Boora Bog

Cutaway Bog Decommissioning and Rehabilitation Plan 2021

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0500-01:

> "*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 Boora Bog upon cessation of peat production and compliments the licence requirement to decommission the site.

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

Industrial peat production has now fully ceased at Boora Bog.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0500-01, 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 the Boora Bog, activities which goes beyond that required by Condition 10 in the Licence, rehabilitation necessary to comply with the 'standard' requirement of Condition 10 (in the absence of the proposed Scheme) is also included, to estimate costs. The inclusion of the 'standard' rehabilitation together with the enhanced rehabilitation in this document allows the Scheme Regulator to distinguish and objectively determine the specific activities (and their associated costs) eligible for support under the proposed Scheme.

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

Lough Boora Discovery Park is a key amenity in the midlands of Ireland that has been developed at Boora Bog over a long period. Rehabilitation will take account of existing land-uses and infrastructure and will seek to positively integrate peatland re-wetting while maintaining other land-uses, particularly amenity.

Any consideration of any other future after-uses for Boora 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: Boora **Area:** 1847.1 ha

Site description:

- Boora Bog is located in Co. Offaly, ca.1.5km north of Kilcormac Village. It is part of the Boora Bog group. The Bord na Móna Works and Offices is located at Leabeg within Boora bog. The overall Boora bog is divided into two main sections, often assigned the designation Boora East and Boora West.
- Boora Bog has been in peat production since the early 1950's. The peat was primarily harvested for fuel peat to be used at Cloghan Power Station, West Offaly Power in Shannonbridge and Derrinlough Brickette Factory in Co. Offaly. Cloghan Power Station was decommissioned in 1990s.
- Large sections of the Boora Bog were cutaway at an earlier stage. Areas were planted with conifer forestry and were developed as farmland in the 1980's-1990s. Other sections were re-wetted and allowed to develop as naturalising mosaic of scrub, woodland and wetland.
- The Lough Boora Discovery Park has been in development since the 1990s and a Visitor Centre was officially opened at Boora in 2014. The Discovery Park includes 5 walking or cycling trails, several lakes (Loch an Dochas, Boora Lake, Tumduff Beag & Finnamores), wetland areas (Tumduff, Leabeg), a sculpture park & bird watching hides etc. Lough Boora Discovery Park now extends to over 2000 hectares and has a network of off-road walking and cycle routes within a perimeter of approximately 20 kilometres, and includes Boora Bog. The Offaly Way way-marked walking trail passes through Lough Boora Discovery Park. Lough Boora Discovery Park is now acknowledged as a nationally important outdoor amenity area and has attracted over 100,000 visitors a year for several years. The wider Boora area is recognised as an important bird-watching area in the midlands and the former cutaway attracts significant breeding and wintering waders and wildfowl. The Grey Partridge Conservation Project is located adjacent to LBPD and is managed for conservation by NPWS.
- A substantial portion of Boora is already rehabilitated/stabilised.
- Industrial peat production in the remaining active peat production areas to the west of the site ceased in 2019.

Rehabilitation goals and outcomes

Bord na Móna is committed to discharging the obligations arising from Condition 10 of the IPC licence. This is defined as:

- Meeting conditions of the IPC licence;
- Stabilisation or improvement in water quality parameters (e.g. suspended solids);
- Environmental stabilisation.
- Optimising hydrological conditions in the former area recently in industrial peat production for the further development of wetland, Reed swamp, wet woodland and fen habitats on shallow cutaway peats, along with management of existing wetlands.
- The site has already developed a mosaic of pioneer cutaway habitats, notably wetland, Birch woodland and fen habitats and is largely stabilised. These areas will be assessed for potential for targeted actions to enhance existing wetland habitats and create small wetland features.
- Integrating rehabilitation measures with current infrastructure and land-uses,
- Supporting current amenity land-use and potential future amenity. Lough Boora Discovery Park is an important amenity area.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future.

- Rehabilitation will support the National Policies on Climate Action and GHG mitigation by maintaining and enhancing the current residual peat storage capacity of the bog (locking the carbon into the ground). It is expected that the bog will have reduced emissions (reduced source) as it develops naturally functioning wetland and peatland habitats. 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 Boora Bog.
- EPA IPC Licence - Ref. P0500-01. 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 Boora Bog optimising **climate action benefits**.
- The local environmental conditions of this bog. Boora Bog has variable environmental characteristics with a range of residual peat depths, hydrology and topography. Much of the bog has been cutaway and has already been rehabilitated or developed for other land-uses.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- To minimise potential impacts on neighbouring land, some boundary drains around Boora Bog will be left unblocked, as blocking boundary drains could affect adjacent land.
- Other constraints including archaeology and rights of way.
- Current Land-uses. Lough Boora Discovery Park is an important midlands amenity site. It is not proposed to carry out any intensive rehabilitation actions to change or negatively affect any amenity infrastructure or existing land-uses.
- Other areas are managed for conifer forestry by Coillte. It is not proposed to carry out any measures that would negatively affect Coillte managed lands.
- Areas developed as farmland in the 1980s-1990s and sold to local farmers are not considered as part of the scope of this rehabilitation plan.

Criteria for successful rehabilitation:

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

- Rewetting of residual deep peat in the former area of industrial peat production to slow water movement across the site to retain silt, encouraging development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat (IPC Licence validation). The target will be the delivery of measures and this will be measured by an aerial survey after rehabilitation is completed. (IPC Licence validation).
- Stabilising/improving key potential emissions to water (e.g. suspended solids). This will be measured via water quality monitoring (suspended solids and ammonia) for at least 2 years after the rehabilitation has been completed (IPC Licence validation).
- Reducing pressure from peat production on the local river catchment (IPC Licence validation). This will be measured by the EPA WFD monitoring programme.
- Optimising the extent of suitable hydrological conditions for climate action (Climate action verification). This will be measured by an aerial survey after rehabilitation has been completed.
- Reduction in carbon emissions (Climate action verification). 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.
- 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 Boora Bog.
- Improvement in biodiversity and ecosystem services (Climate action verification).

Meeting climate action verification criteria and monitoring of these criteria after the Scheme is completed 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 appraisal of the potential impacts of the planned rehabilitation.
- Carry out proposed measures, which will be a combination of drain blocking, peat field re-profiling, wetland creation, targeted drain-blocking within stabilised areas and fertiliser applications targeting bare peat on headlands, high fields and other areas.
- Phase 2 measures may include seeding of targeted vegetation and inoculation of *Sphagnum* in compatible areas.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning phase.
- 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.

Monitoring, after-care and maintenance

The monitoring, after-care and maintenance programme for Boora Bog, as required to meet Condition 10 of the IPC Licence, is defined as:

- Quarterly monitoring assessments of the site to determine the general status of the site, 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, if needed.
- **Water quality monitoring** will be established. Monitoring of key water quality parameters for 2 years after rehabilitation will include: Ammonia, Phosphorous, Suspended solids (silt), pH and conductivity.
- 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. 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 Boora bog group (Ref. P0500-01). 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. Boora bog is part of the Boora bog group (see Appendix I for details of the bog areas within the Boora Bog Group). Boora Bog is located in Co. Offaly.

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0500-01:

> "*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 plan is a specific rehabilitation plan for the bog and outlines:

- Description of site management and status;
- Main issues and approaches to rehabilitation;
- Consultation to date with interested parties;
- Interaction with other policy and legislative frameworks (Appendix VI);
- The planned rehabilitation goals and outcomes:
- The scope of the rehabilitation plan;
- Criteria which define the successful rehabilitation and key targets to validate rehabilitation;
- Proposed rehabilitation actions;
- Proposed timeframe to implement these 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 on its peatlands. Note this proposal is also known colloquially as the 'Peatlands Climate Action Scheme' (PCAS). 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. Bord na Móna have identified a footprint of 33,000 ha as peatlands suitable for this scheme. This proposed Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered.

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. Bord na Móna have now announced the complete cessation of industrial peat production across its estate (January 2021).

It is expected that the 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 PCAS 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 outfall management, drain-blocking and management of water levels within the bog;
- re-profiling/re-wetting of extant deep peat that will deliver suitable conditions for development of wetlands, fens and bog habitats;
- targeted fertiliser applications,
- seeding of targeted vegetation; and
- proactive inoculation of suitable peatland areas with *Sphagnum.*

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

These measures are designed to encourage the development of peat-forming habitats, where possible. They are also designed to further slow the movement of water across the site (with the site acting similarly to a constructed wetland), slowing the release of water (improving local water attenuation) and water quality is also expected to improve as the site returns to a naturally functioning peatland ecosystem. The measures will also accelerate the development of new habitats for a range of species under pressure in the wider landscape and will have the potential to develop habitats (e.g. Annex I raised bog, wetlands that support wader water birds of conservation interest) that will contribute towards the delivery of national biodiversity objectives.

Boora Bog is proposed to be part of this this proposed Scheme (PCAS) and this rehabilitation plan outlines the approach taken.

1.1 Constraints and Limitations

This document covers the area of **Boora Bog**.

Boora Bog is also referred to as comprising 'Boora East' and 'Boora West' and the use of these designations, such as in mapping, should be interchangeable with 'Boora'.

This rehabilitation plan takes account of the **current land-uses** of Boora Bog. Amenity and Biodiversity and ecosystem services have been identified as the current primary land use at Boora Bog, with some ecosystem services already in place. Sections are also used for conifer forestry and are managed by Coillte.

Bord na Móna will continue to review the future after-use of its land-bank. Any consideration of any other future after-uses for Boora 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.

Industrial peat extraction at Boora Bog permanently ceased in 2019.

The area in recent peat production is bare peat. however substantive areas of Boora are recolonising or have been for a number of years, with resultant pioneering vegetation now in situ. In addition, some rehabilitation has been carried out previously, and much of the land area included within the current Bog Boundary is stabilised.

It is anticipated that the combination of active enhanced rehabilitation measures and further natural colonisation will quickly support the further development of pioneer vegetation. Nevertheless, it will take some time (30-50 years) for naturally functioning peatland ecosystems to fully re-establish across the entirety of Boora Bog.

Parts of Boora Bog (outside the areas owned and under the control of Bord na Móna) are currently used by domestic turf cutters to harvest pea., 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 Boora 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.

Other land-uses such as farming and nature conservation (Grey Partridge Conservation Area – owned and managed by NPWS) occur on the margins of Boora Bog. While these areas were cutaway originally, they were rehabilitated in the 1980s and occur outside the IPC licenced area. These areas are outside the scope of the rehabilitation plan.

An existing amenity land use- the Lough Boora Discovery Park and visitor centre was officially opened at Boora in 2014 and includes 5 walking or cycling trails, four lakes, a sculpture park, bird watching hides etc. Lough Boora Discovery Park now extends to over 2000 hectares and has a network of off-road walking and cycle routes within a perimeter of approximately 20 kilometres.

Bord na Móna maintains and operates one of its primary facilities (office and workshop) at Leabeg, within Boora Bog boundary.

A community lease to facilitate a local fishing club is in place at Finnamores.

A ‘Sensory Garden’, utilising another land lease is also in place, with a planned expansion recently announced.

A BOGFOR trial is located within the Boora Bog boundary.

A Bord na Móna willow biomass trial area, is also present.

The Irish Wildlife Trust (hereafter IWT) now manage a land folio at Lough Boora as a Nature Reserve, which was formerly within the IPC license extent, and is now outside the BNM Boora Bog boundary.

The Offaly Way, a national waymarked route, traverses Boora Bog.

Rehabilitation in other areas of the bog may also be constrained due to other property issues or issues such as rights of way. There are known archaeology records at or near Boora itself (a Mesolithic habitation site is known from Lough Boora for example).

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 confirmatory 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 Boora 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:

- Boora Integrated Pollution Control Licence;
- Boora 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 Sur
- vey 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.

- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

2.2 Consultation

Several 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, Boora Bog was surveyed in 2011. Additional ecological monitoring and visits have taken place at Boora Bog between 2013-2020 to inform rehabilitation planning, where required.

A final site visit to inform the current Rehab Plan took place by BNM Ecologists in December of 2020 and habitat maps have been updated, where required, accordingly.

This rehabilitation plan is informed by the original baseline survey as well as subsequent confirmatory site walk-over surveys and visits, and updates to baseline data.

Habitat mapping followed best-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 Boora Bog is contained in Appendix II.

3. SITE DESCRIPTION

Boora Bog is located in Co. Offaly, ca.1.5km north of Kilcormac Village (see Figure 3.1). It is part of the Boora Bog group. The Bord na Móna Works and Offices is located at Leabeg within Boora bog. The overall Boora bog is divided into two main sections, often assigned the designation Boora East and Boora West. There is access to the bog via several public roads. The bog is flanked to the south and west by the Silver [Kilcormac] River, but is also drained by the Boora Stream, the Pollagh Stream [Brosna], and the LEA_BEG, all of which flow northwards to the Brosna River.

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.

Boora is an older production bog with earliest production dating back to the early 1950's. The western section i.e. Boora West contains the most recently active milled peat production areas.

3.1 Status and Situation

3.1.1 Site history

Boora Bog has been in peat production since the early 1950's. The peat was primarily harvested for fuel peat to be used in Cloghan Power Station, Derrinlough Brickette Factory and West Offaly Power in Shannonbridge, Offaly. Most the site is now cutaway and recent peat extraction was confined to a small portion of the western side of the site.

Research into the rehabilitation of cutaway industrial peatlands has been ongoing by Bord na Móna since the 1960s. Initially the main focus was on finding a commercial after-use for these areas and several experimental trials were established across the range of Bord na Móna peatlands to determine the success of vegetable growing, forestry, agricultural grassland and biomass crops. In later years, the focus has shifted towards allowing the post-industrial peatland areas to naturalise and revert to wetland and dry wilderness areas, as well as developing alternative commercial uses such as using cutaway for renewable energy.

Several rehabilitation measures comprising naturalisation and development of alternative after-uses have been already explored at the Boora Bog Group, including coniferous forestry, biomass, agricultural grassland, amenity use, rare species conservation management (specifically Grey Partridge) and wetland creation. While agricultural fields and coniferous forestry have been developed successfully on the cutaway bogs at Boora, these require financial investment that at this time exceeds any potential commercial output value. Former areas of Boora Bog that were developed for agriculture have since been sold to local farmers (1990s). In addition, two large blocks of cutaway were also transferred to NPWS ownership for Grey Partridge conservation. Boora is the only Grey Partridge site in Ireland (Figure 8.1).

3.1.2 Current land-use

The Lough Boora Discovery Park encompasses all areas relating to amenity and biodiversity www.loughboora.com. (Figure 3.3-3.4).

The Lough Boora Discovery Park has been in development since the 1990s and a Visitor Centre was officially opened at Boora in 2014. The Discovery Park includes 5 walking or cycling trails, several lakes (Loch an Dochas, Boora Lake, Tumduff Beag & Finnamores), wetland areas (Tumduff, Leabeg), a sculpture park & bird watching

hides etc. Lough Boora Discovery Park now extends to over 2000 hectares and has a network of off-road walking and cycle routes within a perimeter of approximately 20 kilometres, and includes Boora Bog. The Offaly Way way-marked walking trail passes through Lough Boora Discovery Park. Lough Boora Discovery Park is now acknowledged as a nationally important outdoor amenity area and has attracted over 100,000 visitors a year for several years. The Lough Boora Sculpture Park has significant cultural value and is acknowledged as being of international importance. The wider Boora area is recognised as an important bird-watching area in the midlands and the former cutaway attracts significant breeding and wintering waders and wildfowl. The Grey Partridge Conservation Project is located adjacent to LBPD and is managed for conservation by NPWS.

The Lough Boora Mesolithic site is located towards the centre of the site and is part of a former lake basin. This area is less developed and contains several features of significant ecological interest. Part of this area is designated as a potential National Heritage Area. It is almost completely surrounded by conifer plantation and can be accessed by the main cycle path, which runs through this section. Much of the former Boora lake basin was also drained. This area is part owned by the IWT and it is managed for nature conservation. The adjacent Mesolithic storm beach contains diverse calcareous grassland (GS1).

An active rail line is still operational between Boora West and other sites to the west of the site. Decommissioning of this infrastructure is dependent on the general cessation of industrial peat production for supply of peat to Derrinlough Brickette Factory.

Several conifer plantations were established on this site in the 1980's by Coillte, with the site being leased by Coillte. Stands of mainly Lodgepole Pine and Sitka Spruce were planted on the site. Mixed broadleaves with Oak and Birch were also planted on one section of the site.

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. These job numbers have now declined with the cessation of peat extraction.

In respect of Boora Bog, jobs included in the above study would have included those to facilitate extraction of peat at Boora, and associated processing and transfer to the relevant power station, in addition to staff employment at workshops and the main Bord na Móna facility located at Leabeg.

As the primary employer in many Midland counties, Bord na Móna played a central role in building communities through a number of 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."

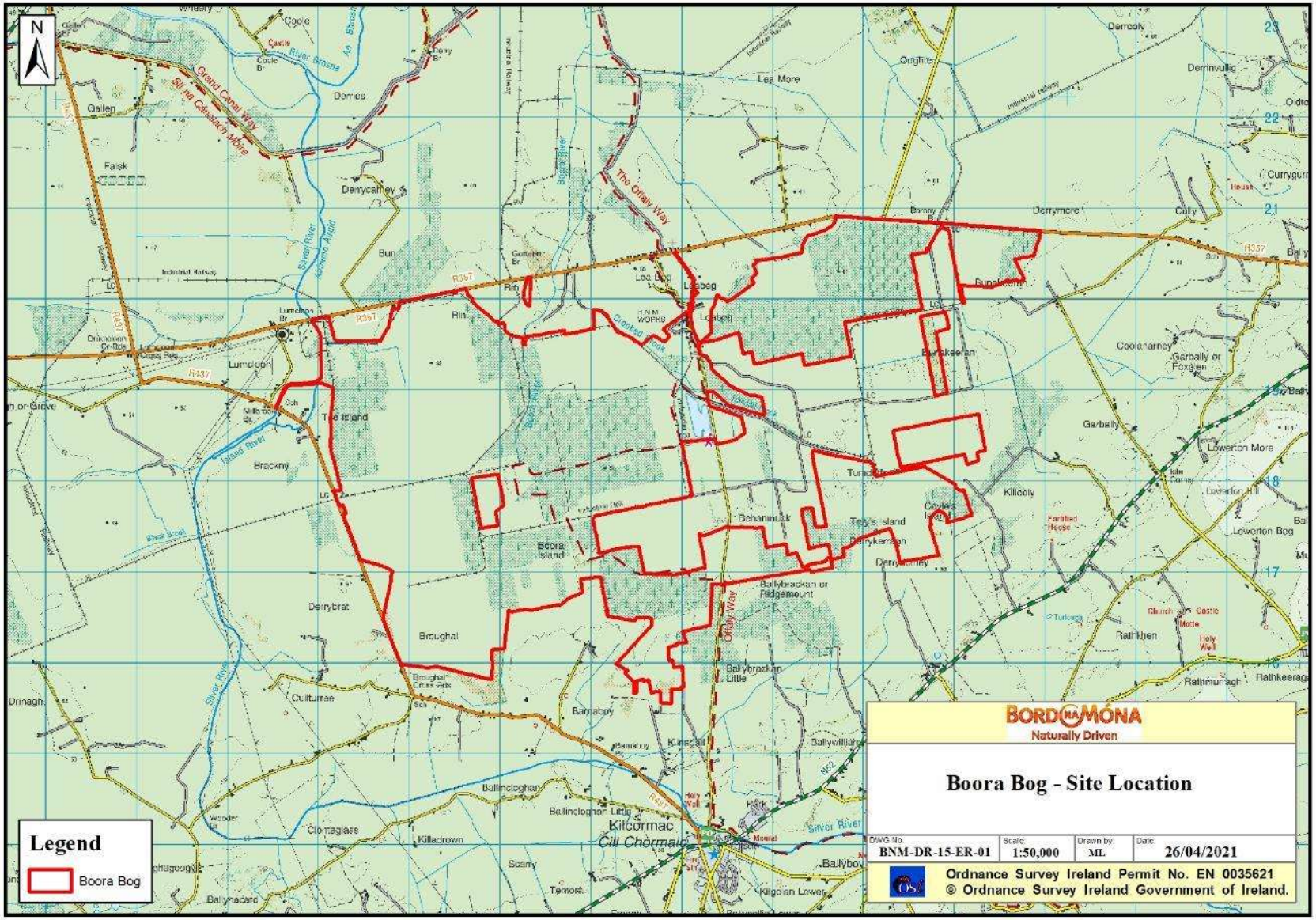


Figure 3.1 Location of Boora Bog in context to other Bord na Móna bogs and surrounding area

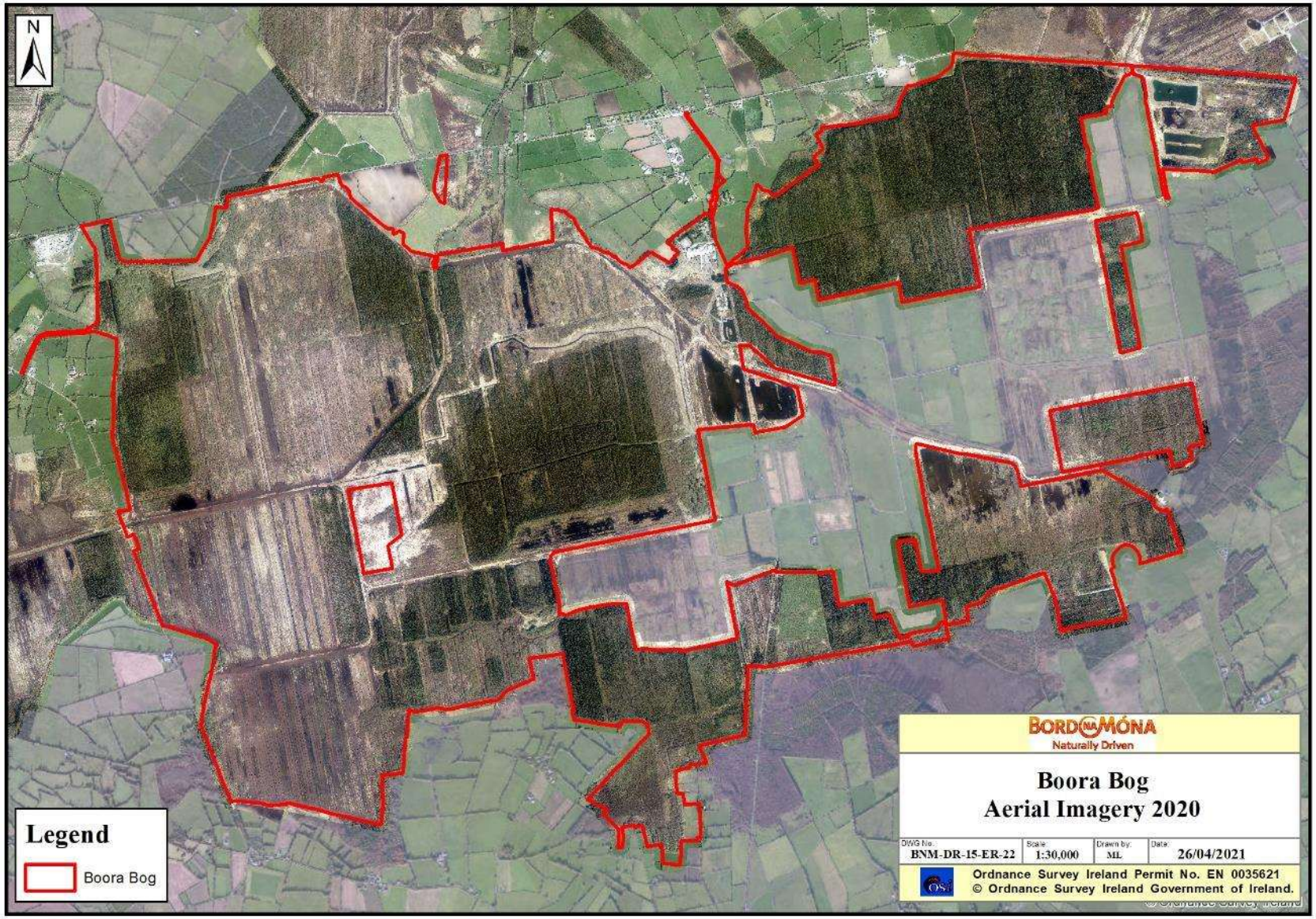


Figure 3.2 Aerial photo of Boora Bog.

