March 2025

Glen Earrach Pumped Storage Hydro

Environmental Impact Assessment Report

Volume 2: Main Report
Chapter 9: Aquatic & Marine Ecology

Glen Earrach Energy Ltd

Glen Earrach AECOM

Quality information

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Issue History

Issue	Issue date	Details	Authorized	Name	Position
1	March 2025	Submission	DL	DL	Technical Director – Renewable Energy

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9. Aquatic and Marine Ecology

9.1 Introduction

9.1.1 This chapter addresses the potential impacts and effects of the Pre-Construction and Enabling, Construction and Operational phases (including maintenance) of the Proposed Development on aquatic ecology features. Where appropriate, it provides details of committed mitigation, compensation and/or enhancement measures identified to minimise or offset adverse effects on these features.

9.1.2 This chapter concerns freshwater and marine aquatic ecological features, including designated nature conservation sites, habitats and species. The following chapters **(Volume 2: Main Report)** are relevant to ecological features and the assessment presented herein, and are referenced where appropriate:

- **Chapter 7: Terrestrial Ecology; and**
- **Chapter 8: Ornithology.**

9.1.3 Due to the interdisciplinary nature of effects, this chapter cross references to other chapters including:

- **Chapter 10: Water Environment; and**
- **Chapter 11: Flood Risk and Water Resources.**

9.1.4 This chapter is also supported by the following appendix **(Volume 5: Appendices):**

- **Appendix 9.1: Aquatic Ecology Baseline Report.**

9.1.5 This appendix is supported by the following figures found within **Annex A of Appendix 9.1: Aquatic Ecology Baseline Report (Volume 5: Appendices):**

- **Figure 9.1.1: Aquatic Scoping Survey Locations;**
- **Figure 9.1.2: Macroinvertebrate Survey Locations;**
- **Figure 9.1.3: Macrophyte Survey Locations; and**
- **Figure 9.1.4: Fish Survey Locations**.

9.1.6 **Appendix 7.2: Statement to Inform Habitats Regulations Appraisal (Volume 5: Appendices)** has been submitted as part of the Section 36 application for the Proposed Development. This describes the assessment conducted to test for adverse effects from the Proposed Development on the qualifying features of European sites, which comprise Special Areas of Conservation (SAC) and Special Protection Areas (SPA). SACs are relevant to this chapter but impacted SPAs are designated for the conservation of bird species and are therefore dealt with in **Chapter 8: Ornithology** (**Volume 2: Main Report**).

9.1.7 Studies have been undertaken to identify potential impacts on aquatic receptors and protected species such as Atlantic salmon (*Salmo salar*) and other aquatic species and habitats. Where appropriate, this chapter provides details of proportionate mitigation and/or enhancement measures relating to freshwater and marine aquatic ecological receptors.

9.1.8 **Chapter 2: Project and Site Description** provides a detailed description of the Proposed Development and the works required to implement it. In this Chapter, animal and vascular plant species are given their common and scientific names when first referred to and their common names only thereafter. Some species may not have common names, and therefore only scientific names are used in those cases. Animal scientific names follow those used by the National Biodiversity Network (NBN). Vascular plant scientific names follow Stace[1], and Atherton *et al*[2] for bryophytes. Locations are given as Ordnance Survey Grid References (OSGR). All distances are cited as the shortest distance 'as the crow flies', unless otherwise specified.

9.1.9 As described within **Chapter 2 Project and Site Description** and summarised within **Chapter 3 Evolution of Design and Alternatives (Volume 2: Main Report)**, the Proposed Development presents two options, Option A

[1] Stace, C. (2019). New Flora of the British Isles. 4th edition. C&M Floristics, Middlewood Green.
[2] Atherton, I., Bosanquet, S. and Lawley, M. (2010). Mosses and Liverworts of Britain and Ireland – a Field Guide. British Bryological Society, London.

and Option B. The differences between these options involve the location of the below ground works and the associated positioning of the Upper Control Works within the Headpond footprint. This assessment has considered both Options A and B; regardless of which option is taken forward, the conclusions of the Aquatic Ecology assessment remain the same for both.

9.2 Legislation and Policy

Legislation

9.2.1 The following nature conservation legislation is potentially relevant to the Proposed Development Site and has been considered during the preparation of this chapter:

- Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (the 'Habitats Directive')[3];
- Council Directive 2000/60/EC establishing a framework for Community action in the field of water policy (the 'Water Framework Directive' [WFD]) [4];
- Nature Conservation (Scotland) Act 2004;
- Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act 2003;
- Water Environment and Water Services (Scotland) Act 2003 ('WEWS Act');
- Wildlife and Countryside Act 1981 (the 'WCA');
- Wildlife and Natural Environment (Scotland) Act 2011 (the 'WANE Act');
- Conservation (Natural Habitats, &c.) Regulations 1994 and the Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations');
- Regulation 1143/2014 on invasive alien species; and
- Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR).

9.2.2 The above legislation has been considered when planning and carrying out the Ecological Impact Assessment (EcIA), using the methods described herein. Compliance with legislation may require obtaining of relevant protected species licences prior to the implementation of the Proposed Development, for example a licence from NatureScot is required for activities that could affect Freshwater Pearl Mussels (FWPM; *Margaritifera margaritifera*).

Planning Policy

9.2.3 Detailed information on relevant planning policy can be found in **Chapter 5 Planning Policy** and the standalone Planning Statement, which has been submitted as part of the Application for the Proposed Development. However, a brief summary of national and local planning policy relevant to the conservation of aquatic habitats and species is given under the following sub-headings.

National Planning Policy

9.2.4 National Planning Framework 4 (NPF4) was formally adopted by Scottish Ministers on 13 February 2023. NPF4 includes the following statements of policy intent: "*To protect, restore and enhance natural assets making best use of nature-based solutions*" and "*To protect biodiversity, reverse biodiversity loss, deliver positive effects from development and strengthen nature networks*". Wherever possible and proportionate to the scale and nature of the project, the Proposed Development has therefore sought to deliver benefits for biodiversity, in addition to protecting existing biodiversity. NPF4 also states that major development will only be supported where nature networks "*are in a demonstrably better state than without intervention*" using best practice and including future monitoring and management where appropriate.

9.2.5 Prior to the UK's exit from the European Union (EU), Scotland's SACs and SPAs were part of a wider European network of such sites known as the 'Natura 2000 network'. They were consequently referred to as 'European sites.' Now that the UK has left the EU, Scotland's SACs and SPAs are no longer part of the Natura 2000 network

[3] Refer to the Habitats Regulations below, which transposes the Directive into UK Law.
[4] Post-Brexit, Statutory objectives are set for Scottish waters through River Basin Management Planning. The CAR Regulations below (and further amendments) enables controls over many activities that can affect the water environment.

but form part of a UK-wide network of designated sites referred to as the 'UK site network'. However, it is current Scottish Government policy to retain the term 'European site' to refer collectively to SACs and SPAs[5].

Local Planning Policy

9.2.6 The Proposed Development Site lies within The Highland Council local planning authority area. Relevant local planning policies are stated in the Highland-wide Local Development Plan (LDP)[6], adopted in 2012, and discussed in context within the Inner Moray Firth LDP[7], adopted in 2015 and currently under review, **Table 9-1: Summary of Relevant Policies Within the Highland-wide LDP** lists those adopted LDP policies relevant to nature conservation.

Table 9-1: Summary of Relevant Policies Within the Highland-wide LDP

Planning Policy	Relevant Purpose
Policy 28: Sustainable Design	Developments will be supported which promote and enhance environmental wellbeing. Assessment of the impact on resources including habitats, freshwater systems, and species will be made and proposals must be compatible with the Sustainable Design Guide.
Policy 57 Natural, Built and Cultural Heritage	Developments are expected to address effects on natural heritage (including designated sites, priority habitat and species (as defined in Annex I and II of the Habitats Directive)). For features of local/regional importance, developments must demonstrate no unacceptable impact. For features of national importance, developments must not compromise the natural environment, and significant adverse effects must be clearly outweighed by social or economic benefits of national importance. Developments affecting features of international importance will not be permitted unless the Habitats Regulations Appraisal process has been followed and a conclusion of no adverse effect on site integrity is reached.
Policy 58: Protected Species	Summarises the legal requirements for protected species that developments are expected to comply with.
Policy 59: Other Important Species	Developments are expected to also address effects on notable species not protected by legislation or site designations, including: Species listed in Annexes II and V of the EC Habitats Directive, Priority species listed in the UK and Local Biodiversity Action Plans and Species included on the Scottish Biodiversity List.
Policy 60: Other Important Habitats	Developments are expected to also address effects on notable habitats not protected by site designations, including natural water courses, habitats listed in Annex I of the EC Habitats Directive, priority habitats listed in the UK and Local Biodiversity Action Plans, habitats included on the Scottish Biodiversity List.
Policy 63: Water Environment	The Council will support proposals for development that do not compromise the objectives of the Water Framework Directive (2000/60/EC), aimed at the protection and improvement of Scotland's water environment. In assessing proposals, the Council will take into account the River Basin Management Plan for the Scotland River Basin District and associated Area Management Plans and supporting information on opportunities for improvements and constraints.
Policy 67: Renewable Energy Developments	Renewable energy development proposals should be well related to the source of the primary renewable resources that are needed for their operation. The Council will support proposals where it is satisfied that they are located, sited and designed such that they will not be significantly detrimental overall, either individually or cumulatively with other developments, having regard in particular to any significant effects on the following: species and habitats, ground water, surface water (including water supply), aquatic ecosystems and fisheries.

Scottish Biodiversity Strategy to 2045

9.2.7 The Biodiversity Strategy aims to 'have restored and regenerated biodiversity across our land, freshwater and seas.'

9.2.8 Specific objectives for rivers, lochs, wetlands and marine and coastal environments include:

- The extent of restored catchments and improvements in ecological status of rivers, lochs and wetlands will have increased with waterbodies in good condition.

[5] Scottish Government (2020). *EU Exit: The Habitats Regulations in Scotland. December 2020.* (online) Available at: https://www.gov.scot/publications/eu-exit-habitats-regulations-scotland-2/.
[6] Scottish Government (2012) *Highland Wide Local Development Plan* (online) Available at: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/199/highland-wide_local_development_plan.
[7] Scottish Government (2024) *Inner Moray Firth Local Development Plan 2* (online) Available at: https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/202/inner_moray_firth_local_development_plan.

- The extent, condition, connectivity and resilience of wetlands, including floodplain wetlands and pond habitats will have significantly improved.
- Beavers, salmon recovery and riparian woodland will be established as key ecological components of restored rivers and wetlands.
- The health, condition, and resilience of pelagic, coastal, shelf, and deep sea marine habitats will have been restored, supporting wider ecosystem function, providing increased benefits to society, and contributing to climate resilience and adaptation through nature-based solutions.

9.2.9 Further, the Strategy aims to embed nature-friendly fishing by ensuring areas under fisheries are 'managed more sustainably, in particular through the conservation and sustainable use of biodiversity, increasing the productivity and resilience of these production systems.'

Tackling the Nature Emergency in Scotland (September 2023)

9.2.10 This Scottish Government consultation aims to establish an overarching framework to combat the Biodiversity Crisis, with high-level objectives including:

- Protect nature on land and at sea, across and beyond protected areas.
- Embed nature positive farming, fishing and forestry.
- Protect and support the recovery of vulnerable and important species and habitats.
- Take action on the indirect drivers of biodiversity loss.

Scottish Biodiversity Delivery Plan 2024–2030

9.2.11 This plan aims to halt biodiversity loss and be Nature Positive by 2030 and to have restored and regenerated biodiversity by 2045. Specific aims and objectives of relevant to aquatic and marine ecology include:

- Manage existing and emerging pressures to improve the conservation status of seabirds, marine mammals, elasmobranchs and wild salmon.
- Develop new approaches to marine biodiversity monitoring, covering both state and pressure assessment and aligned with the UK Marine Strategy.
- Ensure that 81% of all Scotland's waterbodies (rivers, lochs, groundwater, transitional (estuary/ firth) and coastal waters) achieve a 'good' or better classification by 2027 and continue to improve as natural conditions recover beyond that date.
- Develop and implement an INNS Action Plan, which will ensure pathways for the introduction and spread of INNS are managed to prevent or reduce their rate of introduction and establishment, and prevent further damage to ecosystems.
- Take an adaptive approach to abstraction and flows management to protect freshwater biodiversity from the impacts of water scarcity in response to future climate change pressures, using the Controlled Activity Regulations and review of abstraction.
- Maintain the long-term monitoring of the freshwater environment in addition to being enhanced and supplemented by new developing technologies such as eDNA when available.
- Reduce inputs of nutrients to freshwaters that cause enrichment impacts on biodiversity, by controlling both diffuse and point source pollution through effective nutrient management through agricultural reform and SEPA's Priority Catchment programme, ensuring compliance with the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (CAR) under River Basin Management Planning.
- Deliver the actions set out in the Scottish wild salmon strategy implementation plan 2023-2028 to improve habitat and reduce pressures on salmon and other fish species.
- Undertake research on post-smolt and adult Atlantic salmon migration routes around Scottish coastal areas, and the use of estuarine and coastal habitats by other diadromous fish species.

Biodiversity: draft planning guidance

9.2.12 The Scottish Government sets out expectations for implementing and delivering National Planning Framework (NPF) 4 policies which support the cross-cutting NPF4 outcome 'improving biodiversity' in this draft planning guidance, which includes of relevance to aquatic and marine ecology:

- Apply the mitigation hierarchy.

- Consider biodiversity from the outset.
- Provide synergies and connectivity for nature.
- Integrate nature to deliver multiple benefits.
- Prioritise on-site enhancement before off-site delivery.
- Take a place-based and inclusive approach.
- Ensure long term enhancement is secured.

9.2.13 The guidance sets out the role of Ecological Impact Assessment (within EIA) to 'draw together, in a systematic way, an assessment of a project's likely significant environmental effects on a range of factors, including biodiversity. This will include both positive and negative effects.'

Scottish wild salmon strategy implementation plan 2023-2028

9.2.14 The Scottish wild salmon strategy 'sets out the vision, objectives and priority themes to ensure the protection and recovery of Scottish Atlantic wild salmon populations.'

9.2.15 The strategy sets out five broad priority themes for action, 'supported by a strong evidence base underpinned by coordinated scientific research and monitoring.' These priority themes are as follows:

- Improving the condition of rivers and giving salmon free access to cold, clean water.
- Managing exploitation through effective regulation, deterrents, and enforcement.
- Understanding and mitigating pressures in the marine and coastal environment.
- Making a positive contribution through international collaborations.
- Developing a modernised and fit for purpose policy framework.

9.2.16 The strategy reinforces the need for a scientific evidence base of monitoring to inform understanding of the drivers of salmon population declines to enable the adaptation of management responses accordingly.

Local Biodiversity Action Plan

9.2.17 Highland Nature (2021-2026)[8], The Highland Council's LBAP, includes several priority habitats and a list of priority species for local conservation, many of which may be potentially relevant to the Proposed Development, including (but not limited to) the habitats, Freshwater: rivers, burns and lochs, and species, as follows:

- Fish species Atlantic salmon, Arctic charr (*Salvelinus alpinus*), European eel (*Anguilla anguilla*), Lamprey (Sea - *Petromyzon marinus*, river - *Lampetra fluviatilis* & brook - *Lampetra planeri*), sea trout (*Salmo trutta*);
- FWPM;
- Northern February red stonefly (*Brachyptera putata*);
- The bryophyte species *Hygrohypnum polare* and *Bryum muehlenbeckii*; and
- Bottlenose dolphin (*Tursiops truncatus*).

9.2.18 In addition, the LBAP also lists several Invasive Non-Native Species (INNS) where development activity should avoid introducing or spreading these species (INNS). Those potentially relevant to the Proposed Development in relation to aquatic ecology are:

- Pink salmon (*Oncorhynchus gorbuscha*);
- Himalayan balsam (Impatiens glandulifera);
- New Zealand pigmyweed (*Crassula helmsii*); and
- American signal crayfish (*Pacifastacus leniusculus*).

9.2.19 The above planning policies have been considered when assessing potential ecological constraints and opportunities identified by the ecological impact assessment.

[8] Highland Environment Forum (2021) *Highland Nature Biodiversity Plan 2021-2026* (online) Available at: https://www.highlandenvironmentforum.info/wp-content/uploads/2021/07/Highland-Nature-Biodiversity-Action-Plan-2021-2026-_compressed-.pdf.

9.3 Consultation

9.3.1 The assessment of impacts on aquatic ecology features has been informed by consultation held with several statutory and non-statutory consultees. A summary of the consultation held, the information/recommendations provided by consultees, and detail of how this Environmental Impact Assessment Report (EIAR) has responded to consultee feedback is provided in **Table 9-2: Summary of Consultation**. Further details on all consultation undertaken for the EIAR can be found within **Appendix 4.3 Consultation Tracker (Volume 5: Appendices).**

Table 9-2: Summary of Consultation

Consultee	Summary of Response	Action Taken
NatureScot	Key concern is over the River Moriston SAC regarding FWPM and Atlantic salmon / salmon smolts within the Loch Ness catchment. Smolts migrate from the rivers of their birth downstream through Loch Ness, however there is little existing data on their exact movements through the loch, so it is uncertain how they will react to and be affected by PSH (including existing and proposed PSH schemes). As a result, NS want to see evidence-based (i.e., through smolt tracking study) assessment to inform effective mitigation. NS also requested an assessment on upstream adult salmon migration rates. Concerns over the cumulative impact from the four schemes (Foyers, Loch Kemp, Red John and Glen Earrach). Concerns over how smolts will be affected within the Ness Catchment in particular in the Moray Firth SAC where dolphins are known to feed on smolts in the summer months, particularly at Chanonry Point. Therefore, a need to include marine ecology assessment in the scoping report.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. An assessment of the potential effects on bottlenose dolphins in the Moray Firth SAC has been completed as part of this assessment. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage.
Ness District Salmon Fishery Board (NDSFB)	Concerns raised re water temperature rise that might be caused by the PSH. Example is pumps within a fish farm which warm the water quite a lot. Suggestions re trapping and tracking, and depending on what the research shows, this might have to be something that is envisaged. Concerns raised about hydrology and water flows, especially re the Canal as it is an existing problem. Possible worst-case mitigation would be that the GE PSH has to stop pumping/generating when the fish are going by. Suggestion discussed re camera AI smolt detectors. It was suggested that the main current constraint to smolt migration is smolts being diverted down the Caledonian Canal so appears current priority for mitigation is some form of installation to deter smolts from the canal (e.g. bubble barrier/ strop lighting system).	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. Liaison with the design team has been undertaken to establish risks to water quality and temperature during operation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. On-going engagement with consultees throughout the impact assessment and detailed mitigation design.

Consultee	Summary of Response	Action Taken
NatureScot	Aquatic Ecology, Including Marine Ecology We generally agree with the scope of the desk study and ecological field survey described but have the following advice for the applicant in regard to River Moriston SAC and Moray Firth SAC. <u>River Moriston SAC</u> The River Moriston SAC is designated for FWPM and Atlantic salmon. Atlantic salmon are also a critical component of FWPM life cycle as host fish. Therefore, impacts on salmon will also have indirect impacts on FWPM and this link needs to be considered in any assessment. Freshwater mussel populations are vulnerable to changes to water quality (including pollution), hydrological alterations, habitat degradation of riverbeds and banks, illegal pearl fishing and availability of host species. Atlantic salmon live in both freshwater and marine environments as part of their lifecycle. They hatch and live in freshwater as juveniles and then migrate to sea as adults. After one year or more at sea the adults return to their natal river to spawn. This homing behaviour has resulted in the development of genetically distinct populations of Atlantic salmon between Scottish rivers and several populations may exist within the same river. As Atlantic salmon migrate up and down stream, any barriers to fish passage on any part of their route, could have significant negative effects. Facilitating the access of Atlantic salmon to all areas of the catchment (including outside the boundary of the SAC) where they could expect to occur naturally is a key objective of the site. Both qualifying interests are currently in 'unfavourable' condition, with Atlantic salmon known to face significant mortalities both at sea, and during downstream migration including in Loch Ness. At this stage we advise there is a risk that the impacts of this proposal will not allow the conservation objectives for the features of River Moriston SAC to be met. We advise that the applicant provide sufficient information to assess the effects from all possible impact pathways which include, but are not limited to, the following, which should also be used to inform the assessment of impacts on FWPM: Lower water levels in Loch Ness and subsequently in the mouth of River Moriston while the scheme is abstracting water, which may impact FWPM populations in the mouth of the River. ▪ Salmon may become impinged on the intake screen during periods of abstraction ▪ Intake flow attracting downstream migrating salmon smolts ▪ Outlet flow attracting adult migrating salmon ▪ Increased sedimentation / turbidity (non-toxic) in areas of Loch Ness adjacent to the construction site affecting salmon during the Construction phase ▪ Risk of toxic contamination in Loch Ness from fuel / chemical leakage/ and concrete spills affecting salmon during the Construction phase ▪ Risk of noise disturbance to salmon in Loch Ness from heavy machinery, sediment movement, and/or any temporary cofferdam ▪ Reduction of water levels in Loch Ness impeding downstream smolt migration ▪ Reduced productivity of the littoral zone as a consequence of changes to the water level regime in Loch Ness affecting salmon food supply We advise that the applicant provides sufficient information to enable an assessment of potential effects of all impact pathways, including any not listed above, on the conservation objectives of both qualifying	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. Potential impacts to the River Moriston SAC have been addressed in this chapter and in **Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**). Impacts to both Atlantic salmon and FWPM have been assessed, and mitigation considered accordingly. All impact pathways have been considered as part of this assessment. This assessment has considered cumulative effects of the Proposed Development with other existing, consented, and proposed schemes – hydraulic modelling has considered all schemes in-combination to inform a holistic assessment of risks to migratory salmon and other species. This cumulative assessment has also informed the mitigation design, which seeks to provide benefits for migrating Atlantic salmon, and therefore also to FWPM in the River Moriston, in the long term alongside operation of the Proposed Development. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. NatureScot has been consulted on the design of the smolt tracking study and provided comments to ensure the study satisfies their requirements for scientific rigour as per the Scottish wild salmon strategy implementation plan 2023-2028.

Consultee	Summary of Response	Action Taken
	interests and to demonstrate whether it can be ascertained that there will be no AESI. Assessments should be based on realistic worse case scenarios and include the effects of the scheme (a) alone in the context of the current baseline which includes Foyers PSH and the Caledonian Canal, and, separately, (b) in combination with other proposed developments, including Red John and Kemp pump storage hydro schemes. Any mitigation measures proposed should also be assessed against the conservation objectives. We would be happy to advise on draft proposals for the surveys, modelling and assessment approaches that will be required, and also on a draft shadow Habitats Regulations Appraisal (HRA) for the River Moriston SAC prior to submission. As little is known about how smolts move within Loch Ness, or key locations and causes of mortality, surveys of the movement of smolts from the River Moriston SAC through Loch Ness may be required. We consider that this proposal has potential to adversely affect the integrity of the River Moriston SAC. If so, Energy Consents Unit would need to consider whether the tests in Regulations 49 and 53 of the Habitats Regulations can be met. NatureScot has no statutory role in advising on whether these further tests are met, but we are happy to advise on sources of guidance, the impacts of alternative solutions on European sites, and any proposed compensation measures. Further information on these legislative requirements for SACs can be found here https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra	
NatureScot	<u>Moray Firth SAC</u> In the Moray Firth, bottlenose dolphin presence in the summer months coincides with the seasonal migrations of salmonids (Atlantic salmon and sea trout). Salmonids are known to be important prey for bottlenose dolphins, based on the analysis of stomach contents and direct observations of foraging events. Chanonry Point, downstream from the mouth of the River Ness, is a well-known and monitored foraging area for bottlenose dolphin. Here there have been visual observations of foraging (mainly on salmon) and also passive acoustic monitoring which has recorded foraging buzzes and 'brays'. Bottlenose dolphins can eat a wide range of prey but salmon provide an important component of their diet when they are available. The passive acoustic monitoring in this area identified a large number of bray calls which, to date, have only been associated with salmonid prey. Salmon are a preferred prey because they have a high nutritional and calorific value. The Glen Earrach pumped storage scheme therefore has the potential to impact on the bottlenose dolphin feature through impacts on the numbers of migrating salmon exiting the Ness catchment and also potentially reducing the numbers of returning fish. Any assessment should consider the same impact pathways for Atlantic salmon as discussed above, given the importance of Atlantic salmon to the bottle-nosed dolphin qualifying interest of the Moray Firth SAC. We will be happy to comment on the applicant's draft HRA for Moray Firth SAC, prior to submission.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. This assessment has considered potential effects on bottlenose dolphins in the Moray Firth SAC (also refer to **Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**). The impact pathways described have been investigated through establishment of baseline conditions for Atlantic salmon, including current constraints to fish passage at Dochfour Weir and the Caledonian Canal, which serve to limit the number of salmon smolts successfully completing their migration to the Moray Firth. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. NatureScot has been consulted on the design of the smolt tracking study and provided comments to ensure the study satisfies their requirements for scientific rigour as per the Scottish wild salmon strategy implementation plan 2023-2028.

