An Bord Pleanála

Inspector's Report
ABP-310788-21
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Development	Wind Farm
Location	Bargowla, Boleymaguire, Braudphark, Derreens, Derrybofin, Derrycullinan, Derrycullinan Beg, Drummanacappul, Garvagh, Garvagh Glebe, Glassalt, Lisfuiltaghan, Seltan, Sheena and Tinnybeg, County Leitrim Carrowmore & Carrownyclowan, County Sligo
Planning Authority	Leitrim & Sligo County Councils
Planning Authority Reg. Ref.	Leitrim – 20120 Sligo - 20251
Applicant	Coillte CGA
Type of Application	Permission
Planning Authority Decision	Grant
Type of Appeal	First & Third Party
Appellant(s)	Coillte CGA Wild Ireland Defence CLG Wind Aware Dromahair

Observer(s)	Alannah Caffrey
	Adrienne Diamond & Graham Robertson
	Andrea Rankin & Others
	Brigitte Christoph
	Eileen Gibbons
	Gordon Hutchinson
	Kevin Duffy
Date of Site Inspection	14th & 15th June, 2022
Inspector	Kevin Moore

1.0. **Introduction**

1.1. The following addendum to my original report is provided in response to the Board's request.

2.0. **Applicant's Response to Section 132 Notice**

2.1. *The Board's Request*

2.1.1 The Board's Section 132 Notice addressed the following:

A. The Board queried the effectiveness of the proposed peat repositories in providing for the permanent retention of peat and other materials and questioned whether the mitigation measures, inclusive of the drainage system, would be adequate to ensure that there would be no significant risk of environmental impacts or serious injury to properties in the vicinity. It particularly sought information which demonstrated that the applicant had a clear understanding of the existing land and ground conditions associated with the development of the proposed repositories, including final construction, drainage, control of groundwater, type and condition of rock, the hillside siting, and the clear felling of forestry.

B. The Board noted the low noise environment in which the proposed development would be located and the substantial separation distances between proposed turbines and existing houses in the area. It was noted that the applicant acknowledged that there is residual potential for adverse effects from low frequency noise and amplitude modulation and requested information on how this would be mitigated in the event such adverse effects arise.

2.2. *Applicant's Response*

The applicant's response to the request may be synopsised as follows:

2.2.1 Peat Repositories

The applicant submitted:

- A Geotechnical and Peat Stability Assessment Response (Appendix 1),
- A letter setting out information relating to water quality and drainage control for the repositories (Appendix 2), and
- Representative visualisations of the repositories (Appendix 3).

Regarding clear felling of forestry, the Board was directed to Section 2.73.1.1 of the applicant's further information response to Leitrim County Council in April, 2021 and to Appendix 13 of that response. It was noted that the trees within the peat and spoil repository areas would be felled and that tree stumps would only be removed from areas where the excavation of peat and spoil is to take place. It was submitted that, in so far as possible, tree stumps would be left in situ to reduce ground disturbance.

Geotechnical and Peat Stability Assessment Response

This may be synopsised as follows:

- The reasons the locations of the peat repositories were chosen are set out, namely being in locations of relatively shallow peat, at locations where ground investigations indicated the presence of relatively shallow peat underlain by a firm to stiff Clay and the presence of weathered rock close to the surface (southern repository), at locations with relatively flat slopes, avoiding areas of weak peat, and being relatively close to existing tracks.
- Details were provided on the construction of the borrow pit and peat repositories. These include the provisions set out in the existing Peat & Spoil Management Plan, as well as additional provisions now identified in the further information to the Board. The latter referred to perimeter berm and associated peat removal proposals, the provision of level surfaces before peat

and waste deposition, the development of drains through berms, and monitoring after the completion of deposition of peat.

- Updating of the Stability Analysis was given for the borrow pit and peat repositories provided as further information to the planning authorities to show the base of the perimeter berms for the repositories and details to mimic temporary loading during construction.
- Contingency measures were proposed for the borrow pit and peat repositories, notably provisions of check barrages in various locations in the event of failure of the repositories and the threat posed to watercourses in the vicinity.

The response includes illustrative plans and cross sections of the borrow pit and peat repositories, trial pit logs for trial pits dug in the vicinity of the proposed borrow pit and peat repository locations, and Stability Analysis outputs.

Water Quality and Drainage Control Response

This may be synopsised as follows:

- For the northern peat repository, all drainage is to the north and the repository is separated from the stream channel to the south and west by local topographical highs. It is intentionally located here so that it does not drain directly to the Killanummery stream.
- The southern peat repository was purposely located in a similar topographical setting, separated from the Arigna River channel to the west and south-west by local topographical highs, with all drainage to the north-east.
- Reference is made to the applicant's response to further information requests from Sligo and Leitrim County Councils, including the geotechnical assessment, and to similar drainage plans approved by the Board for other wind farm developments.

