, slowing water movement across the bog, minimising effects to downstream waterbodies and meeting the conditions of the IPC Licence. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Habitats will develop that reflect the underlying environmental conditions. Other after-use development may also serve to act as environmental stabilisation.

Marginal land. Marginal land is defined as land around the margin of the industrial peat production area. This margin generally contains a range of habitats including scrub, birch woodland, cutover bog and raised bog remnants. It has a variety of land-uses including turf-cutting (private turbary). The Scheme will consider potential rehabilitation and restoration actions (e.g. drain blocking) within marginal land zones, where appropriate.

Rehabilitation: Rehabilitation is defined in general by Bord na Móna as environmental stabilisation of the former cutaway. This is generally achieved via re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention. It is not possible to restore raised bog habitats on BnM cutaway in general in the short-term. In general, most of the peat mass has been removed from many BnM cutaway sites and the environmental characteristics of these areas have therefore changed radically (peat depths, hydrology, water chemistry, substrate type, nutrient status. This means there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and Birch woodland). Other after-use development may also serve to act as rehabilitation.

Restoration: Ecological restoration to defined as the process of re-establishing to the extent possible the structure, function and integrity of indigenous ecosystems and the sustaining habitats they provide" (SER, 2004). Defined in this way, restoration encompasses the repair of ecosystems (Whisenant, 1999) and the **improvement of ecological conditions in damaged wildlands** through the **reinstatement of ecological processes**. In general, Bord na Móna cutaway peatlands cannot be restored back to raised bog in a reasonable timeframe as their environmental conditions has changed so radically (with the removal of the acrotelem – the living layer and much of the peat mass). However, they can be returned to a **trajectory** towards a naturally functioning peatland system (Renou-Wilson, 2012). **Raised bog restoration** is an objective of some BnM sites where there is residual natural raised bog vegetation and where the majority of the peat is still intact.

Standard rehabilitation: This is defined as rehabilitation that is designed to meet the conditions of the EPA IPC Licence. The key objective of rehabilitation is environmental stabilisation. This is achieved by a combination of re-wetting, where possible, and natural colonisation of the former cutaway, with or without intervention**.** Other after-use development may also serve to act as rehabilitation.

Standard decommissioning: This is defined as decommissioning that is designed to meet the conditions of the EPA IPC Licence. This is defined as to render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.

Wetland cutaway bog. Wetland cutaway bog is defined as former raised bogs that have been in industrial peat production, where production has ceased and the majority of peat has been cutaway, and where this cutaway has the potential to be re-wetted. A significant number of Bord na Móna sites have pumped drainage and these sites are likely to develop a mosaic of wetland habitats when pumping in reduced or stopped. The water chemistry of wetland cutaway frequently is strongly influenced by the more alkaline sub-soils that have been exposed during peat production. This means that pioneer vegetation is more typical of fen and wetland, rather than raised bog. Wetland cutaway will have a broad range of hydrological conditions depending on the local topography. In some cases, these wetlands may form deep water (> 0.5 m) whilst other areas may have the water table at or just below the surface of the ground.

APPENDIX IX: EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

Objective:
The objective of this generic plan is to comply with the requirements of regulation 5 of the Waste Management (Management of Waste from Extractive Industries) Regulations, and to prevent or reduce waste production and its harmfulness.

Scope:
This plan covers IPPC Licence's Ref P0504-01, Mountdillon Group of Bogs located in Co. Longford.

1.0 Extractive Waste:
Waste classified as extractive waste from peat extraction operations arise from three operations associated with this activity.

1.1 Silt Pond excavations and maintenance.
All peat extraction activities in the Allen Clonsast bog group are are serviced by silt lagoons/ponds. During the excavation of these silt ponds, pre IPPC Licensing in 1999 and since licensing, the excavated material is stored adjacent to the silt pond, where it either remains in situ ores levelled out. As required by condition 6.6, these silt lagoons are cleaned twice per annum or more often if inspections dictate. These silt cleanings are also deposited on the same location, adjacent to the silt pond, where they may be levelled periodically to allow room for subsequent cleanings. These mounds of silt pond excavation material and cleanings are generally no higher that 2-3 metres.

1.2 Power Station screenings:
Lough Ree Power Station screens the peat from the bogs prior to processing. This screening removes oversized peat, stones and bogs timbers. Schedule 3 (ii) of the IPPC licence permits disposal of these peat screenings back to the bog, where it is levelled and graded into the surrounding peat landscape. These locations have been agreed with the Agency as per condition 7.4 of the IPPC Licence, and as per the attached locations.

1.3 Bog Timbers:
During peat extraction operations, bog timbers often arise in the bog surface and are required to be cleared. These timbers consist of bog pine, oak and some yew. Some of these timbers, such as the oak and yew are removed for use in the wood craft industry, with the remaining bog pine stockpiled in locations at the opposite end of each bog, where it generally becomes a habitat for flora and fauna. These piles of timber are generally no higher than 1-2 metres.

2.0 P0504-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December 2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

2.2 Condition 7.6 Waste Facility
(i) No new waste facility may be developed or an existing waste facility modified unless agreed by the Agency.
(ii) The licensee shall ensure that all existing waste facilities are managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iii) The licensee shall ensure that all new waste facilities are constructed, managed and maintained to ensure their physical stability and to prevent pollution or contamination of soil, air, surface water or groundwater.
(iv) Operational measures shall be continuously employed to prevent damage to waste facilities from personnel, plant or equipment.
(v) The licensee shall establish and maintain a system for regular monitoring and inspection of waste facilities.
(vi) All records of monitoring and inspection of waste facilities, as required under the licence, shall be maintained on-site in order to ensure the appropriate handover of information in the event of a change of operator or relevant personnel.

2.3 Condition 7.7 Excavation Voids
7.7.1 Unless otherwise agreed by the Agency, only extractive waste shall be placed in excavation voids.
7.7.2 When placing extractive waste into excavation voids for rehabilitation and construction purposes, the licensee shall, in accordance with regulation 10 of the Waste Management (Management of Waste from the Extractive Industries) Regulations, 2009, and the Extractive Waste Management Plan:

- Secure the stability of the waste
- Put in place measures to prevent pollution of soil, surface water and ground water.
- Carry out monitoring of the extractive waste and excavation void.

Condition 7.5. Extractive Waste Management Plan. 5 (1)

3.0 Minimisation.
3.1 Silt pond excavation material and cleanings.
IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is

through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

3.2 Power Station Screenings.
These screenings cannot be minimised as they are a consequence of peat production, stones, timbers and oversize peat materials are naturally occurring on the bog, and are required to be removed prior to processing.

3.3 Bog Timbers.
Bog timbers are also naturally occurring materials within a bog and are required to be removed prior for production. The volume of these bog timbers varies from bog to bog and as such their minimisation is not controllable or quantifiable.

4.0 Treatment
4.1 Silt pond excavation material and cleanings.
The silt pond excavation material and silt cleanings do not require any treatment for its end use which will be either backfilling these silt pond voids as per condition 7.7.1 above as part of the Bog Rehabilitation Plan, or reincorporated into the surrounding peatlands.

4.2 Power Station Screenings.
The factory screenings are permitted to be returned to the bog as they were naturally occurring materials from the bog, and as such do not require any treatment to serve this purpose.