Consultee	Summary of Response	Action Taken
NatureScot	We advise that the applicant provides sufficient information to enable an assessment of potential effects of all impact pathways, including any not listed above, on the conservation objectives of both qualifying interests and to demonstrate whether it can be ascertained that there will be no AESI. Assessments should be based on realistic worse case scenarios and include the effects of the scheme (a) alone in the context of the current baseline which includes Foyers PSH and the Caledonian Canal, and, separately, (b) in combination with other proposed developments, including Red John and Kemp pump storage hydro schemes. Any mitigation measures proposed should also be assessed against the conservation objectives.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. Modelling has included cumulative effects of existing, consented and proposed schemes on Loch Ness and the River Ness, and the cumulative effects of these schemes in operation. Also refer to **Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**, which presents the assessment of adverse effects on site integrity.
NatureScot	We would be happy to advise on draft proposals for the surveys, modelling and assessment approaches that will be required, and also on a draft shadow Habitats Regulations Appraisal (HRA) for the River Moriston SAC prior to submission. As little is known about how smolts move within Loch Ness, or key locations and causes of mortality, surveys of the movement of smolts from the River Moriston SAC through Loch Ness may be required.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; and consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. Refer also to HRA report (**Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).
NatureScot	We consider that this proposal has potential to adversely affect the integrity of the River Moriston SAC. If so, Energy Consents Unit would need to consider whether the tests in Regulations 49 and 53 of the Habitats Regulations can be met. NatureScot has no statutory role in advising on whether these further tests are met, but we are happy to advise on sources of guidance, the impacts of alternative solutions on European sites, and any proposed compensation measures. Further information on these legislative requirements for SACs can be found here https://www.nature.scot/professional-advice/planning-and-development/environmental-assessment/habitats-regulations-appraisal-hra/habitats-regulations-appraisal-hra.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. Refer also to HRA report (**Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).
NatureScot	We advise that a schedule of mitigation is provided which clearly details all measures required to minimise the impacts of the scheme. And which considers potential impacts the mitigation measures may also cause other designated sites and species.	Schedule of Mitigation to be provided (Appendix 19.1 Mitigation Register).
BugLife Scotland	Notes that GE could result in significant adverse effects on ecological features. Requests that adequate surveying is undertaken of invertebrate communities - further methodology is detailed in the body of the response Concerned that further surveying of invertebrates has been scoped out of the assessment. Requests a worst-case scenario of a maximum operational drawdown of over 1.0m must be considered. The body of the response identifies taxa known to be present in Loch Ness.	Terrestrial invertebrates are assessed in the Terrestrial Ecology chapter. The cumulative drawdown of PSH schemes is being assessed through hydraulic modelling, these results inform the EIAR including aquatic receptors such as water bodies and macroinvertebrates. Macroinvertebrate sampling of Loch Ness and Loch nam Breac Dearga follows the procedure outlined in the 'WFD-UKTAG Lake Assessment Methods Benthic Invertebrate Fauna' documentation; please note that both spring and autumn samples are being

Consultee	Summary of Response	Action Taken
	State that using 'River Invertebrates WHPT UKTAG Method Statement', as identified in the scoping, to survey lochs is not appropriate.	taken rather than just spring as outlined in the above methodology to account for temporal variability in the invertebrate assemblage. The reference to all water features being assessed by using 'River Invertebrates WHPT UKTAG Method Statement' is incorrect and the approach has been updated. The 'River Invertebrates WHPT UKTAG Method Statement' sampling procedure is only being used for rivers and streams. All macroinvertebrate surveys include spring and autumn sampling to capture seasonal variation, and the results of these will provide numerous biotic indices including but not limited to, The Community Conservation Index (CCI).
Glen Urquhart Community Council	Provides general advice on Terrestrial and Aquatic Ecology and Ornithology. Requests reference to priority species in the Highland Nature Biodiversity Action Plan.	Detailed aquatic ecological surveys are detailed in the EIAR. Habitat enhancement and mitigation measures are being developed, with cognisance of both protected and priority species including BAP species. Refer also to HRA report (**Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).
NDSFB	Meeting to discuss NDSFB feedback, water levels and smolt study	Noted – On-going engagement with consultees has been completed throughout the impact assessment and detailed mitigation design.
SEPA	Meeting to discuss the project	Noted – On-going engagement with consultees throughout the impact assessment and detailed mitigation design.
The Highland Council	The EIAR should evidence consultation input from the local fishery board(s) where relevant. The EIAR should include a map and assessment of impacts upon GWDTE and buffers, these habitats are easily damaged by insensitive drainage.	The EIAR includes a full assessment of watercourses and aquatic receptors potentially impacted by construction, operation and cumulative effects. The Applicant has undertaken consultation with the NDSFB, which has informed the assessment included within the EIAR. GWDTE are assessed in the Terrestrial Ecology and Water chapters.
NDSFB	Working hypothesis would be that smolts are delayed and subject to enhance mortality at pump storage intakes- the proposed study design does not include a VPs array which means hypothesis cannot be answered The proposed multiple gate arrangement is unlikely to provide answers regarding behaviour of smolts at the intake nor the impact of pumping and generation on smolt migration Note interest in use of littoral and abyssal habitat by smolts during migration through Loch Ness and the study should provide some information on that suggest description of upstream and downstream reaches in a large still water is misleading as surface currents, as well as temperature, are likely influenced by wind direction- therefore think smolts circumvent whilst trying to find exit Highlight key thing is to try and understand the decision-making process of smolts as they approach weir- comparing migration speed smolts circumvent in loch and fast-flowing rivers not needed - Suggest efficiency assessment needed for smolt bypass. Note there is no publicly available information on operation of lift gates at Dochfour Weir- only required at low flows	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. Refer also to HRA report (**Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).

Consultee	Summary of Response	Action Taken
ECU	Scottish Ministers are satisfied with the scope of the EIA set out by the scoping report. In addition to the consultation responses, Ministers provided comments with regarding aquatic ecology: Provides guidelines on how fish populations should be considered during the EIA process Should identify any areas of Special Areas of Conservation where fish are a qualifying feature and proposed felling operations particularly in acid sensitive areas. Scottish Ministers are aware that further engagement is required between parties regarding the refinement of the design of the Proposed Development regarding, among other things, surveys, management plans, peat, radio links, finalisation of viewpoints, cultural heritage, cumulative assessments, and request that they are kept informed of relevant discussions.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. Refer also to HRA report (**Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).
NatureScot	Overall tagging approach is sound but would prefer if all tagged fish originated from the Moriston rather from rivers Oich and Garry suggest sample size may be too small to adequately assess impacts on SAC. Note confusion/contradiction on what will happen once fish are tagged. Generally agree with placement of receivers but advise: if fish are to be released in the rivers themselves would like a receiver located at mouth of each river where smolts are being tagged and suggest more than one in-river receiver in each location should consider array of locations to south of mouth of Moriston Section 3.6-11 provides no detail regarding timing of smolt captures and mechanics of release. Advise survey should be carried out beyond one year to be confident in results.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. Consultee feedback on the scope of the smolt tracking study has informed the design, and this has been discussed and agreed with consultees (NatureScot, SEPA, and the NDSFB).
Scottish Canals	Request to be fully consulted fully during the preparation of the EIA Request water level fluctuations as well as changes to water flow patterns in combination with greater variation in level changes around Caledonian Canal assets are considered in EIA Requests that the significance of potentially altered water flow patterns, due to the Proposed Development in combination with other pumped storage hydro schemes, on the upstream and downstream migration of salmonids and other migratory fish including eels. Adequate focus should be given to assessing potential negative impact that Glen Earrach and other schemes may have on tourism businesses and local communities whose prosperity relies on them.	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. Consultee feedback on the scope of the smolt tracking study has informed the design, and this has been discussed and agreed with consultees (NatureScot, SEPA, and the NDSFB). Scottish Canals have also been consulted on the receiver locations and permissions for the deployment of equipment in Loch Ness.

Consultee	Summary of Response	Action Taken
Ness District Salmon Fishery Board (NDSFB)	NDSFB note that the potential harm arising from the Glen Earrach is exacerbated by the cumulative impact of what could be 4 PSH schemes utilising Loch Ness as the lower reservoir. The main concerns of NDSFB regarding the cumulative impact of existing, consented and proposed PSH on Loch Ness and associated watercourses included: potential for delay and enhanced predation of Atlantic salmon smolts in the vicinity of PSH potential of PSH to impact of water temperatures (temperature regimes and stability of loch stratification daily drawdowns in the region of 1m will be highly detrimental to the shoreline ecology of Loch Ness creating knock-on impacts on species dependent on the Lochside invertebrate populations impact of such large loch level fluctuations on flows in the River Ness discussions with other organisations that operate on the loch highlight that there are already problems caused by low loch levels note the most significant challenge for PSH on loch ness is to demonstrate that it will conserve, restore and enhance biodiversity note lack of information regarding grid connection infrastructure and route (something highlighted as an issue at the public engagement event. Salmon Smolt Migration: concern that smolts may be attracted to intakes during pumping where they will be subject to delay and likely enhanced predation Downstream Flows: no consideration given to new mitigation to counteract what will be huge variations in River Ness flows as a result of large and frequent fluctuations in the level of Loch Ness	These impact pathways are assessed in the EIAR, supported by modelling of water levels in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage.
Ness District Salmon Fishery Board	Comments on Scoping Document: Claim that Glen Earrach may be one of the most important PSH in Europe needs challenged due to biodiversity, environmental and social issues arising. Ask for clarity on the statement ‘The potential impact on salmon smolts will be considered against existing data.’ Confirm Loch nam Breac Dearga presence of Arctic charr. Welcome the use of eDNA to establish the fish population of loch nam Breac Dearga. Advise invertebrate sampling in Loch Ness should be comprehensive. Advise that the potential delay and enhanced mortality of migrating smolts attracted to the vicinity of PSH intakes during pumping added to list of potential significant effects on Atlantic salmon. Request developers commission a study to report on potential impacts of Glen Earrach on water temperature profile of loch ness and its potential impacts on natural limnological processes. Regard Loch Ness as being a relatively clear loch. Expect the cumulative water resources assessment to be comprehensive and to take into consideration all potential uses of water in Loch Ness. Disagree strongly with paragraph 3 in this clause. Mitigation of flows in the River Ness due to variations in the level of Loch Ness is the elephant in the room as far as PSH developers on Loch Ness are concerned (note that at present Glen Earrach do not intend to submit an application to raise height of Dochfour Weir).	These impact pathways are assessed in the EIAR, supported by modelling of water levels and thermal stratification in Loch Ness and flows over Ness (Dochfour) Weir and in the River Ness downstream; embedded mitigation in relation to the intake/outfall; consideration of appropriate additional mitigation. A smolt tracking study has been undertaken in spring/summer 2025, which will serve to evaluate the impact assessment and provide further detail of smolt migration through Loch Ness, and at Dochfour Weir and the Caledonian Canal, to confirm the requirements for any proposed additional mitigation at the detailed design stage. Consultee feedback on the scope of the smolt tracking study has informed the design of the study, and this has been discussed and agreed with consultees (NatureScot, SEPA, and the NDSFB). The impact assessment and mitigation options have been supported by literature review of the movement of salmon smolts through still water bodies, and the efficacy of non-physical deterrents as a mitigation option.

Consultee	Summary of Response	Action Taken
	Note that the wording regarding mitigation, in the eventuality that, 'existing downstream abstraction arrangements are found to be significant' is vague. Baseline data in Table 16.1 should include water temperatures in loch ness and River Ness. Request Glen Earrach developers produce a water resource model, including all existing and proposed water demands, should also factor in climate change driven precipitation predictions.	

9.4 Study Area

9.4.1 The Zone of Influence (ZoI) of the Proposed Development is the area over which ecological features may be subject to impacts as a result of its construction and operation. The ZoI will vary for different ecological features depending on their sensitivity to environmental change. It is therefore appropriate to identify different ZoI for different features and impacts. As recommended by the Chartered Institute of Ecology and Environmental Management (CIEEM)[9], professionally accredited or published studies and guidance, where available, were used to help determine the likely ZoI, as well as professional judgement. However, CIEEM also highlight that establishing the ZoI should be an iterative process informed by both desk study and field survey. Where limited information was available, the Precautionary Principle[10] was adopted and a ZoI estimated on that basis. Refer to **Appendix 9.1: Aquatic Ecology Baseline Report (Volume 5: Appendices)** and accompanying figures for detail of the Study Area relating to aquatic ecology.

9.4.2 NatureScot has devised 21 'Natural Heritage Zones' (NHZ) covering the whole of Scotland, which reflect biogeographical differences across the country. Assessment of the impacts on ecological features in this EIAR has been carried out in the context of the Northern Highlands Natural Heritage Zone (NHZ 7), within which the Proposed Development is located (see **Figure 7.1: Northern Highlands Natural Heritage Zone** (**Volume 3: Figures**)). This includes the assessment of cumulative effects which has considered the potential for in-combination effects to arise due to other energy developments and land use changes within NHZ 7, noting that Loch na Cathrach is outside NHZ 7.

9.4.3 The desk study and field survey areas were designed to allow sufficient data to be collected to establish the baseline condition of aquatic ecological features and determine the impacts of the Proposed Development. The ZoI can extend beyond a development and beyond the survey area. However, at a distance from a development its impacts might not result in significant effects (these being the focus of Ecological Impact Assessment (EcIA) according to CIEEM guidance), and even where a significant effect might occur over a large distance this does not necessarily require the field survey to extend to such distances. In this instance, the ZoI ranged from the perimeter of Loch Ness for macroinvertebrates and macrophytes, to the Moray Firth SAC for bottlenose dolphin. The field survey areas adopted for this assessment were sufficiently precautionary to allow assessment of potentially significant effects from the Proposed Development on ecological features, including within the wider ZoI beyond the field survey areas.

9.5 Methodology

Guidance and Standards

9.5.1 The following guidance was used when designing the field survey carried out to inform this assessment and to determine the scope and method of the assessment itself:

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine[9];
- General Pre-application and scoping advice for onshore wind farms published by NatureScot[11];
- Standing advice notes for protected species published by NatureScot[12];
- Assessing the Cumulative Impact of Onshore Wind Energy Developments[13]; and
- Habitat Surveys Training Course Manual (SFCC, 2007).

[9] CIEEM (2024). *Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine*. Version 1.3 – updated September 2024). Chartered Institute of Ecology and Environmental Management, Winchester.
[10] UNESCO (2005). *The Precautionary Principle*. United Nations Educational, Scientific and Cultural Organisation, Paris. Available from: https://unesdoc.unesco.org/ark:/48223/pf0000139578.
[11] NatureScot (2024) *Pre-application guidance for onshore wind farms* (online) Available at: https://www.nature.scot/doc/general-pre-application-and-scoping-advice-onshore-wind-farms.
[12]NatureScot (2024) *Planning and development: protected species* (online) Available at: https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/planning-and-development-protected-species.
[13] SNH (2018). *Assessing the Cumulative Impact of Onshore Wind Energy Developments*. (online) Available from: https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments. There is no specific guidance for pumped storage hydro schemes, however this detailed wind farm-related guidance is applicable to them in many respects.

Assessment Scope

9.5.2 The scope of survey and assessment described in this chapter was informed by the guidance contained in the published documents listed in **Section 9.5 Methodology, Guidance and Standards**, on the responses of consultees (as set out in **Table 9-2: Summary of Consultation (Section 9.3: Consultation)**), and on the results of detailed study once underway.

9.5.3 The guidelines for EcIA published by CIEEM[9] recommend that only those features that are 'important' and that could be significantly affected by the Proposed Development require detailed assessment, stating that "*it is not necessary to carry out detailed assessment of ecological features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable*".

9.5.4 Consequently, for the purposes of the desk study, field survey and assessment described in this chapter, 'important' aquatic ecological features were considered to include:

- Qualifying features of designated sites within the zone of influence of the Proposed Development;
- Species listed on Annex II of the Habitats Directive;
- All species listed on Schedule 1 of the WCA;
- Species listed on the Scottish Biodiversity List (SBL);
- All species on the Highlands LBAP;
- Species or species assemblages shown to indicate Good habitat conditions, for example in relation to Good Ecological Status or better in relation to the Water Framework Directive (WFD);
- Species or habitats raised through consultation (see **Table 9-2: Summary of Consultation**) as being at risk, or of particular local significance or concern; and
- INNS listed on Schedule 9 of the WCA (although this no longer legally applies in Scotland), those considered to be of European Union (EU) concern under the Invasive Alien Species Regulation, and those listed in Annex B of the NatureScot *Developing with Nature Guidance*[14].

9.5.5 Other habitats or species that may be rare, scarce or otherwise important were also included, where deemed appropriate through available information and/or professional judgement.

9.5.6 The assessment considers the effects during three phases of the Proposed Development lifespan as identified in **Section 2.18** to **Section 2.20** of **Chapter 2: Project and Site Description (Volume 2: Main Report)**. The phases are Pre-Construction and Enabling, Construction and Operation.

9.5.7 Decommissioning has been scoped out of assessment as the decommissioning of large-scale pumped storage hydro projects is extremely rare due to the long operational lifespan of such facilities. Potential decommissioning effects are therefore considered to be similar to and associated with the components described in the Construction project phase and are not separately assessed. However, a decommissioning survey and plan would be produced when required.

9.5.8 Potential impacts to surveyed water bodies have been assessed in this chapter. These water bodies are also assessed in the WFD assessment, supported by WFD monitoring data which is contained within **Chapter 10: Water Environment (Volume 2: Main Report)**.

9.5.9 Based on the results of initial desk study and the feedback provided on the Scoping Report, the scope of the aquatic ecology assessment for the Proposed Development included the following ecological features:

- Statutory and non-statutory designated nature conservation sites;
- Catchment-wide and cross-catchment desk study to establish records of protected / notable species and INNS in the Study Area;
- FWPM habitats;
- Aquatic macrophytes;
- Aquatic macroinvertebrates;

[14]NatureScot (2024) *Developing with Nature guidance* (online) Available at: https://www.nature.scot/doc/developing-nature-guidance.

- Fish and fish habitats; and
- Aquatic INNS.

Baseline Data Collection

Desk Study

9.5.10 A desk study was carried out to identify nature conservation designations and records of important habitats and species (as defined in **Section 9.5 Methodology, Assessment Scope**) potentially relevant to the Proposed Development. A stratified approach was taken when defining the desk Study Area, based on the likely ZoI of the Proposed Development on different ecological features and an understanding of the maximum distances typically considered by statutory consultees. Accordingly, the desk study sought to identify:

- International nature conservation designations within 10 km of the Proposed Development (or further afield where there is clear connectivity, for example through hydrological linkage or where the qualifying species are known to range over a wider distance);
- National statutory nature conservation designations within 2 km of the Proposed Development (or further afield where there is clear connectivity);
- Local non-statutory nature conservation designations within 2 km of the Proposed Development (where these exist in the local context); and
- Records of important species within 2 km of the Proposed Development (or extended beyond this where additional context was required, or where hydrological connectivity exists).

9.5.11 Results of the desk study pertaining to statutory and non-statutory designated sites and terrestrial habitats and species are presented in **Chapter 7: Terrestrial Ecology**.

9.5.12 A desk study specific to the aquatic ecology scope was carried out to identify protected / notable aquatic species, and INNS. For the purposes of the aquatic ecological assessment and baseline, protected and notable habitats and species include:

- All species listed on Schedules 2 and 4 of the Habitats Regulations;
- All species listed on Schedules 1, 5 and 8 of the WCA;
- Species and habitats of principal importance for nature conservation in Scotland which are named on the SBL;
- Priority species listed on the UK Biodiversity Action Plan or the Highland Nature LBAP;
- Other species that are Nationally Rare, Nationally Scarce, or listed in national or local Red Data Lists; and
- INNS of UK concern such as those identified on Schedule 9 of the WCA (although this no longer legally applies in Scotland) and in particular the 29 high impact species identified by Invasive Species Scotland and those listed as species of EU concern on the EU Invasive Alien Species Regulations.

9.5.13 The Study Area was extended to cover the entirety of Loch Ness to establish records of protected or notable species present. Similarly, an additional data request was submitted to NatureScot regarding FWPM. Additional data was also available from outside the 2 km Study Area, which has complemented the assessment.

9.5.14 The desk study was carried out using the data sources detailed in **Table 9-3: Desk Study Data Sources**.

Table 9-3: Desk Study Data Sources

Data Source	Date Accessed	Data Obtained
The Highland Council website (https://www.highland.gov.uk/)	30 October 2024	• Local Development Plan policies relevant to nature conservation. • Information on relevant planning applications for cumulative assessment.
NatureScot SiteLink and Open Data Hub (https://sitelink.nature.scot/home; https://opendata.nature.scot/)	12 December 2023	• Information on international and national statutory designations within the ZoI of the Proposed Development.
SEPA (Freedom of Information Request)	29 February 2024	• Fresh Water Pearl Mussel records within the ZoI of the Proposed Development.

		• Wider aquatic ecology records within the ZoI of the Proposed Development.
NBN Atlas Scotland (https://scotland.nbnatlas.org/)	03 January 2025	• Commercially available records of important species within 1 km of the Proposed Development (or further, where considered necessary), made from 2004 onwards, including those collated by Highland Biological Records Group (HBRG).
SEPA Water Environment Hub	03 January 2025	• WFD status of ecological parameters for watercourses within the ZoI of the Proposed Development. • Barriers to fish migration (natural and artificial) within the ZoI of the Proposed Development.
Ness Catchment Biosecurity Plan 2021 -2030 (https://www.invasivespecies.scot/sites/sisi8/files/Ness-Biosecurity-Plan-2020-v1.1-161220.pdf)	19 December 2024	• Invasive and non-native species recorded within the ZoI of the Proposed Development.
National Electrofishing Programme for Scotland	29 February 2024	• Results of electric fishing surveys completed within the ZoI of the Proposed Development.
University of Otago and University of Highlands and Islands	12 December 2024	• Results of an eDNA study in Loch Ness as part of the Loch Ness Project.
Ness District Salmon Fishery Board	12 April 2024	• Salmonid catch returns data within the ZoI of the Proposed Development.
SEPA *Obstacles to Fish Migration* map	12 December 2024	• Obstacles to fish passage both natural and artificial within the ZoI of the Proposed Development.

Survey Sites

9.5.15 Survey locations were identified according to the proximity of water bodies to areas of proposed works such as watercourse crossings for Access Tracks, inlet/outlet location, proposed culverts, Headpond location, or otherwise to assess potential impacts to water quality during Construction. As such, 23 running water sites on varying watercourses, six sites on Loch Ness and three sites on Loch nam Breac Dearga were selected, with each survey type completed at each survey location shown in **Table 9-4 Glen Earrach Aquatic Survey Sites,** below, and within **Appendix 9.1 Aquatic Ecology Baseline Report, Figures 9.1.1 – 9.1.4 (Appendix 9.1: Aquatic Ecology Baseline Report, Annex A) (Volume 5: Appendices)**.

Table 9-4: Glen Earrach Aquatic Survey Sites

Site Code	Surface water reference	Watercourse	Grid Reference	Macrophyte	Macroinvertebrate	Fish Habitat assessment	Fish Electric fishing	Fish eDNA
Site 1	SW5-C	Trib of Allt Loch an t-Sionnaich 3	NH 44133 21900	✓	✓	✓	SO	
Site 2	SW5-B	Trib of Allt Loch an t-Sionnaich 1	NH 43941 21874	✓	✓	✓	✓	
Site 3	SW11-A	Trib of Allt Coire an Ruighe 8	NH 46621 23577	In	In	In	In	
Site 4	SW10-C	Trib of Allt Coire an Ruighe 6	NH 48108 25268	✓	✓	✓	SO	
Site 5	SW10-E	Trib of Allt Coire an Ruighe 5	NH 48432 25694	✓	✓	✓	SO	
Site 6	SW11	Allt Coire an Ruighe	NH 47985 24938	✓	✓	✓	✓	
Site 7	-	Trib of River Coiltie 10	NH 47620 26971	In	In	In	In	
Site 8	-	Trib of River Coiltie 5a	NH 48319 26682	✓	✓	✓	SO	
Site 9	-	Trib of River Coiltie 5b	NH 48285 26727	✓	✓	✓	SO	
Site 10	SW19	River Enrick	NH 45008 29831	✓	✓	✓	Ab	
Site 11	SW20	Allt Creag an Fhithich	NH 45183 29549	SO	✓	✓	SO	

Site 12	SW22	Allt na Criche	NH 45739 29416	✓	✓	✓	SO	
Site 13	SW24	Allt Luirg nam Broc	NH 46927 29604	SO	✓	✓	SO	
Site 14	SW5	Trib of Allt Loch an t-Sionnaich 2	NH 44167 21767	✓	✓	✓	✓	
Site 15	SW5-D	Trib of Allt Loch an t-Sionnaich 3	NH 44148 21847	✓	✓	✓	✓	
Site 16	SW5	Trib of Allt Loch an t-Sionnaich 2	NH 44509 21883	✓	✓	✓	✓	
Site 17	SW5-E	Trib of Allt Loch an t-Sionnaich 3	NH 44302 22291	✓	✓	✓	✓	
Site 18	SW5-E	Trib of Allt Loch an t-Sionnaich 3	NH 44521 22641	✓	✓	✓	SO	
Site 19	SW11	Trib of Allt Coire an Ruighe 9	NH 46455 23578	In	In	In	In	
Site 20	SW9	River Coiltie	NH 46489 26715	✓	✓	✓	✓	
River 1	SW5	Allt Loch an t-Sionnaich	NH 43495 20836			✓		✓
River 2	SW3	Allt Saigh	NH 43756 19259			✓		✓
River 3	SW3	Allt Saigh	NH 45632 18996			✓		✓
LnBD	SW8	Loch nam Breac Dearga	NH 45266 22412			✓		✓
LnBD A			NH 45614 22642		✓			
LnBD B			NH 44856 22075		✓			
LN2	SW11	Loch Ness[15]	NH 43792 14504		✓			
LN5			NH 38225 09398		✓			
LN6			NH 38345 10273		✓			
LN9			NH 45720 18960		✓			
LN10			NH 52480 29345		✓			
LN12			NH 56283 33068		✓			

SO – Surveys scoped out due to either unsuitable habitat i.e. water depth or barriers causing ecological discontinuity
Ab – Surveys aborted on health and safety grounds due to the water body being in spate at the time of survey
In – Survey sites inaccessible due to unsuitable access and terrain

Macrophyte Survey

9.5.16 Macrophyte surveys were undertaken in September 2024 and were only undertaken on running watercourses. The macrophyte surveys followed the method outlined in the UKTAG River Assessment Method (Macrophytes and Phytobenthos) for use with LEAFPACS2[16], which conforms to BS EN 14184:2014 Water quality - Guidance for the surveying of aquatic macrophytes in running waters. Observations of macrophyte species were made on standing water bodies, but full macrophyte surveys were not completed on Loch nam Breac Darga and Loch Ness due to the marginal water depth and access constrains, respectively.