- A summary of the peat repository drainage control approach as set out in the further information responses to the planning authorities and Appendix 4.5 of the EIAR is provided.
- There will be no specific controls for groundwater management for the repositories based on an analysis of the site geology because the peat will be placed above ground level and on top of in-situ peat and there will be no potential for groundwater to enter the enclosed cells/berms from below the repository.
- The engineered berms will be founded on underlying competent strata but will not give rise to groundwater inflows into the storage area because no deep excavations will be required.
- Discharge from storage areas will be solely rainfall and drainage controls will accommodate flows equivalent to a 10-year return period storm event.
- The repositories will likely have stabilised by vegetation cover within a year.
- The proposed borrow pit will also be used as a peat storage area when rock extraction is complete and the drainage controls will be the same as the repositories, with the only difference being groundwater inflows factored into the borrow pit settlement pond hydraulic design as the majority of the peat will be stored below ground level. Once the borrow pit is backfilled there are unlikely to be any groundwater inflows as it will be backfilled to ground level. Surface water discharge/runoff from the backfilled borrow pit will be rainfall dependent.
- With the implementation of standard forestry mitigation, the impacts from forestry felling will be imperceptible.
- Prior to the commencement of ground works at the repositories, key temporary drainage measures will be installed in the existing forestry drainage network to protect downstream receiving waters.

Computer-generated Representations of Borrow Pit and Peat & Spoil Repositories

These representations show the borrow pit pre-excavation and pre- and post-peat infill, and the pre- and post-peat infill for the repositories.

2.2.2 Low Frequency Noise and Amplitude Modulation

The applicant's response to this issue is presented in Appendix 4 of the further information. It is submitted that neither the EIAR nor the applicant's further information documents state that there is a residual potential for adverse effects arising from low frequency noise or amplitude modulation. The response includes the following:

- The applicant referenced parts of Chapter 11 of its EIAR in relation to low frequency noise. It repeated its recommended mitigation measures at the operational phase as set out in Section 11.5.5.1 of the EIAR. It further states that, if an issue is confirmed, measures would be implemented through operational controls for the relevant turbine type, which may include turbine curtailment and/or stopping turbines under specific operational conditions.

- Regarding amplitude modulation, the applicant again referenced parts of Chapter 11 of its EIAR. It repeated its recommended mitigation measures at the operational phase as set out in Section 11.5.5.2 of the EIAR. It further states that, in the event of a confirmed complaint which indicates potential amplitude modulation, an acoustic consultant would assess the level of AM in accordance with methods outlined in the Institute of Acoustics Noise Working Group Amplitude Modulation Working Group Final Report which would be used to evaluate mitigation requirements. It was then stated that the mitigation measures, if required, would consist of the implementation of operational

controls for the relevant turbine type, which will include turbine curtailment and/or stopping turbines under specific operational conditions.

3.0. **Planning Authority Responses**

1.1. Leitrim County Council notes the Board's request and the applicant's response. The authority stated that it wished to reiterate the requirements set out in the conditions attached to its grant of planning permission. It is acknowledged that the applicant's submission indicates that there is a low risk of peat failure associated with the construction of the peat repositories. The planning authority notes the applicant's response to low frequency noise and amplitude modulation.

1.2. Sligo County Council refers the Board to the reports of the planning authority and considers the issues raised would be best addressed by Inland Fisheries Ireland as the prescribed body with responsibility relating to the matters raised.

4.0. **Third Party Responses**

4.1. Response from Wind Aware Dromahair

The third party's response to the two issues raised in the Board's further information request may be synopsised as follows:

Peat Repositories

- The applicant's Geotechnical and Peat Stability Assessment Response repeats significant sections of the Peat & Spoil Management Plan which forms Appendix 4-2 of the EIAR. New material includes schematic drawings for peat repositories, the output of the slope stability model, and computer-generated representations of the borrow pit and repositories.

- The peat stability assessments do not contain updated conclusions.
- The letter on site drainage provides no new information.
- All of the ground data in the response are taken from earlier reports.
- The levels of control of surface water drainage and runoff cannot be considered entirely fail-safe as the system is based on a train of precautionary measures that will be applied in series to ensure protection of downstream watercourses. This system would likely be overwhelmed, with resulting failure, as a consequence of very heavy, intense or extreme rainfall events. The fact that such a series of installations has been proposed is a clear indication of the unsuitability of the site from a hydrological perspective.
- On 23rd September, 2008, a major peat slide occurred at the nearby Garvagh Glebe wind farm. Intense rainfall was recorded prior to the slide. The proposed wind farm would not have a significantly less likelihood of a peat slippage or failure similar to that which occurred at Garvagh Glebe because:
    - The heads of watercourses and natural drainage routes have not been avoided. T01, T03 and T10 would be located very close to the headwaters of streams, while the area of a 2016 peat slide is very close to the location of T05;
    - There are some areas with shear strengths as low as 5kPa very close to the upper range of the shear strength of 4kPa in the undrained pest at Garvagh Glebe, leaving little or no margin of safety;
    - The turbines at Croagh are larger than those at Garvagh Glebe; and
    - The excavation, construction of turbine bases, and the specifications of the road required to carry much larger and heavier towers and turbines would involve much higher loadings on the peat and the underlying clay layer.
- The proposals for the control of surface water runoff are not sufficiently robust to eliminate downstream damage to vulnerable and sensitive habitats. There would be substantial removal of vegetation cover and excavation of peat and subsoil, giving rise to potential sources of sediment-laden water. Other sources of sediment include stockpiled excavated material and erosion of sediment from site drainage channels. Dewatering of excavations has the potential to impact on local groundwater levels. If mitigation measures are not constructed exactly to specification, the contents of a settlement pond could