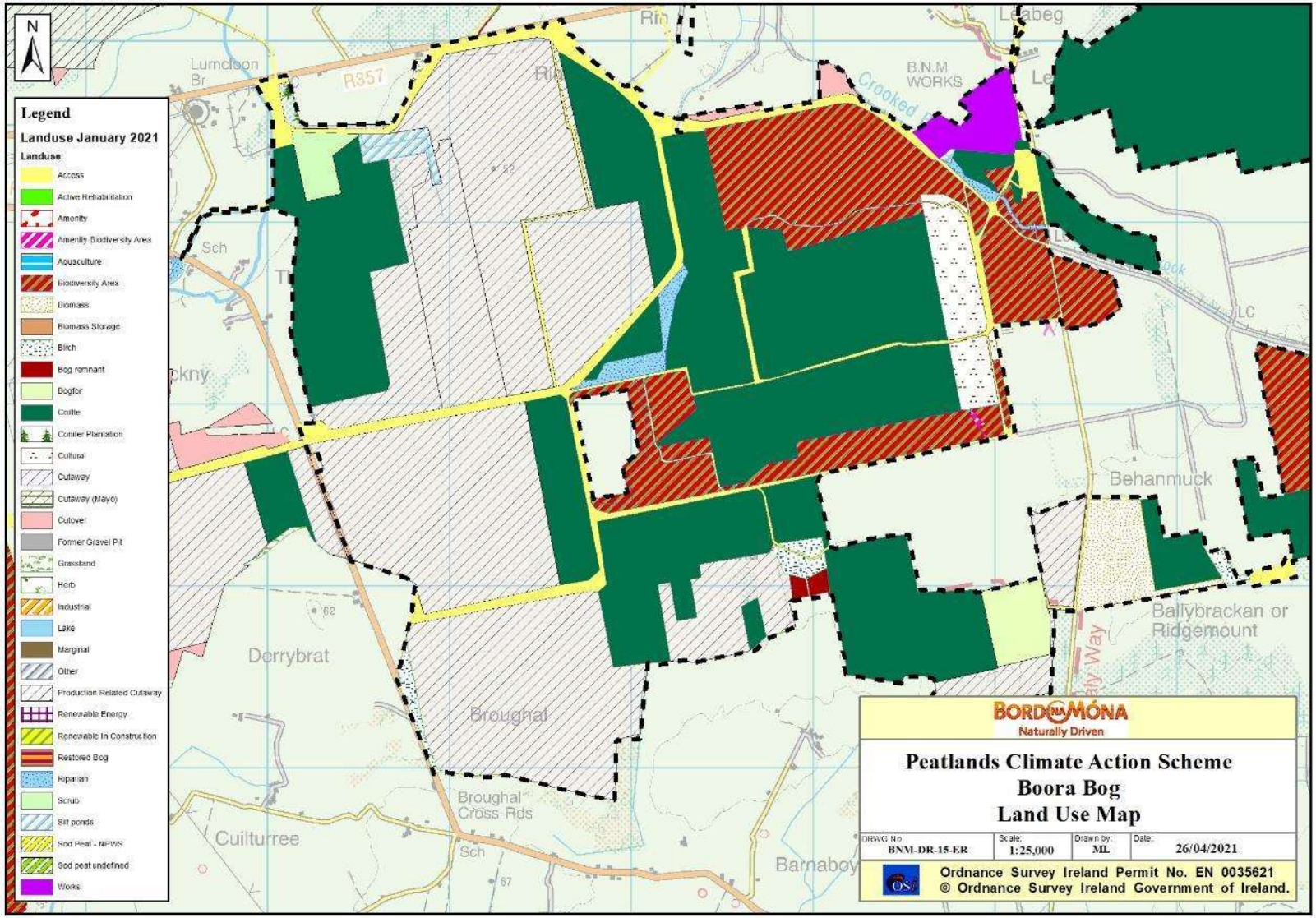


Figure 3.3. Land use at Boora West.

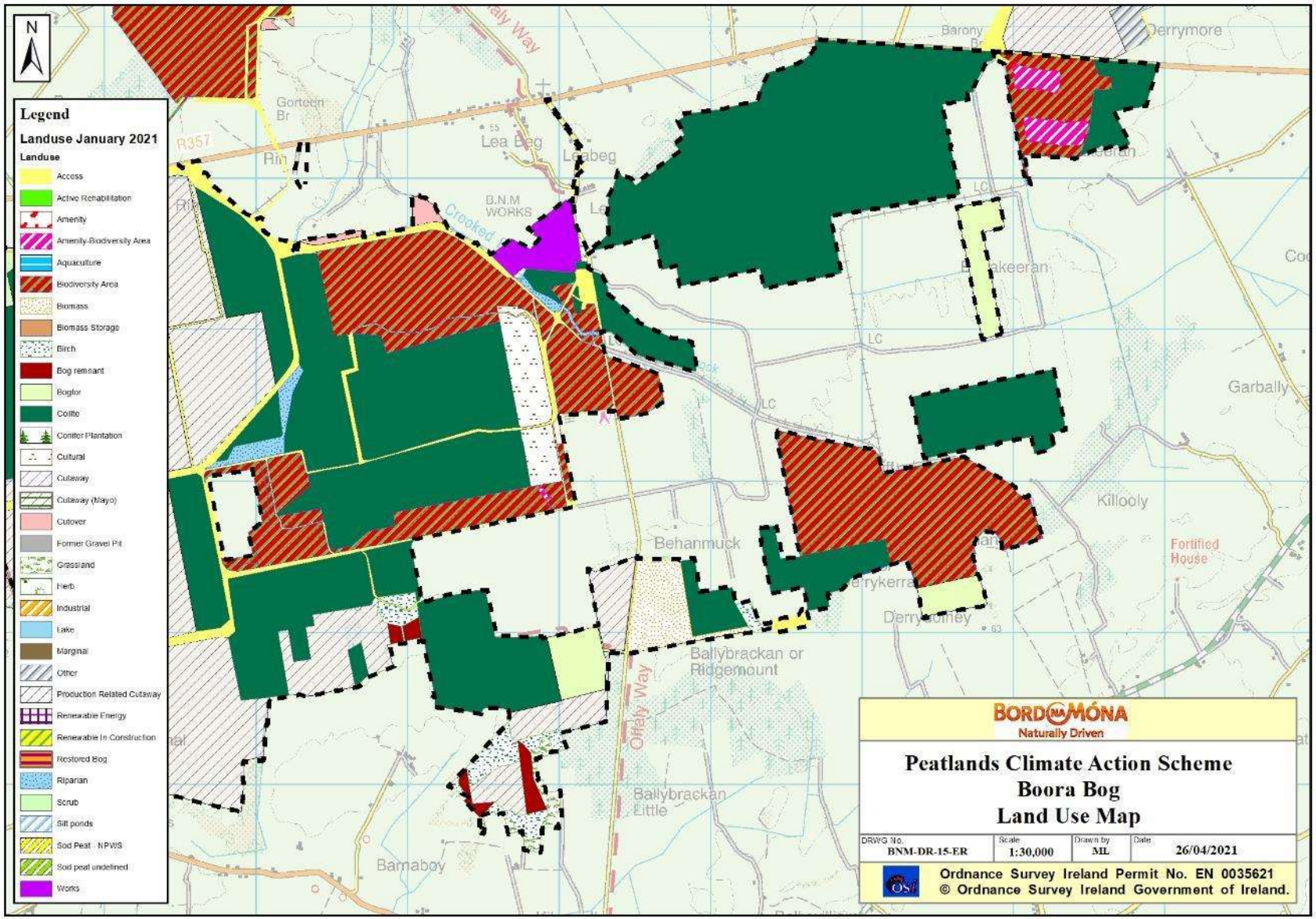


Figure 3.4 Land-use at Boora East

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

The underlying geology at Boora Bog is Visean Limestones (undifferentiated), along with Waulsortian Limestones, described as massive unbedded lime-mudstone.

Subsoils underlying extant peat are significantly lacustrine calcareous marls, and glacial sub-soil mounds and ridges are being exposed in places (Figure 8.1).

3.2.2 Peat type and depths

Commercial peat extraction has been undertaken at Boora Bog since the early 1950's. Most the site is cutaway with shallow residual peat depths or exposed sub-soils (Figure 8.1).

As a result, peat depths of 2-3 m mainly occur within the south-western portion of Boora west, that has been in recent peat extraction.

3.3 Key Biodiversity Features of Interest

Boora bog is located in Co. Offaly, with its centre ca.4.5 km north of Kilcormac. The Bord na Móna Works and Offices is located at Leabeg and is part of the Boora bog. The overall Boora bog is divided into two main sections, Boora East and Boora West for ease of survey. The minor road that connects Leabeg and Kilcormac is the main division between these two sections, with all of the BnM property to the east of the road described in this report.

3.3.1 Current habitats

<u>Boora East</u>

Boora East contains a large area of rehabilitated cutaway. This bog is one of the older bogs that went into production at the beginning of industrial peat production and therefore has some of the oldest developing cutaway. Much of the cutaway has been rehabilitated as agricultural grassland, conifer plantation, or as part of the Lough Boora Discovery Park and has already stabilised. The rehabilitation of the cutaways of Lough Boora Discovery Park has been described in detail by Egan (2008). The improved grassland has been sold to local farmers and a large area of cutaway "known as the Marl square' and a further section in Boora South has since been sold to the NPWS, who now manage this land for Grey Partridge conservation. This has fragmented Boora east into several 'isolated' sub-sections. For ease of description, each of these sub-sections is described separately as follows.

Finnamores Lakes

The Finnamores lakes are located at the north-east corner of Boora east. This area is now managed in part by a local angling club (CACI). Two fishing lakes were constructed by digging into the sub-soil, creating a basin and using the spoil around the lake to create embankments. Both lakes are relatively shallow with calcareous water chemistry and there is likely to be influence from underlying marl and glacial sub-soil/gravel. The lakes attract some water birds with Mallard, Tufted Duck, Little Grebe and feral geese all present.

The use of the spoil from the lake basins around the lake margins has had the effect of creating relatively diverse calcareous grassland. This grassland is in the pioneer phase and is still developing.

The wetlands that have developed associated with the lakes are quite diverse, structurally and at species level. The wetlands in the central area host flocks of roosting Lapwing and other wintering or passage waders. The central wetland margins are vegetated with Bog Cotton-dominated vegetation and Bottle Sedge-dominated vegetation. The wetlands are used by breeding Lapwing and Redshank.

The wetland located adjacent to the northern lake has a highly calcareous water chemistry. This wetland is quite structurally diverse and is infilling with stands of Common Reed and Bottle Sedge. The western margin adjacent to the lake has some diverse sedge-rich vegetation dominated by Yellow Sedge. This community is associated with rich fen habitat. Further east there is extensive tufa precipitation out of the water along around the wetland margins, creating a layer of tufa over the remnant peat or marl that forms the surface. There are some sections where there is extensive development of Charophtyes in the shallow water.

Further south there is similar wetland development. The eastern margin adjacent to the conifer plantation has some typical Birch scrub mosaic and poor fen dominated by Soft Rush. There is one particular wetland area that extends into the conifer plantation that is developing typical fen carr woodland. The wetland vegetation is dominated by Bottle Sedge while the scrub is dominated by Willow.

This sub-section contains a large rabbit population. The rabbits have had a significant impact on the development of the vegetation with a low-cropped grass sward adjacent to the lake and areas of bare peat on the embankment stripped of most vegetation apart from Brambles.

Tumduff Mór wetlands

The Tumduff Mór wetlands are located in the south-east corner of Boora east. As well as the extensive wetland development, there is also a large area of Birch scrub and some conifer plantation. The wetlands were mainly developed in a natural hollow in conjunction with high fields and embankments used by the railway and for travel paths. The main outfall is located at the north-west corner. Water flows out of the wetland over a rock-based channel and into the main drainage system, which directs the water west towards the Boora River. These wetlands attract significant numbers of wintering waterbirds, including Whooper Swans. The wetlands are also used by breeding Lapwing, Redshank and Ringed Plover.

The deepest part of the wetland is the west side, and the wetland gets progressively shallower towards the east. These shallower sections become more and more in-filled with emergent wetland vegetation.

The eastern side of the wetland is divided from the western side by a high field/embankment, although there is likely to be some drainage links. This eastern wetland is much shallower and this has allowed a diverse wetland structure to develop. The northern margin is mostly dominated by a narrow strip of dry heath, bare peat and Purple Moorgrass mosaic, along the old railway embankment.

Further east of the wetland there is generally Birch scrub developing within the BnM property. There is some Birch woodland with mature Pine developing on the margins of the site and Pine and Heather are colonising some small areas on the cutaway. There is a large open area between the two BnM properties (wetland and forestry) that is owned by the NPWS and managed for Grey Partridge conservation. This zone of the cutaway is dominated by bare peat and is slow to re-colonise. There are scattered clumps of Soft Rush and some Birch saplings present, while further east, Bog Cotton begins to become more common.

South of this wetland there is also a substantial area of dense Birch scrub, poor fen mosaic dominated by Soft Rush, and developing Birch woodland.

There are several conifer plantations attached to the Tumduff wetlands area. These have mainly been developed along the southern side on higher ground. The main plantation is located at the south-west end and is primarily Lodgepole Pine. Much of this is poorly developed.

Tumduff Beag lake

This small man-made lake was created from cutaway along the Leabeg-Kilcormac road, along with Boora Lake. It is now a focus point for the Lough Boora Parklands as there is a large bird hide built along the road. It has developed as a wetland with an increasingly diverse structure. Little Grebe and Mute Swan have bred here along with other species. There are several 'islands' within the lake that are used for nesting by small numbers of Black-headed Gulls and in winter are often used by roosting Lapwing and Curlew. Stands of Grey Bulrush, Reedmace and Bottle Sedge are developing within the lake and creating Reedbeds and emergent vegetation. A single stand of Common Reed is also present at the north-east corner.

The lake is surrounded by mainly Purple Moorgrass-dominated grassland. One notable feature is the abundance of Devil's-Bit within this grassland. There are also some patches of Birch and Willow scrub. Dry Heath with Heather is also present, particularly along the road embankment.

Some calcareous grassland with abundant Knapweed and Glaucous Sedge is present along the southern side of this sub-section, on higher ground where the peat is thin or has been totally removed. Some of this grassland is being covered with Brambles and Willowherb and will slowly develop into scrub.

Southern Biomass area

This area is located at the southern end of Boora east in Ballybracken. It is located adjacent to the Leabeg-Kilcormac Road. It includes some conifer forestry developed by Coillte. Like many of the other plantations it is variable in quality.

This sub-section also includes the BnM Willow biomass trial. Adjacent to this area there is some cutaway along the road. This is being colonised by Heather, Birch scrub and Purple Moorgrass.

Northern Conifer plantation

This large area of mainly conifer plantation was developed by Coillte and extends from Leabeg to Finnamores. Conifers. It was planted in the 1990's and is at a post-thicket stage. There has been no significant thinning of any compartments. Lodgepole Pine was the main species planted as well as some Norway Spruce and Sitka Spruce. Some broadleaves were also planted in various compartments. This conifer plantation varies in quality and some is poorly developed.

South-eastern conifer plantations

This plantation is located adjacent to the lands managed for Grey Partridge by NPWS and north of Tumduff Mor wetlands. It is a mixed plantation with some blocks of conifers, some mixed stands and some blocks of broad-leaves that were planted as trials. The eastern side seems to be poorly developed with substantial Birch development amongst the conifers. There is an additional plantation to the north of the above area that is located

adjacent to the east side of the 'Marl Square'. This plantation is a series of blocks of different conifer and broadleaf crop types that was planted for the BOGFOR forestry trial.

Boora West

Boora West contains a large area of cutaway. This bog is one of the older bogs that went into production at the beginning of industrial peat production and therefore has some of the oldest developing cutaway. Much of the cutaway has been developed as conifer plantation by Coillte, or as part of the Lough Boora Discovery Park. A significant portion of cutaway within the Lough Boora Discovery Park has been actively rehabilitated and this includes the construction of two lakes and a large wetland area (Leabeg wetlands). The western side still has some active peat production and younger pioneer cutaway developing in production-related cutaway. There is a railway along part of the northern boundary that connects the Boora yard and workshop to the Boora bog group. The Lough Boora Mesolithic site is located towards the centre of Boora west and is part or a former lake basin. This area is less developed and contains several features of significant ecological interest. Part of this area is designated as a potential National Heritage Area. Further south there is some other cutaway that has been developed as wetlands (South Boora wetlands). A large part of the former southern cutaway area has now been sold to the National Parks and Wildlife Service and is actively managed for Grey Partridge conservation. For ease of description Boora west is further sub-divided into several sub-sections.

Mesolithic site, Boora Lake and surrounding areas

This area is located towards the centre of Boora west. It is almost completely surrounded by conifer plantation and can be accessed by the main cycle path, which runs through this sub-section. Much of the former Boora lake basin (IWT area and adjacent BnM-owned area) was also ditched and developed into fields. However, there are sections of this area and the Mesolithic storm beach that were not stripped of vegetation and retain fen habitats. The former Boora lake basin now contains a small area of developing Birch woodland surrounded by Birch and Willow-dominated scrub that is mainly spreading into poor fen type vegetation.

Leabeg Wetlands

This area includes the large area of wetlands to the north of Boora that extends from the new Lough Boora lake west to the conifer plantation. Wetland enhancement work has been carried out in this area in the past with drain-blocking and the creation of a berm to hold water over a greater area. This has been extremely effective with the result that wetlands communities with open water have established and these are found in mosaic with scrub and poor fen communities. Small number of wintering wildfowl, particularly Wigeon and Teal, regularly use these wetlands, and Lapwing, Snipe and Water Rail nest on some of the drier grassy areas.

South Boora wetlands

This area is located to the south of Boora and adjacent to the Grey Partridge Project area to the south. Conifer forestry borders this area to the north. There has been some wetland enhancement works carried out in the past. More work has recently been carried out (2009-2010) with the blocking of the main outflow with the result that the water level has been raised and there is now more water pushed over the overall area. The wetland development is a younger stage compared to the Leabeg wetlands. Lapwing and Ringed Plover have both been

recorded nesting on some of the barer fields and Black-headed Gulls have nested on some of the emergent vegetation tussocks within the wetlands.

South-east sub-section (including the Bogfor trial area)

Peat production has been much less intensive in these marginal sections of Boora. The Bogfor trial was established on typical dry cutaway. This area is fenced. Some of the planted trees have established but many of the trees seem to be in check. Mixtures of conifers and broad-leaved trees were planted. Birch, Lodgepole Pine and Willow have also naturally colonised within the site along with Soft Rush, Bramble, Raspberry and some Heather. This area is fenced but the fence is now degraded. The vegetation is quite dense.

West of the BOGFOR trial there is a small area of open cutaway that is establishing on higher bog. This is also located adjacent to the road between Leabeg and Kilcormac. Tall Birch and patchy Heather is established along the drains but between the drains there is mainly bare peat and Bog Cotton. Lodgepole Pine is naturally colonising towards the southern side and adjacent to conifer plantation on the margins.

South of the BOGFOR trial and some conifer plantation there is another area of cutaway that is almost completely re-vegetated. This area is also characterised by deep peat that has been extensively naturally colonised by Birch and Pine forming closed scrub, while the open sections are now covered in tall Heather, forming dry heath in mosaic with the Birch scrub.

Further south there is a relatively large area of ditched high bog that may have been undeveloped for peat production, or peat production was minimal. This area is also characterised by very thick impenetrable closed Birch scrub/ woodland along the margins.

North West Boora

This area includes the western side of Boora from the central rail line northwards. A small area immediately to the north of the railway line was until recently still used for peat production. Several access routes are still active through this section and a cycle route to allow access from Boora to Turraun is located at the eastern edge of this area. The cutaway areas had re-vegetated, mainly with a mixture of Birch scrub with open habitats such as grassland and poor fen. A small area (0.15ha) of embryonic bog community is located alongside a section of conifer plantation close to the north western boundary of the site.

The north-west corner of the sub-section (to the north of the conifer plantation and adjacent to the old power station site contained areas of calcareous grassland, scrub and conifer plantation. The Silver River flows along the western boundary of this area. The riparian area comprised trees and scrub mainly.

South West Boora

This sub-section of Boora west encompasses the area directly to the south of the central rail way line. The area immediately to the south of the central rail way line was a mixture of bare peat production fields and re-vegetated cutaway. The pioneer vegetation was a mixture of Birch scrub, poor fen vegetation with some small areas of open water.

The south west corner of the sub-section was until recently in full peat production and comprises, for the most part, bare peat. A small area to the south of the railway line and immediately to the west of the conifer plantation has developed into a wetland. This area comprised of areas of open water, reed beds and poor fen vegetation.

A habitat map of Boora Bog is shown in Figure 3.9 & 3.10.

