Garryduff Bog

Cutaway Bog Decommissioning and Rehabilitation Plan 2020

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0502-01:

> "*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 Garryduff 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 permanently ceased at Garryduff Bog.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0502-01, due regard was also given to the proposed Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed 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 proposed Scheme will be supported by Government through the Climate Action Fund, 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 Garryduff Bog, which goes beyond that required by Condition 10 in the Licence, the list of actions necessary to comply with the 'standard' requirement of Condition 10 (in the absence of the proposed Scheme) is also included. The inclusion of the 'standard' measures together with the enhanced measures in this document allows the Scheme Regulator to distinguish and objectively determine the specific interventions (and their associated costs) eligible for support under the proposed Scheme.

Bord na Móna have defined the key rehabilitation outcome at Garryduff 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 Garryduff Bog, such as amenity, 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.

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SUMMARY

Name of bog: Garryduff **Area:** 972 ha

Site description:

- Garryduff Bog was drained and developed for industrial peat production in the 1960s and has been in active peat production since 1968. Industrial peat production ceased in 2019. Industrial peat extraction has now completely ceased at Garryduff.
- Garryduff has a pumped drainage regime. There are currently large areas of surface water and emerging wetland vegetation across the site as pumping has been reduced. The majority of the former peat production footprint is bare peat (c.50%) and contains active drainage channels.
- The majority of Garryduff Bog is classed as cutaway, although there are small pockets with remnant peat >2.5m deep.
- The site is located adjacent to the River Shannon and several designated conservation sites.

Rehabilitation goals and outcomes

Bord na Móna is committed to discharging the obligations arising from Condition 10 of the IPC licence. The primary goals and outcomes of this plan are to (1) meet condition 10 requirements and (2) optimise climate action benefits from enhanced rehabilitation measures.

Being cognisant of the proposed Scheme for supporting enhanced decommissioning, rehabilitation and restoration measures (PCAS), the primary rehabilitation goal and outcome for Garryduff Bog is **environmental stabilisation** of the site and **optimising climate action benefits**. This will be achieved via intensive **re-wetting and wetland creation**. This is defined as:

- Carrying out enhanced rehabilitation with the application of enhanced peat rehabilitation measures in selected areas to re-wet peat and slow water movement across the site. The site has already developed a mosaic of pioneer cutaway habitats. Rehabilitation will focus on targeted actions to raise water levels and areas where there is still significant bare peat cover. This site is likely to develop wetland habitats dominated by Reed Swamp.
- Optimising hydrological conditions for the development of wetlands, fen and Reed Swamp on shallow cutaway peat, and eventually naturally functioning wetland/peatland habitats.
- Optimising hydrological conditions for the development of embryonic *Sphagnum*-rich vegetation communities in suitable deep residual peat areas.
- Stabilisation or improvement in water quality parameters (e.g. suspended solids).
- Environmental stabilisation.
- Rehabilitation will support the National Policies on Climate Action and GHG mitigation by maintaining and enhancing the current peat storage capacity of the bog (locking the carbon into the ground). It is expected that the bog will have reduced emissions (reduced source) and in time develop its carbon sink function, in part, as some peat-forming habitats develop on site. It will also support Ireland's commitments towards Water Framework Directive and the National River Basin Management Plan 2018-2021.

Scope of rehabilitation

The principal scope of this rehabilitation plan is defined by:

- The area of Garryduff Bog.
- EPA IPC Licence - Ref. P0502-01. 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 key objective of 'rehabilitation', as required by this licence, is achieved by the **environmental stabilisation** of the bog.

- **The proposed Scheme (PCAS)** includes enhanced measures which are designed to exceed/meet the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Garryduff Bog, in particular, optimising **climate action benefits**.
- The local environmental conditions of this bog. Garryduff has pumped drainage and a significant part of the site is suited to wetland development.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- To minimise potential impacts on neighbouring land, some boundary drains around Garryduff Bog will be left unblocked as blocking boundary drains could affect adjacent land.

Criteria for successful rehabilitation:

The Criteria for successful rehabilitation to meet Condition 10 of the IPC Licence have been defined as:

- Rewetting of peat in the former area of industrial peat production to slow water movement across the site to retain silt, accelerating the development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat (IPC Licence validation) through the creation of further wetland/peatland habitat. (IPC Licence validation).
- Stabilising or reducing potential emissions to water (e.g. suspended solids) (IPC Licence validation).
- Reducing pressure from peat production on the local river catchment (WFD) (IPC Licence validation).
- Optimising the extent of suitable hydrological conditions to optimise climate action (Climate action verification).
- Reduction in carbon emissions (Climate action verification).
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including wetland, fen, Reed swamp, wet woodland, heath, embryonic *Sphagnum*-rich peat forming communities, scrub and Birch woodland communities, where conditions are suitable, and eventually towards a reduced Carbon source (Climate action verification). Some areas will naturally be dry and develop Birch woodland and other drier habitats. It will take some time for stable naturally functioning habitats to fully develop at Garryduff Bog.
- Improvement in biodiversity and ecosystem services. (Climate action verification).

Meeting climate action verification criteria and monitoring of these criteria is dependent on support from the Climate Action Fund or other sources of funding.

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 to have sufficient resources (staff and machinery) to deliver the planned rehabilitation.
- Weather conditions to be within normal limits over the rehabilitation plan timeframe
- Natural colonisation of vegetation to develop semi-natural habitats at a rate within the normal limits.

Summary of measures:

The below section is a summary of measures proposed for rehabilitation.

- Planning actions, including developing a detailed site plan and carrying out a hydrology and drainage assessment.
- Carry out an ecological appriasal of the potential impacts of the planned rehabilitation.
- Carry out proposed ground measures, which will be a combination of pump management, drain blocking, peat field re-profiling, cell-bunding and fertiliser applications targeting headlands, high fields and other areas (where required).

- Phase 2 measures may include inoculation of *Sphagnum* in suitable areas.
- Silt ponds will continue to be maintained during rehabilitation and decommissioning.
- Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

- 2020-2021: Short-term planning actions.
- 2021: Short-term practical actions.
- 2021-2024: Any Long term practical actions; Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- 2024: Decommission silt-ponds, if necessary.

Budget and Costing

- The rehabilitation plan outlined in this document is predicated on the understanding that it is the Minister's intention to support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed 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.*
- In relation to the pre-existing Condition 10 IPC Licence requirement to carry out what can be termed the 'standard' decommissioning and rehabilitation, Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. This is updated every year. For more information see the Bord na Móna Annual Report (Bord na Móna 2020). Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence.
- For the avoidance of doubt, should the proposed 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 only the 'standard' decommissioning and rehabilitation measures required under Condition 10, see Appendix 1, and for which financial provisions have been made, to comply with that element of the Licence.

Monitoring, after-care and maintenance

The monitoring, after-care and maintenance programme for Garryduff Bog, as required to meet Condition 10 of the IPC Licence, 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, asses 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 of key water quality parameters will include: Ammonia, Phosphorous, Suspended solids (silt) & pH.
- 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 appropriate assessment and planning procedures.

Additional Monitoring:

- The monitoring and validation of re-vegetation via natural colonisation and changes in bog condition will be carried out using an aerial survey, after rehabilitation measures are implemented. It is proposed that sites can be monitored against this baseline in the future.
- Biodiversity Ecosystem services will be monitored using specific indicators.
- Carbon emissions monitoring only be carried out on a small proportion of BnM sites to develop better understanding of carbon emissions and GHG emission factors from different types of BnM sites and will be developed on association with other established research programmes. Some carbon flux monitoring is currently being carried out at Garryduff as part of the EPA funded Research Project. Reduction in carbon emissions will be modelled by 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.
- Monitoring as part of Climate Action Verification is dependent on support from the Climate Action Fund or other external funding.

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 indicators are stabilising/improving.
- The site has been environmentally stabilised.

1. INTRODUCTION

Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Blackwater bog group (Ref. P0502-01). 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 Blackwater bog group (see Appendix I for details of the bog areas within the Blackwater Bog Group). Garryduff Bog is located in Co. Galway.

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 critical success factors required for successful rehabilitation;
- Proposed rehabilitation actions;
- Proposed timeframe to implement these actions;
- Budget and Costings; and
- Associated aftercare, maintenance and monitoring.

It is proposed by Government that Bord na Móna carry out a Peatlands Enhanced Decommissioning, Rehabilitation and Restoration Scheme (PCAS) on peatlands previously used for energy production. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme'. The additional costs of the proposed Scheme will be supported by Government through the Climate Action Fund. Bord na Móna have identified a footprint of 33,000 ha (a subset of the BnM estate that has been used for energy production) as peatlands suitable for enhanced rehabilitation. This proposed Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII) 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. However, it is important for all stakeholders to understand that 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 proposed Scheme.

It is expected that the proposed 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 Enhanced 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 development of habitats to optimise climate action benefits such as carbon storage, reducing carbon emissions and carbon sequestration, 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.

Garryduff Bog is proposed to be part of this this proposed Scheme (PCAS) and this rehabilitation plan outlines the approach taken. In the event that additional external funding is not secured, Bord na Móna will revert to a standard rehabilitation plan (outlined in Appendix I). This adapted rehabilitation plan will also meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions.

1.1 Constraints and Limitations

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0502-01:

> "*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 document covers the area of **Garryduff Bog.**

Biodiversity and ecosystem services have been identified as the primary land-use at Garryduff Bog. Bord na Móna will continue to review the future after-use of its land-bank. Any consideration of any other future after-uses for Garryduff Bog, will be conducted in adherence to the relevant planning legislation and consultation with relevant authorities and will be considered within the framework of this rehabilitation plan.

Peat production activities have the potential to profoundly impact the habitats and environment of a bog. The ecological processes involved in the creation and maintenance of functioning, active bog systems are complex, happen over very long time periods (>1,000 years) and not all are fully understood. Nevertheless, the basis for the proposed approaches and implementation outlined in the document is the experience gained in 40 years of research and implementation of the after-use development, rehabilitation and restoration of the Bord na Móna cutaway bogs as well as best practise internationally (see reference documents).

Industrial peat extraction at Garryduff Bog permanently ceased in 2019. Currently a significant portion of the former peat production area is bare peat with emerging wetland vegetation. The combination of active enhanced rehabilitation measures and natural colonisation will quickly establish pioneer vegetation. Nevertheless, it will take some time (30-50 years) for naturally functioning peatland ecosystems to fully re-establish

Parts of Garryduff Bog (outside the areas owned and under the control of Bord na Móna) are currently used by domestic turf cutters to harvest peat. These areas are 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 Garryduff Bog that are outside of the control of Bord na Móna. 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.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way.

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 proposed 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 site visits 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-practise 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:
- Hydrological modelling; and
- The development of a **Methodology Paper (draft) outlining the proposed 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 Garryduff 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-practise 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.
- 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.
- 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:

- Blackwater Integrated Pollution Control Licence;
- Blackwater 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 2018 – 2021,
- Bord na Móna Annual Report 2020.

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, Garryduff Bog was surveyed in February and June 2010. It was re-surveyed in 2014. Additional ecological monitoring and visits have taken place at Garryduff Bog between 2013-2020 to inform rehabilitation planning and habitat maps have been updated, where required. The latest visit took place in August 2019. This rehabilitation plan is informed by the original baseline survey as well as subsequent site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-practise 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 (2010), while mosses and liverworts nomenclature follows identification keys published by the British Bryological Society (2010). A more detailed Bord na Móna classification system was 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 Garryduff Bog is contained in Appendix II.

3. SITE DESCRIPTION

Garryduff Bog is located approximately 1 km south of Shannonbridge in Co. Galway. The River Suck flows along the northern boundary and meets the River Shannon, which flows along the eastern boundary (see Figure 3.1). The surrounding landscape is a mosaic primarily consist of low-lying agricultural land (pasture) interspersed with other raised bogs, many of which have also been managed by Bord na Móna for peat production with some areas utilised for domestic turf-cutting (See Figure 3.2). Garryduff Bog is a pumped bog with a water table significantly lower than the surrounding area. The River Shannon and River Suck are immediately adjacent to the northern and eastern sides and parts of Garryduff Bog form part of the flood plain of these rivers. The bog is regularly inundated during winter and occasionally at other times when the water levels on the river are high.

A rail line connects Garryduff bog with Kilmacshane Bog to the south-east and Lismanny Bog to the north-west. There is also a railway connection to the north-east, where the railway line bridges over the River Shannon to connect Garryduff Bog with the power station in Shannonbridge and other bogs around Blackwater, and a bridge over the River Suck to the north, connecting Garryduff Bog to other bogs in the Blackwater Bog Group on the Roscommon side of the River Shannon. There is also road access to the site alongside the railway line in the north and from a public road in the south-west. The only infrastructure on-site, apart from the rail links and associated machinery access roads and tracks, is a tea centre located at the northern end of the site next Garryduff.