be released very quickly. The mitigation measures depend on the absence of rainfall events.

- The applicant's review of historical peat slides in the area does not include more recent events. Reference is made to recent papers by Dr Alan P. Dykes on increased incidence of peat slides and blanket bog failures.
- With regard to the impact of climate change as a risk factor and the Board's request relating to the permanent retention of peat, the applicant's response should have considered the impacts of climate change over a longer term. The effects of extreme rainfall events likely to occur in the area should have been considered.

Low Frequency Noise and Amplitude Modulation

- Reference is made to an array of research and studies on the effects of noise on residents in proximity to wind turbines and to communication received from Professor Alun Evans, Queens University, Belfast.
- A problem not addressed in the applicant's further information is that infrasound travels over long distances without any significant attenuation.
- The presence of wind farms in quiet rural areas will disrupt sleep in a sizeable minority and this affects mental and physical wellbeing.
- Sleep disturbance is associated with the effects of annoyance caused by wind turbine sound and there is an association between annoyance and health complaints.
- The applicant's proposed measures are not satisfactory to mitigate the adverse effects of wind turbine noise on public health, given the locally reliable information and evidence that the existing smaller wind farm at Garvagh Glebe continues to produce adverse effects on residential amenity because of near continuous noise produced by the turbines.

I note the appellant also refers to the status of the Wind Energy Development Guidelines and an ECJ judgement on the need for SEA for plans.

4.2. <u>Response from Adrienne Diamond and Graham Robertson</u>

The observers' response to the two issues raised in the Board's further information request may be synopsised as follows:

Peat Repositories

- Serious concerns are raised about the effects on ground and surface waters from the construction phase and the resulting permanent damage to the hydrology of the area.

Low Frequency Noise and Amplitude Modulation

- Reference is made to the observers' experience of amplitude modulation from the existing Garvagh Glebe wind farm. The reality is a loud, repetitive thumping noise.
- To separate AM from measured audible dB noise is a scientific process and theoretical and does not relate in reality to the noise that turbines produce or what is heard.
- The observers worry about adverse health effects from the existing wind farm and are concerned about further health issues as a direct result of the proposed development.
- There is scientific doubt about effects on health. There is an existing over-saturation of turbines in the area. The precautionary principle must apply.
- The applicant's supporting research from Salford University is 16 years old and is questionable in relation to the modern technology and the issue of protecting health.
- The observers disagree with the statement that AM is a rare and unlikely occurrence at operational wind farms. It is submitted that all turbines in their area produce swish, whoomp, thump or whoosh noise.
- The Board notes that the proposed development is located in a low noise environment. It is not considered that the submitted noise impact assessment is robust or that 17 year old guidelines are adequate.
- Reference is made to Leitrim County Council's Environment Report and to the observation that the proposed development has the potential for a cumulative impact on receptors due to the cluster of existing proximate wind farms.

4.3. Response from Brigitte Christoph

The observer's response focused on the applicant's response to the issue relating to the proposed peat repositories. The response may be synopsised as follows:

- The following will have a knock-on effect on peat stability:
    - The felling of trees along access roads and at infrastructure locations, exposing newly uncovered areas to heavy rainfall;
    - The subsequent digging out of peat down to the rock at the foundation/hardstand locations and the perimeter berms and access tracks will result in trenches and basins where water can gather, seeping into the interface of peat and the underlying stratum and weaking the separated peat sections above; and
    - The extraction of rock by means of rock breaking and blasting will be carried out at the borrow pit and certain turbine and hardstand locations.
- Two turbines (T01 and T05), the northern repository and the substation are proposed within a few metres of areas which have an elevated or higher construction risk (areas with deep, weak and occasionally quaking peat; area with mechanically cut peat). Access roads are also to run through them. A landslide has already occurred beside the weak area of T05 in 2016.
- The applicant's remark that the long-term effects of climate change on rainfall patterns will not be observed during the lifetime of the wind farm appears self-serving and incorrect.
- Most landslides are preceded by heavy rainfall. The dugouts for the roads and infrastructure will disrupt the natural mechanical and hydrological continuity of the peat and reduce the lateral support for the peat layer. The construction of floating roads will put extra pressure on the peat blocks. The chances of shear failure are further enhanced by the weakening of the peat/rock interface after heavy rainfall.
- The only new information on clear felling of forestry is that tree stumps will be left inside the repositories. The issue of clear felling is left completely

unresolved. Its additional impact on the environment is not assessed adequately at all.

