
Carn Fearna Wind Farm

Technical Appendix 8.4: Fisheries



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1 INTRODUCTION

1.1 Background and Report Scope

- 1.1.1 This Technical Appendix has been prepared to accompany **Chapter 8: Ecology**, in **Volume 2**, of the Environmental Impact Assessment (EIA) Report for Carn Fearna Wind Farm (the Proposed Development).
- 1.1.2 It presents detailed methodologies and results of desk studies and field surveys completed to establish baseline fish (and freshwater pearl mussel; FWPM) habitat conditions. In addition, opportunities for enhancements for fish fauna are also considered.
- 1.1.3 The report should be read with reference to the following Figures as presented within **Volume 3a** of the EIA Report:
- **Figure 8.8:** Fish Habitat Survey Plan.
- 1.1.4 Only common species names are used throughout this Technical Appendix. Scientific names for all species referenced are supplied in **Annex 1**.

1.2 Site Overview

- 1.2.1 The term 'site' in this report refers to the land within the red line application boundary as illustrated on **Figure 8.8**.
- 1.2.2 A number of watercourses tribute through the site and either originate from hill lochans, or springheads on-site. The watercourses within the site all tribute either into the Black Water, or Loch Garve to the south of the site. The locations of all watercourses subject to fish habitat survey (FHS) are illustrated on **Figure 8.8**.

1.3 Key Guidance

- 1.3.1 Fish habitat survey methodologies and subsequent interpretation of results has made reference to the following key industry standard guidance and documentation:
- Gardiner, R. (2003). *Identifying Lamprey. A field key for Sea, River and Brook Lamprey*. Conserving Natura 2000 Rivers Conservation Techniques Series No. 4. English Nature, Peterborough.
 - Harvey, J. & Cowx, I. (2003). *Monitoring the River, Brook and Sea Lamprey, Lampetra fluviatilis, L. planeri and Petromyzon marinus*. Conserving Natura 2000 Rivers Monitoring Series No 5, English Nature, Peterborough.
 - Hendry, K. & Cragg-Hine, D. (1997). *Restoration of riverine salmon habitats: A guidance manual*. R&D Technical Report W44. Environment Agency, Bristol.
 - Hendry, K. & Cragg-Hine, D. (2003). *Ecology of the Atlantic Salmon*. Conserving Natura 2000 Rivers Ecology Series No. 7. English Nature, Peterborough.
 - Maitland, P.S. (2003). *Ecology of the River, Brook and Sea Lamprey*. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.
 - Maitland, P.S. & Campbell, R.N. (1992). *Freshwater Fishes of the British Isles*. New Naturalist. HarperCollins, London.

- Mills, D.H. (1973). Preliminary assessment of the characteristics of spawning tributaries of the River Tweed with a view to management. In: M.W. Smith & W.M. Carter (eds.). *International Atlantic Salmon Symposium*, St Andrew's, International Atlantic Salmon Special Publication Series 4 (1), 145-55.
- NatureScot (2024). *NatureScot pre-application guidance for onshore wind farms*. February 2024.
- Scottish Fisheries Co-ordination Centre's (SFCC, 2007). *Habitat Surveys Training Course Manual*. Revised August 2007.
- Scotland & Northern Ireland Forum for Environmental Research (SNIFFER, 2010). WFD111 (2a). *Coarse resolution rapid assessment methodology to assess obstacles to fish migration: Field Manual Level A Assessment*. SNIFFER.
- Skinner, A., Young M. & Hastie, L. (2003). Ecology of the Freshwater Pearl Mussel. *Conserving Natura 2000 Rivers Ecology Series No. 2* English Nature, Peterborough.
- Kyle of Sutherland Fisheries Trust (2018). *Fishery Management Plan 2018 – 2021*.