4.3 Bog Timbers
As per 1.3 above, these timbers are stockpiled at two locations in each bog, as per the attached list of sites and become habitats for various flora and fauna.

5.0 Recovery
5.1 Silt pond excavation material and cleanings.
Condition 2.2.2 (vi) requires the reuse of silt pond waste to be examined. This was undertaken in 2006, the outcome of which was that this waste peat silt material, as a fuel, was contaminated with sub-soils, rendering it unsuitable for combustion. In addition, volumes are small compared to overall peat production volumes.

5.2 Power Station Screenings.
Given the nature of these screenings as outlined in 1.2 above, there is no further use identified and they are permitted to be disposed of back to the bog.

5.3 Bog Timbers
Investigations into processing these materials into smaller fractions for potential heating purposes did not yield any viable results. In addition, these older stockpiles are now classified as habitats and as such would not be considered for reuse as a fuel.

6.0 Disposal
6.1 Silt pond excavation material and cleanings.
Schedule 3 (ii) permits the disposal of silt pond cleanings (Lagoon Sediments) to the bog and these locations, adjacent to the silt pond site, are presented in the attached spreadsheet, with associated grid coordinates.

6.2 Power Station Screenings.
Schedule 3 (ii) permits the disposal of screenings (Peat Screenings) to the bog at designated locations agreed under Condition 7.4, and these locations, are presented in the attached spreadsheet, with associated grid coordinates.

6.3 Bog Timbers
These naturally occurring bog timbers are stockpiled at locations in each bog, grid coordinates attached.

7.0 Extractive Waste Management Plan

5 (2a)(i)
The vast majority of peat extraction bogs were all designed and drained for production prior to the 1960's and as such the production fields layout cannot' be altered. Under our Cleaner Reduction Procedures, various design changes have been implemented to the production machines and process to reduce lost peat which eventually is captured in the silt ponds and requires removal as waste peat silt. This along with training and ongoing research and development will continuously reduce waste peat and subsequently waste silt pond cleanings. Bog timbers are present naturally in various volumes and quantities in different bogs and as peat production involves stripping peat in layers, the exposure, generation and removal of these timbers is unavoidable. Work has been undertaken recently into project looking at grinding of these bog timbers in situ using a timber miller, and if this project becomes viable it will contribute to the reduction of bog timbers.

5 (2a)(ii)
Given the nature and expanse of peat bogs, the stockpiling and storage of these waste materials do not present a visual, storage or stability problem. As required under Condition 10 of the IPPC Licence, the silt pond excavations and screenings will be utilised to backfill the silt pond voids once the bogs have finished and stabilised in accordance with out Bog Rehabilitation Plan. Storage of these wastes in the interim, open to the elements does not present a change on the nature of these wastes that will threaten the environment or prevent their reuse during the bog rehabilitation process.

5 (2a)(iii)
Under Condition 10 of the IPPC Licence, all silt ponds will be decommissioned once the bog surface has stabilised, in agreement with the Agency. This will involve the removal of weirs and flow controls, returning the silt pond back to its original drain or removing the silt pond from the drainage system. Both of these activities will involve placing the silt pond extraction and cleaning material back into the excavation void.

5 (2a)(iv)
The peat bogs do not contain any topsoil, so this is not required.

5 (2a)(v)
Peat mineral resources do not undergo any treatment.

5 (2b)
These three extractive waste are all being reused and recovered back to their original extraction points and have not undergone any physical, chemical, or biological change.

5 (2c)(i, ii & iii)
These three extractive wastes, stored on the bog for reuse or recovery during the bog rehabilitation phase, do not require any management or monitoring during the operation of these bogs. Silt pond excavations and cleanings are stored adjacent to the silt pond and quickly revegetated and stabilise, the screenings are graded back into the bog at the agreed locations upon disposal and the bog timbers do not prevent any water or airborne danger to the environment.

5 (3)
The three extractive wastes arising from peat extraction operations at this site are classified wastes from mineral non-metalliferous excavation, with an EWC code of 0101 02. The materials are not classified as hazardous under Directive 91/689/EEC20, and do not contain substances or preparations classified as dangerous under Directives 67/548/EEC5 or 1999/45/EC6 above a certain threshold.
The peat excavations and cleanings are stored in locations and in a manner that they could not collapse, and are remote in their nature. The stockpiles are located adjacent to silt ponds that are cleaned regularly and as such these stockpiles are managed and levelled to facilitate further cleanings.
Therefore the material stored at these waste facilities would not be considered to be a Category A waste facility.

Classification in accordance Annex II.

Waste Material	Description	**C**lassification	Chemical Process treatment	Deposition description	Transport System
Silt Pond Excavations and cleanings	Peat and mineral soils associated with peatlands. Stored for reuse during bog rehabilitation, with no displacement of overburden	01 01 02	None	Excavated from silt ponds by excavator and deposited adjacent to the silt pond.	Excavator
Peat Screenings	Stones, timbers and oversized peat particles, reincorporated into low areas, agreed with the Agency, and stabilized under normal natural bog conditions	01 01 02	None	Removed by screen at the factory and transported by tractor and trailer to the designated and agreed locations	Tractor and trailer.
Bog Timbers	Pine, Oak and Yew species, stored at locations in each bog. Not subject to any stability issues due to exposure to atmospheric/meteorological conditions.	01 01 02	None	Removed from the bog surface by excavator and transported by tractor and trailer to the agreed locations	Tractor and Trailer

Description of operations.
Silt pond excavations arise from the requirement to have silt ponds treating all peat extraction sites. Silt pond cleanings arise from the removal of peat silt from silt ponds as required under IPPC Licence. Bog timbers arise from preparation of the bogs surface for peat production. Estimated quantities of materials are below:

Closure plan. (Bog Rehabilitation Plan).
Condition 10.1 – 10.3 of the IPPC Licence requires the following:

- 10.1 Following termination of use or involvement of all or part of the site in the licensed activity, the licensee shall:
- 10.1.1 Decommission, render safe or remove for disposal/recovery, any soil, subsoils, buildings, plant or equipment, or any waste, materials or substances or other matter contained therein or thereon, that may result in environmental pollution.
- 10.1.2 Implement the agreed cutaway bog rehabilitation plan (refer Condition 10.2).

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.

- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

10.3 The Rehabilitation Plan shall include as a minimum, the following:

- 10.3.1 A scope statement for the plan; to include outcome of consultations with relevant Agencies, Authorities and affected parties (to be identified by the licensee).
- 10.3.2 The criteria which define the successful rehabilitation of the activity or part thereof, which ensures minimum impact to the environment.
- 10.3.3 A programme to achieve the stated criteria.
- 10.3.4 Where relevant, a test programme to demonstrate the successful implementation of the rehabilitation plan.
- 10.3.5 A programme for aftercare and maintenance.

10.4 A final validation report to include a certificate of completion for the Rehabilitation Plan, for all or part of the site as necessary, shall be submitted to the Agency within six months of execution of the plan. The licensee shall carry out such tests, investigations or submit certification, as requested by the Agency, to confirm that there is no continuing risk to the environment. This plan including maps and ecological classifications are available on file at the Allen Clonsast IPPC Licence Coordinators office.
The location in relation to the silt pond excavations and cleanings are adjacent to the silt ponds, which are considered under the Shannon River Basin Management Plan in accordance with the requirements of Directive 2000/60/EC.
Screenings and bog timbers are all naturally occurring elements of peatland and there placement back to the bog in smaller concentrated designated waste facilities does not constitute a risk to the prevention of water compliance.
The lands under where these materials are deposited are peatlands and are un-effected by the placing of this material.

