
LIMEKILN WIND FARM

SPECIES PROTECTION PLAN

LIMEKILN WIND LTD



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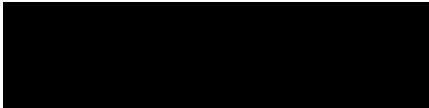
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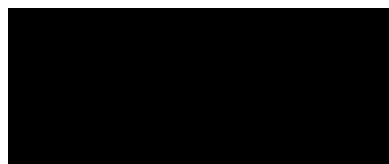
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EXECUTIVE SUMMARY

Nevis Environmental Ltd. (Nevis) has been commissioned in September 2019, by Limekiln Wind Ltd to undertake species specific surveys for otter, pine marten, water vole bats and aquatic ecology at the Limekiln Windfarm site and produce Species Protection Plans (SPPs) for each of the at risk species. The surveys and protection plan are required to discharge Condition 25 of the planning permission, for the construction of a wind farm at Limekiln in northern Scotland, hereafter referred to as the 'site'.

This SPP outlines the key legislation, mitigation measures, and emergency procedures that should be followed to protect protected species during construction, and has been produced in accordance with SNH guidance (SNH, 2019).

The SPP is designed to give on-site guidance as to the actions that should be taken to avoid impacting on any protected species, and what to do if a protected species should be unexpectedly encountered. The SPP will remain a live document, and an up-to-date copy is always to be kept on site.

The proposed development will result in the potential disturbance of otter, water vole, pine marten, bats, reptiles and aquatic ecology during the construction and operational phase of the development. Any potential impacts should be mitigated where possible by following the SPPs outlined in Section 3.

1. INTRODUCTION

1.1 BACKGROUND

Nevis Environmental Ltd. (Nevis) was commissioned by Limekiln Wind Ltd in September 2019 to undertake species specific surveys for otter, pine marten, water vole and bats, at Limekiln Windfarm (hereafter referred to as 'the site') and produce associated Species Protection Plans (SPPs). The surveys and protection plans are required to ensure that legislative requirements pertaining to protected species are upheld during construction and to discharge Condition 25 of the planning permission, for the development.

This SPP outlines the key legislation, mitigation measures, and emergency procedures that should be followed to protect protected species during construction, and has been produced in accordance with SNH guidance (SNH, 2019).

The SPP is designed to give on-site guidance as to the actions that should be taken to avoid impacting on any protected species, and what to do if a protected species should be unexpectedly encountered. The SPP will remain a live document, and an up-to-date copy will be kept on site.

1.2 SITE SUMMARY

The site is located at the Limekiln Estate, Caithness, Highland; approximately 1.5 km to the south of the village of Reay and 3 km south-west of the Dounreay Nuclear Power Station (central Ordnance Survey grid reference NC 98270 60620) in Caithness, northern Scotland. The site boundary covers approximately 1,140 ha.

The site comprises mainly commercial coniferous plantation, with an area of undulating moorland and semi-improved agricultural land to the north, coniferous woodland to the east and open moorland to the west and south. Higher ground is present around Beinn Ratha, with a height of 242 m AOD, which is located approximately 1.2 km west of the site.

The proposed development is to construct, and operate, 21 wind turbines with an installed capacity of 50 MW. The key infrastructure consists of:

- ✓ 21 wind turbines (15 with a maximum blade tip height of 139 m, and 6 with a maximum blade tip height of 126 m) with associated foundations and hard standings;
- ✓ onsite network of underground cables linking the turbines to a grid connection;
- ✓ onsite access tracks connecting each turbine location;
- ✓ onsite substation, if required, and control/maintenance building;
- ✓ two borrow pits;
- ✓ a new vehicular access from the A836 at the Bridge of Isauld;
- ✓ temporary works including a construction compound; and
- ✓ a permanent anemometer mast to measure wind speed and wind direction.

1.3 PLANNING REQUIREMENTS

Condition 19 of the Section 36 consent states that:

No development shall commence unless and until a Construction Environmental Management Plan (CEMP) outlining site specific details of all on-site construction works, post-construction reinstatement, drainage and mitigation, together with details of their timetabling, has been submitted and approved in writing by the Planning Authority. The CEMP shall include:

- ✓ **A Species Protection Plan;** and
- ✓ A Bird Protection Plan

In addition, Condition 25 of the Section 36 consent states that:

No development shall commence unless and until surveys have been carried out at an appropriate time of year for the species concerned, by a suitably qualified person, comprising:

- a) **Otter surveys at watercourses and adjacent suitable habitats and within a 250m radius of each wind turbine and associated infrastructure;***
- b) **Water vole surveys at watercourses and adjacent suitable habitats up to 200m upstream and downstream of watercourse crossings;***
- c) **Pine marten surveys at suitable habitats prior to tree felling, vegetation removal and dismantling of log and rubble piles***
- d) **Bat surveys between May and September to include surveys at all structures within 30m of proposed works;***
- e) **Breeding bird surveys, particularly for breeding waders and raptors, of any land upon which construction takes place, plus an appropriate buffer as agreed with the ECoW to identify any species within disturbance of construction activity (only required if construction work is carried out during the bird breeding season from 15th March to 31st August inclusive); and***
- f) **Electrofishing surveys at Sandside Burn and Achvarasdal Burn.***

The survey results and any mitigation measures required for these species on site shall be set out in species mitigation and management plan, which shall inform construction activities. No development shall commence unless and until the plan is submitted and approved in writing by the Planning Authority and the approved plan shall then be implemented in full.

This SPP includes the results of the pre-construction surveys and the required protection measures for protected species, and has been produced to meet the requirements of conditions 19 and 25 of the consent, and subsequently ensure that the project is compliant with its planning permission.

