Bord na Móna

Lodge Bog

Cutaway Bog Decommissioning and Rehabilitation Plan 2022

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. P0503-01:

> "*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 Lodge 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 Lodge Bog.

In addition, to preparing this document to comply with Condition 10 of IPC Licence Ref. P0503-01, due regard was also given to the Peatlands Climate Action Scheme (PCAS) announced by the Minster. This Scheme will see the Minister support, via the Climate Action Fund and Ireland's National Recovery and Resilience Plan*, Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e, measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support. The additional costs of the Scheme will be supported by Government, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator.*

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

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

Any consideration of any other future after-uses for Lodge 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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NON-TECHNICAL SUMMARY

- Bord na Móna is planning to rehabilitate Lodge Bog, located in Lullymore East, Co. Kildare.
- Lodge bog was a BnM production bog used for peat extraction and is located adjacent to Lullymore and is 3 km west of Allenwood in Co. Kildare. It was part of the former Ballydermot bog group and used to supply milled fuel peat as part of the Derrygreenagh group to Edenderry Power Station. A small area was used to supply sod moss for horticultural use.
- Peat harvesting is now finished at Lodge Bog.
- This is happening as Bord na Móna are obliged to carry out peatland rehabilitation via an IPC License issued by the Environmental Protection Agency. In addition, the Government has agreed to support peatland rehabilitation via the establishment of the Peatland Climate Action Scheme (PCAS). This is funded via the government and by Bord na Móna.
- The key objective of peatland rehabilitation is environmental stabilisation. This means developing habitats and vegetation back onto the bare peat, and minimising impacts to downstream. Essentially this means putting a 'wet skin' of plants and mosses back on the peat. The bog was drained in the past to allow milled peat production. Better results for water quality improvements, climate action, the reduction of carbon emissions and biodiversity are achieved when the remaining peat is re-wetted. This means drain-blocking and other measures to raise water levels to the surface of the bog and to encourage the natural colonisation of vegetation.
- In general, soggy ground conditions are preferred. This means the remaining peat is wet and that plants that prefer wetter conditions, like bog cotton and reeds will thrive.
- Many Bord na Móna bogs can not be restored back to raised bog, as so much peat has been removed and the environmental conditions have been modified. However, other natural habitats will develop like shallow wetlands with reedbeds and birch woodland, and in time a naturalised peatland can be restored.
- Re-wetting peat is also better for climate action. This reduces carbon emissions as re-wetting the remaining peat reduces carbon losses such as the production of Carbon Dioxide, the main Greenhouse Gas. The site is expected to still be a reduced carbon source for some time, but eventually the carbon sink function can re-establish in suitable conditions in parts of the bog, as peat-forming conditions are restored. This will take some time.
- The development of a range of habitats in Lodge Bog will support biodiversity including plants, insects, birds and mammals. This includes some species that are rare and protected in the wider landscape. It will increase the national area of native woodland. Many wetland and peatland habitats in the wider landscape have been reclaimed for agriculture and other uses and peatland rehabilitation is an opportunity to create new wetland and peatland habitats.
- Lodge Bog was drained and developed for industrial peat production in the 1970s. Peat production ceased in 2020. Much of the centre and west of the site has begun to revegetate, with the eastern part of the site dominated by bare peat. A small part of the western part of the site has already been subject to rehabilitation in 2018 and has established pioneer peatland and wetland habitats.
- Bord na Móna are currently developing a proposal for wind energy development that includes Lodge Bog. This project is known as Ballydermot Windfarm. This project is currently in the pre-planning stage and where part of the planned infrastructure occurs within Lodge bog, these areas have been constrained from this rehabilitation plan. Infrastructure will include connecting roads, cabling, a sub-station and supporting infrastructure. No wind turbines are proposed for Lodge Bog. Any other proposed development will be planned in adherence to relevant planning guidelines and will consider the rehabilitation and the condition of the site. The proposed renewable energy project is expected to have

a small footprint on Lodge Bog. In advance of this proposed planning submission, it is planned to rehabilitate **the majority** of Lodge Bog in 2022. Any remaining rehabilitation will be carried out after the renewable energy construction is complete.

- Measures proposed for Lodge Bog include internal drain blocking and other measures required to raise water levels to the surface of the peat (changing levels of pipes for example). Some fertiliser will be spread on headlands and other areas (a small part of the overall area) to encourage vegetation growth. In addition, cell bunding is proposed in areas of residual deep peat.
- These rehabilitation measures will be planned by a team consisting of ecologists, hydrologists and engineers. It is a principle of Bord na Móna rehabilitation planning that no actions will be taken that would negatively impact on adjacent land. No boundary drains will be blocked. Water will still leave the site via the existing outlets.
- Bord na Mona plan to carry out this work in 2022.
- It will take some time for vegetation and habitats to fully develop at Lodge bog, and a peatland ecosystem to be restored. However, it is expected that most of the site with bare peat will be developing pioneer habitats after 5-10 years. Other areas where pioneer habitats have already established will continue to develop.
- Peatland rehabilitation of these bogs will bring a range of benefits to the local community via improvements to the local landscape and is also important for supporting national policies and strategies in relation to reduction of carbon emissions from these peatlands, supporting biodiversity and improvements to water quality.
- The western marginal remnant of Lodge Bog containing remnant high bog and birch woodland was gifted to the IPCC by Bord na Móna in 2005. It is now managed by the IPCC as a nature reserve and is not part of the scope of this rehabilitation plan.

SUMMARY

Name of bog: Lodge **Area:** 408 ha

Site description:

- Lodge Bog was drained and developed for industrial peat production in the 1970's. Lodge Bog formerly supplied milled horticultural peat and fuel peat. Industrial peat production ceased in 2020.
- Lodge had a partially pumped drainage regime to support industrial peat extraction.
- The former peat production footprint now comprises bare peat, mosaics of pioneer vegetation and some emergent scrub habitats. Some active drainage channels are present on site.
- Peat depths are varied across the site. A large portion of the east of the site contains peat depths in excess of 2.6 metres. Much of the central portion of the site contains shallow peat, largely between 0-1 metre, with deeper peat at the bog boundary/near headlands.
- Lodge bog is drained by the Slate River, located adjacent to the south of the site boundary. The Slate River is a tributary of the Figile River, which is in turn a tributary of the River Barrow.

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.
- Carrying out enhanced rehabilitation with the application of enhanced peat rehabilitation measures to re-wet peat and slow water movement across the site. The site has developed a mosaic of pioneer cutaway habitats in some areas; notably on shallow peat/gravel ridges or in low lying wetter depressions. Rehabilitation will focus on targeted actions to raise water levels in areas where there is still significant bare peat cover. This site will develop a mosaic of compatible wetland and cutaway peatland habitats.
- Part of the west of the site has previously been subject to some rehabilitation. These areas have developed a mosaic of wetland (Reedswamp and poor fen) and pioneering Birch woodland. As such, these areas are now largely vegetated and stabilising.
- Optimising hydrological conditions for the development of fen, reed swamp and wet woodland on shallow cutaway peat, and eventually naturally functioning peatland and wetland habitats.
- Stabilisation or improvement in water quality parameters (e.g. suspended solids).
- Environmental stabilisation.
- Rehabilitation will support the National Policies on Climate Action and GHG mitigation by maintaining and enhancing the current 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 Lodge Bog.
- EPA IPC Licence - Ref. PO-503-01. 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 enhanced rehabilitation measures defined in the Scheme (PCAS), which are designed to exceed/meet the standard stabilisation requirements as defined by the IPC Licence and to enhance the ecosystem services of Lodge Bog, in particular, optimising **climate action benefits**.

- The local environmental conditions of this bog. Lodge Bog has variable environmental characteristics with a range of residual peat depths, and variable hydrology and topography. Lodge is suited to cutaway wetland development, particularly in the central and western sections where low lying areas occur.
- The key goals and outcomes of rehabilitation at this bog outlined above.
- Minimising potential impacts on neighbouring land. Some boundary drains around Lodge Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballydermot Windfarm. This proposed project is in the pre-planning stage. The proposed renewable energy project has a small footprint on Lodge Bog.

Criteria for successful rehabilitation:

The Criteria for successful rehabilitation for IPC Licence validation and for climate action verification have been defined as:

- Rewetting of residual peat in the former area of industrial peat production to slow water movement across the site to retain silt, accelerating the development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat (IPC Licence validation) through the creation of compatible fen, reed swamp, wet woodland and other wetland and peatland habitats.
- Stabilising or reducing key emissions to water (e.g. potential silt-run-off). 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 (WFD) (IPC Licence validation). This will be measured by the EPA WFD monitoring programme.
- Optimising the extent of suitable hydrological conditions to optimise climate action (Climate action verification).
- 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 fen, reed swamp, wet woodland, heath, scrub, embryonic *Sphagnum*-rich peat forming communities, birch woodland habitats, where conditions are suitable, and eventually towards a reduced carbon source/carbon sink (Climate action verification). These habitats will generally establish initially as pioneer vegetation. It will take some time for stable naturally functioning peatland habitats to fully develop at Lodge Bog.
- Improvement in biodiversity and ecosystem services. (Climate action verification).

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 drainage management assessment.
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation.
- Carry out proposed measures, which will be a combination of targeted drain blocking, peat field re-profiling, modifying outfalls and water level management.
- Phase 2 measures may include fertiliser application targeting bare peat areas on headlands, high fields and other areas, and further water level management.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning schedule.
- 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:

- 2021-2022. Short-term planning actions.
- 2022. Short-term practical actions.
- 2022-2024. Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate, where necessary.
- 2025 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 and Ireland's National Recovery and Resilience Plan, Bord na Móna in developing a package of measures, 'the Scheme', for enhanced decommissioning, rehabilitation and restoration of cutaway peatlands referred to as, the Peatlands Climate Action Scheme'. However, only the additional costs associated with the additional and enhanced rehabilitation, i.e., measures which go beyond the existing standard mandatory decommissioning and rehabilitation requirements arising from Condition 10 will be eligible for support.
- 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, 2021). 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 Lodge Bog, as required to meet Condition 10 of the IPC Licence, is defined as:

- There will be initial quarterly monitoring assessments of the site to determine the general status of the site, the condition of the silt-ponds, assess the condition of the rehabilitation work, asses the progress of natural colonisation, monitoring of any potential impacts on neighbouring land and general land security. The number of site visits will reduce after 2 years to bi-annually. These site visits will assess the need to any additional rehabilitation.
- **Water quality monitoring** will be established. Monitoring of key water quality parameters 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 required 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 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 PCAS 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 of discharge is stabilising or improving.
- The site has been environmentally stabilised.

INTRODUCTION

Lodge Bog is located adjacent to Lullymore and is 3 km west of Allenwood in Co. Kildare, see Drawing no. *BnM_DR23_21_01 'Bog Site Location'*, Appendix XIII. Bord na Móna operates under IPC Licence issued and administered by the EPA to extract peat within the Allen-Lullymore bog group (Ref. 503). It was part of the former Ballydermot bog group. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the cutaway boglands within the licensed area. The bog is part of the Lodge bog group (see Appendix II for details of the bog areas within the Allen-Lullymore bog group, Ref. 503).

This document seeks to address the requirements of Condition 10.2 of IPC License Ref. Ref. PO 503-01:

> "*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;
- 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 Scheme will be supported by Government through the Climate Action Fund and Ireland's National Recovery and Resilience Plan, administered by the Department of Environment, Climate and Communications (DECC), while the National Parks and Wildlife Service (NPWS) will act as the Scheme regulator. Bord na Móna have identified a footprint of 33,000 ha as peatlands suitable for this scheme. This Scheme will significantly go beyond what is required to meet rehabilitation and decommissioning obligations (Appendix VII & IX) under existing EPA IPC licence conditions. Improvements supported by the Scheme will ensure that environmental stabilisation is achieved (meaning IPC obligations are met), and importantly, significant additional benefits, particularly relating to climate action and other ecosystem services, will also be delivered.

Only the costs associated with the additional, enhanced and accelerated rehabilitation, i.e. those measures which go beyond the existing decommissioning and rehabilitation requirements arising from Condition 10, will be eligible for support under the Scheme. Bord na Móna 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.

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

1.1 Constraints and Limitations

This document only covers the area of Lodge Bog, see Drawing no. *BnM_DR23_21_01 'Bog Site Location'*, Appendix XIII.

Bord na Móna are currently developing a renewable energy project called Ballydermot Windfarm. This proposed project is in the pre-planning stage. The proposed renewable energy project has a small footprint on Lodge Bog. This area has been constrained from this plan. Any further peatland rehabilitation measures integrated into the proposed windfarm constraint area will **either** be in association with a proposed renewable energy project, with peatland rehabilitation integrated into the proposed project, **or** will be completed in the absence of any proposed renewable energy project. It is expected that Bord na Móna will revise and update the rehabilitation plan for Lodge bog when this renewable energy development is complete. Bord na Móna remain fully committed to rehabilitating the whole bog and meeting the conditions of the IPC Licence. Any consideration of any other future after-uses for Lodge Bog, such as renewable energy, 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.

Industrial peat extraction at Lodge Bog permanently ceased in 2020. Currently the former peat production area comprises both bare peat, some re-vegetated areas and open water. The combination of active rehabilitation measures and natural colonisation will quickly establish and/or increase the extent of pioneer vegetation and will be planned to accelerate environmental stabilisation. Nevertheless, it will take some time (30-50 years) for naturally functioning peatland ecosystems to fully re-establish.

Parts of Lodge Bog (outside the areas owned and under the control of Bord na Móna) are currently being used by domestic turf cutters for intensive private sod peat production. 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 Lodge Bog that are outside of the control of Bord na Móna. Nevertheless, Bord na Móna are aware of such issues which may constrain the proposed rehabilitation actions, and this rehabilitation plan considered potential impacts of these on the delivery of the stated objectives.

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

METHODOLOGY

This rehabilitation plan was developed with a combination of desktop and field surveys, consultations with internal and external stakeholders and cognisance of the Scheme (PCAS). The development of this rehabilitation plan considered **recently published** guidance issued by the EPA in 2020 – ***Guidance on the process of preparing and implementing a bog rehabilitation plan***.

The ecological information and site information collected during the Bord na Móna ecological baseline survey, additional confirmatory site visits 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 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 Lodge 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.
- Pschenyckyj et al., 2021, *Optimising Water Quality Returns from Peatland Management while Delivering Co-Benefits for Climate and Biodiversity*, Report produced for An Fóram Uisce, Online, Available at: https://thewaterforum.ie/app/uploads/2021/04/Peatlands_Full_Report_Final_March2021b.pdf, Accessed 17.08.2021.
- 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:

- Lullymore Integrated Pollution Control Licence;
- Lullymore Annual Environmental Reports;
- Review of the National Biodiversity Data Centre (NBDC) webmapper;
- Inland Fisheries Ireland (IFI) Reports;
- Environmental Protection Agency database (www.epa.ie);
- EPA Guidance on Requests for Alterations to a Licensed Industrial or Waste Activity;
- BirdWatch Ireland online data (including I-WeBS and CBS datasets; www.birdwatchireland.ie);
- Geological Survey of Ireland - National Draft Bedrock Aquifer map;
- Geological Survey of Ireland - Groundwater Database (www.gsi.ie);
- National Parks & Wildlife Services Public Map Viewer (www.npws.ie);

- National Parks & Wildlife Services Article 17[1] and Article 12[2] data;
- 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 2021;
- Spatial data in respect of Article 17 reporting, available online at https://www.npws.ie/maps-and-data/habitat-and-species-data/article-17.