2 METHODOLOGY

2.1 Key Species

2.1.1 The following species of conservation significance are considered:

- European eel - Council Regulation (EC) No 1100/ 2007) establishing measures for the recovery of the stock of European eel; listed by IUCN as Critically Endangered and Scottish Biodiversity List (SBL) (Watching Brief Only) Species.
- Atlantic salmon – Annex II of Habitats Directive, Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003 and SBL (Conservation Action Needed & Avoid Negative Impacts) Species.
- Brown trout/sea trout - SBL (Conservation Action Needed) Species.
- Freshwater pearl mussel – Schedule 5 of the Wildlife and Countryside Act (1981) and Annex II of Habitats Directive and SBL (Conservation Action Needed) Species.
- River lamprey - Annex II of Habitats Directive and SBL (Avoid Negative Impacts) Species.
- Brook lamprey - Annex II of Habitats Directive, and SBL (Avoid Negative Impacts) Species.
- Sea lamprey - Annex II of Habitats Directive and SBL (Avoid Negative Impacts) Species.

2.2 Desk Study

- 2.2.1 A desk study was undertaken in 2023 to identify any classified waterbodies and existing fisheries records within the site and surrounding area. A review of the key sources included in the desk study are summarised in **Table 2.1**.
- 2.2.2 Additional peer reviewed literature and industry guidance has also been reviewed and is referred to where relevant.

Table 2.1: Desk study key sources and information sought.

Key Source	Date of Consultation	Information Sought	Study Area
NatureScot Sitelink ¹	October 2024	Proximity to statutory designated sites with fish interests.	Within 10 km of the site.
Highland Biological Recording Group (HBRG) ²	April 2023	Existing fish records, and non-statutory sites.	Within 2 km of the site.
Cromarty Fisheries Management Plan (2024-2028). Cromarty Firth District Salmon Fisheries Board ^{3,4}	October 2024	Existing ecological records and watercourse condition.	Watercourse with potential hydrological connectivity to the site.
Scottish Environment Protection Agency (SEPA) River Basin Management Plan ⁵	October 2024	Watercourse condition.	Within 10 km of the site.
Joint Nature Conservation Committee's (JNCC) distribution of the Freshwater Pearl Mussel ⁶	October 2024	Existing ecological records.	Within 10 km of the site.

2.3 Fish Habitat Survey

- 2.3.1 A FHS was completed of all watercourses within the site (including a 100 m site buffer) on 18th and 19th December 2023, in order to identify any areas of critical fish habitat (i.e. spawning, nursery areas, juvenile and adult holding areas).
- 2.3.2 The survey was undertaken by C. Nisbet *MCIEEM*, who is fully trained on FHS as part of a Level 3 Management of Electrofishing Operations qualification as accredited by the SFCC.
- 2.3.3 All stretches of watercourse with a gradient of $\geq 6\%$ are considered to be unsuitable or non-productive fish habitat for Atlantic salmon and brown/sea trout. Mills (1973⁷) found that gradients of $< 3\%$ were favourable for Atlantic salmon; whilst sea trout were found to spawn in streams with gradients up to 4% . Most populations of lamprey occur where the average stream gradient is $1.9 - 5.7\text{ m/km}$, being rarely found where gradients exceed 7.8 m/km or 0.78% (Maitland and Campbell, 1992⁸). Whilst gradients of $\geq 6\%$ are considered to be typically unsuitable for fish fauna, it is recognised that small,

¹ Available at: <https://sitelink.nature.scot/map> (Accessed 25/10/2024).

² Available at: <https://www.hbrg.org.uk/> (Accessed 25/10/2024).

³ Available at: <https://cromarty.dsfb.org.uk/publications-3/> (Accessed 25/10/2024).

⁴ Available at: <https://storymaps.arcgis.com/stories/7f934cbf8e8b45b1bdf7dd3b081cf8fd> (Accessed 25/10/2024).

⁵ Available at: <https://www.sepa.org.uk/data-visualisation/water-environment-hub> (Accessed 25/10/2024).

⁶ Available at: <https://sac.jncc.gov.uk/species/S1029/> (Accessed 25/10/2024).

