CALEDONIA
Offshore Wind Farm

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Volume 7E Proposed Development (Onshore) Appendices

Appendix 3-5 Fish and Freshwater Pearl Mussel

Caledonia Offshore Wind Farm Ltd.

5th Floor Atria One, 144 Morrison Street, Edinburgh, EH3 8EX

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Acronyms and Abbreviations

DEFRA	Department for Environment, Food and Rural Affairs
DSFB	District Salmon Fishery Board
d/s	Downstream
EIAR	Environmental Impact Addressment Report
FWPM	Freshwater Pearl Mussel
HDD	Horizontal Directional Drilling
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Council
LHB	Left Hand Bank
LWD	Large Woody Debris
MLWS	Mean Low Water Springs
MSS	Marine Scotland Science
NEPS	National Electrofishing Programme for Scotland
NBN	National Biodiversity Network
NESBReC	North East Scotland Biological Records Centre
NPF4	National Planning Framework
ONEC	Onshore Export Cable Corridor
OnTI	Onshore Transmission Infrastructure
OS	Ordnance Survey
RBMP	River Basin Management Plans
RLB	Red Line Boundary
RHB	Right Hand Bank
RHS	River Habitat Survey

RHAT	River Habitat Assessment Technique
cSAC	Candidate Special Area of Conservation
SAC	Special Area of Conservation
SBL	Scottish Biodiversity List
SCIs	Sites of Community Importance
SEPA	Scottish Environment Protection Agency
SSEN-T	Scottish and Southern Electricity Networks Transmission
SSSI	Site of Special Scientific Interest
TJB	Transition Joint Bay
u/s	Upstream
WFD	Water Framework Directive
QEs	Qualifying Elements

1 Introduction

1.1.1.1 This technical appendix supports Volume 5, Chapter 3: Terrestrial Ecology and Biodiversity of the Environmental Impact Assessment Report (EIAR).

1.1.1.2 This technical appendix is supported by the following annexes:

- Annex 1– List of Habitat Walkover Features (Standard); and
- Annex 2- Supporting Figures.

1.1.1.3 This technical appendix describes the methods used to gather and record data pertaining to fish species and freshwater pearl mussel (FWPM) (*Margaritifera margaritifera*) throughout the Onshore Transmission Infrastructure (OnTI) Red Line Boundary (RLB) and provides details of the results.

1.1.1.4 The receptors considered in this technical appendix are:

- Atlantic salmon (*Salmo salar*);
- brown trout (*Salmo trutta*) (including sea trout);
- river lamprey (*Lampetra fluviatilis*);
- sea lamprey (*Petromyzon marinus*);
- brook lamprey (*Lampetra planeri*);
- European eel (*Anguilla anguilla*); and
- FWPM.

1.1.1.5 A detailed description of the OnTI, and the components included within the Proposed Development (Onshore) is presented in Volume 1, Chapter 4: Proposed Development Description (Onshore) and a summary is provided in Section 1.2.

1.2 The Proposed Development (Onshore)

1.2.1.1 Within the OnTI RLB, a proposed Landfall Site has been identified along with an Onshore Export Cable Corridor (ONEC) and Onshore Substation Site. The Onshore Export Cable Route (the area where the infrastructure would be located and would be required for construction activities) for the Onshore Export Cable Circuits will be up to 100 metres (m). The Onshore Export Cable Route will be defined at detailed design stage through further technical studies. At this stage, the ONEC is identified to allow for micro siting of the Onshore Export Cable Circuits at detailed design and allow for flexibility within individual locations for differing construction methodologies including trenchless techniques such as Horizontal Directional Drilling (HDD).

1.2.1.2 The OnTI RLB encompasses:

- The Landfall Site: the area from Mean Low Water Springs (MLWS) where the Offshore Export Cable Circuits are connected to the Onshore Export Cable Circuits via HDD ducts within Transition Joint Bays (TJBs) (buried box-like structures which house the jointing between the Offshore and Onshore Export Cable Circuits). The Landfall Site is located at a rocky bay named Stake Ness, 1 kilometre (km) west of the village of Whitehills and approximately 5km west of Banff.
- The ONEC: where the Onshore Export Cable Circuits will be located which connects the TJBs at the Landfall Site to the Onshore Substation Site. The ONEC extends approximately 37km from Stake Ness to an area in the vicinity of the existing New Deer Substation.
- The Onshore Substation Site: comprising two co-located Onshore Substations located adjacent to the existing New Deer substation. Each substation aligns with the two project phases.
- An Onshore Grid Connection Cable Corridor connecting the Onshore Substation to the Grid Connection Point at the existing New Deer Substation (for Phase 1).

2 Legislation, Policy and Guidance

2.1 Legislation

2.1.1.1 There is a comprehensive system of legislation, both domestic and international, which aims to protect biodiversity at the landscape, habitat and species level. Much of this legislation exists within, and also independently of, the planning process. Table 2-1 details the legislation relevant to this appendix.

Table 2-1: Relevant Legislation for the Proposed Development (Onshore)

Legislation	Description and Relevance
Salmon and Freshwater Fisheries (Consolidation) (Scotland) Act, 2003 (the Salmon Act) (Scottish Parliament, 2003[1])	All channels within the OnTI RLB are potentially subject to the requirements of the Salmon Act irrespective of whether they are located within a protected area, such as a Special Area of Conservation (SAC). Under this Act, it may be an offence to, recklessly or otherwise, interfere with the spawning and migration of anadromous salmonids. This legislation also protects spawning habitats. This Act is regulated by the local District Salmon Fishery Board (DSFB). Atlantic salmon and sea trout are both provided the same level of protection under this Act.
Wildlife and Countryside Act 1981 (as amended) (United Kingdom (UK) Parliament, 1981[2])	Freshwater pearl mussels are protected by the Wildlife and Countryside Act 1981. They are a fully protected invertebrate species (NatureScot, 2023[3]). It is an offence to intentionally: ▪ kill, injure or take them; and ▪ possess or control them (alive or dead). FWPM, it is also an offence to intentionally or recklessly: ▪ damage or destroy a structure or place used for shelter or protection; ▪ disturb them in a place used for shelter or protection; and ▪ obstruct access to a place used for shelter or protection.
The Nature Conservation (Scotland) Act 2004 (Scottish Parliament, 2004[4])	Covers the protection of wildlife and the conservation and enhancement of natural features. It provides for the designation of Sites of Special Scientific Interest (SSSIs), including those applied to geological or geophysical features. There have been some changes to the 2004 Act through The Wildlife and Natural