- During the upgrade of existing roads, the construction of new ones, and the laying open of the perimeter berms, peat and spoil will be dug out. Peat and soft clay are proposed to be removed from below the footprint of the berms, temporarily stored locally, and eventually placed either in the repository or the borrow pit. No detail is given as to where the material dug up along the roads is going, where the temporary storage spaces are located, and whether there is any risk of runoff into a nearby watercourse. It is proposed to "surround stockpiles with silt fences" and "weather off/seal stockpiles" but no further detail has been given.
- The repository areas and borrow pit are very close to the proposed 50m buffer from rivers and access roads cross these rivers in many places. Numerous settlement pond/level spreader arrangements are situated within the 50m zone so it is likely that heavy rainfall will cause spilling. Perimeter berms are intended to hold back the silt but peaty waters will pass through the permeable berms as stockpiling will cause the lower layers of peat to be pressed down by their own weight. The further lowering of pH will be fatal for invertebrate communities and other aquatic fauna.
- With regard to the Garvagh Glebe site nearby where a significant failure took place in 2008, the applicant's information, which purports to show that the proposed Croagh site has a significantly less likelihood of a similar failure, is fundamentally flawed. The southern repository, the borrow pit and Turbine 10 are located at or very near to significant headwaters. Furthermore, the purported differences in peat thicknesses (6.3m vs. 6m) and undrained shear strength are less than compelling and give no confidence that bog slippage and failure will not occur.
- Considering the above and that tree felling will take place during the autumn and winter months when most of the rain is falling, together with three large bogflows/bogslides occurring in 2020 alone, there cannot be absolute scientific certainty that no slippage or no acidification of streams will occur.

4.4. Response from Andrea Rankin

The observer's response to the two issues raised in the Board's further information request may be synopsised as follows:

Peat Repositories

- The nature of the site does not provide for the level of storage of peat and spoil.
- This area has a history of landslides, one of which happened less than 1km from the site and which caused a huge amount of destruction. This history must be taken into account.
- There is concern about the contingency measures in the event of buttress failures. The temporary barrage locations seem to imply the flow can go towards the Arigna River. The applicant has not addressed the possibility of peat and spoil moving further down the mountain and gathering more material, posing a real risk to the community. The landslide at Shass Mountain is referenced and its effect on farming land four years later.
- The applicant proposes to remove all peat and soft clay from below the footprint of the proposed berms, to temporarily store it and eventually place it in the repository or borrow pit. There are no detailed measures included for the safe storage of this peat during the construction stage.

Low Frequency Noise and Amplitude Modulation

- No new useable information has been given. The applicant has not said conclusively that noise will not be an issue. They have raised more concerns.
- The response to assess the level of noise if it happens is not an adequate response.
- Very little can be done to mitigate the noise once a turbine is constructed.

5.0 **Assessment**

My considerations on the issues raised by the Board in its further information request and the response to that request are as follows:

5.1. Peat Repositories

5.1.1 The Board has explicit concerns about the effectiveness of the proposed peat repositories to permanently retain peat and other materials and the proposed mitigation measures, inclusive of the proposed drainage system. The Board expressly indicated where in particular it wanted information from the applicant to demonstrate that it has a clear understanding of the existing land and ground conditions of the proposed peat repositories. This was required to include matters relating to the final construction of the primary repository, the drainage of the repositories, measures for the control of groundwater, the type and condition of rock at the repository locations, and the hillside siting of the northernmost repository and associated clear felling of forestry.

5.1.2. My initial observations are as follows:

- The applicant has undertaken no further site investigations and, as a result, has provided no new data arising from site investigations.
- The Board requested details on the type and condition of rock at the repository locations. It is apparent that no ground investigations were carried out at the locations of each of the proposed repositories or borrow pit. There were no trial hole tests undertaken and no findings at these locations. It is acknowledged that there were peat probes at these locations and that trial pits were dug in the wider vicinity of the locations for the repositories/borrow pit. However, details on the type and condition of rock at the actual repository locations remain unknown.
- The hillside siting of the northernmost repository and associated clear felling of forestry were not addressed in the applicant's response.