Figure 3.5. View of Finnnamores Lakes at Boora Bog East

Figure 3.6. View of Emergent Vegetation at Tumduff Beag, Boora Bog

Figure 3.7. View of wetland at Boora west, Boora Bog

Figure 3.8. View of wetland at Leabeg, Boora Bog

3.3.2 Species of conservation interest

Boora East

The various sub-sections of Boora Bog described above, form part of the Lough Boora Parklands, and their flora and fauna is increasingly becoming well-known, particularly their potential to attract bird species of interest including rare vagrants and passage migrants such as Marsh Harrier and Red-necked Phalarope. Lough Boora Parklands (and the surrounding farmland) are becoming known as one of the best locations in Offaly and the midlands for watching birds. These cutaways are somewhat older in development than many other bogs and therefore are somewhat more diverse with greater biodiversity value.

Tumduff Mór is a diverse wetland that attracts breeding and wintering waders and wildfowl and is an excellent example of wetland habitat rehabilitation. This area was enhanced via the creation of a berm holding back the water into a natural basin. It now contains a range of typical cutaway wetland communities with substantial open water, Reedmace stands, Grey Bulrush stands and other emergent vegetation Boora East also includes a known Hen Harrier winter roost.

Finnamores wetlands are another excellent example of wetlands rehabilitation. This area, along with the two fishing lakes also attracts breeding waders such as Lapwing and Redshank. Part of the wetland is extremely calcareous with a significant amount of tufa precipitating out of the water due to the underlying marl. This area has potential to develop as rich fen. Some of the vegetation communities to the east adjacent to the conifer plantation are naturalising and are developing similar to fen carr woodland. The fishing lakes are surrounded by landscaped grassland that is now diverse orchid-rich calcareous grassland in places.

There have been records of White-clawed Crayfish from the Finnamores lakes. This species is listed on Annex II of the EU Habitats Directive and is a species of conservation importance that is likely to have colonised from the surrounding drainage network.

Tumduff Beag lake is a site that is becoming quite naturalised with features and structure similar to a natural lake.

The site is regularly used by the Grey Partridge and is adjacent to the area managed by the NPWS for Grey Partridge. Tumduff Beg also has a small Black-headed Gull breeding colony.

There are substantial records found in other reports such as Heery *et al.* (1999) and Copland (2009) as well as several other older reports by BirdWatch Ireland.

Boora East attracts breeding waders including Northern Lapwing *Vanellus vanellus* (now Red-listed on the Birds of Conservation Concern in Ireland list[1] and highlighted as a conservation priority in the Government's Prioritised Action Framework 2014-2020[2]). Farmland adjacent to Boora east attracts Whooper Swan *Cygnus cygnus* (Amber listed in Ireland and also on Annex I of the EU Birds Directive) along with other species of wintering waterfowl such as Golden Plover *Pluvialis apricaria*.

Boora West

Boora West includes a pNHA – Lough Boora. The former Boora Lake (now drained) was designated as a pNHA for its geological interest. Part of the site is the Lough Boora Mesolithic site where an old storm beach (of a much older and larger lake) is present, and is also of very significant archaeological interest. This area is now developing some diverse habitats including Birch woodland, poor fen (PF2) and some rich fen (PF1). This habitat type may

[1] Colhoun, K. & Cummins, S. (2013). Birds of Conservation Concern in Ireland 2014–2019. *Irish Birds* 9: 523-544

[2] https://www.npws.ie/sites/default/files/general/PAF-IE-2014.pdf

qualify as the Annex I priory habitat '*Calcareous fens with Cladium mariscus and species of the Caricion davallianae' (7210). The presence of an intact natural transition between raised bog vegetation and this rich fen vegetation is also present. The Birch woodland contains Alder Buckthorn – a species listed in the Red Data Book. In association with this area is the Lough Boora Mesolithic site that has developed rich calcareous grassland (GS1). The Mesolithic site is known for its display of many Marsh Helleborine and several other orchid species including Bee Orchid have been recorded here. The overall area has diverse habitats, a contrast between strongly calcareous habitats (the grassland) and peatland habitats (drained lake), a rich diverse flora and also attracts wildlife of conservation interest such as Long-eared Owl and Whinchat (1999).

The Leabeg wetlands are an exceptional example of wetland habitat rehabilitation. This area was enhanced via the creation of a berm and drain-blocking. It now contains a range of typical cutaway wetland communities with substantial Bulrush stands intermixed with scrub and other poor fen and wetland habitats in drier areas. Some of the plant communities are now quite naturalised and similar to semi-natural sites. The wetlands also consistently attract breeding waders such as Lapwing and wintering waterfowl.

A Hen Harrier winter roost is also present at Boora West.

The South Boora wetlands have also been rehabilitated, although they are less mature. This wetland area also attracts breeding waders such as Lapwing and wintering waterfowl.

The two amenity lakes of Boora lake (new) and Loch an Dochas also have developed typical aquatic plant communities and the fringing wetland communities with extensive Reedbeds around Boora lake are particularly well-developed. Common Gull have attempted to breed at Boora Lake in the past.

The Boora parklands and Sculpture Park contains Blue Fleabane. This plant species is also listed within the Red Data Book and is widespread in the disturbed grassland along the cycle track between the Lough Boora Triangle and past the Tippler Bridge.

Heery (1999) outlines many of the biodiversity features of the overall Lough Boora Parklands, which includes this site. These include the presence of bird species of significant conservation interest such as the Grey Partridge and Hen Harrier, both of which have been noted in Boora West. Information on other groups of flora and fauna is also present in this report.

The bird life of Boora West has been well studied through the initial surveys of 1990's (Heery 1999) IWebs wintering bird surveys and breeding bird surveys carried out by Birdwatch Ireland (Copland 2009). Boora West provides breeding and wintering habitat to many species.

Both Boora East and Boora West was included in the BioBlitz 2012 and over 900 species across all taxa, were recorded. For further information see Appendix III.

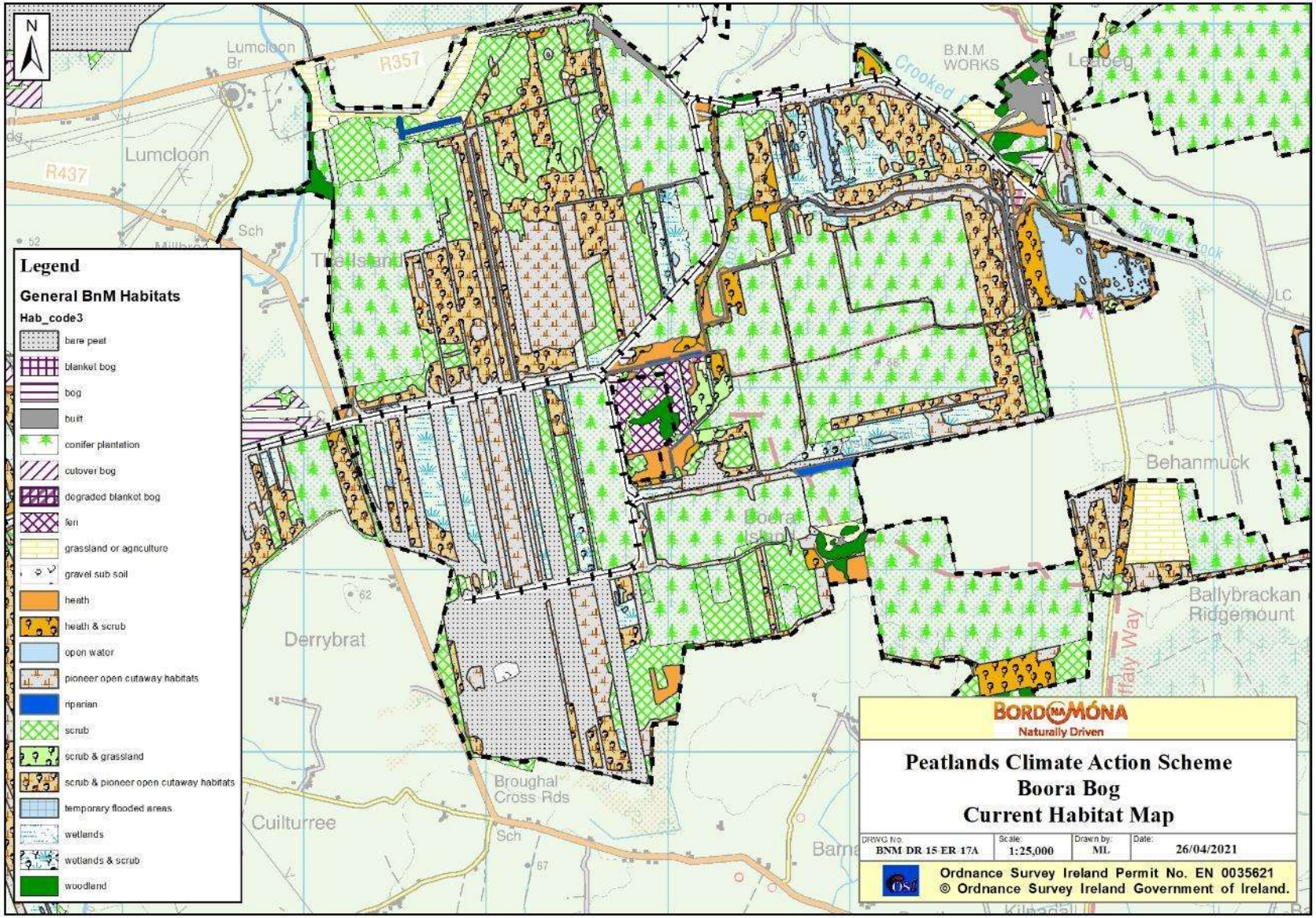


Figure 3.9 Habitat map of Boora Bog showing habitats at Boora East

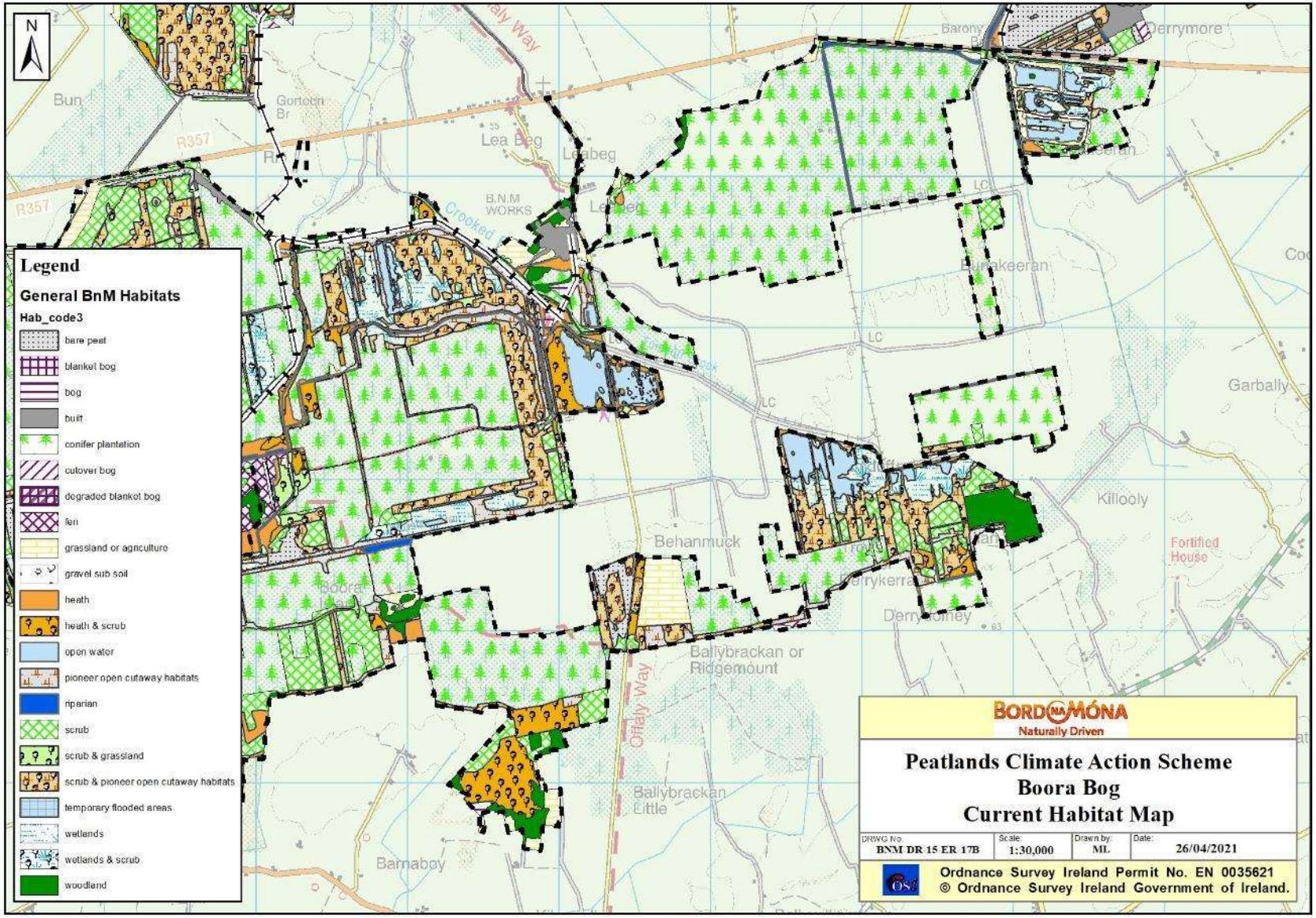


Figure 3.10 Habitat map of Boora Bog showing habitats at Boora West

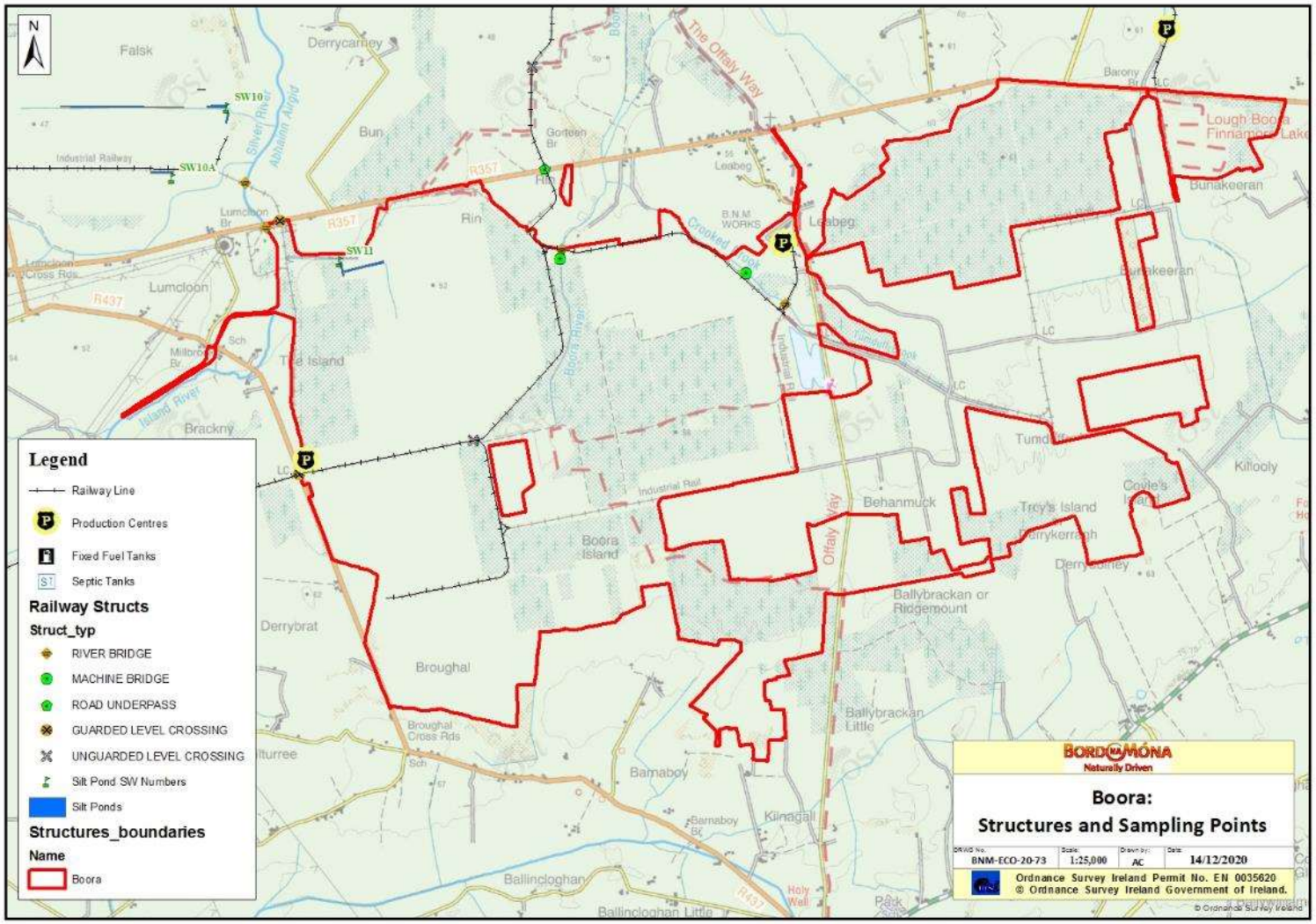


Figure 3.11. Map of Boora Bog showing key structures and designated emission points

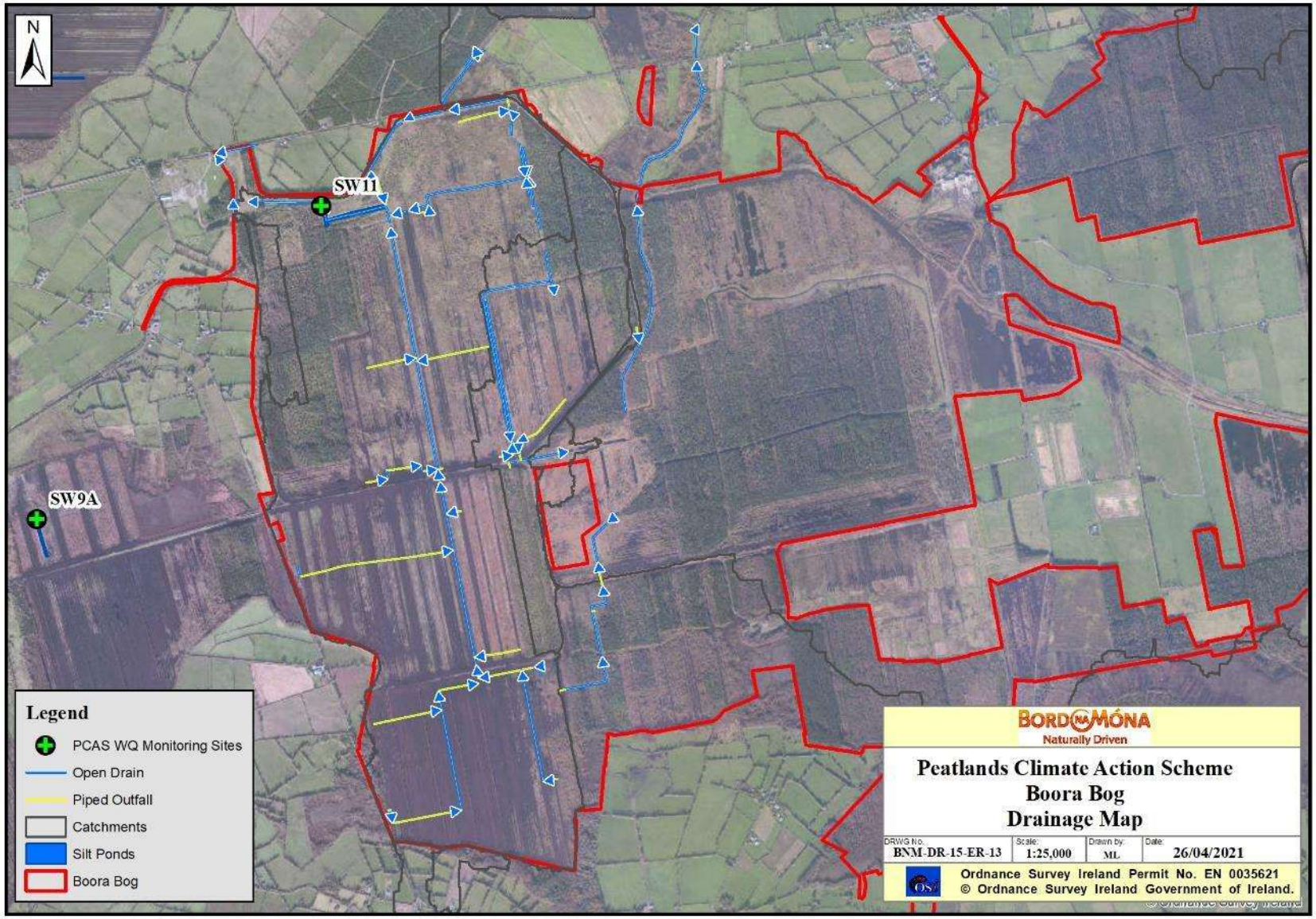


Figure 3.12. Key drainage features.

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.

An invasive aquatic plant species Parrots Feather *Myriophyllum aquaticum* was identified in the amenity areas of Boora in 2016, actions to control its spread have been enacted along with the notification of the presence of this species to the relevant authorities. *Rhododendron ponticum* has also been recorded. American Mink (*Mustela vison*), Eastern Grey Squirrel (*Sciurus carolinensis*, Fallow Deer (*Dama dama*) and Bank Vole (*Myodes glareolus*) have all been recorded within 10km squares which overlap Boora Bog (source NDBC), as have invasive non-marine mollusc's such as Wrinkled Snail (*Candidula intersecta*) and Budapest Slug (*Tandonia budapestensis*). A small herd of Feral Goat utilises Boora West, particularly the area around Rin.

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

3.4 Statutory Nature Conservation Designations

There are no European Sites (SAC's or SPA's) in close proximity (i.e. within a 5km radius at minimum) to Boora Bog. A number of pNHA's namely the Grand Canal pNHA (Site Code 002104), Lough Coura pNHA (Site Code 000909), and Kilcormac Esker pNHA (Site Code 000906) all occur within 5km of Boora Bog (Figure 3.13).

A single pNHA, Lough Boora pNHA (Site Code 001365) overlaps Boora Bog in part. This pNHA, part of which is now partly owned and managed as a reserve by the Irish Wildlife Trust was previously a post-glacial lake, and the now drained lake bed consists of shallow fen peat overlying calcareous shell-marsh. It is of interest botanically due to the mixture of fen and bog species on the former peatland lake-bed and additionally from an archaeological perspective.

