Bhlaraidh Wind Farm Extension Section 36C Variation

Technical Appendix 3.6g: WQFMP

Scottish Government - Energy Consents Unit - Application Details

Bhlaraidh Wind Farm Extension

Water Quality and Fish Monitoring Plan

sse Renewables

Contents

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1. Introduction

1.1. Background

Bhlaraidh Extension Wind Farm is situated adjacent to SSE Renewables' operational Bhlaraidh Wind Farm, located on the Glenmoriston Estate, north-west of Invermoriston in the Great Glen (central Ordnance Survey grid reference NH 38814 20835).

This document forms the Water Quality and Fish Monitoring Plan (WQFMP) for the consented Bhlaraidh Wind Farm extension (herein referred to as "the Development"). The Development was a Section 36 Application which was granted planning permission on 30th August 2022 by Scottish Ministers (Planning Authority ref: 21/04080/S36) and will comprise the construction and operation of 15 (no.) wind turbines. The existing Bhlaraidh Wind Farm has 32 turbines and the Bhlaraidh Wind Farm Extension will construct an additional 15 turbines with a maximum tip height of up to 180m. The Development includes associated infrastructure (e.g., crane hardstandings, substation, borrow pits, new access tracks) and six new watercourse crossings.

This WQMFP has been updated in June 2024 to include the monitoring of two private water supplies (PWS) to reflect the findings of the updated Private Water Supply Risk Assessment[1] (PWSRA).

The purpose of this WQFMP is to detail proposals for how surface water quality, PWS quality, and fish populations will be monitored prior to, during and after construction of the Development and extends to the hydrological networks located within the catchment of the construction areas.

1.2. Objectives

The main objective of this WQFMP is to provide surface water quality, PWS quality and fish population monitoring plans, taking into account the commitments outlined in the Environmental Impact Assessment Report (EIAR), Additional Information Report (AIR), planning and other stakeholder commitments, as well as good practice guidance including the Marine Scotland Science generic monitoring programme guidance document[2].

The methodology presented in this WQFMP will include the hierarchy of monitoring requirements needed to assess and monitor the water quality from watercourses and PWSs which are potentially susceptible to impacts from infrastructure and construction areas within the site. This monitoring plan is designed to outline the means of assessing the effectiveness of wind farm construction and the implementation of associated contingency mitigation measures. In addition, the WQFMP will also present the requirements for monitoring fish populations in watercourses potentially affected by construction of the Development.

1.3. Planning Requirements

A number of planning conditions associated with the Development require detailed attention and subsequent design of environmental protection through appropriate and detailed design considerations as well as the adoption of site-specific monitoring and contingency plans.

Planning Condition (PC) 29 of the decision letter requires a WQFMP to be approved by the Planning Authority in consultation with Ness District Salmon Fishery Board. The condition sets out the

[1] Natural Power (2024) Bhlaraidh Extension Wind Farm: Private Water Supply Risk Assessment.

[2] Scottish Government (2018), Marine Scotland Science, Generic monitoring programme for monitoring watercourses in relation to onshore wind farm developments.

requirements for surface water quality and fish monitoring programmes. It is expected that the application of these monitoring programmes will discharge the conditions outlined in PC 29.

Planning Condition 29 states:

(1) There shall be no Commencement of development until an integrated Water Quality and Fish Monitoring Plan ("WQFMP") has been submitted to and approved in writing by the Planning Authority in consultation with Ness District Salmon Fishery Board;

(2) The WQFMP must take account of Marine Scotland Science's guidance and shall include:

a. Provision that water quality sampling should be carried out for 12 months (or as agreed with the Planning Authority) prior to Commencement of development, during construction and for 12 months after construction is complete;

b. Key hydrochemical parameters (including turbidity and flow data), the identification of sampling locations (including control sites), frequency of sampling, sampling methodology, data analysis and reporting;

c. Fully quantitative electrofishing surveys at sites potentially impacted and at control sites for 12 months (or as agreed with the Planning Authority) prior to the Commencement of development, during construction and for 12 months after construction is completed to detect any changes in fish populations; and

d. Appropriate site specific mitigation measures including those detailed in the EIA Report.

(3) Thereafter, the WQFMP shall be implemented in full within the timescales set out in the WQFMP.

***Reason**: To ensure no deterioration of water quality and to protect fish populations within and downstream of the development area.*

In addition, email correspondence received from The Highland Council (THC) in November 2023 indicated that in order to discharge PC 13, THC Environmental Health department require a private water supply monitoring scheme, including monitoring prior to construction in order to have a baseline for comparison.

Additional consideration has been given to standing advice and guidance from the Scottish Environment Protection Agency (SEPA) and Marine Scotland in the development of this WQFMP.

2. Methodology

The WQFMP was developed jointly by Natural Power and RPS Consulting Ltd. (RPS). Natural Power developed the water quality monitoring plan and RPS developed the fish monitoring plan.

The methodology used to develop the water quality monitoring plan included a review of desktop information in addition to a site visit undertaken by Natural Power.

To develop the fish monitoring plan, a literature review was undertaken followed by a site walkover by the Ness District Salmon Fishery Board (appointed by RPS), as outlined below.

2.1. Desktop Assessment

As part of the identification of the hydrology and fish habitat of the Development as well as to capture any required commitments outlined in the consenting documents, Natural Power and RPS have undertaken a review of the following information:

- Environmental Impact Assessment Report, Volume 1, Chapter 9, Hydrology and Hydrogeology;
- Environmental Impact Assessment Report, Volume 1, Chapter 10, Geology and Soils;
- Environmental Impact Assessment Report, Volume 2, Figure 9.1, Hydrological Overview;
- Environmental Impact Assessment Report, Volume 3, Appendix 5.4, Fish Habitat and Population Baseline Survey;
- Additional Information Report, Figure 2.2, Site Layout Plan – 15 T Layout;
- Additional Information Report, Appendix 9.1, Updated Watercourse Crossing Schedule; and
- Private Water Supply Risk Assessment Report.

Environmental Impact Assessment Report (EIAR) and Additional Information Report (AIR) stakeholder consultation responses were also reviewed including:

- Responses from SEPA, dated August 2021 and March 2022;
- Response from Marine Science Scotland, dated June 2020;
- Response from the Ness District Salmon Fishery Board and Ness & Beauly Fisheries Trust; and
- Response from THC, dated October 2023.

An additional review of secondary source information published as online resources was also completed.

The findings of these reviews are presented in Section 3.

2.2. Site Reconnaissance

A site walkover survey was undertaken by Natural Power in tandem with the first round of pre-construction (baseline) water quality monitoring on 28 July 2022. The findings of the site walkover survey are presented Section 5. A PWS survey was undertaken on 28 May 2024 and the findings of this survey are presented in the PWSRA.

Potential fish population monitoring sites were identified during the desktop assessment by reviewing relevant literature and identifying candidate sites on a map. A site walkover was undertaken by the Ness District Salmon Fishery Board in tandem with the pre-construction fish population survey on 12th September 2022 and 23rd September 2022 to select final watercourses and reaches for fish population surveying. The findings of the site walkover are presented in Section 6 and Appendix C.

2.3. Proposed Approach

Following the establishment of any planning and stakeholder requirements, as well as the characterising the hydrological regime of the Development, a WQFMP (Sections 5 and 6) is presented in accordance with the identified requirements and good practice guidance.

3. Environmental Setting and Summary of Commitments

3.1. Environmental Setting

Land use within the Development is mainly upland moorland. Some areas of deciduous, mixed and commercial forestry are positioned adjacent to the access route from Invermoriston in the south. Woodlands listed on the Ancient Woodland Inventory are also present to the south of the main wind farm site along the access track for the Development.

Peat deposits are present across the majority of the Development. Bedrock across the Development comprises psammite with micaceous layers and calc-silicate pods of the Upper Garry Psammite Formation in the west (also known as the Tarvie Psammite Formation), and psammite and semipelite of the Achnaconeran Striped Formation in the east. As such, the hydrogeology at the Development comprises low productivity bedrock aquifers and it is also anticipated that there is an absence of substantial groundwater within the superficial deposits.

The majority of the site drainage is anticipated to flow to Allt Saigh, either directly or via the Allt Carn Choire Rainich or smaller unnamed watercourses. The west of the Development is included within the Allt Bhlàraidh catchment, which drains into the River Moriston. However, the vast majority of the Development area is assessed as not being in hydraulic connectivity to the River Moriston. The River Moriston is a Special Area of Conservation (SAC) supporting freshwater pearl mussel *Margaritifera margaritifera* and Atlantic salmon *Salmo salar* populations.