Review.
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Allen Clonsast IPPC Licence P0504-01.

APPENDIX X: MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

- Any fertiliser used will be Rock Phosphate and will not be applied in the following conditions:
    1. The land is waterlogged;
    2. The land is flooded, or it is likely to flood;
    3. The land is frozen, or covered with snow;
    4. Heavy rain is forecast within 48 hours (forecasts will be checked from Met Éireann).
    5. The ground slopes steeply and there is a risk of water pollution, when factors such as surface run-off pathways, the presence of land drains, the absence of hedgerows to mitigate surface flow, soil condition and ground cover are taken into account.
- No fertiliser will be spread on land within 2 metres of a surface watercourse.
- Buffer zones in respect of waterbodies, as specified on https://www.epa.ie/about/faq/name,57156,en.html, will be adhered with at all times with regard to fertiliser application. Reproduced as follows:

Water body / Feature	Buffer zone
Any water supply source providing 100m^3 or more of water per day, or serving 500 or more people	200 metres (or as little as 30 metres where a local authority allows)
Any water supply source providing 10m^3 or more of water per day, or serving 50 or more people	100 metres (or as little as 30 metres where a local authority allows)
Any other water supply for human consumption	25 metres (or as little as 30 metres where a local authority allows)
Lake shoreline	20 metres
Exposed cavernous or karstified limestone features (such as swallow holes or collapse features)	15 metres
Any surface watercourse where the slope towards the watercourse exceeds 10%	10 metres
Any other surface waters	5 metres*

APPENDIX XI: CONSULTATION SUMMARIES

Table APX -1 Consultees contacted

Table APX -2 Response summary from Consultees contacted

APPENDIX XII: ARCHAEOLOGY

Role of the Archaeological Liaison Officer

1. To communicate this Code of Practice and the *Archaeological Protection Procedures* (Appendix IV) to all personnel operating on the bog.
2. To ensure that all notices relating to the *Archaeological Protection Procedures* are posted and maintained at appropriate locations on the bog.
3. To report any stray finds, presented to the Liaison Officer from his/her group of bogs, to the Duty Officer of the National Museum of Ireland.
4. To provide for the appropriate protection of the stray find, whether in-situ or removed from the bog, as directed by the Duty Officer of the National Museum of Ireland.

Code of Practice

22

Code of Practice

5. To arrange for the delivery or collection of the stray find, as directed by the Duty Officer of the National Museum of Ireland.

6. To complete the Report of Discovery of Archaeological Object(s) in Bogs (Appendix V), as directed by the Duty Officer of the National Museum of Ireland.

7. To maintain a file of all stray finds and associated documentation and provide copies to the Project Archaeologist.

8. To provide assistance, where required, to the Department during archaeological surveys.

9. To provide assistance, where required, to Bord na Móna's Consultant Archaeologists, during investigation and mitigation of monuments.

10. To report to the Bord na Móna members on the Archaeology Management Liaison Committee any planned developments or new activities on cutaway peatland areas within his/her group of bogs.

Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Derryaroge Bog, Co. Longford

Report For

Bord Na Móna Energy Ltd.

Author

Dr. Charles Mount

Bord Na Móna Project Archaeologist

Introduction

The EPA (2020) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, National monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation of lands at Derryaroge Bog, Co. Longford on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Derryaroge Bog will include:

- Re-assessment of the pumping regime and removing pumps if this desired and has no significant external impact. A significant part of the site has already developed a mosaic of wetland habitats with deeper water. Hydrological modelling will look to optimise water levels. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal flooding regime will develop, with water-levels fluctuating in association with levels in the adjacent River Shannon.
- Intensive drain blocking and construction of berms in shallow peat areas/modelled depressions to create/promote the spread of wetland habitats,
- Modifying outfalls, and management of water levels with overflow pipes and blocking of internal outfalls;
- Regular drain blocking (3/100) on dry cutaway along with the blocking of outfalls and management of water levels,
- Re-alignment of piped drainage.
- Deep Peat measures including field re-profiling, resulting in bunded areas suitable for Sphagnum inoculation, on deeper peat;
- Targeted fertiliser applications to accelerate vegetation establishment on areas of bare peat on headlands and high fields, and within certain areas of dry cutaway. Areas where vegetation has established do not need fertiliser application.
- Initial hydrological modelling indicates that a small part of the site will develop a mosaic of wetland habitats with the potential for some deeper water. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible. It is inevitable that some small sections will naturally have deeper water due to the topography at this site). Water-levels will be adjusted at outfalls and by adjusting piped drainage.

Derryaroge Bog is located c.0.7km north-east of the Lanesborough, Co. Longford, and North of the N63 road. The overall rehabilitation area occupies the townlands of Barnacor, Cloonbearla, Cloonbony, Cloonkeel and Mount Davis on OS 6 inch sheet Longford Nos. 12 and 17.

Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Derryaroge Bog. The overall extent of the rehabilitation is indicated in Fig. 2. This area was examined using information from:

- Peatland Surveys
- The Record of Monuments and Places
- The Sites and Monuments Record that is maintained by the Dept of Housing, Local Government and Heritage
- The topographical files of the National Museum of Ireland
- The Excavations database
- Previous assessments

An impact assessment has been prepared and recommendations have been made.

Desktop assessment

Barry Raftery Survey

Prof. Barry Raftery was notified of the presence of a togher LF017-028---- 0.52-0.85m below the surface in Cloonbony and Mount Davys townlands by Bord na Mona staff in 1988 (see Table 1). Raftery excavated two cuttings along the trackway in in Cloonbony townland in 1988 and 1989 (Raftery 1996, 180-94). The togher, which probably originally extended across the bog a distance of c.1km, was traced in 1988-89 for 400m across the bog and forked into two branches c.150m from dryland at the east. The togher was comprised of two layers of roundwood and split logs 8-15cm thick with pegs, laid transversely upon roundwood runners 10-22cm thick, which gave the trackway a total thickness of c.18-37cm.

IAWU Cat._No.	IAWU Class	SMR No.	SMR Class	Townland	ITM Easting	ITM Northing	Depth BS m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602389	770636	c.1.22m

Table 1. List of sightings recorded by Barry Raftery in Derryaroge Bog in 1988-89.

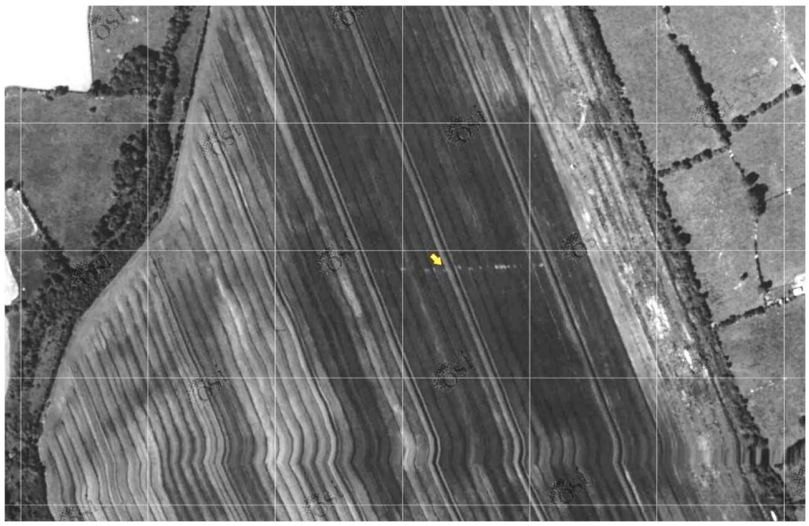


Fig 1. Derryaroge Bog, Co. Longford, OSI Orthophoto taken in 1995 with trackway LF017-028---- indicated with the arrow.