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 Boora Bog (i.e. within 3km) The closest Ramsar Sites to Boora Bog include Pollardstown Fen (Kildare), Clara Bog and Raheenmore Bog (Offaly).

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

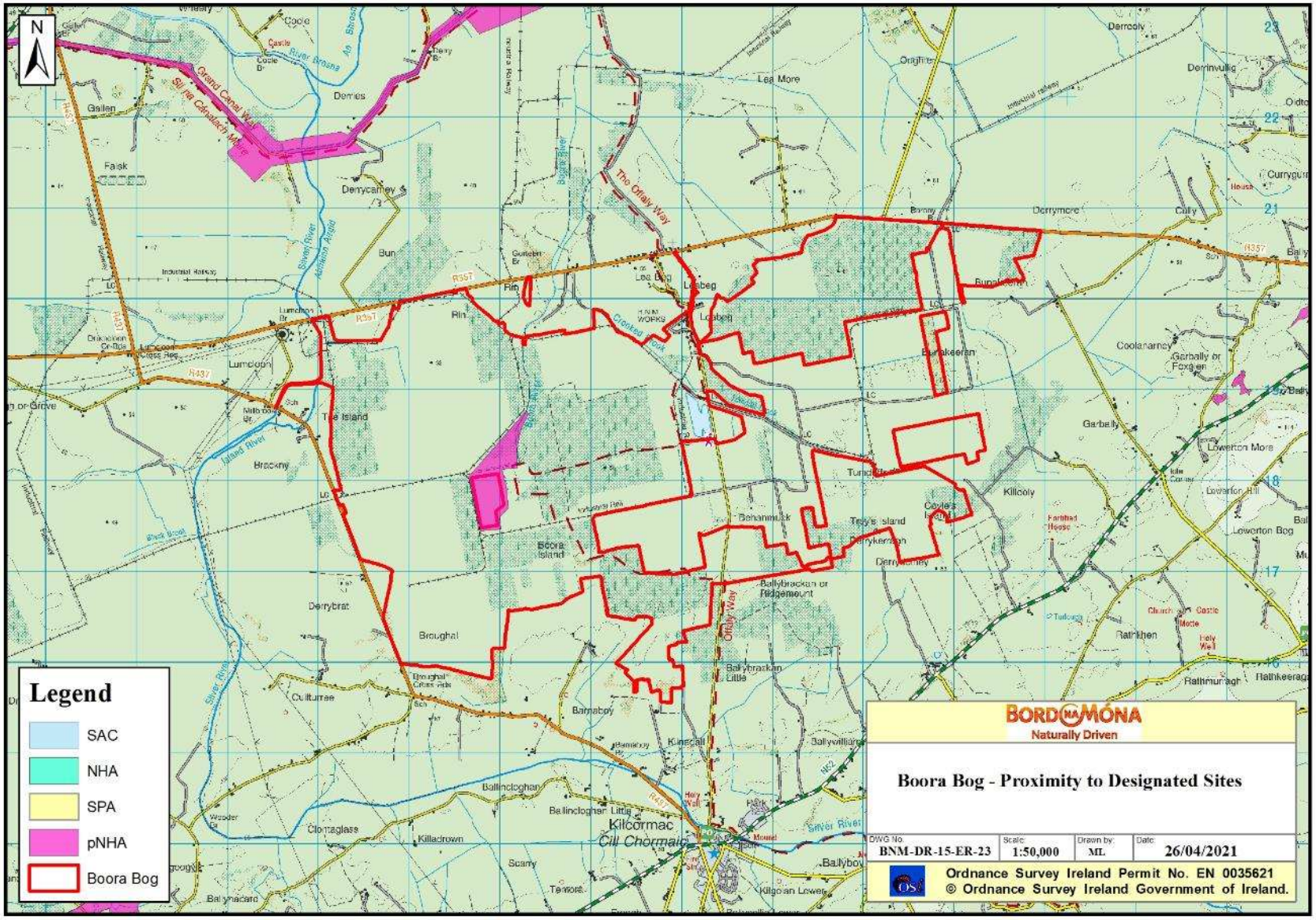


Figure 3.13: Map of Boora Bog showing local context with Designated Sites

3.5 Hydrology and Hydrogeology

Boora Bog currently has a gravity drainage regime. Some sections were pumped in the past but pumping has ceased and pumps have been decommissioned. Hydrological modelling (Figure 8.2 & 8.3) indicates that parts of the bog are natural basin with significant potential for re-wetting, with the assumption that all drains would be blocked. However, as there is significant conifer forestry and amenity infrastructure on site, it is not feasible to block key outfalls that would re-wet all areas. It is likely that a portion of the basins in target areas (Boora west – area recently out of peat production) will re-wet with deeper water, creating a mosaic of wetland habitats, when drains are blocked.

Several lakes have been created at Boora (Tumduff Beag, Boora Lake, Loch an Dochas and Finnamores). Some of these lakes have a very strong alkaline water chemistry, with vegetation characterised by Stoneworts, which is indicative of underlying calcareous marls. These calcareous sub-soils underlie parts of Boora Bog are exposed in places. Other sections are underlain by blue-silty clay/marl, which is less calcareous, and poor fen vegetation is indicative of this sub-soil type. Glacial mixed till/gravel underlies other sections of the bog and these areas tend to be drier and colonised with Birch woodland.

Boora Bog is located in the Lower Shannon Catchment (WFD Catchment_id 25A). Two WFD Sub-catchments include Boora Bog namely the BROSNA_SC_O50 and the BROSNA_SC_070.

The bog is flanked to the south and west by the Silver [Kilcormac] River, but is also drained by the Boora Stream, the Pollagh Stream [Brosna], and the LEA_BEG, all of which flow northwards to the Brosna River.

One outfall and associated silt pond infrastructure is present at the northwest of the bog to manage discharge to the Silver [Kilcormac] – and all remaining drainage flows are towards this location (Figure 3.13). The recently extracted cutaway bog has field drains running in a general north-northwest to south-south east orientation.

Boora West is located mainly in an area with a Locally Important Aquifer zone- i.e. Bedrock which is Moderately Productive only in Local Zones, whilst Boora East is located in an area with a Regionally Important Aquifer - Karstified (diffuse).

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

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

The bog is located in an area mapped by GSI as of medium or high 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 groundwater contamination occurring at this site where PCAS activities are proposed.

The underlying geology at Boora Bog is Visean Limestones (undifferentiated), along with Waulsortian Limestones, described as massive unbedded lime-mudstone. Subsoils underlying extant peat are significantly calcareous, and glacial sub-soil mounds and ridges are being exposed in places.

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. 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 rehabilitation 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 bog lands 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 Boora Bog.

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

Boora bog has 1 treated surface water outlets to the Brosna River IE_SH_25B090761, via the Silver River IE_SH_25S020700 and the Boora River IE_SH_25B080100. Peat extraction was identified as a pressure in the second cycle of the river basin management plan for the Silver and Boora rivers and is indicated as remaining so in the third cycle, currently under preparation, with a Brosna River remaining as not under pressure from peat.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the attached water quality map.

There is a robust monitoring program to track and verify any changes in baseline water quality conditions pre and post decommissioning and rehabilitation so that the success or otherwise can be tracked and verified for the National Parks & Wildlife Service, Environmental Protection Agency and Local Authority Water Program, amongst a range of stakeholders.

The main emission limit value associated with this bog is 35mg/l suspended solids, with trigger levels for ammonia of 3.7mg/l and COD 100mg/l.

Initial monthly ammonia concentrations in February & March 2021 have a range of 0.038 to 0.259mg/l with an average of 0.149mg/l (Table 3.1).

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.

Bog	SW	Monitoring	pH	SS	TS	Ammonia	TP	COD	Colour
West Boora	SW-11	Q2 20	7.6	4	481	0.916	<0.05	52	183
West Boora	SW-11	Q3 18	7.7	5	358	1.5	0.05	52	173
West Boora	SW-11	Q1 17	7.5	28	412	1.5	0.05	57	130

Table 3.1. Decommissioning and Rehabilitation Programme Water Quality Monitoring.

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

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

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

In the preparation of this monitoring programme, Bord na Mona have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2021 monitoring programme and these are included in the Water Quality Map.

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

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

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

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

Rehabilitation of cutaway peatland is closely linked with control of emissions. One of the criteria for successful rehabilitation is stabilisation through re-vegetation, which will stabilise all substrates and in turn remove the need for further silt control measures. Re-wetted peat also aid the primary objective of stabilizing peat, as when peat is re-wetted it minimises risk 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 because of bog rehabilitation and restoration measures and the restoration of natural peatland processes (Bonn *et al*., 20017). Peatland rehabilitation 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 raised bog restoration programme 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 Boora Bog has been completed. This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. his is expected to have a positive impact on status of downstream watercourses.

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 has large sections of drained (degraded) peatland with currently active drainage, which facilitates the oxidation of peat, areas planted with conifer forestry, areas developing Birch woodland and scrub, and areas re-wetted but developing fen and wetland habitats. Peat extraction generally transforms a natural raised bog 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. The EPA NEROS project carried out GHG flux research at Moyarwood Bog and found that Moyarwood Bog was overall a Carbon sink (sink for CO_2 and a source for Methane) 6 years after bog restoration was carried out (Renou-Wilson et al. 2018).

It is expected that Boora Bog can become a reduced carbon source following rehabilitation. The potential of any cutaway site to develop as a reduced carbon source/carbon sink in the longer-term depends on land-use, the success of the rehabilitation measures, the extent of optimal re-wetting and hydrological conditions, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. Some of the cutaway is expected to develop Reed Swamp and fen habitats with alkaline emission factors. This site is expected to develop a mosaic of fen, Reed swamp, wet woodland and scrub. Birch woodland is expected to develop on the drier mounds and peripheral headlands. Part of the site is planted with conifer forestry and the site will continue to be used for amenity.

3.9 Current ecological rating

Most of Boora West can be rated as having a **high local – national ecological value (C-B)** as it is dominated by a significant area of naturalising cutaway habitats in good condition and contains sites, habitats and species of a national interest such as the Boora lake pNHA-Mesolithic site, rich fen and Alder Buckthorn.

Regarding Boora East, it is rated as having a **national ecological value (B-C)** as it is dominated by a significant area of naturalising cutaway habitats in good condition and contains sites, habitats and species of significant regional-national interest. Boora East (including the surrounding area) attracts some wintering wader species at nationally important numbers. The presence of the only remaining Grey Partridge population in Ireland in this area adds to its value.

3.9 Boora Bog site charactereisition summary

- A large part of Boora Bog has been cutaway for some time.
- Significant rehabilitiation has already been carried at at Boora.
- There has been extensive development of cutaway habitats including wetlands, scrub and bog woodland.
- The general area has many features of high biodiversity value including the presenece of Grey Partridge, breeding bird species and use of the area by wintering water birds.
- The site has seen significant development of amenity over the years.
- Extensive conifer forestry has also been developed on site.
- Rehabilitiation will focus on those area that were recently in peat extraction and are largely bare peat.
- Peat deths in this section are variable and cutaway in part.
- The site has a gravity drainage regime.
- Rehabilitiation measures will focus on re-wetting residual peat.
- Rehabilitiation will focus on not impacting on other current land-uses such as amenity and confier forestry, but will intergrate re-wetting with these existing land-uses.

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 their Biodiversity Action Plan programme since 2010. National Stakeholders includes relevant government departments and agencies, relevant semi-state bodies, NGOs and other environmentally-focused groups with a national remit. 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 Boora Bog.

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

- 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).
- Ongoing consultation with Coillte regarding forestry management (forestry leased to Coillte),
- Long-term and ongoing engagement with the Grey Partridge Conservation Project (NPWS),
- The long-term development of Lough Boora Discovery Park (Offaly County Council, Failte Ireland and multiple stakeholders),
- The long-term development of Boora Sculpture Park (artists, Offaly County Council and multiple stakeholders);
- Long-term engagement with angling club at Finnermores,
- Bird surveys and monitoring carried out by Birdwatch Ireland for Bord na Móna,
- Ongoing development of cycle tracks (Offaly Leader, Offaly County Council and Failte Ireland);
- development of a management plan for Lough Boora with local stakeholders (Birdwatch Ireland 2018);
- Deep Mapping – Lough Boora Sculpture Park (2019) (Tim Collins and Reiko Goto Collins).
- Proposed Sensory Garden Project (Leamore Leabeg Community Group and Kilcormac Development Association).
- The proposed development of the nearby Derrinlough Windfarm in Drinagh and Clongawney Bogs and potential further amenity linkage (walking and cycling tracks).

The ecology and amenity potential of Boora has been studied in detail in the past as part of the development of and study of Lough Boora Discovery Park (Barron et al. 1994, Heery and Finney 2009, Copland 2010, Copland 2015, Egan 1998, Lally et al. 2012, Renou-Wilson et al. 2008), Rowlands and Feehan 2000, Trodd 2003).

Local stakeholders will also be identified through ongoing engagement with neighbours whose land adjoins Boora 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 Boora Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Boora 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 rehabilitation goals and outcomes outline what Bord na Móna want to achieve by implementing the rehabilitation. These include:

- Meeting conditions of IPC Licence.
- Stabilisation or reduction in water quality parameters of water discharging from the site (e.g. suspended solids).
- Reducing pressure on receiving water-bodies that have been classified as At Risk from peatlands and from peat extraction, via stabilization or improving water-quality from this bog, and therefore, reducing pressures.
- Optimising hydrological conditions for **climate action benefits as part of PCAS**.
- Carrying out an intensive rehabilitation measures in the area that is recently out of peat extraction (including hydrological management, drain-blocking, re-profiling, wetland creation, fertiliser application, seeding of vegetation &, inoculation of *Sphagnum,* where appropriate).
- Optimising hydrological conditions for the development of embryonic *Sphagnum*-rich raised bog vegetation communities on deep residual peat, where possible.
- Optimising or enhancing hydrological conditions for the development of Reed Swamp and fen on shallow more alkaline peat and other subsoils.
- A significant part of the site has already largely vegetated and stabilised (See Figure 3.2, 3.5-3.10) and is used for a variety of land-uses. These areas are considered rehabilitated. The aerial photo demonstrates the contrast between the older vegetated cutaway and areas at the western part of the site that have recently come out of peat extraction.
- Supporting ongoing amenity land-use. Integrating rehabilitation measures with current amenity infrastructure on site. It is not proposed to carry out any rehabilitation actions to change or negatively affect any amenity infrastructure.
- Supporting ongoing cultural use. Integrating rehabilitation measures with the Lough Boora Sculpture Park. It is not proposed to change any conditions around the Lough Boora Sculpture Park.
- Integrating rehabilitation measures with existing conifer forestry. It is not proposed to change or affect any conifer or commercial forestry via this scheme. The future forestry management of these areas will be defined by Coillte.
- Integrating rehabilitation measures with future potential amenity projects (e.g. proposed sensory garden project). It is not proposed to change any conditions around the area proposed for this project.
- Enhancing existing wetlands and re-wetting peat in the older cutaway, where possible and where feasible. Any measures will be positively aligned with the above land-uses.
- Support Grey Partridge conservation in adjacent lands, where possible.
- Optimising hydrological conditions for the protection of any exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

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

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

6. SCOPE OF REHABILITATION

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

- The area of Boora Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0500-01. 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. Boora Bog is part of the Boora 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 Boora Bog, in particular, optimising **climate action benefits of the area recently out of industrial peat extraction**. 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 Boora Bog identify wetland creation, dry cutaway measures and deep peat re-wetting as the most suitable rehabilitation approach for the area recently out of peat production at this site.
- 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 Mount Lucas Bog as **environmental stabilisation** of the site via **optimising climate action benefits, where possible, and integrating rehabilitation with the existing amenity infrastructure, other site infrastructure and land-uses**. The re-wetting of residual peat in the area recently out of peat extraction will be optimised, **setting the site on a trajectory towards the development of peat-forming communities on residual deep peat, and the development of wetlands/Reed Swamp and fen on shallow more alkaline peat and other subsoils.**
- Enhanced Rehabilitation of Boora 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.
- It is not proposed to carry out any rehabilitation in the marginal cutover bog zone.
- Current land-uses. Lough Boora Discovery Park is an important midlands amenity site. It is not proposed to carry out any intensive rehabilitation actions to change or negatively affect any amenity infrastructure or existing land-uses.

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). At Boora Bog, peat depths of 2-3 m only occur within the south-western portion of Boora West and a very small portion of the site overall. By contrast, the smaller remaining sections contains shallower residual peat, most of which is stabilised and has already developed a mosaic of habitats.

- Furthermore, there are local factors (such as topography and drainage) that will influence the future trajectory of this bog. At Boora Bog, a larger proportion of the bog has existing habitat cover of pioneering vegetation, established woodland and previously rehabilitated areas, with only the most recently utilised portions for peat extraction having an un-vegetated surface over deep peat deposits. These need to be considered as part of the wider rehabilitation work.
- **Current land-use.** Lough Boora Discovery Park has integrated several different land-uses during its development. Key land-uses are **amenity** and **forestry**. The Lough Boora Sculpture Park has significant cultural importance. These areas have largely stabilised and are rehabilitated (Finnamores Lakes). Any proposed enhancement measures (ie. targeted drain-blocking) will be positively aligned with current land-uses and will look to facilitate amenity, where possible.. There are proposals to extend amenity infrastructure (towards Boora West) and rehabilitiation will be positively aligned to enable any future amenity development. Re-wetting will be planned as to not to rule out potential future amenity.
- **Designated areas.** A small part of the site is designated as Lough Boora pNHA. This area also overlaps with the IWT-owned area. Proposed enhancement measures (ie. targeted drain-blocking) will be considered and will be positively aligned with the ongoing management of this site, and considered after agreement with the land-owner.
- **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 designated 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.
- **Grey Partridge conservation**. Areas adjacent to the Bord na Móna-owned area are managed for Grey Partridge and breeding wader conservation. It is not proposed to carry out any rehabilitation actions to change or negatively affect adjacent Grey Partridge conservation. Rehabilitation within the Bord na Móna-owned areas will look to support Grey Partridge and breeding wader conservation, where possible.
- **Archaeology**. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. While the rehabilitation will optimise hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, any new archaeology may require rehabilitation measures will be reviewed and adapted. If this occurs, rehabilitation measures will be reviewed and adapted. An archaeological impact assessment of the proposed rehabilitation at Boora Bog has been carried out (Appendix IX). There is known archaeological features at Boora. Rehabilitation in archaeological zones has been avoided or amended (e.g. buffers in line with Best Practice) to avoid or minimise impact to any archaeological features (Figure 8.4 & Appendix IX). Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.
- **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. At least 1 no. right of way intersects the bog boundary for Boora, at Leabeg.

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 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 drain blocking and other ground activities.

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 **a monitoring and after-care programme** to monitor the rehabilitation during the Scheme and to respond to any needs. It is expected that this rehabilitation plan will set the site on an enhanced and accelerated trajectory towards stabilisation and deep peat re-wetting. 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 in the long-term. 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 Boora Bog.
- The longer-term management of this site, potentially as a nature conservation site, or for amenity, or for other uses in the future.
- Land leased to Coillte. This rehabilitation plan does not cover conifer forestry management on lands leased by Coillte.
- BnM Leabeg Offices. It is not intended to carry out measures in this area.
- Lough Boora Visitor Centre. It is not intended to carry out any rehabilitation measures that would affect the Lough Boora Visitor Centre.
- BOGFOR and biomass trials. It is not proposed to carry out any rehabilitation measures that would affect these areas. These areas are considered rehabilitated through land-use.
- Areas developed as farmland in the 1980s-1990s and sold to local farmers are not considered as part of the scope of this rehabilitation plan.

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.

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

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

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over the past 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends.

As the monthly monitoring program at Boora continues in 2021 during the rehabilitation works, and data from the 2020 monitoring program is compiled, further trending will be produced to verify any ongoing trends.

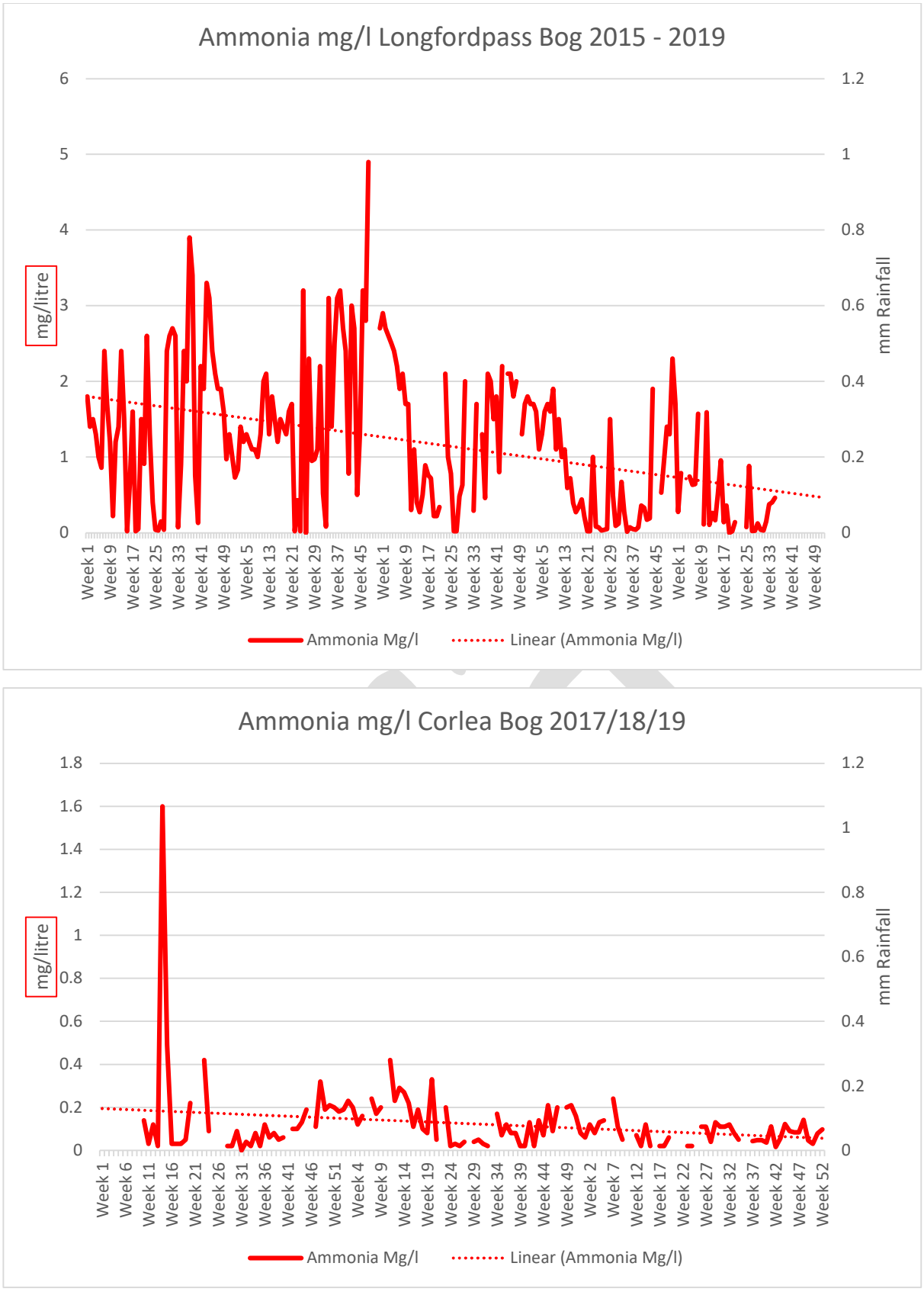


Figure 7.1. Ammonia trends at Longfordpass and Corela 2015-2019.