⁷ Mills (1973). *Preliminary assessment of the characteristics of spawning tributaries of the River Tweed with a view to management*. In Smith & Carter (eds) International Atlantic Salmon Symposium.

⁸ Maitland & Campbell (1992). *Freshwater fishes of the British Isles*. New Naturalist. HarperCollins, London.

isolated, populations of brown trout may occur in locally suitable habitat in stretches with steeper gradients.

2.3.4 The watercourses within the site were systematically walked (including in-stream inspections where required) and the habitats mapped according to the classifications presented in **Table 2.2**.

2.3.5 Specifically, the habitat survey focused on the identification of the following:

- spawning habitat for salmonid and lamprey species;
- nursery habitat for lamprey species;
- areas of habitat important for juvenile salmonids (fry and parr);
- areas of habitat important for adult holding areas; and
- areas of suitable substrate and flow conditions for supporting FWPM.

2.3.6 The habitat classification used in this study is based on the Scottish Fisheries Co-ordination Centre's Habitat Surveys Training Course Manual (SFCC, 2007⁹), the Environment Agency's Restoration of Riverine Salmon Habitats Guidance Manual (Hendry and Cragg-Hine, 1997¹⁰), a review of key habitat requirements for other species of conservation significance including lamprey, salmonids and FWPM (e.g. Maitland, 2003¹¹; Hendry & Cragg-Hine, 2003¹²; Skinner *et al.*, 2003¹³).

2.3.7 Each watercourse within the survey area was visited. Detailed analysis was undertaken at sample points within any diverse geomorphological and hydrological conditions within each watercourse. Samples were taken at each of the representative sections of each watercourse. The following information was collected at each sample location: channel gradient; substrate composition (% bedrock, boulders >256 mm, cobbles 65-256 mm, pebbles 4-64 mm, gravel 2-4 mm, coarse sand 0.5-2 mm and fine sand/silt/peat <0.5 mm); average wetted channel width (m); average depth (m) and turbidity (1 [clear] – 3 [turbid]). Any potential barriers to fish movement within watercourses were also recorded. A photograph was taken at each sample point.

Table 2.2: Fish river habitat classifications.

Cat	Habitat Type	Description	Species Suitability
1	Unsuitable	Usually 1 st – 2 nd order watercourses with steep gradient, 36 % slopes (often substantially greater), abundant bedrock, lack of fixed substrates, high velocity (e.g. headwaters/rivulets). Also includes less steep ephemeral stretches (e.g. headwater sources), flushes,	No productive fish habitat, although some species may migrate through these areas (also refer to 7. Rapids) depending on whether they represent a migration barrier.
1a	Steep > 10% gradient		
1b	Moderate 6-10% gradient		
1c	Other – ephemeral, shallow drains, dry beds		

⁹ SFCC (2007). *Habitat Surveys Training Course Manual*.

¹⁰ Hendry & Cragg-Hine (1997). *Restoration of riverine salmon habitats: a guidance manual*.

¹¹ Maitland (2003). *Ecology of the river, brook and sea lamprey*.

¹² Hendry & Cragg-Hine (2003). *Ecology of the Atlantic salmon*.

¹³ Skinner *et al.* (2003). *Ecology of the freshwater pearly mussel*.