Togher LF017-028---- is visible on an Ordnance Survey Ireland (OSI) Orthophoto taken in 1995 (see Fig 1) and this image was used to generate a set of grid coordinates for the monument (see Table 2).

IAWU Cat._No.	IAWU Class	SMR No.	SMR Class	Townland	ITM Easting	ITM Northing	Depth BS m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602389	770636	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602462.093	770623.409	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602452.102	770622.986	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602442.111	770622.564	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602432.120	770622.141	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602422.129	770621.718	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602412.138	770621.296	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602402.147	770620.873	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602392.156	770620.450	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602382.164	770620.027	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602372.173	770619.605	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602362.182	770619.182	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602352.191	770618.759	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602342.200	770618.337	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602332.209	770617.914	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602322.218	770617.491	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602312.227	770617.069	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602302.236	770616.646	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602292.245	770616.223	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602282.254	770615.800	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602272.263	770615.378	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602262.272	770614.955	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602252.281	770614.532	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602242.290	770614.110	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602232.299	770613.687	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602222.307	770613.264	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602212.316	770612.842	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602202.325	770612.419	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602192.334	770611.996	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602182.343	770611.573	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602172.352	770611.151	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602162.361	770610.728	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602152.370	770610.305	c.1.22m
CY001	TOGH	LF017-028----	Togher	Mount Davys	602142.379	770609.883	c.1.22m

Table 2. Additional grid coordinates of togher LF017-028---- generated from the OSI Orthophoto in Fig. 1.

IAWU Peatland Survey

Derryaroge Bog was the subject of a survey by the Irish Archaeological Wetland Unit (IAWU) in 1991, but no additional sightings of archaeological material were made in the rehabilitation area.

Recorded Monuments

The Record of Monuments and Places (RMP) for Co. Longford which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1996). This record was published by the Minister in 1996 and includes sites and monuments that were known in Derryaroge Bog before that date. This review established that there is one RMP located in the proposed rehabilitation area (see Table 3 and Fig. 2). This sighting was notified by Barry Raftery following his 1988-9 investigations.

IAWU Cat._No.	**IAWU Class**	**RMP No.**	**SMR Class**	**Townland**	ITM Easting	ITM Northing
CY001	TOGH	LF017-028----	Togher	Mount Davys	602389	770636

Table 3. List of sites included in the Record of Monuments and Places in the rehabilitation area.

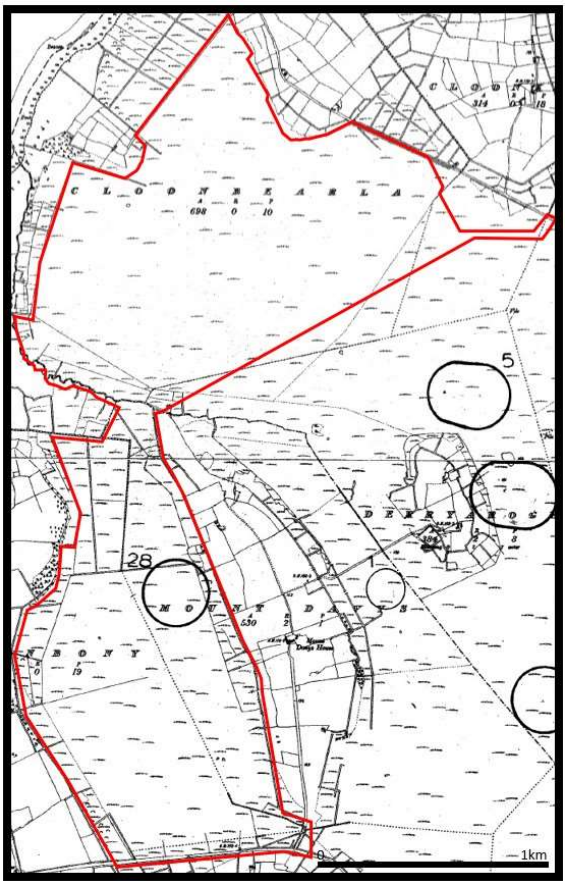


Fig. 2. Derryaroge Bog, Co. Longford, detail of the Record of Monuments and Places map sheets Nos. 12 and 17. The proposed rehabilitation area is outlined with the red line.

Archaeological Excavations

A review of Bord na Móna reports and the Excavations Bulletin at excavations.ie indicated that there has been one unlicensed archaeological investigation carried out in the rehabilitation area (see Table 4 below).

SMR No.	License No.	Cat No.	Cuttings	Classification	Reference
LF017-028----	-	CY001	2	Road – class 1 togher	Raftery 1996, 180-94

Table 4. Excavations carried out in Derryaroge Bog.

Sites and Monuments Record

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 13th of February 2023. The SMR consists of records included in the RMP and sites and monuments notified to the Dept. since the publication of the RMP. This review established that there is one entry in the SMR in the proposed rehabilitation area (see Table 5 and Fig. 3). This entry was reported by Barry Raftery following his 1988-9 investigations.

SMR No.	SMR Class	IAWU Cat._No	Townland	ITM Easting	ITM Northing	depth BS m
LF017-028----	Road - class 1 togher	CY001	Cloonbony, Mount Davys	602389	770636	c.1.22m

Table 5. Sightings in Derryaroge Bog listed in the SMR .

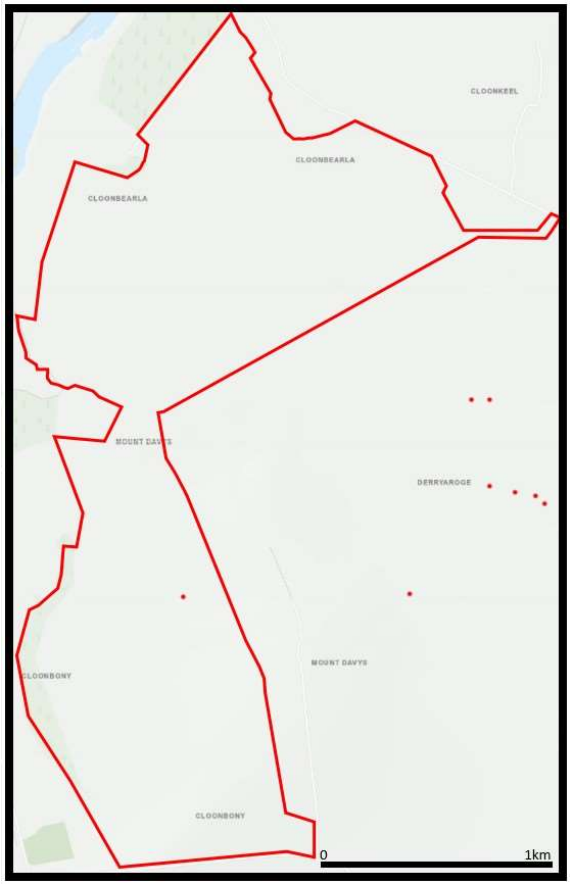


Fig. 3. Derryaroge Bog, Co. Longford, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line.

