Appendix 12.9

Fish Habitat Assessment

Contents

Tables

1 Introduction

1.1 General

1.1.1 CH2M Fairhurst Joint Venture (CFJV) has completed a fish habitat assessment on the River Spey and its tributaries to inform the Design Manual for Roads and Bridges (DMRB) Stage 3 Environmental Impact Assessment (EIA) and the accompanying Habitats Regulations Appraisal (HRA).

1.1.2 Designated sites within the study area that have fish interest features are presented in **Table 12.9.1-1-1**.

1.1.3 As the River Spey Special Site of Scientific Interest (SSSI) underlies the River Spey Special Area if Conservation (SAC), both sites are designated for Atlantic salmon and sea lamprey. The River Spey SAC has the highest conservation status (international) therefore, Atlantic salmon and sea lamprey will be considered under the SAC. The River Spey SSSI is not discussed any further in this Appendix.

Table 12.9.1-1: Designated sites with fish interest features within the study area

Name	Importance	Fish Interest Features
River Spey Special Area of Conservation (SAC)	International	Sea lamprey *Petromyzon marinus* Atlantic salmon *Salmo salar*
River Spey (SSSI)	National	Sea lamprey Atlantic salmon
River Spey – Insh Marshes Site of Special Scientific Interest (SSSI)	National	Arctic charr *Salvelinus alpinus*

1.1.4 The fish habitat assessment was focussed on major watercourses (e.g. as shown on 1:50,000 scale Ordnance Survey map), crossed by the existing A9, which include tributaries to the River Spey as well as the main stem of the river.

1.1.5 The primary objective of the fish habitat assessment is to characterise habitats at watercourse crossings that could support the qualifying species shown in **Table 12.9.1-1-1** at key stages in their life cycle. This will help identify potential impacts of the Proposed Scheme.

1.2 Fish Interest Features

Atlantic salmon

1.2.2 Consultation with Scottish Natural Heritage (SNH), Scottish Environment Protection Agency (SEPA) and Spey Fishery Board (SFB) has highlighted that Atlantic salmon are known to occur throughout the River Spey (i.e. River Spey SAC). The Spey supports one of the largest Atlantic salmon populations in Scotland. Adults spawn throughout virtually the whole length of the river and good quality nursery habitat is found in abundance in the main river and numerous tributaries. Salmon in the Spey river system are little affected by artificial barriers to migration, and the waters in the catchment are largely unpolluted (the river is oligotrophic throughout its

length). For a system of its size, the River Spey is also relatively free from flow modifications such as abstractions, diversions and impoundments. The salmon population includes fish of all ages including migrating smolts and returning adults, possibly reflecting genetic differences within the River Spey stock[1].

Sea lamprey

1.2.3 The River Spey represents the most northern extent of sea lamprey's range in the UK. Recent surveys show that sea lamprey larvae are widely distributed throughout the middle and lower reaches of the river, where the particularly fast-flowing waters of the River Spey provide ideal spawning conditions for this species[1].

1.2.4 There is some uncertainty regarding the extent of sea lamprey within the River Spey. However, suitable sea lamprey habitat was reported immediately upstream of Kingussie and within Insh Marshes[2].

Arctic charr

1.2.5 In Scotland, Arctic charr typically spawn in still water. Spawning in running water does occur but it is considered rare. Loch Insh supports a population of Arctic charr which are known to migrate approximately 15km upstream to spawn in the River Spey around Kingussie and Newtonmore[3].

1.2.6 A study by Walker (2006) found that Artic charr have been confirmed breeding on the River Spey near Newtonmore (NN 724 986) and Kingussie (NN 745 994). They have also been noted in Dunachton Burn (beyond the study area).[3]

[1] Joint Nature Conservation Committee (JNCC). Special Areas of Conservation. River Spey. Available at: http://jncc.defra.gov.uk/protectedsites/sacselection/sac.asp?EUcode=UK0019811 (accessed 27.03.18)
[2] APEM (2004). Assessment of sea lamprey distribution and abundance in the River Spey: Phase II. Scottish Natural Heritage Commissioned Report No. 027 (ROAME No. F01AC608).
[3] Walker AF. Stream spawning of Arctic charr in Scotland. Ecology of Freshwater Fish 2007: 16: 47–53. 2006 The Author. Journal compilation 2006 Blackwell Munksgaard.