The site is bisected by one main railway line running roughly North-west to south-east and this is situated on the old route of the Ballnasloe section of the Grand Canal, which has been infilled.

3.1 Status and Situation

3.1.1 Site history

Garryduff Bog was drained and developed for industrial peat production in the 1960s and has been in active peat production since 1968. Industrial peat production ceased in 2019. The peat was harvested from this site was used for fuel peat West Offaly Power in Shannonbridge.

3.1.2 Current land-use

Industrial peat production has now completely ceased at Garryduff Bog. Biodiversity and ecosystem services has been identified as the main future as its primary land-use by Bord na Móna. The entire bog is not within the ownership of Bord na Móna and domestic turf cutting is having an impact on the bog, both within and outside the BnM boundary. A bog railway crosses through the site (Figure 3.5).

Several different research projects are currently using Garryduff Bog as a study area (SmartBog, WaterPeat).

The River Shannon flows within close proximity to the eastern boundary of the site and some grassland (under BnM ownership) extend from the site to the River Shannon.

This bog is a pumped bog with the water table significantly lower than the surrounding area.

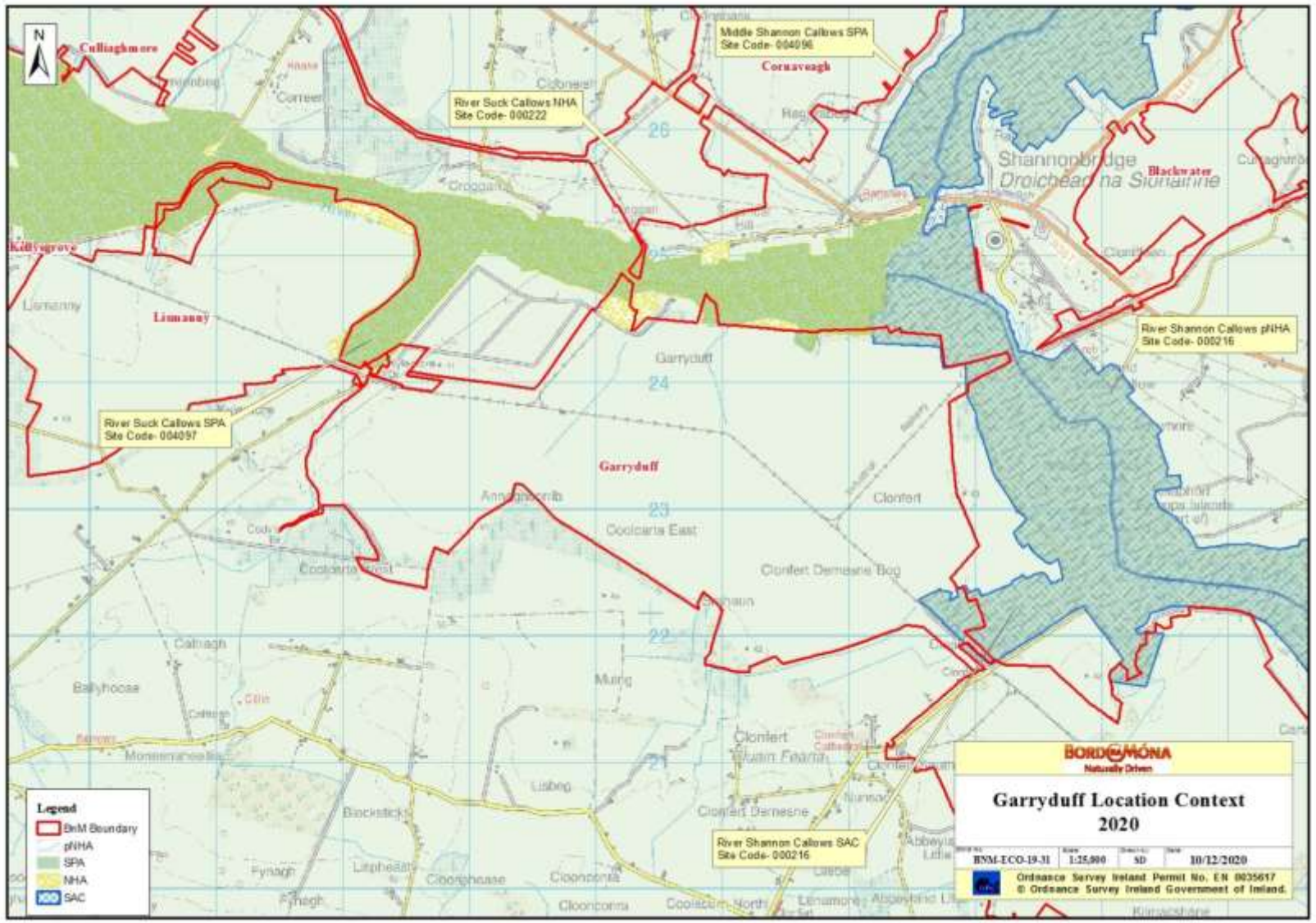

Figure 3.1 Location of Garryduff Bog in context to other Bord na Móna bogs and surrounding area

3.1.3. Socio-Economic conditions

Bord na Móna has historically been a vital employer for the rural community of the Midlands of Ireland. 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 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.

In respect of Garryduff 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 the relevant power station.

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

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

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The majority of the underlying geology at Garryduff Bog is dark limestone and shale,[1]. The underlying soils and sub-soils are classed as 'Raised Bog Cutover Peat'.

Lacustrine deposits (lake deposits) are also present under the peat (lacustrine shell marl). The peat is underlain by glacial deposits interbedded with glacio-fluvial deposits over limestone bedrock in places. The glacial deposits generally consist of grey gravelly clay/silt.

3.2.2 Peat type and depths

Garryduff Bog has been in commercial peat production for nearly 50 years and the majority of the area is predominantly cutaway (Figure 8.2). Marl and sub-soil is frequently exposed. Only small pockets have residual peat depth in excess of 2m.

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

By contrast, a small section in the western edge of Garryduff Bog has relatively larger deposits of peat in situ, with large parts of the peat in these areas in excess of 2.5m deep. The peat harvested on site was used as fuel peat supplying West Offaly Power.

3.3 Key Biodiversity Features of Interest

The majority of Garryduff Bog within the Bord na Móna boundary is developing pioneer cutaway vegetation now along areas still dominated by bare peat (Figure 3.3). The River Shannon flows within close proximity to the eastern boundary of Garryduff Bog, the River Suck flows along the northern edge and the former Ballinasloe Canal (now in-filled) runs along the line of the railway through the middle of the bog.

3.3.1 Current habitats

Much of the site comprises extensive areas dominated by bare peat but with emerging pioneer vegetation (see Figure 3.3 & 3.4). Parts of the cutaway now have well developed wetland and scrub vegetation. Garryduff includes several undeveloped or partially-developed sections around the margin of the production bog that have been designated as part of a nature conservation site (River Shannon Callows cSAC and SPA & Suck River Callows SPA and NHA). Some of the remnant high bog is within the designated boundary, although it is quite degraded. These designated areas also include other typical marginal habitats such as wet grassland, scrub and bog woodland. They also act as part of a buffer between the former production bog and the main channels of both rivers. Small undeveloped sections within the production bog include patches of Birch woodland (WN7), scrub (WS1) and disturbed raised bog (high bog PB1) in poor condition.

Sections of Birch woodland and wet grassland are located along the margins of the site. The areas of callows-type wet grassland are managed as seasonal grazing are located along the banks of the River Suck. A stream flows into the River Suck at the eastern boundary of the site and the last 500m are above ground. The above ground sections of the stream contain riparian habitats such as bracken (HD1), scrub (WS1), riparian woodland (WN5) and wet grassland (GS4). The riparian woodland was comprised of Oak, Ash, Alder, Purging Buckthorn, Willow and Birch.

To the south of the stream a band of scrub is located between the production bog and the wet grassland that runs parallel to the River Suck. This area is not dense scrub and contains tree species such as Crab Apple, Purging Buckthorn and Blackthorn with an under storey of Bracken and Bramble.

A habitat map of the site is shown in Figure 3.4.

Figure 3.3. View of the typical peat surface with existing drainage and early pioneering vegetation communities across Garryduff Bog

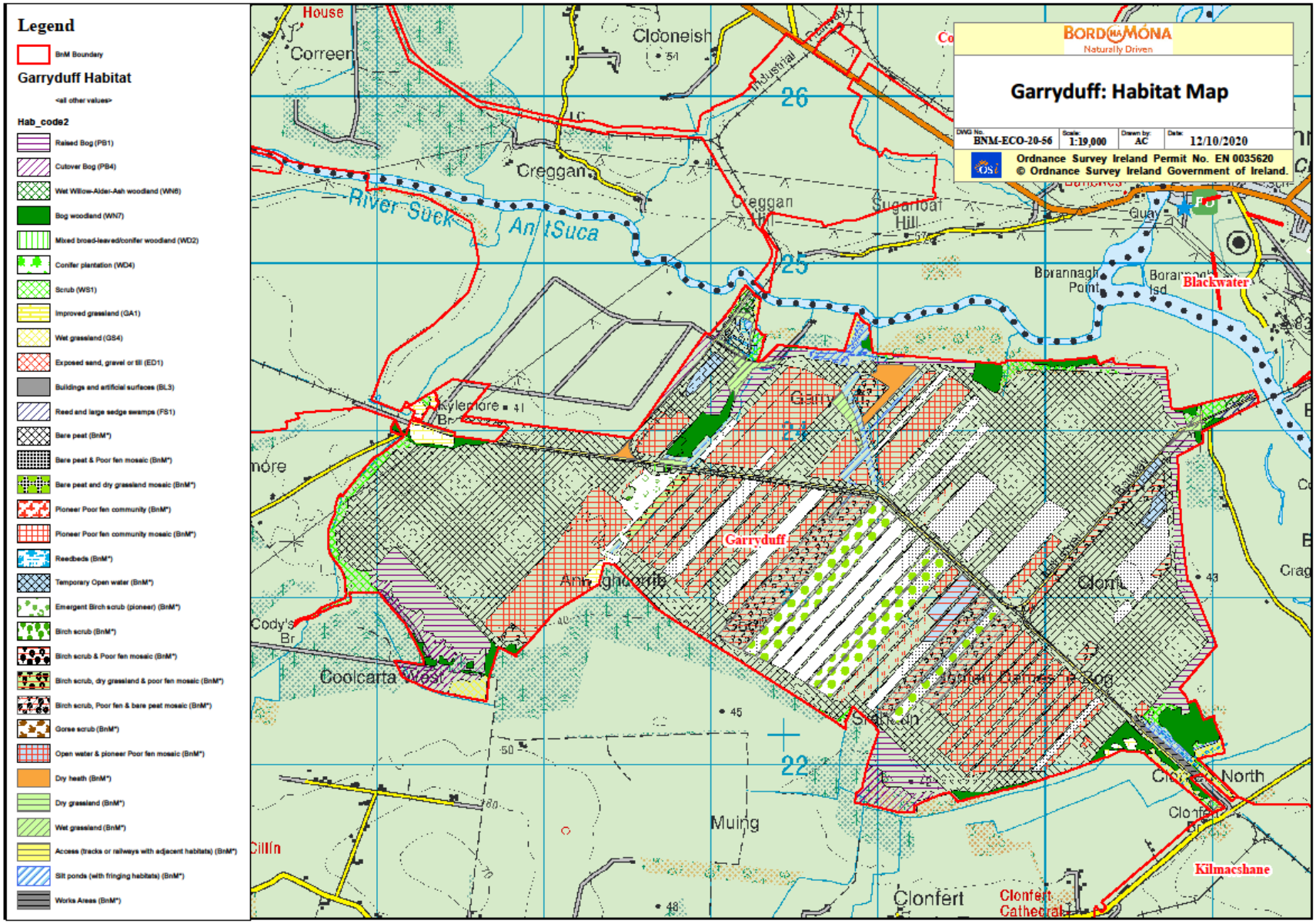

Figure 3.4 Habitat map of Garryduff Bog showing Bord na Móna habitat categorisation.

Figure 3.5. Map of Garryduff Bog showing structures and designated emission points.

3.3.2 Species of conservation interest

The main area of the bog is inundated annually with high winter water levels. These wet areas offer a refuge to significant flocks of Whooper Swans (listed on Annex I of the EU Birds Directive). Peak numbers for Garryduff Bog in February 2011 were 840 Whooper Swans (1% flyaway threshold is 270 individuals (Crowe & Holt, 2013; Wetlands International, 2015; Crowe *et al.*, 2015). Whooper Swan is a Special Conservation Interest (SCI) of the Middle Shannon Callows SPA and the River Suck Callows SPA (see Section 3.4). The temporary wetland also attracted significant numbers of wildfowl with mainly Mallard, Wigeon, Teal and Tufted Duck. Annual winter counts indicate that the site continues to attract large numbers of waterbirds.