Other Surveys

There have been no archaeological surveys of the rehabilitation area carried out since 1991 IAWU Survey.

Previous assessments

Derryaroge Bog has been the subject of an Environmental Impact Assessment Report caried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-03. This assessment included a review of the topographical files and finds registers of the National Museum of Ireland intended to identify all finds from the bog reported to the Museum by that date and these finds are included below in Table 6 (Pers Comm. Jane Whitaker). The assessment noted that there was a moderate potential for archaeological features to be uncovered during the course of any future development works in Derryaroge Bog.

Reported finds

As noted above the Environmental Impact Assessment Report caried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-03 contains a complete list of known finds from Derryaroge Bog reported to the National Museum of Ireland up to 2018 (see Table 6).

Townland	Museum No.	Description
Derryaroge	1967:190	Large shallow tub-shaped copper alloy basin

Derryaroge	1968:72	Roughout for wooden bowl
Derryaroge	1969:73	Roughout for wooden bowl
Cloonbearla	1997:18	Iron billhook
Mount Davis	1958:17	Small wooden vessel
Mount Davis	1958:18	Unfinished wooden vessel
Mount Davis	1958:19	Wooden vessel containing bog butter
Cloonbony	1965:41	Wooden trough containing bog butter
Cloonbony	2000:49	Copper axehead

Table 6. List of archaeological finds from Derryaroge Bog reported to the National Museum of Ireland.

Impact assessment

One class 1 togher was identified and recorded in Derryaroge Bog in 1988-9 and has been included in the SMR. An OSI Orthophoto taken in 1995 (see Fig 1) was used to generate a set of grid coordinates for the monument and the depth of peat removed between 2008 and 2020 was calculated for each point (see Table 7). Note the SMR coordinate 602389, 770636 appears to be a little north of the location of the trackway indicated in the air photo and wasn't used. The depth to the base of the trackway was calculated as the maximum observed depth below the surface in 1988-9 (0.85m) plus the maximum thickness of the trackway observed during excavation (0.37m) giving a total depth of c.1.22m. Note that pegs were driven to a depth deeper than this. When the depths of peat removed from the bog since 2008 are calculated for each point using LiDAR data this indicates a variation in the depth of removal along the line of the trackway. There was no peat removed from the eight eastern points and more peat was removed to the west. These figures indicate that the trackway can only be demonstrated to have been removed at the two western most points and may survive to the east of this.

IAWU Cat._No.	SMR No.	SMR Class	Townland	ITM Easting	ITM Northing	Depth BS m	Peat removed	Status
CY001	LF017-028----	Togher	Mount Davys	602389	770636	c.1.22m	-	-
CY001	LF017-028----	Togher	Mount Davys	602462.093	770623.409	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602452.102	770622.986	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602442.111	770622.564	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602432.120	770622.141	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602422.129	770621.718	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602412.138	770621.296	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602402.147	770620.873	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602392.156	770620.450	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602382.164	770620.027	c.1.22m	0.643	May survive
CY001	LF017-028----	Togher	Mount Davys	602372.173	770619.605	c.1.22m	0.315	May survive
CY001	LF017-028----	Togher	Mount Davys	602362.182	770619.182	c.1.22m	1.007	May survive
CY001	LF017-028----	Togher	Mount Davys	602352.191	770618.759	c.1.22m	0.821	May survive
CY001	LF017-028----	Togher	Mount Davys	602342.200	770618.337	c.1.22m	0.795	May survive
CY001	LF017-028----	Togher	Mount Davys	602332.209	770617.914	c.1.22m	0.729	May survive
CY001	LF017-028----	Togher	Mount Davys	602322.218	770617.491	c.1.22m	0.478	May survive
CY001	LF017-028----	Togher	Mount Davys	602312.227	770617.069	c.1.22m	0.731	May survive
CY001	LF017-028----	Togher	Mount Davys	602302.236	770616.646	c.1.22m	0.574	May survive
CY001	LF017-028----	Togher	Mount Davys	602292.245	770616.223	c.1.22m	0.380	May survive
CY001	LF017-028----	Togher	Mount Davys	602282.254	770615.800	c.1.22m	1.192	May survive
CY001	LF017-028----	Togher	Mount Davys	602272.263	770615.378	c.1.22m	0.906	May survive
CY001	LF017-028----	Togher	Mount Davys	602262.272	770614.955	c.1.22m	0.832	May survive
CY001	LF017-028----	Togher	Mount Davys	602252.281	770614.532	c.1.22m	0.925	May survive
CY001	LF017-028----	Togher	Mount Davys	602242.290	770614.110	c.1.22m	0.121	May survive
CY001	LF017-028----	Togher	Mount Davys	602232.299	770613.687	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602222.307	770613.264	c.1.22m	0.736	May survive
CY001	LF017-028----	Togher	Mount Davys	602212.316	770612.842	c.1.22m	0.580	May survive
CY001	LF017-028----	Togher	Mount Davys	602202.325	770612.419	c.1.22m	1.187	May survive
CY001	LF017-028----	Togher	Mount Davys	602192.334	770611.996	c.1.22m	1.198	May survive
CY001	LF017-028----	Togher	Mount Davys	602182.343	770611.573	c.1.22m	0.158	May survive

CY001	LF017-028----	Togher	Mount Davys	602172.352	770611.151	c.1.22m	0.281	May survive
CY001	LF017-028----	Togher	Mount Davys	602162.361	770610.728	c.1.22m	0.980	May survive
CY001	LF017-028----	Togher	Mount Davys	602152.370	770610.305	c.1.22m	1.583	Poss. Gone
CY001	LF017-028----	Togher	Mount Davys	602142.379	770609.883	c.1.22m	1.503	Poss. gone

Table 7. Grid coordinates of Trackway LF017-028---- with depth of peat removed and probable status.

Conclusion

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the archaeological potential of the proposed rehabilitation area. There is one class 1 togher in Derryaroge Bog. This was noted in 1988-89 as extending across the for about 400m. The grid points for possibly surviving sections of the togher are indicated in Table 8 and these should be preserved with a 20m buffer zone. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