5.1.3. An issue which consistently arises in the applicant's EIAR and which I have highlighted in my original report to the Board relates to the lack of clarity of critical measures when it comes to spoil management. In my opinion, this has continued in the applicant's response to the Board's request. It includes the following:

The Borrow Pit

- Regarding the construction of the borrow pit, the applicant submits that the rock within the borrow pit footprint will be removed by a combination of breaking and blasting, depending on its excavatability, which will be determined from confirmatory ground investigation carried out at the borrow pit. I have already alluded to the lack of ground investigations at the proposed borrow pit location. Thus, the Board does not know about the type and condition of rock at this location and, thus, any issues that may relate to its excavatability. It is most concerning that there would be a clear reliance on future confirmatory ground investigation. I would suggest that this is essential baseline information for a major waste repository.
- The applicant submits that localised deepening of the borrow pit floor may be required depending on extraction operations. This lack of clarity is aligned with the lack of ground investigation. A full understanding of the effects of the deepening of the borrow pit, including impact on groundwater, cannot reasonably be determined as a result.
- The applicant submits that it may be possible to excavate the rock from the borrow pit whilst leaving in place upstands/segments of intact rock. If upstands cannot be left in place, engineered berms are to be constructed using crushed rock. I submit that it should be clear if there are going to be engineered rock buttresses within the borrow pit or not and what the consequences, if any, of engineered berms in place of upstands/segments of intact rock are for such a significant waste repository.
- The applicant refers to leaving in place upstands/segments of intact rock to retain the placed peat and to allow the borrow pit to be infilled in cells. One would wish to understand at this stage of the development of a significant waste repository if it is or is not proposed to leave upstands/segments of intact rock in place to allow infilling of cells. If not, it should be known if the pit is to be infilled in cells and how this is to be done. Otherwise, the alternative provisions should be known at this stage. It may be speculated that engineered berms would be used to accommodate infilling by cells as an alternative but this is not readily understood and the impacts of any alternative arrangement are not known.

- The applicant states that the rock buttress will be founded on glacial till or bedrock. This again points towards a lack of ground investigation and provision of baseline information on a significant waste repository. The Board must gauge an understanding of the sheer scale of the waste management operation that is proposed at this site, the generic approach that is being applied, and the unknowns which result in a significant threat of failure.
- To prevent water retention behind the buttresses, they are proposed to be constructed of coarse boulder fill with a high permeability. In addition, drains are to be placed through the buttresses to allow surface water to drain from the surface of the placed peat. The surface of the placed peat and spoil is to be shaped to allow efficient run-off of surface water from the placed arisings. I submit that, following a prolonged period of dry weather followed by a period of heavy or intense rainfall, there must be a concern about the increased channelling of drains and the functioning of the downslope mitigation measures to allow the safe discharge of surface waters from the borrow pit. The permeability of buttresses and their functioning into the future remain a concern also. There is no clarity on how one would 'shape' peat to allow efficient runoff of surface water.
- It is not known if a layer of geogrid is or is not required in the borrow pit to strengthen the surface of the peat and spoil. Yet again this is to be determined after the planning process.
- The applicant submits that control of groundwater within the borrow pit may be required and measures are to be determined as part of the confirmatory ground investigation programme. Surely the applicant and the Board should know if the control of groundwater will be required for this significant waste repository and what measures the applicant is going to put in place to deal with it before any decision can be issued.
- In addition to the Peat & Spoil Management Plan measures, the applicant proposes that, prior to the construction of the perimeter berm for the borrow pit, all peat and soft clay is to be removed from below the footprint of the berms, temporarily stored locally, and placed in the borrow pit. The Board has no idea of how much peat and soft clay is to be removed, where it is to be temporarily stored, and the Board cannot assess if its temporary storage may pose an environmental threat.

- Another additional proposed measure is to provide drains at regular intervals through the berms at the same level as the top of the peat surface to prevent ponding of water around the edges of the repositories. I query if there may be concerns about the blockage of proposed piped drains and the follow-on of ponding, with consequences for the functioning of surface water provisions beyond.

The Peat Repositories

- Once again the applicant does not know if the stone buttresses are to be founded on glacial till or bedrock.
- The concerns of drainage through buttresses to allow excess water to drain remain for the repositories.
- An interceptor drain is to be installed upslope of the repository areas. The concerns at such locations relate to the potential blockage of such drains in a peat-dominated environment and the failure to clear such blockages to avoid the risk of pollution that may result.
- A settlement pond is proposed at the lower side of the repository areas. The ongoing concern relates to the inundation of such constructed features resulting from the failure of systems behind such ponds at times of intense rainfall.
- A granular layer of material is to be placed at the base of stored spoil immediately upslope of the stone buttresses to act as a drainage layer to prevent a build-up of pore pressure behind the buttresses. There is no clear understanding of the nature and extent of this.
- The ‘shaping’ of peat to allow efficient run-off of water from stored peat remains unexplained.
- In addition to the Peat & Spoil Management Plan measures, the applicant notes that confirmatory ground investigation will have to be undertaken to confirm founding levels for the perimeter berms at the repositories. Yet again this is necessary information for major waste holding facilities being provided post-approval.
- The temporary storage of the peat and soft clay removed from below the footprint of the berms remains an unknown as does its potential impacts.

- Drainage through the berms remains a concern.
- I note the contingency measures in the response to the Board and the reference to failure. Check barrages are proposed as contingency measures. Their locations are premised upon “the most likely route” for failure in particular directions. I submit to the Board that there can be no doubt about likelihood if failure results from these huge repositories. I submit that there is not a full understanding of where adequate measures should be provided in the event of failure and a real threat is posed for watercourses in the vicinity.