2. SURVEYS AND SITE ASSESSMENT

2.1 OBJECTIVES

The site assessment has been based on combination of baseline data from the Environmental Impact Assessment (2016) and pre-construction surveys undertaken between August 2019 and March 2020. The main objectives of the protected species surveys were to:

- ✓ gather detailed information on the European Protected Species (EPS) on site, namely bats and otter *Lutra lutra*; and
- ✓ assess the suitability of the site to support other protected species, including pine marten *Martes martes*, water vole *Arvicola amphibius*, freshwater pearl mussel *Margaritifera margaritifera* and other aquatic ecology including salmonid fish.

2.2 EXISTING SITE KNOWLEDGE

As part of the planning application, an Environmental Statement was produced and included an assessment of the proposed development on the available ecological receptors on site. Full details of methodologies and results can be found in 'Chapter 11: Ecology'.

The site lies near to several areas with statutory designations, all within 10 km. These include Caithness and Sutherland Peatland Special Area of Conservation (SAC) which has otter as a qualifying species.

Due to an absence of species records obtained through the baseline surveys underpinning the Environmental Statement, it was deemed unnecessary to undertake surveys for badger *Meles meles*, red squirrel *Sciurus vulgaris*, Scottish wildcat *Felis silvestris*, reptiles and amphibians.

2.2.1 OTTER

2011 Survey Results

The surveys found signs of otter activity, mainly comprising spraints, latrines and resting sites, along both Reay Burn and Achvarasdal Burn. Four resting sites were identified, all of which showed signs of use, and comprised of three above-ground lie ups and one underground holt. Examination of spraints during the survey and within the laboratory lead to the conclusion that the otter diet mainly consisted of salmonid fish and eels.

2.2.2 PINE MARTEN

2011 Survey Results

The original 2011 surveys identified a total of twenty-six pine martin scats throughout the site. No confirmed den sites were identified, one possible den was identified but the results of the scat DNA analysis was negative.

Suitable habitat for field voles *Microtus agrestis*, a main prey item for the pine marten, were identified as being located within the riparian buffer zones and some of the woodland rides. It was considered likely that these habitats would be the pine martens' main foraging areas.

2.2.3 BATS

2011 Survey Results

The bat surveys undertaken by Aquaterra Ecology in 2011 identified common pipistrelle *Pipistrellus pipistrellus* as the only bat species using the site and their low-level activity was predominantly located within the northern areas. One roost was identified on site which consisted of a small summer roost of males or non-breeding females. This was located in the north-west of the site at grid reference: NC 97352 62819.

All the trees within the survey area were assessed as having low bat roost potential. However, a few old and derelict buildings at Milton, situated on the proposed access route, were identified as having roost potential but no roosts were confirmed during the surveys.

There were no major commuting routes identified within the site boundary and activity in the northern areas commenced soon after sunset; it was therefore suggested that the site is used as a foraging area by common pipistrelle bats whose roost is likely located to the north of the site boundary.

2019 Survey Results

The dusk activity survey conducted by EnviroCentre Ltd in August 2019, of the confirmed roost, did not record any roosting bats at the time of the survey.

A total of five further structures, within 50 m of proposed works activity, were identified as having the potential to host roosting or over-wintering bats. One of these structures, the remnants of a homestead to the north of the site, was recorded as having 'moderate' to 'high' hibernation roost potential. Three buildings, located along the proposed access route at Milton, were identified as having potential to support roosting bats during the bat activity season. Full details can be found in Appendix A.

2.2.4 WATER VOLE

2011 Survey Results

Fourteen active water vole colonies were identified during 2011 surveys.

Six active colonies were found within the Reay Burn catchment:

- ✓ Two colonies on Reay Burn;
- ✓ One colony on an unnamed burn near Borag Knowe;
- ✓ One colony on Meur a' Chrochain Ghill;
- ✓ One colony on Meur an Fhraoich; and
- ✓ One colony on Meur an Fhuarain Ghil.

Eight active colonies were found in the Achvarasdal Burn catchment:

- ✓ Five colonies on Achvarasdal Burn;
- ✓ One colony on the burn draining Milton Moss;
- ✓ One colony on a small tributary to Archvarasdal Leans; and
- ✓ One colony on Allt Cnoc Fhraoich.

The colony identified on Allt Cnoc Fhraoich was located outside of the site boundary but is linked to the site by suitable water vole habitat.

Signs of water vole activity were also found to the north east of Milton Cottage within the main and side drainage channels. However, no signs of activity were found within 100 m of the proposed crossing point; which is located within a bedrock habitat that is unsuitable for water vole.

All of the signs of water vole activity were located along the watercourses and main drainage ditches. The minor ditches located within the plantation were deemed to be unsuitable.

2019 Survey Results

EnviroCentre Ltd found no signs of water vole within 250 m of all five proposed water crossings. Full details can be found in Appendix A

2.2.5 FRESHWATER PEARL MUSSEL

2011 and 2012 Survey Results

The surveys did not identify any freshwater pearl mussels within any of the watercourses that drain the site. However, the Reay Burn and Achvarasdal burn were considered to contain suitable habitat for freshwater pearl mussel, and the drainage channels located at Milton were deemed to be 'sub-optimal'. The tributaries to these burns were deemed to be unsuitable.

2.2.6 AQUATIC ECOLOGY

2011 Survey Results

The electric fishing surveys identified the presence of salmonids within both Reay Burn and Achvarasdal Burn and suitable larval lamprey habitat was located in Achvarasdal Burn.

A large population of trout species were found within the mainstem of Reay Burn where the habitat is considered suitable to support spawning. The upper reaches of Meur a Chrochain Ghill and Meur Fhraoich Ghill were found to be unsuitable for both trout species and European eels *Anguilla anguilla*, and thus both were only found in the lower reaches of these watercourses. The Reay Burn was deemed to be unsuitable to support a salmon *Salmo salmar* population due to its small width and low depth.

