Technical Appendix 6.5: Freshwater Pearl Mussel Survey Report

The MWP (2019) FPM report is attached below.

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Freshwater Pearl Mussel Survey
Barnesmore Wind Farm
20762

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1 INTRODUCTION

Malachy Walsh and Partners (MWP) were commissioned by Woodrow Solutions Ltd. to carry out a Freshwater Pearl Mussel (FPM) survey of selected watercourse reaches in the Eske and Foyle River catchments in Co. Donegal. The purpose of the surveys was to inform a Biodiversity chapter of an EIAR for Barnesmore Wind Farm Repowering. The proposed development is located upslope of the watercourses surveyed during this assessment.

The watercourses in the Eske catchment drain the western extent of the site and are located in a *Margaritifera* sensitive area in Hydrometric Area 37, with previous FPM records from the River Eske downstream of Lough Eske. The Leaghany River (EPA code 01L35) within the Foyle catchment drains the eastern extent of the site.

Below is an account of the methods used, results, conclusions and proposed measures to protect FPM. Photographic plates of representative surveyed areas are provided at the end of the report.

2 METHODOLOGY

MWP applied for and were issued a licence (No. C196/2019) to carry out FPM survey work in selected watercourse reaches in the Eske River catchment. Surveying was carried out following the NPWS guidance '*Margaritifera margaritifera* Stage 1 and Stage 2 survey guidelines, Irish Wildlife Manuals, No. 12' (Anon 2004). Surveying was carried out on the 1st, 2nd and 3rd October 2019 during bright weather. Water levels were slightly elevated. This did not affect underwater visibility in watercourses in the Eske catchment however, as the water was running clear. More turbid conditions were present in the Leaghany River, but the river substrate could be seen at most survey locations. The aquatic moss *Fontinalis antipyretica* occurred in slower flowing parts of the Leaghany River. This plant obscured the substrate in some areas, but the bed of the river was fully visible at transect survey locations. Taking into account the extent of surveying on river reaches and survey effort at transect survey locations, there was a high level of confidence in the degree of certainty of FPM presence/absence.

Transect surveying involved accessing the river at intervals along the river. For each transect where present, FPM across ca. 2.5m bands between left and right banks were recorded, this band corresponding to the area of river-bed visible while wading/snorkelling across the channel. FPM recorded at each transect were counted. The FPM survey included wading in the river while viewing the substrate and looking for FPM with the aid of a bathyscope. Instream movements when wading were from downstream to upstream. A reach of the River Eske downstream of Lough Eske was surveyed by snorkelling, from upstream to downstream. The surveyed areas were also checked for the presence of dead shells, particularly in depositing areas. Where access allowed, FPM were also sought while moving between transects, particularly in areas deemed most suitable for the species with reference to Conserving Natura 2000 Rivers Ecology Series No. 2 *'Ecology of the Freshwater Pearl Mussel*' (Skinner *et al,* 2003).

The bank manager noted the position of transects using GPS coordinates. Photographs of FPM were taken using an underwater digital camera. FPM shells found were removed from the river.

Representative photographs of the transects and river corridors were taken. Physical characteristics of the river at survey sites were recorded, including depth, substrate type and substrate condition.

FPM habitat suitability was noted with reference to Conserving Natura 2000 Rivers Ecology Series No. 2 *'Ecology of the Freshwater Pearl Mussel*' (Skinner *et al.* 2003) and the ecological quality objectives for FPM as outlined in the '*European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009*' (DoEHLG 2009). The following evaluations were employed in the current survey, based on the monitoring methods set out in the Freshwater Pearl Mussel Sub-basin Plans (North South 2 2009) and employed by the NPWS during Freshwater Pearl Mussel monitoring:

- Population densities:
  - Abundant (>250 per 100m of channel)
  - Frequent to Common (20 – 250 per 100m)
  - Occasional (less than 20 per 100m)
  - Absent

- Filamentous algae:
  - Rare: just visible in the field; covers < 1 % of the river bed
  - Occasional: covers 1 % to < 5 % of the river bed
  - Frequent: covers 5 % to < 25 % of the river bed
  - Abundant: covers 25 % to < 50 % of the river bed
  - Dominant: covers > 50 % of the river bed

- Siltation:
  - no visible silt plume
  - some visible silt
  - a lot of visible silt.