2.2 Consultation

A number of stakeholders have been identified during the course of Bord na Móna's rehabilitation and Biodiversity Action Plan activities and will be 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. Additional ecological walk-over surveys and visits have taken place at Lodge Bog in 2021 to inform rehabilitation planning and habitat maps have been updated, where required. This rehabilitation plan is informed by the original baseline survey as well as subsequent site walk-over surveys and visits, and updates to baseline data.

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

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

[1] https://www.npws.ie/publications/article-17-reports

[2] https://www.npws.ie/status-and-trends-ireland%E2%80%99s-bird-species-%E2%80%93-article-12-reporting

SITE DESCRIPTION

Lodge Bog is located adjacent to Lullymore and is 3 km west of Allenwood in Co. Kildare, see Drawing no. *BnM_DR23_21_01 'Bog Site Location'*, Appendix XIII. The location of Lodge bog within the Ballydermot bog group (Ref. 503) is provided in Drawing no. *BnM_DR23_21_24 'Bog group map'*, Appendix XIII. Other BnM bogs in the area include Killinagh to the north and Ballydermot (Barnaran) to the west. There is a BnM rail network connecting Lodge Bog to Barnaran and the wider Ballydermot network, see Drawing no. BnM_ DR23_21_02_"*Structures and sampling"*, Appendix XIII. Lodge bog is bounded by the R414 along part of the northern boundary, and this road separates Lodge Bog from the adjacent Killinagh bog. It also divides Lodge Bog from the adjacent Barnaran bog to the west.

The surrounding landscape comprises of a mosaic 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. Several sections of remnant raised bog are located along the margins of the site, see Drawing no. BnM_DR23_21_17 '*Current habitat map*', Appendix XIII. A small area within the east of the site has also been used for the production of domestic turf. A small area of plantation forestry also occurs in the wider area, outside the northwest of the site.

Lodge Bog has a partially pumped bog drainage whose water table will be below the surrounding water table for part of the site. It can be expected that if pumps are turned off or pumping is reduced that water tables will rise internally and part of the site will develop wetlands, depending on local topography and water courses. There are a series of deep trench drains through the bog at regular intervals that form part of the main drainage system. These drains are open and are flanked by high fields on both sides. There are two main catchments located within the bog, separated by the central east-west railway line and travel path. A number of silt ponds occur in close proximity to the eastern boundary of the site. Lodge bog is drained by the Slate River, located adjacent to the south of the site boundary. The Slate River is a tributary of the Figile River, which is in turn a tributary of the River Barrow.

The majority of the production bog is dominated by bare peat cover. A narrow band of raised bog remnant, scrub and birch woodland separates the site from the Slate River to the southeast. A relatively large part of the bog containing remnant high bog, birch woodland and some scrub along the western margin was gifted to the IPCC by BnM in 2005. It is now managed by the IPCC as a nature reserve and is intensively monitored. There is a small amount of pioneer cutaway vegetation developing at Lodge Bog (production-related cutaway). The ends of several fields have come out of production along the south-west margin of the bog where peat has been exhausted and the mixed till sub-soil is now exposed. These fields are colonising with a range of pioneer communities, dominated by poor fen. Some of the more-established vegetation is dominated by Soft Rush and Bog Cotton on lower fields where it is wetter. This area has now been re-wetted (2017) as part of a rehabilitation trial. Some dry grassland has developed along the railway on the central headland. The railway has been un-used for some time and parts are being overgrown with scrub.

3.1 Status and Situation

3.1.1 Site history

- Lodge Bog was originally developed as a sod peat bog and was only converted to milled peat in 2000. A small area to the south of the site continued to be used for commercial sod moss production. A rail line through Lodge is still present.

3.1.2 Current land-use

Industrial peat production has now permanently ceased at Lodge Bog. Bord na Móna are currently developing a proposal for wind energy development that includes Lodge Bog. This project is known as Ballydermot Windfarm. This project is currently in the pre-planning stage.

Some small areas of turbary and former licenced plots also occur within the site boundary.

3.1.3. Socio-Economic conditions

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

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

In respect of Lodge Bog, jobs included in the above study would have included those to facilitate extraction of peat at this site, and associated processing and transfer to the relevant power station.

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

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

3.2 Geology and Peat Depths

3.2.1 Sub-soil geology

Published bedrock and Quaternary geological maps only present the shallowest deposits encountered and fail to present in information on the buried peat substrate. Coring carried out by RPS in 2021 across Lodge Bog provided further insight into the deposits underlying the site, particularly when combined with GPR data concerning the elevation of the peat substrate.

Combining the two datasets reveals the lowest lying areas of the site to be underlain by (below c. 72.5mOD) and lacustrine clay (below c. 74mOD), while there are a number of ridges of more elevated material (rising to >77mOD). This has been interpreted as glacial till based on coring identifying gritty clayey material in these locations and based on comparable features present in the surrounding area. The lacustrine deposits encountered would be expected to limit vertical losses to depth in areas where this occurs.

Mixed gravel till is exposed in some places at the ends of fields that are developing as cutaway and within the deep drainage ditches under peat across the bog. The majority of the central and northern parts of the site contain residual peat of 0-1m in depth, much of which is associated with gravel ridges that runs east-west through the site.

3.2.2 Peat type and depths

Peat depths are varied across the site. A large portion of the east of the site contains peat depths in excess of 2.6 metres. Much of the central portion of the site contains shallow peat, largely between 0-1 metre, with deeper peat at the bog boundary/near headlands. See Figures BNM-DR-23-09-04: *Lodge Bog Peat Depths* in the accompanying map book.

The main peat type exposed at this site is black fen peat. There is some *Sphagnum* peat exposed towards the south-eastern section, where the bog is higher. Peat depths here have been recorded in excess of 2.6 metres.

3.3 Key Biodiversity Features of Interest

The majority of the site can be rated as local importance (lower value) (NRA, 2009) as the majority of the site comprises bare peat and was managed primarily for industrial peat production until 2019. Some of the marginal lands within the site boundary, containing remnant bog, cutover bog, woodland or dry heath have been assessed as of local importance (higher value) in a local context (NRA, 2009). Some small areas of the Lodge cutaway bog are beginning to develop pioneer cutaway wetland habitats (poor fen, reed swamp, birch scrub).

The majority of the production bog within the east of the site, which came out of production most recently, is dominated by bare peat cover, see Plate 3.1. Some of the vegetation along existing drainage network has developed into linear strips of birch woodland. The production bog is divided into two main sections to the north and south and these are separated by a headland with a railway orientated east-west. Much of the central and western parcels of Lodge bog have developed pioneering cutaway vegetation (production-related cutaway), see Plate 3.2. In some areas within the central and western part of the site, the ends of several production fields have revegetated where peat has been exhausted and the mixed till sub-soil is now exposed. These fields are colonising with a range of pioneer communities, dominated by poor fen. Some of the more-established vegetation is dominated by soft rush and bog cotton on lower fields where it is wetter, see Plate 3.2.

Some higher fields have colonised with a mosaic of pioneer dry grassland communities where it is higher and better drained. These include vegetation dominated by purple moor-grass, some pioneer dry calcareous grassland with species such as knapweed, ox-eye daisy and glaucous sedge, dry grassland dominated by sweet vernal-grass and yorkshire fog and some more established vegetation dominated by cocksfoot and false oatgrass. The pioneer nature of these communities is obvious with horsetail, cocksfoot and willowherb all present. These grassy areas generally cover a small area. Marsh helleborine was found in this vegetation on sub-soil associated with both purple moorgrass and the more calcareous grassland community.

Some dry grassland has developed along the railway on the central headland. This was dominated by the sweet vernal-grass-dominated community. The railway has been un-used for some time and parts are being overgrown with scrub. Some sections along the railway were also developing rank grassland dominated by cocksfoot and false oat-grass.

A relatively large part of the bog containing remnant high bog (PB1), birch woodland (WN7) and some scrub along the western margin was gifted to the IPCC by BnM in 2005. The other margins of the production bog contain

typical marginal peatland habitats. There is a mosaic of birch woodland (WN7), active cutover bog (used by private sod peat cutters) and some remnant bog along the southern margin.

The large trench drains that run north-south through the site are important wildlife corridors for a variety of flora and fauna in the area, see Plate 3.3. The drainage network discharges to the Slate River that occurs outside the southeast of the site. These habitats are ecologically important in a local context and support a wide variety of specie. Saw sedge (*Cladium mariscus*) was identified within one of the silt ponds within the east of the site. This species is indicative of alkaline water chemistry, likely associated with the exposed shell marl within the centre of the site and the depth of some of the trench drains that form the drainage network.

There are small high bog remnants and cutover bog around the margins, see Plate 3.4. In addition, two parcels of high remnants have also been used for sod-peat production, see Plate 3.5. These areas consist of dry heath type vegetation. Some areas of the scrub and birch woodland also occur within the marginal lands.

Basil thyme was noted at a number of locations along the railway track that divides the site and at the southern end of the site, see Plate 3.6. This species is listed on the Flora Protection Order. Basil thyme would not be a typical species of cutaway bog. The exposed gravel along the railway embankments is a perfect habitat for this species.

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

A habitat map of Lodge Bog is shown in Drawing reference no. BnM DR23_21_17 '*Current habitat map' in the Map book*, Appendix XIII of this report. Plate 6.7 provides an example of developing pioneering cutaway vegetation on former cutaway production bog.

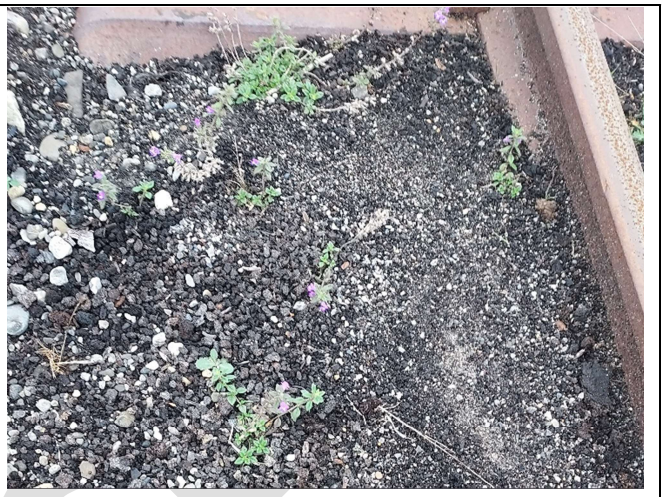
Plate 3.1 Example of cutaway bare peat occurring within the east of the site. This section contains large areas of deep peat.

Plate 3.2 Example of developing pioneering cutaway vegetation on former cutaway production bog.

Plate 3.3 Example of large trench drains that run north-south through the site.

Plate 3.4 Example of remnant sections of raised bog occurring within the south and east of the site. Not old drainage network (right of photo).

Plate 3.5 Example of cutover bog associated with sod peat production. The vegetation comprises of a dry heath type vegetation community, with Sphagnum papillosum and Sphagnum magellanicum occurring in places.



Plat3 3.6 Example of Basil thyme occurring along the old railway track on site.

Plate 3.7 *Example of developing pioneering cutaway vegetation on former cutaway production bog (Drone photography September 2021).*

3.3.2 Species of conservation interest

A number of species of conservation concern utilize the habitats available at Lodge Bog. The following is a summary of the records of these species available within BnM records.

Multiple mammal species have been recorded at Lodge Bog. Evidence of badger (*Meles meles*), fox (*Vulpes Vulpes*), pine marten (*Martes martes*), hare (*Lepus timidus hibernicus*) and common frog (*Rana temporaria*) were observed on site during BnM walkover surveys.

Lepidopteran (butterfly) and Odonata (dragonflies and damselflies) species recorded on site included; marsh fritillary butterfly, ringlet (*Aphantopus hyperantus*), green-veined white (*Pieris napi*), meadow brown butterfly (*Maniola jurtina*), large white butterfly (*Pieris brassicae*), small heath (*Coenonympha pamphilus*), small tortoiseshell (*Aglais urticae*), blue tailed damselfly (*Ischnura elegans*), common darter (*Sympetrum striolatum*) and four-spotted chaser (*Libellula quadrimaculata*). Six-spotted burnet moth (*Zygaena filipendulae*) noted on bog along the central access. Buff-tailed bumblebee (*Bombus terrestris*) has also been recorded. During a BnM walkover surveys in August 2021, a marsh fritillary butterfly larval web was recorded in suitable habitat to the west of the site, indicating the presence of a population within the site. Additional areas of suitable habitat occur at other locations at the site margins and along site access tracks.

The site is used by small numbers of golden plover (*Pluvialis apricaria*) in the winter (Biosphere Environmental Services 2014). Snipe (*Gallinago gallinago*) have been recorded during the breeding season on site. Kestrel (*Falco tinnunculus*) and buzzard (*Buteo buteo*) have also been recorded during recent walkover surveys of the site and suitable habitat exists at the margins. Other more common species recorded within the site include; willow warbler (*Phylloscopus trochilus*), mallard (*Anas platyrhynchos*), wood pigeon (*Columba palumbus*), swallow (*Hirundo rustica*), long-tailed tit (*Aegithalus caudatus*), green finch (*Carduelis chloris*), hooded crow (*Corvus cornix*), chiffchaff (*Phylloscopus collybita*), skylark (*Alauda arvensis*), jay (*Garrulus glandarius*), blue tit (*Cyanistes caeruleus*) and grey heron (*Ardea cinerea*).

3.3.3 Invasive Alien Species

No non-native invasive species, listed on the Third Schedule of the EC Birds and Natural Habitats Regulations, have been recorded within the site during Bord na Mona site.

3.4 Statutory Nature Conservation Designations

Lodge bog is not located within or adjacent to any EU Designated sites i.e. Special Areas of Conservation (SAC) or Special Protection Area (SPA). The nearest EU Designated sites in the wider area include the Long Derries - Edenderry SAC (over 5.5km to the northwest), Ballynafeagh Lake SAC (over 6km to the east of the site), Ballynafeagh Bog SAC (over 7.6km to the east of the site), Mouds Bog SAC (over 5.8km to the southeast of the site), Pollardstown bog SAC (over 7.6km to the southeast of the site) and the River Barrow and River Nore SAC (over 15.3km to the southwest of the site). The nearest SPAs to the site are located a significant distance from Lodge Bog (over 19km from the site); these include the River Boyne and River Blackwater SPA, the Slieve Bloom Mountains SPA, Poulapouca Reservoir SPA and the Wicklow Mountains SPA.

This rehabilitation plan will be subject to the Appropriate Assessment process, as per Article 6 of the EU Habitats Directive 92/43/EEC.

There are no Natural Heritage Areas (NHAs) in close proximity to Lodge bog. The nearest NHA is Hodgerstown Bog NHA, located in excess of 7.5km to the east of the site. The nearest non-statutory designated sites i.e. proposed Natural Heritage Areas (pNHAs) in the wider area around Lodge bog is the Grand Canal, located over 500 metres to the south and north of the site.

3.5 Hydrology and Hydrogeology

Lodge forms part of the Barrow Catchment (Catchment ID : 14) as defined by the EPA under the Water Framework Directive (WFD) and is primarily situated within the Figile_SC_010 sub-catchment, with a small portion of the bog falling within the Slate_SC_010 sub-catchment. The bog is located west of Allenwood and to the east of Lullymore. The bog contains several drainage pathways and discharge locations, with the majority of the bog discharging to the Slate River to the South-east and east of the bog.

Regional hydrological data suggest that Lodge receives average precipitation of 826mm/yr (1981-2010), with an estimated evapotranspiration rate of c. 524mm/yr. A , leaving an average effective precipitation of 302mm/yr. Assuming no recharge to groundwater and no groundwater contribution to discharge from the bog, the available precipitation that may become runoff (assuming no change in storage) is 302mm/yr, which equates to an annual runoff rate of c. 3,020m3/ha.