Achvarasdal Burn was found to have large sections of habitat suitable to support both trout and salmon. Despite this, the presence of salmon was only found at two survey sites; it was suggested by Caithness District Salmon Fishery Board (CDSFB) that this was due to “inter-annual variation of accessibility for spawning fish”. It was considered that the waterfalls at Achvarasdal are a barrier to migrating sea trout and salmon which cannot be surmounted in all years. Some brown trout *Salmo trutta* were observed upstream of these barriers and are considered to be resident. Several scattered areas of the lower gradient reaches were found to be suitable to support larval lamprey *Lampetra fluviatilis*; however, no lamprey were found during the survey and it was considered unlikely that they are present.

2019 Survey Results

EnviroCentre conducted electro-fishing on the Sandside, Achvarasdal and Reay Burn in August 2019, in order to update the 2012 baseline data. Salmon and brown trout were recorded in the Achvarasdal and Sandside Burns, with individuals at a variety of life stages being found.

Brown trout fry (0+) and parr (1++) were identified at all five survey sites. Based on the estimated population densities, three of these sites were classified as ‘moderate’ and two sites as ‘very low’ in the Scottish Fisheries Co-Ordination Centre (SFCC), classification system.

Salmon fry (0+) were not recorded in any of the survey areas. However, Salmon parr (1++) were recorded at all sites, except in the survey area located upstream of the waterfall barrier in Achvarasdal Burn. Based on the estimated population densities, two of these sites were classified as ‘low’ and two were classified as ‘very low’ in the SFCC classification system.

EnviroCentre Limited (2019) concluded that “it is very possible that successful spawning from migratory salmonids is not an annual occurrence” within Achvarasdal Burn and Sandside Burn. Their reasoning being that a combination of high tide and high flow within the watercourse is required to enable access and there are larger, more suitable, watercourses located nearby. It was suggested that the habitat within Achvarasdal Burn and Sandside Burn is particularly suitable for parr growth and development; which was evidenced with the majority of individuals of both salmon and trout, caught across all survey areas, being in the parr stage (1++).

Full details can be found in Appendix B

2.3 PRE-CONSTRUCTION SURVEYS

The windfarm construction will take a phased approach, with the phases outlined below:

- Phase 1 Felling - Keyhole – Mid March to August
- Ground Investigation – August 2020
- Phase 2 Felling & Construction – August - November 2022
- Operation (including commissioning) Summer/Autumn 2022

This SPP will apply through all stages of the windfarm construction from the initial felling through to the operation of the windfarm.

2.3.1 OTTER

Methods

The otter survey was undertaken in broad accordance with the approach detailed by Scottish Natural Heritage "Otters and Development" guidance document (Scottish Natural Heritage 2010) and Chanin, 2003.

The survey concentrated on watercourses and suitable terrestrial habitat present within 250m of turbine locations and infrastructure. A thorough check for otter signs (scats, footprints, slides) and resting places was undertaken by experienced ecologists.

The surveys were undertaken on 6th, 7th, 18th and 19th February 2020.

Results

No protected resting sites were recorded within the survey area, however evidence (spraints) of otter were recorded on both the Achvarasdal and Reay Burns (Figure 1).

2.3.2 PINE MARTEN

Methods

Surveys for pine marten were undertaken in broad accordance with Cresswell *et al.* (2012). The survey was undertaken by ecologists experienced in pine marten survey with active searches conducted for pine marten signs, including scats, prints and den sites within 250m (where accessible) of the turbine locations and infrastructure locations. In the pockets of dense forestry, the stands were assessed from outside, for the potential to contain trees with den features.

The surveys were undertaken on 6th, 7th, 18th and 19th February 2020 by suitably qualified and experienced surveyors.

Results

No protected dens/resting sites were identified however pine marten activity signs (scats) were recorded throughout the development site (Figure 2).

2.3.3 BATS

Methods

One building at Milton, along the proposed access route, was identified as high potential for hosting roosting bats. The potential roost features identified included; loose/missing roof slates, gaps under ridge tiles, gaps above lintels in windows and gaps along the wall heads.

Two dusk emergence surveys and one dawn re-entry survey were completed on 5th, 19th August and 3rd September 2020.

Hibernation surveys were conducted on the structure identified as moderate to high potential to host hibernating bats to the south of the site at NC 98914 60889 (EnviroCentre, 2019). A static detector was deployed within the structure during December 2019, January and February 2020, recording a minimum of two weeks data during each of the months.

Results

The data recorded during the hibernation surveys was downloaded and analysed for any bat calls. No bats were recorded within the structure during the survey period.

2.3.4 NO ROOSTING BATS WERE RECORDED DURING THE ACTIVITY SURVEYS ALONG THE MILTON ACCESS ROUTE. NO BAT ACTIVITY WAS RECORDED DURING THE THREE SURVEYS. WATER VOLE

Methods

Surveys for water vole were undertaken in broad accordance *Dean et al.* (2016), searching for evidence of water vole within 250m upstream and downstream of each of the proposed water crossings. The surveys were undertaken by experienced ecologists on 23rd and 24th June 2020.

Results

No signs of water vole were recorded at each of the locations. The water crossings are located within areas of sub-optimal habitat, i.e. unsuitable bank side vegetation and/or bedrock present in bank.

2.3.5 AQUATIC ECOLOGY

Methods

Further electrofishing will be carried out by Waterside Ecology between July – September 2020 on the Sandside, Achvarasdal and Reay Burns. In order to quantify the results, the survey will be conducted at the existing sample locations used during the 2012 surveys, with additional sample points being created on the Sandside burn.

2.4 IMPACT ASSESSMENT

This SPP is based on the key findings of the Environmental Statement (Infinergy 2016) and subsequent pre-construction surveys completed by Nevis Environmental and EnviroCentre Ltd. A summary of the findings and subsequent scoping is shown in Table 1.