Legislation	Description and Relevance
	Environment (Scotland) Act 2011 (Scottish Parliament, 2011[5]).
Water Environment and Water Services (Scotland) Act (WEWS Act) 2003) (Scottish Parliament, 2003[6]) (transposes 2000/60/EC Water Framework Directive (WFD) (European Union, 2000[7]).	Aims to provide an integrated framework for the protection and restoration of the water environment through the delivery of actions set out in River Basin Management Plans (RBMPs).
Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (UK Parliament, 1994[8])	Atlantic salmon (freshwater only) and river lamprey are protected under Schedule 3 which provides restrictions on their method of capture.
The Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008 (Scottish Parliament, 2008[9])	The Freshwater Fish Conservation (Prohibition on Fishing for Eels) (Scotland) Regulations 2008 makes it an offence to fish for or take eels of the species *Anguilla anguilla* (any method at any time) except under the authority of a licence granted by Scottish Ministers.
The Electricity Act 1989 (UK Parliament, 1989[10])	Under Schedule 9 paragraph 3(3) there is a duty to avoid so far as possible, causing injuries to fisheries or to the stock of fish in any waters.
The Council of the European Union Council Regulation (EC) No 1100/2007	Provides protection measures to European Eel and establishes measures for the recovery of the stock of European eel. These measures are also followed through Eel Management plans (DEFRA, 2010[11]).

2.2 Policy

2.2.1.1 The National Planning Framework 4 (NPF4) (Scottish Government, 2023[12]), adopted in February 2023 outlines under Policy 4f the following in relation to protected species:

"Development proposals that are likely to have an adverse effect on species protected by legislation will only be supported where the proposal meets the relevant statutory tests. If there is reasonable evidence to suggest that a protected species is present on a site or may be affected by a proposed development, steps must be taken to establish its presence. The level of protection required by legislation must be factored into the planning and design of development, and potential impacts must be fully considered prior to the determination of any application."

2.2.1.2 Additional policy that is relevant to this technical appendix include the Scottish Biodiversity List (SBL) (NatureScot, 2020[13]). The SBL is a list of animals, plants and habitats that Scottish Ministers consider to be of principal importance for biodiversity conservation in Scotland. All species discussed in this technical appendix are listed as priority species on the SBL.

2.3 Guidance

2.3.1.1 The guidance relevant to this technical appendix is outlined below:

- NatureScot Standing advice for planning consultations- Freshwater Pearl Mussels (NatureScot, 2020[14]);
- The International Union for Conservation of Nature (IUCN) Red List of Threatened Species where Atlantic salmon are registered as Near Threatened globally (Darwall, 2023[15]).
- European Eel are listed as Critically Endangered on the IUCN Red List of Threatened Species (Jacoby & Gollock, 2014[16]); and
- Extinction risks and threats facing the freshwater fishes of Britain (Nunn et al, 2023[17]). A research article where several species relevant to this appendix are categorised as being threatened with extinction at the regional level. European eel are classified as Critically Endangered and Atlantic salmon are classified as Endangered

3 Methodology

3.1 Desk Study

3.1.1.1 A desk study was undertaken to understand the available information on the presence of important and relevant ecological receptors which could influence the outcomes of this technical appendix. The sources of data considered are listed below:

- NatureScot Site Link, used to identify relevant designated sites and species (NatureScot[18]);
- Scottish Environment Protection Agency (SEPA) WFD, used to identify the WFD status of watercourses within the OnTI RLB (SEPA, 2015[19]);
- SEPA and Marine Scotland Science (MSS) river basin locations, used to identify channel barriers to fish mitigation (SEPA, 2024[20]);
- MSS Salmon Map (MSS, 2024[21]) to identify Scottish rivers with salmon and trout populations;
- JNCC Distribution of SACs/Sites of Community Importance (SCIs)/candidate SACs (cSACs)containing species 1029 *Margaritifera margaritifera* (JNCC [22]);
- MSS The National Electrofishing Programme for Scotland (NEPS) dataa used to view NEPS results on salmon populations (Marine Scotland Science, 2021[23]);
- National Biodiversity Network (NBN) Atlas, used to understand publicly available biological records (NBN[24]); and
- North East Scotland Biological Records Centre (NESBReC), used to understand relevant biological records within the OnTI RLB (NESBReC, 2024[25]).

3.2 Stakeholder Consultation

3.2.1.1 Consultation was undertaken with NatureScot, Aberdeenshire Council and the River Deveron DSFB regarding the scope of this technical appendix. The date and results of these stakeholder discussions are provided in Section 4.2.

3.3 Field Survey

3.3.1.1 The field survey area is shown in Figure 3.5.1 (within Appendix 3-5: Annex 2) and the grid references for the upstream (u/s) and downstream (d/s) extents of the watercourses are provided in Table 3-1.

3.3.1.2 Each channel was assigned a watercourse code during the initial prioritisation process. These codes provide clarity as to which channel is being referred to. The surveys took place over two catchments: the River Deveron catchment (WC02-WC12) and the River Ythan catchment (WC13 and WC14).