Lodge Bog is partially pumped, with the pump located along the eastern boundary. It is proposed to turn off the pump and implement an altered gravity drainage design (see the accompanying Lodge Engineering Report and Drawing no. BnM_DR23_21_02 '*Structures and sampling*'). There are a series of deep trench drains through the bog at regular intervals that form part of the main drainage system. The bog has field drains running in a general north to south orientation. Pipes collect water and direct discharge towards silt ponds and discharge points. There are two main drainage catchments located within the bog, separated by the central east-west railway line and travel path. A number of silt ponds occur in close proximity to the eastern boundary of the site. Lodge bog is drained by the Slate River, located adjacent to the south of the site boundary. The Slate River is a tributary of the Figile River, which is in turn a tributary of the River Barrow.

GSI data indicates that Lodge Bog is underlain by the Boston Hill Formation and Waulsortian Limestones, both of which are classified as a locally important aquifers as they are moderately productive only in local zones. There are no mapped karst features in the surrounding landscape according to Geological Survey of Ireland (GSI) mapping. No data exists concerning depth to bedrock, and there are no mapped areas of exposed bedrock in the immediate vicinity of the bog.

The main subsoil types in the surrounding area includes till derived from limestone which occurs to the north, north-west and south of the bog, while alluvium is mapped along the south-eastern and eastern boundary along the Slate River. Groundwater vulnerability for Lodge Bog is typically low level whilst the surrounding areas generally ranges between low to moderate and moderate to high in sections. While Groundwater Vulnerability is typically used to indicate the susceptibility to groundwater pollution, it can provide a useful proxy indication of likely groundwater flow rates in the surrounding area.

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.

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.

3.6 Emissions to surface-water and water-courses

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

Silt ponds are the key silt control infrastructure to control potential emissions from industrial peat production sites. As required under licence, BNM have a number of procedures for how it manages and maintains its silt pond network. The silt that builds up in silt ponds is excavated on a regular basis by Bord na Móna to facilitate an efficient level of silt control. Silt ponds will continue to be maintained during the rehabilitation and decommissioning period. Silt pond decommissioning will be considered when sites are deemed to be on a trajectory of environmental stability and peatland rehabilitation has been completed. There are silt ponds at several locations within Lodge Bog. The silt ponds discharges into the Slate stream, a tributary of the River Figile, which in turn discharges to the River Barrow. Lodge bog is therefore located in the within the Barrow Catchment.

Lodge bog has two treated surface water outlets to the Slate River IE_SE_14S010100 SLATE_050. The Slate river is at Risk regarding its water quality classification, was indicated as being under pressure from peat and peat extraction and is indicated as remaining so in the third cycle River Basin Management Plan, currently under preparation.

Details of silt ponds, associated surface water emission points and those being monitored and sampled as part of the PCAS scheme are detailed on the accompanying structures map along with water quality map. See Drawing number BNM-DR-23-21-02 titled “Structures and Sampling”, along with Drawing number BNM-DR-23-21-WQ01 titled “Water Quality Map” included in the accompanying Mapbook, which illustrate the various drainage and water quality infrastructure present at Lodge.

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 3.0mg/l and COD 100mg/l.

Initial monthly results are included in Appendix XIII. These results are for 13 months from November 2020 to Dec 2021 and indicate the baseline water quality from a minimum of 70% of the bogs catchment. This was the first full summer season without any peat extraction and as expected, some of the key water quality parameters that can impact water quality from peat extraction activities (such as suspended solids) remained relatively static. These also show a downward trajectory in the latter half of the year. During this period, ammonia also indicating a consistent profile, with various trends evident from the two silt ponds, which service similar peat topography from either half of Lodge bog catchment. Lodge bog was a source of both milled fuel and horticultural peat prior

to peat extraction ceasing, and as such, ammonia levels will be indicative of the mixed peat types present. All other parameters fluctuated slightly, most likely influenced by normal weather patterns, especially rainfall.

Monthly ammonia concentrations from November 2020 to December 2021 had a range of 0.027 to 0.664 mg/l with an average of 0.342 mg/l.

Results for suspended solids for the same period indicate a range of 2 to 13mg/l with an average of 4.25 mg/l.

From an analysis of any monitoring over the past 5 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 with some exceedances in the COD trigger level (Table 3.1).

Table 3.1 Surface water monitoring results for Lodge.

Bog	SW	Monitoring	Sample Date	pH	SS	TS	Ammonia	TP	COD	Colour
Lodge	SW-60	Q3 20	11/08/2020	7.6	11	270	0.208	0.19	95	360
Lodge	SW-61	Q3 20	11/08/2020	7.7	3	276	0.356	0.05	76	294
Lodge	SW-60	Q1 19	20/02/2019	8	5	264	0.02	0.05	43	91
Lodge	SW-61	Q1 19	20/02/2019	7.8	5	314	0.94	0.05	52	195
Lodge	SW-60	Q3 17	31/08/2017	8.1	8	270	0.19	0.05	58	168
Lodge	SW-61	Q3 17	31/08/2017	8.1	6	238	0.2	0.05	63	202
Lodge	SW-60	Q3 16	12/08/2016	8.1	8	364	0.66	0.05	71	49
Lodge	SW-61	Q3 16	12/08/2016	8.2	5	368	0.65	0.05	64	18

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/rehabilitated peatlands normally improves as a result 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 Project and ongoing Bord na Móna rehabilitation is expected to have a positive impact on water quality and help the NWBMP deliver its objectives in relation to the WFD.

Water will still discharge from designated emission points when rehabilitation at Lodge Bog has been completed. The existing silt the silt pond will continue to be maintained and operated as long as required, or such point as they can be decommissioned, with no change in outfall type This discharge will have improving water quality and there will be increased wetland attenuation, meaning slower release of water. This is expected to have a positive impact on status of the key downstream water body receptors, and is expected to support the improvement of the current and future status of Silver River, currently assessed as being of Moderate Status.

3.7 Fugitive Emissions to air

None

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

3.8 Carbon emissions

The bog is likely to be a carbon source as it is a drained (degraded) peatland with currently active drainage, which facilitates the oxidation of peat. 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 C-sink function.

It is expected that Lodge 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 the success of the rehabilitation measures, the extent of development of *Sphagnum*-rich or other peat-forming habitats, the balance of carbon fluxes from different cutaway habitats and future climatic conditions. The site is expected to develop Reed Swamp and fen habitats, with a small portion expected to develop *Sphagnum*-rich vegetation/embryonic raised bog. Birch woodland is expected to develop on the drier mounds and peripheral headlands.

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 Lodge Bog.

There has been ongoing consultation about rehabilitation, biodiversity and other general issues over the years about the Allen-Lullymore group bogs including Lodge Bog with various stakeholders in relation to:

- IPCC Lodge Bog Nature Reserve and management plan (IPCC).
- General consultation with range of stakeholders at annual Bord na Mona Biodiversity Action Plan review days 2010-2018.
- Bord na Móna Biodiversity Action Plan 2016-2021 Review – held in Lullymore in 2018.
- Lodge Bog re-wetting trial (2016-2021) (IPCC and Birdwatch Ireland Kildare). Annual walks of the site with IPCC.
- Lodge Bog *Sphagnum* inoculation trial (2018-2021) (Site visit with NPWS, Community Wetlands Forum, UCD in 2021).
- Peatland rehabilitation in Kildare (2020) (presentation to Kildare County Council and public representatives) and occasional consultation with various local public representatives.
- Peatland rehabilitation in Kildare (2020) (presentation to local Green Party representatives).
- Midlands & East Regional WFD Operational Committee (River Basin Management Plans).
- Archaeological Liaison Committee (National Museum of Ireland & Dept of Culture Heritage and the Gaeltacht).

Local stakeholders will continue to be identified through ongoing engagement with neighbours whose land adjoins Lodge 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 Lodge Bog.

All correspondence received will be acknowledged and evaluated against the rehabilitation work proposed here, and the final draft of the Lodge 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**. Optimising hydrology for the development of embryonic *Sphagnum*-rich vegetation communities on deep peat, and eventually naturally functioning and peatland habitats.
- Optimising hydrological conditions for the development of reed swamp and fen on shallow more alkaline peat and other subsoils.
- Optimising hydrological conditions for the protection of exposed archaeological structures, their retention in situ and preservation into the future, where possible.
- Integrating peatland rehabilitation with planned renewable energy infrastructure on site.
- The main goal and outcome of this plan is the successful rehabilitation (environmental stabilisation) of peatlands used for industrial peat production at the bog in a manner that is acceptable to both external stakeholders and to Bord na Móna and which optimise climate action and other ecosystem service benefits.

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

- It will take some time for stable naturally functioning habitats to fully develop at Lodge 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.
- Some rehabilitation has already been carried out in recent years within the west of Lodge bog. However, some additional works are proposed to further optimise the hydrological conditions within this area.
- 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). However, extensive areas of deep *Sphagnum* peat do remain within the southern and most northern parcels of the bog and do have potential to develop *Sphagnum*-rich habitats in this timeframe. Areas within the centre of the site have been largely cutaway with shallow peat. In addition, areas of shell marl and fen peat remain in this area and as such, will develop fen and reedbed type habitats in the future. Nevertheless, re-wetting across the entire bog, as part of the Scheme, will improve habitat conditions of the whole bog, making the overall bog wetter. 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).
- Re-wetting in general will benefit the future preservation of most known and unknown archaeological features. An Archaeological Impact Assessment (AIA) is to be carried out under the PCAS scheme.
- Bord na Móna have also carried out peatland rehabilitation on other bogs in the catchment including Ummeras bog, located close to Monesterevin, in 2021. There are expected to be cumulative water quality and other ecosystem service benefits to receiving water bodies such as the associated tributaries and downstream to the River Barrow, from rehabilitation more than one bog in the same catchment.

6. SCOPE OF REHABILITATION

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

- The area of Lodge Bog (Drawing reference no. DR23_21_01 '*Bog site location', Appendix XIII of this report*).
- EPA IPC Licence - Ref. PO-503-01. As part of Condition 10.2 of this license, a rehabilitation plan must be prepared for permanent rehabilitation of the cutaway boglands within the licensed area. Lodge bog is part of the Allen-Lullymore bog group.
- The Scheme is designed to exceed the stabilisation requirements as defined by the IPC Licence. This Scheme is designed to enhance the ecosystem services of Lodge Bog, in particular, optimising **climate action benefits**. The proposed interventions will mean that environmental stabilisation 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 Lodge Bog identify cutaway re-wetting as the most suitable rehabilitation approach for the shallow peat areas within the site. In some central parts of the site, where shallow peat depths remain, there is an alkaline influence on the water chemistry. This means that re-wetting will lead to the development of fen, reed swamp and other associated wetland/peatland habitats.
- Some of the western part of Lodge bog has already largely vegetated and stabilised as a result of previous rehabilitation works. A mosaic of wetlands, fen habitats and establishing Birch woodland now support local wildfowl and waders occurring. The wetland areas within the west of the site is now considered rehabilitated. The aerial photo demonstrates the contrast between the rewetted area within the west and those areas that remain drier. Additional measures are needed to optimise the hydrological regime across the site in order to maximise the areas extent of areas that can be rewet.
- Proposed land-use. Bord na Móna are currently developing a renewable energy project called Ballydermot Windfarm. This proposed project is in the pre-planning stage. The proposed renewable energy project is expected to have a small footprint on Lodge Bog. It is planned to integrate rehabilitation with future proposed development.
- Rehabilitation of Lodge Bog will support multiple National strategies of climate action, biodiversity action and other key environmental strategies such as the Water Framework Directive.
- The time frame for the delivery of the planned rehabilitation will be undertaken according to available resources and appropriate constraints.
- Some rehabilitation measures are proposed on the marginal cutover bog zone at the peripheries of the bog. It is not proposed to carry out rehabilitation on all marginal or peripheral cutover bog zones.

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 bogs where there has not been significant industrial peat extraction and the peat body is largely intact (deep peat sites that are drained). At other bogs, 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), and there will therefore be different habitat outcomes (wetlands, fen, heathland, grassland and birch woodland).

- At Lodge Bog, much of the bog has been cutaway, particularly the central and northern sections. There are local factors that will influence the future trajectory of this site (the site has been partially pumped to manage water levels within the east of the site) which need to be considered as part of the wider rehabilitation work.
- **Current/future land-use.** Planned renewable energy development. It is expected that parts of the site will be part of the proposed Ballydermot Windfarm. This project is currently in pre-planning and layout design is advanced. No turbines are planned for Lodge Bog. Infrastructure will include supporting access, cables and an electrical sub-station and works to the existing overhead transmission line. Any proposed rehabilitation measures (i.e. targeted drain-blocking) will be integrated to enable the planned renewable energy development. The potential impact of this infrastructure on the rehabilitated area is expected to be relatively minor and it does not change the overall goals and outcomes of the proposed rehabilitation (re-wetting residual peat) for the overall site. See Lodge Bog: Mapbook, which outlines the proposed cutaway footprint to be rehabilitated with PCAS enhanced rehabilitation measures (drawing number BNM-DR-23-21-05):
- **Surrounding landscape and neighbours.** Another key constraint is the interaction between the Bord na Móna sites and the surrounding landscape. Care must be taken that no active rehabilitation management is carried out that could negatively and knowingly impact on surrounding land. This includes any hydrological management on neighbouring farmland. It is anticipated that the work proposed here (blocking drains and re-wetting cutaway peatlands) will not have any flooding impacts on adjacent land. For example, agricultural grassland occurs outside of, but adjacent to, the eastern corner of Lodge bog.
- **Archaeology**. The discovery of monuments or archaeological objects during peatland rehabilitation may potentially constrain the rehabilitation measures proposed for a particular area. If this occurs, rehabilitation measures will be reviewed and adapted. An archaeological impact assessment of the proposed rehabilitation at Lodge Bog will be carried out (see Appendix XII). There is some known archaeology at this site.
- **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.

6.2 Key Assumptions

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

6.3 Key Exclusions

The scope of this rehabilitation plan does not cover:

- The longer-term raised bog restoration trajectory of the site. The plan covers the short-term rehabilitation **actions** and **an additional monitoring and after-care programme** to monitor the rehabilitation during the Scheme and to respond to any needs (failure of environmental stabilisation for

example). It is expected that this rehabilitation plan will set the site on an enhanced and accelerated trajectory towards environmental stabilisation and wetland creation. 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 Lodge Bog.
- The longer-term management of this site for other uses in the future. This will require further engagement with stakeholders.
- Bord na Móna are currently planning to build a windfarm on cutaway bog in the Ballydermot area. This project is known as Ballydermot Windfarm. Lodge Bog is expected to be part of this project. Rehabilitation will be integrated with this proposed renewable energy project. Where the proposed infrastructure is situated within Lodge bog, this area has been constrained from 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.

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

Rehabilitation is generally defined by Bord na Móna as

- stabilisation of bare peat areas via targeted active management (e.g. drain-blocking/re-wetting) slowing movement of water across the site and encouraging natural colonisation, and,
- mitigation of key emissions (e.g. 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 run off of suspended solids and to encourage development of vegetation cover via natural colonisation, and reducing the area of bare exposed peat. Table 7.1 provides 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 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) 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. This will be measured by the EPA Water Framework Directive monitoring programme.

With regard to predicting and estimating likely trends that might materialise 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, see Plate 7.1.

Similarly monitoring of surface water ammonia emissions from a Corlea bog in Mountdillon over 3 yrs. post cessation of peat extraction with ongoing rehabilitation, indicate downward trends, see Plate 7.2.

As the monthly monitoring program at Lodge continues in 2022 during the rehabilitation works, and data from the 2021 monitoring program is compiled, further trending will be produced to verify any ongoing trends.