The site attracts breeding waders such as Lapwing and Redshank (both BoCCI Red-listed) and Ringed Plover (BoCCI Amber-listed).

Large Heath Butterfly are present on two bog remnants along the southern margin; this species is on the Butterfly Red list.

Other species of conservation interest that have been recorded using the site include Otter (Annex II Habitats Directive species) and Badger (protected under the Irish Wildlife Act).

3.3.3 Invasive species

Invasive alien species known to occur at the subject bog (or desktop review suggests presence is likely), and for which reasonably foreseeable source impact pathways for dispersal may result from the proposed PCAS are described here. No invasive species, as listed under Regulation (EU) 1143/2014 on the prevention and management of the introduction and spread of invasive alien species, have been recorded at Garryduff Bog. A broad range of common garden escapes are occasionally present around the margins of Bord na Mona 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

Garryduff Bog partially overlaps with the River Shannon Callows SAC and pNHA (NPWS Site Code: 000216), the Middle Shannon Callows SPA (NPWS Site Code: 004096) and the Suck River Callows NHA (NPWS site code 000222) and SPA (NPWS site code 0004097).

The northern boundary of the production bog adjoins this River Such SPA and NHA. These sites have been designated for their importance for wintering wildfowl and species of conservation importance such as Greenland White-fronted Geese and Whooper Swan. Some undeveloped and partially fringe habitats within the northern Bord na Móna boundary are designated as part of this NHA and SPA. Two sections contain a series of silt ponds and associated habitats. Other habitats include small amounts of remnant high bog, scrub and Birch woodland. Part of the Bord na Móna boundary extends out to the River Suck and this section takes in some wet grassland and fringing Reedbed and scrub along the edge of the river.

The designated areas on the River Shannon SAC and pNHA and the Middle Shannon Callows SPA partially includes several small areas along the eastern margin of Garryduff Bog. These small areas generally contain sections of remnant high bog (PB1) and other typical fringing habitats such as scrub (WS1) and patches of Birch woodland (WN7). One section was also partially developed as part of the production bog while another section is part of the access route to Shannonbridge. The River Shannon Callows SAC (and pNHA) is designated for grasslands (Molinia and Lowland Hay Meadows) as well as alluvial woodland and Otter. The Middle Shannon Callows SPA is

designated for the assemblage of wintering wildfowl, many species of which occur in internationally and nationally important numbers as well, in addition to breeding Corncrake. It is also noted as being important for breeding waders and a range of other nationally scarce species such as breeding Shoveler, Quail and Whinchat.

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 the local vicinity of Garryduff Bog (i.e. within 3km) The closest Ramsar Sites to Garryduff Bog include Mongan Bog and Clara Bog.

https://www.arcgis.com/apps/MapTour/index.html?appid=cd6e1a247bdc4179b9dfc0461e950f1e#

3.5 Hydrology and Hydrogeology

Garryduff Bog currently has a pumped drainage regime. It is expected than when pumping is further reduced or stopped that water levels will increase across much of the site. Initial hydrological modelling indicates the bog has basins that will develop a mosaic of wetland habitats when pumping is reduced or stopped. Some sections are expected to revert to a mosaic of wetland habitat with deeper water (> 2 m). Water levels will also fluctuate across the bog due to seasonal inundation. There is a strong alkaline influence on the ground water chemistry of this bog due to exposed alkaline marls that are strongly alkaline (See also Table 3.1). This is indicated by ecological indicators of alkaline water chemistry (species assemblage).

Garyduff Bog is located in the Upper River Shannon catchment. The Bord na Móna bog is directly drained by the River Suck, two small watercourses that flow in a largely northerly direction from the bog and drain into the River Suck and one small watercourse that drains in a north-easterly direction into the River Shannon.

In the north-west corner of Garryduff Bog, water has been diverted away from the course of the Annaghcorrib stream through a series of silt ponds and into the River Suck. To the east of this is another series of silt ponds which drain into the Garryduff stream and subsequently into the River Suck c.10m downstream of the last (lowest) silt pond. The north-east corner of the bog drains through into an un-named stream that flows into the River Suck c.450m downstream from Garryduff Bog. The south-east corner of the Bog drains through into an unnamed stream that drains north-east into the River Shannon, c.1.3km downstream from Garryduff Bog. Although there are a number of small watercourses present along the southern edge of Garryduff Bog and the Laurencetown Stream that flows along its western side, none appear to be linked to the Bord na Móna production bog.

Silt ponds are present at the edges of the bog where they drain in to the respective watercourses indicated above.

The bog is located in an area with a locally important bedrock aquifer (Li) with Bedrock that is moderately productive only in local zones (EPA map-viewer). 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.

The bog is largely located in an area mapped by GSI as of low groundwater vulnerability (GSI Mapviewer). 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, although care must be taken if working at the site periphery.

The peat is underlain by glacial deposits interbedded with glacio-fluvial deposits over limestone bedrock. The glacial deposits generally consist of grey gravelly clay/silt (present on an adjacent cutaway site). The bog water table across the site is expected to be high when bog drains are locked, and perched above the underlying regional groundwater table. The ability of the shallow peat water to interact with the underlying regional groundwater flows is limited by the permeability of the underlying glacial deposits. As such the potential for bog restoration to interact or impact on underlying groundwater is very low.

3.6 Emissions to surface-water and water-courses

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 Garryduff 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 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.

Garryduff bog has 3 treated surface water outlets, one to the Shannon Lower IE_SH_25SO12060, and two to the to the River Suck IE_SH_26S071500 catchment. This Suck water body is classified as Moderate Status in the 2013 – 2018 classification, but at risk and was listed as being under pressure from peat extraction in the second cycle of the river basin management plan and is indicated as remaining so in the third cycle, currently under preparation. Peat extraction was not identified as a pressure in the Shannon Lower under the second cycle of the river basin management plan and is indicated as remaining so in the third cycle, currently under preparation.

There are no EPA records of emissions of suspended solids or Ammonia from the bog to downstream water-courses exceeding IPC licence limits. As part of the rehabilitation plan and validation, surface water quality will be monitored to establish an expected stabilization or improvement in water quality parameters. The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 4.27mg/l and COD 100mg/l. From an analysis of any monitoring over the past 3 yrs. of the IPC licence environmental monitoring of some of the discharges from this bog, indicate that results were under the ELV for SS and trigger levels for ammonia and COD (Table 3.1).

Table 3.1.

Bog	SW	Monitoring	pH	SS mg/l	TS mg/l	Ammonia mg/l	TP mg/l	COD mg/l	Colour
Garryduff	SW-11	Q3 20	8.3	3	388	0.501	<0.05	59	151
Garryduff	SW-12	Q3 20	7.8	3	415	0.779	<0.05	55	144
Garryduff	SW-13	Q3 20	8	3	487	0.196	<0.05	55	138
Garryduff	SW-11	Q3 17	7.9	5	388	1.3	0.05	47	84
Garryduff	SW-12	Q3 17	7.9	5	500	1.2	0.05	44	54
Garryduff	SW-13	Q3 17	7.9	5	436	0.32	0.05	46	100

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 largely vegetated. Re-wetted peat also aid 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 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 Garryduff 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 body receptors.

3.7 Fugitive Emissions to air

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

The bog is likely to be a carbon source as it is a drained (degraded) peatland with some active drainage, which facilitates the oxidation of peat. Peat extraction generally transforms a natural peatland which acts as a modest carbon sink into a cutaway ecosystem which is a large source of carbon dioxide (2–5 t C/ha/year) (Waddington & McNeil, 2002; Alm *et al*., 2007; Wilson *et al*., 2007, Wilson *et al*., 2015). Furthermore, they are also a significant source of methane (Huttunen *et al*., 2003; Laine *et al*., 2007a) as a consequence of the conditions within the peat body that provide a suitable environment for the microbial breakdown of plant litter and root exudates.

Degraded peatlands also release carbon/GHG emissions via the fluvial/aquatic pathway (Dissolved Organic Carbon – DOC, Suspended Solids/Particulate Matter, degassing of GHGs from water).

The EPA-funded CarbonRestore Project (Renou-Wilson et. al. 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the carbon sink function.

It is expected that Garryduff Bog can become a reduced carbon source with small sections having potential to develop as a carbon sink (albeit in the longer term) following rehabilitation. The potential of any cutaway site to develop as a reduced carbon source/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 cutaway habitats (some of the cutaway is expected to develop Reed Swamp and fen habitats with alkaline emission factors) and future climatic conditions. The majority of this site is expected to develop wetland with a mosaic of fen, Reed swamp, wet woodland and scrub. Birch woodland is expected to develop on the drier mounds and peripheral headlands. Parts of the bog with residual deeper peat have potential to develop *Sphagnum*-rich habitats.

3.9 Current ecological rating

(Following NRA (2009) Evaluation Criteria)

Current ecological rating ranges from **International** to **Local Importance (lower value).** The site partially overlaps with the River Shannon Callows SAC & pNHA (NPWS site code: 000216), the Middle Shannon Callows SPA (NPWS site code: 004096) and the Suck River Callows NHA (NPWS site code 000222) and SPA (NPWS site code 0004097). As such, Garryduff Bog is deemed to be of **International Importance**. Additionally, the assemblage of wintering Whooper Swans recorded on the site appears to regularly exceed the threshold for international importance (>270 individuals).

The majority of the site is rated as **Local importance (lower value)** due to the dominance of bare peat associated with peat extraction operations. Cutaway habitats are generally poorly developed, as are marginal remnant habitats, which have a somewhat higher value and assigned a rating **Local importance (higher value)**. However some areas, where cutaway habitats have established, would be rated as being of **county importance** due to the wetland habitats that have developed there and the species that have been recorded, including breeding waders.

It is expected that the overall ecological value of this site will increase in the future as the site re-vegetates, matures and forms semi-natural habitats, such as more extensive areas of active raised bog.

4. CONSULTATION

4.1 Consultation to date

Consultation will seek 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 ongoing rehabilitation and their Biodiversity Action Plan programme, in operation since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit. Stakeholders can be emailed a copy of this draft plan when it has been finalised internally by Bord na Móna, and invited to make submissions on the objectives and content of this plan in relation to Garryduff Bog.

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

- Wintering wader and wildfowl usage through surveys of the site by Birdwatch Ireland (commissioned by BnM).
- Hydrological research on site with TCD
- Research on site as part of the EPA-funded SmartBog and WaterPeat Projects
- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018.
- 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).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).

Local stakeholders will also be identified through ongoing engagement with neighbours whose land adjoins Garryduff Bog. Additionally, local representatives of national bodies (such as Regional National Parks and Wildlife staff) and relevant offices in County Councils (such as the Heritage or Environmental Offices) will be contacted. Any identified local interest groups will also be sought and informed of the opportunity to engage with this rehabilitation plan, and when identified will be invited to submit their comments or observations in relation to the proposed rehabilitation at Garryduff Bog.

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

4.2 Issues raised by Consultees

N/A. Not issued to consultees yet.

4.3 Bord na Móna response to issues raised during consultation

N/A

5. REHABILITATION GOALS AND OUTCOMES

The key rehabilitation goal and outcomes for Garryduff Bog are **environmental stabilisation** of the site via **optimising climate action benefits**. This is defined as:

- Carrying out intensive rehabilitation with the application of enhanced rehabilitation measures (including pump management, drain-blocking, re-profiling, cell-bunding, fertiliser application, seeding of vegetation & inoculation of *Sphagnum*).
- Optimising hydrological conditions for the development of wetlands, Reed Swamp, fen and other wetland habitats across the site and eventually naturally functioning wetland and peatland habitats. Garryduff Bog has a pumped drainage regime and a significant area is likely to develop as wetland habitat dominated by Reed Swamp.
- Optimising hydrological conditions for the development of embryonic *Sphagnum*-rich raised bog vegetation communities in suitable conditions.
- Stabilisation or reduction in water quality parameters (e.g. suspended solids).
- Environmental stabilisation.
- Setting the site on an appropriate trajectory to develop naturally functioning peatland and wetland habitats over time. 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). Nevertheless, re-wetting across the entire bog, as part of the proposed Scheme, will improve habitat conditions of the whole bog, making the overall bog wetter. Other peatland and wetland habitats such as fen, wet woodland, Reed Swamp and embryonic *Sphagnum*-rich vegetation will develop in a wider mosaic that reflects underlying conditions. It will take some time for stable naturally functioning habitats to fully develop at Garryduff Bog.

Re-wetting this site 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 (Grand-Clement *et al*., 2015; Anderson *et al*., 2017; Minayeva *et al*., 2017). This will reduce carbon emissions from the site from a larger carbon source to a smaller carbon source.