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 deep peat re-wetting). This will be measured by an aerial survey after rehabilitation has been completed.
- Accelerating the trajectory of the former area of industrial peat extraction towards becoming a reduced carbon source/carbon sink. This will be measured through habitat mapping and the development of cutaway bog condition assessment. This cutaway bog condition assessment will include assessment of environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, *Sphagnum* cover, bare peat cover and water levels (similar to ecotope mapping). Baseline monitoring will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Reduction in carbon emissions. This will be estimated via a combination of habitat condition assessment and application of appropriate carbon emission factors derived from other sites. Baseline monitoring (habitat condition) will be carried after rehabilitation is completed (during the scheme). It is proposed that sites can be monitored against this baseline in the future.
- Setting the site on a trajectory towards establishment of a mosaic of compatible habitats including wetland, Reed swamp, poor fen, wet woodland, heath, scrub, poor fen and embryonic *Sphagnum*-rich raised bog 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 Boora 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)	2021-2025

			Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids, pH and conductivity	Reduction or stabilisation of key water quality parameters	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)	No decline in the WFD status of the local river catchment related to this bog	EPA WFD monitoring programme	WFD schedule
Climate action verification	Optimising the extent of suitable hydrological conditions to optimise climate action	Optimal extent of suitable hydrological conditions	Aerial photography and Habitat mapping to map extent of suitable hydrological conditions. Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and 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 compatible habitats	Establishment of compatible cutaway habitats	Habitat map, Cutaway bog condition map Baseline monitoring to be carried out during the scheme when rehabilitation is complete. Sites can be re-monitored in the future and compared against this baseline.	2021-2025

Climate action verification	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum Breeding and wintering 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.

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

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

- **Funding to pay for resources required to deliver the planned rehabilitation (Bord na Móna and external).** Bord na Móna maintains a Provision on its balance sheet to pay for these future costs when industrial peat extraction ceases. Bord na Móna is fully committed to meeting its obligations relating to rehabilitation and decommissioning under the Integrated Pollution Control Licence. It is expected that additional costs of enhanced rehabilitation will be supported by Government through the Climate Action Fund.
- **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 8.2 & 8.3) 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 8.3) 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 8.4. (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 areas out of recent peat extraction at Boora bog will include**:**

- Initial hydrological modelling indicates that a significant part of the area that has recently come out of peat extraction will develop a mosaic of wet habitats. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths close to the peat surface and at < 0.5 m, where possible). Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined.
- Intensive drain blocking to create wetlands, and the introduction of Reeds and other Rhizomes;
- Management of water levels with overflow pipes;
- Re-alignment of piped drainage;
- 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);
- Regular drain blocking (3/100) on dry cutaway adjacent to wetland mosaics, along with the blocking of outfalls and management of water levels;
- Field re-profiling on deep peat fields using a screw leveller, along with drain blocks, drain infilling and keyed berms across the fields, in conjunction with outfall management;
- Inoculation of *Sphagnum* on compatible residual deep peat areas;
- Targeted fertiliser applications on bare peat areas to accelerate vegetation establishment on headlands and high fields.

Measures for other areas at Boora bog will look to integrate rehabilitation with existing site infrastructure and land-use. Any rehabilitation will look to balance residual peat re-wetting and enhancement of wetland habitats with needs of the infrastructure and land-uses. These will include**:**

- Targeted drain blocking around existing wetlands or standing water to create/promote the spread of wetland habitats;
- Optimising water retention in wetland areas, including placement of berms where required;

- Regular drain blocking (3/100) in targeted dry cutaway adjacent to wetland mosaics, along with the blocking of outfalls and management of water levels;
- 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 water quality parameters meet targets 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).

An indication of the areas for these various measures is shown in Table 8.1 and in Figure 8.4.

Table 8.1 Enhanced rehabilitation measures and target area at Boora Bog. 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.

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	0
	DPT2	More intensive drain blocking (7/100 m) + blocking outfalls and managing overflows	0
	DPT3	More intensive drain blocking (max 7/100 m), + field reprofiling with screw leveller +drain infilling +cross berms + blocking outfalls and managing overflows	156.1
	DPT4	Berms and field re-profiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	0
	DPT5	Cut and Fill cell bunding (30m x 30m cell) + blocking outfalls and managing overflows + drainage channels for excess water + *Sphagnum* inoculation	0
Dry cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	95.1
	DCT2	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes + targeted fertiliser treatment	32.2
	DCT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows + targeted fertiliser treatment	0
Wetland cutaway	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	0
	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	0
	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	0
	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	151.3
	WLT5	More intensive drain blocking (max 7/100 m), + field reprofiling + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	0
Marginal land	MLT1	No work required	77.6
	MLT2	More intensive drain blocking (max 7/100 m)	0
	MLT3	More intensive drain blocking (max 7/100 m) + blocking outfalls and managing overflows with + boundary berm	0
Other		Largely rehabilitated. Assessment will consider additional enhancement measures that align with current land-use, amenity and constraints	1163.9
Other		Silt-ponds	0.4
Other		Constrained Areas	170.5
Other		Archaeology Constrained Areas	0.03
Total			1847.1

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

- Seek formal approval of the enhanced plan, noting the alternative 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 (within the proposed PCAS) will be applied to Boora Bog. This will take account of peat depths, topography, drainage and hydrological modelling. (See Figure 8.4 for an indicative view of the application of different rehabilitation methodologies);
- Carry out a hydrology and drainage management assessment 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, archaeology, turbary, proposed Irish Water pipeline and existing land agreements
- 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, if needed, such as the presence of sensitive ground-nesting bird breeding species (e.g. breeding waders) or larval webs of Marsh Fritillary butterfly, etc. The scheduling of rehabilitation operations will be adapted, as mitigation; and
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- Carry out Appropriate Assessment of the Rehabilitation Plan. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site.
- Track delivery of mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

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 drain blocking, peat field re-profiling, cell-bunding and fertiliser applications targeting headlands, high fields and other areas. All rehabilitation 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
- 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) understand that it is the Minister's intention to impose an obligation on Bord na Móna to develop a package of measures, 'the proposed Scheme', for the enhanced decommissioning, rehabilitation and restoration of cutaway peatlands (PCAS). It is understood that additional costs of the proposed Scheme will be supported by the Government through the Climate Action Fund. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing 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).

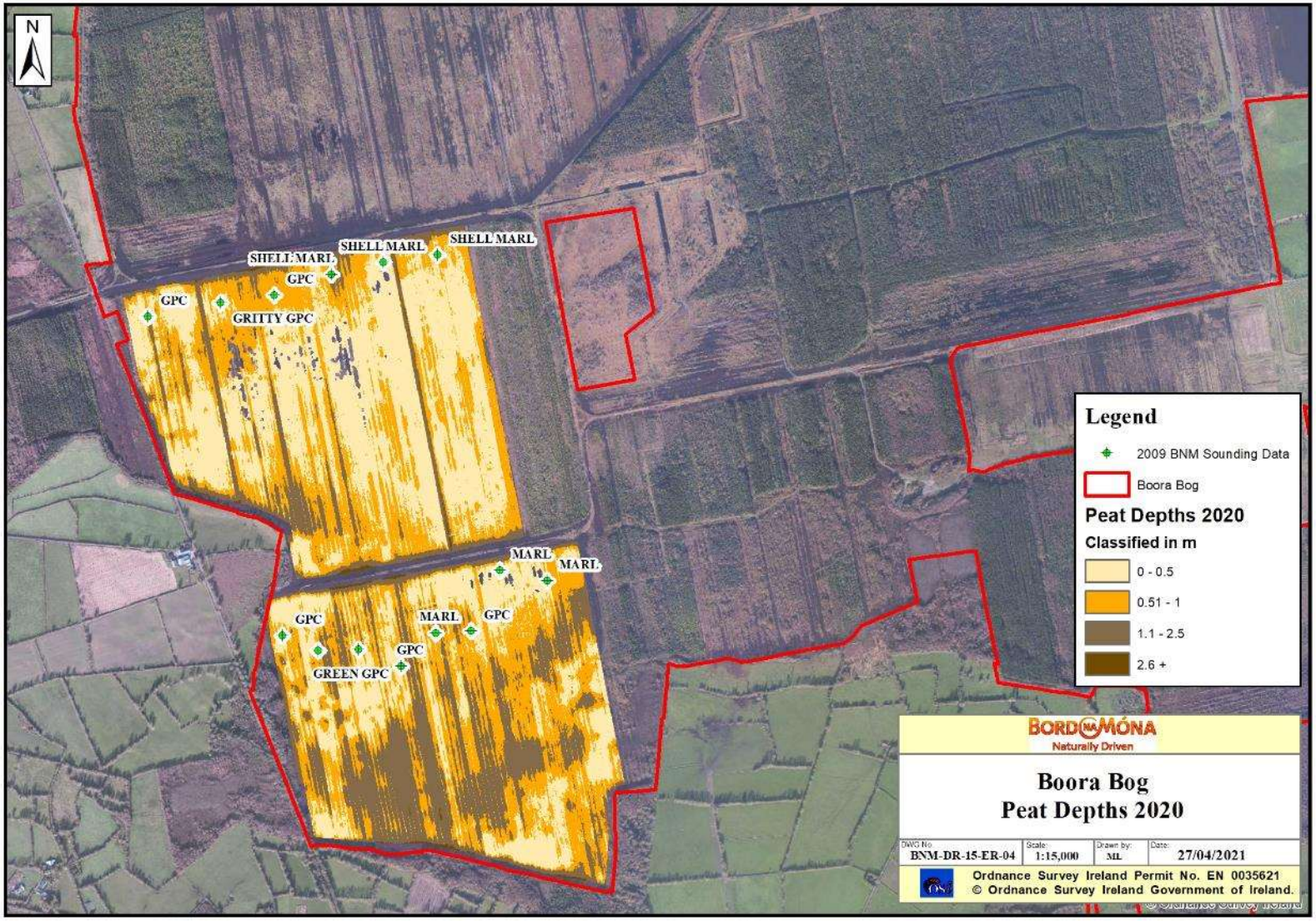
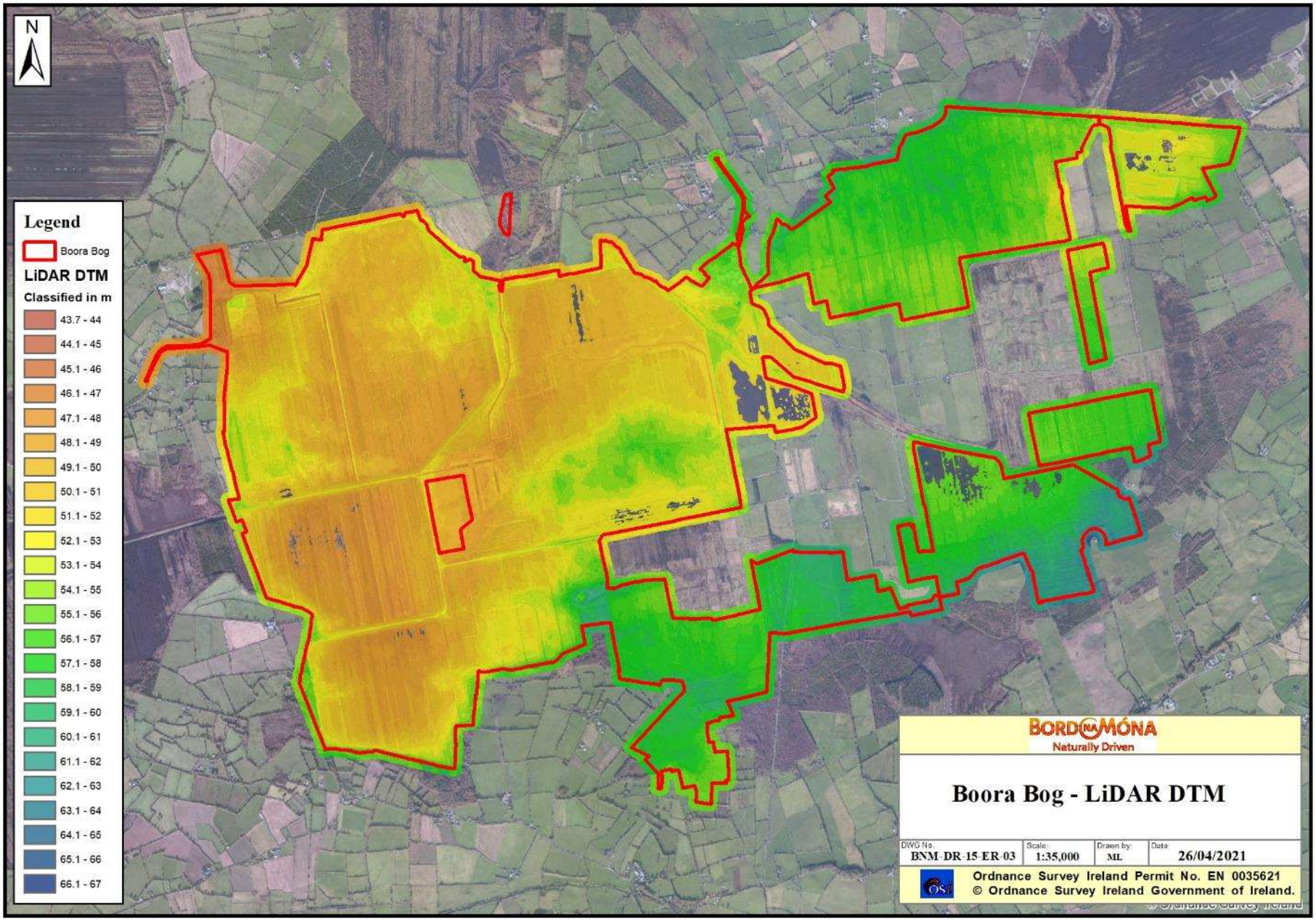


Figure 8.1. Peat depth map for Boora Bog. The majority of the south west of Boora West is characterised as deep peat cutover bog.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BORD NA MÓNA
Naturally Driven
Boora Bog - LiDAR DTM
DWG No. BNM-DR-15-ER-03
Scale: 1:35,000
Drawn by: ML
Date: 26/04/2021
Ordnance Survey Ireland Permit No. EN 0035621
© Ordnance Survey Ireland Government of Ireland.

Figure 8.2. LIDAR topography map of Boora Bog. Low areas and basins are orange-yellow, more elevated areas are blue-green. The majority of the bog slopes towards the east or south east

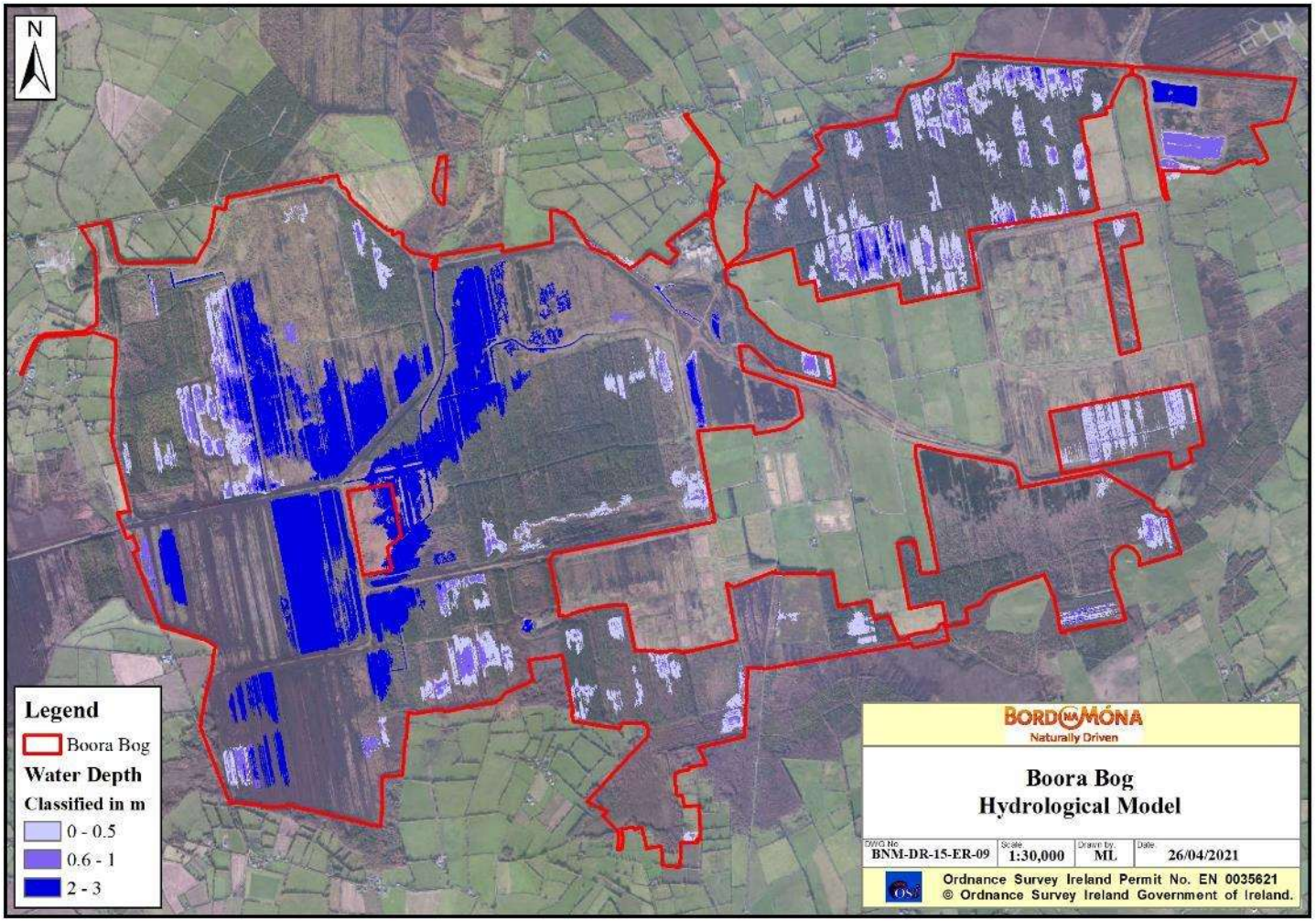

Figure 8.3. Hydrological modelling for Boora Bog showing range of potential water depths based on current topography. This modelling makes assumptions that all drains will be blocked. For avoidance of doubt, areas of forestry or used for amenity will not be re-wetted.

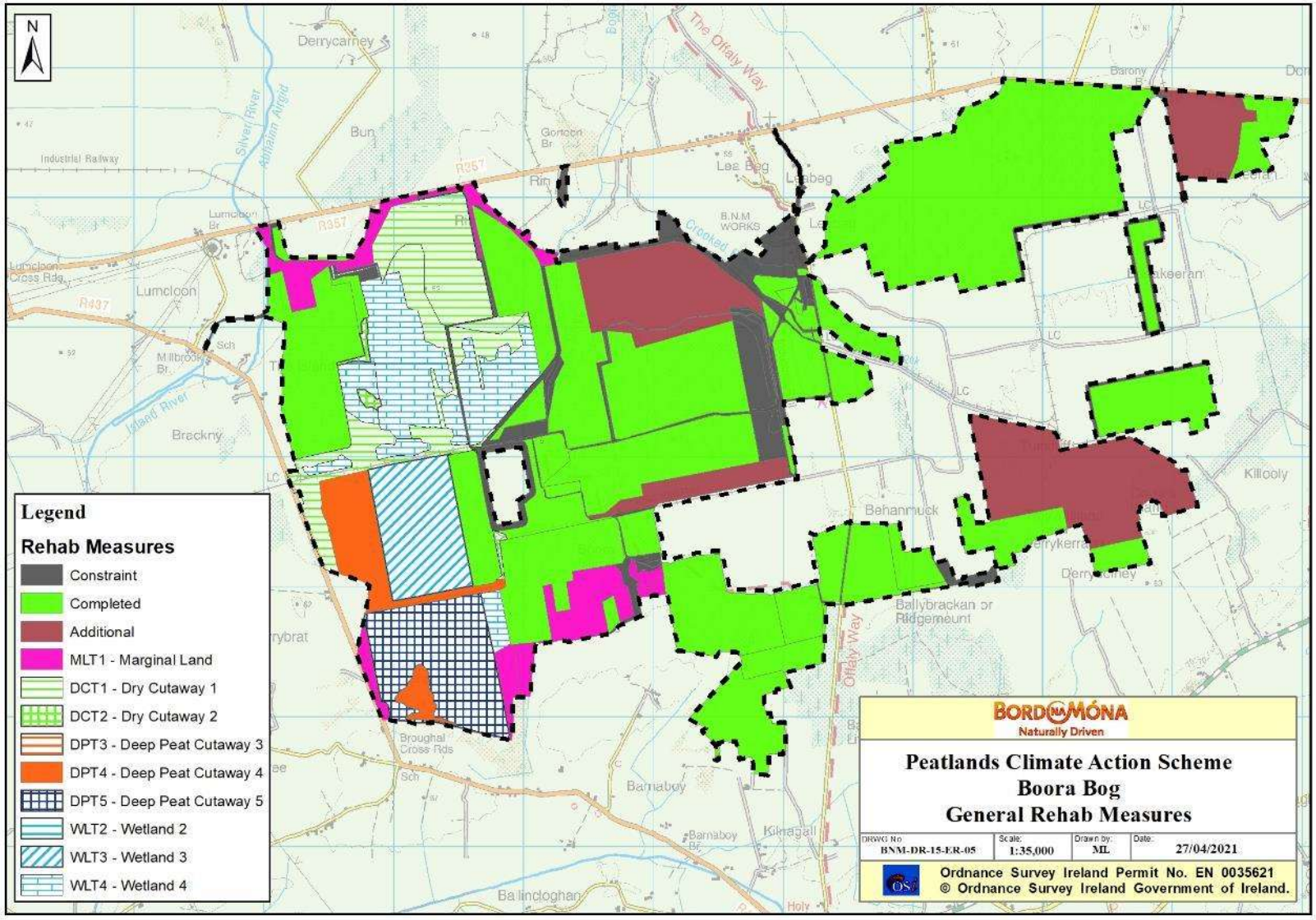

Figure 8.4. Indicative Enhanced Rehabilitation Plan for Boora Bog. Note that the actual distribution of these measures may be subject to change in response to stakeholder consultation and refinement of the enhanced rehabilitation measures.