2 Methods

2.1 Survey Extent

2.1.1 The surveys were carried out to a maximum of 150m upstream and downstream on major watercourses crossed by the existing A9, adapting the approach agreed through consultation with the Cairngorms National Park Authority (CNPA) and SNH, to characterise watercourses crossed by the existing A9. The extent of survey was reduced where significant barriers to fish migration were known or encountered. A list of the major watercourses surveyed is presented in **Table 12.9.2-1**. Where additional information was available, such as detail on water depth and substrate at deeper water locations (from freshwater pearl mussel surveys), these were used to support the fish habitat assessment.

Table 12.9.2-1: Watercourse crossings assessed

Hydro ID	Watercourse Name	Designated Site	Grid Reference
145_1	Allt Eoghainn	-	NN 72821 98282
146_1†	Unnamed Watercourse	-	NN 73150 98401
147_1	Burn of Inverton	SAC	NN 74392 98859
152	River Spey	SAC	NH 76458 00521
155	Unnamed Watercourse	-	NH 76874 01504
157	Allt Cealgach	-	NH 77286 01721
162	Raitts Burn	SAC	NH 78963 02176
167†	Unnamed Watercourse	-	NH 80591 03357
170†	Unnamed Watercourse	-	NH 81180 03736

†Burn not surveyed due to watercourse being culverted throughout its length at this location

2.1.2 Surveys were undertaken during conditions favourable for a freshwater habitat assessment, (i.e. water flow was suitable to record substrate type and typical flow rates). Survey metadata is provided in **Table 12.9.2-2.**

Table 12.9.2-2: Fish habitat assessment survey meta data

Date	Survey	CFJV personnel
July to September 2017	Fish Habitat Assessment	Krzysztof Dabrowski (Fairhurst, Assistant Ecologist, Grad CIEEM) Laura Linsley (Fairhurst, Assistant Ecologist) Susan McAuley (CH2M, Project Ecologist, Grad CIEEM) Scott McKenzie (Fairhurst, Ecologist, Grad CIEEM) April Park (CH2M, Project Ecologist, Grad CIEEM) John Thompson (Fairhurst, Senior Project Ecologist MCIEEM) Maria Thompson (Fairhurst, Assistant Ecologist, Grad CIEEM) Dan Wales (Fairhurst, Assistant Ecologist, Grad CIEEM)
March 2018		April Park (CH2M, Project Ecologist, Grad CIEEM) Melanie Roxburgh (CH2M, Project Ecologist, CEnv)

2.2 Habitat Requirements

2.2.1 The fish habitat assessment is focussed on identifying habitat features considered to be important for Atlantic salmon, sea lamprey and Arctic charr, as detailed in current professional guidance and relevant studies. An overview of habitat requirements is detailed in the following paragraphs with a summary provided in **Table 12.9.2-4.**

Atlantic salmon

2.2.2 Atlantic salmon habitat characteristics are described in accordance with Hendry and Cragg-Hine (2003) [4]. Atlantic salmon are an anadromous species (i.e. adults migrate from the sea to breed in freshwater). They are well known for their abilities and persistence to overcome obstacles during migration up rivers to reach spawning grounds.

2.2.3 There are a range of terms to describe the many life stages of Atlantic salmon (**Table 12.9.2-3**). The life cycle initiates when an adult female lays eggs, which are then fertilised by the male. The eggs hatch into alevins and stay within the redd or nest (a shallow excavation found within gravelly areas) for up to two months. Following this stage, they grow into fry, parr and then smolt, during which they first migrate to sea. Salmon remain at the smolt stage for around four years, before they return to their natal river as adults to spawn. Salmon rivers vary considerably in ecological and hydrological characteristics.

2.2.4 Generally, salmon require clean, well-oxygenated water to breed, feed and survive. Beyond this, in-stream physical habitat variables that determine suitability are water depth, water velocity, streambed substrate and cover. Favourable locations for salmon spawning are likely to occur where the gradient of a river is 3% or less (equivalent to gradient of >5˚) with a water depth ranging between 17cm to 76cm.