Following scoping based on the findings in the Environmental and Planning Report and subsequent surveys, species specific protection plans will be produced for the following species:

- ✔ Otter
- ✔ Pine marten
- ✔ Bats
- ✔ Water vole
- ✔ Aquatic Ecology

Table 1: Species Scoping Table

Species	Summary of survey results	Potential Impacts	Risk Rating	Protection Plan Required?
Otter	Records of recent activity found along both main watercourses. Otters are likely to be active in the area.	Disturbance of animals during construction. Fragmentation of habitat.	Moderate	Yes
Pine marten	Records of recent activity found across the site. No active dens were found. Pine marten are likely to be active in the area.	Disturbance of animals during construction. Fragmentation of habitat.	Moderate	Yes
Bats	Small numbers of common pipistrelle were found foraging in northern areas of the site. In 2011, a small summer roost was identified in the north-west of the site; this was not in use during the 2019 survey. No major commuting routes across the site were located. Three buildings/structures have been identified as having bat summer and/or hibernation roost potential.	Destruction of suitable foraging and/or commuting habitat. Disturbance impacts to commuting/foraging bats. Collision with infrastructure or suffering impacts due to air pressure changes.	Moderate	Yes
Water vole	In 2012, fourteen active water vole colonies were identified across the site, within both Achvarasdal Burn and Reay Burn catchments. In both 2012, 2019 and 2020, no water vole signs were found within 250 m of the proposed crossing points.	Disturbance of animals during construction. Fragmentation of habitat.	Moderate	Yes
Freshwater Pearl Mussel	No freshwater pearl mussel were found within any of the watercourses on site. Reay Burn and Achvarasdal Burn contained suitable habitat.	Reduction in habitat quality due to pollution of watercourse	Negligible	No
Aquatic ecology	Salmonid fish have been found within the mainstem of Achvarasdal Burn, Reay Burn and Sandside Burn; and also, the lower reaches of Meur a Chrochain Ghill and Meur Fhraoich Ghill. Atlantic salmon were absent from Reay Burn. Achvarasdal Burn and Sandside Burn were found to have suitable habitat for spawning brown trout and salmon.	Killing or injuring of animals and/or reduction in habitat quality due to pollution of watercourse.	Moderate	Yes

3. SPECIES PROTECTION PLANS

3.1 OTTER

3.1.1 LEGISLATION

Otter is a European Protected Species (EPS) and is protected by the Conservation (Natural Habitats &c.) Regulations 2012 (as amended). This means it is an offence to deliberately or recklessly:

- ✔ capture, injure or kill a wild animal of a European protected species;
- ✔ harass a wild animal or group of wild animals of a European protected species;
- ✔ disturb such an animal while it is occupying a structure or place which it uses for shelter or protection;
- ✔ disturb such an animal while it is rearing or otherwise caring for its young;
- ✔ obstruct access to a breeding site or resting place of such an animal, or otherwise deny the animal use of that place;
- ✔ disturb such an animal in a manner that is, or in circumstances which are, likely to significantly affect the local distribution or abundance of the species to which it belongs; or
- ✔ disturb such an animal in a manner that is, or in circumstances which are, likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young.

In addition, it is an offence to:

- ✔ damage or destroy a breeding site or resting place of such an animal (whether or not deliberately or recklessly); or
- ✔ keep, transport, sell or exchange, or offer for sale or exchange any wild animal (or any part or derivative of one) obtained after 10 June 1994.

Otter is also a qualifying feature of the Caithness and Sutherland Peatlands SAC.

Otter is listed on the Scottish Biodiversity List (SBL), which comprises species considered to be of principal importance for the conservation of biodiversity in Scotland and aids public bodies in carrying out their biodiversity duty during the decision-making process.

3.1.2 SITE CONDITIONS

The original 2011 surveys assessed the Achvarasdal Burn and Reay Burn as offering suitable habitat conditions for resting and foraging otter. No resting sites were identified during the 2020 surveys, however suitable foraging and commuting habitat was recorded on both the Achvarasdal and Reay Burns.

3.1.3 POTENTIAL IMPACTS

Construction

Any otter commuting or foraging within the site during construction could be at risk of falling into excavations, collisions with construction vehicles or coming into contact with harmful substances. Construction of watercourse crossings through culverting of the watercourse has the potential to impact on habitat connectivity for otter and could potentially result in the killing/injury of animals if they attempt to use culverts during periods of high water flow or if they are forced to divert away from the watercourse bank on to the access track, to navigate an impassable culvert.

Otter are also considered to be at risk of being dissuaded from temporarily using the burns within the site through human presence and lighting of the site during hours of darkness. However, the streams potentially affected by the works are likely to form only part of the otters' range and available foraging habitat, temporary restriction of access to some small areas of suitable habitat within the site would not cause a significant impact on this species.

There is also a potential for sediment laden run-off and pollution from plant and chemicals to enter the watercourses during construction. Pollution of watercourses could result in the killing of fish species, temporarily impacting prey availability for otter. As the streams potentially affected by pollution are likely to form only part of the otters' range and available foraging habitat, temporary impacts to fish numbers would be unlikely constitute a significant impact on this species. Effects on otter may also arise through them consuming prey species which have been themselves been affected by chemical pollution. Consumption of contaminated prey could have a slight adverse impact on otter but is considered highly unlikely as the use of such contaminants on site would be strictly controlled under the Construction Environmental Management Plan (CEMP).

Otters are highly territorial animals with large home ranges. Depending on the quality of the habitat and availability of food, males can range along rivers for 35km. Otters will continue to try and use routes if alternatives are not included in a mitigation strategy. The upper reaches of Meur a Chrochain Ghill and Meur Fhraoich Ghill are considered less likely to be visited frequently by otter resident in this catchment, than areas further downstream where prey items are likely to be more abundant. Achvarasdal Burn and the minor tributaries to Reay Burn hydrologically link the site to the Caithness and Sutherland Peatlands SAC, where otter are a qualifying feature. It is therefore likely that otters will forage and commute between the SAC and the site.