Cat	Habitat Type	Description	Species Suitability
		shallow drains and modified watercourses with dry beds.	
2 2a 2b	Spawning Habitat Salmonids Lamprey	Stable “gravels” of minimum 15-30 cm depth, optimal 20-30 mm pebbles and small cobbles, not compacted or with excessive silt/sands (<20 % by weight) for salmonids. Lamprey spawning habitat where “gravels” include sands. Often at tail end of pools or upstream ends of riffle-runs ensuring oxygenated substrate. Can also be found at end of weir pools.	Spawning habitat - Atlantic salmon (c. 9 m ² per pair) and sea/brown trout; lamprey.
3	Riffle	Shallow (< 20 cm) and fast flowing, with upstream-facing wavelets which are unbroken (although often some broken water), with substrate dominated by gravel and cobbles.	Fry (0+) habitat – Atlantic salmon/ brown trout/sea trout.
4 4a 4b	Run Shallow (< 0.5 m deep) Deep (>0.5 m deep)	Generally deeper (>20-40 cm) and less steep bed compared to riffle, with substrate of boulders, cobbles, pebbles and gravels. Usually disturbed, rippled surface. Often located immediately downstream of riffle.	Mixed salmonid juvenile habitat. Fry (0+) & Par (1+) habitat - Atlantic salmon/ brown trout/sea trout.
5 5a 5b	Glide Shallow (<0.5 m deep) Deep (> 0.5 m deep)	Shallow gradient stretches with smooth laminar flow with little surface turbulence and generally > 30 cm deep; water flow is silent. Often located below pools. Typically, with small substrates of pebbles, gravel, coarse sand and fine sand/silt/peat.	European eel; non-productive salmonid habitat, although may provide some shelter for adults.
6 6a 6b 6c	Pool Plunge/Scour pool Meander pool Weir/bridge pool	No perceptible flow, eddying and usually > 100 cm deep. Substrate with high proportion of sand and silts. Often located on the outside of meanders but includes natural scour or plunge pools and artificial weir pools.	Adult refugia Atlantic salmon, sea/brown trout, European eel.
7 7a 7b 7c	Rapids Steep - >10 % gradient Moderate - 6-10 % gradient Low - <6% gradient	Sections of relatively steeper gradient with fast currents and turbulence, with mixed flow types, including free-fall, chutes and broken, with obstructions such as large boulders, rock outcrops and falls.	Negative feature for migratory species and may pose a migratory barrier; elvers/ yellow eels limited to velocity of <0.5 m/sec and 2.0 m/sec respectively;

Cat	Habitat Type	Description	Species Suitability
			lamprey to 2 m/sec. <i>Low gradient rapids</i> provide mixed salmonid juvenile habitat.
8 8a 8b	Banks of fine sediment of silts and sands Optimal Sub-optimal	Limited flow (sometimes back-flow) allowing deposition of silts/sands, not anoxic, with/without riparian trees. Optimal habitat is stable fine sediment and sand ³ 15 cm deep with some organic detritus. Sub-optimal habitat includes, small areas of deposited silts/sands behind boulders.	Lamprey ammocoete nursery and adult refuge.
9 9a 9b 9c 9d 9e	Vegetation features Riparian trees (tunnel) Flow constriction Aquatic macrophytes Emergent macrophytes Large woody debris	Closed woodland canopy forming tunnel vegetation. In-stream emergents, boulders, narrowing of channel, <i>etc.</i> . Stands of aquatic and floating vegetation. Stands of emergent (usually marginal) vegetation. Large woody debris (LWD) forming dams, <i>etc.</i>	Tunnel riparian trees may be negative feature for salmonids, although tree roots and fallen trees may provide refugia for Atlantic salmon/ brown trout/sea trout and European eel. Aquatics/emergents provide cover for fish.
10	Obstructions to migration	Impassable waterfalls, rapids, flow constrictions, weirs, bridge sills, culverts, shallow braided river sections, pollution preventing upstream migration.	All migratory species; impassability varies between species and feature. Leaping ability: <3.7 m Atlantic salmon; <1.81 trout; European eel and lamprey none.
11 11a 11b 11c 11d	Other features Side channel Backwater Artificial channel Standing water	Includes other channel features, with side channel (connected to main channel) and backwaters. Artificial channels may comprise either man-made banks and/or beds. Standing waters may comprise natural or artificial on-line or with/without inputs or outputs.	Side channel/backwater often important refugia for juveniles. Artificial channels have limited diversity and are often non-productive fish habitat.