2.2.5 Salmon require an uncompact stream substrate of pebble and small cobble size[5]. The sites are generally transitional areas between pools and riffles where flow is accelerating, drawing

[4] K Hendry and D Cragg-Hine (2003). Ecology of Atlantic Salmon. Conserving Natura 2000 Rivers. Available at: http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=home.showFile&rep=file&fil=SMURF_salmon.pdf (accessed 27.03.18).

[5] Scottish Fisheries Co-ordination Centre (SFCC) (2007). Habitat Surveys Training Course Manual

oxygenated water across the eggs as the water depth decreases, with flow moving from the deeper pools to the shallow riffles.

2.2.6 At the fry and parr stage, habitat preferences are towards shallow, fast-flowing water with a moderately coarse substrate and cover. At the juvenile stage, suitable cover includes areas of deep water, surface turbulence, loose substrate and large rocks.

Table 12.9.2-3: Typical habitats for different life stages of salmon

Life Stage	Habitat
Eggs/ alevins	Pebble to small cobble sized substrate
Fry (<1-year-old)	Pebble to small cobble sized substrate, fast flowing, shallow broken water
Parr (>1-year-old)	Small cobble to boulder sized substrate, fast flowing broken water, often slightly deeper water than fry
Smolts	Habitat requirements not determined
Adults	Deep pools

Sea lamprey

2.2.7 Sea lamprey habitat characteristics are described in accordance with Maitland (2003)[6]. Sea lamprey are an anadromous species and require clean gravel for spawning. The scale of gravel beds required ranges from a few square meters to hundreds of square meters in large rivers.

2.2.8 Sea lamprey lay eggs in crude nests within gravel beds. These are comprised of shallow depressions previously created by lifting away small stones with their suckers. Eggs are laid and then sometimes covered with larger stones or vegetation. Once hatched, juvenile lamprey (ammocoetes) drift downstream and areas of sand or silt (typically comprising 90% sand) are utilised by burrowing juvenile ammocoetes, where they spend several years until transformation into adulthood occurs where they migrate downstream to the sea[7].

2.2.9 Sea lamprey migration upstream is limited by physical barriers in watercourses, such as high waterfalls, weirs, dams and severe pollution that other species, such as Atlantic salmon, may be able to pass.

Arctic charr

2.2.10 Arctic charr habitat characteristics are described in accordance with Walker (2006)[3]. Arctic charr breeding in flowing water usually spawn on gravel substrate, however spawning can occur in sediments from coarse sand to boulder gravels. The highest frequency of egg deposition was in walnut-sized gravel, mixed with fist-sized stones, with or without gritty sand. In Scotland, the charr spawning observed in a narrow section at Loch Coulin took place in gently flowing water (c. 0.2–0.3ms^{-1}), on a bed comprising a mixture of gravel, sand and silt.

2.2.11 These conditions suggest that where Arctic charr are present breeding along a flowing watercourse, they are associated with gravel substrate similar to Atlantic salmon preferences, but are restricted to slower flowing water similar to the conditions in still water lochs.

[6] Maitland PS (2003). Ecology of the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Ecology Series No. 5. English Nature, Peterborough.

[7] SNH. Lamprey. Available at: https://www.nature.scot/plants-animals-and-fungi/fish/freshwater-fish/lamprey (accessed April 2018)