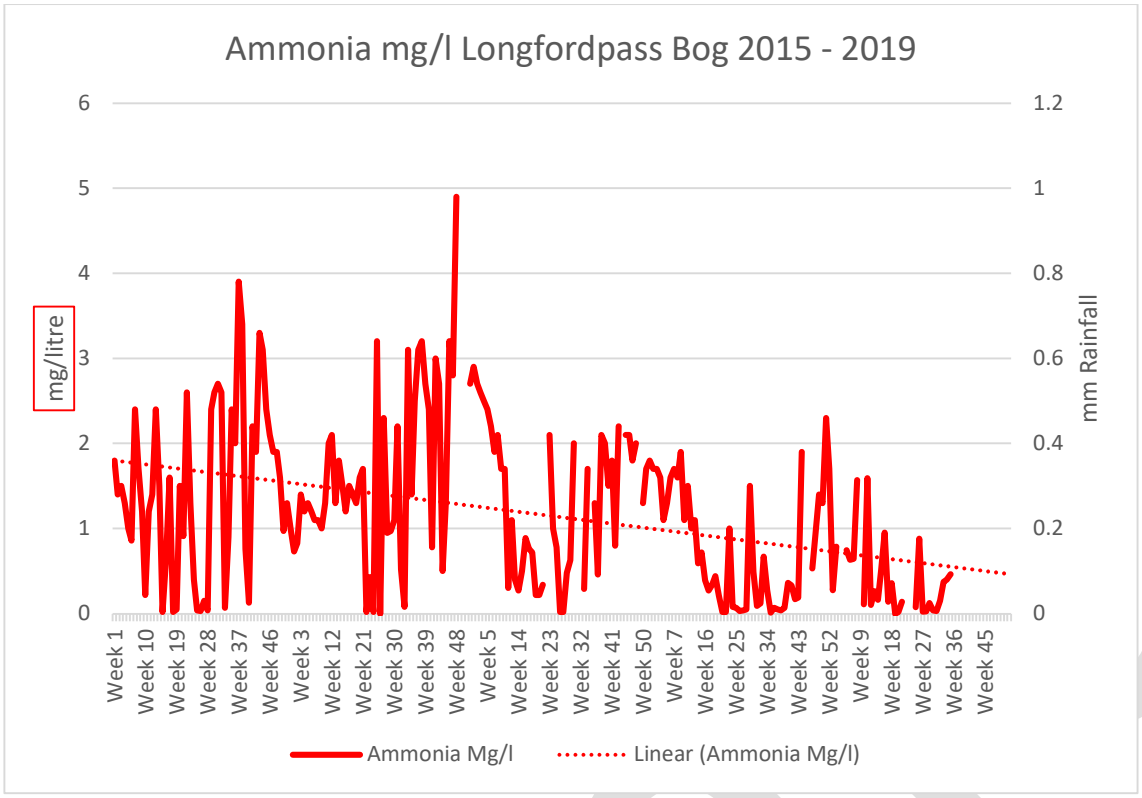


Plate 7.1 Example of decreasing ammonia emissions at Longfordpass bog following cessation of peat extraction and commencement of rehabilitation.

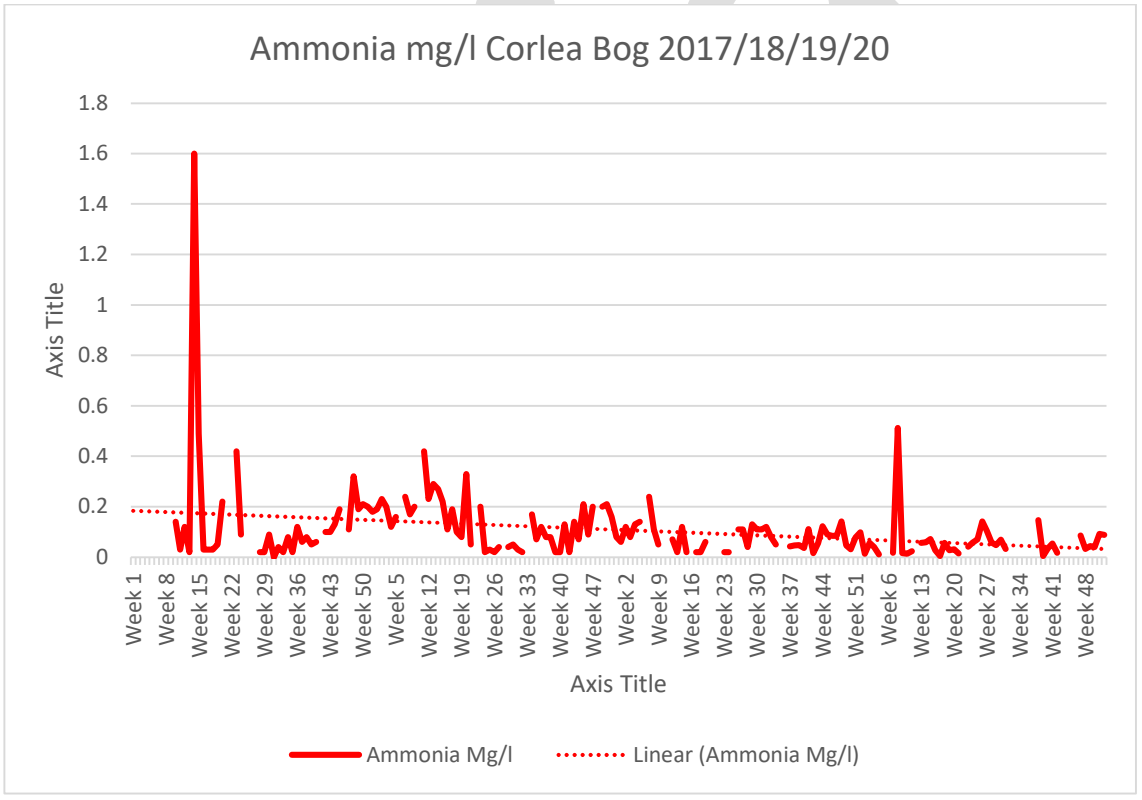


Plate 7.2 Example of decreasing ammonia emissions at Corlea bog following cessation of peat extraction and commencement of rehabilitation.

7.1.1 Additional criteria for successful rehabilitation for the optimisation of climate action and other ecosystem service benefits:

- Optimising the extent of suitable hydrological conditions to optimise climate action and other ecosystem service benefits (optimising residual peat re-wetting). This will be measured and demonstrated by site monitoring (updated aerial photography) to measure the extent of suitable hydrological conditions.
- Accelerating the trajectory of the site towards becoming reduced carbon source/part 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.
- 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, fen, reed swamp, wet woodland, heath, scrub, birch woodland, and embryonic *Sphagnum*-rich peatland communities, where conditions are suitable. These habitats will generally establish initially as pioneer vegetation. It will take some time for stable naturally functioning habitats to fully develop at Lodge Bog. This will be demonstrated by the reduction in bare peat and the establishment of further pioneering habitats. This will be measured via aerial photography, habitat mapping and cutaway/habitat condition assessment.
- 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 etc). This will be measured by collecting a range of scientific data that can then quickly be adapted and into metrics that can be used to measure changes in various ecosystem services. Baseline monitoring will be carried after rehabilitation is completed (during the Scheme). It is proposed that sites can be monitored against this baseline in the future. These metrics will be defined in the context of the overall Scheme resources and after consultation with stakeholders.

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

Criteria type	Criteria	Target	Measured by	Expected Time-frame
IPC validation	Rewetting in the former area of industrial peat production	Delivery of rehabilitation measures Reduction in bare peat.	Aerial photography after rehabilitation has been completed – to demonstrate measures (drain-blocking) Establishment of a baseline for future monitoring of bare peat, vegetation establishment and habitat condition.	2022-2025
IPC validation	Key water quality parameters Ammonia, Phosphorous, Suspended solids (silt), 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 river catchment (WFD)	No decline in the WFD status of the local river catchment	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.	2022-2025
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.	2022-2025

Criteria type	Criteria	Target	Measured by	Expected Time-frame
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.	2022-2025
Climate action verification	Biodiversity and ecosystem services. Habitat establishment Presence of key species – Sphagnum	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 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.	2022-2025

Meeting climate action verification criteria and monitoring of these criteria after the Scheme has been completed is dependent on support from PCAS 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 and Ireland's National Recovery and Resilience Plan.
- **Bord na Móna to have sufficient resources (staff and training) to deliver the planned rehabilitation with required associated skills and competencies.**
- **Bord na Móna to have sufficient resources (suitable machinery) and staff to maintain this machinery.**
- **Weather conditions to be within normal limits over the rehabilitation plan timeframe.** Long periods of wet weather have the capacity to significantly affect ground conditions and constrain the delivery of

rehabilitation. The potential impact of wet weather on ground conditions can be reduced by appropriate planning and management. Bord na Móna have significant experience of managing these issues through 70 years of working in these peatland environments.

- **Rehabilitation measures to be effective.** The rehabilitation measures proposed in this plan are based on 40 years of Bord na Móna experience of peatland management and best 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 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 remaining peat depths, topographical and hydrological modelling (depression analysis) will be important in planning the future peatland landscapes and planning the use of the most appropriate rehabilitation methodologies to maximise climate action benefits. Depression analysis indicates those areas that are likely to re-wet when drains are blocked, based on the current topography, and areas where water levels may have to be modified, where needed. Enhanced rehabilitation measures will look to optimise hydrological conditions for re-wetting peat in other areas. This planning is also essential for matching the most sustainable rehabilitation methodology to the most suitable cutaway environment to maximise the benefits of the resource outlay (maximising cost/benefit).

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

BNM-DR-23-21-22 titled **Lodge Bog: Aerial Imagery2020**

BNM-DR-23-21-04 titled **Lodge Bog: Peat Depths**

BNM-DR-23-21_03 titled **Lodge Bog: LiDAR Map**

BNM-DR-23-21_09 titled **Lodge Bog: Depression Analysis**

The rehabilitation actions themselves will be a combination of PCAS measures to re-wet peat. The distribution of these measures is provisionally outlined in drawing titled BNM-DR-23-21-05 “Rehabilitation Measures” in the accompanying Map book. (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 measures for Lodge Bog will include**:**

- Assessment of the pumping regime and removal of the pump on site, if this has no significant external impact. Initial hydrological modelling indicates that parts of the centre and west of the site will develop a mosaic of open water and wetland habitats with permanent deeper water. A gravity drainage solution is being proposed. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible). It is inevitable that some sections will naturally have deeper water due to the topography at this site. Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal regime of water fluctuation will develop, with water-levels fluctuating in association with levels in the adjacent watercourses and associated groundwater conditions.
- Initial hydrological modelling (depression analysis) indicates that a significant part of the centre of Lodge bog has the potential to retain wet conditions. It is anticipated that this will develop a mosaic of wetland and peatland habitats. Hydrological management will look to optimise summer water levels to maximise the extent and development of wetland vegetation.
- Re-wetting the extensive areas of peat remaining on site within the former production area using berms and drain blocking.
- Undertaking intensive drain blocking, modifying outfalls and managing overflows in areas where depression analysis predicts wet conditions will occur. Drain blocking will also occur across other areas in order to retain surface water locally.

- Modifying water levels at outfalls, as it may be desirable to change and control water levels at the site over time, e.g. to increase water levels as the site becomes increasingly vegetated. This will further slow the movement of water through and out of Lodge bog.
- The creation of berms across some sections of the bog to control/retain water levels. This measure seeks to retain shallow (< 10 cm) water conditions across multiple fields.
- Re-wetting some deep peat areas of the bog through regular more intensive drain blocking using an excavator to create peat dams/blockages along each field drain, along with field re-profiling and drain infilling if required;
- Re-wetting the deep peat areas of the bog using berms, drain blocking 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;
- Seeding of vegetation and inoculation of *Sphagnum* will be undertaken where required. In some areas where vegetation has already established, seeding of vegetation is not required.
- Some targeted drain blocking in marginal (degraded) remnant raised high bog areas is proposed as part of this plan, although they are small in size and degraded nature.
- The existing silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase the silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that the silt ponds are not required, as the bog has been successfully stabilised and there is no run-off of suspended solids, the condition of the silt ponds will be reviewed. The 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).
- Targeted fertiliser applications to accelerate vegetation establishment on areas of bare peat on headlands and high fields as required, see Drawing no. DR_23_21_28 '*Targeted fertiliser map*'.
- Peat field re-profiling to reduce the camber of the fields and cell-bunding between high fields to manage/optimise water levels for revegetation.

Table 8.1: Types of and areas for enhanced rehabilitation measures at Lodge Bog.

Type	Code	Enhanced Rehabilitation Measure	Extent (Ha)
Additional Land	AW2	Minimal/targeted works required	26.24
Archaeological constraint		Known archaeology	0.11
Constraints		Ballydermot windfarm constraint	41.57
Dry Cutaway	DCT2	More intensive drain blocking (7/100 m) + blocking outfalls and managing overflows	55.66
Deep Peat	DPT2	More intensive drain blocking (7/100 m) + blocking outfalls and managing overflows with a controlled weir outfall	6.68
Deep Peat	DPT4	Berms and field re-profiling (45m x 60m cell) + blocking outfalls and managing overflows + drainage channels for excess water + Sphagnum inoculation	90.24
Marginal land	MLT1	No work required	29.29
Marginal land	MLT2	More intensive drain blocking (max 7/100 m)	6.11
Silt Ponds	Silt Ponds	No work required	1.59
Wetland	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	60.63
Wetland	WLT4	More intensive drain blocking (max 7/100 m), + blocking outfalls and managing overflows + transplanting Reeds and other rhizomes	90.2
Grand Total			**408.3**

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

- Seek formal approval of the enhanced plan, noting the alternative adapted standard plan should funding from the 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 (with the Scheme) will be applied to Lodge Bog. This will take account of peat depths, topography, drainage and hydrological modelling (depression analysis). (See map 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;
- An Archaeological Impact Appraisal (AIA) will be undertaken. This will carry out a review of known archaeology and an archaeological impact appraisal of the proposed rehabilitation. Incorporate the results of this appraisal into the rehabilitation plan to minimise known archaeological disturbance, where possible;

- Carry out a review of issues that may constrain rehabilitation such as known rights of way, turbary and existing land agreements. There are no known rights of way at Lodge bog.
- Carry out a review of remaining milled peat stocks. It is expected that all peat stocks will eventually be removed or decommissioned.
- Carry out an ecological appraisal of the potential impacts of the planned rehabilitation, such as the presence of sensitive ground-nesting bird breeding species (e.g. curlew, ringed plover or lapwing) or marsh fritillary butterfly larval webs, etc. The scheduling of rehabilitation operations will be adapted, if needed. Surveys will be scoped and carried out based on the baseline ecological survey and previous knowledge of sites.
- Ensure all activities comply with the environmental protection requirements of the IPC Licence.
- An Appropriate Assessment (AA) of the Rehabilitation Plan will be undertaken. Incorporate any required mitigation measures from the AA in the plan for the delivery of rehabilitation and decommissioning across the site in accordance with the phasing and timeframe of the rehabilitation plan.
- Track implementation and enforcement of the relevant IPC Licence conditions, the mitigation measures (AA) and other environmental control measures during the implantation of the rehabilitation plan.