3.2. Summary of Commitments

The EIAR and AIR identifies the key surface water hydrological networks draining the Development area, as outlined in Section 3.1. The consenting documents identify the potential for pollution impact from silt laden, chemical contaminated or foul drainage runoff during construction and to a lesser extent during operation and specifies that pollution control and good practice mitigation would be used to minimise such impacts. Pollution control measures that will be implemented are outlined in **Bhlaraidh Wind Farm Extension Construction Environmental Management Plan (CEMP)**.

Pre-construction (baseline), construction and post-construction phase water quality monitoring was recommended in Chapters 5 and 9 of the EIAR to ensure there is no long-term deterioration in water quality of surface watercourses and no significant impacts to habitat for fish and freshwater pearl mussel. Therefore, this WQFMP will specify water monitoring locations on these identified watercourses in alignment with the outline water monitoring proposals from the EIAR and AIR.

The PWSRA identifies two PWSs that are assigned a Low risk (No measurable impact on receptor is predicted) and recommends a PWS monitoring plan is implemented for the pre-construction (baseline), construction and post-construction phase of works. Therefore, this WQFMP will specify PWS monitoring plan for these supplies.

Pre-construction (baseline), construction and post-construction fish population monitoring was recommended in Chapter 5 of the EIAR to ensure that any impacts of construction activities on resident fish populations are detected.

4. Definitions and Responsibilities

4.1. Definitions

The below terms used in this WQFMP are defined as follows:

- The WQFMP refers to both the Water Quality and Fish Monitoring Plans (this document).
- The water quality monitoring element of the WQFMP is concerned with water quality monitoring of identified watercourses and PWS.
- The fish monitoring element of the WQFMP is concerned with fish population monitoring in identified watercourses.
- The frequency of water quality monitoring refers to the regularity at which monitoring would be undertaken. Monthly monitoring comprises the inspection and sampling of watercourses once per month. The period between monthly visits would be kept consistent where possible, but is likely to vary due to access constraints, availability, construction program etc. During construction visual monitoring may be undertaken on an ad-hoc basis, including after heavy rainfall.

- The pre-construction (baseline) phase refers to the period prior to which major civils (or excavation) works commence. The baseline phase will include minor on-site preparatory works such as intrusive ground investigation (GI).
- The construction phase refers to the period over which the Development is being constructed and ends following the completion of major civils works, including reinstatement.
- The post-construction (operational) phase refers to the period after the construction phase has ended.
- Standard or good practice mitigation refers to any pollution control, silt or chemical handling and management arrangements as well as contingency and response strategies outlined in the EIAR, AIR, published good practice guidance and also in the CEMP.

4.2. Developer

The Developer will be responsible for appointing a Principal Contractor, Ecological Clerk of Works, independent Water Quality Monitoring Specialist and Fish Monitoring Specialist.

The Developer will have ultimate responsibility for implementation of the WQFMP.

4.3. Principal Contractor

The Principal Contractor, appointed by the Developer, is responsible for pollution prevention for the duration of the construction works and until such time as permanent measures, such as permanent drainage and silt mitigation controls, are deemed to be adequate and appropriately constructed.

As part of the site induction process the Principal Contractor encourages all personnel and visitors to report, any visual indications of changes in water quality (i.e., discolouration or other evidence of contamination) in any watercourses on site. Any evidence must be reported to the Ecological Clerk of Works (ECoW) and Principal Contractor.

4.4. Ecological Clerk of Works

The Ecological Clerk of Works (ECoW), appointed by the Developer, undertakes visual monitoring on site and liaises with the Principal Contractor and, if required, other relevant environmental contractors for the duration of construction.

4.5. Water Quality Monitoring Specialist

Water quality monitoring will be undertaken by the appropriate appointed environmental consultant. Subject to review of the final construction programme the monitoring may be undertaken by the ECoW or by an appropriately qualified water monitoring consultant, employed by the Developer. This responsibility extends to overall coordination of both field and laboratory aspects of the monitoring programme, liaison with nominated site personnel and the Principal Contractor.

The nominated water quality monitoring consultant shall provide regular reporting of the field and laboratory analysis as detailed in Section 5.

4.6. Fish Monitoring Specialist

Fish population monitoring will be overseen by a suitably qualified ecological consultant. The fish monitoring specialist will be responsible for arranging fish monitoring surveys during construction and liaising with the Developer and appointed ECoW during construction, to ensure that any matters potentially affecting fish populations are properly addressed. The fish monitoring specialist will also be in contact with the water quality monitoring specialist.

The appointed fish monitoring specialist will deliver fish population survey reports during construction.

5. Water Quality Monitoring Plan

5.1. Introduction

This section describes the indicative monitoring proposals and protocols that will be adopted including sampling and inspection of site watercourses. This section provides information on:

- The period over which sampling will be undertaken, and the frequencies within each phase of the Development;
- The identification of sampling locations, including control sites;
- The hydrochemical parameters that will be used including in-situ and extractive techniques;
- Trigger / action levels as informed by baseline monitoring and environmental quality standards; and
- An overview of the methodology and proposed reporting arrangements.

5.2. Monitoring Requirements

Table 5.1 provides a summary of the surface water monitoring arrangements to ensure compliance with planning and other environmental commitments.

Table 5.1: Surface Water Quality Monitoring Requirements

Item	Monitoring Method	Monitoring Locations	Monitoring Frequency	Monitoring Phases	Parameter
1	Visual and olfactory	Site wide (locations vary depending on active construction work areas) and receiving watercourses	Daily or Weekly depending on the level and type of construction on site	Construction (as part of ECoW role)	Visual e.g. discolouration, cloudiness, algal blooms etc. and olfactory e.g. hydrocarbon odour
2	In-Situ (data collected using handheld monitors)	14 locations	Monthly	Pre-construction (baseline), Construction and post-construction (up to 12 months)	pH Electrical Conductivity Dissolved Oxygen (DO) Turbidity Temperature
3	Water Sample Collection (samples collected and sent to a UKAS	14 locations	Monthly Monthly or Bi-monthly	Pre-construction (baseline), Construction and post-construction (up to 12 months)	*See Section 5.4.1, Table 5.4. below*

	laboratory for analysis)		depending on construction results		

Table 5.2 provides a summary of the PWS monitoring arrangements to ensure compliance with planning and other environmental commitments.

Table 5.2: PWS Monitoring Requirements

Item	Monitoring Method	Monitoring Locations	Monitoring Frequency	Monitoring Phases	Parameter
1	Visual and olfactory	2 locations	Monthly	Pre-construction (baseline), Construction and post-construction (up to 12 months)	Visual e.g. discolouration, cloudiness, algal blooms etc. and olfactory e.g. hydrocarbon odour
3	Water Sample Collection	2 locations	Monthly	Pre-construction (baseline), Construction and post-construction (up to 12 months)	*See Section 5.4.2, Table 5.5. below*

A list of sampling analytes to be assessed at a United Kingdom Accreditation Service (UKAS) accredited laboratory are presented below in Table 5.6 and Table 5.7.

5.3. Water Quality Monitoring Locations

The fourteen surface water sampling locations listed in Table 5.3 are considered to be representative of the surface water quality within the main catchments of the Development and are located downstream of construction works or in the case of the control location situated outside of the influence of construction related works.

Despite being assessed as having a Low risk level in the PWSRA, the two PWS monitoring locations listed in Table 5.3 will be monitored to provide reassurance that no impacts are arising as a result of the Development.

The same monitoring locations will be used throughout all phases of the Development, ensuring a consistent approach, and allowing for comparison of results over time and identification of any trends. Furthermore, it is noted in Table 5.1 that visual monitoring would be carried out site wide during the construction phase as part of the ECoW role.

Grid references for the monitoring locations are provided in Table 5.3 below, and illustrated in Appendix A. Pictures and preliminary monitoring results from the surveys are presented in Appendix B.