Table 12.9.2-4: Overview of habitat requirements for each fish species

Variable	Rationale – Atlantic salmon	Rationale – Sea lamprey	Rationale – Arctic charr
Watercourse gradient	Favourable conditions for Atlantic salmon spawning occur where the watercourse gradient is 3% (<2 degrees)	Spawning occurs over gentle gradient watercourses of approximately 1.9m to 5.7m km^{-1}	Unknown, however reliance on slow to moderate flow suggests a preference for very low gradients
Substrate	The composition and mean grain size of gravels used by salmon for spawning varies markedly, but typically consists of a mix of cobbles (grain size 22–256 mm), pebbles (2–22 mm) and finer material (< 2 mm)	Spawning: stony gravels (15cm to 115cm) with substrate small enough to move to create a nest. A proportion of sand and smaller substrate is required to consolidate the nest Nursery areas: require slower flowing areas in slower sections of watercourses or at the slower edges of high velocity streams. Sandy silt substrates are required	Course sand to boulder gravels, and have been recorded on a mixture of gravel, sand and silt
Channel width	Atlantic salmon have been recorded spawning in streams <1m wide[8]	Parameter given to characterise the nature of the watercourse	Unknown, typically recorded on main river stems, literature refers to wide channels of 32m to 37m
Channel depth	Salmon typically spawn within water depth of 17cm to 76cm; fry and young are associate with water <20cm depth	Spawning 40cm to 60cm; nursery areas 10cm to 50cm or deeper	Unknown in UK due to typical spawning locations being in still water lochs, literature refers to deep pools (<3m)
Bank structure/ vegetation	Bankside vegetation/ structure can be important in providing cover for adult salmon during upstream migration. Bankside vegetation and woody debris in the watercourse can provide shelter for juveniles	Shading does not appear to influence spawning activity	Unknown in UK due to typical spawning locations being in still water lochs
Presence of barriers	Waterfalls/ man-made structures can impede upstream migration of Atlantic salmon, though they are capable of passing some obstacles (max height 3.7m)	Sea lamprey are more heavily affected by barriers to movement than Atlantic salmon, such as waterfalls, weirs and other structures	Unknown, likely affected by barriers to movement such as waterfalls, weirs and other structures

2.3 Limitations

2.3.1 The unnamed watercourse at Hydro ID 164_1, 167 and 170 could not be surveyed as it is culverted under the current A9.

2.3.2 No other significant constraints to the survey were identified. The assessment had regard to normal conditions within the upper River Spey, as specified by the closest SEPA water-level gauging station located in Kincraig.

3 Results

3.1.1 Details of the fish habitat assessment for each watercourse, not including those watercourses which were culverted under the A9 (Hydro ID 146_1, 167 and 170), are provided in **Annex A** – Fish Habitat Assessment Results**.**

Atlantic salmon

3.1.2 Of the nine watercourses assessed, suitability for Atlantic salmon during specific life stages has been observed within the Burn of Inverton, the River Spey and Raitts Burn. An overview of the suitability of each watercourse, showing which Atlantic salmon life stages the watercourse is suitable for, is presented in **Table 12.9.3-1**.

3.1.3 Some of the smaller watercourses surveyed lacked the deeper 'rest' pools required for adult salmon upstream migration and their potential as spawning areas is likely be limited as a result of this. Similarly, these watercourses are generally exposed, lacking the shade provided by overhanging vegetation, woody debris or undercut banks typically used by adult salmon.

3.1.4 Substrates present within the Burn of Inverton and Raitts Burn showed some suitability to support spawning conditions for Atlantic salmon, with a mixture of gravel, pebble, and cobble sized substrate present. At the Allt Cealgach, the likelihood of either salmon or lamprey accessing the burn for spawning is considered to be low, as the watercourse disperses through heavily vegetated wetland at the downstream end, which would limit migration upstream.

Sea lamprey

3.1.5 Potential sea lamprey spawning gravel habitat was found in similar areas to those highlighted for Atlantic salmon. An overview of the suitability of each watercourse for sea lamprey is presented in **Table 12.9.3-1.**

Arctic charr

3.1.6 Arctic charr habitat was found to be restricted to the River Spey crossing, where the slow flowing conditions with deep pools and gravel sediment provides optimal in-stream spawning habitat (see **Table 12.9.3-1**). Smaller tributaries such as the Burn of Inverton and Raitts Burn do have areas of slower flowing water that could be used by Arctic charr, however the size and depth of the flow at these locations suggest that they are unsuitable.