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

- Carry out proposed measures as per the detailed site plan. This will include a combination of hydrological management, drain blocking, peat field re-profiling and cell-bunding. All rehabilitation will be carried out with regard to best practice environmental control measures (Appendix IV).
- Monitor the success of rehabilitation measures in relation to developing suitable hydrological conditions.
- Carry out the proposed monitoring, as outlined in Section 9 of this report and accompanying documents.
- 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 will include fertiliser application on high fields and headlands (where there is bare peat).
- Silt-ponds will be monitored during this period and there will be continued maintenance and cleaning to prevent run-off of suspended solids from the site during the rehabilitation phase.
- Submit an *ex post* report to the Scheme regulator to verify the eligible measures to be carried out in year 1 of the Scheme, and an *ex ante* estimate for year 2 of the Scheme; and so on for each year of the Scheme

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

8.4 Timeframe

- 2021-2022. Short-term planning actions.
- 2022. Short-term practical actions.
- 2022-2025. Long term practical actions. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- 2025. Decommission silt-ponds, if necessary.

8.5 Budget and costing

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

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

Bord na Móna maintains a provision on its balance sheet to pay for the future costs of **standard** rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year - for more information see the Bord na Móna Annual Report (Bord na Móna 2021). 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 deep peat habitats, wetland habitats, shallow cutaway areas, drier areas, and regenerating bog communities across the bog (See Appendix I).

9. AFTERCARE AND MAINTENANCE

9.1 Programme for monitoring, aftercare and maintenance

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

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

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

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

- Vegetation and habitat monitoring after rehabilitation is completed using a cutaway bog condition assessment (Similar to ecotope mapping). This assessment will include assessment of on environmental and ecological indicators such as vegetation cover, vegetation communities, presence of key species, Sphagnum cover, bare peat cover and water levels. It is proposed that sites can be monitored against this baseline in the future.
- The condition of the bog can be assessed using the condition assessment and suitable Greenhouse Gas (GHG) emission factors can be assigned to different habitats. GHG emission factors have been determined for various peatland habitats in Ireland (Wilson *et al.*, 2015) and are constantly being refined with more and more research. 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. A breeding bird and Pollinator monitoring programme will be established. Specific pollinator indicators will be monitored (i.e. bees and butterflies). To be defined in relation to monitoring of the overall 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.

10. REFERENCES

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

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

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

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

Bord na Móna (2019). From Brown to Green. Bord na Móna Annual Report 2019. https://www.bordnamona.ie/wp-content/uploads/2019/07/Bord-na-M%C3%B3na-Annual-Report-2019_FINAL.pdf

Bord na Móna (2021) Rethink. Renew. Restore. Annual Report 2021. Online, Available at: https://www.bordnamona.ie/wp-content/uploads/2021/07/Bord-na-Mona_Annual-Report-2021-English.pdf, Accessed 28.07.2021

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Fernandez, F., Connolly K., Crowley W., Denyer J., Duff K. & Smith G. (2014) Raised Bog Monitoring and Assessment Survey (2013). Irish Wildlife Manuals, No. 81. National Parks and Wildlife Service, Department of Arts, Heritage and Gaeltacht, Dublin, Ireland.

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

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

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

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

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

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

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

Mackin, F., Barr, A., Rath, P., Eakin, M., Ryan, J., Jeffrey, R. & Fernandez Valverde, F. (2017) Best practice in raised bog restoration in Ireland. Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

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

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

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

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

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

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

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

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

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

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

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

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

Schouten, M.G.C. 2002. Conservation and Restoration of Raised Bogs: Geological, Hydrological and Ecological Studies. Dúchas - The Heritage Service of the Department of the Environment and Local Government, Ireland; Staatsbosbeheer, the Netherlands; Geological Survey of Ireland; Dublin.

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

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

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

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

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

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

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

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

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

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

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

Scope of rehabilitation

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

- EPA IPC Licence - Ref. P0503. 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. Lodge bog is part of the Allen-Lullymore bog group (Ref. 503).
- A key objective of rehabilitation, as defined by this licence, is **environmental stabilisation** of the bog.
- The area of former industrial peat production at Lodge Bog as defined by Drawing no. BnM_DR23_21_01 '*Bog Site Location*', Appendix XIII. Industrial peat production has now permanently ceased at Lodge Bog.
- Minimising potential impacts on neighbouring land. Some boundary drains around Lodge Bog will be left unblocked as blocking boundary drains could affect adjacent land.
- Land-use: Bord na Móna are currently planning to build a windfarm on cutaway bog in the Ballydermot area. This project is known as Ballydermot Windfarm. Lodge Bog is expected to be part of this project. Rehabilitation will be integrated with this proposed renewable energy project. Where the proposed infrastructure is situated within Lodge bog, this area has been constrained from this rehabilitation plan.

Rehabilitation goals and outcomes

The key rehabilitation goal and outcome for Lodge Bog is environmental stabilisation of the site via 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 peatland habitats.

Criteria for successful rehabilitation:

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

Rehabilitation targets

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

Rehabilitation measures: (see Figure Ap-1)

- Blocking field drains in the former industrial production area and creating regular peat barriers (three barriers per 100 m) along each field drain.
- Re-alignment of piped drainage.
- Realignment of gravity outfalls (where needed).
- Fertiliser treatment of high fields and headlands (typically slow to naturally re-colonise) to encourage natural colonisation, if needed.
- No measures are planned for the surrounding marginal peatland habitats.
- Silt ponds will continue to be maintained during the rehabilitation and decommissioning.
- Evaluate success of short-term rehabilitation measures and enhance where necessary.
- Decommissioning of silt-ponds will be assessed and carried out, where required.

Timeframe:

- 2022. 1st phase of rehabilitation. Field drain blocking with dozer/excavator.
- 2023. 2nd phase. Further realignment of piped drainage and other re-wetting measures dependent on success of 1st phase re-wetting, as determined by ongoing monitoring of water levels and re-vegetation.
- Other enhancement measures such as fertiliser treatment will be carried out, if needed. These will be determined by ongoing monitoring.

- 2024-2025. Evaluate success of short-term rehabilitation measures outlined above and remediate where necessary.
- 2024-2025. Decommission silt-ponds, if necessary.

Budget and Costing

- Bord na Móna maintains a Provision on its balance sheet to pay for the future costs of rehabilitation and decommissioning when industrial peat extraction ceases. This is updated every year. For more information see the Bord na Móna Annual Report (Bord na Móna, 2021). 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 has been allocated to the site based on the area of different cutaway types across the bog.

Table AP-1. Rehabilitation measures and target area.

Type	Code	Description	Area (Ha)
Additional Land	AW1	Minimal/targeted works required	26.24
Dry Cutaway	DCT1	Blocking outfalls and managing water levels with overflow pipes	55.66
Deep Peat	DPT1	Regular drain blocking (3/100 m) + blocking outfalls and managing water levels with overflow pipes	96.92
Marginal land	MLT1	No work required	35.4
Other	Silt ponds	Silt ponds	1.59
Wetland	WLT1	Turn off or reduce pumping to re-wet cutaway + blocking outfalls and managing water levels with overflow pipes	150.83
Constraint			41.68
Grand Total			408.3

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 any 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, Suspended Solids, Total Solids, Total Phosphorus, Total Ammonia, Colour, and Chemical Oxygen Demand (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.
- The water quality monitoring demonstrates that water quality of discharge is stabilising or improving.
- The site has been environmentally stabilised.

APPENDIX II: BOG GROUP CONTEXT

The Allen Bog Group comprises 2 main sub-groups: Clonsast (17 bog units, 2 land units used for transport & 1 transport link) and Lullymore (15 bog units & 1 land unit (farmland) acquired for linkages).

The Allen -Lullymore Bog Group is located mainly in counties Kildare and Offaly. The majority of these associated bogs are located in the River Barrow Catchment and some bogs are located in the River Liffey catchment.

The Lullymore Bogs sub-group is mostly situated in west Co. Kildare and overlaps with Co. Offaly. The core area extends across an area between Rathangan and Edenderry (9 km north-south and 10 km east-west). A second section of peatland is found further east (Timahoe North and South Bogs) and is separated from the core area by the Grand Canal. The core area of the Lullymore Bogs sub-group is very much a continuous area of bogland (Bog of Allen) that has developed according to the local topography and been sub-divided by Bord na Móna for administrative purposes. The Edenderry-Rathangan Road crosses the main section and is bordered by milled peat production bog.

The Lullymore Bogs sub-group has had a long industrial peat production history. Sod peat for fuel was originally produced at Lullymore and in the Timahoe Bogs, which then supplied at old power station at Allenwood (now demolished). Milled fuel peat was then supplied to Edenderry Power Station, Co. Offaly) via the Bord na Móna industrial railway. Many bogs have now been in industrial peat production for a number of decades.

An agricultural research station was also established at Lullymore by An Foras Talúntais to investigate the potential future after-uses of cutaway bog. Agricultural grassland was also established in this area by Bord na Móna. This grassland has now been sold to local farmers. A large area of cutaway at Lullymore was also developed for conifer forestry by Coillte.

Bord na Móna also maintains transport links and an industrial railway through some of the cutaway that has developed in the Lullymore Bogs sub-group. The Long Derries SAC is located south of Ticknevin Bog. Ticknevin also contains a relatively large area of remnant raised bog that was never developed by Bord na Móna. This area, called Cloncannon bog, was assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS 2014).

Much of the Allen -Lullymore Bog complex became cutaway as long term peat extraction activity reduced the peat reserves on individual bogs. Rehabilitation measures comprising naturalisation and development of alternative after-uses have been already explored at the Allen -Lullymore Bog Group, including coniferous forestry, biomass, agricultural grassland, amenity use, rare species conservation management and wetland creation. Some of this was carried out in the 1980s Several rehabilitation trials (test programmes) have been developed more recently, where different techniques have been trailed and implemented. While agricultural fields and coniferous forestry have been developed successfully on the cutaway bogs, it was found that these require financial investment that generally exceeds any potential commercial output value.

Much of the earliest cutaway was developed from sod peat production, and therefore had deeper remnant peat. The first forestry trials on cutaway were developed at Clonsast Bog (Trench 14) in the 1960's and this informed much of the forestry development across Bord na Móna cutaway. About 260 ha of cutaway and marginal bog was developed for conifer forestry by Coillte at Lullybeg, Lullymore, Glashabaun South and Killinagh in the Lullymore sub-group. There is ongoing management of these areas by Coillte. More recently, new forestry trials (90 ha) were established at Derrybrennan and Killinagh by Bord na Móna.

Wetlands enhancement with the blocking of the main outfall has also been carried out at Lullymore (2009). There has been ongoing targeted management to maintain and raise water levels in 2016 & 2017 with the construction of a berm to block a low-lying corner, blocking of other outfalls and the construction of an overflow piped outfall. Some cutaway at Lullymore used as a spread-ground for sod peat up until recently was treated with fertiliser to enhance natural colonisation. This trial has been very successful.

Bord na Móna have also transferred ownership of two separate parcels of land to the Irish Peatland Conservation Council. The first section was an intact remnant of raised bog at Lodge Bog. The second was an area of cutaway called Lullymore West. Both areas are now being managed as nature reserves by the IPCC. A small portion of cutaway at Lullymore has recently been leased to Lullymore Heritage Centre for amenity and educational use and Bord na Móna assisted with its rehabilitation. Bord na Móna are also working with Butterfly conservation Ireland to manage another area of cutaway at Lullybeg for butterfly conservation. This site contains Marsh Fritillary (a rare butterfly species listed in Annex II of the EU Habitats Directive).

The Long Derries SAC is located south of Ticknevin Bog. Ticknevin also contains a relatively large area of remnant raised bog that was never developed by Bord na Móna. This area, called Cloncannon bog, was assessed by consultants for NPWS as part of the review of the raised bog Natural Heritage Area network (NPWS 2014).

Industrial peat extraction in the Allen-Lullymore Group ceased in 2020. Decommissioning for the Allen Group started in 2021 at a number of individual bogs and rehabilitation is expected to start in 2021. There is still some historical energy peat stock remaining on some bogs and these peat stock will be transferred via the BnM rail network to Edenderry Power Station up to 2024 when the power station is expected to have ceased using peat

Bord na Móna is currently developing a wind energy project called Ballydermot Windfarm. This proposed project is in the pre-planning stage. It is expected to be submitted to planning in 2021. This proposed project is expected to have a footprint on the majority of bogs in Allen – Lullymore. Bord na Móna is currently developing a project with ESB to develop solar energy at Timahoe North bog. Part of Timahoe South Bog has been re-developed as a waste disposal and composting facility (Drehid).

A breakdown of the component bog areas for the Allen - Lullymore Bog Group IPC License Ref. P0503-01, and current, indicative Peat Production Status, is outlined in Table Ap-2.

Table Ap-2a: Allen - Lullymore Group names, area and indicative status (Allen - Lullymore sub-group)

Bog Name	Area (ha)	Stage of development	Land-Use and History	Peat Production Cessation	Rehab Plan Status
Ballydermot	902	Peat extraction since 1940s Peat extraction ceased in 2020 Parts completely cutaway Parts still have deep peat	Ballydermot formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Some small sections supplied sod moss for horticultural use. Some areas of cutaway are developing pioneer cutaway vegetation communities. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning.	2020	Draft 2017
Barnaran	499	Peat extraction since before 1975 Peat extraction ceased in 2020 Parts completely cutaway Parts still have deep peat	Barnaran formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Parts used for turf production in recent years. Some areas of cutaway are developing pioneer cutaway vegetation communities.	2020	Draft 2017

			Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning.		
Blackriver	790	Peat extraction since before 1975 Peat extraction ceased in 2020 Majority completely cutaway	Blackriver formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Parts used for turf production in recent years. Some areas of cutaway are developing pioneer cutaway vegetation communities. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning.	2020	Draft 2017
Codd	548	Peat extraction since before 1975 Peat extraction ceased in 2020 Majority of bog still has relatively deep peat	Codd formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Some small sections supplied sod moss for horticultural use. Majority of the site is bare peat. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning. .	2020	Draft 2017
Derrybrennan	224	Peat extraction since 1940s Peat extraction ceased in 2020 Majority completely cutaway	Derrybrennan formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Cutaway habitats are emerging. Mostly vegetated. Part used as a BnM commercial forestry trial. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning.	2020	Draft 2017
Glashabaun North	493	Peat extraction since before 1975 Peat extraction ceased in 2020 Majority completely cutaway	Glashabaun North formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Cutaway habitats are emerging. Mosaic of pioneer vegetation and bare peat Long Derries SAC. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning. .	2020	Draft 2017
Glashabaun South	569	Peat extraction since 1940s Part cutaway since 1980s Peat extraction completely ceased in 2020 Majority completely cutaway Parts still have deep peat	Glashabaun South formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Parts used for turf production in recent years. Cutaway habitats are emerging. Mostly vegetated. Part planted with conifer forestry – Leased to Coillte. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning. .	2020	Draft 2017
Killinagh	245	Peat extraction since 1940s Part cutaway since 1990s. Ceased milled peat extraction in 2000s Peat extraction complexly ceased in 2020 Majority completely cutaway Parts still have deep peat	Killinagh formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Parts used for turf production in recent years. Cutaway habitats are emerging. Mostly vegetated. Part used as a forestry trial.	2020	Draft 2017
Lodge	432	Peat extraction since before 1975 Peat extraction completely ceased in 2020 Mosaic of peat depths, part cutaway Parts still have deep peat	Lodge formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Some small sections supplied sod moss for horticultural use. Some areas of cutaway are developing pioneer cutaway vegetation communities. Wetlands cutaway rehab trial BeadaMoss Sphagnum inoculation trial. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning. .	2020	To be updated 2021
Lullybeg	271	Peat extraction since before 1975	Lullybeg formerly supplied turf for fuel and energy and latterly milled peat for electricity	2020	Draft 2017