3.3.1.3 The surveys were located within the OnTI RLB and up to 500m outwith the OnTI RLB (Figure 3.5.1 within Appendix 3-5: Annex 2). Survey areas outside of the OnTI RLB were within a 500m buffer to consider impacts to important downstream habitats, if present.

3.3.2 Walkover Approach

3.3.2.1 Due to the small size of many channels within the OnTI RLB, the walkover surveys were undertaken using two approaches: rapid and detailed. Walkover surveys were conducted on the 13 to 14 February 2024, and 11 to 14 March 2024.

3.3.2.2 This section details the methodology of each approach.

Rapid

3.3.2.3 A rapid walkover of the smaller channels was undertaken to record key habitats that could potentially be impacted by the construction and operation of the Proposed Development (Onshore). This includes the presence and composition of:

- deposition features;
- salmonid and lamprey spawning habitat;
- the presence of lamprey juvenile habitat; and
- instream structures such as:
  - Large Woody Debris (LWD);
  - debris dams; and
  - undercut banks.

3.3.2.4 The presence of other current pressures such as weirs, fords, morphological alteration (e.g., straightening) and poaching was also included. These features were recorded using a "point and line" based approach. A list of these features is provided in Annex 1 to this technical appendix.

Detailed

3.3.2.5 On larger watercourses, such as the River Deveron, a detailed and complete inventory of relevant habitats was recorded.

3.3.2.6 This detailed habitat walkover took the form of an adapted Hendry & Cragg-Hine approach to identify important fish features (Hendry and Craig, 1997[26]). The approach has been made more robust by incorporating elements of the River Habitat Survey (RHS) (Raven et al., 1998[27]) and River Habitat Assessment Technique (RHAT) (Toland et al., 2008[28]), allowing for a longer-term determination of habitat presence, which is more resistant to seasonal factors and provides a more rounded multi-species assessment. These features included the flow types and in-channel features such as barforms and islands and were recorded using a "polygon" based approach. A list of the watercourses and survey type is provided in Table 3-1.

Table 3-1: Walkover Survey Details.

Code	Watercourse	Survey Type	Grid Reference	Distance of Surveyed Watercourse Section (m)
WC02	Burn of Boyndie	Detailed	u/s NJ6346462628 d/s NJ6428363076	936
WC03	Burn of Brydock	Rapid	u/s NJ6599758901 d/s NJ6672558764	865
WC04	River Deveron	Detailed	u/s NJ6915857199 d/s NJ6931758394	1323
WC05	Lenshie Burn	Rapid	u/s NJ7100456688 d/s NJ7042456417	686
WC07	Burn of Kinbate/ Craigston Burn	Rapid	u/s NJ7299153541 d/s NJ7359354742	1590
WC08	Burn of Kinminty / Burn of Brackans	Rapid	u/s North Channel - NJ7522153737 u/s East Channel - NJ7620152778 d/s NJ7499853143	1949
WC09	Burn of Muiryfold	Rapid	u/s NJ7706751885 d/s NJ7648851202	984
WC10	Burn of Monquhitter	Detailed	u/s NJ7800749844 d/s NJ7731249126	1026
WC11	Glen Burn	Rapid	u/s NJ7888848556	1272

			d/s NJ7764848377	
WC12	Burn of Balquholly	Detailed/Rapid	u/s NJ7987145650 d/s NJ7780745978	2332
WC13	Burn of Asleid	Rapid	u/s NJ8238645449 d/s NJ8320344008	1959
WC14	Unnamed Tributary of Burn of Asleid 1	Rapid	u/s NJ8159145031 d/s NJ8281644503	1383

3.4 Assumptions and Limitations

3.4.1.1 Due to land access restrictions, portions of watercourses that were selected for survey were inaccessible. These were:

- Lenshie Burn (WC05): Approximately 260m of channel in the middle of the planned survey extent was not accessible.
- Burn of Monquhitter (WC10): Approximately 350m of channel at the downstream end of the planned survey extent was not accessible.
- Glen Burn (WC11): Approximately 450m of channel at the downstream end of the planned survey extent was not accessible.
- Burn of Balquholly (WC12): Approximately 200m of channel at the downstream end of the planned survey extent was not accessible.
- Burn of Asleid (WC13): Approximately 650m of channel at the downstream end of the planned survey extent was not accessible.

3.4.1.2 It is therefore not possible to provide an assessment of the quality of the habitat in these areas for these channels. Many of these areas are present outwith the OnTI RLB and will not be directly crossed by the Proposed Development (Onshore). Wherever possible, these watercourses were viewed from adjacent land parcels where access was granted. However, the entirety of the channel was not always visible. If these areas are to be directly impacted by crossing points a full assessment of the survey extent would be required at detailed design.

3.4.1.3 Not all channels capable of hosting receptors and their habitats are assessed under the WFD in Scotland, with only those over 11 hectares in catchment size receiving a designation. Therefore, some of the channels listed for survey in this technical appendix are not included in Section 4.1.2. but are assessed.

3.4.1.4 At the time of survey, the exact crossing points for the ONEC are unknown. Furthermore, following the surveys, the OnTI RLB was expanded in several areas, and of relevance to this technical appendix, near the Unnamed Tributary of Burn of Asleid (WC14). Whilst the WC14 watercourse extent within the OnTI RLB was surveyed, the total d/s extent within 500m of the OnTI RLB was not surveyed in its entirety. At detailed design, once crossing point locations are identified, the survey area around the crossing points should encompass 100m u/s of the crossing point, the crossing point itself, and 500m d/s. During detailed design and selection of the crossing points, consideration will need to be given as to whether the existing survey extents within this technical appendix cover this crossing point.