Aquatic Macroinvertebrate Survey

9.5.17 Aquatic macroinvertebrate surveys of the Proposed Development Site were completed in the spring and autumn of 2024, with additional macroinvertebrate surveys of Loch Ness completed in spring 2025.

9.5.18 Macroinvertebrate samples were taken to assess the biological quality of the surveyed water bodies. Using a standard Freshwater Biological Association (FBA) pattern pond net (mesh size: 1 mm), instream habitats were ‘kick sampled’ where practicable, whilst standing water bodies were ‘sweep sampled’. Sampling methodology

[15] Further macroinvertebrate surveys are underway in the marginal habitats or Loch Ness, and will be reported as an addendum to support the development of the detailed mitigation design
[16] Water Framework Directive – United Kingdom Advisory Group (WFD-UKTAG) (2014) UKTAG River Assessment Method Macrophytes and Phytobenthos

adhered to aquatic macroinvertebrate sampling procedures standardised by the Environment Agency[17] and used by regulatory authorities across the UK. These sampling procedures also conform to BS EN ISO 10870:2012 Water Quality – Guidelines for the selection of sampling methods and devices for benthic macroinvertebrates in fresh waters and the WFD-UKTAG Lake Assessment Methods – Benthic Invertebrate Fauna: Lake Acidification Macroinvertebrate Metric (LAMM)[18].

9.5.19 Subsequent laboratory analysis identified specimens to 'mixed-taxon level' using stereo-microscopes; and lists of the aquatic macroinvertebrate taxa present were produced in line with Environment Agency guidance[19].

9.5.20 Using collated survey data, metrics were calculated to inform an assessment of relative conservation value, habitat condition, and general degradation of surveyed water bodies. Aquatic macroinvertebrate data were analysed to generate the Whalley, Hawkes, Paisley & Trigg (WHPT) score, Average Score Per Taxon (ASPT), and Number of scoring taxa (NTAXA) values, which provide an indication of ecological quality in the watercourse (WFD-UKTAG, 2021). Further calculations were undertaken to determine the Proportion of Sediment-sensitive Invertebrates (PSI) index[20], the Lotic-invertebrate Index for Flow Evaluation (LIFE) score[21], which links benthic macroinvertebrate data to flow regimes prevailing in UK waters, and finally the Community Conservation Index (CCI)[22] was used to classify present aquatic macroinvertebrates according to their scarcity and conservation value in a geographic context.

9.5.21 The resultant WHPT-ASPT and NTAXA values and environmental data collected were processed through the River Invertebrate Classification Tool (RICT) version 3 web application, to produce outputs as Ecological Quality Ratio (EQR) values. The EQRs are then translated into a Water Framework Directive (WFD) equivalent classification.

Fish Habitat Assessment

9.5.22 Fish habitat assessments were completed at 10 sites in 2024 to establish suitability for fish spawning habitat and further electric fishing surveys. At each site, key aquatic features assessed included channel dimensions (including water depth), mesohabitat coverage, habitat features, substrate composition, accessibility for migratory species and potential spawning areas for salmonids. These were subsequently analysed following SEPA's Guidance for applicants on supporting information requirements for hydropower applications[23]. The degree of suitable passage was also considered, as natural or artificial barriers may impact passage of salmonids upstream on surveyed water bodies. Where watercourses were assessed as suitable for fishes, electric fishing surveys were undertaken.

Electric Fishing

9.5.23 Electric fishing surveys were undertaken following a derivation of the standard electric fishing practice for operators and equipment, as detailed in the Environment Agency Code of Practice and Electric Fishing Equipment Annex A and B, Issue II regulations revision[24]. Electric fishing was conducted by fully trained fisheries scientists following the EA Operational Instruction 993_08, Electric fishing operations (2019) and in accordance with the Scottish Fisheries Coordination Centre protocols[25].

9.5.24 Time delineated surveys were undertaken, providing an index of abundance; catch per unit of effort (time). This method was advantageous to use as an alternative to the three-run method due to the terrain limiting the equipment that could be transported to the sites preventing the use of stop nets. Additionally, this method also facilitated a larger number of sites to be sampled in a short time frame when weather and flow conditions allowed.

[17] Environment Agency (2017). Freshwater macro-invertebrate sampling in rivers Operational Instruction 018_08. Environment Agency, Bristol, UK.
[18] Water Framework Directive - United Kingdom Advisory Group (WFD-UKTAG) (2008) UKTAG Lake Assessment Methods Benthic Invertebrate Fauna Lake Acidification Macroinvertebrate Metric (LAMM)
[19] Environment Agency (last issue: 2014) Freshwater macro-invertebrate analysis of riverine samples. Operational instruction 024_08
[20] Extence, C.A., Chadd, R.P., England, J., Dunbar, M.J., Wood, P.J., & Taylor, E.D. (2011). The assessment of fine sediment accumulation in rivers using macro-invertebrate community response. River Research and Applications DOI: 10.1002/rra.1569
[21] Extence, C.A., Balbi, D.M. and Chadd, R.P. (1999). River flow indexing using British benthic macroinvertebrates: a framework for setting hydroecological objectives. Regulated Rivers: Research & Management: An International Journal Devoted to River Research and Management, 15(6), 545-574
[22] Chadd, R. & Extence, C. (2004) The conservation of freshwater macro-invertebrate populations: a community-based classification scheme. Aquatic Conservation: Marine & Freshwater Ecosystems 14: 597-624
[23] EPA (2005) Guidance for applicants on supporting information requirements for hydropower applications. The Water Environment (Controlled Activities) (Scotland) Regulations 2005 (CAR)
[24] Beaumont, W.R.C, Taylor, A.A.L, Lee, M.J, and Welton, J.S., (2002) Guidelines for Electric Fishing Best Practice, R&D Technical Report W2-054/TR
[25] SFCC (2021) Scottish Fisheries coordination Centre Training Manual Team Leader Electrofishing. Freshwater Fisheries laboratory, Pitlochry. June 2022

Operatives electric-fished the watercourse in an upstream direction for 10 minutes where possible. The number of fish caught during this time is regarded as an index of abundance; catch per unit effort (time).

9.5.25 Subsequent fish catches were individually measured and identified to species level to inform species presence and abundance within the watercourses.

Fish eDNA Survey

9.5.26 Environmental DNA (eDNA) metabarcoding has been shown to be an effective tool for detecting and monitoring fish communities from lakes, rivers, and reservoirs[26,27,28,29]. For this study, 29 water samples were taken from Loch nam Breac Dearga (n = 20), Allt Loch an t-Sionnaich (n = 3) and Allt Saigh (n = 6). Collected samples were analysed using vertebrate specific eDNA metabarcoding approaches to provide an overall assessment of the fish community.

9.5.27 All water samples were collected by AECOM staff in March 2024 from the loch and associated river. Each individual sample contained 2L of surface water. Samples were collected at roughly equidistant points around the perimeter of the Loch nam Breac Dearga, and at three selected riverine sites (each with three replicates), then filtered within 24 hours. DNA was extracted following the Mu-DNA water extraction protocol. Three polymerase chain reaction (PCR) replicates were carried out for each sample prior to being pooled. Samples were further processed and sequenced following metabarcoding protocols established at UHI Inverness using a vertebrate specific 12S marker.

9.5.28 The full laboratory procedure is outlined in **Appendix 9.1: Aquatic Ecology Baseline Report (Volume 5: Appendices)**.

9.5.29 The fish community composition was summarised using two different metrics. The first used site occupancy (the number of samples with positive detections for a given species), which is commonly used to demonstrate spatial abundance across a site. Previous studies have shown strong correlations with rank abundance of fish estimated from direct catch methods. However, the relationship with total abundance is not linear and the most common species can be underrepresented. The second shows the relative proportion of sequences assigned to each species, which provides a better estimate for the difference in total abundance between the common and rare species but can be less accurate in differentiating the relative abundance of the rarer species.

Assessment Methodology

9.5.30 The assessment of impacts and effects on aquatic ecological features described in this chapter was conducted in accordance with the guidelines published by CIEEM[9]. The principal steps involved in the CIEEM approach can be summarised as:

- Determine baseline conditions through targeted desk study and field survey, to identify important ecological features that might be affected;
- Evaluate the importance of identified ecological features on a geographic scale, determining those that need to be considered further;
- Describe potential impacts on relevant ecological features, considering best practice, legislation and embedded design measures;
- Assess and quantify (as far as possible) likely effects (adverse or beneficial) on relevant ecological features;
- Develop measures to avoid or reduce predicted significant effects, in conjunction with other elements of the design (including mitigation for other environmental disciplines);
- Report residual effects taking into account developed mitigation or compensation; and

[26] Di Muri, C., Lawson Handley, L., Bean, C.W., Li, J., Peirson, G., Sellers, G.S., Walsh, K., et al. (2020), “Read counts from environmental DNA (eDNA) metabarcoding reflect fish abundance and biomass in drained ponds”, Metabarcoding and Metagenomics, Pensoft Publishers, Vol. 4, p.e56959

[27] Griffiths, N.P., Bolland, J.D., Wright, R.M., Murphy, L.A., Donnelly, R.K., Watson, H.V. and Hänfling, B. (2020), Environmental DNA metabarcoding provides enhanced detection of the European eel *Anguilla anguilla* and fish community structure in pumped river catchments”, Journal of Fish Biology, Blackwell Publishing Ltd Oxford, UK, Vol. 97 No. 5, pp. 1375–1384.

[28] Hänfling, B., Lawson Handley, L., Read, D.S., Hahn, C., Li, J., Nichols, P., Blackman, R.C., et al. (2016), “Environmental DNA metabarcoding of lake fish communities reflects long-term data from established survey methods”, Molecular Ecology, Vol. 25 No. 13, pp. 3101–3119.

[29] Pont, D., Rocle, M., Valentini, A., Civade, R., Jean, P., Maire, A., Roset, N., et al. (2018), “Environmental DNA reveals quantitative patterns of fish biodiversity in large rivers despite its downstream transportation”, Scientific Reports, Vol. 8 No. 1, p. 10361.

- Identify opportunities for biodiversity enhancement.

9.5.31 When baseline conditions have been determined, it can become apparent that there is no possibility of effect on certain ecological features, and in this case such features are scoped out of further assessment.

9.5.32 In line with CIEEM guidelines, the terminology used within this chapter draws a clear distinction between the terms ‘impact’ and ‘effect’. Within this chapter, these terms are defined as follows:

- Impact – actions resulting in changes to an ecological feature (for example, a deterioration in water quality leading to adverse effects on aquatic flora and fauna; culverting of a watercourse presenting a barrier to fish migration); and
- Effect – the outcome resulting from an impact acting upon the conservation status or structure and/or function of an ecological feature (for example, deterioration in water quality may have an adverse effect on aquatic communities and corresponding WFD status at a particular scale; barriers to fish passage have an adverse effect on migratory and spawning success of certain fish species).

9.5.33 Impacts are assessed in view of the conservation status of the species under consideration. Conservation status is defined as follows:

- Habitats – the sum of influences acting on it that may affect its extent, structure/functions, distribution and typical species within a given geographical area[9]; and
- Species – the sum of influences acting on it that may affect its long-term distribution and abundance within a given geographical area[9]. Similarly, conservation objectives for European sites indicate that to contribute to favourable conservation status, the following must be maintained: the population as a viable component of its habitats, distribution, and sufficiency of supporting habitats, processes and prey.

9.5.34 NatureScot recommends that the concept of the favourable conservation status for species should be applied at a national (Scottish) level to determine the level of significance of an effect arising from the impact(s) of development. However, consideration of effects at all scales is important[9], and where an impact may not affect conservation status at the national level, the potential for effects on conservation status within the context of NHZ 7 (‘regional’), as well as at local scale, has been considered.

9.5.35 For the purposes of this EIA, effects predicted to be significant on an ecological feature at the Regional or greater geographic level are considered ‘Significant’ in broader EIA terms, whereas those predicted to be significant only at the Local or Negligible levels, are considered to be ‘Not Significant’. The latter does not, however, necessarily imply that mitigation is not required, or that other legal requirements do not necessarily apply.

9.5.36 A detailed description of the CIEEM method for impact assessment is provided in **Chapter 7: Terrestrial Ecology** under **Appendix 7.1: Method for Assessment of Ecological Impacts (Volume 5: Appendices)**.

Limitations And Assumptions

9.5.37 Refer to **Appendix 9.1: Aquatic Ecology Baseline Report (Volume 5: Appendices)** for limitations and assumptions in relation to the aquatic ecology surveys. A summary is provided below.

9.5.38 The aim of a desk study is to help characterise the baseline context and provide valuable background information that would not be captured by a single site survey alone. Information obtained by desk study is dependent upon local recorders and organisations having submitted records for the area of interest. As such, a lack of records for a species does not necessarily mean that the habitats or species do not occur in the Study Area. Likewise, the record of a species does not automatically mean that these still occur within the area of interest or are relevant in the context of the Proposed Development. The relevance of existing data records is assessed in context for the EIA.

9.5.39 Due to the terrain on the Proposed Development Site, it was not possible to access sites 3, 7 and 19.

9.5.40 Quantitative fish surveys were not possible as the terrain across the Proposed Development Site limited the ability of the team to carry bulky stop nets across the Proposed Development Site. As such the team followed the time delineated methodology.

9.5.41 Due to heavy rainfall overnight, the flows on the River Enrick made electric fishing at Site 10 unsafe; as such this site was not surveyed despite being assessed as providing suitable habitat for fish. This is not considered a constraint to the assessment due to the desk study information available for the River Enrick, as described elsewhere.

9.5.42 The large boulder substrate and water depth at Site 20 made it impossible to complete a full 10-minute electrofishing survey. Instead, a zig-zag survey pattern was used where it was safe to do so, and accessible pools within this area were surveyed through spot-checks.

9.5.43 The terrain surrounding Loch nam Breac Dearga prevented the collection of equidistant eDNA water samples from around the banks. Samples could not be collected between NH 45501 22516 and NH 45061 21991, where Meall Fuar-mhonaidh drops vertically to the water's edge limiting safe access to the shoreline – see **Figure 9.1.4: Fish Survey Locations (Appendix 9.1 Aquatic Ecology Baseline Report)**.

9.5.44 At some sites with high proportions of boulders and large cobbles it was not possible to get the macroinvertebrate net flat against the bed of the watercourse. In addition to this, where the substrate was dominated by bedrock and boulders there was limited substrate to disturb during the kick sample. However, best efforts were made to collect a representative kick sample.

9.5.45 The macroinvertebrate survey at the north of Loch nam Breac Dearga was moved to the east of the loch during the autumn suite of surveys, due to the eastern location being more representative of the habitats present on the loch.

9.5.46 While the baseline is not expected to change sufficiently to alter the impact assessment at the time of Construction, the precise situation regarding protected species may nevertheless differ at that time through natural changes. Pre-Construction and Enabling Works surveys should therefore be undertaken as required, depending upon the timescale of consenting and construction, with aquatic ecological data typically remaining valid for a period of three years from the point of collection.

9.6 Baseline Environment

9.6.1 Detailed baseline information regarding important habitats and aquatic species is available in **Appendix 9.1: Aquatic Ecology Baseline Report (Volume 5: Appendices)**. A summary of this baseline information is provided below.

Aquatic Ecology Desk Study Results

Water Framework Directive Water Bodies

9.6.2 The Allt Saigh water body, which includes Loch nam Breac Dearga (Water body ID: 20278), is a heavily modified water body due to the impact of hydroelectricity generation. Allt Saigh is 12.1 km in length and enters Loch Ness at Alltsigh. The Allt Saigh water body is currently classified as having 'Good' overall status (2023). This water body achieved 'Moderate' overall ecological status for hydromorphology whilst having 'High' status for biological elements.

9.6.3 The River Coiltie Water Body (Water Body ID: 20265) is 17.9 km in length. The River Coiltie has 'Moderate' overall status, having 'High' status for biological elements (solely fish) whilst having 'Moderate' status for hydromorphology and overall hydrology.

9.6.4 The River Enrick – Loch Ness to Loch Meiklie (Water Body ID: 20262) is 9.9 km in length. This Water Body is currently classified as having 'Good' overall status (2023). The water body had good overall ecology status, achieving 'High' status for physio-chemical elements and 'Good' for biological elements.

9.6.5 Loch Ness (Water Body ID: 100156) has an area of 55.3 km^2 and is currently classified as having 'Good' overall status (2023). The loch has 'Good' status for biological elements achieving 'High' for both invertebrate animals and fish but 'Good' for alien species.

Statutory Designations

9.6.6 Refer to **Chapter 7: Terrestrial Ecology** for full details of all designated sites within the Study Area. A summary of the statutory designated sites relevant to the aquatic ecology assessment and within 10 km of the Proposed Development Site is provided below.

9.6.7 The Proposed Development does not lie within any statutory site designated for nature conservation, with the exception of Dubh Lochs SSSI, which overlaps the Proposed Development Site boundary by a very small degree – approximately 45 m at the southern extent of the southern loch. The North Inverness Lochs SPA, of which Dubh Lochs SSSI forms a part, is assessed in **Chapter 7 Terrestrial Ecology**. However, there are several statutorily designated sites within the potential zone of influence of the Proposed Development. These are described in

Table 9-5 Statutory Designated Sites in Proximity to the Proposed Development Site. The designations are listed in descending order, with those closest to the Proposed Development Site listed first.

Table 9-5: Statutory Designated Sites in Proximity to the Proposed Development Site

Designated Site	Reason(s) for Designation	Relationship to the Proposed Development
Dubh Lochs SSSI	Aquatic habitat supporting Slavonian Grebe	Within the Proposed Development. There is no hydrological connectivity between the Proposed Development and this designated site, and therefore it is not considered further in the Aquatic Ecology assessment. It is assessed further in **Chapter 7 Terrestrial Ecology** in terms of potential impacts to Slavonian grebe.
Knockie Lochs SSSI	Extensive emergent aquatic vegetation supporting Slavonian Grebe	This SSSI is 0.8 km south east of the Proposed Development. There is no hydrological connectivity between the Proposed Development and this designated site, and therefore it is not considered further in the Aquatic Ecology assessment.
Urquhart Bay Wood SAC/SSSI	One of the remaining floodplain swamp woodlands on the confluence of Rivers Enrick and Coiltie	This SSSI and SAC is 1.8 km north of the Proposed Development. Although there is hydrological connectivity between the Proposed Development and this designated site via Loch Ness, there are no designated aquatic receptors at this designated site and therefore it is not considered further in the Aquatic Ecology assessment. This site is considered further in **Chapter 7: Terrestrial Ecology** and **Chapter 10: Water Environment**.
Balnagrantach SSSI	Diverse aquatic plant community and fringing aquatic and fen vegetation including club sedge *Carex buxbaumii* which is nationally rare.	This SSSI is 2.4 km north of the Proposed Development. There is no hydrological connectivity between the Proposed Development and this designated site, and therefore it is not considered further in the Aquatic Ecology assessment.
Loch Bran SSSI	Supports eleven species of dragonfly including a nationally scarce species, the brilliant emerald *Somatochlora metallica*.	This SSSI is 2.5 km east of the Proposed Development. There is no hydrological connectivity between the Proposed Development and this designated site, and therefore it is not considered further in the Aquatic Ecology assessment.
River Moriston SAC	Designated for its populations of FWPM and Atlantic Salmon	The River Moriston SAC is 3.1 km south west of the Proposed Development. There is hydrological connectivity between the Proposed Development and the designated site via Loch Ness. The impacts on Loch Ness and migrating Atlantic salmon and sea trout, with corresponding effects on FWPM in the SAC, are assessed herein and in **Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**.
Loch Ruthven SAC/SSSI	Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	Loch Ruthven SSSI and SAC is 10.5 km east of the Proposed Development. There is no hydrological connectivity between the Proposed Development and this designated site, and therefore it is not considered further in the Aquatic Ecology assessment.
Moray Firth SAC	Designated for its population of bottlenose dolphins which feed on the salmon.	Moray Firth SAC is 22.0 km north east of the Proposed Development. There is hydrological connectivity between the Proposed Development and this designated site via the River Ness and bottlenose dolphin prey on salmon smolts that have migrated through Loch Ness and the River Ness to the Moray Firth.

Non-statutory Designated Sites

9.6.8 There are no locally designated sites within 2 km of the Proposed Development Site.

Fish

9.6.9 As there were no records of notable fish species returned in the NBN dataset within the last 10 years, the search was then extended to 1960. It is assumed that where there are historical records, residual populations may remain present due to the under-recording of such species. However, a study of eDNA in Loch Ness from 2018 by the

University of Otago (University of Otago, 2019[30]) found the eDNA of several fish species. The fish identified and their designations are shown in **Table 9-6 Species found in desk study and their designations** below.

Table 9-6: Species found in desk study and their designations

Species	Scientific Name	NBN Atlas Data (Most recent year)	Loch Ness eDNA	BAP 2007	Scottish Biodiversity List	Habitat Directive (Appendix)	Bern Convention (Appendix)	Habitat Regulation (Schedule)	OSPAR
Arctic charr	*Salvelinus alpinus*	1979	✓	✓	✓				
Atlantic salmon	*Salmo salar*	1995	✓	✓	✓	A2, A5	A3		✓
Brook lamprey	*Lampetra planeri*	1983			✓	A2	A3		
Brown/Sea trout	*Salmo trutta*	1995	✓	✓	✓				
European eel	*Anguilla anguilla*	1995	✓	✓	✓				
European River Lamprey	*Lampetra fluviatilis*		✓	✓	✓	A2, A5	A3	Sch4	
Grayling	*Thymallus thymallus*		✓			A5	A3	Sch4	
Lamprey species	*Lampetra* sp.	2003		✓	✓	A2	A3	Sch4	
Minnow	*Phoxinus phoxinus*	1985	✓						
Nine-spined stickleback	*Pungitius pungitius*		✓						
Pike	*Esox lucius*	1985	✓						
Rainbow Trout	*Oncorhynchus mykiss*	2002							
Sea lamprey	*Petromyzon marinus*	2003	✓	✓	✓	A2	A3		✓
Stone Loach	*Barbatula barbatula*		✓						
Three-Spined Stickleback	*Gasterosteus aculeatus*	1995	✓						

9.6.10 Catch records from NDSFB show the presence of salmon every year between 2000 and 2020 within Loch Ness. NDSFB also have three monitoring locations on the River Coiltie and four on the River Enrick; all of these monitoring locations are downstream of the Proposed Development Site. The results of NDSFB 2022 quantitative surveys are shown in **Table 9-7: 2022 NDSFB salmonid smolt survey results for the Rivers Coiltie and Enrick** below.

Table 9-7: 2022 NDSFB salmonid smolt survey results for the Rivers Coiltie and Enrick

			Number of individuals caught			
River	Site	Distance from Site	Salmon Fry	Salmon Parr	Trout Fry	Trout Parr
Enrick	Enrick, EFPS1	1.33	236	33	6	1
	Enrick, Kilmichael Burn, EFPS2	1.53	3	3	0	0
	Enrick, EFPS3	1.59	107	21	6	1
	Enrick, EFPS4	1.74	152	18	2	0
Coiltie	Bottom of old bridge footing	1.77	50	26	7	0
	Left channel, start at point of island	2.47	152	40	22	0
	Downstream large gravel bar	2.60	379	21	31	0

9.6.11 There is anecdotal evidence from NDSFB that salmon smolts become trapped in the Caledonian Canal and perish, being unable to complete their migration. At the entrance to the canal from Loch Dochfour there is a 'smolt by-wash' pipe connecting to the River Ness downstream of Dochfour Weir. The sluice at the upstream end of the by-wash at Dochgarroch Lock is set at too high a level and the flow diminishes at low loch levels (NDSFB, pers. comm.). The conclusions of previous smolt tracking studies, the details of which are currently unpublished and

[30] University of Otago (2019). First eDNA Study Of Loch Ness Points To Something Fishy. [Online] Available at: https://www.otago.ac.nz/news/newsroom/first-edna-study-of-loch-ness-points-to-something-fishy

therefore confidential, include that loss of smolts in the canal and delays of their migration in lochs are often fatal. These factors present significant current constraints to the success of salmon smolt migration in the Ness catchment (NDSFB, pers. comm.).

Aquatic macroinvertebrates

9.6.12 Four notable macroinvertebrate species were identified during the desk study: three dragonfly species, brilliant emerald (*Somatochlora metallica*), northern emerald (*Somatochlora arctica*) and azure hawker (*Aeshna caerulea*) and the cranefly (*Tipula limbata*). The brilliant emerald and northern emerald dragonflies are designated as vulnerable and near threatened respectively under the Red List, whereas the azure hawker is classed as vulnerable under the GB Red List and is also listed under the Highland BAP 2021-2026. The cranefly *T. limbata* is a SBL species.