Limitations

- 2.3.8 During the survey, although water levels were elevated following recent rains, it is considered that a robust assessment of the suitability and value of the on-site watercourses for fish fauna was conducted. The survey is therefore considered not to be subject to any substantial limitations.

- 2.3.9 The desk study records were gathered based on an original (reduced) site boundary. Given the final site boundary has only modestly altered from the original boundary, the desk study results are considered robust and have identified records of relevant fish species that may be present at the locality to supplement the field surveys.

3 RESULTS

3.1 Desk Study

Statutory Designated Sites for Nature Conservation

- 3.1.1 A review of NatureScot's Sitelink website identifies that the site does not form part of a statutory designated site for nature conservation with fish as an ecological qualifying feature, nor are there any such designated sites within 10 km of the site.

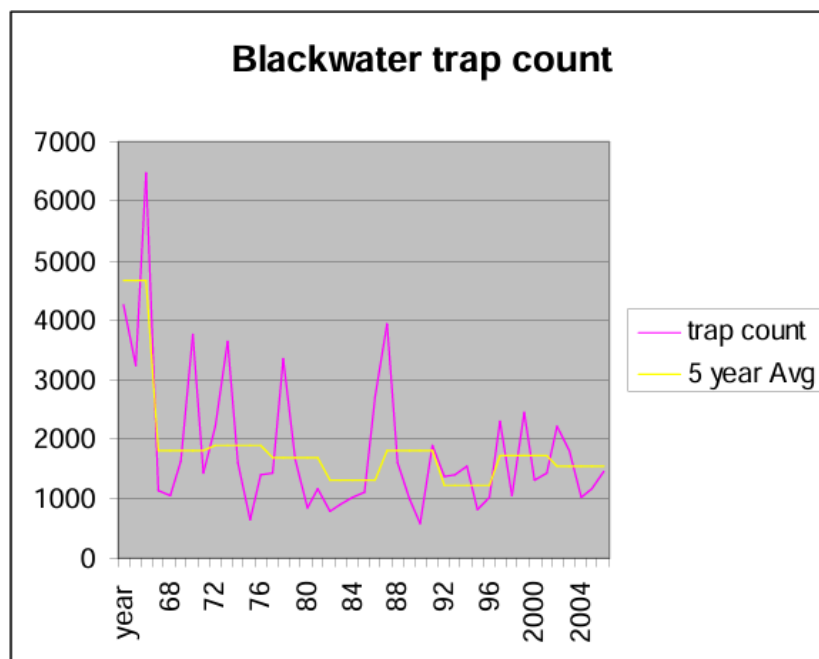
Non-statutory Designated Sites for Nature Conservation

- 3.1.2 Following review of the HBRG data return, no non-statutory designated sites with fisheries interests are located within 2 km of the site.
- 3.1.3 A review of NatureScot's Open Data Geoportal identified that part of the site (and the Off-site turning circle area) is located within the Transitional Zone of the Wester Ross Biosphere Reserve, which is recognised as an internationally world class environment for people and nature. The Wester Ross Biosphere Reserve, which overlaps with the north-western area of the site, does not specify fish as notable feature.

Existing Fish Species Records

- 3.1.4 Following review of returned HBRG species records, no fish species records were identified within the search area.
- 3.1.5 The European Water Framework Directive (WFD) requires that surface waterbodies in member states are classified according to ecological status. SEPA's River Basin Management Plan website confirms there is a single classified waterbody within the survey area. The Black Water (part of the River Conon catchment) is currently classified as having good overall ecological status and high access for fish migration.
- 3.1.6 A review of the Cromarty Fisheries Management Plan (FMP) revealed that the River Black Water supports Atlantic salmon, sea trout, brown trout, eel, rainbow trout, minnow and pike. The River Conon itself supports eel, pike, three-spined stickleback, rainbow trout, flounder, ten-spined stickleback, Atlantic salmon, sea trout, brown trout, perch, sea lamprey, river lamprey, brook lamprey and minnow. The catchment is not stated to include FWPM.
- 3.1.7 The Cromarty FMP states that the River Conon catchment has data across main river systems within the district, including the Black Water. A number of core sites are frequently monitored, providing a comprehensive record of trends in fish populations.
- 3.1.8 The trap catch at Loch na Croic on the Black Water (**Plate 1**) catches the entire upstream run of salmon returning to the Upper Blackwater. Trap catches are considered to be a more reliable indicator of stocks than either rod catches or fish pass counts. The Blackwater time series shows an initial decline after hydro construction activity (in late 1960s) and then variation without a clear trend.