4 Results

4.1 Desk Study

4.1.1 Designated Sites

4.1.1.1 The Cullen to Stake Ness Coast Site of Special Scientific Interest (SSSI) lies within the northern boundary of the OnTI RLB along the coast. The Cullen to Stake Ness Coast SSSI is designated for its geological and biological interests (NatureScot, 2011[29]). None of the Qualifying Features of the SSSI relate to habitats or species of relevance to this technical appendix.

4.1.1.2 There are no other protected areas within the OnTI RLB boundary. There are also no channel connections between the named channels and any European designated sites or SSSI which hold freshwater designations.

4.1.2 Water Framework Directive

4.1.2.1 There are several listed Water Bodies (WB) defined by SEPA for regulatory purposes (WFD) within the OnTI RLB. These are identified within Table 4-1. These WFD statuses must not be negatively impacted by the works.

Table 4-1: WFD Classification of Watercourses within the OnTI RLB.

Code	Watercourse Name	WFD Code	WFD Status and Watercourse Details
WC02	Boyndie Burn	WB ID 23055	Listed as Moderate Ecological Potential as of 2022 and designated as a Heavily Modified Water Body (HMWB) on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land. It is downgraded by several Qualifying Elements (QEs). Overall Ecology and Hydromorphology are both scored as Bad and Water Quality is scored as Moderate. The remaining QEs including Fish, Fish Barrier and Overall Hydrology are scored Good or higher.
WC03	Burn of Brydock	WB ID 23156	Listed at Good Overall Status as of 2022 with QEs of Fish, Fish Barrier and Overall Hydrology listed as High. The remaining QEs including Water Quality and Overall Hydrology are listed as Good or higher.

Code	Watercourse Name	WFD Code	WFD Status and Watercourse Details
WC04	River Deveron – Turriff to tidal limit	WB ID 23010	Listed at Moderate Overall Status as of 2022 having recently been downgraded from Good in 2020. Downgraded to Moderate by QEs of Water Quality and Overall Ecology. All remaining QEs, including Fish, Fish Barrier and Overall Hydrology are listed as Good status or higher.
WC08, WC10 and WC12	Burn of Monquhitter	WB ID 23161	Listed as Moderate Ecological Potential as of 2022 and designated as a HMWB on account of physical alterations that cannot be addressed without a significant impact on the drainage of agricultural land. Downgraded by several QEs. Overall Ecology and Hydromorphology are both scored Bad and Water Quality is scored as Moderate. The remaining QEs including Fish, Fish Barrier and Overall Hydrology are scored Good or higher.

4.1.3 Biological Records

4.1.3.1 No biological records of the ecological receptors considered within this technical appendix (Section 1.1.1.4) were returned from NESBReC.

4.1.3.2 A review of publicly available records on the NBN atlas found records of Atlantic salmon, brown trout (including sea trout), river lamprey, sea lamprey brook lamprey and European eel within a 10km radius of the OnTI RLB. No records of FWPM were returned. Due to the commercial sensitivity of these records, the exact location and date of these records cannot be shared.

4.1.4 Scope of Assessment

4.1.4.1 A desk-based prioritisation exercise was carried out to determine the scope of the assessment and where to focus the subsequent field surveys.

4.1.4.2 The prioritisation exercise utilised ArcGIS to analyse a 500m buffer around the OnTI RLB. This buffer of 500m was used to account for any potential shifts in the OnTI RLB and to capture any potential impacts to important habitats d/s.

4.1.4.3 All named channels within the Ordnance Survey (OS) 1:25,000 scale map within the OnTI RLB and 500m buffer were identified. These channels were then subject to a fish and FWPM priority assessment.

4.1.4.4 This assessment considered the potential ecological quality by reviewing the channel characteristics linked to habitat type and quality. Broad characteristics such as stream order, channel slope, catchment position, presence of lochs at the headwaters of channels, and overall catchment form, were used to assess the likelihood that habitats would be present for the receptors under consideration.

4.1.4.5 Channels were classified into three categories: suitable, potentially suitable or unlikely to be suitable. Characteristics that may interpret a channel unlikely to be suitable include channel stream order and slope. Channels can then be prioritised for field survey or discounted if deemed unlikely to be suitable for any species.

4.1.4.6 During the prioritisation process, FWPM were discounted from the survey as many of the channels within the OnTI RLB and 500m buffer were not deemed suitable to support FWPM due to channel form.

4.1.4.7 Only two channels were deemed to be potentially suitable for FWPM. However, one of these channels, the Burn of Boyne, was subsequently excluded from the revised OnTI RLB and thus removed from assessment in its entirety.

4.1.4.8 The other potential channel was the River Deveron. However, information provided by Stakeholders (Section 4.2) and biological records (Section 4.1.3) indicated there are currently no known records of FWPM in the River Deveron.

4.1.4.9 FWPM were therefore scoped out of further consideration.

4.2 Stakeholder Consultation

4.2.1.1 Consultation was undertaken with NatureScot, Aberdeenshire Council and River Deveron DSFB regarding the scope of this technical appendix, and in particular, the presence of FWPM within the OnTI RLB and catchments that are hydrologically connected to the watercourses that cross the OnTI RLB.

4.2.1.2 The results of this consultation are detailed in Table 4-2.

Table 4-2: Stakeholder Consultation.

Stakeholder	Date	Meeting Summary Relevant to Technical Appendix
NatureScot	25 April 2023	Project team proposed that habitat suitability assessments would be undertaken to determine suitability of watercourses for supporting FWPM and notable fish populations. Following the outcome of these surveys, the requirement to complete more detailed surveys would be discussed with relevant parties (NatureScot, the Deveron, Bogie and Isla Rivers Trust and the Deveron District Salmon Fisheries Board). NatureScot confirmed that the approach was suitable and encouraged discussion with the fisheries boards.