		Part cutaway since 1990s. Ceased milled peat extraction in 2015 Mosaic of peat depths, part cutaway	production. Parts used for turf production in recent years. Part planted with conifer forestry – Leased to Coillte Cutaway habitats are emerging. Mostly vegetated. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning. .		
Lullymore	184	Peat extraction since 1940s Part cutaway since 1980s. Ceased milled peat extraction in 2000s. Peat extraction completely ceased in 2015 (turf) Majority completely cutaway	Lullymore formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Parts used for turf production in recent years. Part planted with conifer forestry – Leased to Coillte Cutaway habitats are emerging. Mostly vegetated. Cutaway - zoned for biodiversity Wetlands rehabilitation trial Carbon Flux research Part-leased to Lullymore Heritage Group - amenity	2020	Draft 2017
Ticknevin	459	Peat extraction since 1980s Peat extraction ceased in 2020 Majority of bog still has relatively deep peat	Ticknevin formerly supplied turf for fuel and energy and latterly milled peat for electricity production. Cloncannon bog remnent – zoned for biodiversity Mostly bare peat. Expected to be part of the proposed Ballydermot Windfarm, which is currently in pre-planning. .	2020	Draft 2017
Timahoe McNally	43	Never in peat extraction	Farmland Rail connection		
Timahoe North	806	Peat extraction since 1940s. Widespread BnM extraction ceased in 1990s Peat extraction completely ceased in 2020 (turf) Relatively deep peat remaining	Timahoe North formerly supplied turf for fuel and energy. It was never converted to milled peat extraction. Parts used for turf production in recent years. Cutaway habitats have developed. Mostly vegetated. BnM-ESB Solar energy project consented 2020 for part of the site.	2020	Draft 2019
Timahoe South	1699	Peat extraction since 1940s. Widespread BnM extraction ceased in 1990s Peat extraction completely ceased in 2020 (turf) Relatively deep peat remaining	Timahoe South formerly supplied turf for fuel and energy. It was never converted to milled peat extraction. Parts used for turf production in recent years. Cutaway habitats have developed. Mostly vegetated. Resource Recovery (Drehid Facility). Extension of facility in planning. Under consideration for a renewable energy project.	2020	Draft 2017

APPENDIX III: ECOLOGICAL SURVEY REPORT

Ecological Survey Report

Note: This report outlines an ecological survey of the bog. This report should not be taken as a management plan for the site as other land-uses may still be considered. Information within this report may inform the development of other land-uses and identify areas with particular biodiversity value. The report outlines potential options for biodiversity management after industrial peat production has ceased, (if this is the proposed main land-use for the site).

Bog Name:	**Lodge**	**Area (ha):**	432ha
Works Name:	Ballydermot	**County:**	Kildare
Recorder(s):	MMC	**Survey Date(s):**	08/08/2012

Ecological rating

This site can be rated as having a **low-high local ecological value (E-C)** in general. As the majority of the site is in active production, its ecological value is **E**. Some sections of cutaway have higher cutaway value **(D-C)** as do some of the remnant habitats such as the area of intact raised bog **(C)**.

Small parts of the site with species of conservation value (RDB species) have a higher value **(B).**

Habitats present (in order of dominance)

The most common habitats present at this site include:

- Bare peat (BP)
- Poor fen mosaics (pJeff) (Codes refer BnM classification of pioneer habitats of production bog. See Appendix I).
- Minor development of other poor fen communities dominated by Horsetail (pEq).
- Dry Heath and Birch scrub mosaics (dHeath and e/oBir)
- Minor development of other pioneer dry grassland communities including Sweet Vernal-grass dominated vegetation (gAn-Ho-Eq), dry calcareous grassland (gCal), rank grassland (gDa-Arr) and Purple Moorgrass-dominated vegetation (gMol).
- Silt-ponds and associated embankments of spoil.

Other habitats found around the margins of this site (not on production bog/cutaway) include:

- Raised bog remnants (PB1)
- Birch woodland (WN7) (Codes refer to Heritage Council habitat classification, Fossitt 2000), See Appendix I.)
- Scrub (WS1) (Birch scrub)
- Cutover bog (PB4)
- Dense Bracken (HD1)
- Wet grassland (GS4)

Description of site

Lodge BnM Production Bog is located adjacent to Lullymore and is 3 km west of Allenwood in Co. Kildare. It was part of the former Ballydermot bog group and now supplies milled fuel peat as part of the Derrygreenagh group to Edenderry Power. Other BnM bogs in the area include Killinagh to the north and Ballydermot (Barnaran) to the west. There is a BnM rail network connecting Lodge Bog to Barnaran and the wider Ballydermot network. The railway also travels north-east to connect Lodge with the Timahoe bogs, although this branch is now quite overgrown. Lodge bog is bounded by the R414 along part of the northern boundary, and this road separates Lodge Bog from the adjacent Killinagh bog. It also divides Lodge Bog from the adjacent Barnaran bog to the west.

A relatively large part of the bog containing remnant high bog (PB1), Birch woodland (WN7) and some scrub along the western margin was gifted to the IPCC by BnM in 2005. The IPCC are located nearby in Lullymore at the Bog of Allen Nature Centre. This section of bog had been used by the IPCC for amenity and education. It is now managed by the IPCC as a nature reserve and is intensively monitored. There has been some raised bog restoration works including drain blocking and scrub removal since 2005. The IPCC produced a conservation management plan for Lodge Bog in 2011. This area was not surveyed during this survey.

The other margins of the production bog contain typical marginal peatland habitats. There is a mosaic of Birch woodland (WN7), active cutover bog (used by private sod peat cutters) and some remnant bog along the southern margin. A small annex to the milled peat production bog is used to produce sod peat by BnM. A small part of the southern marginal zone (within the BnM GIS boundary) is grazed by cattle and is fenced off. A small area towards the south-east corner of the site seems to have been reclaimed and developed into grassland in the past. The eastern margin has similar habitat development, although there is more intensive private sod peat production on adjacent bog along the north-east margin of the site. A narrow strip of Birch woodland and scrub along the northern margin and adjacent to the road completes the marginal habitats.

The majority of the production bog is still in production and has bare peat cover. There are a series of deep trench drains through the bog at regular intervals that form part of the main drainage system. These drains are open and are flanked by high fields on both sides. One side of some of the drains are open to traffic to allow the drains to be cleaned. These verges contain a range of typical habitats including Birch-dominated scrub, dry heath mosaics, and Purple Moorgrass-dominated vegetation. Some of the vegetation has developed into Birch woodland in places. The production bog is divided into two main sections to the north and south and these are separated by a headland with a railway orientated east-west. This headland also divides the bog into two main catchments, north and south, with both draining towards the east.

There is a small amount of pioneer cutaway vegetation developing at Lodge Bog (production-related cutaway). The ends of several fields have come out of production long the south-west margin of the bog where peat has been exhausted and the mixed till sub-soil is now exposed. These fields are colonising with a range of pioneer communities, dominated by poor fen. Some of the more-established vegetation is dominated by Soft Rush and Bog Cotton on lower fields where it is wetter. Some higher fields have colonised with a mosaic of pioneer dry grassland communities where it is higher and better drained. These include vegetation dominated by Purple Moor-grass, some pioneer dry calcareous grassland with species such as Knapweed, Ox-eye Daisy and Glaucous Sedge (gCal), dry grassland dominated by Sweet Vernal-grass and Yorkshire Fog (gAn-Ho-Eq) and some more established vegetation dominated by Cocksfoot and False Oatgrass (gDa-Arr). The pioneer nature of these communities is obvious with Horsetail, Cocksfoot and Willowherb all present. These grassy areas generally cover a small area. Marsh Helleborine was found in this vegetation on sub-soil associated with both Purple Moorgrass and the more calcareous grassland community.

There is also some younger pioneer vegetation dominated by Horsetails (pEq) that is more extensive and seems to have colonised some fields only recently. These are likely to be production fields where there has been no activity in the past year or two years and some fields that have recently com out of production. This type of colonisation is seen around the site. There were also some production fields that have been inactive this summer due to wet conditions and already there is colonisation with extensive Jointed Rush seedlings appearing. Within the production areas there are also several small mounds appearing where there is more extensive vegetation along the edges of the fields on the mounds. This usually

includes dry grassland communities (gAn-Ho-Eq) and poor fen with Soft Rush. Further west towards the Shell marl-influenced area, some Marsh Arrowgrass appeared along the edges of several fields that have been in production. This vegetation was not extensive and the area was therefore mapped as bare peat. However, it does give an indication of how this area will develop if it comes out of production.

Some dry grassland has developed along the railway on the central headland. This was dominated by the Sweet Vernalgrass-dominated community. The railway has been un-used for some time and parts are being overgrown with scrub. Some sections along the railway were also developing rank grassland dominated by Cocksfoot and False Oatgrass.

There is a small annex to the production bog along the southern margin of the site. This area is being used for the production of sod fuel peat by Bord na Móna. This section has somewhat deeper peat and the margins were developing with a typical dry heath and Birch scrub mosaic that is typical of deeper peat. A small area at the western entrance to the bog is also being actively used for the production of sod peat.

The western margin of the production bog is adjacent to the Lodge Bog nature reserve, now managed by the IPCC. The edge of the high bog shows some subsidence and is bordered by a higher field that was drained but probably not put into production. This has now developed into a mosaic of dry heath-dominated vegetation and Birch scrub, with a section towards the centre developing Birch woodland where there is a mound underlying the bog. The first production field adjacent to this high field has been out of production for several years and is being colonised by pioneer Soft Rush-dominated poor fen. This field is adjacent to a stockpile, so the stockpile forms a buffer between the production bog and the nature reserve.

Basil Thyme

Basil Thyme was noted at one location along the railway at the southern end of the site and other small populations further along the railway would not be unexpected. Basil Thyme has not been recorded at this site before and would not be a typical species of cutaway bog. This species was probably unlikely to have been present on the site prior to the development of the cutaway. The exposed gravel along the railway embankments is a perfect habitat for this species. One of its main known populations in Co. Offaly is located close by at the Long Derries cSAC, Edenderry. This site was a BnM gravel pit and material from this site was used to make railway embankments. The spread of Basil Thyme from the Long Derries along the BNM railway network has been recorded in the past (Feehan pers. comm. 2011).

In the long-term, it could be expected that these railway embankments will re-vegetate with grassland and scrub as they go out of use, which will not favour this species. This can already be seen at Lodge as the railway has been unused for several years (particularly the northern branch) and has developed rank grassland communities and is being colonised with scrub. Occasional track maintenance is likely to be beneficial for this species as it will keep the gravel embankments exposed and prevent development of dense vegetation, which would be unsuitable for this species. Other BnM operations are not likely to have a significant impact on the status of this species. One possible solution is to develop some of the main railway line as an amenity walkway when production ceases. A suitable management regime to maintain the habitat of these rare plant species could easily be developed in association with the development and maintenance of these walkways. This will be considered within the wider context of the Derrygreenagh and Ballydermot Bogs, which are viewed as strongholds for the species in east Offaly. Consultation and licensing will be required with NPWS.

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

None

The Grand Canal pNHA (NPWS site code 2104) is located about 0.5 km from the south-east corner of the site.

The remnant high bog is managed as a Nature Reserve by the IPCC.

Adjacent habitats and land-use

Wet grassland (GS4), improved agricultural grassland (GA1), scrub (WS1), Birch woodland (WN7), active and inactive cutover bog (PB4), recently planted woodland (WS5) and (remnant) raised bog (PB1).

Watercourses (major water features on/off site)

- Lodge Bog is located within the River Barrow catchment.
- There are two main catchments located within the bog, separated by the central east-west railway line and travel path. Both drain to the east towards silt-ponds located along the eastern margin of the bog. Water exits from these ponds and enters the Slate River via a small stream/drain.

Peat type and sub-soils

The main peat type exposed at this site is black fen peat. There is some lighter peat exposed towards the east, where the bog is higher.

Mixed gravel till is exposed in some places at the ends of fields that are developing as cutaway and within the deep drainage ditches under peat across the bog. Shell marl is exposed along some edges of fields and in field drains towards the eastern half of the bog.

Fauna biodiversity

Birds

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

- Buzzard (hunting along eastern margin of site).
- Kestrel (hunting over south-east part of the site)
- Other more common birds noted on the site include Reed Bunting, Meadow Pipit, Wood Pigeon, Wren, Swallow, Blackbird, Blue Tit, Chaffinch, Redpoll, Grey Crow (100+ flock moving across site) and Heron.

Mammals

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

- Badger tracks were noted around the bog at several locations.
- Hare droppings were noted at several locations.

Other species

- Small Copper, Green-veined White, Large White, Meadow Brown, Ringlet, Small Heath and Small Tortoiseshell butterflies were recorded on the bog.
- 6-spotted Burnet Moth noted on bog along the central access zone.

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.
- The proposed activities will be restricted to daylight hours and there will be no requirement for artificial lighting.
- All plant and equipment for use will comply with the Construction Plant and Equipment Permissible Noise Levels Regulations (SI 359/1996).
- 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

No invasive species listed under Regulations 49 and 50 of the EC Birds and Natural Habitats Regulations were recorded within the site.

The potential for importation or introduction of non-native plant species (such as Japanese Knotweed, Himalayan Balsam, etc.) during future rehabilitation management, such as drain-blocking using excavators, has the potential to result in the establishment of invasive species within the site.

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

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

The biosecurity measures outlined above are in line with best practice guidelines issued by the National Roads Authority (NRA, 2010) – *The Management of Noxious Weeds and Non-native Invasive Plant Species on National Roads* and broadly based on the Environment Agency's (2013) – *The Knotweed Code of Practice: Managing Japanese Knotweed on Development Sites* (Version 3, amended in 2013, accessed on the Environment Agency's website on the 11th of July 2016).

In addition to the above, Best Practise measures around the prevention and spread of Crayfish plague[3] and Zebra Mussel will be adhered with throughout all rehabilitation 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 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 Allen-Lullymore bog group (Ref. 503). 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 Allen-Lullymore bog group (Ref. 503). This regulatory requirement is the main driver of the development of this rehabilitation plan.

2 The Peatlands Climate Action Scheme (PCAS)

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

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

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

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

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

3 National Climate Policy

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

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

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

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

4 National Peatlands Strategy

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

The strategy recognises that Ireland's peatlands will continue to contribute to a wide variety of human needs and to be put to many uses. It aims to ensure that Ireland's peatlands are sustainably managed so that their benefits can be enjoyed responsibly. It aims to inform appropriate regulatory systems to facilitate good decision making in support of responsible use. It also aims to inform the provision of appropriate incentives, financial supports and disincentives where required. The strategy attempts to strike an appropriate balance between different needs, including local stakeholders like turf-cutters and semi-state bodies such as Bord na Móna.

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

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

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

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

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

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

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

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

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

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

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

6 National Biodiversity Action Plan 2016-2021

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

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

7 National conservation designations

Bord na Móna operates in a wider landscape that also includes a network of European and National nature conservation sites (Special Areas of Conservation (SACs), Special Protection Areas (SPAs), National Heritage Areas (NHAs, cNHAs) and National Nature Reserves). Bord na Móna will take account of this network of conservation objectives and their conservation objectives when developing these rehabilitation plans. It is expected that peatland rehabilitation will, in general, benefit the conservation objectives of this network of nature conservation sites.

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

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

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

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

9 All-Ireland Pollinator Plan 2021-2025

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

10 Land-use planning policies

As Bord na Móna operates in many counties across Ireland, it is important to note the respective development plans in these counties. Many of the existing development plans recognise the potential that exists in the after-use of cutover/cutaway peatlands. Bord na Móna seeks to work with all of the relevant local authorities to ensure that the most appropriate after-uses are reflected in local planning policy. The following areas of consistent importance are of both direct and indirect relevance to Bord na Móna: heritage, tourism, biodiversity/conservation, landscape, renewable energy, and economy/enterprise.