Plate 1: Salmon trap catch at Loch na Croic on the Blackwater (Source: Cromarty FMP)



3.2 Fish Habitat Survey

- 3.2.1 The following presents results of the FHS for each of the watercourses within the survey area, including a summary of channel characteristics at time of survey, and should be read with reference to **Figure 8.8**.
- 3.2.2 The habitats of the watercourses surveyed are characterised based on the habitat classifications in **Table 2.2** and can largely be considered as 'unsuitable' fish habitat (Category 1), or 'suitable' fish habitat (all of the other habitat categories stated in **Table 2.2**). The exception to this is 'rapids' (Category 7) which are largely sub-optimal for fish species.
- 3.2.3 Environmental data for sample points (1-22), including channel dimensions, gradient and substrate composition is provided in **Annex 2**, with photographs showing each sample point presented in **Annex 3**.
- 3.2.4 Where specific species are not regarded for watercourses, the conditions are considered suboptimal for the species, and the species is considered likely to be absent.

Allt Cnoc nan Cleireach and tributaries (W1-4) – Sample Points 1 - 4

- 3.2.5 The Allt Cnoc nan Cleireach (Watercourse W1) tributaries into the Black Water and provides high access for fish migration. W1 is the most substantial of these watercourses with an average wetted width of 3m within the survey area. Each of these four watercourses have run and riffle flow types and lie on relatively shallow gradients (5% or less).
- 3.2.6 W2 has the most variety in terms of substrate, with a mix of cobble, pebble, gravel and sand present, which provides some spawning potential for salmonid species. W1, W3 and W4 however, have an absence of gravel and sand throughout the surveyed reach. There are no known barriers to these watercourses and they are considered to be suitable for supporting both migratory and non-migratory fish fauna, albeit in small numbers, given their relatively minor nature.

Allt a' Mhuilinn (W5) – Sample Point 5

- 3.2.7 The stretch of the Allt a' Mhuilinn (W5) that lies within the survey area is essentially an ephemeral peaty head water and is of little to no suitability for fish fauna.

Allt Abhagaith and Tributary (W6) – Sample Points 6 and 21

- 3.2.8 The Allt Abhagaith (W6) is a minor watercourse with an average wetted width of 1 m across the survey reach. It contains a substrate primarily comprised of larger, cobble sized stone and is thus of limited suitability for spawning. It predominantly supports a run riffle flow structure, with areas of shallow glide and shallow rapids over the faster flowing sections. There are no known barriers to fish migration present and this watercourse is considered to have the potential to support low numbers of migratory and non-migratory fish.
- 3.2.9 By contrast its tributary (W21) is a very minor headwater which is likely to be ephemeral in nature and is considered to be of negligible value for fish fauna.

Allt an Torra-bheithe (W7) – Sample Point 7

- 3.2.10 The Allt an Torra-bheithe (W7) is a minor watercourse, which flows through a moderately steep channel (largely a gradient 6-10%) over the survey area. It has a largely run riffle flow type, but also some shallow rapids in steeper areas. The substrate is dominated by boulder and cobble, with smaller proportions of pebble and gravel also present. It has some limited spawning potential. There are no known barriers present, and this watercourse is considered to be suitable for small numbers of migratory and non-migratory fish fauna.

Allt Brocaig (W8) – Sample Point 8

- 3.2.11 The surveyed section of the Allt Brocaig (W8) that lies within the survey area is a very minor headwater which flows over a moderately steep gradient. It is also likely to be ephemeral in nature and is considered to be of negligible value for fish fauna.