Table 5.3: Water Quality Monitoring Sampling Points

ID	Source Location	Easting	Northing	Rationale for inclusion	Level of monitoring
Surface Water Monitoring Locations					
SW1	Allt Saigh	245584	819146	Location will capture potential impacts on water quality arising from works occurring in the upper catchment associated with Bhlaraidh Wind Farm Extension. Will be used as a proxy to indicate water quality at the PWS.	Visual, olfactory, in-situ and extractive
SW2	River Moriston	241959	816570	Location will capture potential impacts from the temporary construction compound and use of any existing Bhlaraidh Wind Farm access tracks as well as distal works arising in the upper catchment.	Visual, olfactory, in-situ and extractive
SW3	Caochan na Muic	238210	817071	Location will capture potential impacts on water quality arising from works occurring in the upper catchment associated with Bhlaraidh Wind Farm Extension. Will be used as a proxy to indicate water quality at the PWS.	Visual, olfactory, in-situ and extractive
SW4	Allt Bhlaraidh	237798	816887	Location will capture potential impacts on water quality arising from works occurring in the upper catchment associated with Bhlaraidh Wind Farm Extension. Will be used as a proxy to indicate water quality at the PWS.	Visual, olfactory, in-situ and extractive
SW5	Allt Loch a Chrathalch	237423	817915	Location will capture potential impacts on water quality arising from works occurring in the upper catchment associated with Bhlaraidh Wind Farm Extension. Will be used as a proxy to indicate water quality at the PWS.	Visual, olfactory, in-situ and extractive
SW6	Allt Loch a Chrathalch	236830	819180	Monitoring location will capture potential impacts from the temporary construction compound to be located near the existing Bhlaraidh Wind Farm compound in the north of the catchment area. Also includes sections of an existing access track to be used in construction.	Visual, olfactory, in-situ and extractive
SW7	Trib. into Loch Carn Tarsuinn	238203	821569	Monitoring location will capture potential impacts from the construction of turbines T01 and T06 as well as the new access track that will link these to the already built access track to the Existing Bhlaraidh Wind Farm. The nearest infrastructure to potentially influence this monitoring point will be T01 and the connecting access track.	Visual, olfactory, in-situ and extractive
SW8	Outlet to Loch Carn Tar. Beag	238597	820009	Monitoring location will capture potential impacts from the construction of turbines T07 and T08 as well as the new access track that will link these to the already existing access track of Bhlaraidh Wind Farm. This location will also monitor any influence from the planned upgraded access track running along the south towards T09. The nearest infrastructure to potentially influence this monitoring point will be the upgraded access track approx. 30 m to the south.	Visual, olfactory, in-situ and extractive
SW9	Trib. into Loch na Feannaig	239421	820368	Monitoring location will capture potential impacts from the construction of turbine T09 and the connecting planned upgraded access track. The nearest infrastructure to potentially influence this monitoring point will be T09.	Visual, olfactory, in-situ and extractive
SW10	Trib. into Loch na Feannaig	239557	820395	Monitoring location will capture potential impacts from a large proportion of the planned development area with the construction of turbines T04, T05, T10, T12 & T15 having potential influence into the monitoring point. The construction of a batching plant area and substation will also potentially influence this monitoring point. Impacts from access track construction connecting all these points of infrastructure will also be monitored from this monitoring point. The nearest infrastructure to potentially influence this monitoring point will be T10.	Visual, olfactory, in-situ and extractive
SW11	Allt Carn Choire Rainich	240598	820280	Monitoring will capture potential impacts from turbine T17 and potential borrow pit locations. Closest infrastructure to this monitoring point will be T17.	Visual, olfactory, in-situ and extractive
SW12 (Control)	Trib. into Loch na Feannaig	241199	820547	Monitoring location located within the red line boundary, but catchment area does not contain any proposed infrastructure. The catchment characteristics are comparable with the selected monitoring locations and on the same river as two of the other monitoring locations allowing comparisons to be drawn. There are no identified influences from adjacent wind farms or other developments.	Visual, olfactory, in-situ and extractive
SW13	Unnamed WC in Coire Liath	240995	820026	Monitoring location SW13 will capture potential impacts from the northern and eastern development area.	Visual, olfactory, in-situ and extractive
SW14	Allt Saigh	241117	819870	Monitoring location SW14 will capture potential impacts from most of the development area with only the temporary compound area not being within the impacted watershed. The nearest infrastructure will be T16.	Visual, olfactory, in-situ and extractive
PWS Monitoring Locations					
PWS1	Bhlaraidh Wind Farm	236889	820317	The PWS is supplied by a borehole that is located 105m from Development infrastructure (the temporary construction compound).	Visual, olfactory and extractive
PWS2	Briarbank	245574	819178	The PWS is supplied by a surface water abstraction on the Allt Saigh watercourse, which drains catchments containing Development infrastructure.	Visual, olfactory and extractive

5.4. Water Monitoring Methods

5.4.1. Surface Water Monitoring Methods

5.4.1.1. VISUAL AND OLFACTORY INSPECTION

During the construction phase of the Development, as per Item 1 in Table 5.1, the ECoW, will carry out a visual check of the watercourses within the Development site for the following:

- Discolouration;
- Cloudiness;
- Olfactory (hydrocarbon odour); and
- Algal blooms.

Visual inspections will include an assessment from the riverbank of the condition of the water, with photographic records taken, facing upstream and downstream of the monitoring point, for reference. The following should be recorded:

- Precipitation (last 24 hours);
- Catchment construction activity;
- Vegetation;
- Bank condition;
- Oil presence;
- Visual colour observations (clear to very dark);
- Visual turbidity observations (clear (no visible siltation) to opaque (significant siltation));
- Flow condition (ranging from dry to very fast); and
- Water levels (ranging from dry to very high (out of bank)).

Where any higher risk activities are being undertaken that may result in a pollution incident in the vicinity of nearby watercourses, such as concrete pouring, stockpiling of materials, refuelling, felling and any in-channel works, visual inspections will be focussed in these areas and immediately downstream by the ECoW, or other nominated person, during the supervision of these works.

If any of the visual inspection checks during construction indicate a potential pollution incident, onsite sampling will be undertaken at these specific locations to help identify the source and type of contamination and inform the corrective/remedial actions.

Should a construction related incident be identified, construction should cease until the problem is identified and isolated. Following discovery of incident, SEPA should be informed on their pollution hotline number (0800 80 70 60) and mitigation measures implemented (e.g., placement of additional silt traps, check dams, diversion of runoff or other pollution responses) to ensure that no further effects can occur. Further details on emergency response will be provided in the CEMP.

Aside from the detail above during the construction phase of the Development visual information will be collected during each phase of the water quality monitoring programme. Visual field monitoring will include the following:

- Field measurements of parameters listed in Table 5.3;
- Date and time of monitoring and name of person undertaking monitoring;
- Construction activities occurring in the catchment areas of the monitoring location;
- Rainfall and weather conditions preceding and during monitoring;

- Observations of flow rate (high, moderate, or low compared to baseline/steady state at comparative time of year) and any visual/olfactory observations on water quality or potential pollution;
- Whether any samples have been taken for laboratory analysis; and
- Whether site management are to be informed of pollution concerns.

A pro-forma will be developed prior to the commencement of monitoring to ensure consistency of data recording and ease of reporting.

5.4.1.2. IN-SITU MONITORING

In-situ handheld monitoring, as per Item 2 in Table 5.1, will be undertaken by a nominated person trained in the use of the handheld equipment.

The following parameters will be monitored using the handheld equipment:

- pH;
- Electrical Conductivity;
- DO;
- Turbidity; and
- Temperature.

The use of handheld water quality monitors allows for the collection of instantaneous water quality, providing a real-time indication of water quality in the sampled watercourses.

The in-situ monitoring equipment is calibrated on a regular basis in order to maintain accuracy of the data being recorded. Text will be added to the monitoring reports which confirms that the equipment was in calibration during the data collection period, and that certificates can be provided upon request.

The results of the in-situ sample collection will be captured using an App which transfers data from the field to the office using mobile data. This pre-determined form will be used in conjunction with the visual monitoring indicators described above. This will provide additional information which can be put into context with the conditions at the time of sample collection to fully appreciate the effects of natural climatic fluctuations on water quality as well as the influence of construction activities. If high values or exceedances of baseline criteria are identified from the in-situ monitoring and / or Visual Turbidity and Colour observations, the sampler will investigate the runoff sources entering the watercourses in order to identify the cause of the exceedance.

5.4.1.3. WATER SAMPLE COLLECTION (EXTRACTIVE)

Water sample collection, as per Item 3 in Table 5.1 will be followed in accordance with sample collection methods for surface water sampling. Water samples are collected using an extendable pole (up to 3 m) with a beaker attached to the end. Collecting samples in such a manner ensures that the sampler is away from the bank edge and does not need to enter the watercourses. All samples will be dispatched to the laboratory, under chilled conditions accompanied with the relevant chain of custody documentation. All samples will be dispatched to the laboratory within 48 hours of being collected. The UKAS accredited laboratory will analyse the collected water samples for the parameters outlined in Table 5.4.