Biosecurity measures were adhered to during the surveys. Equipment had been sterilised and work was carried out with reference to Inland Fisheries Ireland 'Biosecurity Protocol for Field Survey Work' (IFI, 2010).

Plate 1 Surveying by bathyscope on an un-named stream (left) and snorkelling in the River Eske (right).

Table 1 gives the extent of FPM surveys and the type of survey of methodology applied. The survey extents and locations where FPM were recorded are illustrated in **Figure 1**.

Table 1 FPM survey stretches (Co-ordinates in ITM).

Catchment	River	Tributary	Location	Upstream limit (x, y)	Downstream limit (x, y)	Survey method	Approx. survey length	No. of transects	Transect code
Eske	Eske		Upstream of Thrushbank Bridge	596115, 881246	595530, 880919	Snorkelling	700m	9	E
	Lowerymore		Environs of Bridge upstream of Lough Eske	598294, 882081	597846, 882185	Bathyscope	650m	8	L
	Lowerymore	Mullanalamphry	Keadew Upper	601066, 882781	599677, 882757	Bathyscope	2km	10	M
	Lowerymore	Clogher	Clogher	600122, 881362	599116, 881218	Bathyscope	1.2km	6	C
				602091, 881013	602034, 881135	Bathyscope	150m	2	C
	Lowerymore	Un-named stream	Keadew Upper	603582, 884001	601792, 884235	Bathyscope	2km	18	-
Foyle	Leaghany		Croaghnakern	606006, 879769	606337, 879289	Bathyscope	800m	12	F