5.1.4. I note that the third party and observers have also raised reasonable and relevant concerns relating to the proposals from which there is distinct doubt about the reliability of the applicant’s proposals. These include:

- The felling of trees along access roads and at infrastructure locations, exposing newly uncovered areas to heavy rainfall;
- The digging out of peat down to the rock at the perimeter berms and access tracks, resulting in trenches and basins where water can gather, seeping into the interface of peat and the underlying stratum and weakening the separated peat sections above;
- Rock breaking and blasting causing instability;
- The proximity of the northern repository to an area which has an elevated or higher construction risk (i.e. an area with deep, weak and occasionally quaking peat);
- The long-term effects of climate change on rainfall patterns not being observed during the lifetime of the development;
- Disruption to the natural mechanical and hydrological continuity of the peat and reduction in the lateral support for the peat layer, with the construction of floating roads putting extra pressure on the peat, as well as the weakening of the peat/rock interface after heavy rainfall;
- The issue of clear felling being left unresolved;
- The access road to the first repository and no detail given as to where the material dug up along the road is going, where the temporary storage spaces are located, and whether there is any risk of runoff into nearby watercourses.

- No comprehensive details being provided on the proposals to surround stockpiles with silt fences and the weathering off/sealing of stockpiles;
- The proximity of the repository areas and borrow pit to the proposed 50m buffer from rivers, access roads crossing these rivers, settlement pond/level spreader arrangements sited within the 50m zone and potential heavy rainfall causing pollution incidents;
- The effects of peaty waters passing through permeable berms;
- The similarities to the conditions at Garvagh Glebe where there was a significant failure, notably in relation to proximity to significant headwaters, peat thicknesses, and higher loadings on peat arising from the scale of the proposed development;
- The lack of scientific certainty on slippage and the resulting acidification of streams;
- The lack of new information in the response and reliance on previously gathered data; and
- The requirement for mitigation measures to be constructed exactly to specification to avoid settlement pond overloading.

5.1.5. I note the reasons set out in the response as to why the locations of the peat repositories were chosen, namely being in locations of relatively shallow peat, at locations where ground investigations indicated the presence of relatively shallow peat underlain by a firm to stiff Clay and the presence of weathered rock close to the surface (southern repository), at locations with relatively flat slopes, avoiding areas of weak peat, and being relatively close to existing tracks. It is pertinent to note again that there were no trial pits within the peat repository areas and borrow pit location and one cannot be definitively assured of the type and condition of rock at these locations. The matters relating to *relatively* shallow peat and *relatively* flat slopes are of concern. It is apparent that the repositories are located on sloping hillsides in a peat-dominated environment. As is well known at this stage from other wind farm sites where peat slides have occurred and where essentially the same generic approach to peat management and site drainage has been applied, relatively flat slopes can frequently not be a reliable attribute to prevent peat slides.

5.1.6. Regarding the applicant's computer-generated representations of the borrow pits and peat and spoil repositories (Appendix 3 of the applicant's response), I note the clean parkland-type representation in the first instance. I consider that one can reasonably set aside such a construed context and setting for the proposed development when considering the reality of the context for this proposed development. Setting these misplaced contexts aside, I consider that the indicative representations of the repositories and the evident challenges of containing such vast volumes of peat and other spoil in a somewhat precarious position on hillsides give an inkling of what the developer is proposing to do, namely to contain some 400,000m^3 peat and other waste spoil. They illustrate, in an indicative manner, large lakes of peat and other spoil on sloping hillsides.

5.1.7. I anticipate that the applicant may query many of the basic observations I have made on the lack of clarity on the ground conditions of this site. I submit to the Board that there can be no room for any lack of clarity on these major waste repositories. when one is considering:

- the permanent storage of 406,830 cubic metres of spoil on hillsides (most of which is peat),
- an upland area that is a peat dominated environment,
- a site that has been subject to three landslides,
- the siting of significant infrastructure in the immediate vicinity of the location where a peat slide has occurred recently on this site,
- the siting of significant infrastructure in the immediate vicinity of areas which the applicant clearly flags as areas which have an elevated or higher risk due to them being areas with deep peat and occasionally quaking peat,
- extensive proposed infrastructure works occurring in the immediate vicinity of the repositories, including widening of roads and provision of new roads, as well as deep excavations for turbines,
- substantial clear felling of forestry,
- construction occurring through periods of the year when heaviest precipitation is anticipated, and

- the site being in the vicinity of an area where a significant peat slide has occurred due to neighbouring wind farm construction.