9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

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

- There will be **initial quarterly monitoring assessments** of the site to determine the general status of the site, the condition of the silt ponds, assess the condition of the rehabilitation work, monitoring of any potential impacts on neighbours land, general land security, boundary management, dumping and littering.
- The number of these site visits will reduce after 2 years to bi-annually and then after 5 years to annual visits.
- These monitoring visits will also consider any requirements for further practical rehabilitation measures.
- The **baseline condition of the site will be established** post-rehabilitation implementation by using an aerial survey to take an up to date aerial photo, when rehabilitation is completed. This will be used to verify completion of rehabilitation measures. The extent of bare peat will be assessed using this baseline data, and habitat maps will be updated, if needed.
- **Water quality monitoring** at the bog will be established. The main objective of this water quality monitoring will be to establish a baseline and then monitor the impact of peatland rehabilitation on water quality from the bog.
- In order to assist in monitoring surface water quality from this bog, it is planned to increase the existing licence monitoring requirements to sampling for the same parameters to every month during the scheduled activities and for a period up to two years. post rehabilitation, depending on the period required to confirm that the main two parameters, suspended solids and ammonia are remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration.
- This new sampling programme commenced in November 2020 and is enabling a baseline to be established, with sampling to progress during the scheduled works, and for a period of up to 2 years post rehabilitation. Depending on the period required to confirm that the main two parameters, suspended solids and ammonia as remaining compliant with the licence emission and trigger limit values and there is an improving trajectory in these two parameters i.e. reduction in concentration, the monitoring programme and intensity will be periodically reviewed and amended.
- In the preparation of this monitoring programme, Bord na Mona have been providing the Local Authority Water Programme (LAWPRO) with details of the surface water emissions points associated with this bog and will be amending some of the proposed monitoring locations on foot of this engagement. LAWPRO have in turn provided details of their 2021 monitoring programme and these are included in the Water Quality Map.
- This is necessary to ensure that there is alignment with the WFD monitoring programme and that where possible, the monitoring programme will enable any improvements in water quality or establishing trends to be quantified against any available WFD monitoring data. It will also enable the periodic sharing of data which will inform the monitoring reports, success criteria and enable LAWPRO under the Water Framework Directive to track any changes in pressures and be aware of changes in water chemistry.
- This enhanced monitoring programme will aim to include a minimum of 70% of a bog's drainage catchments, whatever number of surface water outlets these include.

- Monitoring results will be maintained, trended every six months and reported on each year and as required, as part of the requirement to report on Condition 10.1 of the IPC Licence on Bog Rehabilitation in the Annual Environmental Report, and will be provided to LAWPRO and the EPA as required to inform progress and national monitoring requirements under the WFD. These results will also be available in April each year as a requirement of the Annual Environmental Report at www.epa.ie.
- The parameters to be included as per condition 6.2 of the IPC Licence include monthly monitoring for pH, Flow, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour & COD. In addition, DOC has been included as a parameter to try and identify any changes in carbon in the surface water, and where required by LAWPRO, to assist in investigating other changes in water chemistry, the series of parameters can be reviewed and amended.
- This monthly sampling regime on a selected number of silt ponds will be carried out over a two-year cycle. The original (licence) requirement was for a quarterly sampling regime but this has been increased to a monthly regime to appropriately track the changing water chemistry that will occur as part of this enhanced rehabilitation. In addition, DOC will be included as a parameter to try and identify any changes in carbon in the surface water.
- If, after two years, key criteria for successful rehabilitation are being achieved and key targets are being met, then the water quality monitoring will be reviewed, with consideration of potential ongoing research on site. The water quality data, the aerial surveys and the habitat mapping will be collated and will be submitted to the EPA as part of the final validation report.
- If, after two years, key criteria for successful rehabilitation have **not** been achieved and key targets have **not** been met, then the rehabilitation measures and status of the site will be evaluated and enhanced, where required. This evaluation may indicate no requirement for additional enhancement of rehabilitation measures, but may demonstrate that more time is required before key criteria for rehabilitation has been achieved. Monitoring of water quality will then also continue for another period to be defined.
- Where other uses are proposed for the site that are compatible the provision of biodiversity and ecosystem services, these will be assessed by Bord na Móna in consultation with interested parties. Other after-uses can be proposed for licensed areas and must go through the appropriate assessment process and planning procedures.

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

- Vegetation and habitat monitoring will be carried out using a 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.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al.*, 2015) and are constantly being refined with more and more research. BnM is actively supporting research into GHG fluxes in different rehabilitated

peatland habitats. This means that potential GHG emissions can be estimated from the site, as the site continues along its trajectory towards a naturally functioning peatland ecosystem.

- 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 key targets have been met;
- Water quality monitoring demonstrates that water quality of discharge is stabilising or improving; and
- The site has been environmentally stabilised.

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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 Boora Bog (Figure 3.1).
- EPA IPC Licence - Ref. P0500-01. 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. Boora bog is part of the Boora Bog group.
- The current condition of Boora Bog. Pioneer cutaway vegetation is developing across parts of the site, whilst some parts have already been stabilised/rehabilitated whilst other remain unvegetated .
- 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 Boora Bog will be left unblocked as blocking boundary drains could affect adjacent land.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Boora 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 watercourses associated with surface water from this bog are excluded in the EPA's list of peat pressure water bodies as reported in the River Basin Management Plans. Where the watercourse 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 blockages and re-wetting). This will be demonstrated by a post rehab survey.
- Stabilising potential emissions from the site (e.g. suspended solids). The key target will be developing a stable or downward trajectory of water quality indicators (suspended solids and ammonia). This will be demonstrated by water quality monitoring results.

Rehabilitation measures: (see Figure Ap-1)

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

Timeframe:

- 2021. 1st phase of rehabilitation. Field drain blocking and water-level management.
- 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, if needed. 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.

Table AP-1. Rehabilitation measures and target area.

Type	Code	Description	Area (Ha)
Deep peat	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	156.1
Dry cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	127.3
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	151.3
Marginal Land	MLT1	No work required	77.6
Other	Silt Pond	Silt ponds	0.4
Other	Completed	Rehabilitation Complete	1163.9
Other	Constraint	Rights of Ways and constrained areas/buffers/Archaeology	170.5
Total			**1847.1**

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 required assessment and planning procedures.

Validation and IPC Licence surrender

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

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

- The site has been environmentally stabilised.

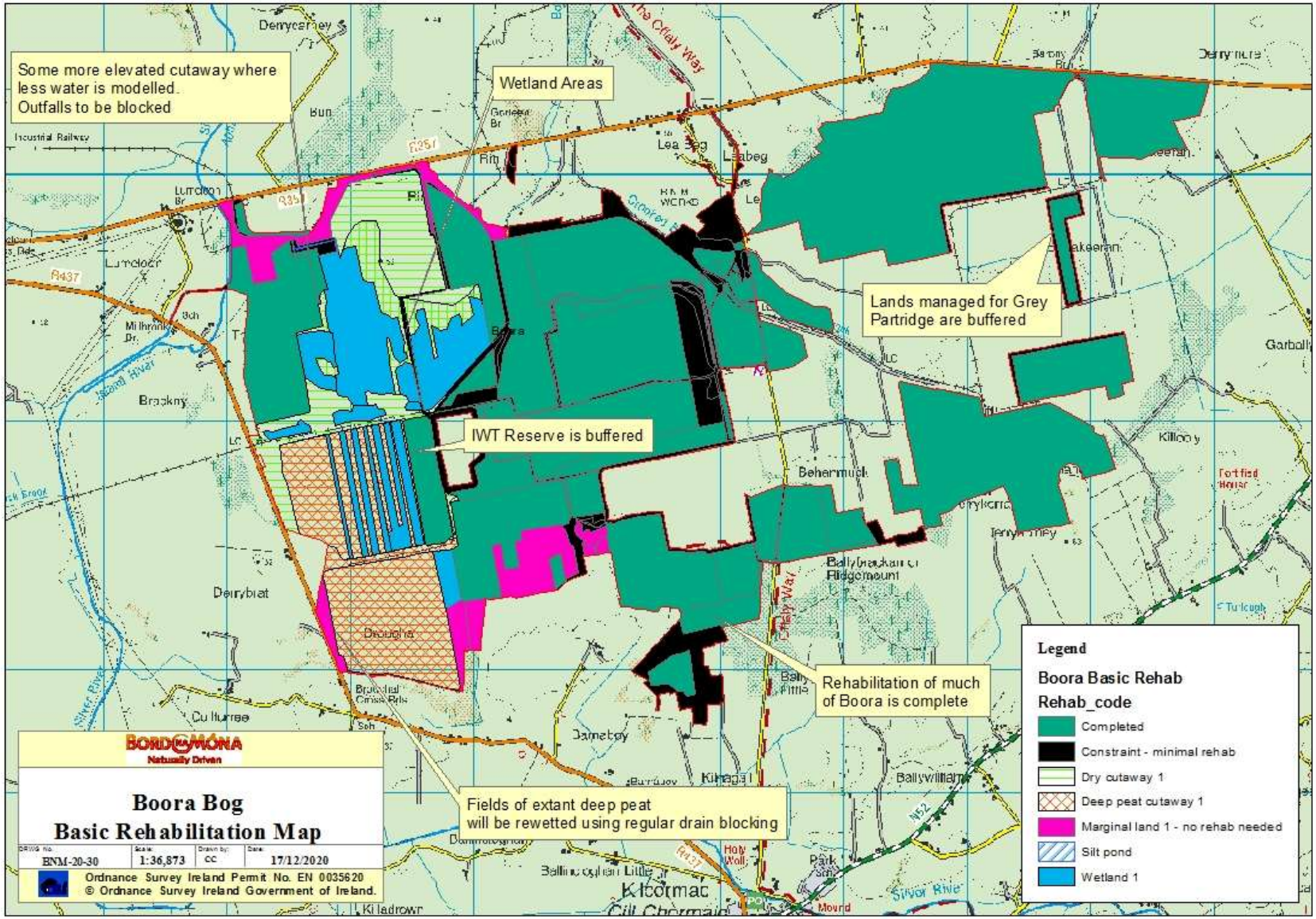


Figure Ap-1. Indicative standard rehabilitation plan for Boora Bog.

APPENDIX II: BOG GROUP CONTEXT

The Boora group of bogs are sited between Killeigh (Offaly) in the East to Banagher (Offaly) in the West and between Kinnitty (Offaly) in the south and Clara (Offaly) in the North. The River Shannon is the major river catchment for the area with a smaller area lying within the Barrow catchment.

The Boora Group is one of the oldest bog groups in Ireland. Bord na Móna was set up in 1946 and it commenced the development of the Boora Bogs in 1946 with milled peat production commencing in 1955. Milled peat was produced in the Boora Bog for the supply of fuel peat to the power station in Ferbane which commenced power generation in 1957 and closed in 2001. The Boora bogs were also developed for the supply of milled peat to the Derrinlough Briquette factory, which commenced production in 1957.

Much of the Boora Bog complex became cutaway as it was in peat production at an early stage. A number of rehabilitation measures comprising naturalisation and development of alternative after-uses have been already explored at the Boora Bog Group, including coniferous forestry, biomass, agricultural grassland, amenity use, rare species conservation management (specifically Grey Partridge) and wetland creation. Some of this was carried out in the 1980s While agricultural fields and coniferous forestry have been developed successfully on the cutaway bogs at Boora, it was found that these require financial investment that at this time exceeds any potential commercial output value. The Lough Boora Discovery Park encompasses all areas relating to amenity and biodiversity. www.loughboora.com.

The bogs in The Boora Bog Group have been used in the past to supply milled peat for the horticultural market, local power stations (Ferbane, Shannonbridge and West Offaly Power) and Derrinlough Briquette factory.

A breakdown of the component bog areas for the Boora Bog Group IPC License Ref. PO500-01, and current, indicative Peat Production Status, is outlined in Table Ap-2. These areas are also outlined on Figure AI-2 (Map of the Boora Bog Group).

Table Ap-2: Boora Bog Group names, area and indicative status

Bog	Area (Ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Killaun	359.5	Cutover Bog Industrial peat production commenced at Killaun Bog in 1996 and ceased in 2020. Only the upper most layers of peat have been harvested. Deep peat reserves remain on site. Killaun is considered a deep peat cutover bog.	Killaun Bog formerly supplied a range of commercial customers including; horticultural peat and fuel peat. Most of the former production area is bare peat.	2020	Draft 2017
Boora	1,842.4	Cutaway Harvested since the 1950's resulting in the exhaustion of the commercially viable peat resource at the bog. The majority of Boora Bog is considered a shallow peat cutaway bog. Some areas of deep peat persist at this site.	The majority of Boora bog has already been rehabilitated. A significant area of cutaway bog has been re-wetted, developed as conifer forestry (Coillte) and developed as farmland (1980s). This site now forms the core of Lough Boora Discovery Park.	2020	Finalised 2021

Pollagh/ Cornalaur	280.8	Cutaway At Pollagh Bog, industrial peat production began in 2004 and ceased in 2020. Peat reserves of variable depth remain on site. Some deep peat areas remain. Pollagh is considered a cutover bog with variable peat depths.	Pioneer emergent peatland vegetation communities are developing throughout the bog. The adjacent Cornalaur Bog was never developed for peat production.	2020	Finalised 2021
Noggusboy	917.4	Cutaway Bog Industrial peat production commenced at Noggusboy during the 1950's and ceased in 2020. Long-term peat extraction has exhausted commercially viable peat reserves on this bog. Noggusboy is considered a shallow peat cutaway bog.	Part of the site was developed for conifer forestry by Coillte. Part of the site was developed as Cloghan Lake, as part of Lough Boora Discovery Park, in 1999. There is some emerging naturally colonising cutaway.	2020	Draft 2017
Drinagh	1,339.1	Cutaway Bog Industrial peat production commenced at Drinagh during the 1950's and ceased in 2020. Some small pockets of deep peat reserves remain in parts of Drinagh Bog but most of the commercially viable peat reserves have been exhausted. Drinagh is considered a shallow peat, cutaway bog.	Drinagh East is cutaway and has been extensively rehabilitated as wetland. This part of the site has extensive development of naturally functioning peatland habitats. Some Coillte conifer forestry is also present. There is some emerging naturally colonising cutaway in Drinagh West.	2020	Draft 2017
Killaranny	242.8	Cutover Bog Industrial peat production commenced at Kilaranny during the 1980's. Deep peat reserves remain on much of the bog. Kilaranny is considered a deep peat cutover bog.	Kilaranny Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat. A portion of the site is leased by NPWS since 2011 as a re-location area for turf cutters from nearby Clara Bog SAC.	2020	Draft 2017
Oughter	352.9	Cutaway Development of Oughter Bog commenced in the 1960's. Industrial peat production ceased in 2012. Shallow peat depths remain over much of the former production bog area. Oughter is considered a shallow peat cutaway bog.	The site has naturally been re-wetting and there is already significant natural colonisation. Part of the site has been developed as the Midlands National Shooting Centre of Ireland.	2012	Finalised 2021
Galros	191.5	Cutover Bog Industrial peat production commenced at Galros during the 1980's and ceased in 2020. Some areas of deep peat remain on the former production area. Galros is considered a cutover bog of variable peat depth.	Galros Bog formerly supplied a range of commercial customers including; horticultural peat and fuel peat. Some naturally emerging cutaway habitats are developing in part of the site.	2020	Draft 2017
Clongawny More	987.2	Industrial peat production commenced at Clongawny More during the 1950's and ceased in 2020. Some pockets of deep peat persist, particularly in the south-	Part of the site rehabilitated, as part of Lough Boora Discovery Park, in 1999.	2020	Draft 2017

		western portion of the former production area. Clongawny More is considered a cutover bog with variable peat depths throughout the site.	Some Coillte conifer forestry is also present. The site has naturally been re-wetting and there is already significant natural colonisation. BnM currently have submitted an application for renewable energy development on this bog.		
Derrinboy	305.7	Cutover Bog Derrinboy was first developed by BnM in the 1980's. Peat production ceased at Derrinboy in 2020. This bog was used to supply horticultural peat. Only the upper layers of peat have been harvested. Derrinboy is considered a deep peat cutover bog.	Derrinboy Bog formerly supplied a range of commercial customers including; horticultural peat and fuel peat.	2020	Draft 2017
Moneitta	707.5	Cutover Bog Moneitta was first developed by BnM in the 1970's. Peat production ceased at Monietta in 2020. This bog was used to supply horticultural peat. Only the upper layers of peat were harvested. Moneitta is considered a deep peat cutover bog.	Moneitta Bog formerly supplied a range of commercial customers including; horticultural peat and fuel peat.	2020	Draft 2017
Boora Lemanaghan Rail_Link	6.9	N/A	Not applicable	N/A	N/A
Derries	368.2	Cutaway Bog Development of The Derries Bog commenced in the 1960's. Industrial peat production ceased in 2005. Shallow peat depths remain over much of the former production bog area. The Derries Bog is considered a shallow peat cutaway bog.	Wetland rehabilitation carried out over part of site in 1999. Amenity trackway development in 2015. Part of the Lough Boora Discovery Park. The site has now been extensively naturally colonised and is a mosaic of wetland and Birch woodland habitats.	2005	Finalised 2021
Turraun	534.5	Cutaway Bog Development of Turraun Bog commenced in the 1950's. Industrial peat production ceased in 2018. Turraun is considered a shallow peat cutaway bog.	Wetland rehabilitation carried out over part of area in 1999 as part of the Lough Boora Discovery Park. This section of the site has now been extensively naturally colonised and is a mosaic of wetland and Birch woodland habitats.	2018	Finalised 2021
Derryclure	327.6	Cutover Bog Derryclure was first developed by BnM in the 1980's. Peat production ceased at Derryclure in 2020. This bog was used to supply horticultural peat. Only the upper layers of peat were harvested. Derryclure is considered a deep peat cutover bog.	Derryclure Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat.	2020	Draft 2021
Lemanaghan	1,253.7	Cutover Bog Industrial peat production commenced at Lemanaghan during the 1950's and ceased in 2019. Varied peat depths across the site. Deep peat reserves remain on	Lemanaghan Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat.	2020	Draft 2017

		much of the former production area of Lemanaghan Bog. It is considered a cutover bog.	There are some naturally emerging cutaway habitats.		
Belair North	565.7	Cutover Bog Belair North was first developed by BnM in the 1960's. TPeat production ceased at Belair North in 2020. This bog was used to supply horticultural peat. Only the upper layers of peat were harvested. Belair North is considered a deep peat cutover bog.	Belair North Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat.	2020	Draft 2017
Derrybrat	171.6	Cutaway Bog Industrial peat production commenced at Derrybrat during the 1950's and ceased in 2016. Derrybrat has shallow peat depths across the site. It is considered a shallow peat cutaway bog.	The site has been partially rehabilitated and there is already significant natural colonisation. Some conifer forestry has been developed by Coilte on the site.	2016	Finalised 2021
Belair South	228.8	Cutover Bog Belair South was first developed by BnM in the 1970's. Peat production ceased at Belair South in 2020. This bog was used to supply horticultural peat. As a result, only the upper layers of peat were harvested. Belair South is considered a deep peat cutover bog.	Belair South Bog formerly supplied a range of commercial functions including; horticultural peat and fuel peat.	2020	Draft 2017
Boora Bog Group Total	**10,983.7**				

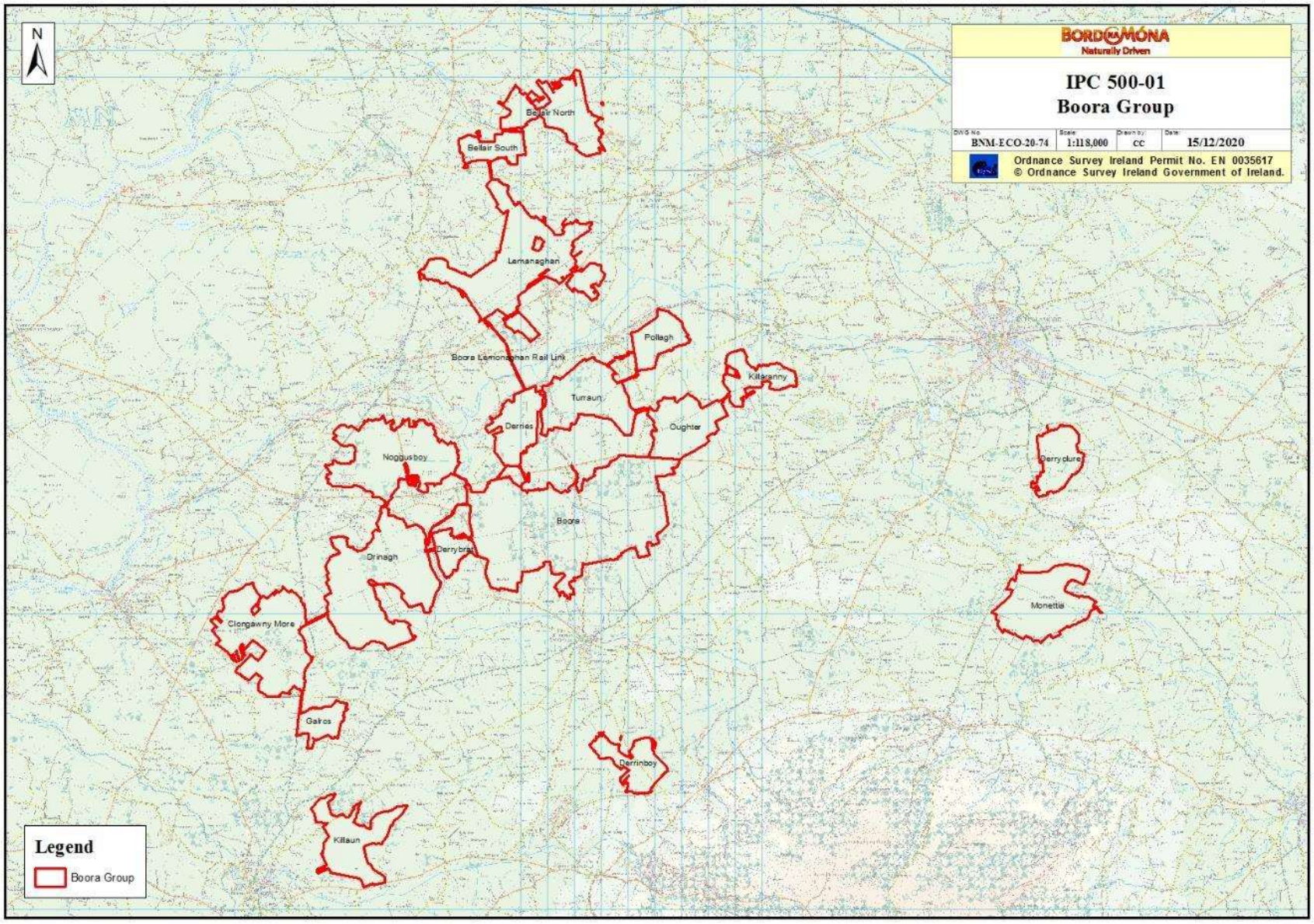


Figure Ap-2: Boora Bog Group

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.