In time, a small part of the site has the capacity to develop in part as a carbon sink (residual deep peat areas with suitable hydrology). *Sphagnum*-rich raised bog communities are considered to be actively peat-forming and are considered to be raised bog carbon sinks (Renou-Wilson *et al*., 2011; NPWS 2017a). The bog will improve in condition after re-wetting and also has the capacity to reduce Carbon emissions with the development of wetlands in time.

The EPA-funded CarbonRestore Project (Renou-Wilson *et al*., 2012) found that rewetting of drained peatlands can lead to restoration of functional peatland, such as the return of typical plant and animal species, which in turn may lead to the restoration of peat-formation and the Carbon sink function.

The main deliverable of this enhanced 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.

6. SCOPE OF REHABILITATION

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

- The area of Garryduff Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0502-01. 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. Garryduff Bog is part of the Blackwater Bog group.
- The proposed Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This scheme is designed to enhance the ecosystem services of Garryduff 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 Garryduff Bog identify wetland creation and deep peat re-wetting as the most suitable rehabilitation approach for different part of this site. Garryduff Bog has a pumped drainage regime and a significant area is likely to develop as wetland habitats, particularly Reed swamp.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog. Bord na Móna have defined the key goal and outcome of rehabilitation at Garryduff Bog as **environmental stabilisation** and **optimising suitable hydrological conditions, and setting the site on a trajectory towards the development of naturally functioning peatland and wetland habitats (embryonic *Sphagnum*-rich peat-forming habitats, fen, Reed Swamp, wet woodland and other associated wetland habitats).**
- Enhanced Rehabilitation of Garryduff 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). On parts of Garryduff Bog, only a certain proportion of peat has been removed leaving a largely un-vegetated surface over deep peat deposits whilst on other areas almost all the peat layer has been removed, revealing subsoil visible. There are local factors that will influence the future trajectory of this site (underlying alkaline sub-soil) which need to be considered as part of the wider rehabilitation work. Hydrological factors – Garryduff Bog is a pumped bog – mean that a significant portion of the site is likely to develop as wetland.
- **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, as well as potential changes to the hydrology

of surrounding designed sites. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land.

- **Public Rights of Way**. 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.
- **Archaeology**. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. If this occurs, rehabilitation measures will be reviewed and adapted. An archaeological impact assessment of the proposed rehabilitation at Garryduff Bog is being carried out (Appendix IX). There are several archaeological features known from this bog. These are generally located towards the margins of the site and will not be directly affected by the proposed rehabilitation. Rehabilitation in these zones will be avoided or minimised (peat barriers located to avoid damage to any archaeological features) (Figure 8.5). Rehabilitation methodologies in these areas will be amended or the areas excluded, depending on the AIA, to minimise or remove any impact.

6.2 Key Assumptions

- It is assumed that Bord na Móna will have all resources required to deliver this project. For the avoidance of doubt, should the proposed 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 only the 'standard' decommissioning and rehabilitation measures required under Condition 10, and for which financial provisions have been made, to comply with that element of the Licence.
- 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 practical ground interventions.

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term raised bog restoration trajectory of the site. 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 (failure of environmental stabilisation for example). It is expected that this rehabilitation plan will set the site on an enhanced and accelerated trajectory towards the restoration naturally functioning wetland and peatland habitats. The plan does not set any goals or outcomes, for example, the extent (specific area) of active raised bog habitat (ARB) that may develop at this site. This is beyond the scope of this rehabilitation plan.
- This plan is not intended to be an after-use or future land-use plan for Garryduff Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future. This will require further engagement with stakeholders.

7. CRITERIA FOR SUCCESSFUL REHABILITATION

This section outlines what criteria will be used to indicate successful rehabilitation and what key criteria/targets will be used to mark 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 potential key emissions (e.g. suspended solids).

In addition, Bord na Móna wish to optimise climate action and other ecosystem service benefits via enhanced rehabilitation measures. Enhanced rehabilitation will significantly go beyond what is required to meet rehabilitation and decommissioning obligations under existing EPA IPC licence conditions. The proposed interventions will mean that environmental stabilisation is achieved (meaning IPC obligations are met) and, in addition, significant other benefits particularly for climate action will be accrued.

In general, the key objective will be to optimise the area of suitable hydrological conditions for climate action benefits (re-wetting peat and keeping water levels close to the peat surface) across this heterogeneous cutaway landscape to accelerate (1) the trajectory of deep peat re-wetting towards the establishment of embryonic *Sphagnum*-rich peat-forming habitat in suitable conditions, and (2) the trajectory of peat re-wetting towards the establishment of naturally functioning peatland and wetland habitats (fen and Reed swamp).

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 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.
- Where sections of the water body that this bog drains to, have been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body shows positive improvements in water quality impacts that can be attributable to the rehabilitation works undertaken on this bog, based the monitoring results of these inputs. Where they 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. This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed.
- That the main water body associated with surface water from this bog continues to be excluded in the EPA's list of peat pressure water bodies as reported in the River Basin Management Plans. Where the water body has been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body shows positive improvements in water quality impacts that were attributable to the original peat extraction activity. This will be measured by the EPA WFD monitoring programme.

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 deep peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the site 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. Some carbon flux monitoring (chamber measurements) is being carried out at Garryduff Bog as part of the EPA-funded SmartBog project.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including Reed swamp and wetland, fen, wet woodland, scrub, Birch woodland and embryonic *Sphagnum*-rich peatland communities, where conditions are suitable. These habitats will generally establish initially as pioneer vegetation. It will take some time for stable naturally functioning habitats to fully develop at Garryduff 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. These metrics will be defined in the context of the overall Scheme resources and after consultation with stakeholders.

Table 7.1. Summary of Success criteria, targets, how various success criteria will be measured and expected time-frames.

Criteria type	Criteria	Target	Measured by	Expected Time-frame
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.	2021-2025
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. Started in advance of the proposed rehabilitation.	2021-2023
IPC validation	Reducing pressure from peat production on the local water body catchment (WFD)	Where sections of the water body that this bog drains to, have been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body shows positive improvements in water quality impacts that can be attributable to the rehabilitation works undertaken	EPA WFD monitoring programme	WFD schedule

		on this bog, based the monitoring results of these inputs. Where they 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.		
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 compared against this baseline.	2021-2025
Climate action verification	Reduction in carbon emissions.	Reduction in carbon emissions	Carbon emissions – estimated using a high bog condition assessment and appropriate carbon emission factors.	2021-2025
Climate action verification	Setting the site on a trajectory towards establishment of a mosaic of	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	2021-2025

	compatible habitats		can be re-monitored in the future and compared against this baseline.	
Climate action verification	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum Breeding birds Pollinators	Improvement in biodiversity and ecosystem services.	Metrics that relate to selected biodiversity and ecosystem services (to be defined). Presence of key species – Sphagnum – Walkover survey Breeding birds – Breeding bird survey Pollinators – Pollinator walk	2021-2025

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

- **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.
- **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 practise 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 cutaway peatland takes time. Pioneer vegetation can develop relatively quickly (3-10 years) and wetland habitats can develop relatively quickly. Birch woodland make take 20-30 years to develop. However, it may take 50 years for active raised bog vegetation to re-develop on ground that was previously cutaway. Different environmental conditions will have a significant impact on the rate of natural colonisation, and as a result of the combination of different environmental conditions and the application of different rehabilitation measures, there will be a variety of habitat outcomes.
- 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 (Figure 8.3 & 8.4) 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 (Figure 8.4) 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).

The rehabilitation actions will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in Figure 8.5. (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 Garryduff Bog will include**:**

- Re-wetting the deep peat and some shallow peat areas of the bog using berms and field re-profiling. This enhanced measure seeks to create large (c. 45m x 60m) flat areas or cells of shallow (< 10 cm) water conditions on bare peat, across multiple fields that are enclosed by shallow berms to retain shallow surface water;
- Re-wetting some deep peat areas of the bog through field drain blocking using a dozer to create peat barriers (up to seven every 100 m along each field drain);
- Re-profiling of some fields within the deep peat and shallow peat areas to improve water retention capacity;
- Re-alignment of piped drainage;
- Maximise water retention in wetland areas, including placement of berms where required;
- Re-assessment of the pumping regime and turning off pumps if this desired and has no significant external impact. Initial hydrological modelling indicates that a significant part of the site will develop a mosaic of wetland habitats with deeper water, when pumping is reduced or stopped. 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 variable topography). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. It is expected that a natural seasonal flooding regime will develop, with water-levels fluctuating in association with levels in the adjacent River Shannon and Callows.
- Targeted fertiliser applications to accelerate vegetation establishment on headlands and high fields. (It is noted that the application of fertiliser may need additional assessment and approval as per the IPC Licence),
- Seeding of vegetation such as Reeds in targeted areas;
- Seedling of vegetation in much of the site is not required as this bog has already undergone significant natural colonisation and the development of pioneer habitats is already significantly progressed in particular sections.
- Silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that silt ponds are not required, as the bog has been successfully stabilised and there is no silt

run-off, the condition of the silt ponds will be reviewed. Silt ponds will either be de-watered (water levels lowered to a level where the silt pond will naturally develop as a small wetland feature), left in situ, or infilled (where discharges do not require silt control).

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

- Seek formal approval of the enhanced plan, noting the alternative adapted standard plan should funding from the proposed 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 detailed site drawings outlining how the various rehabilitation methodologies (PCAS) will be applied to Garryduff 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);
- Carry out a hydrology and drainage management appraisal of the proposed enhanced rehabilitation measures;
- Carry out a review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation. Incorporate the results of this assessment into the rehabilitation plan to minimise known archaeological disturbance, where possible;
- Carry out a review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements. Several known rights of way are present along the Bord na Móna margins.
- Carry out a review of remaining milled peat stocks. It is expected that all peat stocks will eventually be removed or decommissioned.
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation, such as the presence of sensitive ground-nesting bird breeding species (e.g. Curlew) or larval webs of Marsh Fritillary butterfly, etc. The scheduling of rehabilitation operations will be adapted as appropriate; and
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.

Table 8.1. Enhanced rehabilitation measures and target area. 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	Code	Description	Area (Ha)
Deep peat cutover bog	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	
	DPT2	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows	
	DPT3	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows	
	DPT4	Berms and field re-profiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	17.6
	DPT5	Cut and Fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	

Dry cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	
	DCT2	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	146.1
	DCT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows + targeted fertiliser treatment	
Wetland cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	
	WLT2	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes + Targeted blocking of outfalls within a site	
	WLT3	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes + Targeted blocking of outfalls within a site + constructing larger berms to re-wet cutaway + transplanting Reeds and other rhizomes	
	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	608.1
	WLT5	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	59.0
Marginal land	MLT1	No work required	112.9
	MLT2	More intensive drain blocking (max 7/100 m)	7.6
	MLT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows with + boundary berm	
Other		Silt-ponds	12.3
		Archaeology	1.6
		Riparian	6.1
Total			971.3

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

- Carry out proposed measures as per the detailed site plan. This will include a combination of pump management, drain blocking, peat field re-profiling, cell-bunding and fertiliser applications targeting headlands, high fields and other areas (where required). All rehabilitation actions will be carried out with regard to 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 silt run-off from the site during the rehabilitation phase; and

- 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 proposed Scheme.

8.3 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; and
- Reporting to the EPA will continue until the IPC License is surrendered.

8.4 Timeframe

- **2020-2021**: Short-term planning actions.
- **2021**: Short-term practical actions.
- **2021-2024**: Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- **2024**: Decommission silt-ponds, if necessary

8.5 Budget and costing

Bord na Móna (BnM) appreciates the Minister's intention to support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed 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 proposed 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 2020). 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 types of cutaway across the site (See Appendix I).

Figure 8.1 Aerial photo of Garryduff Bog. The whiteness present in the aerial photo north of the railway is exposed calcareous marls.