Allt na Goibhle and Tributary (W9 and W10) – Sample Points 9 and 10

- 3.2.12 The Allt na Goibhle (W9) is a minor watercourse which comprises a predominantly boulder/cobble substrate, with smaller proportions of pebble and gravel also present. It contains a run and riffle flow type and there are no known barriers present. As such, it is considered suitable for supporting low numbers of both migratory and non-migratory fish fauna.
- 3.2.13 The tributary of Allt na Goibhle (W10) and is a peaty head water which is considered to be of negligible suitability for fish.

Allt an Achaidh Mhoir (W11) – Sample Point 11

- 3.2.14 The Allt an Achaidh Mhoir (W11) is a minor watercourse which comprises a predominantly boulder/cobble substrate, with smaller proportions of pebble and gravel also present. It contains a run and riffle flow type and there are no known barriers present. As such, it is considered suitable for supporting low numbers of both migratory and non-migratory fish fauna.

Allt Fionnaidh and Tributaries (W12-16) – Sample Points 12-16

- 3.2.15 The Allt Fionnaidh (W12) is one of the more substantial watercourses within the survey area, but is still relatively minor in nature, with an average wetted width of 3 m. The substrate within the channel is dominated by bedrock, but also contains smaller proportions of boulder, pebble and gravel. It largely supports a run and riffle flow type but also has shallow rapids along steeper sections. As there are no known barriers present, it is considered to be suitable for supporting low numbers of both migratory and non-migratory fish, but it is of little value for spawning, given the low percentage of small gravel substrate and absence of sand within the channel.

- 3.2.16 The tributaries at W13-W16 are all very minor headwaters dominated by peaty substrates and are of negligible suitability for fish fauna.

Unnamed Tributary Watercourses (W17 – W21) – Sample Points 17 - 21

- 3.2.17 The unnamed tributary watercourses at W17 (a headwater of Allt Gleann Sgathaich), W18 and W19 (unnamed tributaries of Loch a' Bhealaich), W20 (a tributary of Allt Fearna) and W21 (minor tributary into the Black Water) are all minor peaty headwaters and are considered to be of negligible suitability for fish fauna.

Black Water (W22) – Sample Point 22

- 3.2.18 The Black Water (W22) is the most substantial watercourse within the survey area. It lies approximately 50 m from the edge of the site at its closest point and all of the watercourses within the survey area tribute into the watercourse. The Black Water is the only classified watercourse within the survey area. It is classified as having good ecological status and high access for migratory fish. This watercourse has an average width of 8 m and supports a range of different flow conditions within the survey area. There are areas of run and riffle flows in shallower areas. As well as glides, deep pools and rapid sections. The average depth within the survey area is approximately 0.5 m, however this excludes the deep pool sections, for which depth was not measured. This watercourse is considered to be suitable for larger numbers of migratory and non-migratory fish, including salmonid species of a range of age classes.

ANNEX 1 - SCIENTIFIC NAMES

Table A1.1 provides common and scientific names of fish species (and FWPM) included in this Technical Appendix.

Table A1.1: Common and scientific names of fish (and FWPM).

Common Name	Scientific Name
Atlantic salmon	<i>Salmo salar</i>
Brook lamprey	<i>Lampetra planeri</i>
Brown trout / sea trout	<i>Salmo trutta</i>
European eel	<i>Anguilla anguilla</i>
Flounder,	<i>Platichthys flesus</i>
Freshwater pearl mussel	<i>Margaritifera margaritifera</i>
Minnow	<i>Phoxinus phoxinus</i>
Perch	<i>Perca fluviatilis</i>
Pike	<i>Esox lucius</i>
Rainbow trout	<i>Onchorhynchus mykiss</i>
River lamprey	<i>Lampetra fluviatilis</i>
Sea lamprey	<i>Petromyzon marinus</i>
Stone loach	<i>Barbatula barbatula</i>
Ten-spined stickleback	<i>Pungitius pungitius</i>
Three-spined stickleback	<i>Gasterosteus aculeatus</i>

ANNEX 2 - ENVIRONMENTAL DATA

Table A2.1: Environmental data from W1 – W22.