Bog Name:	**Boora East**	**Area (ha):**	594.9 Ha (1420.5 acres)
Works Name:	Boora	**County:**	Offaly
Recorder(s):	MMC & DF	**Survey Date(s):**	19-23/08/2011

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Emergent wetland and Reedbed communities with stands of Bulrush (pTyph), Bottle Sedge (pRos), Horsetails (pEq), and Bog Cotton (pEang). Found in mosaic with open water. (Codes refer BnM classification of pioneer habitats of production bog.
- Birch scrub (oBir, cBir) and woodland (BirWD) – frequently in mosaic with poor fen and wetland communities.
- Poor fen communities dominated by Soft Rush and Bog Cotton (pJeff, pEang) – frequently in mosaic with wetland and scrub.
- Disturbed vegetation (DisTuss, DisWill), calcareous grassland (gCal) and Purple Moorgrass-dominated grassland. Found along the cycle track and in other dry open parts of the site.
- Limestone/marl lakes (FL3)
- Conifer plantation (WD4) planted on cutaway bog. (Codes refer to Heritage Council habitat classification, Fossitt 2000),
- Raised bog (PB1) – small remnant dry sections.

Description of site

Boora East is located in Co. Offaly, 4.5 km north of Kilcormac. The Bord na Móna Works and Offices is located at Leabeg and is part of the Boora bog. The overall Boora bog is divided into two main sections, Boora East and Boora West for ease of survey. The minor road that connects Leabeg and Kilcormac is the main division between these two sections, with all of the BnM property to the east of the road described in this report.

Boora East contains a large area of rehabilitated cutaway. This bog is one of the older bogs that went into production at the beginning of industrial peat production and therefore has some of the oldest developing cutaway. Much of the cutaway has been rehabilitated as agricultural grassland, conifer plantation, or as part of the Lough Boora Parklands. The rehabilitation of the cutaways of Lough Boora Parklands has been described in detail by Egan (2008). The improved grassland developed in the 1980' and 1990s has been sold to local farmers and a large area of cutaway "known as the Marl square' has since been sold to the NPWS. This has fragmented the current BnM properly somewhat into several 'isolated' sections. For ease of description, each of these sections is described separately as a sub-section.

Finnermores Lakes

The Finnamores lakes are located at the north-east corner of the site. This area is now managed by a local angling club. Two fishing lakes were constructed on the site by digging into the glacial sub-soil, creating a basin and using the spoil around the lake to create embankments. Both lakes are relatively shallow with a calcareous water chemistry and there is likely to be influence from underlying marl and glacial sub-soil/gravel. The lakes attract some water birds with Mallard, Tufted Duck, Little Grebe and feral geese all present. However, there is not a

significant amount of riparian or emergent vegetation cover around the lake edges, meaning that potential for breeding by these species is low.

The use of the spoil from the lake basins around the lake margins has had the effect of creating relatively diverse calcareous grassland. This grassland is still in the pioneer phase and is still developing. There are sections that were initially re-seeded and are dominated with clover, Perennial Ryegrass and other species. However, the grassland around the lakes is notable for the number of Common Spotted Orchids and other Spotted Orchid species that are present. Marsh Helleborine is also present in places as well as fragrant Orchid. This grassland also attracts a diverse range of butterfly species with Common Blue, Red Admiral, Meadow Brown and Peacock all present. Orange-Tip, Green-veined White, Ringlet and Small Heath were all numerous earlier in the season. Some scrub (Birch and Gorse) is beginning to spread into this grassland in places, particularly along the northern margin.

The wetlands that have developed associated with the lakes are quite diverse, structurally and at species level. The wetlands in the central area flocks of roosting Lapwing and other wintering or passage waders. Red-necked Phalarope is one rare species that has been recorded in 2009 and 2010. Lapwing, Redshank and Ringed Plover also breed in this wetland. The water-level in the wetland is generally much shallower and there is developing stands of Bottle Sedge and Grey Bulrush in the shallower sections. The central wetland margins are vegetated with Bog Cotton-dominated vegetation (pEang) and Bottle Sedge-dominated vegetation.

The wetland located adjacent to the northern lake has a highly calcareous water chemistry. This wetland is quite structurally diverse and is infilling with stands of Common Reed and Bottle Sedge. The western margin adjacent to the lake has some diverse sedge-rich vegetation dominated by Yellow Sedge (pVir). This community is associated with potential rich fen sites. Further east there is extensive tufa precipitation out of the water along around the wetland margins, creating a layer of tufa over the remnant peat or marl that forms the surface. There are some sections where there is extensive development of Charophtyes in the shallow water. Some of the wetland vegetation with stands of Bottle Sedge, Common Reed and open areas of water have scattered standing-dead conifers. These are likely to have colonised naturally from the adjacent conifer plantation. On the cutaway prior to the development of the wetland. When the wetland was created, these trees died. However, they are still standing dead after a significant period of time. Common Reed is continuing to spread in this area. Several high fields divide the wetland into sections and these are generally vegetated with Heather, scrub (Birch and conifers), Purple Moorgrass and Bog Cotton along the water's-edge. One clump of Black bog-rush is located in this area. Greater Tussock Sedge was also noted along with False-Fox sedge. This wetland is located quite close to a similar area in Oughter where there was development of potential rich fen caused by springs.

Further south there is similar wetland development. The eastern margin adjacent to the conifer plantation has some typical Birch scrub mosaic and poor fen dominated by Soft Rush. There is one particular wetland area that extends into the conifer plantation that is developing typical fen carr woodland. The wetland vegetation is dominated by Bottle Sedge while the scrub is dominated by Willow.

The southern end of the site contains a large rabbit population. The rabbits have had a significant impact on the development of the vegetation with a low-cropped grass sward adjacent to the lake and areas of bare peat on the embankment stripped of most vegetation apart from Brambles. There is some open and closed Birch scrub developing in this area. Some of the open scrub also has Purple Moorgrass-dominated grassland with high cover of Devil's-Bit, which may have potential for Marsh Fritillary.

The eastern section of Finnamores was developed as a conifer plantation by Coillte. Some of this plantation failed due to flooding during the development of the wetlands. This entire plantation has now been designated as being for general biodiversity on the Coillte map viewer (Management objective). The aerial photo of this plantation indicates that the plantation is quite poorly developed. This plantation borders the main Cloghan-Blueball road and there does seem to be some better developed trees along the road.

Tumduff Mór wetlands

The Tumduff Mór wetlands are located in the south-east corner of the site. As well as the extensive wetland development, there is also a large area of Birch scrub and some conifer plantation. The wetlands were mainly developed in a natural hollow in conjunction with high fields and embankments used by the railway and for travel paths. The main outfall is located at the north-west corner. Water flows out of the wetland over a rock-based channel and into the main drainage system, which directs the water west towards the Boora River.

The deepest part of the wetland is the west side, and the wetland gets progressively shallower towards the east. These shallower sections become more and more in-filled with emergent wetland vegetation. These are complex mosaics of single-species stands of Common Reed, Grey Bulrush, Reedmace, Bottle Sedge and Horsetails. The

wetlands are divided into several sections by long high fields. These fields have largely vegetated with scrub, poor fen and wetland vegetation. Some fields have been opened to allow water flow between various sections. The southern margin of the wetland has extensive emergent vegetation that is developing in mosaic with open water between the high fields with scrub. This structurally diverse zone is popular with wildfowl as there is significant amount of cover. The drier section to the south is re-vegetating with Birch scrub. Much of this is becoming quite dense and closed and maturing to Birch woodland. Former travel paths are now fairly inaccessible. Signs of Fallow Deer were noted in this area. The northern margin is relatively narrow with some Purple Moorgrass-dominated grassland developing on the embankment of the old railway. Much of the embankment is still a bare peat mosaic and is slow to vegetate (probably used as travel path/access in the past). Birch scrub is developing along the margins of the wetland in association with poor fen dominated by Soft Rush and or Bog Cotton.

The eastern side of the wetland is divided from the western side by a high field/embankment, although there is likely to be some drainage links. This eastern wetland is much shallower and this has allowed a diverse wetland structure to develop. As with the other section, there are stands of Common Reed, Reedmace, Bulrush, Bottle Sedge and Horsetails. Horsetail-stands are more common in this section and probably reflect the shallower water, which tends to get quite low during the summer, exposing bare peat mud beds. There is also some development of aquatic communities of Charophytes in this section, which reflects the more calcareous water chemistry. Tufa is also precipitating out of the water onto the exposed bare peat fields that dry out during the summer. Emergent stands of vegetation are also to be found along the southern margin, forming mosaic with open water between higher fields vegetated with Birch scrub. The northern margin is mostly dominated by a narrow strip of dry heath, bare peat and Purple Moorgrass mosaic, along the old railway embankment.

Further east of the wetland there is generally Birch scrub developing within the BnM property. This area of scrub seems to have enclosed quite quickly compared to the aerial photos. There is some Birch woodland with mature Pine developing on the margins of the site and Pine and Heather are colonising some small areas on the cutaway. There is a large open area between the two BnM properties (wetland and forestry) that is owned by the Grey Partridge Conservation Trust. This zone of the cutaway is dominated by bare peat and is slow to re-colonise. There are scattered clumps of Soft Rush and some Birch saplings present, while further east, Bog Cotton begins to become more common.

South of this wetland there is also a substantial area of dense Birch scrub, poor fen mosaic dominated by Soft Rush, and developing Birch woodland. This area is slowly enclosing and becoming inaccessible. Further south there is some more open ground with more-frequent bare peat adjacent to the boundary. Part of this has been utilised as a travel path in the past. It is quite dry with patchy Birch, Soft Rush and Heather appearing between denser clumps of Birch scrub. Further east there are some patches of more established dry Heath and Purple Moorgrass-dominated grassland that are rapidly being colonised by Birch. There has been some recent drainage and reclamation work carried out in this area by an adjoining land-owner. A drain draining some of the adjacent farmland has been deepening and cleaned. There has also been some reclamation of a mostly bare peat area along the margin and a new fence has been erected. A new drain has also been dug through the Birch scrub. This may be in preparation for future reclamation.

There are several conifer plantations attached to the Tumduff wetlands area. These have mainly been developed along the southern side on higher ground. The main plantation is located at the south-west end and is primarily Lodgepole Pine. Much of this is poorly developed and has been designated by biodiversity on the Coillte map viewer (Management objective). Further east there is another block of forestry at Derrydolney. This plantation is younger and is part of the experimental BOGFOR trial. The last plantation is found at Coyle's Island. This plantation is more mature than some of the other plantations. It now seems to be dominated by Birch although it is a mixed stand and there is Sitka Spruce through it. The Birch has now overtaken the Spruce and generally completely shades it.

Tumduff Beag lake

This small man-made lake was created from cutaway along the Leabeg-Kilcormac road, along with Boora Lake. It is now a focus point for the Lough Boora Parklands as there is a large bird hide built along the road. It has developed as a wetland with an increasingly diverse structure. Little Grebe and Mute Swan have bred at this site along with other species. There are several 'islands' within the lake that are used by roosting Lapwing and Curlew during the winter. Stands of Grey Bulrush, Reedmace and Bottle Sedge are developing within the lake and creating Reedbeds and emergent vegetation. A single stand of Common Reed is also present at the north-east corner of the site.

The lake is surrounded by mainly Purple Moorgrass-dominated grassland (gMol). One notable feature is the abundance of Devil's-Bit within this grassland in some sections. (There may be potential for Marsh Fritillary,

although there may not be enough shelter in places and it is likely that if Marsh Fritillary is present here, then it would have been spotted). Another unusual species found around the lake in this habitat is Cow-Wheat, which is an uncommon species of cutaway. There are also some patches of Birch and Willow scrub. Dry Heath with Heather is also present, particularly along the road embankment. There are some indications of plant community zonation developing in places as this site matures. Dry heath with Heather dominates the higher drier ground. Of interest is the fact that this dry heath still contains some bare peat cover and seems to be one of the slowest zones, or vegetation communities to fully create a 100% vegetation cover. This gives way to Purple Moorgrass-dominated grassland, which in turn transitions to emergent or riparian vegetation on the water's-edge dominated by Bottle Sedge or in some cases Bog Cotton. One notable feature is the development of some hummocks of *Sphagnum. subnitens* in the damper lower zone along the road and in the north-west corner. *Sphagnum capillifolium* and *S. palustre* are also present. This is probably due to the influence of remnant acidic peat left along the road that could not be put into production. It may also be an indication that the water chemistry of this lake is less calcareous compared to Loch an Dochas. No Charaphyte growth was noted in the lake but there was some growth in the main drain that serves as an outfall.

Some calcareous grassland with abundant Knapweed and Glaucous Sedge is present along the southern side of the site on higher ground where the peat is thin or has been totally removed. Some of this grassland is being covered with Brambles and Willowherb and will slowly develop into scrub. Red Admiral and numerous Meadow Brown were on the site during the survey.

Southern Biomass area

This area is located at the southern end of the site in Ballybracken. It is located adjacent to the Leabeg-Kilcormac Road. It includes some conifer forestry developed by Coillte. Like many of the other plantations it is variable in quality.

This section also includes the Willow biomass trial. Adjacent to this area there is some cutaway along the road. This is being colonised by Heather, Birch scrub and Purple Moorgrass. There is also still a significant portion of bare peat still visible. Production was not as deep in this area.

Further south there is some Birch woodland, scrub, cutover bog and remnant raised bog. The scrub/Birch woodland area along the road is occupied by squatters. The cutover bog is still active and the remnant high bog is still being cut for domestic sod turf. There is only a small area of high bog left and this is quite dry and dominated by Heather cover.

Northern Conifer plantation

This large area of mainly conifer plantation was developed by Coillte and extends from Leabeg to Finnamores. Conifers. It was planted in the 1990's and is at a post-thicket stage. There has been no significant thinning of any compartments. Lodgepole Pine was the main species planted as well as some Norway Spruce and Sitka Spruce. Some broadleaves were also planted in various compartments. This conifer plantation varies in quality and some is poorly developed. One compartment along the southern side of the plantation is described as being 'open'.

There is a travel path along the northern boundary of the plantation. This links Oughter bog to the Boora Works. The plantation borders the Cloghan-Blueball Road and some scrub has developed along the margin. There is also some minor scrub development with Gorse and Birch at the north-east margin, adjacent to the Finnamores.

South-eastern conifer plantations

This plantation is located adjacent to the Grey Partridge Conservation Project and north of Tumduff Mor wetlands. It is a mixed plantation with some blocks of conifers, some mixed stands and some blocks of broad-leaves. About a third of the plantation has been designated for biodiversity while the other section is classed as timber production (Coillte mapviewer - Management objective). The eastern side seems to be poorly developed with substantial Birch development amongst the conifers.

There is an additional plantation to the north of the above area that is located adjacent to the east side of the 'Marl Square'. This plantation is a series of blocks of different conifer and broadleaf crop types that was planted for the BOGFOR forestry trial.

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

None

Adjacent habitats and land-use

The surrounding landscape is typically low-lying and contains farmland with improved grassland, much of which has been reclaimed from peatland. A significant part of Boora East was developed into improved grassland by Bord na Móna and has been sold to local farmers. A significant area of former cutaway (Marl Square) also been sold to the NPWS and is now managed specifically for Grey Partridge with a range of open and disturbed grassland habitats. Other adjacent habitats include those of reclaimed cutover bog such as conifer plantation (WD4), improved grassland (GA1) and wet grassland (GS4). There is also some high bog (PB1) remnants and active cutover bog (PB4) around the margins that are not in ownership by BnM. The margins around the cutaway are typically dominated by scrub (WS1) and Birch woodland (WN7) developing on peat remnants.

Watercourses (major water features on/off site)

- There are several constructed wetlands and fishing lakes in this section (Tumduff Beag, Tumduff Mór and Finnamores). Tumduff Beag, Tumduff Mór and Finnamores wetlands all have calcareous water chemistry. Parts of the Finnamores wetlands are very strongly calcareous with tufa being deposited on the marl.
- Tumduff Beag and Tumduff Mór are linked to the Tumduff Brook, a small stream that flows north-west to the Boora River.
- Finnamores is linked to a small channelized stream that flows north towards the Little Brosna River.
- East Boora is within the Shannon catchment.

Peat type and sub-soils

The majority of the exposed peat is fen peat. There are some pockets of more acidic peat towards the south of the site, adjacent to the Leabeg-Kilcormac road, and around the margins.

The underlying sub-soils are significantly calcareous. Lake marls and glacial gravels/sub-soils are dominant.

Fauna biodiversity

Birds

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

- Snipe, Little Grebe, Reed Bunting, Lapwing, Heron, Mute Swan (2 adults and 4 cygnets), Mallard (8), Greenshank (2), Raven, Lapwing (150), Curlew (~50), Blue Tit, Redpoll and Sedge Warbler.
- Swallows were feeding over the lake in a mixed group with Sand Martins.
- Wood Pigeon was recorded on a nest in scrub around Tumduff Beag (particularly late in the season).
- Wheatears were using Tumduff Mór (passage migrants).
- A Marsh Harrier was also spotted on Tumduff Mor.
- The above species list reflects the seasonality of the survey. In addition, there are detailed lists of various types of fauna recorded in Boora within Heery (1999). There are several surveys of breeding birds for sub-sections such as Tumduff Mór and the site is regularly counted for wintering waders and wildfowl by BirdWatch Ireland for the IWeBs survey. Overall species diversity and use by wintering waders and wildfowl in the wider area (including farmland) is significantly greater.

Mammals

Several mammals and signs of mammals were noted on the site during the survey.

- Fox, Badger, Hare
- There is an extensive Rabbit colony at the southern end of Finnamores.
- Otter have been recorded in the area in the past.
- Signs of Fallow Deer were noted along the southern side of Tumduff Mor, within the Birch scrub/woodland.
- Red Deer have also been noted in the area. These have probably been released for hunting.

Other species

- Butterflies in the eastern section of the site included Red Admiral, Common Blue (Finnermores), Meadow Brown (numerous), Small Copper (Tumduff), Small Heath, Speckled Wood, Large White, & Peacock.

Fungal biodiversity

N/A

Ecological Survey Report

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

Bog Name:	**Boora West**	**Area (ha):**	1322.9 ha, (3269.1 acres)
Works Name:	Boora	**County:**	Offaly
Recorder(s):	MMC & DF	**Survey Date(s):**	17-19/05/2011

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Emergent wetland and Reedbed communities with stands of Bulrush (pTyph), Bottle Sedge (pRos), Horsetails (pEq), and Bog Cotton (pEang). Found in mosaic with open water. (Codes refer BnM classification of pioneer habitats of production bog.
- Birch scrub (oBir, cBir) and woodland (BirWD) – frequently in mosaic with poor fen and wetland communities.
- Poor fen communities dominated by Soft Rush and Bog Cotton (pJeff, pEang) – frequently in mosaic with wetland and scrub.
- Disturbed vegetation (DisTuss, DisWill), calcareous grassland (gCal) and Purple Moorgrass-dominated grassland. Found along the cycle track and in other dry open parts of the site.
- Limestone/marl lakes (FL3) (Loch an Dochas and Boora Lake)
- Embryonic bog community (PBa with *Juncus*). This community represented by a mat of *Sphagnum* sp. cover is found close to the western boundary of the site adjacent to a section of conifer plantation.
- Conifer plantation (WD4) planted on cutaway bog. (Codes refer to Heritage Council habitat classification, Fossitt 2000),
- Broad-leaved plantations planted on cutaway bog (WS2)
- Calcareous grassland (GS1) – Mesolithic site
- Poor fen (PF2) - former Lough Boora
- Birch woodland (WN7) – former Lough Boora and around the site
- Rich fen (PF2) – former Lough Boora
- Raised bog (PB1) – small remnant dry sections.

Description of site

Boora West is located in Co. Offaly, 4.5 km north of Kilcormac. The Bord na Móna Works and Offices is located at Leabeg and is part of the Boora bog. The overall Boora bog is divided into two main sections, Boora East and Boora West for ease of survey. The minor road that connects Leabeg and Kilcormac is the main division between these two sections.

Boora West contains a large area of cutaway. This bog is one of the older bogs that went into production at the beginning of industrial peat production and therefore has some of the oldest developing cutaway. Much of the cutaway has been developed as conifer plantation by Coillte, or as part of the Lough Boora Parklands. A significant portion of cutaway within the Lough Boora Parklands has been actively rehabilitated and this includes the construction of two lakes and a large wetland area (Leabeg wetlands). The western side still has some active peat production and younger pioneer cutaway developing in production-related cutaway. There is a railway along part of the northern boundary that connects the Boora yard and workshop to the Boora bog group. The Lough Boora Mesolithic site is located towards the centre of the site and is part or a former lake basin. This area is less developed and contains several features of significant ecological interest. Part of this area is designated as a potential National Heritage Area. Further south there is some other cutaway that has been developed as wetlands (South Boora wetlands). A large part of the former southern cutaway area has now been sold to the National

Parks and Wildlife Service and is actively managed for Grey Partridge conservation. For ease of description the site is further sub-divided into several sub-sections.

Mesolithic site , Boora Lake and surrounding areas

This area is located towards the centre of the site. It is almost surrounded by conifer plantation and can be accessed by the main cycle path, which runs through this section. The majority of this section is not significantly developed. However, deep drains and silt ponds were dug through this area. Much of the former Boora lake basin was also ditched and developed into fields. However, there were probably parts of the wettest sections and the Mesolithic storm beach that were not stripped of vegetation.