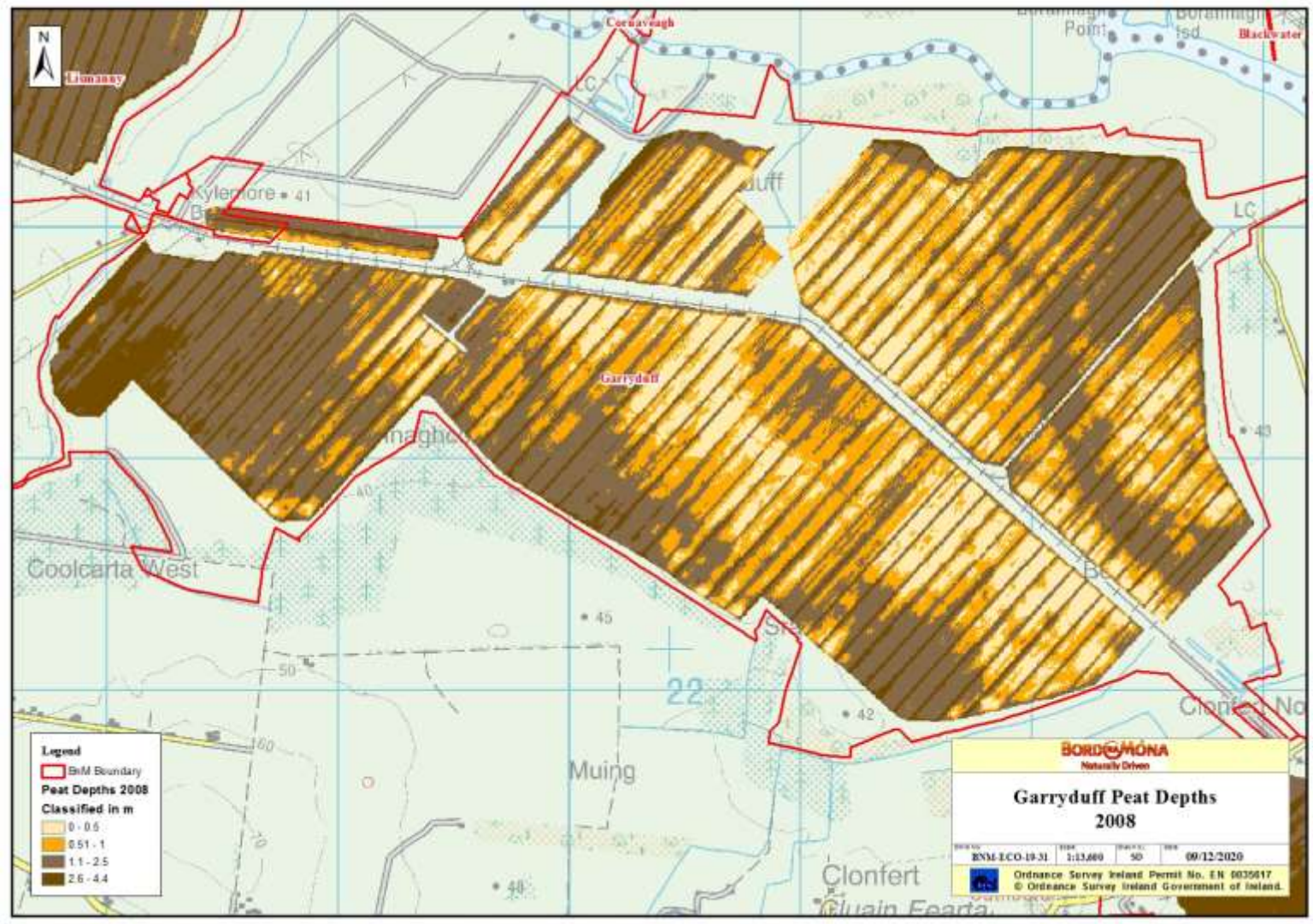

Figure 8.2. Peat Depth Map for Garryduff Bog. Deep peat reserves remain in the west of the bog areas, the peat over the remainder of the site has been harvested resulting in shallower peat reserves.

Figure 8.3. LIDAR topography map of Garryduff Bog. Low areas and basins are orange-yellow, more elevated areas are blue-green.

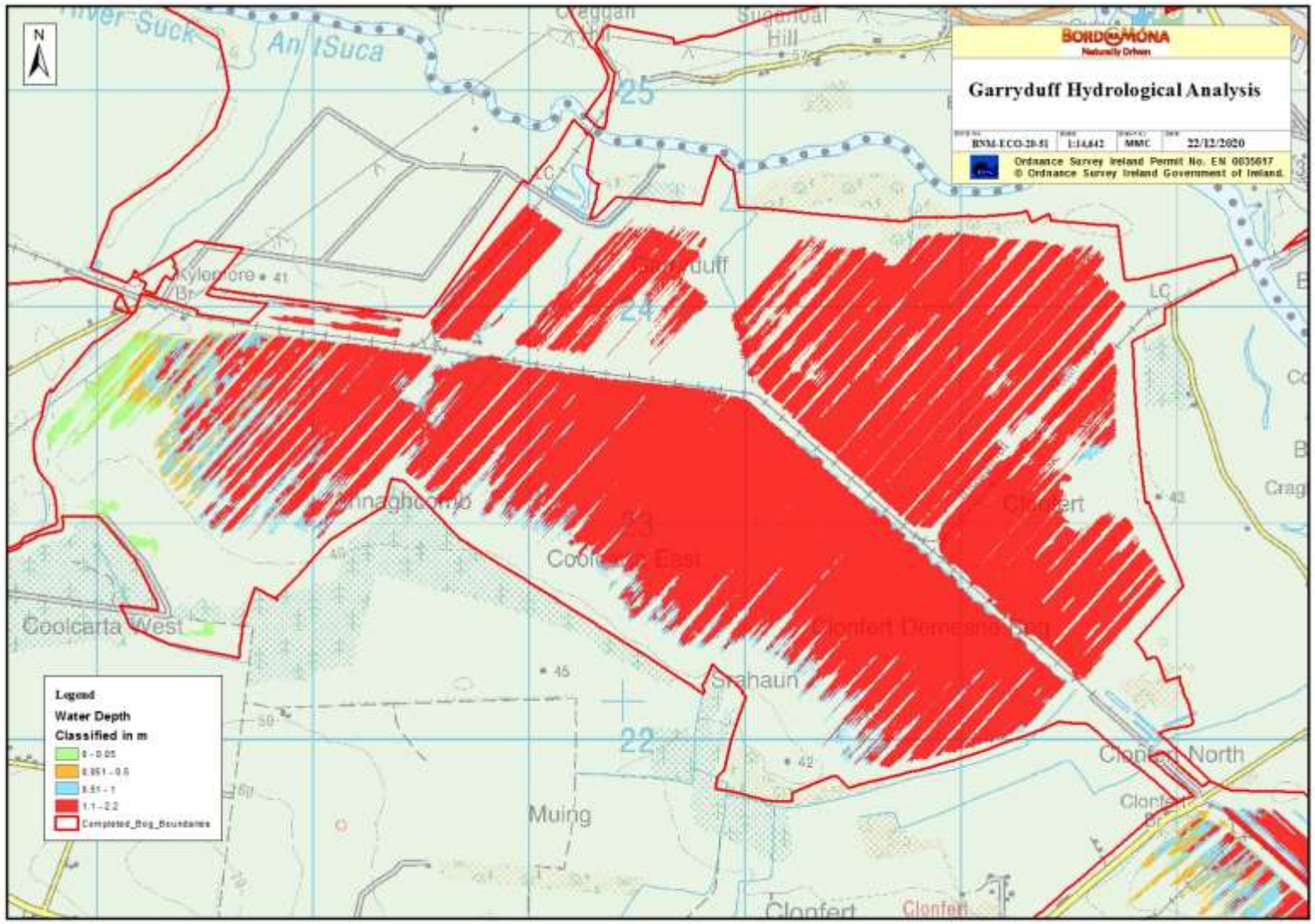

Figure 8.4. Hydrological model of Garryduff Bog. This shows expected water depths showing range of expected water depths based on current topography in the winter if pumps are turned off.

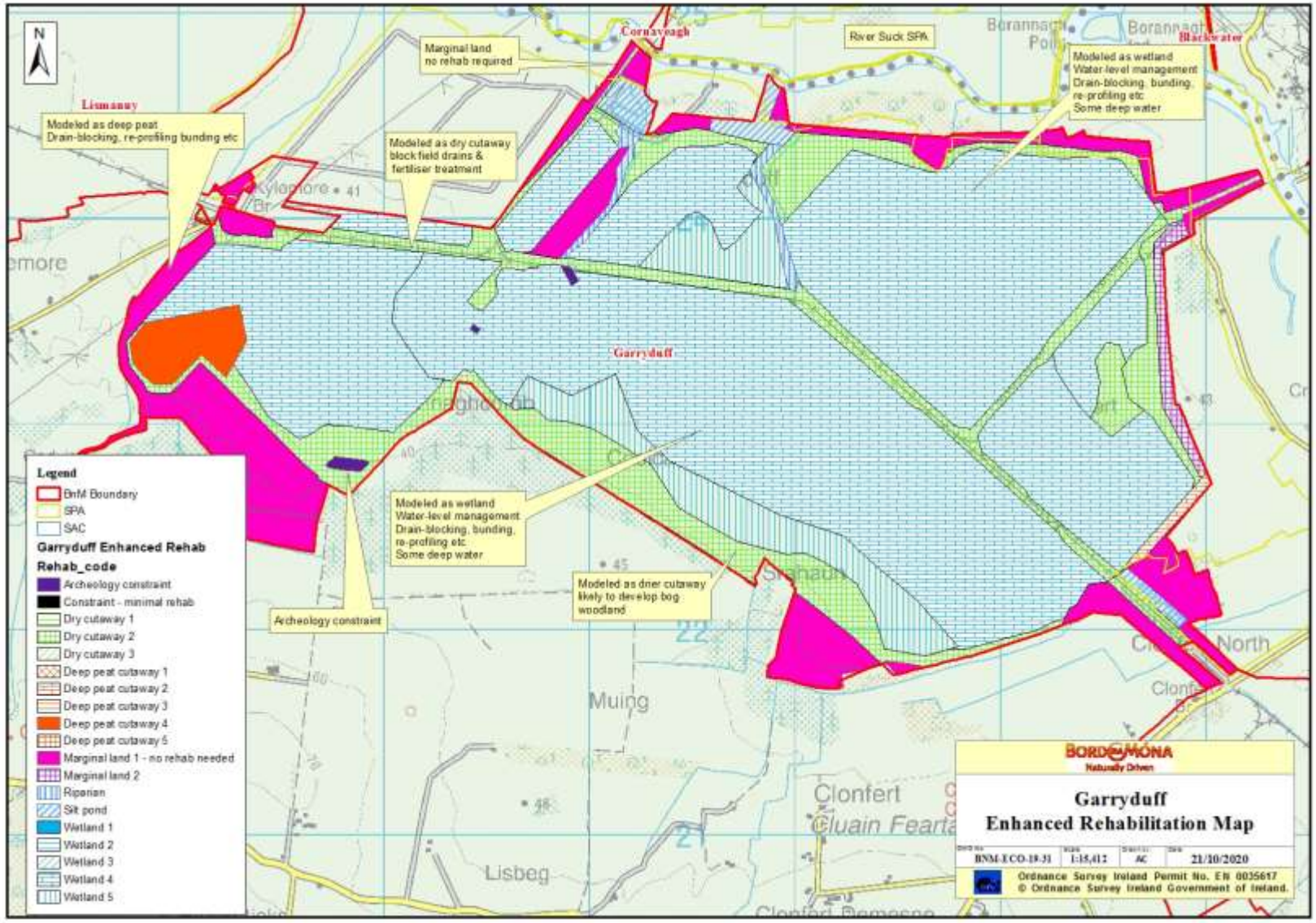

Figure 8.5. Indicative Enhanced Rehabilitation Plan for Garryduff Bog. *Note that the types of rehab and areas of rehab may change in response to stakeholder consultation and* refinement of the enhanced rehabilitation measures.

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. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated. It is proposed that sites can be monitored against this baseline in the future.
- **Water quality monitoring** at the bog will be established. This will start in advance of the proposed rehabilitation. 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.
- Water quality monitoring will aim to include up to 70% of a bogs drainage catchments. With regard to this bog.
- 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.
- 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 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 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, 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 the enhanced rehabilitation. These proposed monitoring measures will be funded by the proposed scheme or additional other funding. These are defined as:

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment (Similar to ecotope mapping). 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. Bord na Móna 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.
- It is proposed to monitor the improvement of some biodiversity ecosystem services. To be defined in relation to monitoring of the overall proposed Scheme and after consultation with stakeholders.

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 has been achieved and critical success factors have been met;
- The water quality monitoring demonstrates that water quality indicators are moving towards what would be typical of a re-wetted cutaway bog; and
- The site has been environmentally stabilised.

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

In the event that the proposed 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.

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 Garryduff Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0502-01. 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. Garryduff Bog is part of the Blackwater Bog group.
- The current condition of Garryduff Bog. This site has pumped drainage. Pioneer wetland vegetation is developing across a significant part of the site.
- The key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- To minimise potential impacts on neighbouring land. some boundary drains around Garryduff Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Biodiversity and ecosystem services have been identified as the primary land-use by Bord na Móna.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Garryduff Bog is environmental stabilisation of the site via wetland creation and deep peat re-wetting. 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 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).
- That the main water body associated with surface water from this bog continues to be excluded in the EPA's list of peat pressure water bodies as reported in the River Basin Management Plans. Where the water body has been identified as under pressure from peat extraction, that the intervening EPA monitoring programme associated with its Programme of Measures for this water body shows positive improvements in water quality impacts that were attributable to the original peat extraction activity.