11 National Archaeology Code of Practise

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

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

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

12 Bord na Móna Biodiversity Action Plan 2016-2021

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

One example of a key CBD target is:

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

The EUs headline target for progress by 2020 is to:

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

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

13 Bord na Móna commitments

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

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

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

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

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

14 Bord na Móna Strategic Framework for the future use of cutaway peatlands 2021 (Draft)

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

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

APPENDIX VII. DECOMMISSIONING

1. Condition 10 Decommissioning

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	Lodge 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	Stockpiles to be removed
4	Decommissioning or Removal of Buildings and Compounds	Decommission and Removal of Porto-cabin tea centre and materials store
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.

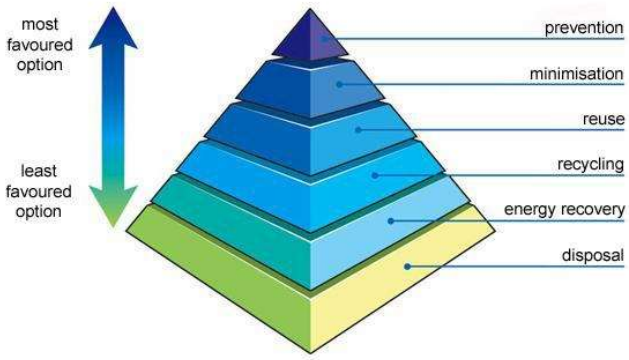
7.3.5 The tonnages and EWC Code for the waste materials listed in *Schedule 2(i) Hazardous Wastes for Disposal/Recovery* and *Schedule 2(ii) Other Wastes for Disposal/Recovery* sent off-site for disposal/recovery.

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	Lodge Decommissioning Plan
1	Removal of Railway Lines	Removal of Railway Lines
2	Decommissioning Bridges and Underpasses	Not Applicable
3	Decommissioning Railway Level Crossing	Decommissioning Railway Level Crossing where required
4	Restricting Access (bogs and silt ponds)	Restricting Access to Bog.
5	Removal of High Voltage Power Lines	Not 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 (i.e. at the margin) where the peat can not be re-wetted due to boundary constraints. Dry cutaway may also develop in situations where there a relatively steep slope that inhibits re-wetting. The majority of dry cutaway will develop towards grassland, heath, scrub and dry woodland habitats.

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

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

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

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

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

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

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

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

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

APPENDIX IX. EXTRACTIVE WASTE MANAGEMENT PLAN

(Minimisation, treatment, recovery and disposal)

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

Scope:
This plan covers IPPC Licence's Ref. P0503, Allen-Lullymore bog group.

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

1.2 Power Station screenings:
Peat from the bogs is screened 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 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 National 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 IPPC Licence Ref. PO503 -01.

APPENDIX X. MITIGATION MEASURES FOR THE APPLICATION OF FERTILISER

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

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

An map of the areas identified for targeted fertiliser application is provided in Figure APX 1 below.

APPENDIX XI. CONSULTATION SUMMARIES

Table APXI -1 Consultees contacted

Bog Name	Contact Organisation	Contact Name	Date of Issue	Communication Format	Date Response Received	Response format

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	**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	13/10/2020	First release	EMcD

Archaeological Impact Assessment of Proposed Bog Decommissioning and Rehabilitation at Lodge Bog, Co. Kildare

Draft

Report For

Bord Na Móna Energy Ltd.

Author

Dr. Charles Mount

Bord Na Móna Project Archaeologist

Introduction

The EPA (2020) *Guidance on the process of preparing and implementing a bog rehabilitation plan* notes that the licensee should characterise the bog prior to embarking on detailed planning and implementation. This characterisation should detail how the land is classified in terms of statutory protections, e.g. as European sites, world heritage sites, RAMSAR sites, National Heritage Areas, national monuments, archaeological heritage, etc. This archaeological impact assessment report was prepared by Dr. Charles Mount for Bord na Móna Energy Ltd to fulfil this characterisation in relation to archaeological heritage. It represents the results of a desk-based assessment of the impact of proposed bog rehabilitation of c.408 hectares at Lodge Bog, Co. Kildare on the known archaeological heritage of the bog. The proposed rehabilitation actions will be a combination of measures to create wetlands and re-wet deep peat as outlined in the draft Methodology Paper for the proposed Bord na Móna Decommissioning, Rehabilitation and Restoration Scheme. These enhanced measures for Lodge Bog will include:

- Re-assessment of the pumping regime; removal of the pump on site is desired if this has no significant external impact. Initial hydrological modelling indicates that parts of the centre and west of the site will develop a mosaic of open water and wetland habitats with permanent deeper water. Hydrological management will look to optimise summer water levels to maximise the development of wetland vegetation (by looking to set water depths at < 0.5 m, where possible). It is inevitable that some sections will naturally have deeper water due to the topography at this site. Water-levels will be adjusted at outfalls and by adjusting piped drainage. More sustainable permanent gravity drainage solutions will be examined. Some targeted bunding may be required. It is expected that a natural seasonal regime of water fluctuation will develop, with water-levels fluctuating in association with levels in the adjacent watercourses and associated groundwater conditions.
- Intensive drain blocking around existing wetland or standing water to create/promote the spread of wetland habitats.
- Re-wetting some areas of the bog through regular field drain blocking using a dozer/excavator to create three peat barriers every 100 m along each field drain.
- Peat field re-profiling to reduce the camber of the fields and cell-bunding between high fields to manage/optimise water levels for revegetation.
- Re-alignment of piped drainage.
- Blocking drains in targeted existing pioneering vegetation mosaics, to accelerate re-wetting, and/or manage water levels to the correct height to accelerate the current trajectory towards reed swamp and fen, using a dozer/excavator.
- The creation of berms across some sections of the bog to control/retain water levels. This measure seeks to retain shallow (< 10 cm) water conditions across multiple fields.
- Re-wetting some deep peat areas of the bog through regular more intensive drain blocking using an excavator to create up to a maximum of seven peat dams/blockages every 100 m along each field drain, along with field re-profiling and drain infilling if required;
- Re-wetting the deep peat areas of the bog using berms, drain blocking 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;
- Targeted fertiliser applications to accelerate vegetation establishment on areas of bare peat on headlands and high fields as required, see Drawing no. DR-23-21-28 “Fertiliser Application Map”.
- Modifying water levels at outfalls, as it may be desirable to change and control water levels at the site over time, e.g. to increase water levels as the site becomes increasingly vegetated. This will further slow the movement of water through and out of Lodge Bog. There is some blocking of drains in marginal

(degraded) remnant raised high bog areas proposed as part of this plan, although they are small in size and degraded nature.

- The existing silt ponds will be retained and maintained during the rehabilitation phase. During the monitoring and verification phase the silt ponds will be continually inspected and maintained, where appropriate. When it is deemed that the silt ponds are not required, as the bog has been successfully stabilised and there is no run-off of suspended solids, the condition of the silt ponds will be reviewed. The 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).
- Seeding of vegetation and inoculation of Sphagnum will be undertaken where required. In some areas where vegetation has already established, seeding of vegetation is not required.

Lodge Bog is just south-east of Allenwood, Co. Kildare, and south of the R414 road. The overall rehabilitation area occupies the townlands of Allenwood South, Drumsru and Lullymore East, on OS 6 inch sheets Kildare Nos. 12 and 17.

Methodology

This is a desk-based archaeological assessment that includes a collation of existing written and graphic information to identify the likely archaeological potential of Lodge Bog. The overall extent of the rehabilitation is indicated in Fig. 1. This area was examined using information from:

- The2004 Peatland Survey
- The Sites and Monuments Record that is maintained by the Dept of Housing, Local Government and Heritage
- The topographical files of the National Museum of Ireland.
- The Excavations database
- Previous assessments

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

Desktop assessment

Recorded Monuments

The Record of Monuments and Places (RMP) for Co. Kildare which was established under Section 12 of the National Monuments (Amendment) Act, 1994 was examined as part of the assessment (DAHGI 1995). This record was published by the Minister in 1996 and includes sites and monuments that were known in Lodge Bog before that date. This review established that there are no RMPs located in the proposed rehabilitation area (see Fig. 1).

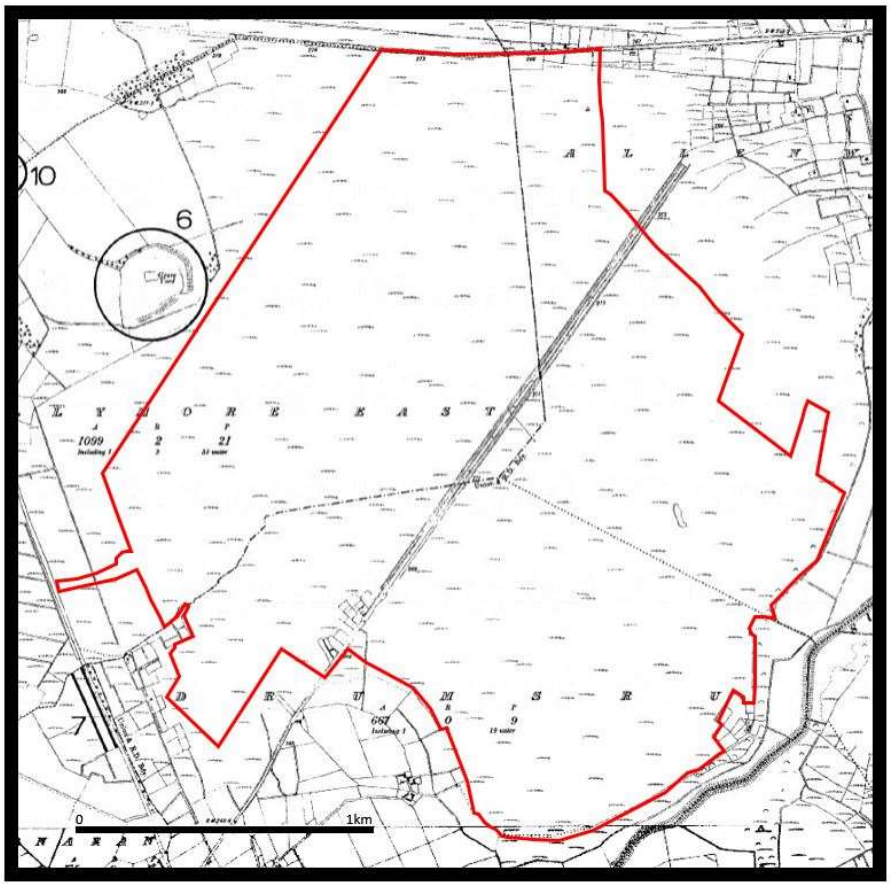


Fig. 1. Lodge Bog, Co. Kildare, detail of the Record of Monuments and Places map sheets Nos. 12 and 17. The proposed rehabilitation area is outlined with the red line. There are no Recorded Monuments in the rehabilitation area.

2004 Peatland survey

Lodge Bog was surveyed by the ADS Ltd. in 2004 as part of the Archaeological Survey of Ireland Peatland Survey (Licence No. 04E1005). Eight sightings of material were made in the bog (see Table 1). These sightings were mostly on the surface with one just below the surface. Sighting KD-LGE002, a single piece of worked brushwood that was sampled and removed from the bog, was dated to the medieval period (Cal AD1430 to 1650). Sighting LGE001 was dated to the modern period (Cal AD 1940 to 1950) and the remaining six sightings were all thought to date to the modern period. The sightings were notified to the Archaeological Survey of Ireland and two were included in the SMR.

Survey No.	Survey Type	Townland	SMR_NO	SMR Class	ITM E	ITM N	Irish Grid E	Irish Grid N	Depth BS m
KD-LGE001	Non-Archaeological Wood	Drumsru	-	-	672164	724268	272229	224239	0
KD-LGE002	Wood Remains	Drumsru	KD012-018----	Structure - peatland	672119	724322	272184	224293	0
KD-LGE003	Wood Remains	Drumsru	-	-	672004	724465	272069	224437	0
KD-LGE004	Wood Remains	Drumsru	-	--	672168	724736	272233	224707	0
KD-LGE005	Wood Remains	Drumsru	-	-	672124	724756	272189	224727	0
KD-LGE006	Platform (poss)	Drumsru	KD012-019----	Platform - peatland	671539	724561	271604	224532	0.15

KD-LGE007	Wood Remains	Allenwood South	-	-	672509	725971	272575	225943	0
KD-LGE008	Wood Remains	Allenwood South	-	-	672405	726077	272470	226049	0

Table 1. List of sites recorded by the 2004 Peatland Survey in Lodge Bog.

Sites and Monuments Record

The Sites and Monuments Record (SMR) which is maintained by the Department of Housing, Local Government and Heritage was examined as part of the assessment on the 14th of January 2022. The SMR consists of records included in the RMP and sites and monuments notified to the Dept. since the publication of the RMP. This review established that there are two entries in the SMR in the proposed rehabilitation area (see Table 2).

SMR_NO	SMR Class	Survey No.	Townland	ITM E	ITM N	Irish Grid E	Irish Grid N	Depth BS m
KD012-018----	Structure - peatland	KD-LGE002	Drumsru	672119	724322	272184	224293	0
KD012-019----	Platform - peatland	KD-LGE006	Drumsru	671539	724561	271604	224532	0.15

Table 2. List of sites recorded by the 2004 Peatland Survey in Lodge Bog.

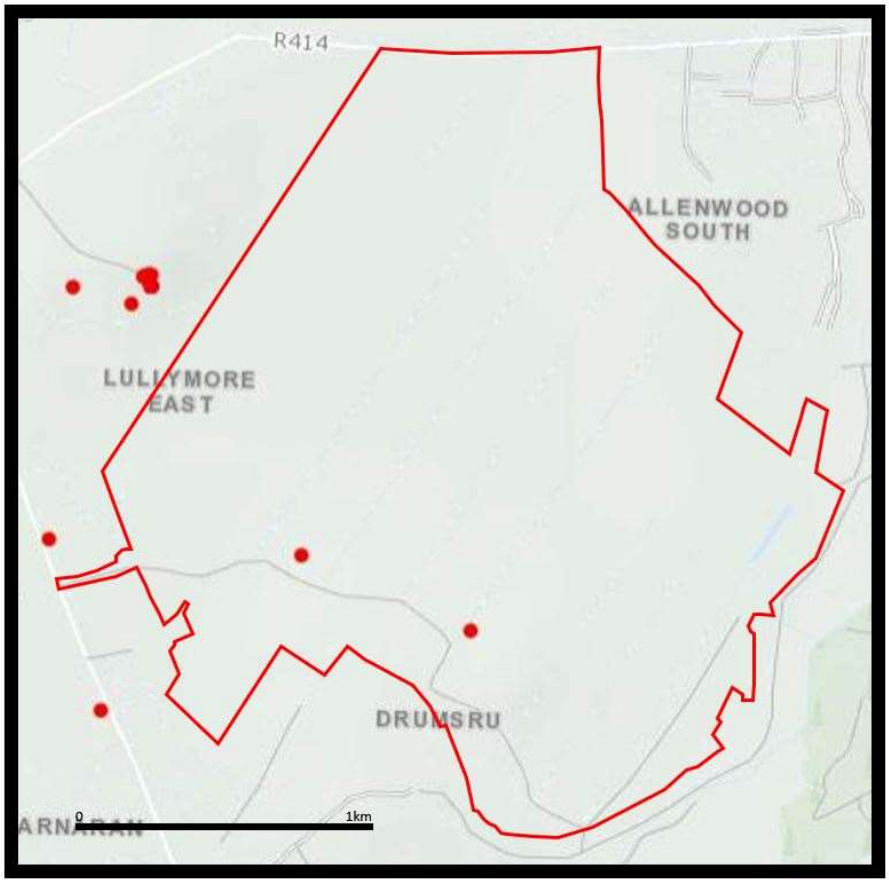


Fig. 2. Lodge Bog, Co. Kildare, detail of the Sites and Monuments Record. The proposed rehabilitation area is outlined with the red line. There are two SMRs in the rehabilitation area.