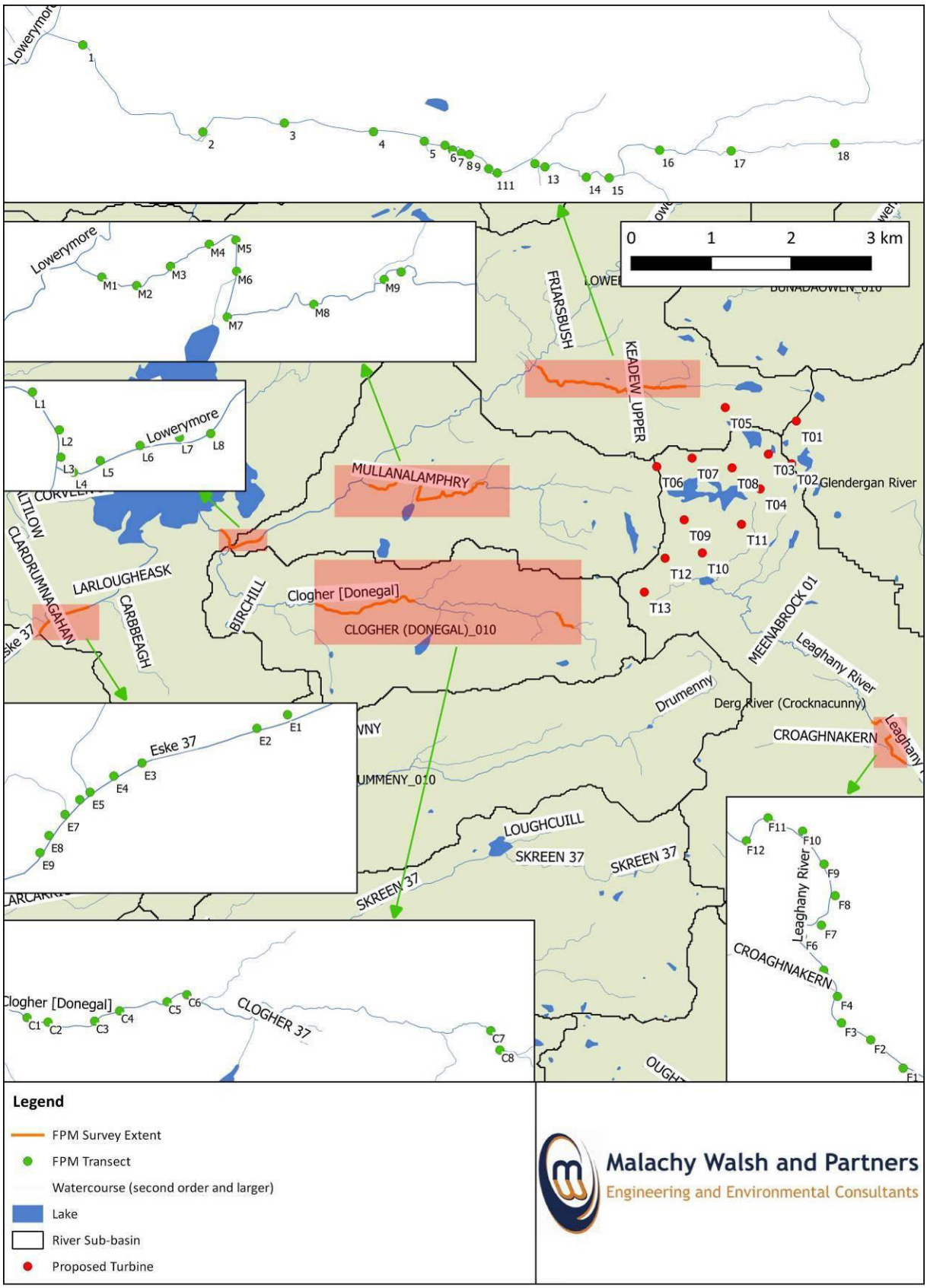

Figure 1 FPM Survey extents in the watercourses draining the proposed development.

3 RESULTS

Water levels and clarity were suitable for FPM surveying during the survey. Weather conditions were suitable with regard to cloud cover and light intensity, with prolonged sunny spells. The riverbed could be seen at all transect survey locations. **Table 2** gives the FPM population densities of the watercourse reaches surveyed and the FPM habitat evaluations. The physical characteristics of the watercourse reaches examined during the FPM survey are presented in **Table 3**. FPM were not recorded in any of the survey sections upstream of Lough Eske, where a total channel length of ca. 4.8km was surveyed. FPM were not recorded in the Leaghany River, where a channel length of ca. 800m was examined.

Table 2 FPM population densities and FPM habitat evaluations of watercourses draining Barnesmore Wind Farm.

Catchment	River	Tributary	Location	Population density	Filamentous algae	Siltation
Eske	Eske		Upstream of Thrushbank Bridge	Abundant	Occasional	No visible silt plume
	Lowerymore		Environs of Bridge upstream of Lough Eske	Absent	Rare	No visible silt plume
	Lowerymore	Mullanalamphry	Keadew Upper	Absent	Rare	No visible silt plume
	Lowerymore	Clogher	Clogher	Absent	Rare	No visible silt plume
				Absent	Rare	No visible silt plume
	Lowerymore	Un-named stream	Keadew Upper	Absent	Frequent	No visible silt plume
Foyle	Leaghany		Croaghnakern	Absent	Rare	Some visible silt

Table 3 Characteristics of the watercourse reaches examined during the FPM survey.

Catchment	River	Tributary	Transect code	Watercourse order	Wetted width (m)	Mean depth (cm)	Max depth (cm)	Substrate composition (≈%)				Shade (%)
								Rock	Cobble	Gravel	Sand	
Eske	Eske		E	5	12	90	2	20	50	20	10	60
	Lowerymore		L	5	11	60	1.2	15	45	35	5	55
	Lowerymore	Mullanalamphry	M	2	4.5	45	1	40	40	20	0	30
	Lowerymore	Clogher	C	4	3	25	65	35	50	10	5	40
			C	3	2	20	55	65	25	20	0	25
	Lowerymore	Un-named stream	-	2/3	2.2	40	80	45	40	15	0	10
Foyle	Leaghany		F	4	3.5	25	1.3	20	65	15	0	10

A total of 195 live FPM were recorded in the stretch of ca. 700m surveyed in the River Eske (downstream of Lough Eske). FPM were recorded at all but one of the survey transects. The majority of FPM were found in the less turbulent parts of the river in shaded areas. Given that each transect across the river was ca. 3m, the total length of river surveyed in the River Eske was ca. 27m. The FPM

population density in the River Eske upstream of Thrushbank Bridge is therefore assessed as 'Abundant'. Indeed, during transition from transect to transect from E3 to E9, numerous other FPM were recorded, especially in the more shaded areas. The stretch of river of ca. 250m between E2 and E3 runs through a deep gorge where the substrate is dominated by bedrock. FPM density in this reach are probably lower. A total of 4 FPM shells were recorded during the transect surveys. **Figure 2** and **Table 4** gives the locations of the FPM recorded in the River Eske.