Stakeholder	Date	Meeting Summary Relevant to Technical Appendix
Aberdeenshire Council	17 May 2023	Aberdeenshire Council noted that there was a known population of FWPM in the River Ugie, however that this is likely to be too far east for consideration by the Proposed Development (Onshore). Aberdeenshire Council also advised that it was unknown if there were any populations of FWPM in the River Deveron and that NatureScot were most likely to hold the most recent records of any known FWPM populations.
River Deveron District Salmon Fisheries Board and Deveron, Bogie and Isla Rivers Charitable Trust	24 May 2023	River Deveron DSFB noted that the tributaries to the east of the River Deveron hold strong populations of trout and that the Burn of Boyne holds populations of migratory fish and should be considered in the assessment. The Project team outlined that there are no known records of FWPM in the OnTI RLB. The River Deveron DSFB noted that in response to FWPM, research has been published (by the University of Aberdeen) that has identified FWPM as functionally extinct within the River Deveron. However, this does not mean that there could be isolated populations within the River (The Deveron, Bogie and Isla Rivers Charitable Trust. 2020[30]).

4.3 Field Survey

4.3.1.1 Walkover surveys were undertaken over two weeks. The weather conditions during both weeks were overcast with sunny spells and favourable for survey, with river levels low and water clear.

4.3.1.2 The results of the walkover surveys are presented in this section separately for each of the 12 channels.

4.3.2 Burn of Boyndie (WC02)

4.3.2.1 This channel is located in the northern area of the OnTI RLB and crosses the OnTI RLB 5.7km west of Banff (see Photograph 1 and Figure 3.5.2 within Appendix 3-5: Annex 2). A detailed survey was undertaken and comprised approximately 935m in total within the OnTI RLB and 500m buffer.

Photograph 1:Burn of Boyndie (WC02).

4.3.2.2 The channel is straightened and incised throughout the survey extent and flows north-east toward Banff through open arable land. A culvert, likely passable, is situated just downstream of the survey extent (Photograph 2). There are a small number of trees providing some cover and LWD throughout. There is erosion taking place throughout the survey extent, an example of which is shown in Photograph 3. Upstream the channel remains straightened and incised with embankments and hard reinforcement in places. The channel consists primarily of run, with intermittent areas of riffle and glide. Substrates are predominately sand or gravel/pebble. This creates excellent areas of juvenile lamprey habitat throughout the survey extent (Photograph 4). Several areas of salmonid spawning habitat are located in the upper extent where gravel/pebble become the dominant substrate.

Photograph 2: Burn of Boyndie (WC02), Culvert at d/s end of the Survey Extent.

Photograph 3: Burn of Boyndie (WC02), Erosion and LWD.

Photograph 4: Burn of Boyndie (WC02), Juvenile Lamprey Habitat.

4.3.3 Burn of Brydock (WC03)

4.3.3.1 The Burn of Brydock is located in the northern area of the OnTI RLB where it crosses south-west of Bythstone (see Figure 3.5.3 within Appendix 3-5: Annex 2 and Photograph 5). Downstream of the survey extent, the Burn of Brydock confluences with the Burn of Ryland and becomes the Burn of Stonieley. It then becomes the Burn of Auchenbadie where several barriers are located before flowing into the River Deveron. A rapid survey was undertaken over approximately 860m of channel within the OnTI RLB and 500m buffer.

Photograph 5: Burn of Brydock (WC03).

4.3.3.2 The channel is realigned as it flows east through agricultural land toward the River Deveron. Hard reinforcement is present throughout the lower area of the survey extent in an attempt to halt several areas of erosion. Overhanging trees are present providing shade and cover for fish and some LWD to the channel. This LWD has accumulated to form a debris dam in the d/s area of the survey extent. Just u/s of a confluence with another burn, the channel flows through a culvert under a bridge which is passable for fish. From here, the channel is widened and embanked for a short stretch (Photograph 6), before becoming a smaller, steep, energetic channel, characterised by several cascades. There is a small area of deposition in the form of a barform consisting of gravel/pebble and a small area of salmonid spawning habitat. However, it should be noted that there are impassable barriers d/s of the survey extent which means it is likely that only brown trout and brook lamprey will be present.

Photograph 6: Burn of Brydock (WC03), Widened and Embanked Section of Channel.

4.3.4 River Deveron (WC04)

4.3.4.1 The OnTI RLB crosses the River Deveron approximately 6.5km south of Banff and 8.5km north of Turriff (see Figure 3.5.4 within Appendix 3-5: Annex 2 and Photograph 7). A detailed survey was undertaken and comprised approximately 1.3km within the OnTI RLB and 500m buffer.

Photograph 7: River Deveron (WC04).

4.3.4.2 The River Deveron meanders through a mix of woodland and agricultural land as it flows north toward Banff. Overhanging trees are present throughout most of the survey extent and erosion is present in places. In the lower extent, flow types are predominately glides and runs. Deposition is evidenced in the lower survey extent by the presence of barforms (Photograph 8). In-channel substrates are largely not visible due to channel depth. Where visible, gravel and pebble substrates are present providing three areas of salmonid spawning habitat, all in the lower survey extent. As the channel moves u/s to the OnTI RLB crossing, the channel slope becomes steeper and the channel velocity increases. This forms a fast run and becomes rapid in places, (Photograph 9). Substrate is largely not visible due to channel depth, however, the energetic flow types present suggest that salmonid spawning habitat is unlikely. Upstream of this area, there is some channel diversity as the channel rounds a bend. An island has formed with a side channel on the Left-Hand Bank (LHB) and a pool on the Right-Hand Bank (RHB).

Photograph 8: River Deveron (WC04), Barform in Lower Survey Extent.

Photograph 9: River Deveron (WC04), Rapids.

4.3.5 Lenshie Burn (WC05)

4.3.5.1 The Lenshie Burn rises within the OnTI RLB south-west of North Hollymill and flows west for a short distance before its confluences with the River Deveron (see Figure 3.5.5 within Appendix 3-5: Annex 2 and Photograph 10). A rapid survey was undertaken over approximately 425m of channel within the OnTI RLB and 500m buffer.