5.1.8. The Board must see that there can be no room for being unsure about the containment and management of 406,830 cubic metres of waste spoil on the side of a hill, most of which is made up of peat. I understand that the Board may have difficulty in conceptualising such a significant volume of waste material. With the definitive uncertainties in this application, there can be no reliance on the applicant's concepts and generic approach to spoil management and site drainage that one sees at this site. These are the same concepts that were pursued at Meenbog in County Donegal and what followed at the construction stage of that project was an environmental catastrophe. There should be no gambling on concepts when dealing with 406,830 cubic metres of waste spoil on a hillside. The environmental risk is too great. The pursuit of climate change policy should never be at the expense of potential environmental destruction. It would be foolish to gamble with an environmental risk of this magnitude at this site, in my opinion.

5.1.9. My assessments in this addendum and in my original report focus on what the Board appears not to know and, therefore, the inability to conclude that what the applicant proposes will not cause serious adverse environmental impacts by way of a landslide. The applicant's generic approach in an area where landslides have occurred in recent times, even on this site, appears unacceptable. I have no reason to draw any different conclusion to that drawn in my original report.

5.2. Low Frequency Noise and Amplitude Modulation

5.2.1. The Board will note my original report dated 1st July, 2022. While I note the Board's further information request referred to residual potential for adverse effects from low frequency noise and amplitude modulation, I did not contend in my report that the

applicant referred to residual potential for adverse effects arising from either low frequency noise or amplitude modulation. What I clearly indicated was that the applicant acknowledged the potential for low frequency noise and, as mitigation, recommended that an appropriate investigation be undertaken should this arise. I have highlighted that there was no reference to anything that should be done after an investigation in the event that a problem arises with low frequency noise. There were no explicit mitigation measures proposed. Regarding amplitude modulation, I again noted that the applicant acknowledged the potential for amplitude modulation and that it proposed an assessment of the level of amplitude modulation in accordance with stated guidance should this issue arise. I indicated to the Board that no reference was made to what would actually be done in the event that there is a problem with amplitude modulation. That was the extent of my original considerations on low frequency noise and amplitude modulation.

5.2.2. Regarding the issue of low frequency noise, I acknowledge that the applicant considers that low frequency noise would be an unlikely issue and that it is not expected. However, I must again note the applicant's proposed 'mitigation' in the event that an issue arises with low frequency noise. Section 11.5.5.1 of the EIAR provides this. It states that an appropriate detailed investigation would be undertaken and due consideration would be given to guidance on conducting such an investigation which is outlined in Appendix VI of the EPA document entitled Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (EPA, 2016). I repeat for the Board that the EIAR's reference to carrying out an investigation and having regard to *guidance on how to carry out this investigation* is not mitigation. It is merely an investigation and there is nothing known about what would be done in the event that there is a problem. The applicant refers to operational control measures for the relevant turbine type which *may include* turbine curtailment and/or stopping turbines under specific operational conditions. Thus, the Board still does not know what actual control measures (mitigation) are proposed to be put in place. Furthermore, the Board has

no understanding of the relevant turbine type, what turbine curtailment may actually mean in this instance, and how it would affect the functioning and output of particular turbines in a practical manner (e.g. how long does one turn off a turbine causing a problem or curtail its functioning and what do you actually do to address a turbine that is causing a low frequency noise problem). Most importantly, there is no understanding if these measures would definitively work as mitigation.

5.2.3. Regarding amplitude modulation, I note that the applicant, in its response to the Board, acknowledges from research that amplitude modulation occurs at operational wind farms, albeit a rare and unlikely occurrence according to the applicant. However, I must again note the applicant's proposed 'mitigation' in the event that an issue arises with amplitude modulation. Section 11.5.5.2 of the EIAR provides this. It states that an acoustic consultant would assess the level of amplitude modulation, with the measurement method providing "a robust and reliable indicator" of amplitude modulation, yielding important information on the frequency and duration of occurrence, which can be used to evaluate different operational conditions including mitigation. I repeat for the Board that the EIAR's reference to carrying out an assessment is not mitigation. It is merely an assessment and the EIAR provides no details on what would be done in the event that there is a problem with amplitude modulation. The applicant's further information to the Board also refers to operational control measures for the relevant turbine type which will consist of turbine curtailment and/or stopping turbines under specific operational conditions. Therefore, for amplitude modulation, the applicant is clearly telling the Board that turbine curtailment and/or stopping turbines will take place as mitigation measures. However, the Board has no understanding of the relevant turbine type, what turbine curtailment may actually mean in this instance, how it would affect the functioning and output of particular turbines in a practical manner (e.g. how long does one turn off a turbine causing an AM problem and what do you actually do to address a turbine that is causing an amplitude modulation problem), and if these measures would address the issue.

5.2.4. Having regard to the above, the Board has no clear understanding of what mitigation is to be employed, what effects any mitigation may have on the functioning of the wind farm, and if these mitigation measures would work.

5.2.5. I submit to the Board that the applicant has not addressed the primary issue of concern, namely the recognition of the potential for adverse noise impacts arising from low frequency noise and amplitude modulation and the need to provide quantifiable and effective mitigation measures to address one or both if they were to arise. The Board cannot second guess what the applicant may or may not do and if the measures would or would not work because it does not have information on these measures and their effectiveness and the practicality of keeping any such measures in place.