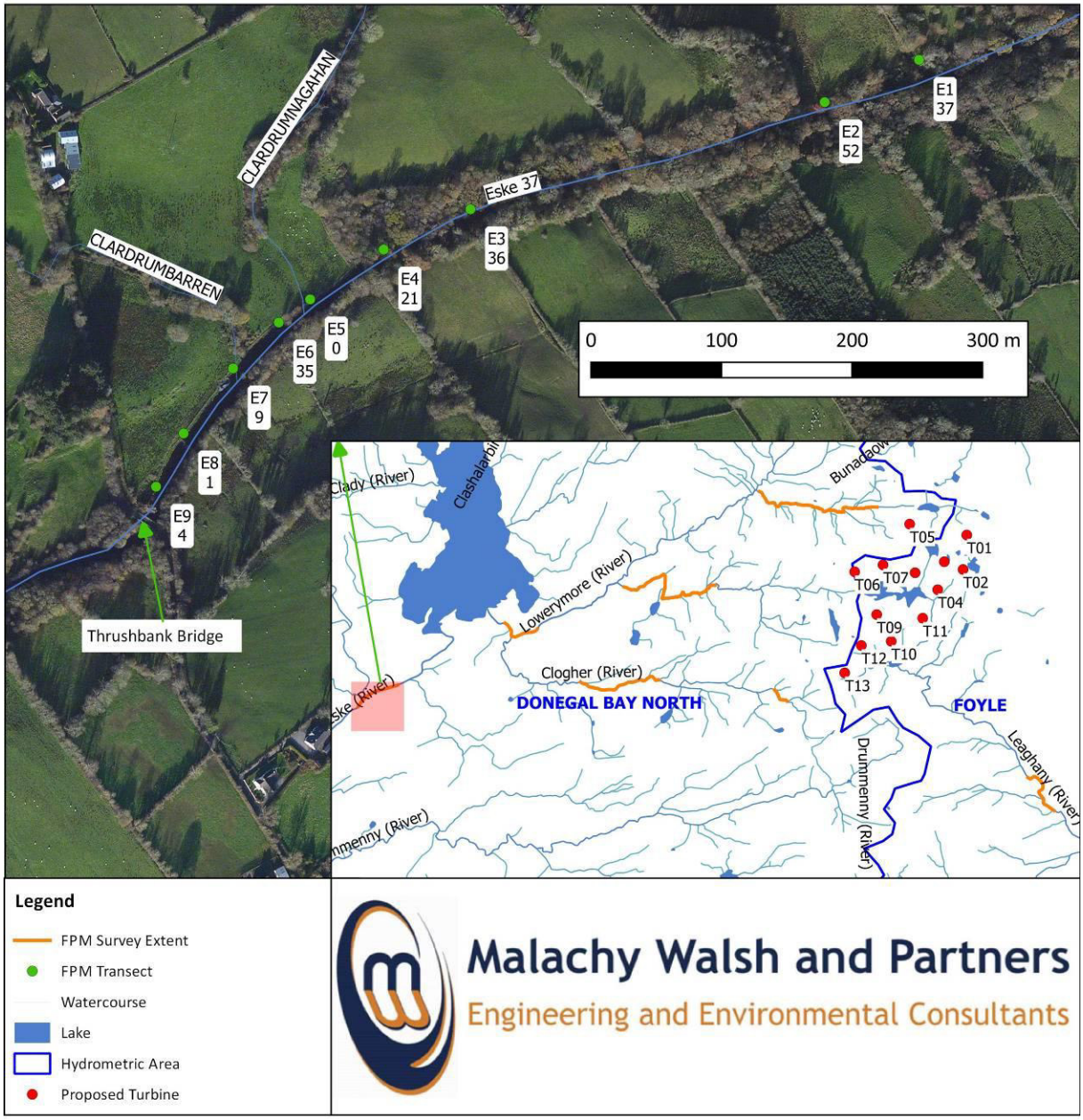

Figure 2 Locations of the FPM recorded in the River Eske during transect surveys in October 2019 (e.g. 4 live FPM at Transect E9).