9.6.13 No records of FWPM were available within the Study Area; however, records of FWPM are generally confidential and are not held by the biological records centres. FWPM are known to be present in the River Moriston but the exact distribution of the species in that river is not known – it is therefore assumed that the species may be present in the River Moriston to its confluence with Loch Ness. Through a specific data request to SEPA, it was confirmed that there are no records of FWPM in the River Coiltie.

Aquatic macrophytes

9.6.14 Three notable bryophyte species were recorded in the desk study: yellowish fork-moss (*Dichodontium flavescens)* and curled hook-moss (*Palustriella commutata)* were recorded within the Proposed Development Site – both are SBL species. Green shield-moss (*Buxbaumia viridis)* was recorded 1.2 km east on the opposite side of Loch Ness and is listed under Appendix 1 of the Bern Convention, Annex 2 of the Habitat Directive, and Schedule 8 of the Wildlife and Countryside Act (as amended); it is also classified as Near Threatened under the Great Britain Red List.

Non-native and Invasive Species

9.6.15 One INNS of relevance to the aquatic ecology assessment was recorded on NBN Atlas Scotland – three records of Himalayan balsam (*Impatiens glandulifera*) were recorded within the Study Area. While this species is not truly aquatic, it inhabits riparian habitats and its seeds can be spread in water. Therefore, it is considered in the aquatic ecology assessment.

9.6.16 The Ness District Salmon Fishery Board has identified 12 INNS within the Ness and Beauly catchments; their Ness Catchment Biosecurity Plan (2021 – 2030) identified five species in Loch Ness and connected watercourses which are designed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended by the Wildlife and Natural Environment (Scotland) Act 2011[31]). These were:

- Canadian Waterweed (*Elodea canadensis*) – South Loch Ness;
- New Zealand Pigmyweed – Caledonian Canal;
- Japanese Knotweed (*Reynoutria japonica*) – Urquhart Bay Wood SAC;
- Himalayan Balsam (*Impatiens glandulifera*) – Urquhart Bay Wood SAC; and
- Giant Hogweed (*Heracleum mantegazzianum*) – Urquhart Bay Wood SAC.

9.6.17 They also identified the North American flatworm *Phagocata woodworthi* in Loch Ness, a non-native species which is not listed in legislation in the UK.

Marine Ecology Desk Study Results

Bottlenose Dolphin

9.6.18 A number of marine species rely on migratory fish associated with Loch Ness as a food source, such as the bottlenose dolphin and harbour seal (*Phoca vitulina*) which are known to prey upon Atlantic salmon. Atlantic salmon are an anadromous fish species, meaning that they use both fresh and saltwater throughout their life cycle. After salmon spawn in rivers and streams (Jonsson and Jonsson, 2011), juveniles migrate down-river to the ocean usually in spring to early summer (Thorstad et al., 2012). Adults then spend 1-5 years at sea before

[31] Wildlife and Natural Environment (Scotland) Act 2012. Available at: https://www.legislation.gov.uk/asp/2011/6/contents/enacted (accessed November 2023)

returning to their spawning rivers.[32] The occurrence of bottlenose dolphin within the inner reaches of the Moray Firth is thought to coincide with this migration period of Atlantic Salmon out to sea.[33,34]

9.6.19 The Moray Firth is located within the International Council for the Exploration of the Sea (ICES) Greater North Sea Ecoregion, within which bottlenose dolphin are considered resident. Bottlenose dolphins have a near global distribution and are common throughout UK waters. Within the UK, the Inter-Agency Marine Mammal Working Group (IAMMWG) has established management units (MU) for commonly occurring cetacean species. The Proposed Development is located within the Greater North Sea MU for bottlenose dolphin, within which the most recent abundance estimate is 1,885 individuals.[35]

9.6.20 In Scotland, there are two main resident groups of bottlenose dolphin. The Moray and Cromarty Firths on the east coast host the main population, whilst the west coast hosts a smaller population.[36] Of this population, >50% is known to use the Moray Firth, resulting in its designation as an SAC.[37] This area has been regularly monitored since 1989 and the most recent assessment of bottlenose dolphin abundance associated with the Moray Firth SAC has reported 94 individuals. Whilst this has been a decline from the previous monitoring effort (which observed 122 individuals) long-term stability in the use of the SAC by bottlenose dolphins has been reported from 2001-2022. Data have also indicated that the proportion of the population using the SAC has declined in recent years, but increased habitat usage has been noted elsewhere along the Scottish east coast, namely the Tayside region.

9.6.21 Passive acoustic monitoring of the region has also indicated intra-annual variability, with a peak in dolphin abundance observed during summer months within the SAC. This peak in abundance has been linked to the seasonal migration of Atlantic salmon, which are a known important prey species for local bottlenose dolphin. However, dolphin in the area have also been observed feeding upon mackerel, flatfish, cod, saithe, whiting, haddock, and cephalopods.

Harbour Seal

9.6.22 Harbour seal are known to haul out within the Moray Firth and also prey upon Atlantic salmon.[38] Approximately 32% of the European harbour seal population is found in the UK, with a current population estimate in UK waters of 30,855 individuals.[39] Similar management units have been delineated for seals in UK waters by the Sea Mammal Research Unit (SMRU) Special Committee on Seals (SCoS). The Proposed Development occurs within the Moray Firth Management Unit with the most recent estimate of harbour seal abundance being 940 individuals.[40]

9.6.23 Harbour seals live in discrete regional populations, usually staying within 50 km of the coast.[41,42] They come onshore at haul-out sites, where they rest, breed, and moult. In Scotland, seal haul-out sites are protected under Section 117 of the Marine (Scotland) Act 2010. Protected haul-out sites within the Moray Firth are located at Beauly Firth, Ardersier, Findhorn, and the Cromarty Firth. Additionally, connectivity has been indicated between the haul-out sites within the Moray Firth and the Dornoch Firth SAC.[43] The most recent counts for harbour seals

[32] Cowx, I.G. and Fraser, D., 2003. Monitoring the Atlantic Salmon. Conserving Natura 2000 Rivers Monitoring Series No. 7. [Online]. Available at: https://publications.naturalengland.org.uk/publication/113031 [Accessed: 10 July 2023].
[33] Wilson, B, Thompson, PM, Hammond, PS. (1997). Habitat use by bottlenose dolphins: 899 seasonal distribution and stratified movement patterns in the Moray Firth, Scotland. Journal 900 of Applied Ecology, 34(6), 1365-1374.
[34] Arso Civil, M, Quick, NJ, Cheney, B, Pirotta,E, Thompson, PM, Hammond, PS. (2019). Changing distribution of the east coast of Scotland bottlenose dolphin population and the challenges of area-based management, Aquatic Conservation: Marine and Freshwater Ecosystems 29(S1), 178-196. https://doi.org/10.1002/aqc.3102
[35] IAMMWG. (2021). Updated abundance estimates for cetacean Management Units in UK waters. JNCC Report No. 680, ISSN 0963-8091. Peterborough
[36] Sea Watch Foundation. (2012a). Bottlenose dolphin in the UK. [Online] Available at: https://seawatchfoundation.org.uk/wp-content/uploads/2012/07/Bottlenose_Dolphin1.pdf
[37] Cheney, BJ, Arso Civil, M, Hammond, PS and Thompson, PM. (2024). Site Condition Monitoring of bottlenose dolphins within the Moray Firth Special Area of Conservation 2017-2022. NatureScot Research Report 1360.

[38] Sharples, RJ, B Arrizabalaga, PS Hammond (2009). Seals, sandeels, and salmon: diet of harbour seals in St Andrews Bay and the Tay Estuary, south east Scotland. Marine Ecology Progress Series 390: 265-276.
[39] SCOS. (2022). Scientific advice on matters related to the management of seal populations: 2022. Retrieved from http://www.smru.st-andrews.ac.uk/scos/scos-reports/
[40] Duck, CD and Morris, CD (2015). Surveys of harbour and grey seals on the west coast of Scotland (Ullapool to Scarba), in the Moray Firth and in the Firth of Tay, in August 2014. Scottish Natural Heritage Commissioned Report No. 869.
[41] Russell, D., & McConnell, B. (2014). Seal at-sea distribution, movements and behaviour. Report to UK Department of Energy and Climate Change (DECC). Issue URN: 14D/085.
[42] Russel, D., Jones, E., & Morris, C. (2017). Updated Seal Usage Maps: The Estimated at-sea Distribution of Grey and Harbour Seals. Scottish Marine and Freshwater Science Report Vol 8 No 25. St. Andrews, Fife: Marine Science Scotland.
[43] Butler, JRA, Middlemas, SJ, McKelvey, SA, McMyn, I, Leyshon, B, Walker, I, Thompson, PM, Boyd, IL, Duck, C, Armstrong, JD, Graham, IM, Baxter, JM. (2008). The Moray Firth Seal Management Plan: an adaptive framework for balancing the conservation of seals, salmon, fisheries, and wildlife tourism in the UK. Aquatic Conservation: Marine and Freshwater Ecosystems 18:1025-1038.

at these haul-out sites are provided in **Table 9-8: Mean harbour seal counts at haul out sites within the Moray Firth**.

Table 9-8: Mean harbour seal counts at haul out sites within the Moray Firth

Seal Haul Out Site	Mean Harbour Seal Count (2014)[44]	Mean Harbour Seal Count (2021)
Beauly Firth	37	58
Ardersier	28	84
Findhorn	260	198 (Culbin and Findhorn)
Cromarty Firth	100	82

Aquatic Ecology Field Survey

9.6.24 Aquatic surveys were completed across the ZoI of the Proposed Development, informed by the proposed water body crossings by above ground infrastructure and aquatic receptors identified as being potentially affected by the scheme. An overview of all survey sites is presented in **Table 9-4: Glen Earrach Aquatic Survey Sites**.

Freshwater Pearl Mussel

9.6.25 Limited optimal riverbed FWPM habitat (boulder-stabilised deposits of clean sand) was observed at any of the surveyed sites within the Proposed Development Site. Additionally, no evidence of FWPM (mussels, shells) was found at any site, and no historical records were found in the Proposed Development Site during the desk study, as confirmed through a data request to SEPA. Therefore, FWPM are considered absent from water bodies within the Proposed Development Site. However, FWPM is known to be present in the River Moriston SAC, and therefore indirect effects to FWPM in the River Moriston SAC through impacts to migrating salmonid fish are assessed in this chapter (refer also to **Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).

Macrophytes

9.6.26 No rare or notable macrophyte species were recorded within any of the survey sites.

9.6.27 The sites surveyed were on small oligotrophic headwater streams and support typical macrophyte communities characterised by bryophytes with higher plants limited and generally confined to the margins. These macrophyte communities are considered typical of upland watercourses in this part of Scotland. The steep gradients, resulting high velocity flow conditions, and unstable substrates, does not allow the development of extensive or diverse stands of macrophytes, while bryophytes, which are able to cope with these conditions, dominate.

9.6.28 Similar macrophyte communities are likely to be very common across the wider landscape and therefore the macrophyte communities encountered are considered as of **Local value**.

Macroinvertebrates

9.6.29 The most notable species recorded during the spring surveys were the caseless caddisfly (*Chimarra marginata)* and the diving beetle (*Agabus biguttatus;* conservation score: 7, Notable but not Red Data Book status) at sites 10 and 12 respectively. Neither species is listed under the SBL, but their distribution is limited by specific habitat requirements. However, in the local context, these habitats are fairly common and as such it can be expected to occur wherever there are comparable habitats. The most notable species recorded within the autumn surveys was found on the shores of Loch nam Breac Dearga at site B – this was the diving beetle (*Nebrioporus depressus)*, which has a conservation score of 8 – Nationally Scarce. All other aquatic macroinvertebrates were common and typical of the habitats present. None were threatened or legally protected.

9.6.30 Five locally notable species were present across the autumn surveys, as classified by their Community Conservation Index (CCI) score (5: local). The stonefly (*Protonemura montana)* was widespread, being found at seven sites (Sites 11, 12,13, 14,16, 17 and 20) and the blackfly (*Simulium angustitarse)* present at site 8. The non-biting midge *Thaumalea verralli* was present at site 9 during both seasons. The caddisfly (*Ceraclea albimacula)* was recorded at site 10 during the spring surveys, and the stonefly (*Capnia atra)* was recorded at site 20 in autumn; although both species have a conservation score of 5: local, they are both also nationally scarce.

9.6.31 Within the Loch nam Breac Dearga samples, the most notable species was *N. depressus*, recorded in autumn at LnBD2 (Conservation Score: 8 – Red Data Book Rare and IUCN Near Threatened). Both loch samples have

[44] The total harbour seal count for the entire Moray Firth SMU in 2021 was 690. This was 32% lower than the 2019 count. Approximately 30% of the harbour seals were observed between Culbin and Findhorn, significantly lower than the 60% seen in that area in 2021.

varying conservation values between the spring and autumn samples with the CCI score of Loch nam Breac Dearga having a very high conservation value during the autumn sample. *Procloeon bifidum* and *Ameletus inopinatus* were recorded at LnBD2 during the autumn surveys with the latter also recorded at LnBD1, both species are classified as regionally notable with *A. inopinatus* also recorded as Nationally Scarce. At both sites in the autumn surveys the caddis *Apatania wallengreni* was identified which is recorded as nationally scarce. All other aquatic macroinvertebrates were common and typical of the habitats present. None were threatened or legally protected.

9.6.32 Within the Loch Ness samples of spring (March) 2025, the only notable species was *N. depressus* which has a conservation score of 8: Red Data Book Rare and IUCN Near Threatened; within the LN6 sample. However, this is common across the surveyed area and typical of lochs and lochans in Scotland. Within the Loch Ness autumn samples, the sole notable species was the stonefly *Zwicknia bifrons*, which is regionally notable, identified within the autumn sample of LN9. All other species identified across the other surveys were of very common to occasional conservation status with conservation scores between 1 and 4 and are not legally protected.

9.6.33 On this basis, there are no other species considered greater than negligible nature conservation value and therefore the macroinvertebrate assemblage is considered of **Local value**.

Fish Habitat and Fish Species

9.6.34 Only brown / sea trout were identified during the electric fishing surveys. It is likely that the fish identified within the tributaries of Allt Loch an t-Sionnaich (SW5-B, C, D & E), adjacent to Loch nam Breac Dearga, are part of a resident population, with the hydroelectric dam at NH 43893 21620 acting as a barrier to migration. Allt Coire an Ruighe (SW11) is likely to support spawning fish. During the surveys, a single brown trout was caught with areas of optimal spawning habitat for salmonids, however, it should be noted that the steep gradients and numerous natural obstacles likely restrict fish migration within this watercourse.

9.6.35 Due to the prevalence of habitat for brown trout locally, and the likelihood that these represent resident rather than migratory populations due to the presence of natural and artificial barriers to migration, this species is considered as of **Local value**.

9.6.36 The River Coiltie (SW9) was identified as having the barriers to dispersal on the SEPA *Obstacles to Fish Migration* map layer preventing fish from migrating upstream onto the Proposed Development Site.

9.6.37 Although it was not possible to undertake surveys on the River Enrick (SW19), it has been assumed that the river supports migratory species following the precautionary principle.

Fish eDNA

9.6.38 eDNA from Loch nam Breac Dearga identified only brown / sea trout (UKBAP and SBL Priority Species) present. Arctic charr (UKBAP species) were thought to be present within Loch nam Breac Dearga as “Breac dearg” (literally ‘Red Trout’) is the Scots Gaelic term for charr; however, no eDNA for this species was detected.

9.6.39 eDNA results from Allt Loch an t-Sionnaich (SW5) identified the notable species brown / sea trout (UKBAP and SBL Priority Species). Whereas results from Allt Saigh (SW3) returned the presence of brown/sea trout, European eel (IUCN Critically Endangered, UKBAP and Scottish Biodiversity List (SBL) Priority Species), and Atlantic salmon (IUCN Endangered in the UK; Annex II Habitats Directive, UKBAP, and SBL Priority Species). Atlantic salmon was only identified in site River 3 in the Allt Saigh at its confluence with Loch Ness.

Fish Species and Assessment of Value

9.6.40 Salmon and brown / sea trout are unlikely to be utilising the margins of Loch Ness to spawn as it is widely understood that migratory salmonids prefer to spawn in rivers and streams (Jonsson and Jonsson, 2011). However, migratory species will be utilising Loch Ness as a migratory pathway from the sea to rivers such as the River Enrick (SW19), Allt Saigh (SW3), and River Moriston, in which salmon and brown/sea trout have been found. Migratory species are considered to utilise the watercourses on the Proposed Development Site which enter Loch Ness.

9.6.41 Due to the designation of Atlantic salmon as Habitats Directive Annex II species and qualifying features of the River Moriston SAC, and as SBL species and an endangered species in the UK (IUCN, 2024), this species is assessed as of **International value.**

9.6.42 From eDNA surveys by University of Otago in 2018, brown/sea trout were present in Loch Ness, most likely utilising it as a migratory route between the sea and their spawning grounds. Lamprey species (brook and river) are also European protected species (listed in Annex II of the Habitats Directive) and are likely still present in Loch Ness. Loch Ness also supports a community of priority fish species including the species Arctic charr,

European eel, Atlantic salmon, and brown trout, together with a wider range of more common species. As European protected species and forming a notable fish assemblage in Loch Ness and connected watercourses, together these fish species are assessed as of **Regional value** due to the presence of a community including SBL priority species.

9.6.43 Allt Loch an t-Sionnaich (SW5) and the lower reaches of Allt Saigh (SW3) were found to support small numbers of European eel, but natural and artificial obstacles severely restrict fish movements and have reduced the chance of colonisation higher up the watercourses within the Proposed Development Site. Similarly, the steep gradients of the watercourses, in addition to a lack of suitable riverbed substrates (stable fine sand deposits) are unlikely to support suitable nursery habitats for lamprey ammocoetes (larvae).

Marine Ecology field surveys

9.6.44 No marine ecology field surveys were completed as part of this assessment, which is based on desk study data and that available from the freshwater aquatic ecology assessment. Marine ecology field surveys were not required due to the lack of direct impacts to marine ecological receptors, which are linked to the migration of Atlantic salmon, notably smolts.

Future Baseline

Baseline at Time of Construction

9.6.45 Construction and Enabling Works for the Proposed Development are proposed to start in 2026 and take approximately eight years to complete. No other major land use changes are expected within the Proposed Development Site prior to the commencement of construction.

9.6.46 Changes in the distribution of aquatic and marine species before the commencement of construction activities are considered unlikely due to the stability of aquatic habitats, and the existence of natural and artificial barriers to fish migration, which limit fish communities present under current circumstances. Any such changes are very likely to be within the range of normal inter-annual variation in the distribution and abundance of species populations.

9.6.47 It is therefore expected that the current baseline conditions will remain largely unchanged by the time of construction of the Proposed Development.

Baseline in the Absence of the Proposed Development

9.6.48 In the absence of the Proposed Development, and for this purpose taking a point 30 years in the future, there are unlikely to be significant changes from the current baseline within the Proposed Development Site. This is because current land management practices would be likely to continue as at present, and significant changes of land use are unlikely, especially in the more upland part of the Proposed Development Site containing the Headpond. Small changes might occur in the more lowland parts of the Proposed Development Site, such as possible implementation of biodiversity measures (e.g., planting of new woodland), but would likely not influence aquatic receptors and be of minimal impact to aquatic habitats relative to the size of the Proposed Development Site. Some impact from climate change could occur, however it is difficult to predict the direction of change on aquatic habitats, since the effects of possible drier and hotter periods but also increased rainfall could counteract each other.

9.6.49 The Loch na Cathrach and Loch Kemp PSH schemes may be operational by that time (the latter if consented) and would result in fluctuations in the level of Loch Ness in combination with the existing Foyers PSH power station. In the absence of improvements on Dochfour Weir by those developers, which are not currently proposed as part of the Environmental Impact Assessments of those schemes, and in combination with potential climate change effects, fish passage at Dochfour Weir would be adversely impacted, reducing the migratory success of Atlantic salmon and other migratory species.

9.6.50 As described in **Chapter 04 Approach to EIA**, when assessing cumulative effects, the operational effects relating to the water catchment of other schemes, such as Loch na Cathrach PSH and Loch Kemp PSH are considered. The cumulative operation in terms of drawdown and discharge on the hydrology and water balance of the receiving catchments is considered, although this could be controlled through the conditions of the Controlled Activities Regulations (CAR) and abstraction licence. For example, hydraulic modelling has included the cumulative effects of the Proposed Development with Foyers PSH, Loch na Cathrach PSH, and Loch Kemp PSH, and the proposed additional mitigation would be designed to mitigate for the effects of all schemes in combination.

9.7 Embedded Mitigation

9.7.1 Embedded mitigation measures are incorporated into the design of a development and aim to avoid or reduce adverse effects, including those on ecological features. Embedded mitigation can be considered at the impact assessment stage, whereas specific mitigation measures which are not part of the design and are developed after the initial impact assessment, are assessed at a later stage when considering the residual effects. For specific additional mitigation see **Section 9.9 Mitigation and Monitoring, Additional Mitigation.**

Infrastructure Design

9.7.2 The Proposed Development has sought to avoid impacts on ecological features as far as possible by several infrastructure refinements embedded into the design, as set out below:

- The implementation of Sustainable Drainage (SuDs) features and attenuation features will control runoff into watercourses and lochs and avoid contamination of these water bodies;
- The risk of cross-catchment contamination during construction, for example by the spread of INNS between Loch Ness, River Coiltie and other catchments, will be minimised by measures set out in the Construction Environmental Management Plan (CEMP), and the incorporation of temporary SuDs and attenuation features in the intervening land; and
- Where culverts are installed at watercourse crossings, i.e., for the installation of new watercourse crossings or the upgrade of existing crossings, the culvert invert will be set below the existing watercourse bed to ensure continued longitudinal connectivity and fish passage through the culvert. Such culverts will be designed and installed according to SEPA best practice guidance[45].
- Watercourse crossings (new or upgraded) where appropriate will be designed as bottomless watercourse crossings, which will maintain natural bed material to ensure continued longitudinal connectivity and fish passage.
- The permanent Access Tracks will partially incorporate the existing forestry road and so it is proposed to apply a 50 m limit of deviation either side of the existing track. This would allow a 100 m buffer for the proposed Permanent Access Track, and allow for micro-siting for local ground conditions, topography, forestry, and watercourses.
- The principal Borrow Pit has been intentionally located within the Headpond inundation zone and thus avoids further habitat loss. A small Borrow Pit to facilitate the enabling works has been removed from the design and replaced by use of an existing rock quarry in the Forestry and Land Scotland (FLS) land through which the northern access passes.
- Water feature buffers will be applied as described in detail in Chapter 10 Water Environment. A 50 m buffer has been applied to all water features other than PC12 Valve House that needs to be located close to the watercourse SW5-C. Where possible components of the Proposed Development and areas of construction works have been sited outside of this zone. However, for large spatial components such as the Headpond, linear components like access tracks, and works that must be located by or in water features (e.g. LCW or outfalls), this is not possible. **Appendix 10.3 Geomorphic Baseline and Watercourse Crossing (Volume 5: Appendices)** sets out occurrences of where the buffer has to be encroached with regards to watercourses. The other exceptions include works along and within Loch Ness and Loch nam Breac Dearga. To minimise risks to water bodies, a dynamic approach is proposed whereby temporary 50 m buffers will be applied where necessary until it is necessary to undertake works that physically impact the water features.
- Permanent and temporary access tracks will be required (refer to **Chapter 02 Project and Site Description**), including widening of existing tracks, watercourse crossings. Post-construction, the access tracks will be reduced in width to a single-track road, with passing places retained at suitable increments. All access track alignments have been designed utilising the local natural topography along with environmental constraints, as identified in this EIAR, in order to minimise impacts.
- The southern access route from Allt Saigh has been revised to be used on an infrequent basis by smaller vehicles such as 4x4s only, with negligible works required to the existing rough track, and requiring a

[45] SEPA (2015). WAT-PS-06-02: Culverting of Watercourses - Position Statement and Supporting Guidance. Available at: https://www.sepa.org.uk/media/150919/wat_ps_06_02.pdf

relatively short section of new track at the northern end to reach the Headpond, limiting potential impacts on Allt Loch an t-Sionnaich and Allt Saigh.

- The design includes compensation flow discharge from the Headpond via permanent compound PC12 into the Allt Loch an t-Sionnaich and by extension Allt Saigh, to maintain its typical hydrological regime, which will minimise impact on associated terrestrial riparian habitats. The discharge rate will be agreed with SEPA.
- The Lower Control Works (LCW) (the intake and outlet to Loch Ness) will have a smolt screen, which is decoupled from the main structure and sits approximately 53 m from the end of the intake-outtake structures, and energy generation velocities not exceeding 0.3 m/s. This will ensure entrainment and/or impingement of salmon smolts (and other fish) from Loch Ness is avoided. This screen will also minimise the potential transfer of INNS from Loch Ness.