Sampling should be undertaken under a range of flow conditions, such as immediately after a period of heavy rainfall and after a period of no to minimal rainfall, in order to collect a representative dataset.

Table 5.4: Surface water laboratory analysis list

Item	Parameter	Detection Limit	Technique
1	Dissolved Organic Carbon (DOC)	1 mg/L	OX/IR
1	DOC	0.1 mg/L	NDIR Analyser
2	Chemical Oxygen Demand (COD)	2 mg/L	Reflux oxidation followed by colorimetry
3	Iron	4 µg/L	ICP/MS (filtered)
4	Aluminium	1 µg/L	ICP/MS (filtered)
5	Chloride	0.15 mg/L	Discrete Analyser
6	Nitrate (NO_3)	0.5 mg/L	Discrete Analyser
7	Phosphate (PO_4)	62 µg/L	Discrete Analyser
8	Total Suspended Solids (TSS)	2 mg/L	Gravimetric Analysis
9	Ammonia (Amm. Nit.)	15 µg/L	Discrete Analyser
10	Total Petroleum Hydrocarbons - Carbon Working Group (TPH-CWG)	0.01 mg/L	GC/MS
11	Benzene, Toluene, Ethylbenzene, Xylene & MTBE (BTEX)	1 µg/L	GC/MS

In addition to the laboratory suite listed above, a number of parameters will also be measured in the field prior to sampling. These will include the following:

- pH (Units);
- Electrical Conductivity (µS/cm);
- DO (mg/l);
- Turbidity (NTU); and
- Temperature (°C).

5.4.2. PWS Monitoring Methods

5.4.2.1. VISUAL AND OLFACTORY INSPECTION

Visual information will be collected to supplement the extractive monitoring during each phase of the water quality monitoring programme. Visual and olfactory field monitoring will include recording of the following:

- Date and time of monitoring and name of person undertaking monitoring;
- Construction activities occurring within the catchment areas of the monitoring location / potential pollution sources (if applicable);

- Rainfall and weather conditions preceding and during monitoring;
- Flow rate and water level compared to baseline / steady state at comparative time of year;
- Visual presence of hydrocarbons i.e. visible sheen
- Olfactory evidence of impacts e.g. hydrocarbon or sulphurous odours;
- Visual turbidity;
- Colour and clarity;
- Any unusual observations and issues of material significance;
- Any additional information on tap or tank condition; and
- Photographs of source where applicable.

These observations will be recorded electronically. Providing such information ensures that results can be put into context with conditions at the time of sample collection to fully appreciate the effects of natural climatic fluctuations on water quality as well as the influence of construction activities (if applicable).

Should a construction related incident be identified, construction should cease until the problem is identified and isolated. Following discovery of incident, SEPA should be informed on their pollution hotline number (0800 80 70 60) and mitigation measures implemented (e.g., placement of additional silt traps, check dams, diversion of runoff or other pollution responses) to ensure that no further effects can occur. Further details on emergency response are provided in the CEMP and the PWSRA.

5.4.2.2. WATER SAMPLE COLLECTION (EXTRACTIVE)

Extractive samples will be collected for analysis on a monthly basis at the private water supply locations selected. Sterilisation of sample points, sampling equipment and the use of nitrile gloves is required for the collection of microbial water samples.

All samples will be collected and dispatched directly to a UKAS accredited laboratory (Scottish Water laboratory in Inverness) on the day of sampling. There is a standard turnaround of 10 working days to receive the results of the analysis. The laboratory will analyse the collected water samples for the parameters listed in Table 5.5.

Baseline sampling should be undertaken under a range of flow conditions, such as immediately after a period of heavy rainfall and after a period of no to minimal rainfall, in order to collect a representative dataset.

Table 5.5: PWS extractive parameter list

Item	Parameter	Detection Limit (units)
1	Alkalinity	7 mg/l
2	Ammonium	<0.04 mg/l
3	Chloride	2 mg/l
4	Coliform bacteria	N/A
5	E. coli	N/A
6	Enterococci	N/A
7	Colour	3 mg/l Pt/Co

Item	Parameter	Detection Limit (units)
8	Conductivity	10 µS/cm at 20°C
9	Aluminium (dissolved)	8 µg/l
10	Iron (dissolved)	6 µg/l
11	Manganese (dissolved)	2.0 µg/l
12	Lead (dissolved)	1.1 µg/l
13	Nitrite (NO_2)	0.020 mg/l
14	Hydrogen ion (pH)	pH value
15	Soluble reactive phosphate	18 µg/l
16	Sulphate	0.5 mg/l
17	Suspended solids	2 mg/l
18	Total organic carbon	0.5 mg/l
19	Total organic carbon (filtered)	0.5 mg/l
20	Nitrate (NO_3)	0.50 mg/l
21	Total oxidised nitrogen (TON)	0.50 mg/l
22	TON ratio	N/A
23	Total petroleum hydrocarbons (C8-C40)	<0.040 mg/l
24	Turbidity	0.3 NTU

5.5. Water Quality Assessment Criteria

Environmental quality standards (EQS) will be used as the assessment criteria (AC) along with baseline values to use as a benchmark for measuring the effectiveness of mitigation during the construction phase.

Further details of the EQS and baseline criteria are presented in the below sections. Exceedances of the AC and baseline may trigger the need for action or additional mitigation. “Trigger levels” are discussed further in Section 5.7.

5.5.1. Surface Water Environmental Quality Standards

As part of the assessment, results should be compared with reference to the Environmental Quality Standards (EQS) for freshwater rivers as provided by The Scotland River Basin District (Standards) Directions 2014[3] and Amendment Directions 2015[4].

The prescribed regulatory EQS will be used as an AC for each analyte (where available) and results which exceed the criteria or do not meet the minimum required value will be highlighted. For most parameters, the EQS is a maximum acceptable criterion. However, the EQS for pH requires it to remain between a minimum of 6 and a maximum of 9 units and for DO the EQS is a minimum of 7 mg/l.

In the absence of specific EQS relating to aluminium, turbidity, specific conductance, nitrate and phosphate in surface waters, results are benchmarked against drinking water standards to provide a point of comparison. Drinking water standards provide a conservative benchmark therefore slight or moderate exceedances of these standards may still be considered acceptable in surface waters.

There is currently no surface water EQS for TPH in Scotland. Whilst there are applicable EQS's for hydrocarbon indicator compounds such as benzene, toluene, ethyl benzene and xylene (BTEX), it is expected that such analytes would be absent given the remote and generally undeveloped nature of the catchments. Therefore, to provide a precautionary assessment approach, any concentration reported above their respective Limits of Detection (LoDs) will be considered a breach of the AC.

5.5.2. PWS Environmental Quality Standards

As part of the assessment, results should be compared with reference to the drinking water standards (DWS) as provided by The Public Water Supplies (Scotland) Regulations 2014)[5] and the Council Directive 98/83/EC of 1998 on the quality of water intended for human consumption[6].

The prescribed regulatory DWS will be used as an AC for each analyte (where available) and results which exceed the criteria or do not meet the minimum required value will be highlighted. For most parameters, the DWS is a maximum acceptable criterion. However, the DWS for pH requires it to remain between a minimum of pH 6 and a maximum of pH 9.

5.5.3. Baseline Criteria

Baseline values represent the "most adverse" or highest/lowest concentration of a particular determinant identified during the baseline monitoring period. The range of baseline values for pH will be presented for both maximum and minimum, while only a minimum value is required for DO.

To allow for the calculation of average baseline values where LoDs may be reported inconsistently, LoD concentrations will be interpreted as being an interval value lower than the stated LoD i.e., <0.25 mg/l is equal to 0.249 mg/l. This then allows for a more representative baseline value to be calculated.

[3] The Scottish Government (2014), Environmental Protections, The Scotland River Basin District (Standard) Directions 2014, https://www.gov.scot/publications/scotland-river-basin-district-standards-directions-2014/ [accessed 15/09/2022]

[4] The Scottish Government (2015), Environmental Protection, The Scotland River Basin District (Standards) Amendment Directions 2015, https://www.gov.scot/publications/scotland-river-basin-district-standards-amendment-directions-2015/ [accessed 15/09/2022]

[5] The Scottish Government (2014), The Public Water Supplies (Scotland) Regulations 2014, https://www.legislation.gov.uk/sdsi/2014/9780111024782/contents [accessed 20/06/2022]

[6] The Scottish Government (2020), COUNCIL DIRECTIVE 98/83/EC of 3 November 1998 on the quality of water intended for human consumption, https://www.legislation.gov.uk/eudr/1998/83 [accessed 20/06/2022]

5.6. Monitoring Frequency & Duration

All water monitoring shall be undertaken monthly, apart from ad-hoc daily or weekly visual monitoring undertaken by the ECoW. Additional in-situ and extractive monitoring may also be undertaken on an ad-hoc basis in response to any discrete events e.g. a pollution incident.