IAWU Cat._No.	SMR No.	SMR Class	Townland	ITM Easting	ITM Northing	Depth BS m	Peat removed	Status
CY001	LF017-028----	Togher	Mount Davys	602462.093	770623.409	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602452.102	770622.986	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602442.111	770622.564	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602432.120	770622.141	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602422.129	770621.718	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602412.138	770621.296	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602402.147	770620.873	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602392.156	770620.450	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602382.164	770620.027	c.1.22m	0.643	May survive
CY001	LF017-028----	Togher	Mount Davys	602372.173	770619.605	c.1.22m	0.315	May survive
CY001	LF017-028----	Togher	Mount Davys	602362.182	770619.182	c.1.22m	1.007	May survive
CY001	LF017-028----	Togher	Mount Davys	602352.191	770618.759	c.1.22m	0.821	May survive
CY001	LF017-028----	Togher	Mount Davys	602342.200	770618.337	c.1.22m	0.795	May survive
CY001	LF017-028----	Togher	Mount Davys	602332.209	770617.914	c.1.22m	0.729	May survive
CY001	LF017-028----	Togher	Mount Davys	602322.218	770617.491	c.1.22m	0.478	May survive
CY001	LF017-028----	Togher	Mount Davys	602312.227	770617.069	c.1.22m	0.731	May survive
CY001	LF017-028----	Togher	Mount Davys	602302.236	770616.646	c.1.22m	0.574	May survive
CY001	LF017-028----	Togher	Mount Davys	602292.245	770616.223	c.1.22m	0.380	May survive
CY001	LF017-028----	Togher	Mount Davys	602282.254	770615.800	c.1.22m	1.192	May survive
CY001	LF017-028----	Togher	Mount Davys	602272.263	770615.378	c.1.22m	0.906	May survive
CY001	LF017-028----	Togher	Mount Davys	602262.272	770614.955	c.1.22m	0.832	May survive
CY001	LF017-028----	Togher	Mount Davys	602252.281	770614.532	c.1.22m	0.925	May survive
CY001	LF017-028----	Togher	Mount Davys	602242.290	770614.110	c.1.22m	0.121	May survive
CY001	LF017-028----	Togher	Mount Davys	602232.299	770613.687	c.1.22m	0.000	May survive
CY001	LF017-028----	Togher	Mount Davys	602222.307	770613.264	c.1.22m	0.736	May survive
CY001	LF017-028----	Togher	Mount Davys	602212.316	770612.842	c.1.22m	0.580	May survive
CY001	LF017-028----	Togher	Mount Davys	602202.325	770612.419	c.1.22m	1.187	May survive
CY001	LF017-028----	Togher	Mount Davys	602192.334	770611.996	c.1.22m	1.198	May survive
CY001	LF017-028----	Togher	Mount Davys	602182.343	770611.573	c.1.22m	0.158	May survive
CY001	LF017-028----	Togher	Mount Davys	602172.352	770611.151	c.1.22m	0.281	May survive
CY001	LF017-028----	Togher	Mount Davys	602162.361	770610.728	c.1.22m	0.980	May survive

Table 8. Grid coordinates of Trackway LF017-028---- for the sections that should be preserved with a 20m buffer zone.

References

DAHGI 1996. Recorded Monuments Protected under Section 12 of the National Monuments (Amendment) Act, 1994. County Longford.

Raftery, B. 1996. Irish Archaeological Wetland Unit Transactions: Volume 3. Dept. of Archaeology, University College Dublin.

Dr. Charles Mount
15 February 2023

Bord na Móna	**Procedure: ENV017**	**Rev: 1**
Title: Archaeological Findings	**Approved: EM**	**Date: 13/10/2020**

1) Purpose

The purpose of this procedure is to describe the arrangements in Bord na Móna for findings of Archaeological material (Stray Finds).

All objects, sites or monuments, no matter how fragmentary, are important elements of our heritage.

2) Procedure

1. Check whether there are any known archaeological monuments in your area.
2. Be vigilant at all times - objects or traces of structures can be found on the field surfaces, in the drain faces, on the bog margins or caught within the mechanics of machinery.
3. If an object is found leave it in place, if it is safe to do so, note its position and immediately contact your Archaeological Liaison Officer who will assess the situation and contact the Duty Officer of the National Museum of Ireland.
4. Resist the temptation to investigate the find spot as this may disturb fragile archaeological deposits.
5. If the object is already dislodged or is in imminent danger, remove it carefully, mark its find spot and report it immediately to your Archaeological Liaison Officer.
6. Objects made of wood, leather or textile, which are removed from peat should be kept in conditions similar to those in which they are found. This can be done by packing them in peat or, if waterlogged, placing them in a clean basin of water and sealing the container. Resist the temptation to clean or remove peat from the object.
7. If timbers or other materials, such as gravel or stones, which could be part of a man-made structure are noted on the bog, mark the location and report it immediately to your Archaeological Liaison Officer. If you suspect the find is of archaeological importance, resist the temptation to expose it any further as this could result in damage to the structure.
8. Report anything that looks unnatural in the bog – your Archaeological Liaison Officer will decide whether it should be referred to the appropriate authorities.

NOTE: Our archaeological heritage is a finite, non-renewable resource. Once a site is destroyed its information is lost forever and we have lost the chance to understand a little more about our past, where we have come from and perhaps the opportunity to learn for the future.

Your Archaeological Liaison Officer is ……

3) Records

Revision Index			
Revision	Date	Description of change	Approved
1	13/09/2020	First release	EMcD
2			