Standard Measures

9.7.3 A range of measures that are standard good practice for a development of this type, and which are required to comply with environmental protection legislation, will also be implemented. These are well-developed and have been successfully implemented on infrastructure projects across the country and there is a high degree of confidence in their success. They can therefore be treated as embedded mitigation. Details of this mitigation will be included in a CEMP, which would be prepared and submitted for approval by The Highland Council, in consultation with SEPA and NatureScot, where necessary, prior to commencement of Construction. The CEMP will set out all environmental management measures and the roles and responsibilities of construction personnel. Measures will include:

- An Ecological Clerk of Works (ECoW) will be employed for the duration of the construction of the Proposed Development. The remit of the ECoW will include, but may not be limited to:
- Ensuring that all personnel involved in the construction and operation of the Proposed Development are made aware of the ecological features within the ZoI and the mitigation measures and working procedures that must be adopted. This would be achieved as part of the induction process and through the delivery of Toolbox Talks, where required;
- Advising on exact infrastructure placement within micro-siting tolerances, including for example the location and placement of watercourse crossings and culverts;
- Monitoring of, and advising on, storage of overburden to minimise habitat damage, including the stand-off from water bodies and the placement of silt fencing to prevent runoff, where deemed necessary;
- Advising on habitat reinstatement;
- Monitoring of pollution control measures (including silt fencing as above) and advising on placement of ditches, settlement ponds, etc. to minimise habitat damage; and
- Monitoring and advising on the additional control measures (e.g. construction lighting, standard wildlife protection measures etc) mentioned below.
- Sightings of protected and/or important species (including INNS) within the Proposed Development Site during the construction period would be recorded. If any evidence or sightings of protected species are recorded in the works area, then works would stop immediately and the ECoW would be contacted for further advice;
- During all phases of the Proposed Development, pollution prevention measures would be adopted, following SEPA Guidance on Pollution Prevention (GPP), including the following:
- Controls and contingency measures would be provided to manage run-off from construction areas and to manage sediment;
- All oils, lubricants or other chemicals would be stored in an appropriate secure container in a suitable storage area, with spill kits provided at the storage location and at places across the Proposed Development Site; and
- To avoid pollution impacts watercourses/water bodies during Construction, all refuelling and servicing of vehicles and plant would be carried out in a designated area which is bunded and has an impermeable base. This would be situated at least 50 m away from any watercourse.
- Construction traffic will be subject to controls including on speed within the Proposed Development Site;

- Biosecurity protocols would be implemented as required to prevent the spread of INNS both within and off-site, including vehicle washing facilities, washing and disinfection stations for plant, equipment and PPE, and briefing of construction staff on the risks of INNS transfer, especially in high-risk areas; and
- Any artificial lighting required for construction works would be directional to avoid or minimise light spill beyond immediate works areas, and away from water bodies, and would be turned off when not required.

9.8 Assessment of Effects

Features Scoped Out of Further Assessment

9.8.1 As stated in **Section 9.5 Methodology, Assessment Scope**, relevant ecological features are those that are 'important' and have the potential to be significantly affected by the Proposed Development[9]. In view of the baseline data obtained through desk study and field survey, the features in **Table 9-9: Aquatic ecological Features Scoped Out of Further Assessment** have been excluded from further assessment because:

A. available data indicate that they are likely to be absent from the ZoI of the Proposed Development;

B. it is clear that no impact from the Proposed Development is possible; and/or

C. they are features that, although identified as being 'important' by the criteria given in this chapter, are common and widespread and/or their conservation status is clearly not threatened by the Proposed Development.

Table 9-9: Aquatic ecological Features Scoped Out of Further Assessment

Ecological Feature	Rationale for Exclusion from Further Assessment
Urquhart Bay Wood SAC/SSSI	There are no aquatic ecological features as designated features for this SAC/SSSI, therefore it is not considered further in the Aquatic Ecology assessment. However, given the hydrological linkage to Loch Ness, this site has been considered further in **Chapter 7: Terrestrial Ecology** and **Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**.
Loch Ruthven SAC/SSSI	There is no hydrological connectivity between the Proposed Development and this SSSI, and therefore it is not considered further in the Aquatic Ecology assessment
Dubh Lochs SSSI	There is no hydrological connectivity between the Proposed Development and this SSSI, and therefore it is not considered further in the Aquatic Ecology assessment
Knockie Lochs SSSI	There is no hydrological connectivity between the Proposed Development and this SSSI, and therefore it is not considered further in the Aquatic Ecology assessment
Balnagrantach SSSI	There is no hydrological connectivity between the Proposed Development and this SSSI, and therefore it is not considered further in the Aquatic Ecology assessment.
Loch Bran SSSI	There is no hydrological connectivity between the Proposed Development and this SSSI, and therefore it is not considered further in the Aquatic Ecology assessment
Other sites with non-statutory designation for nature conservation	There are no such sites within 2 km of the Proposed Development.
Impacts of lighting on aquatic species	There will be a requirement for lighting during Construction, and operational external lighting at Tunnel Portals and along access tracks and Construction Compounds. External lighting will also be required at the Headpond and Tailpond for access, although this will only be used occasionally. Lighting may also be fitted to the Lower Control Works on Loch Ness, although this is only intended for occasional operational use. It is envisaged that embedded mitigation, including directional cowling and restrictions to the hours of operation, will ensure that the potential effects of this lighting will be Negligible on all receptors.

9.8.2 Although FWPM are considered absent from water bodies within the Proposed Development Site, the species is known to be present in the River Moriston SAC. Therefore, indirect effects to FWPM in the River Moriston SAC through impacts to migrating salmonid fish are assessed in this chapter (refer also to **Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).

Importance of Ecological Features

9.8.3 The assessed importance of those ecological features identified in the baseline conditions, and which have not been scoped out, are set out in **Table 9-10: Importance of Aquatic Ecological Features**, together with a rationale. Importance has been assessed considering geographic scale, in accordance with CIEEM guidelines[9].

9.8.4 When considering geographic scale, for the purposes of this assessment, the geographical level of Regional is defined as the area encompassed by NHZ 7, and Local as the area within 10 km of the Proposed Development.

9.8.5 With regard to assessment of terrestrial habitats and species, including Urquhart Bay Wood SAC, otters and water voles, please refer to **Chapter 7: Terrestrial Ecology**.

Table 9-10: Importance of Aquatic Ecological Features

Ecological Feature	Importance	Rationale
River Moriston SAC	International	River Moriston is internationally designated as an SAC with the aquatic features Atlantic salmon and FWPM. Sustainable areas of SBL priority habitat: Rivers that form an essential component of the network of aquatic habitats, including other priority habitats, in the Proposed Development Site. Provide suitable habitat, including spawning habitat, for the SBL species Atlantic salmon and brown trout.
Moray Firth SAC	International	Moray Firth is internationally designated as an SAC with Bottlenose dolphin (an SBL priority species) and subtidal sandbanks as designated features. It also acts a migratory pathway for the migratory fish assemblage of the Ness catchment, including salmon smolts as a prey resource for bottlenose dolphins.
Loch Ness habitat: SBL habitat oligotrophic and dystrophic lakes	International	Loch Ness is assessed as of International value as it represents SBL Priority Habitat Oligotrophic and dystrophic lakes and is an important resource of large lochs of this size nationally. It is also hydrologically linked to internationally designated sites and provides habitat to a range of migratory and protected fish species.
Loch nam Breac Dearga	Regional	Loch nam Breac Dearga represents a receptor of Regional value as small areas of SBL priority habitat: oligotrophic and dystrophic lakes of surface area larger than 1 ha, that are an important component of this habitat resource regionally.
River Ness	National	River Ness represents a receptor of National value, deemed a Sustainable area of SBL priority habitat: Rivers that form an essential component of the network of aquatic habitats, including migratory pathway for the protected migratory fish assemblage.
Flowing watercourses: SBL Rivers: Allt Saigh Allt Loch an t-Sionnaich River Coiltie River Enrick Trib of Allt Loch an t-Sionnaich 1 Trib of Allt Loch an t-Sionnaich 2 Allt Coire an Ruighe	Regional	Sustainable areas of SBL priority habitat: Rivers that form an essential component of the network of aquatic habitats, including other priority habitats, in the Proposed Development Site. Provide suitable habitat, including spawning habitat, for the SBL species Atlantic salmon and brown trout.
Flowing watercourses: SBL Rivers: All other watercourses and water bodies within the Proposed Development Site	Local	Sustainable areas of SBL priority habitat: Rivers that form an essential component of the network of aquatic habitats, including other priority habitats, in the Proposed Development Site.
Aquatic macrophyte assemblage: All water bodies	Local	The communities present are likely to occur in numerous other locations and in other similar lochs and water bodies within the local area. However, macrophyte cover does provide a valuable local resource for fauna, in particular aquatic macroinvertebrate community.
Aquatic macroinvertebrates	Local	While several sites were found to support an aquatic macroinvertebrate community indicative of very good, unpolluted and unimpacted status, all species recorded were widespread and common. Similar macroinvertebrate communities are likely to be common across the wider landscape.
Aquatic macroinvertebrates in Loch Ness	Local	While several sites were found to support an aquatic macroinvertebrate community indicative of very good, unpolluted and unimpacted status, all

Ecological Feature	Importance	Rationale
		species recorded were widespread and common. Similar macroinvertebrate communities are likely to be common across the wider landscape.
Atlantic salmon in: Loch Ness Allt Saigh River Coiltie River Enrick	International	Loch Ness is a migratory route between the sea and spawning grounds, although these do not include watercourses within the Proposed Development Site. Salmon is a European protected species and present in Loch Ness, including as a migratory route via the River Ness to the River Moriston SAC and other rivers. Salmon smolts navigate through Loch Ness on their downstream migration in spring/early summer. Salmon was identified through eDNA surveys in Allt Saigh and suitable salmonid spawning habitat was identified. Records of salmon in the Rivers Coiltie and Enrick were provided from NDSFB.
Brown/sea trout, Arctic charr, European eel, and lamprey species (Loch Ness)	Regional	Loch Ness supports a fish community of several notable species, including SBL species. Loch Ness is a migratory route between the sea and spawning grounds for sea trout and river/sea lamprey, although these do not include watercourses within the Proposed Development Site.
Brown/sea trout in six water bodies: Loch nam Breac Dearga Allt Saigh Allt Loch an t-Sionnaich River Coiltie River Enrick Allt Coire an Ruighe	Local	Brown/sea trout is a SBL priority species. Loch nam Breac Dearga, Allt Saigh, Allt Loch an t-Sionnaich, River Coiltie, River Enrick and Allt Coire an Ruighe were identified to have brown/sea trout populations and/or provide suitable spawning habitat for salmonids. Similar habitat is abundant locally, and the habitat resource within the red line boundary is considered of Local significance given natural and artificial barriers to fish migration limit the dispersal of trout locally.
Other fish species (All water bodies)	Local	Water bodies support a broader community of common and widespread fish species.
INNS	n/a	INNS are known to be present in Loch Ness, including non-native species (i.e., those not designated as INNS) that are considered a risk to native flora and fauna in the local context.

The Potential Impacts of the Proposed Development

9.8.6 The following broad categories of impact could arise during the construction and operation of the Proposed Development and are considered, where potentially relevant, in relation to each of the ecological features scoped in to detailed assessment as set out within **Table 9-10: Importance of Aquatic Ecological Features**.

Pre-Construction Impacts

9.8.7 Pre-Construction and Enabling activities of relevance to aquatic ecology are as follows:

- Site clearance within the River Coiltie Area – potential impacts to the River Coiltie e.g., from runoff and pollution (assessed under Construction Effects: **D: Impacts to Water Quality During Construction**);
- Compound set up within the River Coiltie area, including the Temporary Worker's Accommodation – as above (assessed under Construction Effects: **D: Impacts to Water Quality During Construction**);
- Borrow Pits – potential runoff of sediment and pollution to watercourses (assessed under Construction Effects: **D: Impacts to Water Quality During Construction**);
- Construction of new Access Track from existing FLS track to Main Access Tunnel Portal – watercourse crossings (assessed under Construction Effects: **B: Watercourse Crossings**); and
- Realignment of the Affric Kintail Core Path – potential watercourse crossings (assessed under Construction Effects: **B: Watercourse Crossings**).

9.8.8 Potential impacts of these Pre-Construction and Enabling activities are assessed in the corresponding sections under Construction Impacts below.

Construction Impacts

9.8.9 The potential effects during the Proposed Development's construction on aquatic ecological features that require impact assessment are considered to comprise the following:

A. Cofferdam Construction – a cofferdam will be installed as part of the LCW in Loch Ness, which is a water-tight, temporary structure that will encircle the area required for the Tailpond works. The area

within the cofferdam will be pumped dry to facilitate the construction of the Tailpond inlet / outlet Structure. Impacts resulting from the construction of the cofferdam on the shoreline of Loch Ness at the LCW, including piling, de-watering and substrate removal, potentially resulting in the disturbance or displacement of species during Construction;

B. Watercourse Crossings – Impacts of watercourse crossings for Temporary and Permanent Access Track and temporary site compounds, including upgrade to and new culverting of watercourses and new bridges. Loss of watercourse bed during the upgrade/installation of pipe culverts, bottomless arch culverts and bridges;

C. Loss of Aquatic Habitat due to construction of the Headpond and Headpond Embankments – including land take and transport of excavated material; Loss of Loch nam Breac Dearga and part of the upstream catchment of Allt Loch an t-Sionnaich as a result of Headpond construction (refer to Chapter 10: Water Environment for further details); Loss of habitat which supports freshwater aquatic species as a result of the construction of infrastructure associated with the Proposed Development, potentially resulting in the disturbance or displacement of species during Construction;

D. Impacts to Water Quality During Construction – pollution during the construction of the cofferdam, access to the cofferdam via Loch Ness, and also during LCW excavation and construction; Impacts due to the transport of excavated tunnel material to the Headpond via dump trucks, and spoil management of material from tunnelling works; Impacts of construction of the temporary marine facility and delivery of equipment and materials by barge;

E. Temporary Site Drainage, Including SuDs, Settlement Ponds, Temporary Ditches and Other Drainage Features – impacts to water quality due to runoff and pollution;

F. General plant movement throughout the Proposed Development Site and compounds – impacts to water quality due to runoff and pollution;

G. Potential Spread or Introduction of INNS – impacts of the spread of INNS through the Proposed Development Site, and due to transporting materials onto or away from the Proposed Development Site and the potential introduction of INNS.

9.8.10 There are no likely pathways for pollution of surface water, groundwater, soils or vegetation given that industry-standard good practice mitigation measures would be implemented at all stages of the Proposed Development to meet legal and regulatory requirements, as described in **Section 9.7 Embedded Mitigation, Standard Measures.** These measures are considered as embedded and this impact is therefore not considered for any ecological feature.

Operational Impacts

9.8.11 The potential effects during operation of the Proposed Development on aquatic ecological features that require impact assessment are considered to comprise the following:

A. Impacts on water levels and water quality in Loch Ness – This section includes the following:

- Due to regular generation cycles with water pumped up to the Headpond then returned to the loch causing a distraction from migratory routes for salmon (including smolts) and other migratory species, including increased risk of predation;
- Impacts on water quality in Loch Ness during generation cycles with water returned to the loch (e.g., temperature fluctuations);
- Changes to water quality in Loch Ness during generation cycles, including temperature changes and potential effects on thermal stratification; and
- Impacts on marginal habitats in Loch Ness (SBL habitat), including impacts to flora and fauna inhabiting marginal habitats as a result of increased frequency of water level fluctuations.

B. Impacts of the LCW on Loch Ness shoreline, including screen during operation – This section includes the following:

- Impacts on water levels at Dochfour Weir due to regular generation cycles;
- Reduced water levels at Dochfour Weir constrain fish passage at the weir, and divert downstream migrating smolts toward the Caledonian Canal; and
- Entrainment/ impingement of fish at the LCW smolt screen, and distraction from migratory routes due to the operation of the LCW (water intake/outlet).

C. Impacts of watercourse crossings for permanent access tracks, including bridges and culverts;

D. Impacts of Waterways in Operation - Waterways transfer water between the Headpond and Tailpond. Waterways will be underground and will have no operational effects on aquatic ecology receptors. Therefore, these are not assessed further.

E. Impacts of construction compounds, including permanent land-take;

F. Impacts of the Headpond and Embankments, including land take and drainage;

G. Permanent site drainage, including SuDs, settlement ponds, temporary ditches, and other drainage features;

H. Indirect impacts to marine mammals through impacts to prey species (e.g. bottlenose dolphin and harbour seal) associated with the Moray Firth SAC from impacts to migrating salmon; and

I. Spread of INNS through the Proposed Development Site as a result of operation – for example from Loch Ness to the Headpond and connected catchment, especially as compensation flows are required to downstream watercourses.

Assessment of Construction Effects

A. Cofferdam Construction (Loch Ness)

9.8.12 There will be temporary disturbance to the shoreline and margins of Loch Ness, with the temporary cofferdam extending out into the loch. The cofferdam is a water-tight, temporary structure that will encircle the area required for construction of the LCW. The area within the cofferdam will be pumped dry to facilitate the construction of the Tailpond inlet / outlet structure.

9.8.13 The effects on habitats within Loch Ness (International value) will be localised to the relatively small area of the cofferdam (0.01% of the total loch area). These effects will consist of disruption and removal of substrate, including dredging after removal of the cofferdam, and de-watering of this area. Due to the small area to be temporarily impacted, this is considered to represent a Low magnitude impact, resulting in a **temporary Minor adverse effect**.

9.8.14 The migratory routes of salmon and other migratory species through Loch Ness are not well known, but it is likely that these species will be present in the vicinity of the cofferdam during their migration: late spring and early summer for salmon smolt migration; late autumn or early winter for adult migration.

9.8.15 Potential effects on the assemblage of fish in Loch Ness including Atlantic salmon, brown/sea trout, Arctic charr, European eel, and lamprey species (International value) through the cofferdam construction include:

- Direct mortality or physical injury through construction, piling and de-watering activities;
- Physical injury as a result of piling noise – although the effects of piling noise vary with size of piles and blow energy, under the most likely scenario (vibro-driven piles, so percussive noise will be kept to a minimum), auditory injury to salmon is calculated to occur out to approximately 20 m from the noise source, a strong avoidance reaction is calculated to occur out to 330 m and a significant avoidance behaviour reaction is calculated to occur out to 2.1 km (Mason and Collett, 2011);
- The impacts of piling noise on other fish species remains largely unstudied (Hawkins and Popper, 2012); however, the effects are likely to be similar to those for salmon described above;
- Physical injury and disturbance as a result of blasting – blasting for the excavation of Waterways and Tunnels will have a similar effect to that of piling described above. Therefore, blasting in the vicinity of Loch Ness has the potential to cause auditory injury to fish and a strong avoidance reaction.
- Avoidance reaction by salmon, potentially disrupting the migratory pathway.

9.8.16 In the absence of mitigation, the potential effects on the fish assemblage in Loch Ness through construction of the cofferdam are considered to be of Medium magnitude due to the disruption of migratory behaviour and potential mortality and physical injury to fish, including Atlantic salmon. This would result in a **temporary Major adverse effect** in the case of Atlantic salmon (International importance), and a **temporary Minor adverse effect** in the case of brown trout, European eel, Arctic char, and lamprey species (Regional importance).

9.8.17 Effects on aquatic macrophytes, macroinvertebrates and other fish species (Low value) through the cofferdam construction are considered Negligible, resulting in a **Negligible effect** that is effectively a ‘no change’ situation and not significant.

B. Watercourse Crossings for Temporary and Permanent Access Tracks and Culverting of Watercourses

9.8.18 This section includes the assessment of Pre-Construction and Enabling impacts as referred to in the Pre-Construction Effects section above, in addition to Construction impacts.

9.8.19 Part of the Access Track works involves upgrading or creating new watercourse crossings. The upgrading of watercourse crossings is required to accommodate the higher vehicular loads and increased amounts of passage. The creation of new watercourse crossings is necessary to avoid diverting both watercourses and existing access tracks whilst keeping the length of new tracks to a minimum. These tracks will provide access to Construction Compounds and the Headpond and Embankments, and for the compounds themselves. Where possible, existing crossing points are being utilised; however, these may need to be upgraded using pipe culvert crossings or single span bridge watercourse crossings.

9.8.20 Where new Temporary and Permanent Access Tracks are required, new open bottom watercourse crossings will be created in line with the standard detail in **Figure 2.33 Water Crossing Detail (Volume 3: Figures)**. The routes of access tracks have been selected to minimise watercourse crossings. All crossings will adhere to Controlled Activities Regulations (CAR) requirements. For further details on watercourse crossings, refer to **Appendix 10.3: Geomorphic Baseline and Watercourse Crossings (Volume 5: Appendices)**.

9.8.21 **Table 9-11: Locations of proposed watercourse crossings and type of crossing proposed** below provides a summary of all proposed watercourse crossings, whether from proposed new or upgraded crossing points (culverts or bridges), for Access Tracks.

Table 9-11: Locations of proposed watercourse crossings and type of crossing proposed

Watercourse Crossing No.	NGR	Upgraded or New	Type of Crossing
SW25 Crossing 1	NH47940 29438	Upgrade	Assumed pipe culvert
SW18 Crossing 1	NH47412 27489	Upgrade	
SW3-H Crossing 1	NH43385 19324	Upgrade	
SW12-C Crossing 1	NH 46026 26415	New	Bottomless arch culvert
SW12-C Crossing 2	NH 45962 26352	New	
SW12-B Crossing 1	NH 46185 26070	New	
SW12 Crossing 1	NH 46132 25072	New	
SW11-B Crossing 1	NH 45635 23347	New	
SW11-B Crossing 2	NH 45652 23217	New	
SW5-E Crossing 1	NH 44494 22702	New	
SW5-E Crossing 2	NH 44505 22690	New	
SW5-E Crossing 3	NH 44441 22475	New	
SW5-D Crossing 1	NH 44247 22088	New	
SW5-B Crossing 1	NH 43749 21993	New	
SW13 Crossing 1	NH 44627 23729	New	
SW13 Crossing 2	NH 44574 23681	New	
SW27 Crossing 1	NH45050 29830	New temporary	
SW 31 Crossing 1	NH 48159 21879	New	
SW9 Crossing 1 (River Coiltie)	NH46489 26715	New	Bottomless culvert
SW19 Crossing 1 (River Enrick)	NH45008 29834	New temporary	Bridge
SW3 Crossing 1 (Allt Saigh)	NH45591 19142	Upgrade	
SW3-F Crossing 1	NH44047 19197	Upgrade	
SW3 Crossing 2 (Allt Saigh)	NH43731 19254	Upgrade	
SW5 Crossing 1 (Allt Loch an t-Sionnaich)	NH 43495 20814	Upgrade	
SW20 Crossing 1	NH45183 29549	Upgrade	Concrete bottomless box culvert

Watercourse Crossing No.	NGR	Upgraded or New	Type of Crossing
SW21 Crossing 1	NH45255 29549	Upgrade	Pipe culvert
SW28 Crossing 1	NH45477 29475	Upgrade	
SW22 Crossing 1	NH45741 29415	Upgrade	
SW23 Crossing 1	NH46498 29484	Upgrade	
SW24 Crossing 1	NH46924 29606	Upgrade	
SW29 Crossing 1	NH47010 29652	Upgrade	
SW30 Crossing 1	NH47599 29698	Upgrade	
SW26 Crossing 1	NH49374 29433	Upgrade	
SW17 Crossing 1	NH46691 27021	Upgrade	
SW3-D Crossing 1	NH44313 19287	Upgrade	
SW7 Crossing 1 (Trib of Allt Loch an t-Sionnaich)	NH 43417 21321	Upgrade	

9.8.22 Allt Saigh (SW3), Allt Loch an t-Sionnaich (SW5), River Coiltie (SW9), River Enrick (SW19), and Trib of Allt Loch an t-Sionnaich 1 & 2 (SW7) are assessed as of Regional value. Other watercourses throughout the Proposed Development Site are assessed as Local importance. As per the assessment in **Chapter 10 Water Environment**, the impacts of all watercourse crossings is considered a negligible adverse impact, which on watercourse habitats of regional importance is considered a **Minor adverse effect**, and on watercourse habitats of local importance is considered a **Negligible adverse effect**.

9.8.23 Atlantic salmon are present in Allt Saigh (SW3), River Coiltie (SW9) and the River Enrick (SW19). Due to the potential spawning habitat present in these watercourses, installation of new bridges may have an impact on fish passage and spawning habitat for species of International importance (salmon in these rivers). Given that bridges on Allt Saigh (SW3), and the River Enrick (SW19) already exist, and that the crossing point on the River Coiltie (SW9) is upstream of an impassible barrier to fish migration, impacts to salmon in these watercourses are assessed as a Low magnitude permanent **Minor adverse effect**.

9.8.24 The effects on other watercourses of Local importance (brown trout watercourses) of permanent watercourse crossings is assessed as a Medium magnitude permanent **Minor adverse effect**.

9.8.25 Effects on aquatic macrophytes, macroinvertebrates, and other fish (Low importance) through watercourse crossings are considered of Low magnitude, resulting in a **Negligible effect** that is effectively a ‘no change’ situation and not significant.

C. Loss of Aquatic Habitat due to Construction of the Headpond and Headpond Embankments

9.8.26 Construction of the Headpond and Embankments will result in the loss of a proportion of the Loch Ness hydrological catchment with this impact assessed in detail within **Chapter 10: Water Environment**. Loch nam Breac Dearga will be lost due to construction of the Headpond and will result in a loss of aquatic habitat for notable fish (brown trout). Loch nam Breac Dearga will be inundated and permanently altered to become the Headpond. Although a larger water body, the Headpond will be artificial and lack the same natural character of Loch nam Breac Dearga. This loch is of Regional importance, and its loss is considered to represent a Medium magnitude impact; however, due to the presence of multiple similar water bodies in the surrounding area, this is assessed as a **Minor adverse effect**.

9.8.27 The primary potential indirect effects due to construction of the Headpond and Embankments are impacts to water quality in watercourses and water bodies that will receive temporary and permanent drainage from the Embankment areas. The effects of permanent drainage from the Embankments are assessed in the Operational Effects section that follows.