5.6.1. Baseline (Pre-construction)

Baseline monitoring will comprise of all monitoring locations and all parameters as detailed in Section 5. The surface water monitoring shall occur over a period of 12 months prior to the commencement of construction. All watercourse monitoring locations will be collected for in-situ and laboratory analysis, on a monthly basis, during the baseline (pre-construction) phase. PWS baseline monitoring shall occur in the construction break after enabling works are completed, but prior to commencement of the main phase of the construction works. All PWS monitoring locations will be collected for laboratory analysis, on a monthly basis during the baseline (pre-construction) phase.

5.6.2. Construction

During the main construction phase daily visual checks of the water management features and downstream hydrological features will be undertaken by the ECoW when construction activities (i.e., ground-breaking and or erection works) are within 500 m or upstream of a monitoring location.

All watercourse and PWS monitoring locations will be visited for in-situ and laboratory analysis on a monthly basis during the main construction phase.

Additional monitoring will be undertaken in the event that a potential pollution incident is reported during any of the weekly checks by the ECoW.

It is expected that only ad-hoc visual monitoring would take place in the intervening period between the completion of the enabling works and commencement of the main construction phase. During this period in-situ or extractive monitoring would be undertaken in the event that any such ad-hoc visual monitoring trigger / action levels require it (see Section 5.7).

5.6.3. Post-Construction

All watercourse and PWS monitoring locations will be collected for in-situ and laboratory analysis for a period of up to 12 months at which point the results will be evaluated. The frequency of monitoring will be subject to the results recorded during construction, with samples collected monthly or every two months. It is envisaged that if there is no prolonged impact noted as a result of the construction of the Development that the monitoring would be completed following this 12-month period. The need to extend the monitoring will be discussed and approved with the relevant parties.

5.7. Trigger / Action Levels

Trigger levels refer to actions which must be taken in the event of an environmental incident that may affect surface watercourses or PWSs. Trigger level actions could be required following the reporting of an incident by the Principal Contractor, the Developer, the ECoW etc. These may also be required following the identified exceedance identified during visual, in-situ or extractive monitoring.

In the event of a potential incident the Principal Contractor's Site Manager and the ECoW would undertake a preliminary assessment to decide whether an incident requires an immediate stop to works. This should be undertaken as soon as possible following an incident being reported. In the event of a stop to works, a proportionate investigation should be undertaken to determine the cause for the impact and complete actions to minimise / mitigate any effects by following the Emergency Contingency Measures outlined in the CEMP and Pollution Prevention Plan.

Communication of any incident potentially affecting a watercourse and / or a PWS should be undertaken by the Developer or delegated representative as soon as possible. Depending on the scale of the incident, THC and SEPA may also need to be notified.

It is not proposed that the results of monitoring would trigger suspension of the construction works unless the results of the assessment have indicated a high risk to water quality if work was to continue. Events that may indicate a possible need to suspend the works are:

1. If any single monitoring result is significantly elevated above the normal baseline concentration;
2. Concerns raised by stakeholders / PWS owners that are subsequently investigated and validated by the ECoW as to any reported impacts on a watercourse or PWS;
3. Unusually low water levels are recorded or are flagged by stakeholders / PWS owners; and
4. Monitoring shows a trend of increasing Development-related contamination, indicating that an unacceptable level is likely to be reached should work continue.

Where exceedances have been recorded, a re-test of the samples may be requested, or confirmatory samples collected for confirmation of water quality degradation. This protocol should be included to avoid unnecessary cessation of site works on the basis of single results.

Should works be suspended as a result of the adverse monitoring results, the source of the problem would be investigated with emergency monitoring being undertaken and will continue whilst mitigation measures are being implemented. The duration of emergency monitoring will be determined based on the severity of the incident and following consultation with the Principal Contractor and the ECoW, and works would resume on consultation and approval from the regulator.

5.8. Reporting & Contingency

The following reporting regime will be implemented for the water quality monitoring programme:

- Baseline surface water quality report following collection of 12 months pre-construction dataset;
- Baseline PWS report following collection of the pre-construction dataset;
- Monthly combined surface water and PWS reports during the construction period;
- Final surface water and PWS construction report will provide an overall summary of water quality during the construction phase, prior to entering the post-construction phase of water quality monitoring; and
- Post-construction surface water and PWS report following collection of 12 months data.

It is expected that regular communication between the EcoW and the WQM consultant will assist in the preparation of the monthly report as well as targeted laboratory sampling in the week(s) ahead. Laboratory and monitoring results shall be assessed for trends with regards to baseline levels and the control location results. Should these be exceeded, immediate contact shall be made with the ECoW to inform of the situation so they can take the appropriate action on site.

The monthly construction reports will consider all field monitoring and results of the laboratory analysis completed in that period. Reports shall describe how the results compare to the baseline data as well as the previously collected construction period water quality data. The maximum (e.g. Total Suspended Solids), minimum (e.g. DO) or upper and lower limit range (e.g. pH) observed during baseline is used as a threshold limit. Results will be provided in a table and will be highlighted if they are noted to exceed the site-specific baseline criteria and they are also compared to applicable water quality standards. The reports will also detail any deterioration or improvement in water quality which has been observed and whether any effects are attributable to construction activities and, if so, what remedial measures or corrective actions have been implemented. Results are compared with seasonal trends and with reference to; local rainfall data, the control catchment characteristics, and maximum limits observed. Graphs will be presented displaying the entire dataset, from baseline through to construction, then post-

construction. These will be presented in the appendix of the report and will allow for the longer-term trends to be observed across all monitoring locations.

The baseline, monthly construction reports, and final construction report will detail a summary of all field monitoring and laboratory analysis results for respective development phases. Any significant results and observations will be communicated as soon as possible by the relevant personnel to the onsite team (during construction).

Watercourse pollution incidents are preventable and a pro-active water quality monitoring campaign (inclusive of visual inspections, sampling, and reporting) alongside the development and implementation of mitigation measures will ensure the water environment does not suffer any adverse impacts as a result of the Development.

In line with available guidance, good practise measures would be employed to ensure a comprehensive coordinated approach to the management of the hydrological aspects of the Development and the surrounding environment.

6. Fish Monitoring Plan

6.1. Introduction

This section outlines the proposals for monitoring fish populations in watercourses potentially affected by the Development. The fish monitoring plan includes:

- Watercourses and reaches to be surveyed for fish populations;
- Location of control sites;
- Period in which fish population surveying can be undertaken;
- Detailed methodology for fish population field surveys and data management.

6.2. Monitoring Requirements

In line with Planning Condition 29, fish populations must be surveyed within 12 months of the commencement of construction (pre-construction surveys), during construction works, and within 12 months of the conclusion of construction (post-construction surveys). The purpose of the monitoring is to detect any changes in fish populations in watercourses potentially impacted by the construction of the Development.

The target species of the fish monitoring plan are Atlantic salmon Salmo salar and brown/sea trout S. trutta, however other fish species of conservation interest (e.g., brook lamprey Lampetra planeri, river lamprey L. fluviatilis, sea lamprey Petromyzon marinus, and European eel Anguilla anguilla) may be encountered during the surveys.

All monitoring shall be undertaken in line with the general guidelines in the Marine Science Scotland generic monitoring programme for monitoring watercourses in relation to onshore wind farm developments[7].

During each survey (pre-construction, construction, post-construction), fish populations will be enumerated using fully quantitative electrofishing methodology (as detailed in Section 6.4.4.2), and a general description of fish habitat (e.g., substrates, flow, width, depth, in-stream cover) will also be completed (further details in Section 6.4.3 below). The information obtained from these surveys will

[7] Scottish Government (2018), Marine Scotland Science, Generic monitoring programme for monitoring watercourses in relation to onshore wind farm developments, https://www.gov.scot/publications/monitoring-watercourses-in-relation-to-onshore-wind-farm-developments-generic-monitoring-programme/ [accessed October 2022]

provide information on fish habitat availability and the composition of the fish community which can be compared between surveys.