Location			Substrate Composition (%)							Channel Information				Habitat Type
Sample No/ Photo	Easting	Northing	Bed-rock	Boulders >256 mm	Cobbles 65–256 mm	Pebbles 4 – 64 mm	Gravel 2 – 4 mm	Coarse sand 0.5 –2 mm	Peat/fine sand/silt <0.5 mm	Av. Wetted Width (m)	Av. Depth (m)	Turbidity (1 [clear]-3[turbid])	Channel Gradient (%)	
1	240419	864088	20	20	40	20	0	0	0	3	0.25	1	3-5%	3, 4a
2	240453	864069	0	0	20	40	20	20	0	0.5	0.25	1	3-5%	3, 4a, 7b
3	240879	864237	0	20	70	10	0	0	0	2	0.2	1	3-5%	3, 4a
4	240892	864253	0	40	50	10	0	0	0	1	0.25	1	5%	3, 4a
5	240932	864183	0	10	0	0	0	0	90	0.5	0.1	1	5%	1c
6	241851	863967	0	40	50	10	0	0	0	1	0.3	1	6-10%	3, 4a, 5a, 7b
7	241252	862460	0	40	30	20	10	0	0	1	0.25	1	6-10%	3, 4a, 7b
8	241057	861488	0	40	50	10	0	0	0	0.5	0.1	1	6-10%	1c
9	241747	860616	0	30	40	20	10	0	0	2	0.25	1	3-5%	3, 4a
10	241838	860748	0	0	0	0	0	0	100	0.5	0.1	1	6-10%	1c
11	242438	860529	0	40	40	10	10	0	0	2	0.2	1	3-5%	3, 4a
12	243287	861686	60	20	0	10	10	0	0	3	0.25	1	3-5%	3, 4a, 7c
13	243717	861298	0	0	0	0	0	0	100	0.5	0.1	1	6-10%	1c
14	243280	861842	0	20	30	0	0	0	50	0.5	0.1	1	5-6%	1c
15	243074	862188	0	0	0	0	0	0	100	0.5	0.1	1	2-3%	1c
16	242843	862445	0	0	0	0	0	0	100	0.5	0.1	1	3-6%	1c
17	243489	863331	0	0	0	0	0	0	100	0.5	0.1	1	2-3%	1c
18	242439	863160	0	0	0	0	0	0	100	0.5	0.1	1	2%	1c
19	242323	863212	0	0	0	0	0	0	100	0.5	0.1	1	2-3%	1c
20	241708	861786	0	0	0	0	0	0	100	0.5	0.1	1	6-10%	1c
21	240885	863866	0	0	0	0	0	0	100	0.5	0.15	1	2-3%	1c
22	240254	863924	80	20	0	0	0	0	0	8	0.5	1	3-5%	3, 4a, 4b, 5a, 5b, 6c, 7c

ANNEX 3 - PHOTOGRAPHIC PLATES

1



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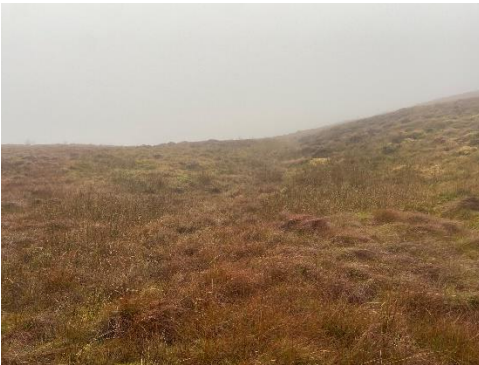
15



16



17



18



19



20



21



22a



22b