Operation

Subject to inclusion of a sensitive lighting scheme within site design and ongoing maintenance of any underpasses/culverts, no impacts to otter during the operational phase of the development are predicted.

3.1.4 MITIGATION MEASURES

The following mitigation measures are proposed to minimise the impact of the development on otter:

Table 3: Otter species protection plan

Controls/Mitigation measures	Responsibility	Achievement Criteria	Phase	Notes/further actions
A pre-works survey for otter will be conducted along all watercourses within 250m of the works area prior to construction.	Ecologist	Completion	Prior to construction	Survey methodology to be based on Chanin (2003).
Site inductions and toolbox talks will be used to ensure all staff on site are aware of the potential presence of protected species.	Contractor/Ecologist	Completion	All times	Any sightings should be reported back to the ECoW or Site Agent.
If an otter holt/resting site is identified an exclusion zone will be marked out. An exclusion of at least 200m will be erected around a suspected/confirmed breeding holt. For a non-breeding holt, a 30m exclusion will be marked. If works are required within the exclusion zones, an SHN Licence will be required to continue.	Contractor/Ecologist	Avoidance/Completion	All times	
With the exception of watercourse crossings, all construction works will maintain a minimum buffer distance of 50 m from all watercourses.	Contractor	Avoidance	Construction	
The ECoW will attend site on a regular basis throughout the construction and will have responsibility for the delivery of environmental mitigation.	Ecologist	Completion	Construction	
All watercourse crossings will be either be bridged structures or open bottomed culverts to avoid effects on otter associated with habitat fragmentation.	Designers	Completion	Design	
Potential hazards such as trenches and steep-sided holes that could act as pitfall traps will be covered at night. Holes left open overnight will have a means of escape, such as an access ramp, provided for any animals that may fall in. Excavations should be checked for trapped animals daily, prior to commencement of works	Contractor	Avoidance	Construction	The ECoW should be contacted immediately should a trapped animal be discovered.
Construction works that may affect otters will be limited to daylight hours to reduce the impact on otters active during hours of darkness	Contractor	Avoidance	Construction	Any lighting used should be restricted to the specific area needed with minimised light spill.
Any lighting scheme should be sensitively designed so not to illuminate watercourse corridors.	Designers	Completion	Operation	

3.1.5 EMERGENCY PROCEDURE

Should an otter, holt site, spraint or other signs be identified unexpectedly during the works the following emergency procedure should be followed:

- ✔ All activity will stop immediately.
- ✔ The ECoW and Site Agent or Project Manager will be informed.
- ✔ The ECoW will confirm presence of otter or holt site, and if necessary, consult SNH over appropriate mitigation and whether an EPS licence is required.
- ✔ The activity should not resume until written approval, detailing any appropriate mitigation has been provided by the ECoW/project ecologist.

3.2 PINE MARTEN

3.2.1 LEGISLATION

Pine marten receive full protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended), and also receive protection under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended).

Under this legislation, it is an offence to intentionally or recklessly:

- ✔ Kill, injure or take a pine marten
- ✔ Damage, destroy or obstruct access to a nest or den – i.e any structure or place which such an animal uses for shelter or protection.
- ✔ Disturb such an animal when it is occupying a nest or den for shelter or protection (except when this is inside a dwelling house).
- ✔ Possession, sale and transport offences are acts of strict liability (intention or recklessness isn't required). It is an offence to:
- ✔ Possess or control, sell, offer for sale or possess or transport for the purpose of sale any living or dead pine marten or any derivative of such an animal.

The reader should refer to the original legislation for the definitive interpretation.

Pine marten is listed on the SBL and are considered a species of principal importance.

3.2.2 SITE CONDITIONS

Pre-construction surveys undertaken in February 2020, identified, a total of 33 pine marten scats throughout the site.

No dens or resting sites were identified within the survey area of any proposed construction works, turbines or infrastructure. No licence is currently required for works to commence.

3.2.3 POTENTIAL IMPACTS

Construction

Potential impacts on pine martens resulting from the development may result from changes in habitat use, through the management of the plantation. The felling plan extends to 2033 and onwards, with most compartments being completely felled by 2033. Although the plantation will be re-stocked as per the forestry management plans, only a small area at the very north of the site will be retained throughout the felling plans.

In general, the thicket stage conifer at Limekiln is likely to be used by martens mainly as cover since it is unlikely to support high concentrations of prey resources except perhaps at the edges where birds may be more abundant.

Felling of conifers is likely to result in a proliferation of ground cover species, particularly grasses such as *Molinia caerulea*, and would be expected to result in increases in habitat availability for voles (Lambin et al. 2000) and ground nesting birds such as meadow pipits. This in turn might be expected to enhance prey resources for pine martens at Limekiln. Pine martens do not favour very open habitats but would be expected to exploit vole rich habitats where some cover is available. Caryl's (2008) study in Easter Ross found that pine martens used scrub cover for travel between favoured foraging areas and for resting sites. Brash and other woody debris provides similar cover and the retention of these types of three-dimensional structure in clear felled areas would be expected to ensure continued use by pine martens.

It is worth noting, however, that positive site management requirements for pine martens may run counter to those for raptors. Scottish Natural Heritage guidance for post-construction of management of wind farm sites near SPAs (SNH 2016) aims to reduce vole and ground nesting bird numbers in order to make the sites unattractive to raptors, minimising collision risk.

A Habitat Management Plan (HMP) has been developed for the site, incorporating the felling and re-stocking plans. This HMP, produced by Nevis Environmental (2020) advises compensation, through the installation of pine marten breeding boxes and increasing the percentage of broadleaved tress, through riparian planting.