Table 4 Locations of FPM recorded in the River Eske during October 2019.

Transect	Number of live FPM	Number of FPM shells
E1	37	3
E2	52	1
E3	36	0
E4	21	0
E5	0	0
E6	35	0
E7	9	0
E8	1	0
E9	4	0

4 CONCLUSIONS

It is concluded that the watercourses in close proximity to the Barnesmore Wind Farm do not support FPM: the 4th order Leaghany River in the Foyle catchment and the watercourses flowing into Lough Eske.

The Leaghany River appeared to be affected by peat silt and was highly turbid compared to the watercourses examined in the Eske catchment. This could be attributed to the presence of commercial forestry and associated operations in the upper leaghany catchment (e.g. land drainage, clear-felling). Habitat for FPM in the Leaghany River is regarded as suboptimal for FPM. Based on the current survey, FPM are not considered present in the upper 5km of the Leaghany River, the lower extent of this reach, and one of the subject watercourses of the current survey.

The Lowerymore River and its tributaries (Clogher, Mullanalamphry Streams, un-named stream at Keadew Upper) are not considered suitable habitats for FPM due to their high gradient and highly erosive nature. According to Skinner *et al.* (2003), the characteristics of riverbed substrata are of critical importance for FPM populations. The typical substrate preference is small sand patches, stabilised amongst large stones or boulders in fast-flowing streams and rivers. The scarcity of sand patches in these watercourses indicates turbulent conditions during spates/floods. Habitat for FPM in the watercourses upstream of Lough Eske is therefore assessed as marginal/unsuitable based on physical characteristics. Habitat suitability generally decreases with increasing elevation and proximity to the proposed development. The lack of sheltered refugia and/or paucity of salmonids in these reaches are considered factors affecting FPM distribution in the study area upstream of Lough Eske. For example, the upper reaches of the un-named tributary of the Lowerymore River do not support Salmon, a host for the early life stage of FPM, as there is an impassable waterfall less than 100m upstream of the Lowerymore confluence.

With the exception of the Leaghany River, the current observed water quality did not appear to be a factor that would affect FPM distribution. The degree of algal growth and siltation of surveyed reaches were favourable with respect to FPM habitat requirements. Evidence of anthropogenic activities affecting FPM habitats were minimal, with generally good riparian cover, low/moderate live-stocking densities and adequate bank protection. An old artificial embankment along a stretch of ca. 50m of the lower reach Mullanalamphry Stream was noted however, this is likely to have been created by excavating the river. There are serious pressures on the FPM population in the Eske

catchment. Significant mussel kills were recorded in the abundant stretch downstream of the N56 in 2014 and 2016 (Moorkens 2017 in NPWS 2019).

The watercourses in the Eske catchment are part of a *Margaritifera* sensitive area. Mussels are distributed throughout the River Eske from Lough Eske to the estuary NPWS (2019). The Eske FPM population is in a catchment listed in S.I. 296 of 2009 [European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009], an internationally important population and listed as a conservation interest in the Lough Eske and Ardnamona Wood cSAC (000163).

Based on the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (S.I. No. 296/2009) for FPM habitat, the surveyed watercourses in the Eske catchment 'pass' for filamentous algae and siltation. With maintenance of buffer zones between the Barnesmore Wind Farm and headwaters of the streams in the Eske catchment, it is considered that the FPM which occur downstream of Lough Eske are unlikely to be at risk, with implementation of the measures in **Section 5**. Any development in the Eske catchment will need to carefully consider and conform to the conservation objectives for the Lough Eske and Ardnamona Wood cSAC.