Photograph 10: Lenshie Burn (WC05).

4.3.5.2 Throughout the survey extent, Lenshie Burn flows west through agricultural land. The channel is small here (Photograph 10) as it is close to its source. It is straightened along field boundaries, with little habitat available for freshwater receptors. Substrates are small consisting mostly of gravel/pebble (Photograph 11). However, these are not consistent with salmonid spawning habitat as silt has compacted the channel bed.

Photograph 11: Lenshie Burn (WC05), Example of Substrates within the Channel.

4.3.6 Burn of Kinbate (WC07)

4.3.6.1 The Burn of Kinbate rises just to the north of the OnTI RLB to the north of Kinbate Croft before crossing the OnTI RLB (see Figure 3.5.6 within Appendix 3-5: Annex 2 and Photograph 12). There was some uncertainty as to which way the channel flowed when viewing mapping assets during the desk study as two channels are shown travelling both north and south from the source area. This potentially links the OnTI RLB to another important channel not within the OnTI RLB but within the 500m buffer, the Craigston Burn (Figure 3.5.7 within Appendix 3-5: Annex 2). Therefore, both channels were surveyed. A rapid survey was undertaken over approximately 1.6km of channel within the OnTI RLB and 500m buffer.

Photograph 12: Burn of Kinbate (WC07).

4.3.6.2 The survey extent runs through agricultural land and under the A947. The area between the north and south channels (and including the channel source) is culverted under a field and the A947. The northern channel (Photograph 13) flows north into the Craigston Burn and can be described as a drainage ditch straightened between two fields. The channel runs dry in places.

Photograph 13 Burn of Kinbate (WC07), Northern Channel.

4.3.6.3 The southern channel is small, straightened and incised along field boundaries (Photograph 12) and flows south-west through a croft holding and agricultural land. Substrates are generally small in this channel. However, much of the lower survey extent is heavily silted and iron enriched (Photograph 14). At the d/s end of the survey extent there is one salmonid spawning habitat point where the siltation and iron enrichment have cleared. Overhanging trees are present along the LHB for large portions of the survey extent, providing cover and shade for fish along with a few areas of LWD and a debris dam. Erosion is evident in areas along the RHB. Upstream of here, the channel becomes smaller before entering the previously mentioned culvert.

Photograph 14: Burn of Kinbate (WC07), Silt and Iron Enrichment.

4.3.7 Burn of Kinminty/Burn of Brackans (WC08)

4.3.7.1 The Burn of Kinminty source is just u/s of the OnTI RLB east of Kiminty. It flows north-west for a short distance before its confluence with an unnamed channel, which rises within the OnTI RLB at Crossfields, and becomes the Burn of Kinminty (see Figure 3.5.8 within Appendix 3-5: Annex 2 and Photograph 15). A rapid survey was undertaken over approximately 1.95km of channel within the OnTI RLB and 500m buffer. As the unnamed channel originates within the OnTI RLB, it was also included within this survey extent.

Photograph 15: Burn of Kinminty/Burn of Brackans (WC08).

4.3.7.2 The Burn of Kinminty is heavily culverted at the d/s end of the survey extent as it passes under a field. The culvert covers approximately 400m of channel and is potentially impassable to fish. Upstream of here the unnamed channel and Burn of Brackans (Photograph 15) are again straightened and flow through agricultural land. The unnamed channel is short and has no habitat features of interest. At the time of survey the unnamed channel was polluted by an unknown point source upstream of the confluence with the Burn of Brackens. The Burn of Brackens is a small steep channel, highlighted by the presence of several cascades. There are two further culverts located near the holding of Kinminty with three more located u/s of here. There is little habitat present but small areas of overhanging trees have provided LWD in places. There also appears to be some turf in the channel near a stand of overhanging trees (Photograph 16).

Photograph 16: Burn of Kinminty/Burn of Brackans (WC08), Turf in Channel near Overhanging Trees.

4.3.8 Burn of Muiryfold (WC09)

4.3.8.1 Burn of Muiryfold crosses the OnTI RLB 4.5km east of Turriff (see Figure 3.5.9 within Appendix 3-5: Annex 2 and Photograph 17). A rapid survey was undertaken over approximately 980m of channel within the OnTI RLB and 500m buffer.

Photograph 17: Burn of Muiryfold (WC09).

4.3.8.2 The channel is straightened and incised down to the bedrock in places along the side of a minor road (Photograph 17) and flows south-west through agricultural land and a farmyard. Hard reinforcement is evident in places to support the road, especially in the lower extent. Photograph 18 shows the channel is culverted in the downstream survey extent for approximately 120m under a farmyard. Due to the length of this culvert, it is potentially impassable for fish migration. Substrates through the survey extent are generally small and there is one salmonid spawning habitat point upstream of this culvert. Upstream of here, there are a further four culverts that would be passable for fish in the right conditions. Several instances of either stock poaching, diffuse sources of sediment from fields (Photograph 19) or field drains are present providing potential pathways for excess silt. This is evident in various locations in the channel and could negatively affect salmonid habitat. However, juvenile lamprey habitat, which is typically silty/sandy margins, is present throughout the survey extent.

Photograph 18: Burn of Muiryfold (WC09), Channel Culverted under Farmyard.

Photograph 19: Burn of Muiryfold (WC09), Diffuse Pollution Source.

4.3.9 Burn of Monquhitter (WC10)

4.3.9.1 Burn of Monquhitter crosses the OnTI RLB 5km east of Turriff (see 3.5.10 and Photograph 20). A detailed survey was undertaken and comprised approximately 1km within the OnTI RLB and 500m buffer.

Photograph 20: Burn of Monquhitter (WC10).

