

## Appendix 6-3 – Freshwater Pearl Mussel Review



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### A6.3.1 INTRODUCTION

This review was prepared by Sinead O'Reilly. It reviews the known status of the Freshwater Pearl Mussel in the area around the Cloghercor Wind Farm site, the ecological requirements of the species and the potential for it to occur in the streams draining the wind farm site.

### A6.3.2 FRESHWATER PEARL MUSSEL RECORDS

Freshwater Pearl Mussel (*Margaritifera margaritifera*) has been recorded at three locations, Mullanieran Bridge, West Donegal, Mullanmore, West Donegal and Mullantiboyle, West Donegal. The total abundance recorded from all three sites was 40 molluscs. Further downstream in grid square G79, there is a record of over 2490 recorded at Site S, Owenea River, West Donegal and another 3350 recorded at Owenea Bridge, Owenea River, West Donegal. These recordings were all taken during Non-marine molluscs - Northern Ireland survey and recorded into the All Ireland Non-Marine Molluscan Database of 1993 - 1994. There is no online record of this species been present within the proposed development site nor downstream in the Gweebarra Estuary.

A data request was sent to NPWS in October 2019. A number of records were received for hecatad G79 and G89 relating to the Owenea River and Stracashel. These are in catchments that are hydrologically isolated from the wind farm site.

### A6.3.3 FIELD SURVEY FOR FRESHWATER PEARL MUSSEL

A broad appraisal / overview of the upstream and downstream habitat at each aquatic survey site was undertaken to evaluate the wider contribution to Freshwater Pearl Mussel and the potential for this species to be present within the proposed development. Based on the general riverine habitat, topography, steep gradient, substrate and surrounding habitat, the potential for this species to be present was universally poor. Therefore no Freshwater Pearl Mussel survey was carried out within the streams of the proposed development site.

### A6.3.4 DISCUSSION

The Freshwater Pearl Mussel (*Margaritifera margaritifera*) is found in rivers with clean, well oxygenated gravelly riverbeds that generally flow over granite or sandstone rock.

This species requires very clean well-oxygenated river habitats to successfully reproduce. The species is found within stable cobble and gravel beds which contain very little fine material. This type of substrate allows for free water exchange between the open river and the water within the substrate. The continuous exchange of water ensures high oxygen levels in the substrate, which is essential for juvenile development.

No inorganic silt, organic peat, and detritus should be present in the water as this material can not only block oxygen exchange but also consume oxygen as a result of decomposition processes. Extremely low levels of nutrients in the water are therefore also key for the species to complete its life cycle (Moorkens *et al.*, 2017). The streams within the proposed development flow through upland blanket bog and conifer plantation that contain inorganic silt, organic peat, and detritus (pine needles) which results in unsuitable oxygen levels.



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The species is very sensitive to the deterioration of its natural habitat, and initiatives to stabilise riverbanks and riverbed re-profiling can be highly detrimental. Conifer afforestation has been highlighted as a pressing factor in Belgium. Tree planting contributes to the release of sludge and silt into the river system due to wetland drainage and destabilization of the river bank. This was present within the proposed development site with areas of cleared forestry, and also evident was the undercutting on the banks of the streams.

Nutrient enrichment may impact upon the species and/or its habitat. Nutrient enrichment is the increase in the concentration of nutrients such as phosphorus and/or nitrogen in the water. Phosphorus and nitrogen compounds can be directly toxic to Freshwater Pearl Mussel. Again, the streams within the proposed development would have exposure to nutrients due to the forestry plantation.

This species has a complex life cycle, a long life and the dependence on salmonid fish population as larval hosts. The hosts for *Margaritifera glochidia* in Ireland are young native salmonids (first three year classes). A healthy population of juvenile salmonids is thus essential for mussel survival, as the chances of a glochidium attaching itself to a salmonid are very low; almost all glochidia are swept away downriver and die.

At around ten months later, usually in May or early June, the glochidia, drop off the fish gills. They must land and bury themselves 5–10 cm into sandy, gravelly substrate to continue to grow and mature to adult mussels. These sandy gravels must be clean in order to allow the exchange of oxygen with the main water column, otherwise the young mussels will suffocate.

As outlined, the streams within the proposed development do not hold suitable habitat for salmonids due to the steep gradient, poor spawning habitat and lack of nursery habitats. There is an absence of the sandy, gravelly substrate, which is needed by both the juvenile pearl mussel to develop, but also the salmonids to spawn.

Studies in Sweden have shown that generally Freshwater Pearl Mussels are found in the upper, narrower parts of the river basin, often with a stream order of 2–4. The gradient is often high and there is little sediment deposition. In the smallest watercourses there is a risk of drying out or bottom freezing, and consequently mussels are seldom found.

Several studies of different large freshwater mussels have described the negative effects of extremely high flows (e.g. Bolden & Brown 2002, Hastie *et al.* 2001, 2003, Kleiven and Dolmen 2008) which disturb the substrate.

The watercourses that flow through the proposed development site are high and contain little sediment deposition. They are of stream order 1-2 with a very steep gradient in places. These streams may be prone to drying out in summer months.

Freshwater Pearl Mussels require a substrate that is stable. The site must also be a fast-flowing area without too much sedimentation, with sufficiently low water temperatures. Areas with major sedimentation of silt do not contain Freshwater Pearl Mussels (Hendelberg 1960).

The stability of the substrate is important (Strayer 2008) and is governed by the substrate's composition, the extremes of flow and the gradient of the watercourse. Swedish studies show that mussels often have better reproduction in stretches of water that lie downstream of lakes (Lundstedt and Wennberg 1995), ideally large ones (Söderberg *et al.* 2008b), i.e. areas where the water flow and temperature is stabilised and the quantity of sediment and organic material



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is lower. Within the proposed development, there are small ponds of water and small lakes (Lough Aneane More and Lough Aneane Beg). A small stream flows out of these lakes and remains a stage 1-2 stream before it reaches the Gweebarra Estuary. The stream's substrate composition is mainly boulders, cobbles and a small percentage of gravels with the presence of organic matter from the blanket bog and conifer plantation.

The risks of sites drying out and of freezing must be low in suitable habitat for Freshwater Pearl Mussels. Areas which are stabilised by larger blocks and which contain sand and small gravel make an ideal habitat for juvenile Freshwater Pearl Mussels (Hendelberg 1960, Hastie *et al.* 2000a, 2001, 2003, Geist and Auerswald 2007). While the streams within the proposed development site are fast flowing, and lack sedimentation, they are at risk of drying out. Within the majority of the streams across the proposed development, large boulders were present. However there was no sand or small gravels present suitable for juvenile pearl mussels.

It is important both on the meta- and macro-habitat scale that the area close to the watercourse has a high degree of tree coverage. The optimal habitat for Freshwater Pearl Mussels has shade of 60-100 percent (Moog *et al.* 1993). The forest provides shade and thereby reduces the water temperature, which is an increasingly important factor the further south the population is located (e.g. Morales *et al.* 2004). The streams within the proposed development site do not have a high degree of tree coverage and the majority of streams had 0-25% shading present. The streams with heavy shading are located within a conifer plantation.

Overall, it can be seen that the ecological requirements for Freshwater Pearl Mussel are not present within the streams of the proposed development due to a number of factors, as discussed above. Therefore it can be assumed that there is no potential impact on this species within the proposed development.

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