Table 12.9.3-1: Summary of fish habitat assessment results

Hydro ID	Watercourse name	Suitability upstream			Suitability downstream			Comments on suitability
		Salmon	Sea lamprey	Arctic charr	Salmon	Sea lamprey	Arctic charr	
145_1	Allt Eoghainn	None	None	None	None	None	None	Channel depth, steep gradient and substrate structure are unlikely to provide suitable spawning, juvenile or adult habitat for any of the freshwater fish considered.
146_1	Unnamed Watercourse	None	None	None	None	None	None	Watercourse is culverted under the A9, and on the downstream side, the culvert is deeper than the land and therefore water appears to seep out of the ground. On the downstream side, shortly after where the water appears, there is a trash screen present which forms a barrier. Upstream habitats cannot be accessed due to the limited flow of water, trash screen and sunken culvert. This watercourse does not provide suitable spawning, juvenile or adult habitat for any freshwater fish considered.
147_1	Burn of Inverton	Suitable spawning and juvenile habitat	Suitable spawning and juvenile habitat	None	Suitable spawning and juvenile habitat	Suitable spawning and juvenile habitat	None	Habitats immediately upstream and downstream of the crossing provide suboptimal conditions for spawning and juveniles. However, away from the immediate vicinity of the A9 crossing, the Burn of Inverton is a high-quality feature for both Atlantic salmon and sea lamprey given the structure and dynamic nature of habitats, which included potential spawning areas and nursery areas for both Atlantic salmon and sea lamprey species. The relatively shallow flow conditions immediately upstream and downstream, and relatively fast flow, is considered unsuitable for Arctic charr.
152	River Spey	Suitable juvenile habitat	Suitable juvenile habitat	Suitable spawning and juvenile habitat	Suitable juvenile habitat	Suitable juvenile habitat	Suitable spawning and juvenile habitat	No distinct pool and riffle formation. The lack of these features in vicinity of crossing likely to limit suitable spawning habitat for Atlantic salmon and sea lamprey. Fish fry were noted during the assessment which suggests the habitat is suitable for juveniles. The slow flowing water is provides suitable for Arctic charr spawning habitat.
155	Unnamed Watercourse	None	None	None	None	None	None	Highly modified channel resulting in ditch structure. Barrier at upstream side. Substrates offer unsuitable spawning habitat for all three species

Hydro ID	Watercourse name	Suitability upstream			Suitability downstream			Comments on suitability
		Salmon	Sea lamprey	Arctic charr	Salmon	Sea lamprey	Arctic charr	
157	Allt Cealgach	Sub-optimal	Sub-optimal	None	Sub-optimal	Sub-optimal	None	Downstream channel disperses into wetland with limited continuous upstream channel for fish movement. Channel is shallow and lacks pools suitable for juvenile shelter. Absence of fine sediment for juvenile lamprey. Presence of gravels downstream indicates the substrate could be used for spawning in higher flow conditions, though due to the lack of pool and riffle structure, it is considered unlikely.
162	Raitts Burn	Suitable spawning and juvenile habitat	Suitable spawning	Sub-optimal	Suitable spawning habitat and juvenile habitat	Suitable spawning habitat	Sub-optimal	Presence of gravels suggests habitat is suitable for spawning Atlantic salmon and sea lamprey. Absence of finer sediments limits potential for use as a nursery area by sea lamprey. Presence of slower flowing water upstream of crossing may allow Arctic charr to breed and rest, although shallow water (<0.5m deep) means this would be sub-optimal habitat.
167	Unnamed Watercourse	None	None	None	None	None	None	Watercourse is underground for a large section, with the downstream section highly modified and forming a waterfall effect onto rock ballast. The watercourse is then further culverted under the B9152 and dispersed into a wetland area. Therefore, the watercourse is not considered to provide suitable spawning, juvenile or adult habitat.
170	Unnamed Watercourse	None	None	None	None	None	None	Watercourse is under ground, likely flowing through a pipe culvert; therefore, the watercourse is not considered to provide suitable spawning, juvenile or adult habitat for all three species.

3.1.7 The presence of suitable habitat for notable fish species will have implications for timings of construction activities, particularly watercourse crossings and in-channel work. This is due to the vulnerability of fish at egg or alevin (for Atlantic salmon) stage where the species are more susceptible to impacts as they are immobile within river sediments.

3.1.8 The sensitive periods (i.e. migration and spawning) for Atlantic salmon[9], Arctic charr[3] and sea lamprey[9] are summarised in **Table 12.9.3-2**. Months presented in red indicate where in-channel works within suitable watercourses, or percussive works in proximity, should not be undertaken. Those months presented in green indicate where restrictions on in-channel works/ percussive works can be lifted and works can proceed.

Table 12.9.3-2: Overview of most sensitive periods for freshwater fish

Species	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Atlantic salmon												
Sea lamprey												
Arctic charr												

[9] SNH (2006). Guidance for competent Authorities. Table 4 (Atlantic salmon) Table 7 (sea lamprey). Available at: http://www.snh.org.uk/pdfs/publications/heritagemanagement/guidanceforcompetentauthorities.pdf (accessed April 2018).