Operation

Subject to inclusion of a sensitive lighting scheme within site design, no impacts to pine marten during the operational phase of the development are predicted.

3.2.4 MITIGATION MEASURES

The following mitigation measures are proposed to minimise the impact of the development on pine marten:

Table 4: Pine Marten species protection plan

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
Pre-construction pine marten surveys should be carried out, resurveying accessible habitats around proposed infrastructure and encompassing a 250m buffer of suitable den habitat.	Ecologist	Completion	Prior to construction	Should take place no more than ten weeks pre-construction /felling and will determine any licensing needs.
If a non-breeding den is identified during works, an exclusion zone of 30m will be marked out. If the den is breeding (or suspected) then an exclusion zone of 100m will be marked out. If works are required within these exclusion zones (including the destruction of a den) then a licence will be sought from SNH.	Ecologist/Contractor	Avoidance/Completion	All times	A licence may be required to camera trap den sites to confirm breeding status.
In areas that will be felled or otherwise disturbed, but where trees are too dense to permit survey, further mitigation may be required to minimise the risk to pine marten dens. Seasonal restriction of felling in any sensitive areas that are identified by pre-construction/pre-felling survey.	Ecologist	Completion	Completion of felling works	May include additional checks of any areas that provide good potential for den sites if these become exposed by felling.
Pine marten should be considered in any post-development habitat management plans.	Ecologist	Completion	Operation	Measures for pine marten included in HMP
Site inductions and toolbox talks should be used to ensure all staff on site are aware of the potential presence of protected species.	Contractor	Completion	All times	Any sightings should be reported back to the ECoW or Site Agent.
The disturbance corridor should be kept to a minimum wherever practically possible.	Contractor	Completion	All times	

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
Any lighting used should be restricted to the specific area needed with minimised light spill.	Contractor	Avoidance	All times	
All open trenches must be fitted with a mammal escape ramp, installed at an angle of less than 45°. Excavations should be checked for trapped animals daily, prior to commencement of works	Contractor	Avoidance/ Completion	During construction	The ECoW should be contacted immediately should a trapped animal be discovered.

3.2.5 EMERGENCY PROCEDURE

Should a pine marten, its den, or other signs be identified unexpectedly during the works the following emergency procedure should be followed:

- ✔ Stop the activity being undertaken in the area of the pine marten or den site immediately.
- ✔ The ECoW and Site Agent or Project Manager will be informed.
- ✔ The ECOW will confirm presence of the pine marten or den site and consult SNH over appropriate mitigation and whether a licence is required.
- ✔ The activity should not resume until written approval, detailing any appropriate mitigation has been given by the ECOW.

3.3 BATS

3.3.1 LEGISLATION

Bats and the places they use for shelter or protection (i.e. roosts) receive European protection under The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2012. They receive further legal protection under the Wildlife and Countryside Act (WCA) 1981 (Scotland), as amended. This protection means that bats, and the places they use for shelter or protection, are capable of being a material consideration in the planning process.

Regulation 41 of The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2012, states that a person commits an offence if they:

- ✔ deliberately or recklessly capture, injure or kill a bat;
- ✔ deliberately or recklessly disturb bats; or
- ✔ obstruct access, damage or destroy a bat roost (breeding site or resting place).

Disturbance of animals includes in particular any disturbance which is likely to impair their ability to survive, to breed or reproduce, or to rear or nurture their young, or in the case of animals of a hibernating or migratory species, to hibernate or migrate; or to affect significantly the local distribution or abundance of the species to which they belong.

It is also an offence under for any person to have in his possession or control, to transport, to sell or exchange or to offer for sale, any live or dead bats, part of a bat or anything derived from bats, which has been unlawfully taken from the wild.

As bats re-use the same roosts (breeding site or resting place) after periods of vacancy, legal opinion is that roosts are protected whether or not bats are present. The following bat species are Species of Principal Importance for Nature Conservation in Scotland and are listed in the Scottish Biodiversity Action Plan which may be found:

- ✔ Daubenton's Bat (*Myotis daubentonii*)
- ✔ Common pipistrelle
- ✔ Soprano Pipistrelle (*Pipistrellus pygmaeus*)
- ✔ Nathusius pipistrelle (*Pipistrellus nathusii*)

The reader should refer to the original legislation for the definitive interpretation.

3.3.2 SITE CONDITIONS

The surveys conducted (2020) on the only structure, within 30m of any of the works, with suitable summer roosting potential found no signs of roosting bats. The previous surveys conducted in 2011 within the forest boundary showed that the site was being used by a single species of bat, common pipistrelle. One small non-breeding summer roost was found within the site boundary in 2011, however a survey conducted in 2019 did not confirm the presence of this roost.

No SNH licence is currently required for works to commence.

3.3.3 POTENTIAL IMPACTS

Construction

There is currently very little known of the potential impact of wind farms on bats in Britain although studies in North America and continental Europe have shown direct impacts on bats and bat populations with effects varying with site, species and season. Effects during construction may be caused by loss of foraging habitat, loss of roost sites, fragmentation of habitat and loss of connectivity resulting in disruption of commuting routes.

In general, the most common and effective method of avoiding disturbance to bats is to carry out the work at an appropriate time of the year. In the case of the summer non-maternity roost identified at the site, any works likely to disturb this should be conducted between 1st September and 1st May. Timings may be modified depending on site specific species information. Developments involving the loss of a roost site will require mitigation depending upon the conservation value of the roost. Mitigation varies from the provision of bat boxes in the case of a non-maternity roost of the more common species, to a like for like roost replacement with evidence of significant usage before the destruction of the original roost in the case of a maternity roost of the rarest species (Mitchell-Jones 2004).