6.3. Fish Monitoring Locations

Fish population and habitat surveying will be undertaken at 10 reaches on 7 watercourses (Table 6.1, Appendix C). These include eight sites potentially impacted by the Development and two sites on a control watercourse. Candidate watercourses for sampling were identified using a combination of existing information on fish populations in the Development boundary, aerial imagery and Ordnance Survey mapping.

The exact locations of survey reaches on the watercourses were determined during the baseline fish population monitoring survey in September 2022. The identified reaches were considered to be representative of the watercourse as a whole and provided suitable habitat for salmonids (i.e., Atlantic salmon and brown/sea trout), as these are the target species of electrofishing and the monitoring programme.

The control watercourse, Allt Coire Liath, is a tributary to Allt Saigh. This watercourse was identified as a suitable control watercourse as it is located in the same catchment as the potentially impacted watercourses, is of a similar size and has similar characteristics to the other watercourses (e.g., a minor tributary to Allt Saigh that includes minor lochs in its upper reaches).

The same watercourses and reaches will be surveyed throughout all phases of the Development to ensure consistency between surveys and allow for results to be compared between surveys.

Visual monitoring of water quality will be undertaken during construction by the ECoW, which will allow for any potential significant pollution events (e.g., chemical or sediment) to be identified and addressed. Any such events will be recorded to aid in interpretation of fish habitat and population surveying results.

Table 6.1: Proposed electrofishing and fish habitat survey sites

Site Code	Grid Reference (downstream)		Watercourse	Notes
	Easting	Northing		
Potentially Impacted Sites				
AS1	240549	819862	Allt Saigh	Furthest downstream of all potentially impacted sites.
AS2	240013	820221	Allt Saigh	150m downstream of Loch na Feannaig outlet.
AS3	238844	820042	Allt Saigh	Upstream of Loch an Dubhair.
CR1	240596	820283	Allt Carn Coire Rainich	Near confluence with Allt Saigh.
LL1	239554	820401	Loch Liath outflow	Furthest downstream site, near inlet to Loch na Feannaig.
LL2	239666	821110	Loch Liath inflow (west)	Near inlet to Loch Liath.
LL4	239803	820954	Loch Liath inflow (east)	Near inlet to Loch Liath.

RD1	238473	820591	Lochan an Ruighe Dhuibh outflow	Downstream of Lochan an Ruighe Dhuibh.
Control Sites				
ACL1	n/a	n/a	Allt Coire Liath	Downstream site, near confluence with Allt Saigh.
ACL2	n/a	n/a	Allt Coire Liath	Upstream site, close to Loch Liath outlet.

6.4. Fish Population and Habitat Surveying Methodology

6.4.1. Monitoring Frequency

6.4.1.1. PRE-CONSTRUCTION SURVEYS (BASELINE SURVEYING)

Pre-construction surveys will be undertaken in the 12 months prior to the commencement of construction. The results from these surveys will provide baseline information about fish community composition, fish population size and instream habitat conditions. Information collected to inform the EIAR may also be used to establish the baseline but should not be a complete replacement for pre-construction surveys.

6.4.1.2. CONSTRUCTION SURVEYS

Fish population and habitat surveys will be undertaken during construction. If the construction programme is expected to last for several years, annual surveys during the length of the programme are recommended[8].

6.4.1.3. POST-CONSTRUCTION SURVEYING

Post-construction surveys will be undertaken in the 12 months following the completion of construction. The results from these surveys will be compared to the pre-construction and construction survey results so that comparisons can be made between the availability of fish habitat and fish population size.

6.4.2. Fish Population Surveying

At each of the survey reaches, a fully quantitative fish population survey will be undertaken, following relevant guidance (e.g., National Electrofishing Programme for Scotland[9], Scottish Fisheries Co-Ordination Centre[10]).

Where possible, fully quantitative surveying (i.e., multi-pass electrofishing) should be undertaken, as this survey methodology provides the most accurate estimates of fish density. Where fully quantitative surveying is not possible (e.g., watercourse is very small with a low capture of fish), semi-quantitative surveying may be undertaken which provides a minimum estimate of fish density for the reach. Semi-

[8] Scottish Government (2018), Marine Scotland Science, Generic monitoring programme for monitoring watercourses in relation to onshore wind farm developments, https://www.gov.scot/publications/monitoring-watercourses-in-relation-to-onshore-wind-farm-developments-generic-monitoring-programme/ [accessed October 2022]

[9] Scottish Government (2019), Electrofishing Programme for Scotland: Standard Operating Procedures Field Data Collection Protocol

[10] Scottish Fisheries Co-Ordination Centre (2021), Training Manual Team Leader Electrofishing

quantitative surveying is less accurate than fully quantitative surveying and the density estimates are not accompanied by confidence limits.

Electrofishing as a survey method targets salmonids and therefore surveys should be timed to avoid the salmonid spawning and emergence seasons. For salmonids in Scotland, the generally accepted electrofishing season is from July to September inclusive, with a preference for surveying in late summer or early autumn.

As capture efficiency of fish varies based on fish size, all three surveys for the Development should ideally be undertaken in the same month of each year, to minimise the impact of different capture efficiencies on the results of the surveys.

Following standard guidance, an electrofishing team should be composed of at least two people, preferably three. The team must include at least one qualified Electrofishing Team Leader and at least one additional experienced member of the team. The team leader must hold a current licence from Marine Scotland to undertake the survey.

6.4.2.1. FULLY QUANTITATIVE ELECTROFISHING

Fully quantitative electrofishing involves completing at least three electrofishing passes in a delineated reach. The electrofishing reach should cover a minimum area of 100m^2 or be 50m in length (for very narrow watercourses), whichever results in the shorter reach length. Upstream and downstream coordinates should be recorded for each reach.

The reach should reflect the range of habitats present in the wider watercourse and upstream and downstream extents should be situated at natural breaks in the watercourse (e.g., at the top of a riffle and not in the middle of a pool).

Stop nets should be placed at the upstream and downstream extent of the survey reach to prevent fish from entering or leaving the survey reach.

The reach should be fish in a downstream to upstream direction. Captured fish should be collected with nets and transferred to holding buckets for processing.

6.4.2.2. SEMI-QUANTITATIVE ELECTROFISHING

For semi-quantitative surveying, the same protocols should be undertaken as for fully quantitative sampling, but only one electrofishing pass is completed.

6.4.2.3. FISH PROCESSING

Following the completion of all electrofishing passes, all collected fish should be identified to the lowest taxonomic level possible and measured. All fish collected should be measured to fork length (or total length for European eel and lamprey species) to 1 mm accuracy.

Fish species and lengths should be recorded on field sheets, making clear which fish were captured in which pass.

After processing, all fish should be returned to the reach in which they were captured.

6.4.3. Fish Habitat Survey

At each reach surveyed for fish populations, habitat characteristics should be recorded. The parameters measured should characterise important aspects of fish habitat, particularly for salmonids, including:

- Physical characteristics (e.g., wetted width, bed width, bank width);
- Depth;

- Substrate composition (e.g., estimated proportions of silt, sand, gravel, pebble, cobble, boulder, bedrock, artificial substrate);
- Substrate stability and compactedness;
- Flow types (e.g., estimated proportions of pool, slack, glide, run, riffle, torrent/cascade);
- Availability of fish cover (e.g., undercutting, overhanging vegetation, roots, rocks);
- Riparian vegetation cover and complexity;
- Land use; and
- Any other significant features (e.g., point source pollution, nearby obstacles to migration, significant physical alterations).

Habitat characteristics should be recorded by suitably trained and experienced ecologists and should follow standard methods for describing fish habitat (e.g., Scottish Fisheries Co-Ordination Centre (SFCC) general electrofishing habitat survey[11]).

Significant events that may affect fish habitat should be recorded at each site. Such events could be natural (e.g., drought or prolonged high flows) or anthropogenic (e.g., pollution events).

6.4.4. Data Analysis and Reporting

For all salmonids collected during surveys, population size should be calculated using standard metrics including:

- Zippin model[12];
- Carle & Strub[13];
- Minimum density estimate (fish/100m^2 using wetted stream width).

For all non-salmonid fish, the total number caught in the survey should be reported.

The Zippin and Carle & Strub estimates both calculate fish population size using depletion sampling, and therefore require data obtained from fully quantitative surveys (minimum three electrofishing runs). Confidence intervals (95%) should also be calculated for both the Zippin and Carle & Strub estimates.