Rehabilitation indicators

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

Rehabilitation measures: (see Figure Ap-1)

- Blocking field drains in the former industrial production area using a dozer to create regular peat barriers (three barriers per 100 m) along each field drain;
- Re-alignment of piped drainage to manage water levels across the site.
- Realignment of gravity outfalls.
- Pump management – reducing or ceasing pumping.
- Fertiliser treatment of high fields and headlands (typically slow to naturally re-colonise) to encourage natural colonisation, if needed. (It is noted that the application of fertiliser may need additional assessment and approval as per the IPC Licence).
- No measures are planned for the surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during rehabilitation and decommissioning.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

- 2021. 1st phase of rehabilitation. Field drain blocking.

- 2021. 2nd phase. Further realignment of piped drainage and other re-wetting measures dependent on success of 1st phase re-wetting, as determined by pump management, ongoing monitoring of water levels and re-vegetation.
- Other enhancement measures such as fertiliser treatment will be carried out. These will be determined by ongoing monitoring.
- 2023-2024. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- 2023-2024. Decommission silt-ponds, if necessary.

Budget and Costing

- Bord na Móna maintains a Provision on its balance sheet to pay for the future costs of 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 2020). 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 basic rehabilitation provision has been allocated to the site based on the area of different cutaway types across the site.

Table AP-1. Rehabilitation measures and target areas.

Type	Code	Description	Area (Ha)
Deep Peat	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	17.6
Dry Cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	146.1
Wetland cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	667.1
Marginal land	MLT1	No work required	126.6
Other		Silt-ponds	12.3
		Archaeology	1.6
Total			971.4

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, asses 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 appropriate 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.

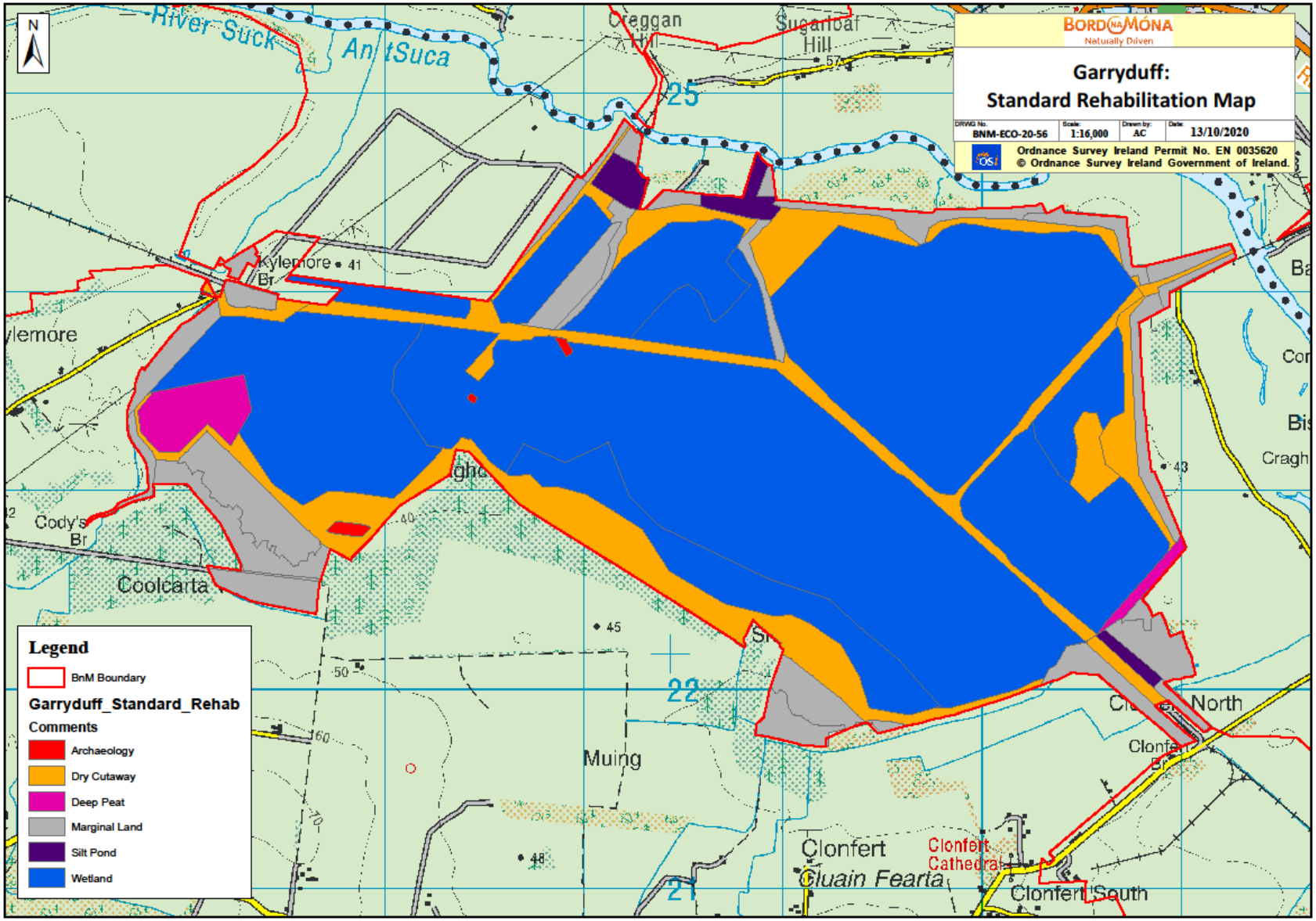

Figure Ap-1. Indicative adapted standard rehabilitation plan for Garryduff Bog.

APPENDIX II: BOG GROUP CONTEXT

The Blackwater Bog Group IPC Licensed area is made up of three sub-groups (Attymon, Blackwater and Derryfadda) and have been in industrial peat production for several decades. The majority of sites are situated alongside the Shannon and Suck Rivers within counties Roscommon, Galway, Westmeath and Offaly and cover an overall area of 15,515 ha. Each bog area further comprises a range of habitats from bare milled peat production areas to re-colonising cutaway to workshops areas and transport infrastructure. Industrial peat extraction from these sites mainly supplied ESB power stations at Shannonbridge (WOP) and Lanesborough (LRP).

Industrial peat extraction in the Blackwater Bog Group has permanently ceased on the majority of sites. It is planned to supply remaining milled peat stocks to Shannonbridge (WOP) and Lanesborough (LRP) during 2020. Both power stations will cease using peat by the end of 2020. Decommissioning and rehabilitation for the Blackwater Bog Group is expected to start in 2020/2021.

A number (6) of bogs were initially drained but have never been used for industrial peat production (three former development bogs (Kellysgrove, Tirrur-Derrymore and Newtown-Loughgore), Clonboley, Killeglan and Derrydoo-Woodlough). The latter three bogs are classed as restored raised bogs, still contain active bog habitat (that qualifies as the Annex I EU Habitats Directive habitat) and now form the core of the Bord na Móna Raised Bog Restoration Project due to their high biodiversity value and bog restoration potential. NPWS have identified the Clonboley bog cluster as having high ecological value within the recent assessment of raised bog SACs, NHAs and non-designated sites (NPWS 2014[2]).

Several sections of Tirrir-Derrymore bog have been leased to NPWS for domestic turf cutting as part of the SAC turf-cutting compensation scheme. Turf-cutters from neighbouring SACs have been relocated to this site by NPWS. Several other bogs are being assessed for similar use.

The depth of remnant peat within Blackwater bog units will have a very significant impact on the development of these sites, with deeper peat (Derryfadda milled peat production bogs) having potential for the establishment of embryonic peat-forming (*Sphagnum*-rich) vegetation communities. Milled peat cutaway (such as at Blackwater) develops in a somewhat different way as in places the underlying gravel is exposed, there is significant alkaline influence on the water chemistry and in many of these cutaway bogs will develop fen and wetlands due to the local topography, hydrology and water chemistry.

[2] http://www.npws.ie/peatlandsturf-cutting/nationalraisedbogsacmanagementplan/

A breakdown of the component bog areas for the Blackwater Bog Group IPC License Ref. PO502-01 is outlined in Table Ap-2.

Table Ap-2a: Blackwater Bog Group names, area and indicative status (Attymon sub-group)

Bog Name	**Area (ha)**	**Indicative Peat Production Status**
Attymon	336	BnM Industrial peat production permanently ceased – 2018. Cutaway Sod peat production now ceased Partially planted with Conifer forestry – Coillte
Cloonkeen	252	BnM Industrial peat production permanently ceased – 2018. Cutaway Sod peat production now ceased Partially planted with Conifer forestry – Coillte
Derrydoo-Woodlough	452	Never in peat production – zoned for biodiversity Rehabilitation (bog restoration) now complete
Total	**1,040**	

Table Ap-2b: Blackwater Bog Group names, area and indicative status (Blackwater sub-group)

Bog Name	**Area (ha)**	**Indicative Status**
Ballaghhurt	597	Milled peat production is anticipated to continue at Ballaghurt Bog for the foreseeable future, depending on future peat resource requirements (subject to current substitute consent applications and future planning applications for industrial peat production). It is proposed to continue milled peat production to supply Derrinlough Briquette Factory Partial emerging naturally colonising cutaway
Belmont	316	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Fragmented former bare peat production areas Partial emerging naturally colonising cutaway Conifer forestry – Coillte
Blackwater	2,303	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Fragmented former bare peat production areas Extensive emerging naturally colonising cutaway Conifer forestry – Coillte
Bloomhill	883	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat
Bunahinly-Kilgarvan	390	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat Deep peat rehabilitation of a small area (25 ha)
Glebe	132	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat

Clooniff	523	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat Partial emerging naturally colonising cutaway
Cornafulla	460	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat
Cornaveagh	492	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat
Culliaghmore	442	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat Partial emerging naturally colonising cutaway
Garryduff	970	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Fragmented former bare peat production areas Extensive emerging naturally colonising cutaway
Kellysgrove	202	Former development bog (peat reserve) – drained, never in industrial peat production Bog restoration planned.
Kilmacshane	1,294	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Fragmented former bare peat production areas Peat reserve areas Partial emerging naturally colonising cutaway
Lismanny	449	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat Partial emerging naturally colonising cutaway
Total	**9,453**	

Table Ap-2c: Blackwater Bog Group names, area and indicative status (Derryfadda sub-group)

Bog Name	**Area (ha)**	**Indicative Status**
Derryfadda	1,111	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat
Boughill	415	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat
Castlegar	517	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat Annaghbeg Bog NHA – intact undrained raised bog
Gowla	650	Industrial peat production permanently ceased – 2019. Cutaway – 2019, Former peat production area is bare peat Emerging naturally colonising cutaway

Tirrur-Derrymore	422	Industrial peat production permanently ceased – 2019. Drained development bog, never in industrial peat production NPWS turf-cutting relocation site
Newtown-Loughgore	448	Drained development bog, majority of site never in industrial peat production Some sod peat production Rehabilitation (raised bog restoration) ongoing
Killeglan	581	Drained development bog, never in industrial peat production –biodiversity site Rehabilitation (raised bog restoration) complete
Cloonboley 1	675	Drained development bog, majority never in industrial peat production – biodiversity site Some sod peat production Rehabilitation (raised bog restoration) now complete
Cloonboley2	203	Drained development bog, never in industrial peat production – biodiversity site Rehabilitation (raised bog restoration) now complete
Total	**5,022**	

APPENDIX III: ECOLOGICAL SURVEY REPORT

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. The report outlines potential options for biodiversity management after industrial peat production has ceased, (if this is the proposed main land-use for the site).

Bog Name:	**Garryduff**	**Area (ha):**	972.1 ha (2401 .1 acres)
Works Name:	Blackwater	**County:**	Galway
Recorder(s):	MMC & DF	**Survey Date(s):**	22/02/2010 & 04/06/2010 16 & 18/06/2014

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (BP). The majority of the site is active production and there is little or no natural re-colonisation, even along the drains, the active production area (although this may be related to work practises on the site). Production is also exposing bare marl along portions of many fields. Some of this marl is being vegetated.
- Some typical poor fen habitats (pJeff, pTrig, pRos and pEang) and Birch scrub (eBir) are developing in production-related sections. (Codes refer BnM classification of pioneer habitats of production bog and cutaway. See Appendix II). A small area of dry heath (dHeath) has also developed in the northern part of the site.
- There are minor amounts of Reedbeds (pPhrag and pTyph) appearing in some fields with the majority appearing along the drains and being too small to map.
- Minor areas of other habitats associated with higher ground around silt ponds such as dry calcareous grassland (gCal), Molinia-dominated grassland (gMol) and Gorse scrub (eGor) are present in the silt pond complex.
- Several small patches of bog woodland (WN7) are present.
- A very minor area of Reedbeds (FS1) has developed in old drainage channels related to the old Grand Canal (SE corner).
- Fringe habitats around the margins of the production bog include raised bog remnants (PB1, PB4) scrub developing on high bog (WS1), Bracken (HP1) and bog woodland (WN7). (Codes refer to Heritage Council habitat classification, Fossitt 2000),

Description of site

Garryduff is located in east Galway, 1 km south of Shannonbridge. The River Suck flows along the northern boundary and meets the River Shannon, which flows along the eastern boundary. Garryduff is a relatively large industrial peat production site. This bog is a pumped bog with the water table significantly lower than the surrounding area. The site experienced rapid rising water levels in November 2009, and significant areas of open water was present at the time of the survey. The site is bisected by one main railway line running roughly NW-SE and this is situated on the old route of the Ballinasloe section of the Grand Canal, which has been infilled.