5 RECOMMENDATIONS

5.1 OVERVIEW

The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. 272 of 2009) and as amended, establish legally binding quality objectives for all surface waters and environmental quality standards for pollutants for purposes of implementing provisions of E.U. legislation on protection of surface waters. These regulations clarify the role of public authorities in the protection of surface waters and also concern the protection of designated habitats. The 2009 Irish Red list of non-marine molluscs identified the following as major threats to FPM: reduction in water quality; increases in siltation and physical interference with habitat (Byrne *et al.* 2009). These threats decrease macroinvertebrate and fish habitat quality in general. In a recent and detailed study carried out by Davis *et al.* (2018), sediment, phosphorus and nitrogen were manipulated simultaneously. Davis *et al.* (2018) concluded that:

- sediment was the most pervasive stressor particularly at high cover levels
- improving river ecological quality requires improved management of sediment inputs.

Silt control will be a primary concern during construction stage. The proposed development will be constructed in cognisance of the following guidelines:

- '*Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters*' (IFI, 2016)
- '*Control of water pollution from construction sites - Guidance for consultants and contractors*' (Masters-Williams *et al*. 2001)
- '*Control of water pollution from linear construction projects*' (Murnane *et al.* 2006).

Taking into account the sensitivity of FPM, the proposed works will follow a CEMP designed to protect water quality, as detailed below.

5.2 CEMP

In advance of any works taking place at the proposed development site, a Construction Environmental Management Plan (CEMP) will be prepared by the developer to include details on the machinery and methodology to be employed to undertake the proposed works. Guidance will be taken from the documents cited in **Section 5.1**. This will include details on the exact location of storage materials and equipment, management of access and limitation of disturbance outside of the site, how water quality will be protected with the avoidance of spills and the use of bio-degradable oils. This CEMP will also include for the protection of the site with regard to the cleaning of machinery and the avoidance of the importation and spread of non-native, invasive species.

The CEMP will include a Surface Water Management Plan (SWMP) to identify and eliminate the risks of construction materials and / or pollutants from equipment being discharged or released into waterbodies (See **Section 5.3**).

The CEMP will include a schedule of environmental commitments to include the mitigation measures prescribed in NIS and EIAR documents, and any further requirements set out as conditions of the proposed planning. Environmental protection measures will be used as an Environmental Audit Checklist tool to ensure compliance by the appointed contractor and will be completed during environmental monitoring of the works.

5.3 WATER QUALITY PROTECTION

All construction machinery operating near any watercourse will be systematically checked in order to avoid leaks of oils, hydraulic fluids and fuels. Any stockpiling of material, top-soil, peat or spoil will be within pre-selected areas (in accordance with planning documentation and consultation with the site ecologist). All storage and stockpiling of material should be at a minimum of 20m from any surface water drainage on the site. Temporary fencing (paling with 25mm mesh) will be erected around the required site works to delineate the works area and to minimise the potential for disturbance impacts outside of the works area.

Generally accepted best practice pollution control measures, as outlined below, will be employed during the construction phase when working in or near the minor watercourses in the study area to prevent the transport of deleterious substances to the headwaters of the River Eske tributaries:

- Release of suspended solids to all surface waters will be controlled by interception (e.g. silt traps) and management of site run-off. Any surface water run-off must be treated to ensure that it is free from suspended solids, oil or any other polluting materials
- Silty water shall be treated using silt trays/settlement ponds and temporary interceptors and traps will be installed until such time as permanent facilities are constructed
- Straw bales or silt fences shall be appropriately located near watercourses to help prevent untreated surface water run-off entering any watercourse
- All fuels, lubricants and hydraulic fluids will be kept in secure bunded areas away from watercourses. The bunded area will accommodate 110% of the total capacity of the containers within it
- Containers will be properly secured to prevent unauthorised access and misuse. An effective spillage procedure will be put in place with all staff properly briefed

- Any waste oils or hydraulic fluids will be collected, stored in appropriate containers and disposed of offsite in an appropriate manner
- Fuelling and lubrication will not be conducted within 50m of watercourses
- Storage areas, machinery depots and site offices will be located at least 50m from the nearest watercourse
- Foul drainage from the site offices and facilities will be properly treated and removed to a suitable treatment facility
- Spill kits will be made available close to streams and all staff will be properly trained on correct use
- Disposal of raw or uncured waste concrete will be controlled to ensure that watercourses or other sensitive areas will not be impacted
- Attenuation ponds and a constructed wetland shall be designed, allowing 24hr settlement before discharge into the surrounding watercourses (See **Section 5.4**).