Annex A – Fish Habitat Assessment Results

Table 12.9.A-1: Allt Eoghainn fish habitat assessment

<table>
<tr><td colspan="2">Watercourse: Allt Eoghainn</td><td>Hydro ID: 145_1</td><td colspan="2">Grid Reference: NN 72821 98282</td><td></td></tr>
<tr><td>Upstream</td><td></td><td>Comments</td><td>Downstream</td><td></td><td>Comments</td></tr>
<tr><td>Channel width</td><td>2m</td><td rowspan="6">Watercourse flows through pipe culvert. Wooden trash screen present however, it is not considered a barrier to fish passage. Moderate flow, riffles present.</td><td>Channel width</td><td>2m</td><td rowspan="6">Wooden trash screen present however, it is not considered a barrier to fish passage.</td></tr>
<tr><td>Channel depth:</td><td>30cm</td><td>Channel depth:</td><td>15cm</td></tr>
<tr><td>Substrate:</td><td>Boulders, cobbles and pebbles.</td><td>Substrate:</td><td>Concrete slab, boulder and cobbles.</td></tr>
<tr><td>Gradient:</td><td>c15°</td><td>Gradient:</td><td>c10°</td></tr>
<tr><td>Bank structure/ vegetation:</td><td>Banksides vegetated with grassland and dry heath.</td><td>Bank structure/ vegetation:</td><td>Banksides vegetated with grassland and birch scrub.</td></tr>
<tr><td>Barriers Y/N</td><td>N</td><td>Barriers Y/N</td><td>N</td></tr>
<tr><td colspan="3">Photograph Upstream:</td><td colspan="3">Photograph Downstream:</td></tr>
<tr><td colspan="3"> 
</td><td colspan="3"> 
</td></tr>
<tr><td colspan="6">Overview of suitability for fish:
The Allt Eoghainn comprises a relatively minor channel with a maximum width of 2m. Channel depth is shallow and reported as 15cm downstream. The watercourse lacks suitable rest pools for upstream Atlantic salmon migration. The channel structure is uniform both upstream and downstream of the existing A9 crossing. The coarse nature of the substrate does not offer suitable habitat conditions for nursery areas for sea lamprey ammocoetes and the relatively exposed nature of the channel and steep gradient is considered to be of low suitability for juvenile Atlantic salmon. While the substrate may provide potential spawning conditions for Atlantic salmon and sea lamprey the other factors discussed above are considered to eliminate this potential. Given the steep nature of the watercourse with lack of slow flowing water in pools and the narrow width, this watercourse is not considered suitable for breeding Arctic charr.</td></tr>
</table>

Table 12.9.A2: Burn of Inverton fish habitat assessment

Watercourse: Burn of Inverton		Hydro ID: 147_1	Grid Reference: NN 74392 98859		
Upstream		Comments	Downstream		Comments
Channel width	3-5m	A short distance upstream of the existing A9 crossing, the Burn of Inverton has a deeper channel surrounded by a narrow band of alder woodland. Where the woodland ends, the channel is more dynamic and comprises pool riffle structure.	Channel width	6-10m	Downstream of the existing A9, there is an additional culvert that supports an access track across the burn. The burn between the A9 culvert and the track culvert is modified. Downstream of the access culvert, the burn comprises a very dynamic natural channel which is braided in parts and incudes good pool riffle structure throughout.
Channel depth:	Variable 15-70cm		Channel depth:	Variable 15-70cm	
Substrate:	Comprises mixture of coarse and fine sand, pebble and cobbles.		Substrate:	Comprises mixture of cobbles - pebbles. Sand and silt around meanders and backwaters.	
Gradient:	<5°		Gradient:	<5°	
Bank structure/ vegetation:	Narrow band of alder woodland within heathland.		Bank structure/ vegetation:	Dominated by Alder woodland and marshy grassland Shallow banks immediately upstream but low vertical banks through woodland.	
Barriers Y/N	N		Barriers Y/N	N	
Photograph(s) Upstream:			Photograph(s) Downstream:		
					
Overview of suitability for fish: The Burn of Inverton is a high-quality feature for both Atlantic salmon and sea lamprey given the structure and dynamic nature of habitats, which include potential spawning areas and nursery areas for both species. Salmonid fry have been recorded both immediately upstream and downstream of the existing A9 culvert structures. Habitats in the immediate vicinity of the crossing are considered unsuitable for spawning due to the shallow depth of the watercourse.					