9.8.28 There is the potential for smaller water bodies within the construction area to receive runoff from the Headpond construction area and associated impacts on water quality. In the absence of mitigation, the assessment of impacts for these water bodies is as follows:

- The receiving water bodies from the Headpond, Allt Loch an t-Sionnaich (SW5), Trib of Allt Loch an t-Sionnaich 1 & 2 (SW7) and Allt Saigh (SW3), (Regional importance) are to receive a compensation flow to

maintain the operation of the hydroelectric dam on Allt Loch an t-Sionnaich (SW5) and maintain the natural flow regime during both Construction and Operation (assessed in **Chapter 10: Water Environment**). Given that Construction will adhere to measured outlined in the CEMP, the potential impacts to species within these water bodies is assessed as a Low magnitude and represent a **temporary Negligible effect**.

9.8.29 Effects on fish species (brown trout; Local value) through the Headpond and Embankments' construction are considered to be of Medium magnitude impact due to the potential for injury and/or mortality of this species, resulting in a **Minor adverse effect**.

9.8.30 Effects on aquatic macrophytes, and macroinvertebrates through the Headpond and Embankments' construction are considered to be Low due to the limited assemblages of these species in Loch nam Breac Dearga. The Headpond will remain post-construction, and while it will cease to function as a natural water body, it will continue to provide habitat for some macroinvertebrate species in particular. Therefore, some elements of the impacts will be temporary. Some habitat for macrophytes and macroinvertebrates will be lost permanently, along with the species themselves; however, there is abundant alternative similar habitat for these species locally. Therefore, this is considered to result in a **Negligible effect** on receptors of local importance.

D. Impacts to Water Quality During Construction

9.8.31 This section includes the assessment of Pre-Construction and Enabling impacts as referred to in the Pre-Construction Effects section above, in addition to Construction impacts.

9.8.32 Material will be excavated from tunnels and from the cofferdam area in Loch Ness, potentially resulting in impacts to water quality including by the release of sediment and runoff. Mitigation measures to manage the pollution risk to water bodies are detailed in **Chapter 10 Water Environment**.

9.8.33 Materials excavated from the tunnels will be transported throughout the Proposed Development Site and stockpiled in pre-agreed locations. Therefore, the primary impacts on aquatic habitats associated with spoil transport and management are the spread and runoff of sediment and resulting reductions in water quality.

9.8.34 The effects of sediment input into watercourses and water bodies on each receptor is assessed in the points that follow:

- Loch Ness – There is the potential for Loch Ness to be impacted due to substrate and sediment removal and mobilisation, pollution from spoil and equipment transport via Loch Ness, and other construction activities such as piling. The assessment of runoff impacts to Loch Ness from excavation and other construction activities is described in detail in **Chapter 10 Water Environment**. Due to the localised area of works on the loch shore and in the context of Loch Ness as a whole, this is assessed as a negligible adverse impact resulting in a **Minor adverse effect**.
- Impacts to other watercourses and water bodies due to the transport of excavated tunnel material are the same as those described above for the Headpond construction.

9.8.35 The fish community in Loch Ness (Atlantic salmon (International value); brown/sea trout, Arctic charr, European eel, and lamprey species (Regional value)) is considered unlikely to be adversely affected by the impact pathways to water quality described above due to the localised nature of the works on the loch shoreline in the context of the loch as a whole. Therefore, this is assessed as Negligible magnitude and represents a **temporary Minor adverse effect**.

9.8.36 Other fish species in Loch Ness and other watercourses in this area of construction (Local value) will also be unlikely to be adversely affected by sediment runoff due to the localised nature of the works on the loch shoreline in the context of the loch as a whole. Therefore, this is assessed as a **temporary Negligible effect**.

9.8.37 Several watercourses within the Proposed Development are inhabited by salmon (Allt Saigh, River Coiltie and River Enrick) and brown trout (Allt Loch an t-Sionnaich, River Coiltie, Trib of Allt Loch an t-Sionnaich 1 & 2 and Allt Coire an Ruighe). Due to the potential spawning habitat present in these watercourses, water quality impacts may have an adverse effect upon spawning success for species of up to International importance (salmon). Due to the embedded mitigation detailed in **Chapter 10 Water Environment** to protect water quality, this is assessed as a Low magnitude **temporary Minor adverse effect**.

9.8.38 Macrophytes, macroinvertebrates, and fish species (other than salmon and brown trout) would be subject to similar reductions in water quality and reduced oxygen levels and therefore impacts to these receptors is assessed as a Low magnitude **temporary Negligible effect**.

E. Temporary Site Drainage, Including SuDs, Settlement Ponds, Temporary Ditches and Other Drainage Features

9.8.39 During the Pre-Construction phase, on-site SuDs will be implemented along access tracks (including downslope silt fences and temporary ditches) and within the area of the River Coiltie. Additional SuDs required for the Construction phase will also be necessary within the wider construction area. The extent, positions, size and filtration methods that will be used are available within **Appendix 3.1: Outline CEMP (Volume 5: Appendices**).

9.8.40 It is anticipated that the locations for these components will avoid direct impacts to other aquatic receptors, and therefore **no effects** are envisaged.

9.8.41 Potential effects of runoff and siltation through these components are assessed in the preceding section for effects due to spoil transport and management, including in the event that temporary site drainage features fail or are ineffective, and thus result in the introduction of runoff or sediment into aquatic habitats.

F. General Plant Movement Throughout the Proposed Development Site

9.8.42 Plant movement through the Proposed Development Site has the potential to result in the spread of sediment through the Proposed Development Site or water quality impacts such as the introduction of pollutants such as oil or diesel into aquatic habitats. Such effects are assessed in the section above on **Impacts to Water Quality During Construction**, and the effects stated above also apply here. Such effects are also assessed in detail in **Chapter 10 Water Environment**.

G. Potential Spread or Introduction of INNS

9.8.43 There is the potential for INNS to be spread through or introduced to or beyond the Proposed Development Site during Construction by:

- Cofferdam construction in Loch Ness, where INNS are known to be present;
- Stockpiling of spoil materials, which may contain INNS fragments or propagules;
- Transport of spoil materials throughout the Proposed Development Site, or off-site;
- General plant and vehicle movement onto, through, and beyond the Proposed Development Site;
- Transfer of INNS on Personal Protective Equipment (PPE), site clothing and other materials and equipment; and
- Transport of materials by barge on Loch Ness.

9.8.44 The effects of the introduction of INNS on different receptors are summarised in the points below.

9.8.45 Loch Ness is currently inhabited by several INNS, as established in the baseline assessment. Equipment and materials will be transported to Loch Ness and to the Proposed Development Site by barge via the Caledonian Canal and road routes. Therefore, the potential for the spread of INNS from elsewhere on the Proposed Development Site or off-site to Loch Ness as a result of construction activity is considered low, and this is assessed as a **Negligible effect**.

9.8.46 Other watercourses and water bodies throughout the Proposed Development Site have been predominantly shown through the baseline assessments as having a likely absence of INNS (refer also to **Chapter 7: Terrestrial Ecology** for terrestrial and riparian INNS). Therefore, the introduction of INNS, in the absence of mitigation, would cause a potential deterioration in the ecological quality of these water bodies, and is considered to constitute:

- For Regional value watercourses Allt Saigh, Allt Loch an t-Sionnaich, River Coiltie, River Enrick, Trib of Allt Loch an t-Sionnaich 1 & 2, and Allt Coire an Ruighe, and water bodies of Regional value (excluding Loch nam Breac Dearga). These are connected to Loch Ness and there is already a pathway for the spread of low-impact INNS such as the amphipod *Crangonyx pseudogracilis/floridanus*, and the American flatworm *Phagocata woodworthi*, the latter not having been identified in field surveys. For INNS plants such as waterweed *Elodea* spp., it is considered that upland fast-flowing watercourses present unsuitable habitat for these species and therefore they are unlikely to become established if transferred from Loch Ness. Therefore, this is assessed as a low magnitude **Minor adverse effect**.
- Given that Loch nam Breac Dearga will be lost in its natural state and will no longer function as a natural water body as the Headpond, this is considered to represent no impact for that water body, and therefore there is **No effect**.
- For all other watercourses (Low value) Therefore, this is considered a low magnitude **Negligible adverse effect**.

9.8.47 The fish assemblage in Loch Ness (International value) would be vulnerable to the introduction of other INNS that may have the potential to adversely affect fish such as salmon, for example high-impact INNS that are currently absent from Loch Ness. There is a pathway for the introduction of this and other INNS into Loch Ness, namely construction routes from the Caledonian Canal; however, this pathway already exists for regular boat traffic. Therefore, it is considered that the potential for the Proposed Development to increase the risk of introduction is low. This is assessed as a low magnitude **Minor adverse effect**.

9.8.48 Atlantic salmon (International value) and brown trout (Local value) in watercourses, namely Allt Saigh and River Enrick, Allt Loch an t-Sionnaich, River Coiltie, Trib of Allt Loch an t-Sionnaich 1 & 2 and Allt Coire an Ruighe, are considered at low risk of INNS being introduced into those watercourses due to the reasons described above. Therefore, this is assessed as a low magnitude **Minor adverse effect**.

9.8.49 Macrophytes, macroinvertebrates and fish species (other than brown trout; Local value) may also be adversely affected by the potential introduction of INNS, through factors such as inter-species competition and displacement. However, due to the reasons described above, this is assessed as a low magnitude impact representing a **Negligible adverse effect**.

Assessment of Operational Effects

A. Impacts on Water Levels and Water Quality in Loch Ness

9.8.50 Hydrological effects on Loch Ness are assessed in detail in **Chapter 10: Water Environment**. The operation of the Proposed Development will depend on water level constraints within Loch Ness as well as electricity generation market conditions. The duration and frequency of operation will reflect energy generation needs at a particular time and has been modelled; the results of this modelling, including cumulative effects with other schemes, has informed this assessment.

9.8.51 Due to regular energy generation cycles with water being pumped up to the Headpond then returned to the loch, changes in the frequency and extent of water level fluctuations in Loch Ness will be greater than in the baseline scenario. As such, there will be resulting effects on fish passage on Dochfour Weir and the corresponding effects on marginal habitats and species, due to fluctuating water levels.

Fish

9.8.52 As described in **Appendix 10.1 Water Framework Directive Assessment** of **Chapter 10: Water Environment**, Loch Ness is classified in the WFD assessment as 'High Status' for the 'fish barrier' element, indicating that there are currently no constraints to the migration of fish in and out of the loch. However, during consultation with NDSFB, concerns were raised over the effectiveness of fish pass provision currently installed on Dochfour Weir due to insufficient flows under baseline conditions. As detailed later in this section, current fish pass provision on Dochfour Weir is inadequate, and fish passage is also constrained by the presence and operation of the lift gates, and the Caledonian Canal and associated 'by-wash' at Dochgarroch (a pipe connecting the canal to the west of Dochgarroch Lock to the River Ness). Salmon smolts that enter the Caledonian Canal are unlikely to complete their migration to the Moray Firth and therefore perish.

9.8.53 In terms of upstream adult salmon migration, modelling of the fish pass on Dochfour Weir has been completed and shows that flow velocity is between 0.9 and 1.44 m/s over the top of the fish pass, and 1.83 to 2.30 m/s at the downstream toe. The maximum sustained swimming speed of adult salmon has been shown to be 0.91 m/s (0.45 m body length) and 0.54 m/s (0.15 m body length)[46], with burst swimming speeds reaching 4.13 m/s for the largest fish (8.35 body lengths per second). This maximum speed is unsustainable, and a maximum of 1.92 m/s is realistic in allowing fish to navigate a flume or fish pass[47]. As such the modelling supports the views of NDSFB that there is currently a high probability that some adult salmon, especially the smaller specimens, are unable to navigate the existing weir and fish pass under current conditions.

9.8.54 Migration for salmon at Dochfour Weir is also impeded through its flow control measures to regulate the water levels within Loch Ness, Loch Dochfour and the Caledonian Canal. Firstly, lift gates are installed on the southern extent of the weir (right bank) to maintain a compensation flow to the River Ness whereby when loch levels fall below 15.62 m Above Ordnance Datum (AOD) the first gate is partially opened to maintain a pass forward flow of 28.3 m^3/s (1000 cubic feet per second) into the River Ness. As levels fall beyond this, the gates are opened further, thereby limiting flow to the fish pass. Secondly, the waste weir on the northern half of the weir (left bank) has a crest level of 15.53 m AOD and once loch levels fall below this level, flow is again limited to the fish pass.

[46] Tang, J. and Wardle, C.S. (1992) Power output of two sizes of Atlantic salmon (*Salmo salar*) at their maximum sustained Swimming speeds. J. exp. Biol. 166, 33-46.
[47] Colavecchia, M. et al. (1998) Measurement of burst swimming performance in wild Atlantic salmon (*Salmo salar* L.) using digital telemetry. River Research and Applications: Volume14, Issue1: Special Issue: Ecohydraulics, Pages 41-51.

As water levels fall further, up to a maximum of 15.33 m AOD (hands-off flow; HoF), to maintain the downstream flows in the River Ness, the lift gates are opened further and therefore a greater percentage of the flow goes under the gate rather than over the fish pass (Water Control Manual – Caledonian Canal, Version 9.0, Scottish Canals).

9.8.55 Modelling shows that the fish pass will remain passable to upstream migrating adult salmon at these levels, with a low ratio between flow velocity over the pass and through the gates. Although a reduction in flow over the fish pass may be beneficial in these scenarios in increasing fish passability, its effectiveness is being hindered through the attraction flow being created by the lift gates. In this instance, adult salmon would be attracted to the lift gates and may fail to find the fish pass, and due to the lift gates being impassible, their migration would be delayed until either suitable flow conditions are met or the fish pass is found. These lift gates are also potentially harmful to downstream smolt movements due to velocities through the lift gates when open. In addition to these flow control measures, remedial works to the weir in 2017 were completed to reinforce the weir with the aim of extending its lifespan by a century. These works included installing reinforcing steel piles along the upstream edge of the entire weir and also along the downstream toe of the fish pass to reduce erosion at the toe of the weir. Due to erosion at the crest and downstream toe of the weir, this sheet piling is now exposed presenting significant 'steps' as further likely barriers to migration.

9.8.56 Atlantic salmon return to their river of birth to spawn and may migrate upstream in Scottish rivers at any time of the year, although this migration peaks in two distinct seasons, spring (those returning upstream between January and June) and autumn (peaks during September and October). Spawning takes place in the late autumn or winter (October to February) in catchment headwaters. Modelling for the Proposed Development has shown that under all Q flow scenarios, apart from Q10, flows in the River Ness will decrease with the Proposed Development (**Table 9-12 Seasonal and annual modelled River Ness flows (m^3/s) with and without the Proposed Development (GE)**). Conversely, Q10 flows were shown to increase under all scenarios. In relation to salmon migration, a reduction in flow during the key migratory timings (spring and autumn) is likely to have an impact on fish passability, be it through a reduction in flows through the fish pass, and/or increase the attraction flow to the lift gates.

Table 9-12: Seasonal and annual modelled River Ness flows (m^3/s) with and without the Proposed Development (GE)

Key Parameters	Baseline Annual	GE Annual	Baseline Winter	GE Winter	Baseline Spring	GE Spring	Baseline Summer	GE Summer	Baseline Autumn	GE Autumn
Q95	30	24.5	50	33	34	26.5	25	22	28	26
Q90	35	29	58	39	37	30.5	30	24	36.5	31
Q50	76	74	125	123	67.5	60	45	37	89	75
Q10	174	204	257	276	135	160	89	105	173	208

9.8.57 It is clear that under the current configuration, the weir and existing fish pass are not conducive to successful migration of Atlantic salmon upstream. Therefore, fluctuating water levels in Loch Ness have the potential to impact upon fish passage through Dochfour Weir using the associated fish pass, and therefore impact on the migratory success of fish species in the loch and River Ness, including Atlantic salmon, brown/sea trout, European eel, and lamprey species. This is not considered likely to impact Arctic charr, which are a deep-water species. In the absence of mitigation, the impact of the Proposed Development (and including cumulative impacts of other existing, consented, and proposed schemes) on Atlantic salmon (International importance) in Loch Ness, is assessed as Medium magnitude and represents a **permanent Major adverse effect**, in the absence of mitigation.

9.8.58 The effects on other migratory fish in Loch Ness, brown/sea trout, European eel, and lamprey species (Regional importance) is also assessed as Medium magnitude and represents a **permanent Minor adverse effect**.

9.8.59 Downstream movements of smolts could also be impeded by a reduction of flow. Salmon smolts migrate to the sea in late spring or June having spent two to three years in rivers. The downstream migration is largely passive, with smolts drifting downstream with the current. To aid this migration, a smolt pass and bypass has been installed in Dochfour Weir and between the Caledonian Canal and the River Ness respectively. As with the fish pass, there are concerns about the efficiency and the general design of these smolt passes as it is known that a proportion of smolts are carried into the canal and fail to complete their migration to the sea. Given the potential reduction in flows to the River Ness under all Q flow scenarios, apart from under Q10, there is a risk that smolt passage through the passes will be reduced with a greater proportion seeking the higher flows through the lift gates or

down the Caledonian Canal. Both routes could result in injury, loss of fitness and potential mortality to salmon smolts. In the absence of mitigation, the impact of fluctuations of flow on the International value salmon smolts in Loch Ness is assessed as Medium magnitude and represents a **permanent Major adverse effect**, in the absence of mitigation.

9.8.60 It is considered that the intake of the Proposed Development will not pose a significant impact to the downstream migration of smolts as it has been designed to best practice (i.e. 12.5 mm aperture screen and intake and outflow velocities of ≤0.3 m/s). However, it is not currently clear what route is taken by migrating smolts through Loch Ness, which the proposed smolt tracking study aims to establish with greater certainty. As smolt migration is largely passive, with smolts drifting downstream with the current, there is a risk that the operation of the LCW may disrupt their migration. Therefore, in the absence of mitigation, this is assessed as Medium magnitude and represents a **permanent Major adverse effect**, in the absence of mitigation.

Macroinvertebrates and Macrophytes – Marginal Habitats

9.8.61 Loch Ness levels fluctuate, owing in part to the existing SSE pumped storage hydro scheme operating at Foyers which includes a HoF at 15.33 m AOD where pumping is required to be curtailed, and also due to natural climatic variations. Modelling for the Proposed Development has shown that these fluctuations would become more frequent with more rapid drawdown. However, the more frequent fluctuations would result in marginal habitat being wetter for longer. Given that research has shown that lochs subject to PSH schemes (with headponds showing much greater fluctuations in level than tailponds) have impoverished marginal macrophyte and macroinvertebrate assemblages[48], additional marginal wetting as a result of increased fluctuations may provide a benefit to marginal aquatic ecological communities – especially as the magnitude of fluctuations in a water body the size of Loch Ness are predicted to be minor. The Proposed Development will operate between a lowest water level for abstraction of 15.38 m AOD, to an upper level of 17.35 m AOD, without mitigation. This is compared to a baseline maximum water level of 17.53 m AOD.

9.8.62 Macroinvertebrate surveys of Loch Ness have identified a species assemblage typical of large standing water bodies of this type. Species, as identified in the baseline section, are characteristic of standing water and marginal habitats prevalent in Loch Ness – largely vegetation-free with an often-rapid drop-off into deeper water. While there are some better-vegetated areas, such as Urquhart Bay, these are relatively scarce in the context of the size of Loch Ness. Species of note for the assessment, for which relevant information has been sourced through literature review, are described in further detail below:

- The diving beetle *Nebrioporus depressus*, identified in both Loch nam Breac Dearga and Loch Ness, can be found particularly in southern Scotland. Habitat is typically vegetation-free deep water in larger lakes (including Loch Ness), but also northern Scottish rivers, living on fixed substrata with little vegetation, often in comparatively deep (>0.5 m) water. The association of *N. depressus* with vegetation-free areas of base-poor lakes indicates that it must be at risk of eutrophication, with the consequent growth of marginal vegetation and the formation of algal blooms[49]. Due to the preference of this species for vegetation-free deeper water, it is considered that changes in level fluctuations would not result in an adverse effect upon its lifecycle as it is mobile and would seek out deeper water.
- The very common cinnamon sedge caddisfly *Limnephilus marmoratus* has been documented to oviposit on the damp marginal substrate underneath logs and other debris when inhabiting temporary water bodies, counting upon flooding after late Summer to submerge the eggs for hatching[50]. This is a reproductive strategy that relies upon water fluctuations to successfully complete and such evidence demonstrates that the *L. marmoratus* population on Loch Ness has the potential to benefit from water fluctuations occurring in the late Summer oviposition season, and it is considered to adapt to changing fluctuation regimes. The rate of drawdown is not stated as a limiting factor to the lifecycle of this species, and therefore the potential for rapid drawdown (followed by rapid rebound in level as described above), is not considered an adverse impact to this species. The Limnephilidae Red Data Book describes *L. marmoratus* as a widespread and common species of still waters of all types, usually ones that dry up to a central wet area[51],and therefore it is resilient to significant fluctuations in water level.

[48] Smith, B.D., Maitland, P.S., and Pennock, S.M. 1986. A comparative study of water level regimes and littoral benthic communities in Scottish lochs. *Biological Conservation* **39** pp. 291-316.
[49] Foster, G.N. 2010. A review of the scarce and threatened Coleoptera of Great Britain Part (3): Water beetles of Great Britain. Species Status 1. Joint Nature Conservation Committee, Peterborough.
[50] Clifford C, Friend K, Skipp S, Wallace I, Price BW (2023) The genome sequence of the cinnamon sedge caddisfly, *Limnephilus marmoratus* (Curtis, 1834). Wellcome Open Res. Feb 8;8:64. doi: 10.12688/wellcomeopenres.18753.1.
[51] WALLACE, I.D. 2016. A review of the status of the caddis flies (Trichoptera) of Great Britain - Species Status No.27. Natural England Commissioned Reports, Number191

9.8.63 Macrophyte assemblage in Loch Ness is limited to discrete locations such as Urquhart Bay where conditions allow plants to become established. Elsewhere, regular fluctuations in level and constant wave action, combined with large substrate sizes and a lack of organic material, mean that macrophytes cannot become established. Details of macrophyte species present, identified from literature review, are as follows:

- Urquhart Bay is a small delta located on the north western shore of Loch Ness and is inhabited by sparse emergent vascular plants. Predicting the effect of hydropower operations on these and other macrophytes may be challenging due to varying data in the literature. There is evidence to suggest that water fluctuations can exert negative effects on macrophyte growth rates (Deegan et al., 2007) and species richness (Riis and Hawes, 2002; Van Geest et al., 2005) due to the stresses of exposure, such as risk of dehydration or greater gravitational strain due to loss of buoyancy. However, there is also evidence that growth rate of some species is maximized at amplitudes of water fluctuation, as an adaptation to the fluctuations that occur naturally in many littoral habitats (Wagner & Falter, 2002; Lenssen & De Kroon, 2005; Deegan et al., 2007; Peintinger et al., 2007; Xin et al., 2022). There is also the beneficial effect of sediment aeration on plant growth that may be permitted by temporary exposures of lake substrate[52,53,54,55,56,57,58,59,60,61]. Given that levels will fluctuate more regularly and will not remain low due to the proposed control of loch levels, it is considered that potential benefits would outweigh the negatives of exposure at low water levels, which will be less likely to occur through the operation of the Proposed Development.
- There is evidence to suggest that the effect of water level fluctuation upon marginal macrophytes conforms to the Intermediate Disturbance Hypothesis (Wilkinson, 1999) which suggests that species richness is maximised at levels of moderate disturbance as this simultaneously inhibits takeover of competitive but less resilient species or of resilient disturbance-tolerant species. This is demonstrated by studies suggesting that moderate levels of water fluctuation promote biodiversity of marginal habitats, possibly by intermittently removing less resilient species during large flood or drawdown events but also permitting those species opportunity to re-establish (Keddy and Reznicek, 1986, Wilcox and Meeker, 1991). This evidence is also supplemented by instances of low biodiversity observed on lakeshores with highly stable water levels[62,63,64,65].
- Further evidence that water fluctuations can promote emergent macrophyte biodiversity, finding a positive correlation between fluctuation intensity and emergent richness -0.4m to +0.2m relative to the waterline, is provided by Grabas et al[66].