APPENDIX XIII: WATER QUALITY MONITORING RESULTS FOR DERRYAROGUE BOG

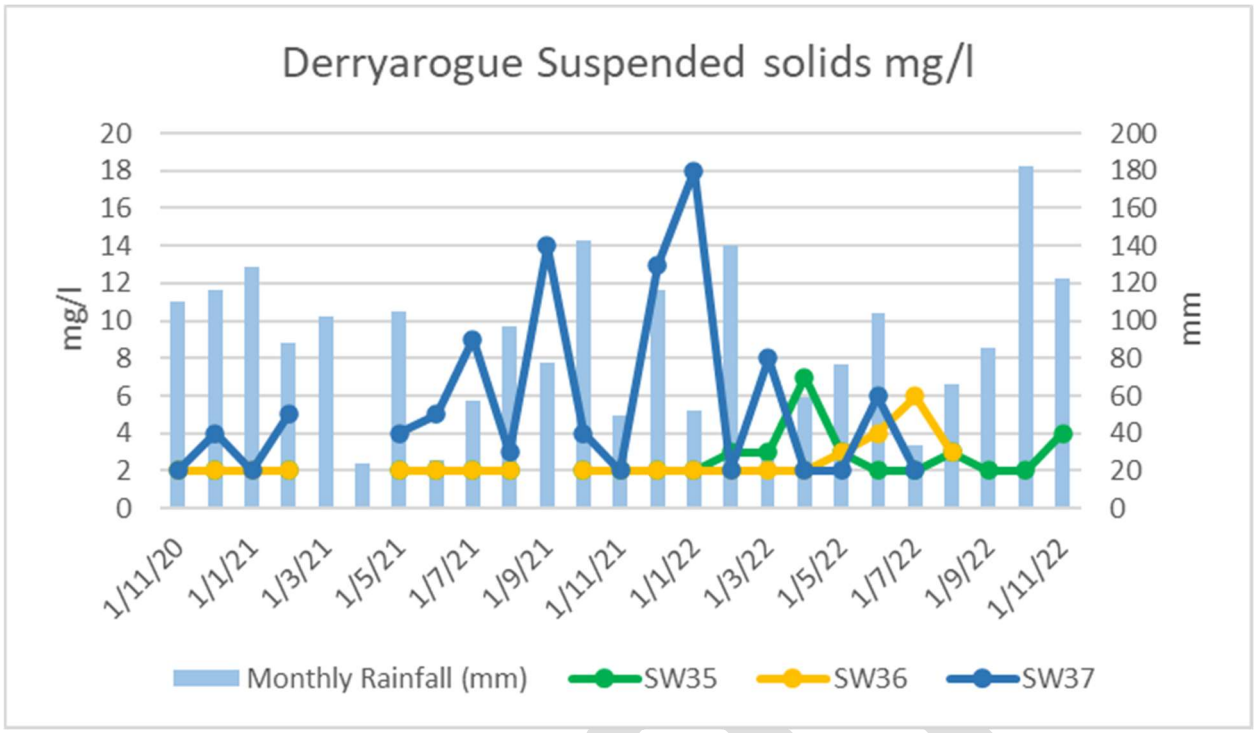


Plate 0-1 Derryarogue suspended solids sampling results

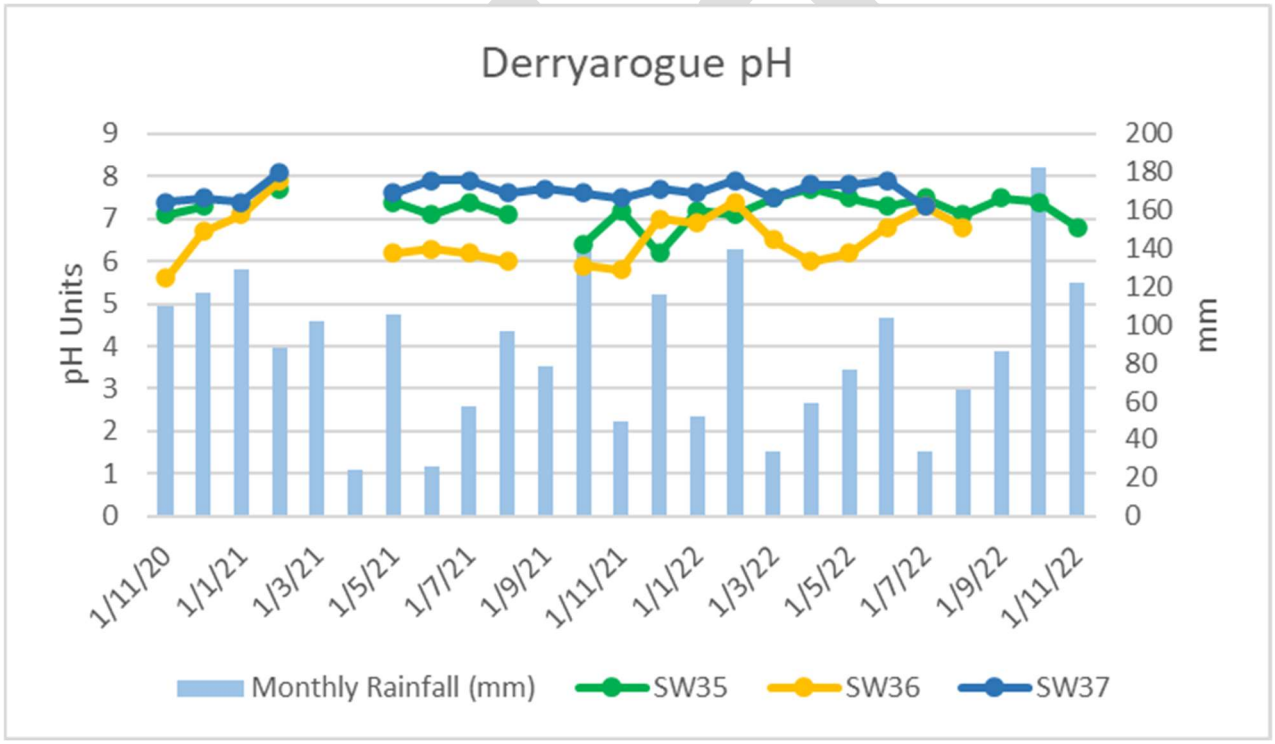


Plate 0-2 Derryarogue pH sampling results

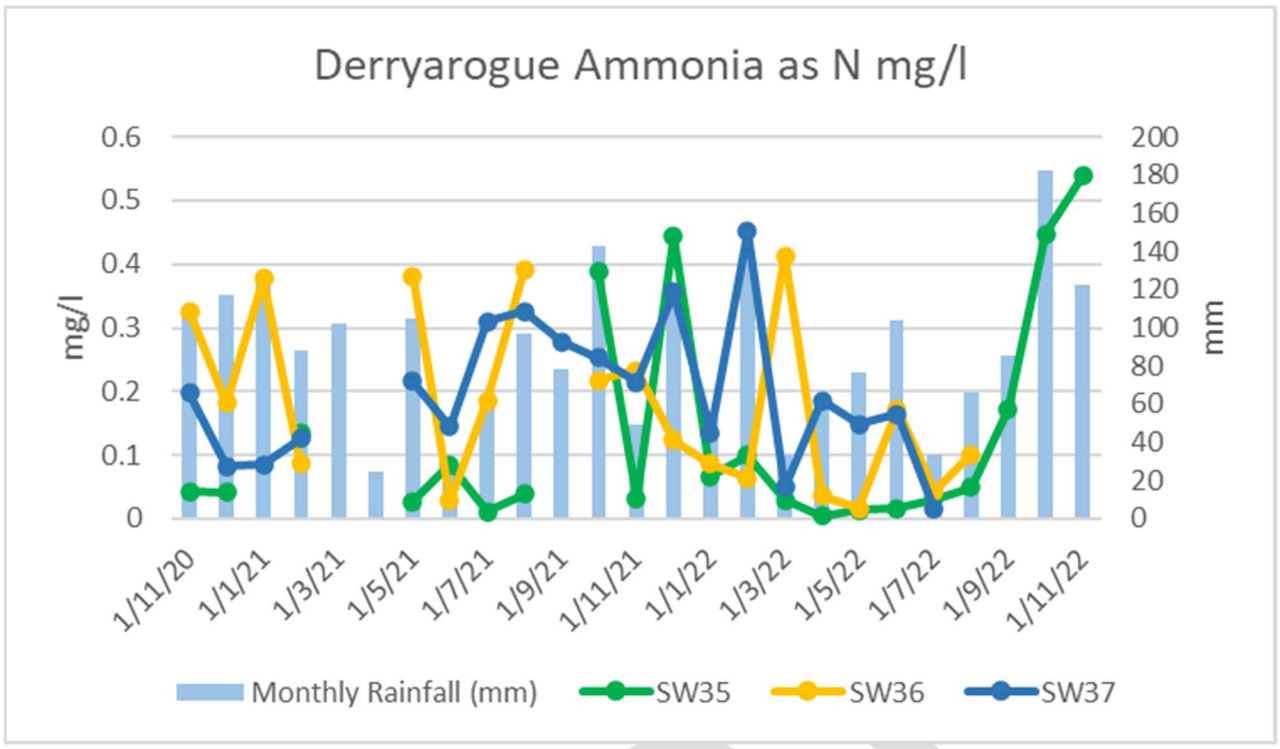


Plate 0-3 Derryarogue ammonia sampling results

PCAS SW Sampling Scheme				Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids
Bog Group	Licence No	Bog Name	SW Code -GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	1/12/22	
Mountdillon	P0504-01	Derryarogue	SW35	2	2		2			2	2	2	2		2	2	2	2	3	3	7	3	2	2	3	2	2	4		
Mountdillon	P0504-01	Derryarogue	SW36	2	2	2	2			2	2	2	2		2	2	2	2	2	2	2	3	4	6	3					
Mountdillon	P0504-01	Derryarogue	SW37	2	4	2	5			4	5	9	3	14	4	2	13	18	2	8	2	2	6	2						
			Monthly Rainfall (mm)	110.2	116.8	129	88.3	102	24.2	105.1	25.7	57.8	96.9	78	143	49.6	116.4	52.4	140	33.5	59.4	76.9	103.7	33.7	66.3	85.9	182.8	122.1	104.6	