The majority of the site is not vegetated and was either bare peat or temporarily inundated with surface water at the time of the survey (when the site was revisited, most of the temporary open water sections were now exposed

and some pioneer poor fen vegetation was present, particularly where there was exposed marl). The site is divided into two main north and south sections by the main railway. The eastern side of the site contains a relatively narrow strip of land with access to the site.

Northern Section

This side of the site can be further divided by another railway that runs north and connects the main line with a bridge over the Shannon and also by several large drainage channels. A second branch of the railway is located further west along the western boundary and connects the main line with an adjacent site in Roscommon called Cornaveagh, across a bridge over the River Suck.

The eastern part of this section was dominated in the main by bare peat (east of the railway branch). A large part of this area (between the two railways) was also inundated with surface water at the time of the survey. This section was notably clear of vegetation and there was even very little vegetation developing along the edges of drains or within the drains. Small patches of Marsh Arrowgrass and Bog Cotton were most commonly seen along some of the drains. Bulrush was present in some of the drains but was rare. A small area has been out of production for several years and this was the only section that had developed any pioneer vegetation. The most common pioneer habitats were Birch scrub (eBir) and poor fen communities (pJeff and pEang). Some Bulrush was present within the drains. Several drier fields were being colonised by mainly tussocks of grass (Creeping Bent and Cocksfoot).

The area west of the railway branch was even less diverse. This area almost entirely comprised large areas of open water with several individual underwater fields separated by bare high stock-piles. The fields were surrounded by bare peat headlands. Further west (west of the bog woodland) there is a drain leading to a series of silt ponds. Towards the east side of these silt ponds there is a regenerating area with dry heath (dHeath) where production has not reduced the depth of the bog to the same extent as the majority of the site. The silt ponds also contain Reedbeds (pPhrag) with extensive Common Reed.

A small undeveloped block along the northern boundary contains some maturing bog woodland. This woodland was dominated by Birch and also contained some Scot's Pine and several Oak and Ash in the canopy. The shrub and understorey layers were poorly developed and dominated by dense Holly and Brambles. Some open patches contained thickets of Bracken and Bramble. The ground cover was also poorly developed and low in diversity. This was dominated by Ivy, mosses and leaf litter. Some bare peat was evident. Broad Buckler Fern was frequent. There were signs of Deer and Badger using this habitat.

The section of production bog between the large drain and an undeveloped area to the west was a complex mosaic of rewetted and dry sections with some pioneer vegetation. This area contained a series of pioneer poor fen communities (pJeff, pEang) including some areas dominated by Marsh Arrowgrass (pTyph). Both Common Reed and Bulrush were naturally colonising some of the drainage channels in this section. Birch was scattered through this section but overall the development of scrub was poor.

A narrow strip of undeveloped high bog is located near the western boundary. This section mainly contains bog woodland and scrub dominated by Birch. This area was not surveyed in detail due to access difficulties. Electric powerlines pass through this strip of land. Much of the intact raised bog has been disturbed or degraded and much of this area at the northern and southern margins is now grassland dominated by Purple Moor-grass.

The north-west corner contains a series of silt-ponds and associated habitats. These silt-ponds also contain extensive Reedbeds (pPhrag), although have been cleaned out to some extent in the recent past. Associated habitats around the silt-ponds include banks of peat that are developing scrub (eGor) Bracken (and Purple Moor-grass dominated grassland (gMol). Much of the grassland around the silt ponds in calcareous in nature (gCal). Other communities include some poorly developed pioneer grassland (mainly gMol and pJeff) developing on bare peat. Further north there is a small area close to the main River Suck channel and the railway bridge that is developing wet Willow dominated woodland. This habitat is poorly developed.

The eastern and northern margins of the production bog mainly contained a fringe of disturbed dry raised bog (PB1, high bog) that was being colonising by scrub and by conifers. Both Gorse and Birch were quite frequent

along the high bog margin and Pine saplings and small trees were frequently scattered over the high bog. There was occasional development of scrub on the high bog. The raised bog was dominated by Heather.

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When the site was surveyed a second time in June 2010, the majority of the rewetted section now comprised exposed bare peat. Exposed marl was present in many of the fields to some extent and this was being vegetated by mainly pioneer Arrowgrass-dominated vegetation and other poor fen communities (pEang and pJeff). The development of these communities was generally quite poor as they are quite young and at an early pioneer stage with significant proportion of bare peat. Greater Tussock Sedge (*Carex paniculata*) was one species of note that was recorded in the poor fen vegetation. Arrowgrass was spread over the area mapped as bare peat but was mainly at low densities. Further west of the silt pond complex in the northern section, several fields mainly vegetated with poor fen communities contained small amounts of Common Reed (pPhrag).

Southern Section

The southern section of the site can be further divided into a western side and an eastern side, with a works area and a tall stand of Birch trees acting as a divider for the two sub-sections.

The eastern side of the site was for the most part comprises with temporary surface water, long stretches of higher fields and stockpiles converged on surface waters. There were signs that water levels had indeed been higher in the weeks previous to the ecological survey. A section of bog woodland (WN7) is located within the BnM property in the far east of the site; however this area is actively managed by a party other than BnM. A section of degraded raised bog (PB1) is located along the southern boundary of the site. This area was dry and was dominated by Heather; some small sections of old cutover (PB4) were located to the south of the high bog. This area seems to have been used for domestic turf cutting but this appears to have been some time ago and bog woodland (WN7) was developing here.

As previously mentioned the majority of this section was inundated with areas of open water at the time of the ecological survey due to heavy rainfall. Large numbers of Whooper Swan were recorded along with high numbers of water fowl including Teal, Mallard and Tufted Duck. The areas along the southern boundary that were not inundated with rising water levels mostly comprised bare peat with the development of wetland and scrub habitats in places. Species that had developed here included Birch, Sitka Spruce, Pine (Scot's and Lodgepole), Cotton Grass, Soft Rush, Reedmace and Marsh Arrow Grass. The latter species was relatively abundant in places and had provided a food source for Whooper Swans.

To the far west of this site habitats such as a silt pond and Birch woodland were located. The Birch woodland was located on an area that had been used to store machinery in the past and the Birch had developed around this, further development of young Birch scrub was occurring to the east of this woodland. Immediately to the north, before the railway line a works area was located, it contained dining facilities, machinery and sheds. A small area immediately surrounding this facility had been planted with Leylandii Cypress trees while some Alder and Birch were also located here.

The western section was for the most part bare peat with only two small areas of temporary open water; the south eastern corner of the site was becoming revegetated with Birch and Marsh Arrow Grass. This section is in active production and many of the drainage ditches had been recently cleared out. Some of the stockpiles were also being taken off the site for use in the nearby West Offaly Power Plant. Sections of remnant raised bog (PB1) were located along the margins of this section. These habitats were dry and degraded, the largest area of raised bog to the south had been burned and active domestic turf cutting was evident.

A small section of Coillte managed conifer plantation (WD4) was located in the north eastern corner of the site within the BnM boundary. Small areas of bog woodland (WN7) that were dominated by Birch were located along the edges of the site. Two small fields of wet grassland (GS4) were located in the south of the site; these fields are actively managed by someone other than BnM. A field that is classified as improved grassland (GA1) is located

in the north west corner of the site, again this field is managed by a party other than BnM. A small area of bog woodland (WN7) containing Birch, Sycamore, Hawthorn, Rowan, Ash and Holly adjoins this field, while an un-maintained hedgerow forms the boundary between the field and the bog.

04/06/2010

The southern side was similar to the northern section in that hen the site was surveyed a second time in June 2010, the majority of the open water section now comprised exposed bare peat. However, this side was vegetated to a much greater extent with the exposed marl being colonised by mainly poor fen communities and some emergent scrub (eBr). Exposed marl was much more prevalent the southern side of the railway. Pioneer Marsh Arrowgrass-dominated vegetation was prominent in places as was mosaic of vegetation dominated by Bog Cotton, Rushes and emerging Birch. Bottle Sedge and Horsetail-dominated patches were also present, but to a lesser extent. Several patches of Common Reed were developing on this side of the railway.

Eastern access zone

This small area contains a gravel track, travel paths and a railway, with associated pioneer calcareous grassland (gCal). There is some wet grassland, bog woodland and scrub on both sides of this area. Some of the wet grassland and bog woodland along the southern boundary was fenced off and grazed by cattle. Part of the old canal drainage system is still intact and this wide drain was infilling with reedbeds (FS1) and contained other aquatic vegetation. The northern side was cut off by drainage channels and silt ponds.

2014.

The majority of the site is underlain by shell-marl and this is having a significant influence on the colonising vegetation. High fields are creating a pattern of 1-2 bare peat fields separated by 4-6 re-vegetating fields. This is generally dominated by Marsh Arrowgrass, Jointed Rush and Bog Cotton and can be quite open with significant amount of bare peat cover (25-50%). This vegetation type occurred on low fields between high fields and there is still surface water in places. This vegetation can mainly be seen south of the railway. The area north of the railway in the central section has similar pioneer vegetation, but it is less well developed. Small scrubby Birch and Willow can be scattered through this vegetation, but it tends to be light. There is also some Reed cover scattered through the site, forming stands that are slowly getting larger. There are occasional clumps of *Carex rostrata*, generally with Bog Cotton in wetter areas where there is some standing water. Overall, the pioneer vegetation tends to be quite diverse and is not dominated by one or two species, as is the case with other sites. The moss layer in the wetter areas is poorly developed. There was one small area towards the NW section that was dominated by Yellow Sedge and also had some colonising Black Bog-rush.

The NE section has a somewhat different topography in that there are several ridges of underlying gravel that are influencing the re-vegetation. Where the cutaway is dry, the vegetation tends to contain more Birch and Soft Rush. Wetter areas tend to have greater cover of Bog Cotton.

The two main bog remnants are generally relatively dry and dominated by marginal ecotope. There was a small area in the southern remnant that tended towards sub-central and had a spongy surface with good *Sphagnum* cover. Large Heath butterfly were flying on the bog remnants.

Key biodiversity features of interest

- Overall this site has relative few features of particular ecological interest from a botanical perspective. Wetland habitats are developing. .
- Garryduff includes several undeveloped or partially-developed sections around the margin of the production bog that have been designated as part of a nature conservation site (River Shannon Callows cSAC and SPA & Suck River Callows SPA and NHA). Some of the remnant high bog is within the designated boundary, although it is quite degraded. These designated areas also include other typical marginal habitats such as wet grassland, scrub and bog woodland. They also act as part of a buffer between the production bog and the main channels of both rivers.

- Small undeveloped sections within the production bog include patches of bog woodland (WN7), scrub (WS1) and disturbed raised bog (high bog PB1) in poor condition.
- The main area of the bog was temporarily inundated with surface water and rising water levels at the time of the survey. These areas of open water offer a refuge to a very significant flock of Whooper Swan (Annex I; EU Birds Directive). Peak numbers for this site were 840 (cut off point for classifying a site as internationally important for Whooper Swans is 1% of national population – 210 in 2006 (this figure has been updated to 270 in line with current population trends Crowe et al. 2015)). The temporary wetland also attracted significant numbers of wildfowl with mainly Mallard and Wigeon and some Teal and Tufted Duck.
- Other species of conservation interest that were noted using the site include Otter (Annex II Habitats Directive species) and Badger (protected under the Irish Wildlife Act).
- 2014 Area now out of production are re-vegetating with a range of pioneer wetland and poor fen communities, predominantly influenced by underlying shell-marl. There are several indicators of potential rich fen development in places.
- 2014. There have been several anecdotal records of Hen Harrier around the site in the past few years. Peak Whooper Swan numbers are still quite high (> 270 international importance) during winter months.
- 2014. Large Heath Butterfly was recorded on two bog remnants along the southern margin. This species is on the Butterfly Red list.

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

Suck River Callows NHA (NPWS site code 000222) and SPA (NPWS site code 0004097)

The northern boundary of the production bog adjoins this long designated area that follows the path of the River Suck. This site has been designated for its importance for wintering wildfowl and species of conservation importance such as Greenland White-fronted Geese and Whooper Swan.