No disturbance of the historic bat roost is anticipated during the works, due to low levels of activity predicted around the roost site, however a no works buffer zone of 20m will be installed around the roost to prevent traffic from obstructing any entry/exit points.

Operation

Direct impact on bats may result from mortalities due to direct collision with turbine blades, with mortality as much as five times more likely when blades are operating (Arnett et al. 2011). Bat mortality may also result from barotraumas in the form of lung damage from sudden air pressure changes close to blades (Baerwald et al. 2008).

Common pipistrelle has been classed as being at a high collision risk from wind turbines and medium risk of population vulnerability (SNH, 2019).

3.3.4 MITIGATION MEASURES

The following mitigation measures are proposed to minimise the impact of the development on bats:

Table 5: Bat species protection plan

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
All potential bat roosts within 30 m of any proposed infrastructure will be surveyed by a qualified bat surveyor prior to disturbance or construction works.	Ecologist	Completion	Prior to construction	No felling is expected within 30m of any potential roost, however construction of access track is within 30m of potential roosts.
If any bat roosts are identified within 30m of any proposed works, an SNH licence for disturbance may be required. A minimum of 20 m no work exclusion zone will be marked between construction and any identified roost.	ECoW/Contractor	Avoidance/Completion	All Times	

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
Site inductions and toolbox talks should be used to ensure all staff on site are aware of the potential presence of protected species.	ECoW/Contractor	Completion	Prior to construction	
Establish a minimum stand-off distance of 50m from the turbine blade tip to a habitat feature likely to be used by bats (SNH 2019). A typical habitat feature would include the edges of woodland or plantations, and hedgerows.	Contractor	Completion	Prior to construction	
Any task lighting will be used and be directional if required.	Contractor	Avoidance	All times	
Should any bat roosts be encountered during the felling operations all works and activity must cease immediately and a licensed/experienced bat worker contacted for advice	Contractor/ Ecologist	Completion	All times	ECoW to be informed in the first instance
Where roosts of low conservation significance are to be lost to development, bat boxes may provide an appropriate form of mitigation, either alone or in combination with the provision of new roosts in buildings.	Ecologist	Completion	Post construction	Any activity of this nature will require consultation with SNH and a licence in place prior to taking place.

3.3.5 EMERGENCY PROCEDURE

Should a bat or bat roost be identified unexpectedly during the works the following emergency procedure should be followed:

- ✔ Any activity should be stopped immediately (within 50m of the roost or individual).
- ✔ Unless the bat is in immediate danger do not attempt to handle. If handling is required ensure thick gloves are used to move the bat to a secure, well ventilated container which should be placed in a cool dark place.
- ✔ Inform the site supervisor, ECoW, and Environmental Manager.
- ✔ ECoW to confirm presence of species and/or roost and consult SNH over appropriate mitigation measures to implement and whether disturbance licence is required.
- ✔ The activity should not resume until written approval, detailing any appropriate mitigation has been given by the ECoW and Environmental Manager.

3.4 WATER VOLE

3.4.1 LEGISLATION

Water voles receive partial protection under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). In Scotland, this legal protection is currently restricted to the water vole's places of shelter or protection rather than to the animal itself.

Under this legislation it is an offence to intentionally or recklessly:

- ✓ damage, destroy or obstruct access to any structure or place that water voles use for shelter or protection
- ✓ disturb a water vole while it is using any such place of shelter or protection

The reader should refer to the original legislation for the definitive interpretation.

Water vole are also listed on the SBL and as such are considered species of principal importance for the conservation of biodiversity in Scotland.

3.4.2 SITE CONDITIONS

Suitable habitat conditions for water vole were recorded within the catchment areas for both Achvarasdal Burn and Reay Burn; with a total of 14 active colonies being identified during surveys in 2011. No water vole activity signs were found within 100 m of the proposed crossing point near Milton Cottage, during the 2011 or 2020 surveys. No water voles were recorded during a pre-construction survey in February 2020, within 250m of the five proposed water crossings. **No licence** is currently required for works to commence.

3.4.3 POTENTIAL IMPACTS

Construction

Loss of good quality water vole habitat should be avoided, as the majority of the turbines and infrastructure are in low quality habitat. The streams that were surveyed had broad buffer zones, generally conforming to the Forest and Water Guidelines (Forestry Commission 2019), and all water vole signs identified were within the unplanted riparian strips.

Similarly, care will be required during any tree felling operations that precede construction to avoid loss or damage to suitable habitats.

Five water crossings have been proposed along the track network. All are in sub-optimal water vole habitat. Minor losses of these habitat types would not be expected to have any negative impact on water voles at the site so long as no barriers to migration are created.

There is also a potential for sediment laden run-off and pollution from plant and chemicals to enter the water courses during construction. Pollution of watercourses would likely result in a slight adverse impact on water voles through temporary degradation of foraging habitat. A water quality monitoring management plan has been produced by Nevis Environmental and will be implemented from pre-construction through to the completion of construction.

Water vole resting sites are legally protected and it will be necessary to avoid damage to them during enabling works and construction of the wind farm. It cannot be assumed that simply avoiding the colonies identified during the current survey will achieve this, since new colonies may become established or old ones become recolonised. Therefore, pre-construction surveys at proposed stream crossings, and within 50m of any infrastructure, should be repeated annually until construction is completed, to ensure that water vole burrows are still absent.

Operation

Subject to inclusion of a sensitive lighting scheme within site design and ongoing maintenance of the drainage measures outlined in the WQMMP (Nevis Environmental, 2020), no impacts to water voles are anticipated during the operational phase of the development.