9.8.64 Wilkinson (1999) states that there is no consistent or universally accepted definition of what qualifies as a "moderate" disturbance.' However, moderate disturbance generally refers to a level that is not so intense that it destroys most or all life in the community. In the case of forecast changes in levels of disturbance as a result of operation of the Proposed Development, it is considered that the species shown to be present are resilient to

[52] Baastrup-Spohr L, Møller CL, Sand-Jensen K (2016) Water-level fluctuations affect sediment properties, carbon flux and growth of the isoetid *Littorella uniflora* in oligotrophic lakes. *Freshwater Biology*. 61(3):301-315
[53] Deegan BM, White SD, Ganf GG (2007) The influence of water level fluctuations on the growth of four emergent macrophyte species. *Aquatic Botany*. 86(4):309-315
[54] Lenssen JPM, De Kroon H (2005) Abiotic constraints at the upper boundaries of two Rumex species on a freshwater flooding gradient. *Journal of Ecology*. 93:138-147
[55] Moravcová L, Zákravský P, Hroudová Z (2001) Germination and seedling establishment inAlisma gramineum, A. plantago-aquatica andA. lanceolatum under different environmental conditions. *Folia Geobotanica*. 36:131-146
[56] Odland A (2002) Patterns in the secondary succession of a Carex vesicaria L. wetland following a permanent drawdown. *Aquatic Botany*. 74(3):233-244
[57] Peintinger M, Prati D, Winkler E (2007) Water level fluctuations and dynamics of amphibious plants at Lake Constance: Long-term study and simulation. *Perspectives in Plant Ecology, Evolution and Systematics*. 8(4):179-196
[58] Riis T, Hawes I (2002) Relationships between water level fluctuations and vegetation diversity in shallow water of New Zealand lakes. *Aquatic Botany*. 74(2):133-148
[59] Van Geest GJ, Wolters H, Roozen FCJM, Coops H, Roijackers RMM, Buijse AD, Scheffer M (2005) Water-level fluctuations affect macrophyte richness in floodplain lakes. *Hydrobiologica*. 539:239-248
[60] Wagner T, Falter CM (2002) Response of an aquatic macrophyte community to fluctuating water levels in an oligotrophic lake. *Lake and Reservoir Management*. 18(1):52-68
[61] Xin K-J, Cao Y, Xie Q-Z, Liang R-H, Huang H-X, Chen Y-T, Qi J-J (2022) Effects of water level changes on the morphological and physiology of the submerged macrophyte *Vallisneria natans*. *Journal of Freshwater Ecology*. 37(1):405-424
[62] Hill NM, Keddy PA (1992) Prediction of rarities from habitat variables. Coastal plain plants of Nova Scotian lakeshores. *Ecology*. 73:1852–1859
[63] Wilkinson DM (1999) The Disturbing History of Intermediate Disturbance. *Oikos*. 84(1):145–7
[64] Keddy PA, Reznicek AA (1986) Great lakes vegetation dynamics: the role of fluctuating water levels and buried seeds. *Great Lakes Res*. 12:26–36
[65] Wilcox DA, Meeker JE (1991) Disturbance effects on aquatic vegetation in regulated and unregulated lakes in northern Minnesota. *Can. J. Bot*. 69:1542–1551
[66] Grabas GP, Fiorno GE, Reinert A (2019) Vegetation species richness is associated with daily water-level fluctuations in Lake Ontario coastal wetlands. J Great Lakes Res. 45(4):805-810.

increased rate and frequency of drawdown, and therefore this qualifies as a 'moderate' level of disturbance that the community will adapt to and may also provide a benefit to resident species.

9.8.65 On a precautionary basis and considering the general uniformity of aquatic habitats and the species identified in the margins of Loch Ness, this 'moderate level of disturbance' (as defined above) is assessed as a Low magnitude impact on aquatic macrophytes, macroinvertebrates, and other fish species in Loch Ness, and the impact of fluctuating water levels is considered to result in a **Negligible effect**.

Water Quality

9.8.66 Water quality impacts on Loch Ness as a result of the operation of the Proposed Development have been discussed in the **Chapter 10: Water Environment** including stratification leading to changes in water quality and algal blooms. Impacts to water quality in Loch Ness are assessed as a negligible adverse impact, representing a minor adverse effect. The impacts on thermal stratification in Loch Ness are assessed as a low adverse impact, representing a moderate adverse effect.

9.8.67 Operation of the Proposed Development will be limited to the existing HoF limits and given the very large volume of Loch Ness, exposure to wind induced mixing, and the thermocline being present between 30 – 70 m deep, this is not considered to be significant in terms of aquatic ecology and is therefore assessed as a Negligible impact. Any adverse effects to thermal stratification would be physical only and are considered unlikely to affect biological productivity of the loch or corresponding prey resources.

9.8.68 The impacts of operation of the Proposed Development on water quality are therefore considered to result in:

- a **Negligible effect** on the fish assemblage of International/Regional importance within Loch Ness (Atlantic salmon, brown/sea trout, Arctic charr, European eel, and lamprey species); and
- a **Negligible effect** on aquatic macroinvertebrates, macrophytes and other fish species of Local importance.

B. Impacts of the LCW on Loch Ness Shoreline, Including Screen During Operation

9.8.69 The LCW will occupy a relatively small area of the Loch Ness shoreline and during operation it is anticipated that it will operate relatively maintenance-free, with the exception of regular checks and screen cleaning. The lower part of the intake-outlet structure will be backfilled with natural materials. Therefore, the effects of the permanent loss of Loch Ness shoreline habitat due to this structure during operation are considered Negligible and represent a **Minor adverse effect**.

9.8.70 Fish species in Loch Ness (Atlantic salmon (International value); brown/sea trout, Arctic charr, European eel, and lamprey species (Regional value)) will continue to utilise the loch, including as a migratory pathway, and may therefore pass the LCW. Screening requirements will be finalised through discussion with SEPA for the CAR Licence to prevent the entrapment and/or impingement of fish. Best-practice screening is being adhered to whereby a smolt screen with a maximum 12.5 mm aperture and a maximum inflow velocity of ≤0.30 m/s (at the screen frontage) will be installed. To achieve this the proposed screen will be 220 m wide and approximately 14 m deep below the normal water level. To achieve this, the smolt screen is decoupled from the main structure and sits approximately 53 m from the end of the intake-outtake structures.

9.8.71 Based on the available literature, the swimming speeds of selected species are outlined below:

- The maximum sustained swimming speed of adult salmon has been shown to be 0.91 m/s (0.45 m body length) and 0.54 m/s (0.15 m body length) (Tang and Wardle, 1992), with burst swimming speeds much higher than this.
- The sustained / burst swimming speed of European eel has been shown to be 0.09 m/s (sustained) / 1.01 m/s (burst) (0.10 m body length) and 0.58 m/s / 1.26 m/s (0.70 m body length) (Sheridan et al, 2011).
- The swimming speed of lamprey ammocoetes (juvenile lamprey) is no more than 0.45 m/s, and more usually between 0.10 and 0.30 m/s (Maitland, 2003). These swimming speeds seem to apply when the lamprey are disturbed or are seeking out food resources, and most larval movement results from passive downstream migration. Lamprey tend to commute along the bed of the water body, for example in silt beds in the margins (Maitland, 2003) and would therefore be some distance from the screen under normal circumstances.

9.8.72 Lamprey ammocoetes will be among the weaker swimming fish species in Loch Ness, and therefore the majority of fish in the loch will swim sufficiently fast to avoid impingement at the inlet screen. Sustained and burst swimming speeds of salmon and European eel certainly indicate that they will be able to escape the inlet screen.

9.8.73 Given the sporadic operation of the inlet and the evidence that even the weaker swimming fish species swim sufficiently fast to escape the inlet velocity, together with the very small size of the inlet structure in the context of the size of Loch Ness, the potential impact of the LCW on the fish assemblage in Loch Ness is as follows:

- For Atlantic salmon (International importance) this is assessed as of Negligible magnitude and represents a **Minor adverse effect.**
- For the fish assemblage of Regional importance in Loch Ness this is assessed as of Negligible magnitude and represents a **Negligible adverse effect**.

9.8.74 The LCW may present a rheotactic (the tendency of fish to face into an oncoming current) distraction by attracting migratory fish such as salmon (adult and smolt) from their migration path[67]. One risk of such distractions is fish entering the LCW and becoming entrained within the LCW. This will not be the case for the Proposed Development, as the intake will be impassable to such migratory fish due to the proposed smolt screen (being designed according to best practice guidance). Therefore, the impacts of the LCW on fish in Loch Ness are assessed as follows:

- Entrainment/impingement and distraction impacts by the LCW on migratory Atlantic salmon of International importance in Loch Ness is considered Negligible and constitutes a **Minor adverse effect**.
- Fish species of regional importance in Loch Ness are, as above, considered able to escape the inlet velocity and therefore avoid entrainment and impingement effects. Therefore, the impact of the LCW on other fish species of regional importance is assessed as a **Negligible adverse effect**.
- Other fish species in Loch Ness of local importance are likewise considered able to escape the intake screen, and this is therefore considered a **Negligible adverse effect.**

9.8.75 As part of the LCW, the proposed smolt screen will be situated approximately 53 m from the end of the intake-outtake structures to ensure appropriate inlet velocities are achieved. There is a lack of understanding on the full spatial extent of the potential hydrological change caused by the energy generation cycle (outflow). As with inflows, changes in outflows can cause distraction to migratory fish such as salmon smolts from their migration path (O'Keeffe & Turnpenny, 2005). This distraction can delay smolt movements within Loch Ness leading to a risk of loss in condition/fitness, injury, or mortality from increased predation risk or being lost to the system. Not only could that have an impact to the fish assemblage of International/Regional importance within Loch Ness, but it may also impact the site integrity on the following International value designated sites:

- Moray Firth SAC (*direct impact pathway*) – the designated feature Bottlenose dolphin rely on the salmon smolts as a food source. This is described in more depth in section **Indirect Effects to Marine Mammals through Impacts to Prey Species**;
- River Moriston SAC (*direct impact pathway*) – Atlantic salmon are a designated feature and a loss to the population may impact the integrity of this species and therefore the site; and
- River Moriston SAC (*indirect impact pathway*) – FWPM are a designated feature which rely on Atlantic salmon to complete their life cycle. Therefore, a loss to their population of salmon may impact the integrity of this designated feature.

9.8.76 In the absence of detailed information of the migratory routes taken by salmon smolts through Loch Ness, to be established through the ongoing smolt tracking study, the effect of distraction by the inlet / outlet on International value Atlantic salmon in Loch Ness, and by extension the potential impact on the International value designated sites (Moray Firth SAC and River Moriston SAC) is considered High Magnitude and constitutes a **Major adverse effect**, in the absence of mitigation.

9.8.77 Macrophytes and macroinvertebrates in Loch Ness will not be subject to any adverse effects through the operation of the inlet / outlet. A small number of macroinvertebrates may be drawn into the inlet, but in the context of their populations in Loch Ness as a whole, this is considered to constitute a **Negligible effect**.

9.8.78 INNS are known to be present within Loch Ness, including *Elodea* sp. (Nuttall's waterweed and/or Canadian pondweed) and the American flatworm *Phagocata woodworthi*. Fragments of *Elodea* sp. and individual *P.*

[67] Turnpenny A.W.H. & O'Keeffe N. (2005) Screening for Intake and Outfalls: A Best Practice Guide. Environment Agency report, Science Report SC030231.

woodworthi may be drawn into the inlet and such INNS may become established in the Headpond, resulting in on-going maintenance requirements to prevent clogging of infrastructure (in the case of *Elodea* sp).

9.8.79 The effects of the transfer of INNS through construction activities have been assessed above, and these may result in INNS becoming permanently established in the Headpond. The effects of the transfer of INNS to those receptors from the Headpond would be comparable with the effects assessed above, and therefore the impact assessment will not be repeated here.

C. Impacts of watercourse crossings for Permanent Access Tracks

9.8.80 Several watercourses may be crossed by Permanent Access Tracks, or existing access tracks upgraded to accommodate construction traffic. There are existing forestry access tracks on the Proposed Development Site, however, some other watercourse crossings may need to be improved and/or widened, including the upgrade of culverts and/or bridge crossings. Culverting of watercourses, where required, will follow SEPA best practice guidance (i.e. new culverts being box culverts, upgraded pipe culverts to have the invert set below the watercourse bed and single span bridges), but this may result in a permanent impact on watercourse conditions in those locations. This is considered a Low magnitude permanent effect, and is assessed as follows for the watercourses crossed and species present:

- For watercourses of Regional importance, Allt Saigh (bridge upgrade), Allt Loch an t-Sionnaich (bridge upgrade), River Coiltie (new bottomless culvert), and Trib of Allt Loch an t-Sionnaich 1 & 2 (pipe culvert upgrade), a low magnitude impact that represents a **Negligible effect**.
- For all other watercourses (Local importance), a **Negligible effect**.
- Atlantic salmon (International value) in Allt Saigh, River Coiltie, and the River Enrick may be impacted by the upgrade of existing watercourse crossings, or the installation of new crossings, for example by presenting barriers to fish migration, or direct impacts to spawning habitat. This is assessed as a **Minor adverse effect** in the case of salmon.
- Brown trout (Local value) in watercourses, namely Allt Saigh and River Enrick, Allt Loch an t-Sionnaich, River Coiltie, Trib of Allt Loch an t-Sionnaich 1 & 2 and Allt Coire an Ruighe: a **Negligible effect** on brown trout.
- Effects on aquatic macrophytes, macroinvertebrates and other fish (Low value) through new or upgraded watercourse crossings are considered to be Low, resulting in a **Negligible effect**.

E. Impacts of Construction Compounds, Including Permanent Land-Take

9.8.81 Where Construction Compounds will be constructed to facilitate the Proposed Development, these have been designed to avoid watercourses and water bodies, and therefore there will be no adverse effects to these features. In keeping with SEPA guidance, a 50 m buffer zone has been applied to all water features where possible. Temporary and Permanent Construction Compounds TC1, TC02, TC03, TC05, TC06 and PC07 present a greater risk of chemical pollution as they are where fuel and other chemicals may be stored. However, all compounds are at least 50 m from a water feature. Potential effects to water quality due to Construction Compounds are assessed in the construction effects section, and also in **Chapter 10: Water Environment**.

F. Impacts of the Headpond and Embankments, including Land Take and Drainage

9.8.82 The loss of Loch nam Breac Dearga through construction of the Headpond and Embankments is assessed in the construction effects section, and also in **Chapter 10: Water Environment**.

9.8.83 The duration and frequency of operation of the Headpond will reflect energy generation needs at a particular time and has been modelled for the Proposed Development (refer to **Chapter 2 Project and Site Description** and **Chapter 11 Flood Risk and Water Resources**). During discharge, the aquatic ecological features present within the Headpond will likely be impinged or entrained into the wet tunnel infrastructure resulting in mortality. Therefore, the potential impact to aquatic receptors is assessed as a High magnitude resulting in a **Minor adverse effect** in the case of brown trout (local importance in Loch nam Breac Dearga), and a **Minor adverse effect** on aquatic macroinvertebrates and macrophytes (local importance).

G. Permanent Site Drainage, Including SuDs, Settlement Ponds, Temporary Ditches, and Other Drainage Features

9.8.84 During the Operational phase, drainage from the Proposed Development Site will constitute clean surface water runoff, which will be comparable with current drainage conditions. **Chapter 10: Water Environment** assesses

the effects of site drainage and hydrology. It is anticipated that the design of site drainage will facilitate the maintenance of water supply to the existing water bodies and watercourses on the Proposed Development Site.

H. Indirect Impacts to Marine Mammals through Impacts to Prey Species

9.8.85 Impacts to Atlantic salmon within Loch Ness may reduce the availability of smolts within the Moray Firth to serve as prey for marine mammals such as bottlenose dolphin and harbour seal. Atlantic salmon is a key prey item for both species and a peak in abundance of bottlenose dolphin within the Moray Firth in summer months is thought to align with the migration of salmon smolt out to sea.

9.8.86 However, Atlantic salmon migrate to the Moray Firth from a number of local catchments. In addition to the River Ness, the River Beauly, and the River Nairn have been identified as Scottish Salmon Rivers within the Inner Firth. In the wider Moray Firth, 18 total salmon rivers have been identified. Within the firth, salmon abundance has been declining since the mid-1980s. More recently, the Moray Firth Tracking Project by the Atlantic Salmon Trust has reported that about half of juvenile salmon do not survive their downstream migration out to sea in the region. Furthermore, an assessment of salmon migration associated with Loch Ness reported that only approximately 20% of salmon smolts survived out to sea in 2020 and 2021.[68]

9.8.87 When considering the significant number of important salmon rivers which outlet into the Moray Firth, it is unlikely that impacts to salmon from the Proposed Development will affect marine mammals within the Moray Firth. Additionally, salmon have been declining in the region for decades and this has not been correlated with any local declines in bottlenose dolphin or harbour seal abundance, populations of which are considered stable. Furthermore, both species are known to have a reasonably varied diet, with bottlenose dolphin also observed feeding on mackerel, flatfish, cod, saithe, whiting, haddock, and cephalopod and harbour seal preying upon flatfish, gadoids, and sand eel.[69] In the Moray Firth specifically, the harbour seal diet is seemingly dominated by sand eel.[69]

9.8.88 Therefore, as the number of salmon migrating into the Moray Firth from the River Ness is already low and both bottlenose dolphin and harbour seal exhibit stable local populations which feed on a variety of prey items, indirect effects to marine mammals through impacts to prey species is considered of low magnitude and a **Minor adverse effect** in the absence of mitigation.

I. Spread of INNS through the Proposed Development Site as a Result of Operation

9.8.89 There is the potential for INNS to be spread or introduced during the operation of the Proposed Development, for example through movement of vehicles and personnel, maintenance activities, and through the regular pumping of water from Loch Ness to the Headpond. The latter could be exacerbated by the utilisation of the Headpond by wildlife and the transfer of INNS to nearby water bodies.

9.8.90 The effects of the introduction of INNS on different receptors during operation are consistent with construction effects assessed above; refer to **9.8.5 G. Potential spread or introduction of INNS**, and are therefore not repeated here.

9.9 Mitigation and Monitoring

Additional Mitigation

Introduction

9.9.1 A suite of additional mitigation measures is proposed to mitigate the potential adverse effects of the Proposed Development on Atlantic salmon (International importance), and other migratory fish species. As described above, hydrological and hydraulic changes in Loch Ness as a result of the operation of the Proposed Development may present challenges for the migration of salmon and other migratory fish species, although such migration is shown to be hindered under baseline conditions by Dochfour Weir, the associated fish passes, and existing lift gates.

9.9.2 Modelling has been undertaken to determine the cumulative effects of the Proposed Development and other existing, consented, and proposed schemes. This modelling is being used to design mitigation appropriately to mitigate significant effects and aims to improve the baseline scenario of fish passage for Atlantic salmon, sea trout, European eel, and lamprey species.

[68] Ness District Salmon Fishery Board, personal communication.
[69] Sea Mammal Research Unit (2015) CSD 3.2 Report: Harbour seal diet composition and diversity. Report to Scottish Government, Marine Mammal Scientific Support Research Programme.

9.9.3 There have been few studies on the migration of salmon smolts through large bodies of still water such as Loch Ness. Generally, smolts move more slowly through lentic water with lower survival rates in these habitats, partly due to predation. Migration through lentic water is in relatively random directions, with daylight affecting movements differently seasonally, and wind direction playing an important role in the direction of smolt movement – the south-westerly prevailing wind in Loch Ness is generally favourable in facilitating their downstream migration toward Dochfour Weir.

9.9.4 The final design of additional mitigation will be evaluated using the results of the on-going salmon smolt tracking study of spring/summer 2025, which will provide further information of the timing and routes of smolt migration through Loch Ness and Loch Dochfour, the success of smolt migration over Dochfour Weir and in the River Ness downstream, and the diversion of smolts down the Caledonian Canal. The results of previous smolt tracking studies undertaken by NDSFB and the Atlantic Salmon Trust will also feed into the data available to inform the mitigation design.

9.9.5 The design of the smolt tracking study has allowed for the gathering of data on the direction, speed, and depth of smolt migration, and on the routes taken by smolts through Loch Ness. This will be critical to inform the detailed design of the mitigation described below.

9.9.6 A suite of additional mitigation options is provided, and it is likely that a combination of these will be implemented to mitigate the potential significant effects of the Proposed Development, including cumulative effects with other schemes. The final design of this suite of mitigation requires further investigation, informed in part by the smolt tracking study, but is set out in the following hierarchy:

- Additional mitigation during Construction – required to prevent significant effects during Construction;
- Fisheries Management Plan;
- Mitigation for impacts during Operation with respect to risk of smolt distraction at the LCW:
  - Curtailment of the operation of the Proposed Development;
  - Installation of additional screening and/or non-physical deterrents;
- Mitigation for impacts at Dochfour Weir:
  - Installation of improved fish pass(es);
  - Installation of a non-physical deterrent at the entrance of the Caledonian Canal; and
  - Dochfour Weir Upgrades.

Impacts During Construction

9.9.7 Construction of the cofferdam and LCW has the potential to impact upon the migratory success of salmon smolts passing in the vicinity of the LCW. Therefore, the following mitigation measures are proposed:

- Avoidance of key stages of the Atlantic salmon smolt (downstream) migration season between April and June, for example if it is shown that smolts are migrating in the vicinity of the LCW and it is considered by the ECoW that there is a risk of disturbance to smolts during Construction. Otherwise, it is considered that the proposed mitigation below will be sufficient to deter adult salmon from the LCW during their upstream migration, and smolts during their downstream migration, and therefore mitigate adverse effects;
- To minimise the effects of noise from piling on fish, there will be a ‘soft start’ to piling works to deter fish from the immediate area where physical injury may occur. Mason and Collett (2011)[70] suggest a soft start to piling using a blow energy of 150 kJ and show that using a soft start will have a lower impact on the salmon initially. Alternatively, vibro-driven piles will be used to minimise the effects of underwater noise and vibration on fish, including Atlantic salmon;
- Blasting in the vicinity of Loch Ness (details of which to be finalised when details of the construction program are available) should avoid the smolt migration season of April to June inclusive; and
- The installation of a silt curtain/bubble screen to deter fish from the works area, positioned a minimum 30 m distance from the location of piling, the distance at which physical injury to salmon from piling noise would be avoided. Although the effects of piling noise vary with size of piles and blow energy, under the most likely scenario (1.8 m piles and a blow energy of 300 kJ), auditory injury to salmon is calculated to occur out to approximately 20 m from the noise source, a strong avoidance reaction is calculated to occur

[70] Mason, T. & Collett, A., 2011. MEP Impacts of Underwater Piling Noise on Migratory Fish, s.l.: Subacoustech Environmental Ltd.

out to 330 m and a significant avoidance behaviour reaction is calculated to occur out to 2.1 km (Mason and Collett, 2011).

9.9.8 Watercourse crossings for Temporary and Permanent Access Tracks and culverting of watercourses has the potential to impact upon resident fish in these watercourses, including Atlantic salmon and brown trout. As such, additional mitigation will be implemented as follows:

- Installation of watercourse crossings outside the migration and spawning seasons of brown/sea trout and Atlantic salmon, where these species are present; and
- Avoid suitable spawning habitat, if present (to be identified through Pre-Construction checks). If suitable spawning habitat is not present, the avoidance of spawning season will not be required

Fisheries Management Plan

9.9.9 It is proposed that a Fisheries Management Plan (FMP) is implemented in consultation and agreement with stakeholders and regulators, to ensure that any mitigation meets the requirements of all stakeholders. The Fisheries Management Plan will be instigated in partnership with NDSFB, SEPA, Nature Scot, other stakeholders, and other operators/developers of PSH schemes in Loch Ness, in order to finalise the mitigation measures to be implemented and agree measures to ensure their success in the long term. The aim of the FMP will be to improve the migratory success of Atlantic salmon and other migratory species in the Ness catchment.

Impacts During Operation with Respect to Smolt Distraction

9.9.10 Distraction of migratory species at the LCW, and entrainment/impingement of fish at the intake screen, may result from the Operation of the Proposed Development. Mitigation to be implemented during Operation of the Proposed Development is dependent upon the outcomes of the smolt tracking study, which will allow the proposed mitigation to be confirmed at the detailed design stage. It should be noted that it is possible the smolt tracking study will allow it to be concluded that given the inclusion of the smolt screen as embedded mitigation at the LCW, no further mitigation is required.

9.9.11 However, in the event that further mitigation is identified as being required as an outcome of the smolt tracking study, the following mitigation options are put forward, beginning with the option to curtail Operation of the Proposed Development during key parts of the smolt migration season. The timing of such curtailment would be agreed with stakeholders through the Fisheries Management Plan described below and would be informed by monitoring of smolt movements during each migration season. For example, Operation could be curtailed at night between April and June, or at observed peaks of the migration season, or when smolts are known to be present in the vicinity of the LCW.

9.9.12 Mitigation may also be possible, avoiding the need for curtailment, by the installation of additional screening or ‘non-physical deterrents.’ While such deterrents are implemented regularly in river systems, their effectiveness, and the specific combination and design of measures to be implemented in this case, require further investigation as best-practice measures evolve. However, a summary of the potential for such mitigation options is set out as follows:

- Installation of a non-physical deterrent (to be finalised at detailed design) to deflect fish away from the smolt screen during key migration seasons (downstream smolt migration April to June inclusively). A literature review has established that there is little evidence of the effectiveness of such deterrents in still waters; however, this will be explored further to inform the detailed design;
- There is limited literature on deterrents and the significance of their success, especially in large bodies of still water such as Loch Ness;
- Flexible fish fences are deemed the most efficient deterrent, with the efficiency of [strobe] light deterrents depending on environmental factors;
- Multi-modal stimuli are most effective at diverting brown trout (*Salmo trutta*), i.e., light, sound, physical deterrent (it is considered that this research would also apply to Atlantic salmon as a closely related species); and
- The non-physical deterrent ‘screen’ should be placed at an angle on the upstream (southwestern) end in Loch Ness to deflect fish away from the loch shore and around the permanent intake screen. It could be operated during the migration season, or as required and as agreed through the Fisheries Management Plan.