If fully quantitative surveying is not possible, then single-run electrofishing data can be used to calculate a minimum density (fish/100m^2) for the site. If semi-quantitative surveying is not possible then a total number of fish collected can be reported, but this is the least preferable metric of fish population and all efforts should be made to complete semi-quantitative or fully quantitative surveying.

Salmonid population size should be calculated for both fry and parr. For the purposes of reporting, fry refers to all fish in the first year of their life (age 0+) and parr refers to all fish aged at least one year and older (age 1++). If any smolts (Atlantic salmon or sea trout leaving freshwater to migrate to sea) are collected, these should be noted on field sheets.

The following reports will be produced:

- Baseline report following pre-construction surveys;
- Survey report following each survey completed during construction;

[11] Scottish Fisheries Co-Ordination Centre (2021), Training Manual Team Leader Electrofishing

[12] Zippin, G. (1956). An evaluation of the removal method for estimating fish populations. Biometrics 12, 163-189

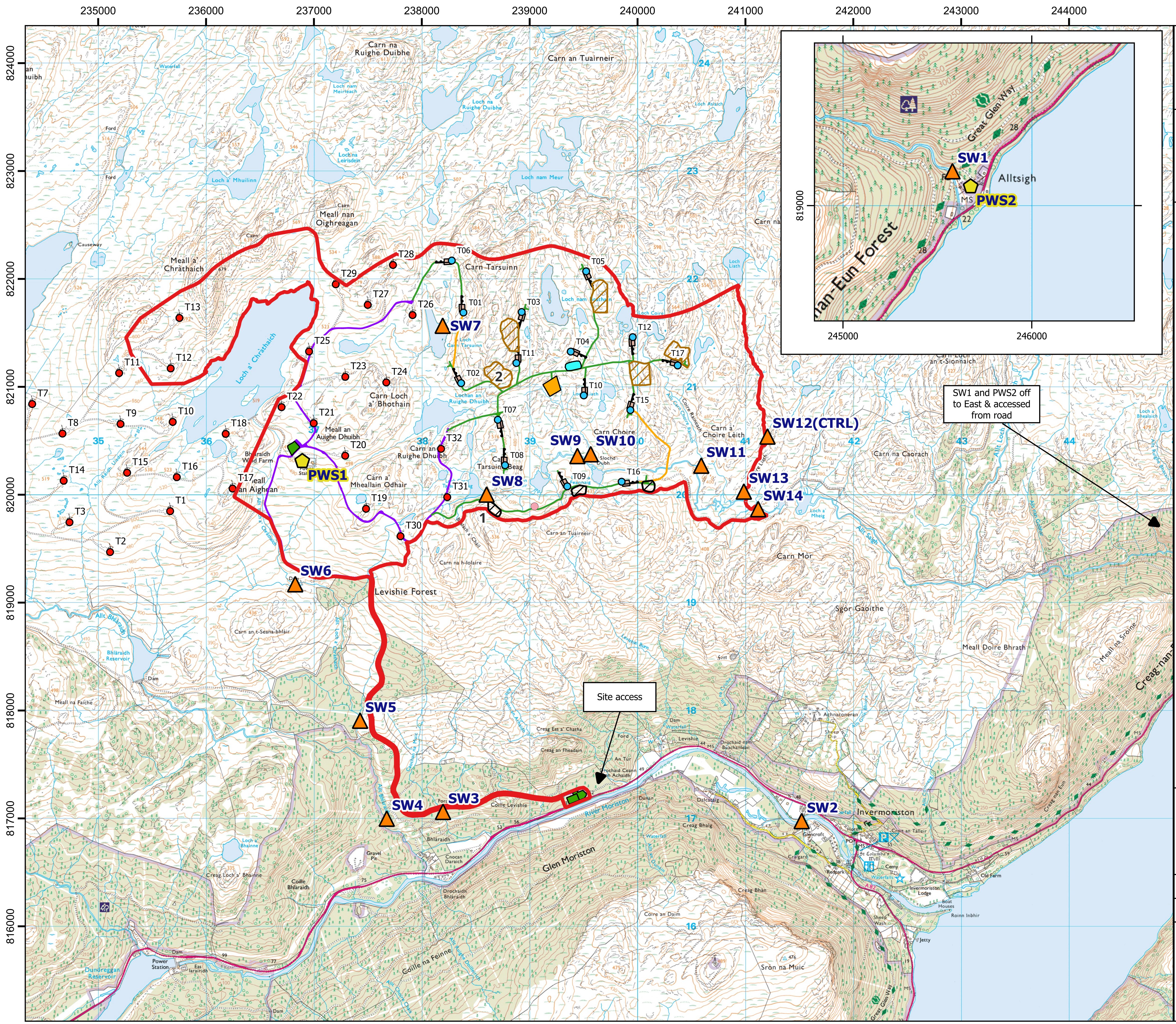
[13] Carle, F.L., and Strub, M.R. (1978). A new method for estimating population size from removal data. Biometrics 34, 621-830.

- Final report presenting the results of the post-construction survey and an interpretation of any trends observed between the baseline, construction and post-construction surveys.

Any significant results (e.g., significant changes in habitat or fish densities) will be communicated to the Developer and Client immediately, in advance of detailed reporting.

The result of water quality monitoring (as contained in baseline reports, monthly construction reports, post-construction report, Section 5.8) should be used in interpretation of fish population and habitat surveying to aid in interpreting any observed trends.

Appendix A: Water Quality Sampling Map



Project:

Bhlaraidh Wind Farm Extension, Highland

Title:

Water Monitoring Location & Layout Plan

Key

- Surface water monitoring location
- Private water supply monitoring location

Existing Wind Farm

- Phase 1 turbines
- Existing access tracks

Consented Extension Wind Farm

- Extension development boundary
- Phase 2 consented turbines
- LiDAR station
- Access track
- Cross country cable route
- Phase 2 crane pad
- Substation
- Borrow pit search area
- Hydro borrow pit search area
- Batching plant
- Temp. construction compound

Scale @ A3: 1:35,000

Coordinate System: British National Grid

0 0.5 1 1.5 2 km

N

Date: 20-06-24	Prepared by: EM	Checked by: PM

Ref: GB204104_M_001_H	Layout: 080722_15t_A

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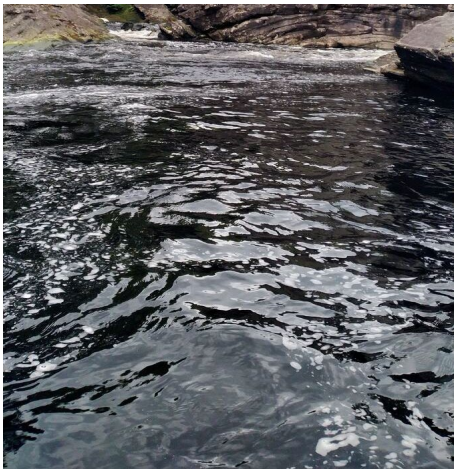
Appendix B: Field Notes

Surface Water Quality Monitoring Locations (July 2022)

SW01	Date/Time: 2022-07-27 19:22:00

Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Fast
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW02	Date/Time: 2022-07-27 18:54:00

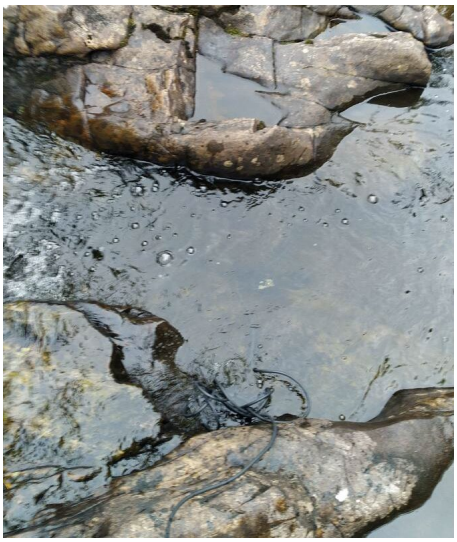


Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW03	Date/Time: 2022-07-27 18:16:00

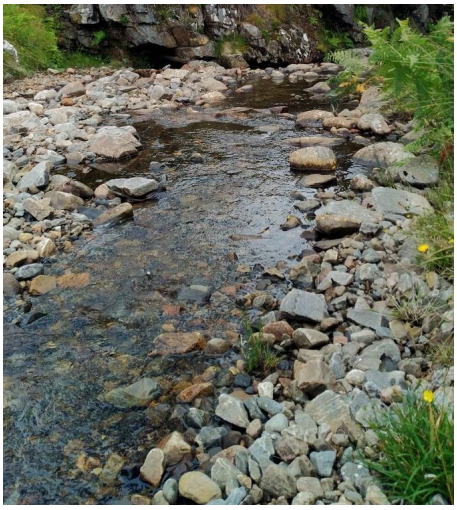
Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Thickly vegetated banks (overhanging/partially in channel)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW04	Date/Time: 2022-07-27 17:52:00



Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Thickly vegetated banks (overhanging/partially in channel)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW05	Date/Time: 2022-07-27 17:28:00



Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

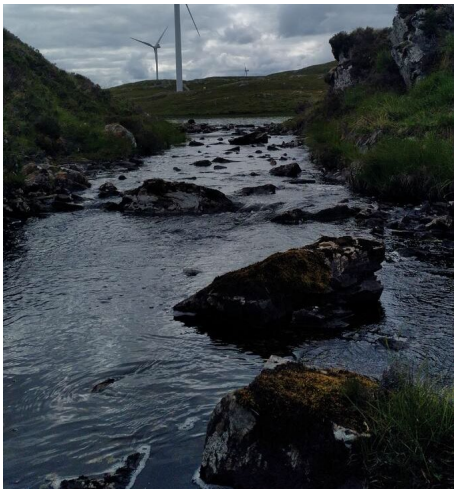
SW06	Date/Time: 2022-07-27 17:10:00

Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW07	Date/Time: 2022-07-27 17:20:00

Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW08	Date/Time: 2022-07-27 16:43:00



Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

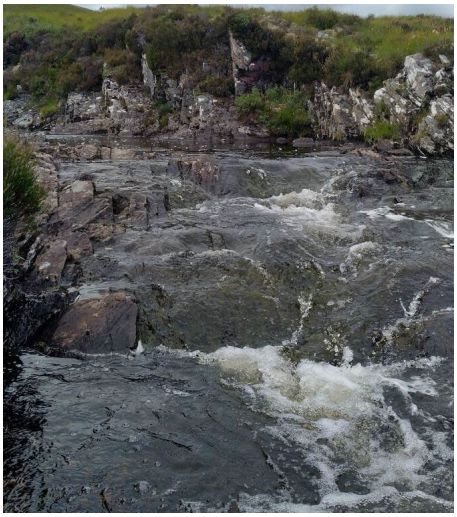
SW09	Date/Time: 2022-07-27 16:21:00

Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW10	Date/Time: 2022-07-27 16:09:00

Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Thickly vegetated banks (overhanging/partially in channel)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW11	Date/Time: 2022-07-27 15:33:00



Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW12	Date/Time: 2022-07-27 15:56:00

Weather Conditions:	Light Showers
Catchment Activity:	Control
Flow Conditions:	Slow
Water Levels:	Moderate
Vegetation (bed/banks):	Thickly vegetated banks (overhanging/partially in channel)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	*Relocated to 241199,820547 from August 2022*

SW13	Date/Time: 2022-07-27 15:20:00

Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Thickly vegetated banks (overhanging/partially in channel)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

SW14	Date/Time: 2022-07-27 14:53:00

Weather Conditions:	Light Showers
Catchment Activity:	Baseline
Flow Conditions:	Moderate
Water Levels:	Moderate
Vegetation (bed/banks):	Standard (vegetated banks)
Bank Conditions:	Stable
Visual Colour Observations:	Clear
Visual Turbidity Observations:	Clear (No visible siltation)
Visible Oil:	No
Comments:	None

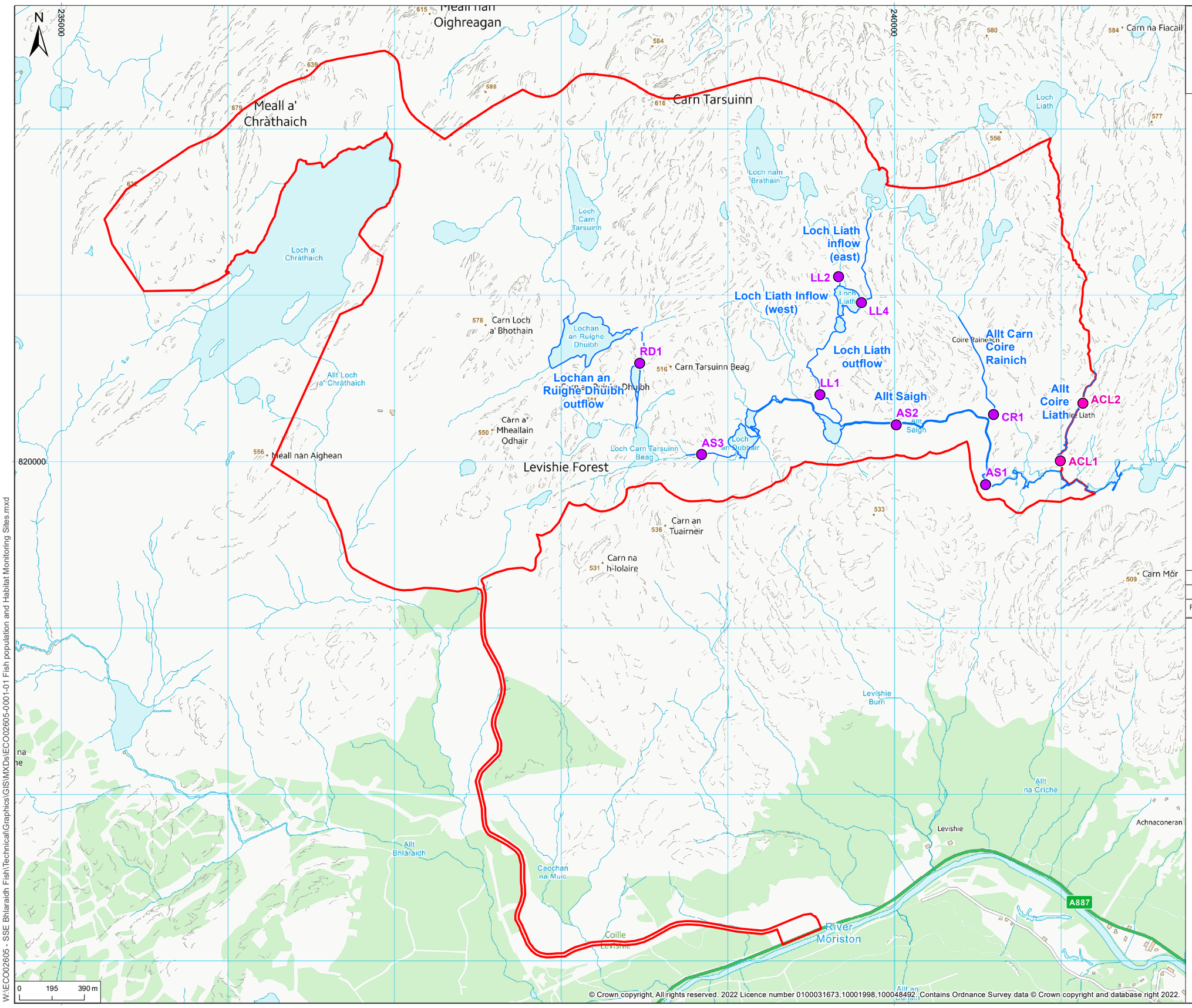
PWS Monitoring Locations (August 2024)

Photologs to be inserted following first monitoring visit scheduled for August 2024.

It is considered likely that PWS1 (Bhlaraidh Wind Farm Substation) will be monitored from the internal kitchen tap due to potential issues accessing the water supply prior to filtration and treatment. Borehole installation information is detailed in the PWSRA.

It is considered likely that PWS2 (Briarbank) will be monitored from an external tap (as discussed with resident). The Briarbank PWS has no filtration or treatment systems in place. Full survey notes are presented in the PWSRA.

Appendix C: Fish Population Monitoring Locations



Notes
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2. If received electronically it is the recipients responsibility to print to correct scale. Only written dimensions should be used.

Legend

- Development boundary
- Watercourse

Site type

- Control site
- Potentially impacted site

Rev	Description	By	CB	Date

MAKING COMPLEX EASY

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Client: SSE

Project: Bhlaraish Wind Farm

Title: Fish Population and Habitat Monitoring Sites

Status	Drawn By	PM/Checked By
DRAFT	DGH	NW

Project Number	Scale @ A3	Date Created
ECO02605	1:21,629	OCT 2022

Figure Number: **C.1**

Rev: -

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