Photograph 21: Burn of Monquhitter (WC10), Salmonid Spawning Habitat.

4.3.9.2 The channel flows south-west through rough pasture and is both straightened and embanked along the survey extent (Photograph 21). This embankment is eroded in places. The extent is dominated by a steep run, and where there is some deposition on the riverbed, riffles have formed. There is an abundance of substrates, such as gravel/pebble and cobble, that supports salmonid spawning habitat throughout the survey extent with 15 salmonid spawning points recorded, an example of which is shown in Photograph 21. However, it was noted during the survey that the interstitial area amongst the gravel substrate appears to be silted in some places, which could potentially affect the quality of this habitat. Silt and sand substrates have accumulated in places throughout the survey extent creating good juvenile lamprey habitat.

4.3.9.3 Further u/s, Photograph 22 shows a collapsed weir which is passable for fish and delimits the zone of good salmonid spawning. Hard reinforcement is present on the RHB, likely to support the embankment around the collapsed weir. There are overhanging trees along the entirety of the LHB (Photograph 21 to Photograph 22). However, there is no LWD present in the channel. There are three field drains located throughout the survey extent.

Photograph 22: Burn of Monquhitter (WC10), Salmonid Spawning Habitat.

4.3.10 Glen Burn (WC11)

4.3.10.1 The Glen Burn crosses the OnTI RLB 6km east of Turriff and confluences with the Burn of Monquhitter shortly after the end of the survey extent (see Figure 3.5.11 within Appendix 3-5: Annex 2 and Photograph 23: Glen Burn (WC11). A rapid survey was undertaken over approximately 1.3km of channel within the OnTI RLB and 500m buffer.

Photograph 23: Glen Burn (WC11).

4.3.10.2 The channel is small, realigned and embanked in places throughout the survey extent (Photograph 23), as it flows west through rough pasture. There is evidence of stock poaching in the downstream end of the survey extent. Upstream of here, both banks of the channel are eroded in places (Photograph 24). Where overhanging trees are present there is some complexity in the channel form (such as increased variation in flow type and changes in substrate size and structure) (Photograph 24). However, there is little fish habitat present within the channel. It should be noted that a culvert was observed downstream of the survey extent that is potentially impassable for fish.

Photograph 24: Glen Burn (WC11), Erosion and Overhanging Trees.

4.3.11 Burn of Balquholly (WC12)

4.3.11.1 The Burn of Balquholly is located in the southern area of the OnTI RLB and is 8km south-east of Turriff (see Figure 3.5.12 within Appendix 3-5: Annex 2 and Photograph 25). The upper reaches of this channel were subject to a rapid survey comprising approximately 1.4km of channel within the OnTI RLB and 500m buffer. The channel then returns to the border of the OnTI RLB in the lower reaches of the survey extent. Here an additional unnamed tributary of the Burn of Balquholly joins the burn, and the channel was subject to a detailed survey for approximately 850m. The channel borders the OnTI RLB and is within the 500m buffer.

Photograph 25: Burn of Balquholly (WC12).

4.3.11.2 The Burn of Balquholly is similar to many of the channels in the OnTI RLB. It is straightened and embanked in places (Photograph 25) as it flows north and

then west through agricultural land. In the d/s detailed survey extent, the channel is predominately a steep run and forms sequences of run-riffle-run in places. Substrates are primarily gravel/pebble and cobble creating good salmonid spawning habitat as 20 points are present throughout the survey extent.

4.3.11.3 There is accumulations of silt and sand in places creating juvenile lamprey habitat (Photograph 26). However, it appears that large sections of the channel have recently been dredged (Photograph 27). This means that large amounts of substrate consistent with salmonid spawning may have been lost along with any recent spawning activity in this channel. Nonetheless, the remaining substrates are still consistent with salmonid spawning habitat. This dredging has also resulted in toe erosion for much of this area.

4.3.11.4 The survey continued u/s to the rapid survey area where the channel becomes smaller, but still containing pockets of salmonid spawning habitat. However, again the channel is dredged in places resulting in a loss of some potential salmonid spawning habitat. Toe erosion and bank erosion are prevalent throughout this area. Photograph 28 shows a culvert under a minor road approximately halfway along the rapid survey extent which would likely be passable for fish in the right conditions. Upstream of this culvert, the channel becomes increasingly smaller, incised and steep and obscured by tunnel vegetation in places.

Photograph 26: Burn of Balquholly (WC12), Lamprey Habitat.

Photograph 27: Burn of Balquholly (WC12).

Photograph 28: Burn of Balquholly (WC12), Culvert under Minor Road.

4.3.12 Burn of Asleid (WC13)

4.3.12.1 The Burn of Asleid is located in the southern area of the OnTI RLB near the Onshore Substation Site, within the River Ythan catchment (see Figure 3.5.13 within Appendix 3-5: Annex 2 and Photograph 29). A rapid survey was undertaken over approximately 1.9km of channel within the OnTI RLB and 500m buffer.

Photograph 29: Burn of Asleid (WC13).

4.3.12.2 In keeping with the rest of the surveyed channels, the Burn of Asleid is straightened and embanked in places (Photograph 29). The channel is primarily a long run with isolated pockets of salmonid spawning and juvenile lamprey habitat present. Four salmonid spawning habitat points and several juvenile lamprey habitat points are present throughout the survey extent. Photograph 30 shows a culvert that is likely passable for fish and is located approximately halfway along the survey extent. Small areas of overhanging trees are present throughout, providing shade and cover for fish.

Photograph 30: Burn of Asleid (WC13), Culvert.

4.3.13 Unnamed Tributary of Burn of Asleid 1 (WC14)

4.3.13.1 The Unnamed Tributary of Burn of Asleid 1 rises within the OnTI RLB south-west of Bridge Valley and is located in the southern area of the OnTI RLB near the Onshore Substation Site within the River Ythan catchment (see Figure 3.5.14 within Appendix 3-5: Annex 2 and Photograph 31). A rapid survey was undertaken over approximately 1.4km of channel within the OnTI RLB and 500m buffer.