Impacts at Dochfour Weir

9.9.13 Effects on water levels at Dochfour Weir and on fish passage (upstream and downstream) of Atlantic salmon and other migratory fish species could be mitigated by improvements to fish passage at Dochfour Weir, including the Dochfour Weir Upgrade described in **Chapter 11 Flood Risk and Water Resources**. This mitigation includes the following options:

- A fish pass or fish passes will be designed and installed on Dochfour Weir to facilitate and improve the upstream and downstream passage of migratory fish compared to the current sub-optimal situation. The fish pass(es) will be designed according to current best practice guidance as part of the weir mitigation described below and will be confirmed through detailed design. It is considered that this presents an opportunity to improve fish passage in the catchment for all migratory species, for which there is currently concern about reductions in their numbers and recruitment in the catchment. This also has knock-on effects on the River Moriston SAC and the FWPM and salmon for which it is designated and will inform the HRA (**Appendix 7.2: Statement to Inform HRA (Volume 5: Appendices)**).
- Installation of a non-physical deterrent at the entrance of the Caledonian Canal adjacent to Dochfour Weir to prevent the diversion of smolts along the canal. The current culvert to direct smolts from the entrance of the canal to the River Ness is inadequate and ineffective, as is the smolt pass on the Dochfour Weir itself, and therefore in combination with the fish pass(es) described above, this will serve to enhance fish passage down the River Ness above the current baseline situation.
- An alternative scheme, referred to as Dochfour Weir Upgrades, is being considered in collaboration with Scottish Canals, and in anticipated partnership with the existing PSH operator and future operators, the Applicant for this Proposed Development, and Loch na Cathrach. Whilst the Dochfour Weir Upgrades do not form part of this application it would form part of the additional mitigation measures to the Proposed Development in isolation and with the cumulative assessment of other proposed developments. The scheme consists of the construction and operation of a variable weir that will adjust the height of the weir to manage flows within the River Ness to isolate the flows in the River Ness from the impact of the PSH activities in Loch Ness. This will result in a more natural flow in the River Ness controlled by meteorological conditions rather than PSH activities. Additional details are included in **Appendix 2.1 Dochfour Weir Upgrade Description (Volume 5: Appendices)**. This will be a permanent installation that through automated control will maintain flows in the River Ness downstream at current levels.
- The variable weir will be designed according to the modelled cumulative water level changes of all existing, consented, and proposed pumped storage hydro schemes on Loch Ness, and also to mitigate flood risk during times of high water levels. Refer to **Chapter 11: Flood Risk and Water Resources** for further details.

General Construction Mitigation

Construction of the cofferdam on the shoreline of Loch Ness, including piling, de-watering, and substrate removal

9.9.14 A fish rescue will be required during de-watering of the cofferdam as it is highly likely that fish will congregate in these sheltered areas during Construction and then become trapped as the cofferdam is sealed. Detailed methodology will be provided for the CAR licence application.

Watercourse crossings for Temporary Access Tracks, including culverting of watercourses

9.9.15 In addition to the pre-commencement fish surveys described below, it is recommended that culverting of watercourses is supervised by the ECoW, and this is likely to form a condition of the CAR licence. The ECoW will ensure the correct installation and functioning of silt and pollution control measures.

9.9.16 Culverting of watercourses will require sections to be isolated and fish rescues carried out, according to the conditions of the CAR licence. This process will be informed by the fish surveys of watercourse crossing locations.

Construction of the Headpond and Headpond Embankments, including land take and transport of excavated material

9.9.17 The Pre-Construction fish surveys described below will inform the mitigation requirements for the loss of Loch nam Breac Dearga. This may involve the translocation of fish to a suitable nearby receptor site or sites (based on the size of the trout population likely present and the relatively small size of other water bodies locally) – there are numerous similar lochans locally. Due to the abundance of this type of habitat locally, it is considered that a replacement water body is not required.

9.9.18 Alternatively, the trout population in Loch nam Breac Dearga would be monitored during operation to determine whether it is a viable population in its own right in the long term.

Effects due to temporary site drainage, including settlement ponds, temporary ditches, and other drainage features

9.9.19 As described above, the installation of temporary site drainage will be supervised and monitored by the ECoW to ensure that it is effective in preventing the contamination of watercourses and water bodies.

Potential effects due to the spread of INNS through the Proposed Development Site

9.9.20 Material excavated or dredged from Loch Ness would ideally be retained in the immediate area, i.e., stockpiled on the loch shoreline, to prevent the spread of INNS, including *Elodea sp.*, which is known to be present in Loch Ness. If such contaminated material is to be transported away from the Site, consideration would need to be given to the appropriate disposal of waste contaminated with INNS according to statutory legislation.

9.9.21 The ECoW will supervise all excavation and dredging works in Loch Ness to check for the presence of INNS and ensure that appropriate biosecurity measures, as detailed in the CEMP, are implemented. (**Appendix 3.1 Outline CEMP (*Volume 5: Appendices*)**).

Further Surveys and Pre-Commencement Checks

9.9.22 It is recommended that the following pre-commencement surveys are completed to inform the proposed works:

- Surveys of all watercourses proposed to be crossed or culverted to inform mitigation for permanent and temporary watercourse crossings. The presence of resident Atlantic salmon and brown trout populations has been demonstrated within the catchment, and fish rescue and translocation may be required during Construction, for example prior to and during the draw-down and/or over-pumping of watercourses for the installation of watercourse crossings. It is recommended that all crossing points are resurveyed pre-construction.
- Walkover survey of watercourse crossing locations for INNS, both aquatic and riparian species (to be combined with pre-commencement surveys for terrestrial INNS.

Future Monitoring

9.9.23 Monitoring of aquatic habitats upon completion of the Proposed Development is recommended for the following aspects:

- Annual monitoring surveys for the presence of aquatic INNS, to be combined with surveys for terrestrial INNS, in watercourses within the Proposed Development Site and assessed as receptors in relation to INNS above. Due to the potential for INNS to be transferred to the Headpond, it is recommended that the Headpond and these receptors are monitored for INNS for a period of five years.
- Regular monitoring and maintenance of the inlet / outlet on the shore of Loch Ness should be carried out to ensure the integrity of the screen and assess any potential impacts in relation to fish, in particular migratory salmon, and other species due to the potential for distraction and entrapment / impingement.
- Where permanent culverts are installed in watercourse crossings, it is recommended that these are monitored to ensure that there are no lasting effects on fish passage, especially in the event that Atlantic salmon or brown trout or other protected / notable species are shown to be present in the pre-commencement fish surveys described above.
- Monitoring of the fish pass(es) installed on Dochfour Weir, and other mitigation installed such as non-physical deterrents, should be undertaken for their effectiveness in improving fish passage at the weir, compared to the baseline scenario described earlier in this report.

9.10 Residual Effects

9.10.1 For the purposes of this assessment, only effects deemed to be Regionally, Nationally or Internationally Significant (according to the CIEEM method for EcIA) are considered Significant in EIA terminology. On this basis, and accounting for the specified mitigation, **five residual effects** that have reduced from the initial impact assessment are predicted for aquatic ecological features.

9.10.2 Where residual effects are the same as those reported in the initial assessment of effects, they have not been repeated in this section but are presented in the summary of effects **Table 9-13: Summary of Effects:** Construction and **Table 9-14 Summary of Effects: Operation**.

Construction Residual Effects

Cofferdam Construction (Loch Ness)

9.10.3 Additional mitigation has been proposed to minimise the effects of noise from piling on fish, thereby reducing the residual effects to a level that is not significant. Considering the proposed additional mitigation, it is considered that the residual effect of cofferdam construction on Atlantic salmon will be as follows:

- Atlantic salmon (International importance): **Minor adverse, not significant**.

Loss of Aquatic Habitat due to Construction of the Headpond and Headpond Embankments

9.10.4 Loch nam Breac Dearga will be lost as a result of construction of the Headpond. Additional mitigation is proposed, whereby Pre-Construction surveys would inform the requirement to relocate brown trout from the loch during Construction to a suitable receptor site or sites locally. Alternatively, if this is not considered feasible. the trout population in Loch nam Breac Dearga would be monitored to establish if it remains viable during operation of the Proposed Development.

9.10.5 The residual effect as a result of construction of the Headpond for brown trout (Local importance) is as follows:

- Fish species (brown trout; Local value) – Negligible effect, **not significant**.

Operation Residual Effects

A. Impacts on water levels in Loch Ness

9.10.6 Due to regular generation cycles with water pumped up to the Headpond then returned to the loch, water levels in Loch Ness will fluctuate to a greater extent than in the baseline scenario, and with greater regularity. There will be resulting effects on Dochfour Weir and fish passage, due to fluctuating water levels.

9.10.7 Additional mitigation is proposed through the hydrological assessment (**Chapter 11: Flood Risk and Water Resources***),* the Dochfour Weir Upgrades, which will maintain flows in the River Ness downstream at current levels. In this way, and in combination with the other additional mitigation proposed including fish pass(es), it is considered that fish passage will be improved for Atlantic salmon and sea trout (downstream migrating smolts and upstream migrating adults) and migrating European eel and lamprey species.

9.10.8 Residual effects as a result of impacts to water levels in Loch Ness are as follows:

- Atlantic salmon (International importance) – **Minor beneficial effect**, which is **significant**.
- Brown/sea trout, European eel, and lamprey species (Regional importance) – **Minor beneficial effect**, which is **significant**.

B. LCW on Loch Ness Shoreline, Including Screen During Operation

9.10.9 Additional mitigation is proposed in the form of a non-physical deterrent to deter downstream migrating Atlantic salmon smolts from the screen at the LCW. Mitigation requirements will be evaluated by the results of the smolt tracking study, being undertaken in spring/summer 2025. As a final mitigation option, should there be insufficient certainty following the smolt tracking study, curtailment of the operation of the Proposed Development could be instigated during the smolt migration season (April to June inclusive).

9.10.10 The residual effects due to the operation of the LCW and associated screen on Loch Ness are as follows:

- Atlantic salmon smolts in Loch Ness (International importance) – **Minor beneficial effect**, which is **significant**.

H. Indirect Effects to Marine Mammals of the Moray Firth SAC through Impacts to Prey Species (smolts)

9.10.11 The proposed additional mitigation aims to improve fish passage at Dochfour Weir and reduce the loss of smolts down the Caledonian Canal, thereby increasing the number of smolts reaching the Moray Firth SAC. Therefore, the residual effects on the qualifying features of the SAC are as follows:

9.10.12 Moray Firth SAC (International importance) – bottlenose dolphin and harbour seal – **Minor beneficial effect**, which is **significant**.

Table 9-13: Summary of Effects: Construction (including Pre-Construction and Enabling, where indicated)

Description of Impact	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
Cofferdam Construction (Loch Ness)	Loch Ness habitat (International importance)	Temporary Minor	To minimise the effects of noise from piling on fish, there should be a 'soft start' to piling works to deter fish from the immediate area where physical injury may occur. Mason and Collett (2011) suggest a soft start to piling using a blow energy of 150 kJ and show that using a soft start will have a lower impact on the salmon initially. Alternatively, vibro-driven piles will be used to minimise the effects of underwater noise and vibration on fish, including Atlantic salmon. Blasting in the vicinity of Loch Ness to avoid the smolt migration season of April to June inclusive. Avoidance of salmon smolt (downstream) migration seasons (April to June inclusive) – it is considered that the proposed mitigation below will be sufficient to deter adult salmon from the LCW during their upstream migration and therefore mitigate adverse effects. The installation of a silt curtain/bubble screen to deter fish from the works area, positioned a minimum 30 m distance from the location of piling. A fish rescue will be required during de-watering of the cofferdam as it is highly likely that fish will congregate in these sheltered areas during Construction and then become trapped as the cofferdam is sealed. This process will form part of the CAR licence, and detailed methodology will be provided for the licence application.	Temporary Minor	Not significant
	Fish assemblage in Loch Ness: Atlantic salmon (International importance)	**Temporary Major adverse**		Minor	Not significant
	Brown/sea trout, Arctic charr, European eel, and lamprey species (Regional importance)	Temporary Minor			
	Macrophytes, macroinvertebrates, and other fish species in Loch Ness (Local importance)	Negligible	N/A	Negligible	Not significant
Watercourse crossings for Temporary Access Tracks and temporary site compounds, including diversion and culverting of watercourses. Includes Pre-Construction and Enabling activities associated with Construction of new Access Track from existing FLS track to Main Access Tunnel Portal; and Realignment of the Affric Kintail Core Path.	Flowing watercourses (Regional importance)	Minor	Pre-commencement fish surveys described above. Culverting of watercourses will require sections to be isolated and fish rescues carried out. This process will be informed by the fish surveys of watercourse crossing locations. Installation of watercourse crossings outside the migration and spawning seasons of brown/sea trout and Atlantic salmon, where these species are present. Avoid suitable spawning habitat, if present (to be identified through Pre-Construction checks). If suitable spawning habitat is not present, the avoidance of spawning season will not be required.	Minor	Not significant
	Flowing watercourses (Local importance)	Negligible		Negligible	
	Watercourses supporting Atlantic salmon (International importance)	Minor		Minor	Not significant
	Other watercourses (Local importance)	Minor		Minor	
	Aquatic macrophytes, macroinvertebrates and other fish species (Local importance)	Negligible		Negligible	
Loss of Aquatic Habitat due to Construction of the Headpond and Headpond Embankments	Loch nam Breac Dearga (Regional importance)	Minor	The Pre-Construction fish surveys will inform the mitigation requirements for the loss of Loch nam Breac Dearga. This may involve the translocation	Minor	Not significant

Description of Impact	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
	Brown trout in Loch nam Breac Dearga (Local importance)	Minor	of fish to a suitable nearby receptor site(s) – there are numerous similar lochans locally; alternatively, the trout population in Loch nam Breac Dearga could be monitored to establish if it is viable during operation of the Proposed Development.	Negligible	Not significant
	Receiving water bodies from the Headpond, Allt Loch an t-Sionnaich (SW5), Trib of Allt Loch an t-Sionnaich 1 & 2 (SW7) and Allt Saigh (SW3), (Regional importance)	Negligible		Negligible	Not significant
	Macrophytes, macroinvertebrates, and fish (Local importance)	Negligible		Negligible	Not significant
Impacts to Water Quality During Construction	Loch Ness habitat (International importance)	Minor	N/A	Minor	Not significant
	Fish community in Loch Ness: Atlantic salmon (International importance) Brown/sea trout, Arctic char, European eel, and lamprey species (Regional importance)	Temporary Minor		Temporary Minor	Not significant
	Other fish species in Loch Ness and other watercourses in this area of construction (Low value)	Temporary Negligible		Temporary Negligible	Not significant
	Atlantic salmon (International importance) and Brown trout (Local value) in watercourses, namely Allt Saigh and River Enrick, Allt Loch an t-Sionnaich, River Coiltie, Trib of Allt Loch an t-Sionnaich 1 & 2, and Allt Coire an Ruighe	Temporary Minor		Temporary Minor	Not significant
	Macrophytes, macroinvertebrates, and other fish species (Local importance)	Temporary Negligible	N/A	Temporary Negligible	Not significant

Description of Impact	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
Temporary site drainage, including SuDs, settlement ponds, temporary ditches, and other drainage features. **Includes Pre-Construction and Enabling activities associated with the River Coiltie area; and borrow pits.**	All	No Effects	Assessed in **Chapter 10: Water Environment**	No Effects	Not significant
Potential spread or introduction of INNS	Loch Ness habitat (International importance)	Negligible	Measures to be outlined in the Outline CEMP which includes an outline Biosecurity Management Plan **(Appendix 3.1 Outline CEMP, Volume 5: Appendices)**. Pre-Construction survey of the extent of the proposed cofferdam and temporary jetty works in Loch Ness for the presence of INNS, notably *Elodea* sp. (Nuttall's waterweed and/or Canadian pondweed). Walkover survey of watercourse crossing locations for INNS, both aquatic and riparian species.	Negligible	Not significant
	Regional importance water bodies: Allt Saigh, Allt Loch an t-Sionnaich, River Coiltie, River Enrick, Trib of Allt Loch an t-Sionnaich 1 & 2, and Allt Coire an Ruighe	Minor		Minor	Not significant
	Loch nam Breac Dearga (Regional importance)	No effect		No effect	
	All other watercourses (Low importance)	Negligible		Negligible	
	Fish assemblage in Loch Ness (Up to international value)	Minor		Minor	Not significant
	Atlantic salmon (International importance) and brown trout (Local importance) in watercourses, namely Allt Saigh and River Enrick, Allt Loch an t-Sionnaich, River Coiltie, Trib of Allt Loch an t-Sionnaich 1 & 2 and Allt Coire an Ruighe	Minor		Minor	Not significant
	Macrophytes, macroinvertebrates and other fish species (Local importance)	Negligible		Negligible	Not significant

Table 9-14: Summary of Effects: Operation

Description of Impact	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
Impacts on water levels and water quality in Loch Ness	Loch Ness habitat (International importance)	Negligible	Suite of mitigation options, the detailed design of which will be evaluated using the results of the smolt tracking study underway in spring/summer 2025: Avoidance of key stages of the salmon smolt (downstream) migration season (April to June inclusive), to be identified by the ECoW including through engagement with stakeholders. The installation of a silt curtain/bubble screen to deter fish from the works area. Installation of a non-physical deterrent (to be finalised at detailed design) to deflect fish away from the smolt screen during key migration seasons. A fish pass or fish passes will be designed and installed on Dochfour Weir. Installation of a non-physical deterrent at the entrance of the Caledonian Canal. Dochfour Weir Upgrades. Fisheries Management Plan. As a final mitigation option, curtailment of the operation of the Proposed Development could be instigated during the smolt migration season.	Negligible	Not significant
	Atlantic salmon (International importance)	**Major adverse**		**Minor beneficial**	**Significant**
	Brown/sea trout, European eel, and lamprey species (Regional importance)	Minor adverse			
	Aquatic macrophytes, macroinvertebrates, and other fish species in Loch Ness (Local importance)	Negligible		Negligible	Not significant
	Water quality: Fish assemblage in Loch Ness (International/Regional importance) Aquatic macrophytes, macroinvertebrates, and other fish species in Loch Ness (Local importance)	Negligible		Negligible	Not significant
LCW on Loch Ness Shoreline, Including Screen During Operation	Loch Ness habitat (International importance)	Minor	Installation of a non-physical deterrent (to be finalised at detailed design) to deflect fish away from the smolt screen during key migration seasons (downstream smolt migration April to June inclusive). Fisheries Management Plan. As a final mitigation option, curtailment of the operation of the Proposed Development could be instigated during the smolt migration season.	Minor	Not significant
	Atlantic salmon smolts (International importance)	**Major adverse**		**Minor beneficial**	**Significant**
	Adult Atlantic salmon (International importance)	Minor		Minor	Not significant
	Fish assemblage of Regional importance in Loch Ness	Negligible		Negligible	
	Other fish species, macrophytes, and macroinvertebrates in Loch Ness (Local importance)	Negligible		Negligible	Not significant

Description of Impact	Receptor	Effect	Additional Mitigation	Residual Effects	Significance
Impacts of watercourse crossings for Permanent Access Tracks	Regional importance watercourses: Allt Saigh, Allt Loch an t-Sionnaich, River Coiltie, River Enrick, Trib of Allt Loch an t-Sionnaich 1 & 2, and Allt Coire an Ruighe	Negligible	N/A	Negligible	Not significant
	All other watercourses (Local importance)	Negligible		Negligible	Not significant
	Atlantic salmon (International importance)	Minor		Minor	Not significant
	Brown trout (Local importance)	Negligible		Negligible	Not significant
	Aquatic macrophytes, macroinvertebrates, and other fish (Local importance)	Negligible		Negligible	Not significant
Headpond and Embankments, including Land Take and Drainage	Brown trout (Local importance) Aquatic macroinvertebrates and macrophytes (local importance)	Minor	The Pre-Construction fish surveys will inform the mitigation requirements for the loss of Loch nam Breac Dearga. This may involve the translocation of fish to a suitable nearby receptor site(s) – there are numerous similar lochans locally; alternatively, the trout population in Loch nam Breac Dearga could be monitored to establish if it is viable during operation of the Proposed Development.	Minor	Not significant
Indirect Effects to Marine Mammals of the Moray Firth SAC through Impacts to Prey Species (smolts)	Moray Firth SAC (International importance) – bottlenose dolphin and harbour seal	**Minor adverse**	The proposed additional mitigation aims to improve fish passage at Dochfour Weir and reduce the loss of smolts down the Caledonian Canal, thereby increasing the number of smolts reaching the Moray Firth SAC.	**Minor beneficial**	**Significant**
Spread of INNS through the Proposed Development Site through operation of the Proposed Development	Refer to Construction Effects section above	-	As above for Construction Effects	-	Not significant

9.11 Cumulative Effects

Inter-Cumulative Effects

9.11.1 The assessment of likely cumulative effects is based on the cumulative schemes identified in **Chapter 4: Approach to EIA (Volume 2: Main Report)**. Cumulative schemes identified are those that are already in operation, or reasonably foreseeable – i.e., in the public domain at scoping stage, or have been consented but not yet under construction/constructed at the point of writing the assessment or at submission.

9.11.2 In this case the cumulative schemes of relevance to the Proposed Development are as follows:

- Foyers Power Station (operational since 1974) – located on the opposite shore of Loch Ness to the intake of the Proposed Development.
- Loch na Cathrach PSH (consented) – located at the north eastern corner of Loch Ness south of Dores.
- Loch Kemp PSH (under application) – located to the south of the intake of the Proposed Development on the opposite side of Loch Ness from Alltsigh.

9.11.3 The additional mitigation described above in **Section 9.9 Mitigation and Monitoring** has been supported by hydraulic and hydrological modelling to establish the requirements for the proposed seasonally adjustable weir. This modelling has taken into account the likely volumes and operation of all of the above schemes in combination. Therefore, the adjustable weir will be designed to control flows in the River Ness downstream of Dochfour Weir, and in parallel with other proposed mitigation will facilitate improvements to fish passage in the Ness catchment.

9.11.4 The adjustable weir and associated fish pass(es) on Dochfour Weir will be finalised at detailed design. The assessment of residual effects detailed above has considered all cumulative schemes and the described additional mitigation, and therefore the results of the assessment of residual effects are valid for the cumulative assessment.

9.11.5 The smolt tracking study being completed in spring/summer 2025 will provide data on the movement of smolts through Loch Ness in order to evaluate the proposed mitigation and feed into the detailed design. The mitigation strategy will be finalised and agreed with other stakeholders in a Fisheries Management Plan, which will aim to facilitate improvements in fish passage and migratory success in the Ness catchment.

Intra-Cumulative Effects

9.11.6 It is possible for different aspects of a single development to combine to produce greater effects.

9.11.7 Intra-project effects due to component parts of the project being undertaken concurrently have been assessed as part of the construction effects assessment above. This assessment has been made on a worst-case precautionary approach, and therefore cumulative intra-project effects will not increase the magnitude or significance of effects on individual receptors.

9.11.8 With regard to habitats, given in this case the significant habitat impacts arising at the Headpond with minor additional impacts elsewhere, and that construction impacts are far more pronounced in effect than enabling and operational effects (where there are any), there is not considered to be any intra-cumulative effect that would be more significant than the highest assessed effect significance of the phases individually.

9.11.9 For protected and notable species, impacts from the operational phase are specific to aquatic ecology and it is therefore unlikely that they would work in combination with effects from the other phases to result in an effect of elevated significance.

9.11.10 It is concluded that there are no intra-cumulative effects that would exceed in significance that stated for the individual effects alone.

9.12 Summary

9.12.1 This chapter provides an assessment of the effects on aquatic ecological receptors (aquatic habitats and species: fish, macroinvertebrates, macrophytes) that are likely to arise from Pre-Construction and Enabling, Construction, and Operational phases of the Proposed Development. The baseline assessment identified several important ecological features of interest to aquatic ecology, including:

- European 'Habitats Sites' – the River Moriston SAC (designated for Atlantic salmon and FWPM) and the Moray Firth SAC (designated in part for bottlenose dolphin);
- Notable aquatic habitats including Loch Ness and the River Ness, Loch nam Breac Dearga, and watercourses of an upland nature representing good quality habitat for fish and other aquatic fauna;
- Notable fish species including Atlantic salmon, brown trout, and a broader assemblage of resident and migratory fish species; and
- Aquatic macroinvertebrate and macrophyte species indicative of good habitat quality and biological water quality.

9.12.2 Notable concerns raised by Consultees focus on the potential effects of the Proposed Development on migratory fish species in Loch Ness, at Dochfour Weir and in the River Ness downstream, and the distraction, entrainment or impingement of fish at the intake screen of the Lower Control Works. This includes the downstream migration of Atlantic salmon smolts, and the upstream migration of adult Atlantic salmon.

9.12.3 A suite of mitigation measures in addition to mitigation embedded in the design of the Proposed Development is proposed, including curtailment of the Operation of the Proposed Development during key stages of the smolt migration season, measures to deter salmon smolts from the intake screen, installation of improved fish passage at Dochfour Weir, a non-physical deterrent to prevent smolts being lost down the Caledonian Canal, and the installation of a seasonally variable weir on Dochfour Weir to control water levels in Loch Ness and maintain flows in the River Ness downstream (including to mitigate for the cumulative effects of all existing, consented, and proposed pumped storage hydro schemes on Loch Ness).

9.12.4 An Atlantic salmon smolt tracking study is underway in spring/summer 2025 to establish the migratory routes taken by smolts through Loch Ness and current constraints to successful migration at Dochfour Weir and the Caledonian Canal. The results of this study will be used to evaluate the suite of proposed mitigation described above, to be finalised at detailed design of the Proposed Development.

9.12.5 It is concluded that there are no significant adverse residual effects of the Proposed Development on aquatic ecology that cannot be mitigated to a level whereby they are not significant, or are otherwise **significant beneficial**.

9.12.6 Through the proposed additional mitigation, it is considered there would be a beneficial effect on fish passage at Dochfour Weir, including due to the prevention of the loss of smolts down the Caledonian Canal, and a corresponding beneficial effect on bottlenose dolphins in the Moray Firth SAC due to the improved prey resource resulting from increased migratory success of Atlantic salmon.

9.12.7 As a result, no significant adverse residual effects are predicted, and significant beneficial residual effects are predicted.

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