PCAS SW Sampling Scheme				Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour
Bog Group	Licence No	Bog Name	SW Code -GIS	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	1/12/22	
Mountdillon	P0504-01	Derryarogue	SW35	239	234	NF	156	NF	NF	253	285	252	374	NF	284	244	166	204	314	182	249	222	220	237	380	267	304	485	NF	
Mountdillon	P0504-01	Derryarogue	SW36	155	383	117	189	NF	NF	257	396	358	280	NF	297	262	304	272	193	128	222	276	300	284	303	NF	NF	NF	NF	
Mountdillon	P0504-01	Derryarogue	SW37	170	155	197	174	NF	NF	188	114	112	214	149	144	209	111	268	85.8	186	93.1	97.6	80.9	332	NF	NF	NF	NF	NF	

PCAS SW Sampling Scheme				COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD
Bog Group	Licence No	Bog Name	SW Code -GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	2/11/22	
Mountdillon	P0504-01	Derryarogue	SW35	45	57	NF	44	82	NF	62		87	96	NF	69	57	38	41	54	47	101	38	71	61	91	33	62	92	NF	
Mountdillon	P0504-01	Derryarogue	SW36	25	74	89	50	NF	NF	68	91	87	81	NF	72	55	59	63	36	37	54	47	75	77	79	NF	NF	NF	NF	
Mountdillon	P0504-01	Derryarogue	SW37	32	48	48	42	NF	NF	57	36	52	65	53	50	67	47	75	39	36	41	35	38	90	NF	NF	NF	NF	NF	

PCAS SW Sampling Scheme				pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	#N/A	#N/A	pH	pH	pH	pH	pH	pH	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Bog Group	Licence No	Bog Name	SW Code -GIS	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	1/12/22	
Mountdillon	P0504-01	Derryarogue	SW35	7.1	7.3		7.7			7.4	7.1	7.4	7.1		6.4	7.2	6.2	7.2	7.1	7.5	7.7	7.5	7.3	7.5	7.1	7.5	7.4	6.8		
Mountdillon	P0504-01	Derryarogue	SW36	5.6	6.7	7.1	7.9			6.2	6.3	6.2	6		5.9	5.8	7	6.9	7.4	6.5	6	6.2	6.8	7.3	6.8					
Mountdillon	P0504-01	Derryarogue	SW37	7.4	7.5	7.4	8.1			7.6	7.9	7.9	7.6	7.7	7.6	7.5	7.7	7.6	7.9	7.5	7.8	7.8	7.9	7.3						
			Monthly Rainfall (mm)	110.2	116.8	129	88.3	102	24.2	105.1	25.7	57.8	96.9	78	143	49.6	116.4	52.4	140	33.5	59.4	76.9	103.7	33.7	66.3	85.9	182.8	122.1	104.6		

PCAS SW Sampling Scheme				TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P
Bog Group	Licence No	Bog Name	SW Code -GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/22	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	1/12/22	
Mountdillon	P0504-01	Derryarogue	SW35	0.05	0.05	NF	0.05	NF	NF	0.05	0.06	0.06	0.07	NF	0.05	0.05	0.05	0.08	0.1	0.05	0.05	0.05	0.19	0.05	0.08	0.06	0.05	0.12	NF	
Mountdillon	P0504-01	Derryarogue	SW36	0.05	0.05	0.05	0.05	NF	NF	0.05	0.06	0.08	0.05	NF	0.05	0.05	0.05	0.06	0.05	0.05	0.08	0.06	0.06	0.09	0.12	NF	NF	NF	NF	
Mountdillon	P0504-01	Derryarogue	SW37	0.05	0.05	0.05	0.05	NF	NF	0.05	0.08	0.1	0.05	0.17	0.07	0.05	0.16	0.08	0.05	0.05	0.06	0.06	0.05	0.1	NF	NF	NF	NF	NF	

PCAS SW Sampling Scheme				TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS
Bog Group	Licence No	Bog Name	SW Code -GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	1/12/22	
Mountdillon	P0504-01	Derryarogue	SW35	191	199	NF	307	NF	NF	209	224	224	231	NF	116	237	114	208	153	140	302	229	233	257	211	295	223	314	NF	
Mountdillon	P0504-01	Derryarogue	SW36	57	172	236	291	NF	NF	101	127	118	138	NF	107	95	210	145	164	173	124	132	173	186	185	NF	NF	NF	NF	
Mountdillon	P0504-01	Derryarogue	SW37	247	264	244	158	NF	NF	301	412	379	350	439	360	404	374	260	345	112	323	333	349	193	NF	NF	NF	NF	NF	

PCAS SW Sampling Scheme				Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N
Bog Group	Licence No	Bog Name	SW Code -GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	1/12/22	
Mountdillon	P0504-01	Derryarogue	SW35	0.043	0.041		0.135			0.027	0.085	0.011	0.039		0.388	0.032	0.444	0.067	0.099	0.03	0.005	0.014	0.016	0.031	0.05	0.173	0.447	0.539		
Mountdillon	P0504-01	Derryarogue	SW36	0.326	0.182	0.378	0.087			0.381	0.028	0.185	0.39		0.217	0.233	0.124	0.086	0.064	0.413	0.036	0.016	0.173	0.043	0.101					
Mountdillon	P0504-01	Derryarogue	SW37	0.197	0.082	0.085	0.126			0.216	0.144	0.31	0.326	0.278	0.253	0.215	0.356	0.135	0.452	0.049	0.186	0.148	0.164	0.015						
			Monthly Rainfall (mm)	110.2	116.8	129	88.3	102	24.2	105.1	25.7	57.8	96.9	78	143	49.6	116.4	52.4	140	33.5	59.4	76.9	103.7	33.7	66.3	85.9	182.8	122.1	104.6		

PCAS SW Sampling Scheme				DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC
Bog Group	Licence No	Bog Name	SW Code -GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
				1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21	1/1/22	1/2/22	1/3/22	1/4/22	1/5/22	1/6/22	1/7/22	1/8/22	1/9/22	1/10/22	1/11/22	1/12/22	
Mountdillon	P0504-01	Derryarogue	SW35	22.3	22.7	NF	16.1	NF	NF	23.9	30.4	27.2	29.4	NF	26.4	24.4	16.3	23	23.6	19.8	26.7	26.9	27	24.7	32.8	19.7	24.8	33.9	NF	
Mountdillon	P0504-01	Derryarogue	SW36	13.6	28.7	36.3	18.7	NF	NF	23.6	26.2	31.8	50.8	NF	26.7	20.7	25.7	25.1	17.5	13.1	21.7	24	26.7	24.4	27.3	NF	NF	NF	NF	
Mountdillon	P0504-01	Derryarogue	SW37	18.2	18.2	19.8	13.1	NF	NF	20.2	13.3	13.8	49.8	17.1	18.7	27.5	16.2	19.1	16.1	15.2	14.2	15	13.8	30	NF	NF	NF	NF	NF	