Table 12.9.A-2: River Spey fish habitat assessment

Watercourse: River Spey		Hydro ID: 152	Grid Reference: NH 76458 00521		
Upstream		Comments	Downstream		Comments
Channel width	20m	Slow uniform flow throughout. Fish fry observed. Gabion baskets present on the north bank under the crossing, sheet piling present on south bank of the crossing. Presence of fish indicated by piscivorous bird species. South bank of river shallow and dominated by silty deposits.	Channel width	20m	Shingle island present approx. 10m downstream of crossing. Presence of fish indicated by piscivorous bird species.
Channel depth:	1-6m (deeper toward north bank)		Channel depth:	1-6m (deeper toward north bank)	
Substrate:	Substrate upstream is characterised by mobile sandy substrate. Exposed gravel bars at meanders indicate a throughput of gravels in the river at the crossing location. Stable cobble substrate present in some areas.		Substrate:	Substrate includes fine sediment at the margins. During the habitat assessment, the deep water prevented a visual inspection of the substrate, however, freshwater pearl mussel (FWPM) surveys indicated a spread of stable cobbles, substrate suitable for FWPM.	
Gradient:	<5°		Gradient:	<5°	
Bank structure/ vegetation:	Scattered alder trees are present on the north bank that has steep banksides. Grazed grassland present on south bank that are low in height and form part of the River Spey flood plain.		Bank structure/ vegetation:	Scattered alder trees are present on the north bank that has steep banksides. Grazed grassland present on south bank that are low in height and form part of the River Spey flood plain.	
Barriers Y/N	N		Barriers Y/N	N	
Photograph Upstream:			Photograph Downstream:		
					

Watercourse: River Spey	Hydro ID: 152	Grid Reference: NH 76458 00521
Overview of suitability for fish: The River Spey at the existing A9 crossing comprises a clear span bridge structure across the water. At this location, the river forms a glide/ pool structure between significant meanders both upstream and downstream. No riffles are present immediately upstream or downstream. Due to the slower velocity and lower energy of the river at this location, accumulations of fine sediments are present both upstream and downstream of the crossing and soft earth banks are present surrounding the crossing. These habitat types are likely to provide suitable nursery grounds for sea lamprey ammocoetes. Smilarly the deeper channel at this location is likely to provide excellent rest pool habitat for adults and parr of Atlantic salmon, though the depth and stable cobble substrate will reduce the likelihood of Atlantic salmon or sea lamprey using the river at this location for spawning. The slow flow, wide channel and greater depth indicates that this watercoruse crossing may be sutiable for breeding Arctic charr.		

Table 12.9.A-3: Unnamed watercourse fish habitat assessment

Watercourse: Unnamed Watercourse		Hydro ID: 155	Grid Reference: NH 76874 01504		
Upstream		Comments	Downstream		Comments
Channel width:	1-2m	Deep plunge pool, 2m drop below road, depth unknown.	Channel width	1m	Low flow rate. Straight channel/ ditch.
Channel depth:	20-40cm		Channel depth:	20-40cm	
Substrate:	Coarse sand		Substrate:	Sand/ silt	
Gradient:	<5°		Gradient:	<5°	
Bank structure/ vegetation:	Banksides heavily vegetated with dense shrubs.		Bank structure/ vegetation:	Banksides and channel heavily vegetated with dense shrubs.	
Barriers Y/ N	Y		Barriers Y/ N	N	
Photograph Upstream:			Photograph Downstream:		
					
Overview of suitability for fish: This unnamed watercourse comprises a heavily modified channel where it passes under the existing A9. The presence of a significant vertical drop upstream of the A9 is a barrier to fish. Downstream, the heavily modified nature of the channel limits the value of the watercourse to fish species. Substates comprising of sand and silt do not represent suitable spawning habitat for either Atlantic salmon or sea lamprey. This watercourse is suboptimal in comparison to aquatic habitats on the River Spey and its more substantial tributaries (e.g. Raitts Burn and Burn of Inverton). Due to the narrow heavilly vegetated channel on this watercourse, it is considered unsuitable for Arctic charr.					