Some undeveloped and partially fringe habitats within the northern BnM boundary are designated as part of this NHA and SPA. Two sections contain a series of silt ponds and associated habitats. Other habitats include small amounts of remnant high bog, scrub and bog woodland. Part of the BnM boundary extends out to the River Suck and this section takes in some wet grassland and fringing Reedbed and scrub along the edge of the river. There are 14 ha within the NHA boundary in the Garryduff property.

River Shannon Callows cSAC & pNHA (NPWS site code 000216) and SPA (Middle Shannon Callows, NPWS site code 004096)

This large designated area extends between Athlone and Portumna. The designated area partially includes several small areas along the eastern margin of the site. These small areas generally contain sections of remnant high bog (PB1) and other typical fringing habitats such as scrub (WS1) and patches of bog woodland (WN7). One section is also partially developed as part of the production bog while another section is part of the access route to Shannonbridge.

There are 22 ha in total within the cSAC designation in the Garryduff property.

There are 36 ha in total within SPA between the two designations.

Adjacent habitats and land-use

Habitats around the margins of the site include:

- The River Shannon and Suck Callows (low-lying wet grassland and Reedbeds that are prone to inundation during winter months) around the northern and eastern boundaries.
- Improved grassland (GA1) and wet grassland (GS4) that is grazed during the summer and fodder is also cut.

- Typical marginal peatland habitats such as remnant high bog (PB1), cutover bog (PB4), bog woodland (WN7) and scrub (WS1). There is intensive active cutting of domestic peat around the north-west side of the site, outside the BnM boundary.
- Conifer forestry that has also been planted in places (non-Coillte) adjacent to the southern boundary.

Watercourses (major water features on/off site)

- The main channel of the Shannon and the Suck passes close to the east and north sides of the site respectively. All the drainage on the site is linked to the river. Parts of the site are less than 250 m from the main channels of both rivers.
- An old branch of the Grand Canal extending between Ballinasloe and the Shannon passes through the mid-section of Garryduff. It was constructed in 1823. This canal was closed in 1961 and was infilled to create the main BnM railway line through the site. Some of the old drains along the base of the canal at still intact. These are located at the eastern end along the main access zone into the site.
- Garryduff formerly contained a small lough called Lough Kimmeen. This lough was drained and removed during production. The bog also formerly contained several flush/soak features that were mapped on the old OSI 2nd edition 6 inch map. There are no sign of these features now.
- Several small streams mapped on the old OSI 2nd edition 6 inch map flow north from the bog to the River Suck. Some of these streams have been canalised and piped and are now part of the main drainage of the production bog. One stream has also been channelised and flows though an undeveloped section on the western half of the site.

Peat type and sub-soils

The majority of the site in underlain by shell-marl, which is having a significant influence on pioneer vegetation development.

Fauna biodiversity

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

- A max number of 890 Whooper Swans was recorded from the site (23/02/2010). The previous day 356 Whooper Swans were counted but it was felt this was an incomplete count. Swans were likely to be collecting here prior to final migration back to Iceland. It was noticeable that there were far more Whooper Swans at Garryduff compared to Kilmacshane, where water levels had gone down significantly. High numbers of Whooper Swans were noted on this site at several other occasions in January including the surveys of Lismanny (25/01/2010) and Kilmacshane (19-21/01/2010) (where 350 swans were counted). A very significant number of Whooper Swans (internationally important > 270) seems to have been present on this site, especially since the bogs are probe to inundation during winter months, and on the adjacent Kilmacshane bog for several months in 2009/2010, according to these counts and to other accounts of swan usage for these sites.
- There was significant numbers of other wildfowl. Wigeon and Mallard seemed to be most numerous. Teal were also present and there were several Tufted Duck. A max count of 250 wildfowl was recorded. Several pairs of mallard were also flushed from some of the various silt ponds.
- A pair of Ravens were calling and displaying over the site for a relatively long period. Ravens are likely to nest in the adjacent woodland around the site.
- Common birds such as passerines and corvids were also noted on the site. These included Wren, (using adjacent high bog margin) Pied Wagtail along access routes), Blackbird (in bog woodland), Pheasant (in bog woodland), Blue Tits (bog woodland), Long-tailed Tit (Bog woodland), Wood Pigeon, (over-flying and using adjacent woodland), Grey Crow (over-flying and roosting), Reed Bunting (using scrub around silt ponds), Redwing (using silt pond area), and Rook (over-flying and roosting).

- Snipe (15 in total) were flushed from several sections of the site including some of the remnant high bog around the margins.
- Pair of Cormorants was observed flying over the site.

04/06/2010

- Two Lapwings were also flushed from the production bog.
- 2 Heron using TOW
- Other more common species included Meadow Pipit, Mallard (2) Skylark, Wren and Chaffinch.

Mammals

- Signs of Deer (most likely Fallow Deer) were noted at several locations around the margins of the site.
- Grazing by Rabbits/Hares was noted along some of the access routes through the site and Hare droppings were noted around the margins and on some of the high bog.
- Signs of Squirrel (probably Red Squirrel) were noted in the bog woodland along the north of the site.
- Signs of Fox noted around the margins of the site.
- Signs of Badger foraging and footprints were also frequently noted around the margins of the site.
- Otter and Mink have both been sighted at Garryduff by local BnM staff in recent years
- Signs of Pine Marten noted along the railway track (04/06/2010)

Other species

- 4-Spotted Chaser

June 2014

- Large Heath Butterfly (5), (on two remnants along the southern margin), Common Blue, Meadow Brown, Orange Tip,
- Meadow Pipit, Hen Harrier, Whooper Swan, Ringed Plover, Heron,

Forestry and potential forestry on site

There are several small areas of woodland on the site. Some of these are bog woodland that has naturally developed on mounds within the production area are in one case a small undeveloped section along the northern boundary. Bog woodland and scrub is also developing on undeveloped fringe high bog along the northern boundary of the site.

Garryduff is a pumped bog and it is likely that the water-table will rise significantly once the bog comes out of production and large sections may be permanently rewetted as a result of surface water inundation. This will render nearly the entire site unsuitable for the development of forestry. There is some cutover bog located on the south-west corner. This may be suitable for planting. There has been private planting of conifers on adjacent cutover bog outside the BnM boundary adjacent to this area.

Activities on the site

Activities on the site include:

- Industrial peat production. The majority of this site is in active production with only a small proportion considered production-related cutaway. There are no significant areas permanently out of production at this site.
- Use of rail links. The main railway line links adjoining sites Kilmacshane, Lismanny and others to West Offaly Power, across a bridge over the Shannon.
- There is a small Works/Tea Hut along the central railway in the western section of the site.
- Electric powerlines pass over some of the site.
- Domestic peat cutting. There is intensive active domestic peat cutting of an undeveloped section of high bog located in the south-west part of the site. This area is accessed by a bog track.
- Burning had occurred within the past five years in the previously mentioned area of raised bog.

There is some wet grassland and bog woodland along both sides of the eastern access zone that was fenced off and grazed by cattle. There may be boundary/ownership issues with some of the land on both sides of the eastern access zone. Other areas of lands that were actively managed by parties other than BnM were located along the margins of the southern section.

HABITAT DESCRIPTIONS

(See Habitats Description Document for detailed description of each vegetation community not described in this section.)

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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 measures 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, work will be halted.
- Rehabilitation 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.
- Rehabilitation and decommissioning will be carried out in accordance with 'best practice' (Currently being updated). 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

No invasive plant species have been recorded at Garryduff Bog.

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 inspecting and washing vehicles prior to entering sites.

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, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practise measures around the prevention and spread of Crayfish plague[3] and Zebra Mussel will be adhered with throughout all rehabilitation activities.

[3] 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 Blackwater bog group (Ref. P0502-01). 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 Blackwater Bog 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) appreciates the Minister's intention to support, via the Climate Action Fund, Bord na Móna in developing a package of measures, 'the proposed Scheme', for the enhanced decommissioning, rehabilitation and restoration of cutaway peatlands, referred to as the 'Peatlands Climate Action Scheme'. The proposed Scheme includes lands previously used to supply peat for electricity generation within the State. The enhanced decommissioning, rehabilitation and restoration of the peatlands funded by the proposed 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.

It is envisaged that Bord na Móna carry out an enhanced decommissioning, rehabilitation and restoration scheme, (PCAS), across a footprint of 33,000 ha (a subset of the BnM estate that has been used for energy production). This proposed 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 costs associated with the additional and enhanced measures, i.e., those which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the proposed Scheme.

The proposed enhanced rehabilitation measures detailed in this document, are predicated on the understanding that the element of the rehabilitation, over and above the 'standard' measures necessary to comply with pre-existing Condition 10 IPC Licence requirements, will be deemed eligible costs for the Scheme regulator.

For the avoidance of doubt, should the proposed 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. 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 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.

5 National River Basin Management Plan 2018-2021 (Water Framework Directive)

The National River Basin Management Plan (2018-2021) (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 outlines 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) is part of the WFD (2018-2021) programme of measures. The NRBMP takes account of the fact that Bord na Móna is 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 rehabilitation target is set to be superseded by the acceleration of the Bord na Móna de-carbonisation programme and the proposed **Scheme (PCAS)**.

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

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.

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.

Garryduff Bog partially overlaps with the River Shannon Callows SAC and pNHA (NPWS Site Code: 000216) and Middle Shannon Callows SPA (NPWS Site Code: 004096) at three small location on the eastern and southern periphery of the site. The River Shannon Callows SAC (and pNHA) is designated for grasslands (Molinia and Lowland Hay Meadows) as well as alluvial woodland and Otter. The Middle Shannon Callows SPA is designated for the assemblage of wintering wildfowl, many species of which occur in internationally and nationally important numbers as well, in addition to breeding Corncrake. It is also noted as being important for breeding waders and a range of other nationally scarce species such as breeding Shoveler, Quail and Whinchat.

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.

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 2015-2020

The All-Ireland Pollinator Plan 2015-2020 outlines key objectives and actions to protect and support pollinating insects and the habitats they rely on. There are several Bord na Móna specific actions in this plan including 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, wind energy, and economy/enterprise.

Garryduff Bog is located in an area zoned by Galway County Council as open countryside.

11 National Archaeology Code of Practise

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 endeavour to adhere to this code of practise during the peatland rehabilitation phase and appropriate archaeology mitigation is carried out before and during cutaway peatland rehabilitation. An Archaeological Impact Assessment is being carried out for the proposed rehabilitation at this site (Appendix IX). The recommendations of this assessment will be incorporated into the rehabilitation plan to minimise impacts on known archaeology. In addition, Bord na Móna will adhere to the Archaeology Code of Practise relating to management of stray 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."*

The Garryduff Bog 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 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 will 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 has also committed to a significantly larger rehabilitation target. This is 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 plan to restore a further

1,000 hectares of raised bog habitat by 2025. These targets are significant in both timing and scale and are indicative of Bord na Móna's increased new ambition in this area.

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.

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

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. 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, 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

This 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	Garryduff 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 via Levelling
4	Decommissioning or Removal of Buildings and Compounds	If feasible
5	Decommissioning Fuel Tanks and associated facilities	Decommissioning and De-Gassing Mobile Fuel Tanks
6	Decommissioning and Removal of Bog Pump Sites	If feasible
7	Decommissioning or Removal of Septic Tanks	De-sludge Septic Tank

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.

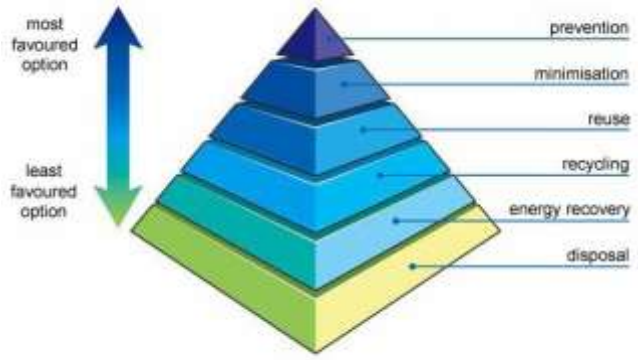
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

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 afteruse 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	Garryduff Decommissioning Plan
1	Removal of Railway Lines	Removal of Railway Lines
2	Decommissioning Bridges and Underpasses	If feasible
3	Decommissioning Railway Level Crossing	Decommissioning Railway Level Crossing
4	Restricting Access (bogs and silt ponds)	Restricting Access to Bog.
5	Removal of High Voltage Power Lines	If feasible

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 cutaway 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 (ie. at the margin) where the peat can not 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 proposed Scheme, which is proposed to externally funded.

Enhanced rehabilitation: This is defined as rehabilitation carried out under proposed 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 proposed 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 proposed Scheme.

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. 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

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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.

BORD NA MÓNA Naturally Driven	**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			

Archaeological Impact Assessment of Proposed Bog Rehabilitation at Garryduff Bog, Co. Galway. Dr. Charles Mount. Nov 2020.