5.2.6. Finally, I have noted for the Board in my original report the wholly inadequate and outdated existing Wind Energy Development Guidelines and their complete failure to address these matters in any way. This failure and policy inadequacy should not, and cannot, result in avoiding the issue, which is a real environmental issue clearly acknowledged by all parties and is an issue needing a constructive response to deal with it. One cannot shy away from the potential environmental effects. The Board is in no position to conclude that the proposed development would mitigate the environmental impacts from low frequency noise and/or amplitude modulation should they arise as a result of the proposed development.

6.0. Conclusion and Recommendation

6.1. The Board will note from my original report that the applicant's EIAR has referenced concerns from Inland Fisheries Ireland, Geological Survey of Ireland, and Irish Peatland Conservation Council (IPCC) in the scoping responses received by the applicant on soils and geology and water. This site is classified by Geological Survey

Ireland as being of low to moderately high landslide susceptibility. This site has been subject to landslides, one as recent as 2016 between the locations for proposed turbines T05 and T10. There was a significant environmentally destructive peat slide in the immediate vicinity at the construction stage of Garvagh Glebe Wind Farm. There was also a blanket bog landslide at Shass Mountain north-east of Drumkeeran as recent as 2020 upstream of the Dawn of Hope Bridge. That slide occurred on a moderately south sloping upland bog after a period of prolonged dry weather followed by heavy rainfall. The Board will also note the experience of Meenbog Wind Farm in County Donegal (ABP-300460-17). The same generic conceptual approach to site drainage and spoil management was proposed in that instance. The construction stage of that proposed development contributed to serious adverse environmental impacts due to a bog slide. The same generic approach is proposed in this application.

6.2. I note again for the Board Inland Fisheries Ireland's scoping response to the applicant. Therein, it was stated:

"*In September 2008, the Owengar River was severely polluted as a result of a catastrophic landslide caused by construction activities in association with wind farm and site road construction close to the Upper reaches of the Owengar River in Garvagh Glebe, Drumkeerin, Co. Leitrim. Water samples showed the impact of the pollution spread downstream through the Owengar River as far as Lough Allen over 9 kilometres downstream. The resulting pollution resulted in a fish kill of thousands of fish, mainly brown trout. The peaty material which was displaced into the watercourse led to the destruction of fisheries habitat on a massive scale. It will take many years for the impacted section of the river to recover.*

IFI is seriously concerned over the potential for landslides in this area, based on the occurrence of two landslides in close proximity to this site during the construction and clear felling for the neighbouring Garvagh Glebe windfarm, which resulted in significant damage to the fisheries resource and water quality in the Owengar River. The Geological Survey of Ireland have also identified numerous landslides in this area, indicating significant risks from activities involved (sic) large scale earth works such as windfarms."

6.3. I cannot impress enough upon the Board the seriousness of the threat posed by the proposed wind farm. Given the sheer scale of the proposed waste materials to be stored on hillsides with this proposed development, the vast quantities of peat in particular, the extent of what is not known about the actual locations of the proposed repositories, and the definitively clear risk to waterbodies arising from failure of these repositories, I unequivocally recommend to the Board that the proposed development be refused.

6.4. In the event that the Board does not agree with my recommendation, I would ask the Board, as a minimum, to seek a report from an independent Hydrogeologist to critically assess the applicant's proposals relating to spoil management and the site drainage provisions before making its decision on this application. I estimate that failure associated with the management and storage of 406,830 cubic metres of spoil on this site would result in very significant adverse environmental impacts, similar or greater to those which arose for the adjoining site at Garvagh Glebe, at Shass Mountain, and which has recently been experienced at Meenbog where effectively the same measures were pursued as is being proposed in this application. This is evidently an environmental impact which must be avoided. I, therefore, consider that my original reason should be upheld.

6.5. Further to the matter of low frequency noise and amplitude modulation, I submit that the applicant has failed to produce meaningful mitigation, with a distinct reliance on taking measures which the Board has no understanding of or their likely effects. Therefore, I recommend that an appropriate reason for refusal should attach with its decision to refuse permission for the wind farm. I recommend the following reason:

Having regard to:

(a) The reliance on a detailed noise curtailment strategy or on alternative turbine technologies in order to adequately mitigate adverse noise impacts, the details of each of which are unknown,

(b) The acceptance of potential adverse noise impacts resulting from low frequency noise and amplitude modulation,

(c) The lack of any guidance in the *Wind Energy Development Guidelines: Guidelines for Planning Authorities* (June, 2006) on low frequency noise and amplitude modulation, and

(d) The lack of coherent measures to mitigate impacts from low frequency noise and amplitude modulation,

the Board is not satisfied that the proposed wind farm, in itself and cumulatively with other wind energy development in the vicinity, would not seriously injure the amenities of residential property in the vicinity by way of noise effects.

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Kevin Moore

Senior Planning Inspector

22nd February, 2023