Previous assessments

Lodge Bog has been the subject of an Environmental Impact Assessment Report caried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-

01 (Whitaker 2018). This assessment included a review of the topographical files and finds registers of the National Museum of Ireland carried out in 2014 and intended to identify all finds from the bog reported to the Museum by that date and these finds are included below (Pers Comm. Jane Whitaker). The assessment noted that there was a high potential for archaeological features to be uncovered during the course of any future development works in Knappoge Bog.

Reported finds

As noted above the Environmental Impact Assessment Report caried out by Irish Archaeological Consultancy LTD in 2018 for Bord na Móna Energy Limited in relation to IPC Licence P0500-01 contains a complete list of known finds from Lodge Bog reported to the National Museum of Ireland up to 2014. The finds are included below in Table 3.

Townland	Museum No.	Description
Lullymore East	IA/194/64	Stone battle axe and bronze sword blade
Lullymore East	1989:16	lower part of a rotary quern

Table 3. List of archaeological finds from Lodge Bog reported to the National Museum of Ireland.

Archaeological investigations

Reports of archaeological excavations and licensed monitoring in the study area listed in the excavations database at excvations.ie were examined as part of the assessment. There are no additional reports of archaeological investigation carried out in the rehabilitation area.

Impact assessment

A total of eight sightings of archaeological material were identified and recorded in the rehabilitation area by the 2004 Peatland survey and two of these were subsequently entered into the Sites and Monuments Record. All recorded sightings of archaeological material in the rehabilitation area are included in Table 4. These sightings consisted of small quantities of wood consisting of from one to three pieces mostly exposed on the surface of the peat. KD-LGE001 was dated and found to be a modern roundwood dating to AD 1940-50. KD-LGE002 was a single piece of worked brushwood dated to the medieval period (AD 1430 to 1650) that was sampled and removed from the bog. KD-LGE006 was visible as three roundwoods in the drain face and as LIDAR data does not record peat removed from this location it may survive (see Table 5). The LIDAR data which records the quantity of peat removed from each sighting since 2008 indicates that the remaining sightings have all been removed by harvesting. (see Table 4).

Survey No.	Survey Type	Townland	SMR_NO	ITM E	ITM N	Depth BS m	Peat depth 2008	Peat depth 2020	Status
KD-LGE001	Non-Archaeological Wood	Drumsru	-	672164	724268	0	75.05	75.17	Gone
KD-LGE002	Wood Remains	Drumsru	KD012-018---	672119	724322	0	75.71	75.88	Gone
KD-LGE003	Wood Remains	Drumsru	-	672004	724465	0	74.99	74.80	Gone
KD-LGE004	Wood Remains	Drumsru	-	672168	724736	0	73.43	72.79	Gone
KD-LGE005	Wood Remains	Drumsru	-	672124	724756	0	74.13	73.53	Gone
KD-LGE006	Platform (poss)	Drumsru	KD012-019---	671539	724561	0.15	74.47	74.56	May survive
KD-LGE007	Wood Remains	Allenwood South	-	672509	725971	0	76.80	75.99	Gone
KD-LGE008	Wood Remains	Allenwood South	-	672405	726077	0	76.96	76.29	Gone

Table 4. All the known sightings in the rehabilitation area with the Lidar depth data.

Survey No.	Survey Type	Townland	SMR_NO	ITM E	ITM N	Depth BS m	Peat depth 2008	Peat depth 2020	Status
KD-LGE006	Platform (poss)	Drumsru	KD012-019---	671539	724561	0.15	74.47	74.56	May survive

Table 5. The Possibly surviving sighting in the rehabilitation area

Recommendations

There is one possibly surviving sighting in the rehabilitation area KD012-019---**.** The area of this monument should be avoided by the regeneration works with a 20m buffer. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

Conclusion

This is a desk-based archaeological assessment and includes a collation of existing written and graphic information to identify the likely archaeological potential of the proposed rehabilitation area. There is one possibly surviving sighting in the rehabilitation area KD012-019---**.** The area of this monument should be avoided by the regeneration works with a 20m buffer. Should any previously unknown archaeological material be uncovered during the rehabilitation works, it should be avoided and reported to the Bord na Móna Archaeological Liaison Officer and the National Museum of Ireland.

References

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

EPA 2020. Guidance on the process of preparing and implementing a bog rehabilitation plan.

Whitaker, J. 2004. *Peatland Survey 2004 Derrygreenagh Bogs Counties Offaly & Kildare*. Unpublished report for Department of the Environment, Heritage and Local Government.

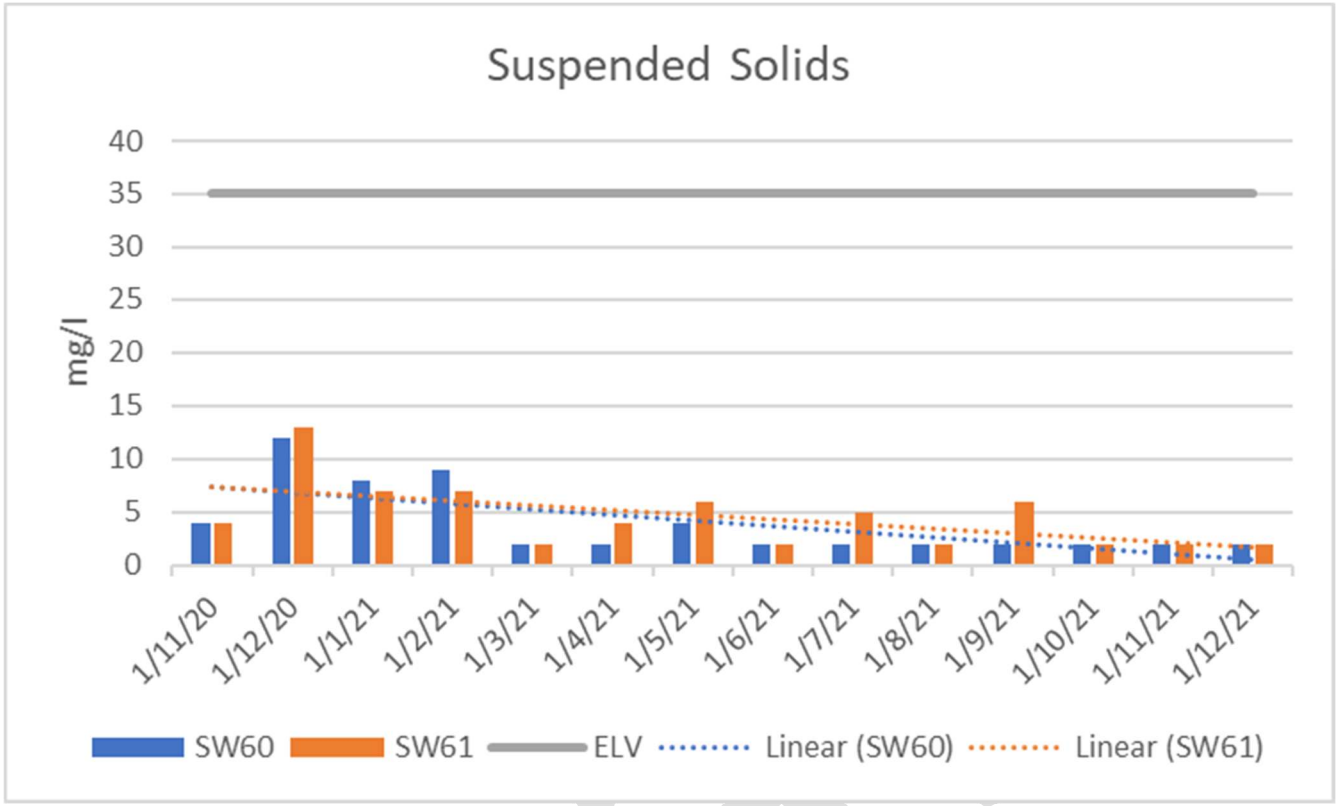
Whitaker, J. 2018. Cultural Heritage Assessment Of The Boora Bog Group On Behalf Of: Bord Na Mona IPCC Licence: P0500-01. Unpublished report prepared by IAC LTD for Bord na Mona.

Dr. Charles Mount
17 January2022

APPENDIX XIII. WATER QUALITY MONITORING RESULTS FOR LODGE BOG

Table AP13.1. Water quality data for 12 months from November 2020 to Dec 2021 at Lodge bog.

PCAS SW Sampling Scheme					Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids	Suspended Solids
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Allen Group	P0503-01	Lodge	452	SW60	4	12	8	9	2	2	4	2	2	2	2	2	2	2
Allen Group	P0503-01	Lodge	453	SW61	4	13	7	7	2	4	6	2	5	2	6	2	2	2
				ELV	35	35	35	35	35	35	35	35	35	35	35	35	35	35
PCAS SW Sampling Scheme					Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour	Colour
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co	mg/l Pt Co
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Allen Group	P0503-01	Lodge	452	SW60	351	323	409	235	263	194	211	202	138	193	154	226	378	400
Allen Group	P0503-01	Lodge	453	SW61	361	342	409	231	215	185	222	177	124	190	141	229	366	68.2
PCAS SW Sampling					COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD	COD
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Allen Group	P0503-01	Lodge	452	SW60	101	99	85	33	75	57	62	65	58	57	60	68	83	55
Allen Group	P0503-01	Lodge	453	SW61	109	103	89	35	88	59	68	64	55	53	54	70	87	56
PCAS SW Sampling Scheme					pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH	pH
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units	pH Units
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Allen Group	P0503-01	Lodge	452	SW60	7.5	7.4	7.7	7.6	7.5	8.2	7.9	8.3	8.1	8.1	8.2	7.8	7.6	7.7
Allen Group	P0503-01	Lodge	453	SW61	7.5	7.4	7.1	7.6	7.8	8	8	8.2	8.2	8	8.2	7.8	7.6	7.6
PCAS SW Sampling					TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P	TP as P
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Allen Group	P0503-01	Lodge	452	SW60	0.09	0.11	0.09	0.09	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Allen Group	P0503-01	Lodge	453	SW61	0.12	0.1	0.08	0.09	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
PCAS SW Sampling Scheme					TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS	TS
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Allen Group	P0503-01	Lodge	452	SW60	285	282	207	213	178	333	246	371	369	294	317	270	242	228
Allen Group	P0503-01	Lodge	453	SW61	324	328	198	79	257	316	262	383	392	324	405	276	268	176
PCAS SW Sampling Scheme					Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N	Ammonia as N
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/11
Allen Group	P0503-01	Lodge	452	SW60	0.205	0.462	0.332	0.38	0.027	0.664	0.483	0.186	0.343	0.21	0.201	0.295	0.349	0.445
Allen Group	P0503-01	Lodge	453	SW61	0.205	0.464	0.327	0.192	0.027	0.561	0.515	0.467	0.469	0.367	0.291	0.331	0.341	0.45
PCAS SW Sampling					DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC	DOC
Bog Group	Licence No	Bog Name	Unique I.D No.	SW Code GIS	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l	mg/l
					1/11/20	1/12/20	1/1/21	1/2/21	1/3/21	1/4/21	1/5/21	1/6/21	1/7/21	1/8/21	1/9/21	1/10/21	1/11/21	1/12/21
Allen Group	P0503-01	Lodge	452	SW60	42.2	38.2	30.2	21.8	27.6	17.8	22.2	20.9	20.1	62.5	72.3	26.1	29.7	14
Allen Group	P0503-01	Lodge	453	SW61	42.2	37.9	30.8	21.6	33.1	17.9	22.2	20.1	18.9	65.8	75.7	26	31.2	21.6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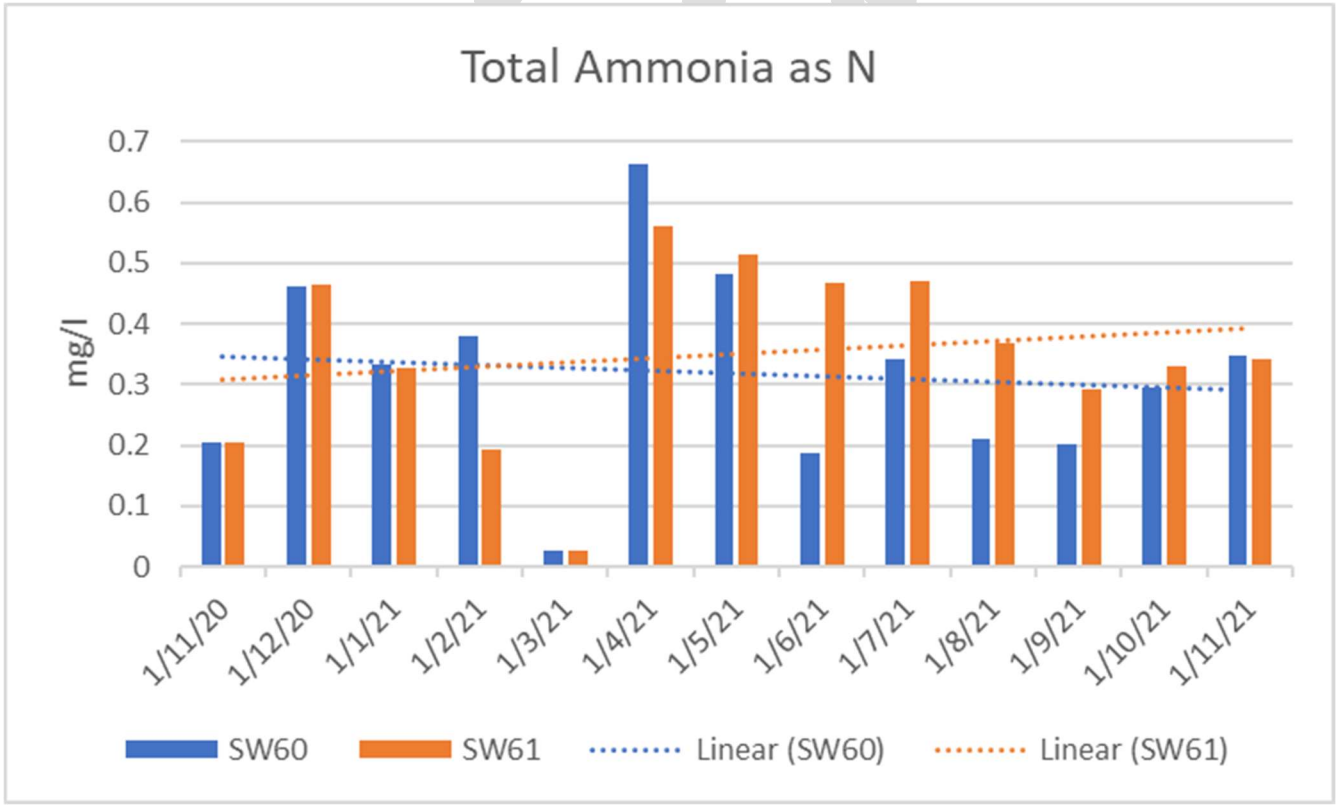
SW60
SW61
ELV
Linear (SW60)
Linear (SW61)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0.5
0.4
0.3
0.2
0.1
0
mg/l
1/11/20
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1/3/21
1/4/21
1/5/21
1/6/21
1/7/21
1/8/21
1/9/21
1/10/21
1/11/21
SW60
SW61
Linear (SW60)
Linear (SW61)