Table 12.9.A-4: Allt Cealgach fish habitat assessment

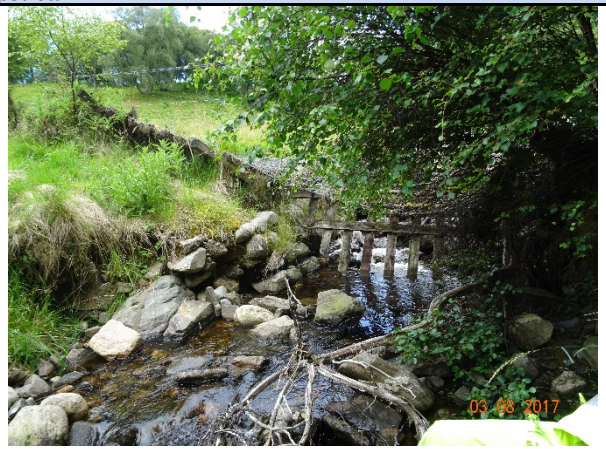
Watercourse: Allt Cealgach		Hydro ID: 157	Grid Reference: NH 77286 01721		
Upstream		Comments	Downstream		Comments
Channel width:	2m	Watercourse flows through pipe culvert. Wooden trash screen present, however it is not considered a barrier to fish passage. Fast flow.	Channel width	1m	Large pool present 4m x 7m. Fish fry observed. Slow flow, approximately 20m downstream channel stops and disperses into marshy grassland.
Channel depth:	20-30cm		Channel depth:	10cm	
Substrate:	Boulders and cobbles interspersed with pebbles.		Substrate:	Pebbles, cobbles and gravels.	
Gradient:	5° - 10°		Gradient:	5° - 10°	
Bank structure/ vegetation:	Banksides vegetated with scattered birch trees and grassland		Bank structure/ vegetation:	Banksides vegetated with marshy grassland	
Barriers Y/N	N		Barriers Y/N	Yes – during low flows	
Photograph Upstream:			Photograph Downstream:		
					
Overview of suitability for fish: Substrate upstream and downstream of the existing crossing provides potential spawning habitat. However, the potential use of the watercourse is inhibited, as the watercourse disperses through wetland habitats with no obvious channel for upstream migration in normal flow conditions, though a channel may persist in higher flows allowing for upstream migration. Additional limitations are present given the shallow depth recorded on the downstream channel. Absence of fine sediment in the reach surveyed indicates no suitability for lamprey ammocoetes. Due to the narrow channel of this watercourse, and the dispersal of water into the marshy grassland creating a small heaviliy vegetated channel, it is considered unsuitable for Arctic charr.					

Table 12.9.A-5: Raitts Burn fish habitat assessment

Watercourse: Raitts Burn		Hydro ID: 162	Grid Reference: NH 78963 02176		
Upstream		Comments	Downstream		Comments
Channel width	3m	Deeper with reduced flow, forming pool like conditions.	Channel width	4m	Corrugated iron stock fence located across the burn, however it is not considered a barrier to fish passage. Wooden walkway present under the crossing comprising of bridge structure with sediment. Moderate flow, with riffles present.
Channel depth:	40cm		Channel depth:	20cm	
Substrate:	Gravels and pebbles with the occasional cobble.		Substrate:	Mixture of boulders, cobbles and pebbles interspersed with gravel.	
Gradient:	5°		Gradient:	5°	
Bank structure/ vegetation:	Banksides vegetated with scattered broadleaved trees.		Bank structure/ vegetation:	Banksides vegetated with scattered broadleaved trees.	
Barriers Y/N	N		Barriers Y/N	N	
Photograph Upstream:			Photographs Downstream:		
					

Overview of suitability for fish:
Substrates within Raitts Burn are of variable size class and provide potential for gravel beds to form, which would allow spawning for both sea lamprey and Atlantic salmon. Deeper pool features reported upstream, along with shading and occasional larger boulders, provide conditions suitable for younger stage salmonids. The watercourse around the crossing does not support finer sediment ranges suitable for sea lamprey ammocoetes. The rapid flow conditions with riffles and pools and narrow width of the channel is considered unsuitable for Artic charr.