Photograph 31: Unnamed Tributary of Burn of Asleid 1 (WC14).

4.3.13.2 The channel is small, realigned and embanked in places (Photograph 31). It flows south-east through agricultural land. The channel is incised throughout much of the survey extent and overhanging trees are present along sections of the RHB providing cover and shade for fish. Approximately halfway along the survey extent there is a culvert partially blocked by a debris dam resulting in an impoundment u/s (Photograph 32). There is an accumulation of silt here within the impoundment providing good juvenile lamprey habitat. There are a few other small, isolated pockets of juvenile lamprey and one salmonid spawning habitat d/s of the culvert.

Photograph 32: Unnamed Tributary of Burn of Asleid 1 (WC14), Impoundment Upstream of Debris Dam and Culvert.

5 Discussion and Summary

5.1 Survey Findings

5.1.1.1 There is one designated site within the OnTI RLB, the Cullen to Stake Ness Coast SSSI. However, this is a coastal designation. None of the watercourses within the OnTI RLB are connected to any statutory designated areas.

5.1.1.2 Following the outcome of the desk study it is considered that FWPM are not present within the OnTI RLB and can be scoped out from future assessment.

5.1.1.3 There are three listed obstacles on the SEPA database for the watercourses within the OnTI RLB (SEPA, 2024[20]). All three obstacles are located d/s of the survey extent of WC03 and listed as impassable. Therefore, the presence of migratory salmonids and other diadromous fish can be discounted from this WC03.

5.1.1.4 Some substantial culverts have been recorded on WC08 and WC09 and d/s of WC11 which are not recorded on the SEPA Barrier Database. Therefore, there remains some uncertainty as to whether diadromous fish can access these channels. Further assessment would need to be carried out to determine the passability of these barriers. Using a precautionary approach, it is assumed that fish can reach these channels.

5.1.1.5 The salmonid distribution map on the Marine Scotland portal (Marine Scotland, 2024[21]) indicates that salmon are present in the River Deveron and River Ythan. The NEPS data (MSS, 2021[23]), also suggests that migratory salmonids are present in many of the tributaries of the River Deveron and River Ythan catchments, including channels within the OnTI RLB.

5.1.1.6 The vast majority of the channels within the OnTI RLB are modified and realigned. Many of the channels are embanked, straightened or realigned for agricultural purposes. Consequently, this has led to faster flows with little variation in many of the channels surveyed. This can lead to reduced habitat diversity as the channel flow becomes uniform and smaller substrates are absent as the effects of natural processes such as erosion and deposition are reduced and transportation of such sediment increases. In addition, high levels of silt and fines have compromised some areas of salmonid spawning habitat. During the process of siltation, the interstitial spaces amongst the smaller substrates are infiltrated, and can affect the hatching success of embryos in redds (Levasseur et al., 2006[31]). The agricultural landscape at the time of the survey was ploughed, bare soil fields. This could have contributed to the high levels of sand, silt and fine sediment observed in many of the channels surveyed.

5.1.1.7 Despite this, good areas of salmonid spawning habitat were recorded in eight channels, particularly WC02, WC04, WC10 and WC12. Smaller pockets of spawning habitat were also recorded in WC07, WC09, WC13 and WC14. These channels, therefore, have the potential to, or do, host salmonid and diadromous fish. Spawning habitat was recorded in WC03, however, the presence of three impassable barriers mentioned discounts migratory fish from being present. It is therefore likely to be a brown trout and brook lamprey spawning habitat. No spawning habitat was recorded at the time of survey in the remaining channels: WC05, WC08 and WC11.

5.1.1.8 This excess of sand in these channels has created excellent juvenile lamprey habitat along the sections of channel margins, particularly in WC02, WC10 and WC14.

5.1.1.9 The River Deveron (WC04) is the largest channel within the OnTI RLB and is the primary migratory route for many migratory salmonids and other diadromous species that use this catchment to spawn. Therefore, it has the highest risk attached when considering the potential impacts of the Proposed Development (Onshore). This is considered in Volume 5 Chapter 3: Terrestrial Ecology and Biodiversity of the EIAR.

5.1.1.10 A generic seasonal sensitivity receptor for the species considered in this technical appendix has been provided in Table 5-1. Seasonality can vary between catchments and individual watercourses, however seasonality of each species should be considered at detailed design. This is discussed further in Volume 5 Chapter 3: Terrestrial Ecology and Biodiversity of the EIAR..

Table 5-1: Generic Seasonal Sensitivity Table

Species	Stage	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Atlantic salmon	Adult migration												
	Spawning												
	Incubation												
	Swim up												
	Winter dispersal												
	Smolt migration												
	Kelts												

Species	Stage	Sept	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
Brown trout (*sea trout)	Adult migration												
	Spawning												
	Incubation												
	Swim up												
	Winter dispersal												
	Smolt migration*												
	Kelts												
Eel	Adult migration												
	Juvenile migration												
Lamprey (3 spp.)	Adult migration												
	Spawning												
	Incubation												
	Juvenile migration												

* Red indicates a high sensitivity, orange a moderate sensitivity, and yellow a low sensitivity.

5.2 Summary

5.2.1.1 The findings from the desk study and walkover surveys suggest several channels are likely to host Atlantic salmon, sea/resident brown trout and eel and the three species of lamprey. The assessment of impacts and mitigation, if necessary are considered further in Volume 5, Chapter 3: Terrestrial Ecology and Biodiversity of the EIAR.

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Caledonia Offshore Wind Farm
5th Floor, Atria One
144 Morrison Street
Edinburgh
EH3 8EX

www.caledoniaoffshorewind.com

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