The Mesolithic storm beach contains diverse calcareous grassland (GS1). This is characterised by scattered exposed limestone rock that is interspersed with wild flowers and grasses. Species such as Mountain Everlasting, Birdsfoot, Carline Thistle, Ox-eye Daisy, Coltsfoot, Long-leaved Plantain, Creeping Willow, Glaucous Sedge and Knapweed are frequent. The moss cover is characterised by abundant *Ctenidium molluscum.* Later in the summer the site is covered in Marsh Helleborine. Other orchids such as Common Spotted Orchid and Fragrant Orchid are also common. Bee Orchid and Butterfly Orchid has also been recorded. Birch, Willow, Hawthorn and Pine saplings and young trees are present. Areas with some peat are generally colonised with Purple Moorgrass. Species such as Devil's-Bit, Carnation Sedge and Milkwort are associated with this type of grassland. To the west there is increased cover of Heather where the peat becomes somewhat deeper (dHeath and gMol). Further south there is much more Birch scrub. There are patches of calcareous grassland and Purple Moorgrass-dominated grassland throughout this scrub. This area is bordered in the south by a deep drain and riparian zone. Along the riparian zone there are piles of limestone spoil, probably from old drainage works. Elements of esker and calcareous grassland flora (GS1) are associated with these piles such as Columbine, Hartstongue and Mountain Everlasting.

The former Boora lake basin now contains a small area of developing Birch woodland (WN7) surrounded by Birch and Willow-dominated scrub that is mainly spreading into poor fen type vegetation. The Birch woodland is generally dry and poorly developed. The ground cover is dominated by scattered Bramble and or Purple Moor-grass with patches of moss cover and bare peat. Typical species include Broad Buckler Fern, Ivy, Devil's-Bit, Elder, Guelder Rose, Bog Myrtle and Twayblade. The Birch woodland is developing over areas that were initially drained as the drains are still present. However, some of the trees are probably developing prior to this drainage work. Other species present include Alder and a single Yew. Alder Buckthorn was also noted within the woodland and around the edges developing in the scrub. The poor fen (PF2) is dominated by either Purple Moorgrass and/or Heather. Other typical species include Tormentil, Devil's-Bit, Carnation Sedge, Board Buckler Fern, Cross-leaved Heath, Creeping Willow and Bramble. Scrub is patchy throughout and forms a mosaic with the open areas. The ground is quite treacherous with tall tussocks and cracks in the peat, although it was quite dry. Towards the western side there is a narrow band of rich fen (PF1) vegetation where indicator species such as Saw Sedge and Black Bog-rush are present. This area is quaking in sections. Other species include Greater Tussock Sedge and Bog Thistle. This rich fen (PF1) area is still dominated by Purple Moor-grass in parts. There are indications that this area is drying and the rich fen habitat area is diminishing. Towards the NW corner there is a small remnant section of high bog that remained uncut, although it was still ditched. This area is quite dry and dominated by Heather. There is a somewhat semi-natural transitional zone between the raised bog down a slope to the rich fen zone.

Leabeg Wetlands

This area includes the large area of wetlands to the north of Boora that extends from the new Lough Boora lake west to the conifer plantation. Wetland enhancement work has been carried out in this area in the past with drain-blocking and the creation of a berm through the site to hold water over a greater area. This has been extremely effective with the result that wetlands communities (pTyph, pPhrag, pRos, pEqf) with open water have established and these are found in mosaic with scrub (oBir, oWill) and poor fen communities. Further south towards the Boora Parklands bike trail the conditions are somewhat drier and pioneer grassland (gCal) and disturbed vegetation communities (DisTuss, DisWill) are more common.

Some of the most diverse wetland vegetation surveyed so-far is found in the Leabeg wetlands. Typically there are stands of Bottle Sedge and Bog Cotton-dominated areas. However, these communities are somewhat more diverse compared to younger pioneer cutaway communities recorded at other bogs. Other species such as Water Horsetail, Marsh Horsetail, Pondweed sp., Jointed Rush, Soft Rush, Bulbous Rush, Mint, Gypsywort, Cuckoo Flower, Floating Sweet-grass and other Sedges are frequently found within these wetland communities. These

emergent wetland species can also be found with areas dominated by Bulrush. Both Common Reed and Grey Bulrush are less frequently found within the wetland areas but can create large mono-dominant stands. Willow is scattered through these wetland communities and scrub dominates some higher fields that divide the various lower sections. Further west the wetland communities seem to be somewhat eutrophic with significant and dense wetland vegetation growth.

South Boora wetlands

This area is located to the south of Boora and adjacent to the Grey Partridge Project area to the south. Conifer forestry borders this area to the north. There has been some wetland enhancement works carried out in the past. More work has recently been carried out (2009-2010) with the blocking of the main outflow with the result that the water level has been raised and there is now more water pushed over the overall area. This has had some effect on the more mature vegetation to the west by creating some drowned scrub dominated by Willow. The main wetland communities include open water in mosaic with patchy poor fen vegetation represented by Bog Cotton, Soft Rush and Bottle Sedge. This vegetation is best developed along the drains, particularly towards the east side. Willow has also developed along the drains but the recent raising of the water level may mean some of this Willow dies back. Bulrush-dominated vegetation is also developing (pTyph). The wetland development is a younger stage compared to the Leabeg wetlands and there is also a significant amount of bare peat. The vegetation development seems to be younger towards the east and this seems to be where there has been more recent re-wetting of previously dry bare peat.

This wetland attracts breeding waders and two pairs of Lapwing were recorded at the time of the survey. Little grebe and a family of Mallard were also present. Redshank have been recorded breeding in the past.

South-east section (including the Bogfor trial area)

Peat production has been much less intensive in these marginal sections of Boora. The Bogfor trial was established on typical dry cutaway. This area is fenced. Some of the planted trees have established but many of the trees seem to be in check. Mixtures of conifers and broad-leaved trees were planted. Birch, Lodgepole Pine and Willow have also naturally colonised within the site along with Soft Rush, Bramble, Raspberry and some Heather. This area is fenced but the fence is now degraded. The vegetation is quite dense.

West of the BOGFOR trial there is a small area of open cutaway that is establishing on higher bog. This section is also located adjacent to the road between Leabeg and Kilcormac. Tall Birch and patchy Heather is established along the drains but between the drains there is mainly bare peat and Bog Cotton. Lodgepole Pine is naturally colonising this area towards the southern side and adjacent to conifer plantation on the margins. The peat is quite dry and *Campylopus* sp. is colonising the Bog Cotton areas. Several fields within this section are completely bare. Some *Sphagnum* spp. is present in some of the drains, but most of the drains are dry. A pond seems to have been excavated in one field, and this is also developing *Sphagnum* spp. cover.

South of the BOGFOR trial and some conifer plantation there is another section of cutaway that is almost completely re-vegetated. This area is also characterised by deep peat that has been extensively naturally colonised by Birch and Pine forming closed scrub, while the open sections are now covered in tall Heather, forming dry heath in mosaic with the Birch scrub.

Further south there is a relatively large area of ditched high bog that may have been undeveloped for peat production, or peat production was minimal. This area is also characterised by very thick impenetrable closed Birch scrub/ woodland along the margins. Further south the scrub opens somewhat and the open Birch is scattered over dry tall Heather. Some *Sphagnum* appears in the drains in this area. Cattle have broken into this area on occasion with some poaching and grazing. Some high bog within the BnM GIS site boundary has been fenced off and is now grazed by cattle.

North West Boora

This area includes the on the western side of Boora from the central rail line northwards. The majority of this section of the site is classed as cutaway and is no longer used for peat production. However a small area immediately to the north of the railway line was still used for peat production. Several access routes are still active through this section of the site. Approximately 200mm of peat was all that remained, under which limestone gravel was located.

The cutaway areas had re-vegetated, mainly with a mixture of Birch scrub (oBir, cBir) with open habitats such as grassland (gCal) and poor fen (pJeff). Several raised mounds are located this area as a result of peat production exposing some underlying gravel hills. These mounds were becoming colonised by a mixture of disturbed vegetation (DisCf), grassland (gCal) and Birch scrub.

A small area (0.15ha) of embryonic bog community (PBa) is located alongside a section of conifer plantation close to the north-western boundary of the site. This habitat was dominated by *Sphagnum cuspidatum* and also contained Sundew, Soft Rush and Bog Cotton.

The north west corner of the site (to the north of the conifer plantation and adjacent to the old power station site) contained areas of calcareous grassland, scrub and conifer plantation. The areas of calcareous grassland were dry and scrub was encroaching on these areas. The Silver River flows along the western boundary of the site in this area. The riparian area comprised trees and scrub mainly. Otter have been spotted close to this point in the past and the river appeared to provide excellent habitat for Otters.

The Deer population appeared to be quite high in this section of the site.

South West Boora

This area encompasses the area directly to the south of the central rail way line. The area immediately to the south of the central rail way line was a mixture of bare peat production fields and re-vegetated cutaway. The pioneer vegetation was a mixture of Birch scrub (eBir and oBir), poor fen vegetation (pEang and pJeff) with some small areas of open water. At the time of the ecological survey some areas of vegetation were being removed in order to open these areas up for further peat production.

The south west corner of the site was mainly in full peat production and was, for the most part, bare peat. A small area to the south of the railway line and immediately to the west of the conifer plantation had developed into a wetland. This area comprised of areas of open water, reed beds and poor fen vegetation. Three pairs of Lapwing were observed in this area along with one pair of Mallard, Redshank have also been recorded in this area in the past.

Red Data Book species

Blue Fleabane was recorded at several locations around the site. It has not been recorded at this site before. Blue Fleabane (*Erigeron acer*) is an annual species that is found in dry pastures and sandy or gravely places such as eskers and its distribution is mainly confined to the central and south-eastern parts of Ireland (Webb et al 1992). It has been recorded in several 10 km grid squares in Offaly in the past, including the grid square where the current sites are located.

It is widely distributed in disturbed grassland on both sides of the cycle track from the Lough Boora Triangle and past the Tippler Bridge to the new sculpture - From Earth to Sky. This area has patches of disturbed gravel and glacial material that were excavated from the canal-watercourse and spread out and mixed with peat. This has created a suitable habitat from this species. It is also found around the Boora works on disturbed gravel.

This species is not likely to have been present on the site prior to the development of the cutaway. Subsequent development of the site including construction of railways on gravel embankments, construction of drains and silt pond have created suitable exposed areas up of calcareous rich material that this species prefers. In the long-term, it could be expected that these spoil heaps and exposed gravel patches will re-vegetate with grassland and scrub, which may not favour this species. This species has not been recorded at the Mesolithic site (which would also be expected to provide suitable habitat for this species), and has not been recorded around other parts of the cycle track.

Alder Buckthorn (*Frangula alnus*) is a very rare shrub/tree that is usually found in rocky places associated with limestone pavement at lake margins and boggy places such as Birch woodland. It is a Red Data Species (Curtis and McGough 1988) whose status is rare.

Several individuals (young and older trees) were recorded around and within the Birch woodland developing on the old Boora lake. This species seems to be spreading.

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

Lough Boora pNHA (NPWS site code 001365)

This pNHA is located in the centre of the Lough Boora Parklands. Lough Boora was originally designated as an Area of Scientific Interest due to its geographic interest (Farrell 1972). It incorporates part of the former Lough Boora basin and part of the Boora River that flows north. Part of the pNHA is now owned by the Irish Wildlife Trust. The landscape of this area has been significantly changed by Bord na Móna operations in the past. The original Lough Boora lake was drained and the raised bog surrounding the lake has now been cutaway. This exposed the Lough Boora Mesolithic Site, a storm beach of a more ancient lake.

The pNHA now includes the majority of the remaining intact former Boora lake basin, conifer plantation (planted on cutaway) old silt ponds and drainage systems and part of the old Boora River, which is now channelized in deep embankments. The former lake basin now contains Birch woodland (WN7), some rich fen (PF2) and scrub (WS1) spreading over poor fen (PF2) communities. Other habitats within the pNHA include some remnant high bog (PB1), which is now dried out and dominated by Heather. The majority of the diverse calcareous grassland that has developed on association with Lough Boora Mesolithic storm beach is actually excluded from the PNHA boundary. The actual pNHA boundary of this site should be revised.

Lough Boora NPWS site synopsis

'This drained lake, surrounded by cutaway bog, lies 5 km north-west of Kilcormac. Previously a post-glacial lake, it was impounded and much reduced, in size by raised bog development. The drained lake-bed consists of shallow fen peat overlying calcareous shell-marsh.
The surface of the western portion has been left undisturbed allowed plant colonisation and regeneration. This includes Birch (*Betula pubescens*) and Willow (*Salix* sp.) with a ground flora of Bog-myrtle (*Myrica gale*), Common Cottongross (*Eriophorum angustifolium* and Ling Heather (*Calluna vulgaris*). Along with these acid-loving plants are other base-loving fen species such as Great Fen-sedge (*Cladium mariscus*), Marsh Cinquefoil (*Potentilla palustris*) and Ragged-robin (*Lychnis Flos-cuculi*). The site also contains various orchids including Fragrant Orchid (*Gymnadenia cojopsea*) and Lesser Butterfly-orchid (*Platanthera bifolia*). The above forms part of a 1972 'An Foras Forbartha' description of the site. A recent (April 1994) aerial view of the site appears to confirm this ecological status.
The peatland and former lake has been drained by Bord na Móna but otherwise the site is now mostly undisturbed. Archaeological excavations have revealed evidence of past human activities. The site has supplied the earliest evidence of an Early Mesolithic hunter gatherer settlement in the Irish Midlands at about 7000 B.C.

Lough Boora is of interest botanically due to the mixture of fen and bog species on the former peatland lake-bed. Its importance archaeologically gives added dimension to the site quality.'

Adjacent habitats and land-use

The surrounding landscape is typically low-lying and contains farmland with improved grassland, much of which has been reclaimed from peatland. Land to the south of the site was developed into improved grassland by Bord na Móna and has been sold. A significant area of former cutaway to the south of the site has also been sold to the Grey Partridge Conservation Trust and is now managed specifically for Grey Partridge with a range of open and disturbed grassland habitats. Other adjacent habitats include those of reclaimed cutover bog such as conifer plantation (WD4), improved grassland (GA1) and wet grassland (GS4). There is also some high bog (PB1) remnants and active cutover bog (PB4) around the margins that are not in ownership by BnM. The margins around the cutaway are typically dominated by scrub (WS1) and Birch woodland (WN7) developing on peat remnants.

Watercourses (major water features on/off site)

- The Boora River drains the central section and flows north from the former, now drained Lough Boora, and eventually flow to the River Brosna. This river is now embanked in a deep channel and is more typical of a drainage ditch with extensive sections colonised by Common Reed, Grey Bulrush and Pondweed.
- The Silver River flows south along the north-west corner of the site. A channelized stream flows into this river.
- The Crooked Brook flows through channelized embankments along the north side of Boora Lake.
- There are two constructed lakes within Boora west (Boora Lake and Loch an Dóchas), both of which are part of the Lough Boora Parklands.
- West Boora is within the Shannon catchment.

Peat type and sub-soils

The majority of the exposed peat is fen peat. The south-east sections have some higher bog where *Sphagnum* peat (high bog) has been re-colonised with Heather, Birch and frequent Lodgepole Pine in places.

The underlying sub-soils are significantly calcareous. Lake marls and gravels are dominant.

Fauna biodiversity

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

- Redpoll, Blackbird, Wren, Goldcrest, Chaffinch, Willow Warbler, Snipe, Chiffchaff all recorded around the new Lough Boora area and adjacent conifer plantations.
- Blackcap and Chaffinch both using the Birch woodland of the Mesolithic site.
- Sedge Warbler, Willow Warbler, Moorhen, Heron, Lapwing (2 pairs) and Water Rail were recorded in the Leabeg wetlands.
- Little Grebe, Mallard and Lapwing were present in the South Boora wetlands.
- Dingy Skipper and Common Blue using old railway line to the west of the Lough Boora fen area.
- The western side of the site contained Coal Tit, Snipe, Skylark, Cuckoo, Wren, Robin, Grey Crow, Rook, Raven, Magpie, Willow warbler, Grasshopper Warbler, Swallow, Swift, Pheasant, Moorhen, Woodcock and Blackcap.
- The wetland in the south western section of the site (next to the conifer plantation) contained three pair of Lapwing and two pairs of Mallard. Redshank have been recorded there in the past.
- Butterflies in the western section of the site included Green-veined White, Orange Tipped, Dingy Skipper and Common Blue. The Cinnabar Moth was also observed.
- In addition, there are detailed lists of various types of fauna recorded in Boora within Heery (1999).

Activities on the site

Activities on the site include:

- Lough Boora Parklands – amenity area with walking, cycling and fishing.
- Sculpture Park and Conifer forestry

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

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

APPENDIX V. BIOSECURITY

Invasive flora species have been recorded at Boora Bog, including Parrots Feather *Myriophyllum aquaticum* and *Rhododendron ponticum* . Within systems where it has established, internal spread of Parrots Feather by natural means is common, principally occurring via vegetative fragmentation that is induced naturally or by human-related disturbance and through the dispersal of rhizomes (Global Invasive Species Database 2005; CABI 2007). The species only reproduces asexually through vegetative fragmentation. Small infestations may be removed by hand, but measures will have to be in place to prevent inadvertent dispersal into rewetted areas. This will include the identification in advance of all infested systems or waterbodies, classification of same as constrained areas, and the implementation of checks on machinery/equipment to prevent transfer between systems within Boora Bog. All measures will follow Best Practice. In addition the use of Light-excluding benthic barriers, such as jute matting or other similar methods, may be used to bring about control / prevent spread by wildfowl (a possible vector for dispersal).

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

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

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

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads and broadly based on the Environment Agency's (2013) – The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites (Version 3, amended in 2013, 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] /other aquatic invasive species such as Parrots Feather will be adhered with throughout all rehabilitation measures and 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 have now announced the complete cessation of industrial peat production across its estate (January 2021).

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 Boora Bog Group (Ref. P0500-01). 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 Boora 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) understand that it is the Minister's intention to impose an obligation on Bord na Móna to develop a programme of measures, 'the proposed Scheme', for the enhanced decommissioning, rehabilitation and restoration of boglands (PCAS) 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. 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.

Boora Bog overlaps one site, a pNHA designated for nature conservation.

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.

Boora Bog is located in an area classified by Offaly County Council as of high sensitivity with amenity value[4].

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.

[4] https://www.offaly.ie/eng/Services/Planning/Development-Plans/County-Development-Plan-2014-2020/Volume-1-9-10-14-FINAL-pdf.pdf

- 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 has been 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 Esker 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	Boora Bog 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	Not relevant
5	Decommissioning Fuel Tanks and associated facilities	Decommissioning and De-Gassing Mobile Fuel Tanks
6	Decommissioning and Removal of Bog Pump Sites	Where Applicable
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.

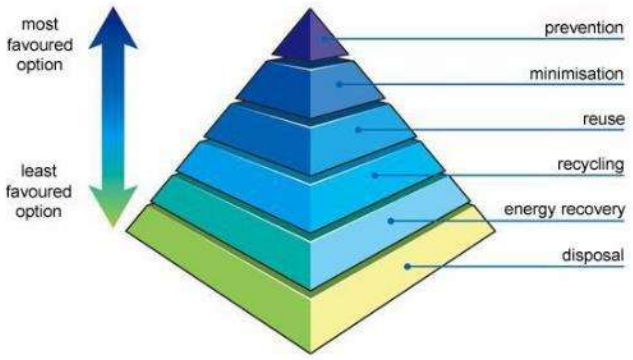
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

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	Boora Bog Decommissioning Plan
1	Removal of Railway Lines	Removal of Railway Lines
2	Decommissioning Bridges and Underpasses	Where Applicable
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	Where Applicable

APPENDIX VIII. GLOSSARY

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

Deep peat cutover bog. Deep peat 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 cannot be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

Enhanced decommissioning: This is defined as decommissioning carried out under 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. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

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

Scope:
This plan covers IPPC Licence's P0500-01, Boora Group of Bogs in Counties Offaly and Westmeath,

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

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

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

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

2.0 P0503-01 IPPC Licence Extractive Waste Conditions

2.1 Condition 7.5 Extractive Waste Management
The licensee shall draw up a Waste Management Plan (to be known as an Extractive Waste Management Plan) for the minimisation, treatment, recovery and disposal of extractive waste. This Plan shall meet the requirements of regulation 5 of the Waste Management (Management of Waste from the Extractive Industries) Regulations,2009. The Plan shall be submitted for agreement by the Agency by the 31' December2012. The Plan shall be reviewed at least once every five years thereafter in a manner agreeable to the Agency and amended in the event of substantial changes to the operation of a waste facility or to the waste deposited. Any amendments shall be notified to the Agency.
All extractive waste shall be managed in accordance with the Extractive Waste Management Plan. A report on the implementation of the Extractive Waste Management Plan shall be provided in the AER.

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

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

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

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

3.0 Minimisation.
3.1 Silt pond excavation material and cleanings.
IPPC Licence conditions require all production areas to be serviced by an appropriately designed silt pond based on storage volume and retention time. Condition 6.6 requires all ponds to be cleaned bi-annually and more often if inspections dictate, so the only opportunity for minimisation of same is through Standard Operating Procedures. These are required under condition 2.2.2 (i) regarding minimisation of suspended solids, and are in-place to minimise the generation of silt, which in-turn will minimise the generation of silt pond waste.

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

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

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

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

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

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

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

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

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

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

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

7.0 Extractive Waste Management Plan

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

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

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

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

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

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

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

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

Classification in accordance Annex II.

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

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

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

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

10.2 Cutaway Bog Rehabilitation Plan:

- 10.2.1 The licensee shall prepare, to the satisfaction of the Agency, a fully detailed and costed plan for permanent rehabilitation of the cutaway boglands within the licensed area. This plan shall be submitted to the Agency for agreement within eighteen months of the date of grant of this licence.
- 10.2.2 The plan shall be reviewed every two years and proposed amendments thereto notified to the Agency for agreement as part of the AER. No amendments may be implemented without the written agreement of the Agency.

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

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

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

Review.
This plan will be reviewed every five years, the first review to take place in September 2017. This review will entail an inspection of these waste facilities to ensure their placing, management, maintenance and stability comply with the requirements of the Extractive Waste Management requirements and condition 7.5, 7.6 and 7.7 of the Boora Bog Licence P0500-01.
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APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

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

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

APPENDIX XI. CONSULTATION SUMMARIES

TBC

APPENDIX XII. ARCHAEOLOGY

Role of the Archaeological Liaison Officer

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

Code of Practice

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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	13/19/2020	First release	EMcD
2			

Archaeological Impact Assessment of Proposed Bog Rehabilitation at Boora Bog, Co. Offaly. Dr. Charles Mount. April 2021.