5.4 ADDITIONAL MEASURES FOR CONSERVING WATER QUALITY AND AQUATIC LIFE

Altmüller and Dettmer (2006) studied the FPM populations in the Lutter River (Germany) and outlined measures for water protection that especially apply to the preservation of the FPM. Altmüller and Dettmer (2006) point out that the experiences and knowledge from the Lutter Project will be used for FPM conservation measures in other catchments. The measures described in Altmüller and Dettmer (2006) will be specifically referred to in the SWMP for the proposed development site as the appropriate standard of sediment control for the construction stage of the proposed development. Therefore, in addition to the mitigation measures provided above, it is recommended that the lagoon-type sediment trap and plant filtration beds as described in Altmüller and Dettmer (2006) are also incorporated into the SWMP to further reduce the risk to FPM in the River Eske downstream of the proposed development. Diagrams of these traps should be included in the SWMP.

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PLATES

Plate 2 Transect survey (left) and FPM (right) in the River Eske at site E1.

Plate 3 FPM in the River Eske at site E2 (left) and E3 (right).

Plate 4 Lower survey reach on Lowerymore River (left) and substrate (right).

Plate 5 Transect L5 on the Lowerymore River (left) and substrate (right).

Plate 6 Lower survey reach (left) and upper (right) survey reach of the Mullanalamphry Stream.

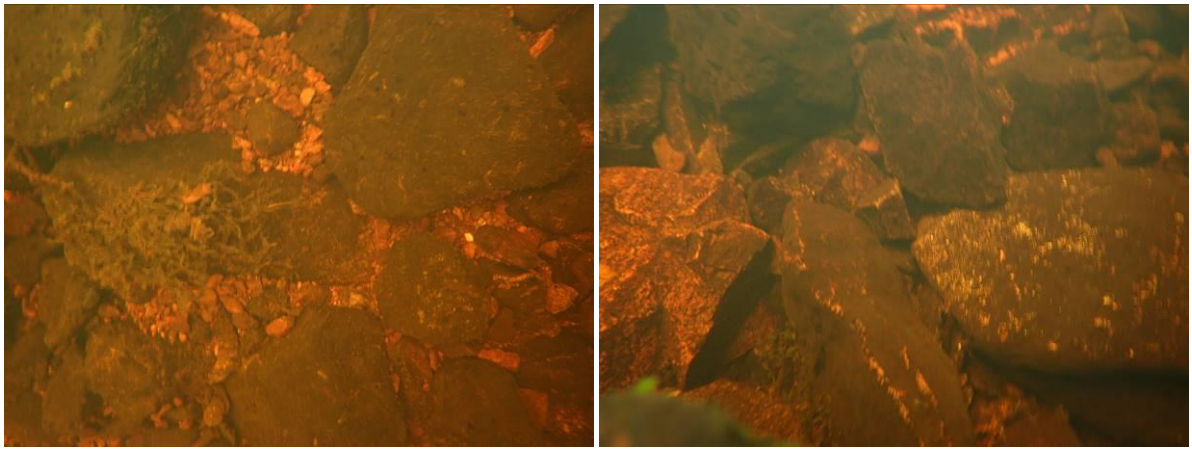

Plate 7 Typical view of substrate in the Mullanalamphry Stream in slow (left) and fast (right) slow flow.

Plate 8 Transect C1 on the Clogher Stream (left) and substrate (right).

Plate 9 Transect C5 on the Clogher Stream (left) and substrate (right).

Plate 10 Mid reach of the un-named stream at Keadew Upper (left) and view of substrate (right).

Plate 11 Lower survey reach (left) and upper (right) reach of the un-named stream at Keadew Upper.

Plate 12 Lower survey reach (left) and upper (right) reach of the Leaghany Stream.

Plate 13 Transect F2 on the Leaghany Stream (left) and substrate (right).