3.4.4 MITIGATION MEASURES

The following mitigation measures are proposed to minimise the impact of the development on water vole:

Table 6: Water vole species protection plan

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
Pre-works survey for water vole should be conducted along all watercourses within 50m of the works area and 250m up and downstream of the water crossings, prior to construction works taking place and annually until construction is completed.	Ecologist/ECoW	Completion	Prior to construction	The surveys will be undertaken during a period of dry weather and will be based on to Dean et al (2016).
Site inductions and toolbox talks should be used to ensure all staff on site are aware of the potential presence of protected species.	Contractor/Ecologist	Completion	All times	Any sightings should be reported back to the ECoW or Site Agent.
The ECoW will attend site on a regular basis throughout the construction period to ensure all environmental mitigation is delivered.	Ecologist	Completion	Construction	
With the exception of watercourse crossings, all construction works will maintain a minimum buffer distance of 50m from all watercourses. Watercourse crossings will be subject to checks and location agreement with onsite ECoW	Contractor/ECoW	Avoidance	Construction	Buffer will avoid damage to riparian habitats during enabling works and construction. In particular to avoid or minimise impacts on optimal water vole habitats.
Should any water vole burrows be encountered within 30m of any proposed works, all works and activity must cease immediately and a SNH approached for further advice/licence before works can continue.	Contractor/ Ecologist	Completion	All times	ECoW to be informed in the first instance

3.4.5 EMERGENCY PROCEDURE

Should a water vole or water vole burrow be identified unexpectedly during site works, the following emergency procedure should be followed:

- ✔ Stop the activity being undertaken immediately.
- ✔ The ECoW and Site Agent or Project Manager will be informed.
- ✔ The ECoW is to confirm presence of species and/or burrow(s) and consult SNH over appropriate mitigation measures to implement and whether a disturbance licence is required.

- ▼ No works should resume until written approval, detailing any appropriate mitigation, has been given by the Site Agent and the ECoW/project ecologist.

3.5 AQUATIC ECOLOGY

3.5.1 LEGISLATION

Within Scotland, there are nine species of fish that inhabit the freshwater environment, either permanently or are anadromous species, which are afforded legal protection, these are:

- ✓ Allis shad *Alosa alosa*;
- ✓ Atlantic salmon;
- ✓ Barbel *Barbus barbus*;
- ✓ Grayling *Thymallus thymallus*;
- ✓ River lamprey
- ✓ Common sturgeon *Acipenser sturio*;
- ✓ Twaite shad *Alosa fallax*;
- ✓ Vendace *Coregonus albula*; and
- ✓ Whitefish *Coregonus lavaretus*.

The level of protection differs between species. The legislation of each is summarised in Table 7 below:

Table 7: Summary Legislation for fish species in Scotland

Fish species	Legislation	Schedule
Allis shad	Habitats Regulations 1994	Schedule 3
	Wildlife and Countryside Act 1981 (as amended in Scotland)	Schedule 5
Atlantic salmon <i>*Only when in freshwater</i>	Habitats Regulations 1994	Schedule 3
Barbel	Habitats Regulations 1994	Schedule 3
Grayling	Habitats Regulations 1994	Schedule 3
River Lamprey	Habitats Regulations 1994	Schedule 3
Common Sturgeon	Habitats Regulations 1994	Schedule 2 <i>*European protected species.</i>
Vendace; and whitefish.	Habitats Regulations 1994	Schedule 3
	Wildlife and Countryside Act 1981 (as amended in Scotland)	Schedule 5

For species that are protected under Schedule 3 of the Habitats Regulations 2012, it is an offence to catch or take fish in freshwater using certain methods; this includes any method which is indiscriminate and able to cause the local disappearance of, or serious disturbance to, a population.

Schedule 5 of the Wildlife and Countryside Act 1981 (as amended in Scotland), provides an additional level of protection and differs between species. The offences for each species found in Scotland is summarised below:

- ✓ Allis shad are protected against:
 - intentional killing and injuring;
 - intentional or reckless taking; and
 - intentional or reckless damage to, destruction of, obstruction of access to any structure or place used for shelter or protection.

✓ Vendace and whitefish are protected against:

- intentional killing, injuring, taking;
- possession or control (live or dead animal, part or derivative);
- damage of animal occupying such a structure or place;
- selling, offering for sale, possessing or transporting for the purpose of sale (live or dead animal, part or derivative)
- advertising for buying or selling such things.

Schedule 2 of Habitats Regulations 1994, in which common sturgeon is listed, contains EPS which are afforded further protection to the above. Under this legislation it is an offence to:

- ✓ capture, injure or kill such an animal;
- ✓ harass an animal or group of animals;
- ✓ disturb an animal while it is occupying a structure or place used for shelter or protection;
- ✓ disturb an animal while it is rearing or otherwise caring for its young;
- ✓ obstruct access to a breeding site or resting place, or otherwise deny an animal use of a breeding site or resting place;
- ✓ disturb an animal in a manner or in circumstances likely to significantly affect the local distribution or abundance of the species;
- ✓ disturb an animal in a manner or in circumstances likely to impair its ability to survive, breed or reproduce, or rear or otherwise care for its young; and
- ✓ disturb an animal while it is migrating or hibernating.

In Scotland, there are 14 species of freshwater, or anadromous, fish that are listed as priority fish species. These are:

- ✓ Common sturgeon
- ✓ Allis shad
- ✓ European eel
- ✓ Vendace
- ✓ River lamprey
- ✓ Smelt *Osmerus eperlanus*
- ✓ Sea lamprey *Petromyzon marinus*
- ✓ Atlantic salmon
- ✓ Brown/sea trout
- ✓ Arctic charr *Salvelinus alpinus*

The reader should refer to the original legislation for the definitive interpretation.

3.5.2 SITE CONDITIONS

The electric fishing surveys in 2019 recorded brown trout and Atlantic salmon in Achvarasdal Burn and Sandside Burn. It was concluded that annual spawning within these watercourses was unlikely, but both have high suitability for the growth and development of salmonid parr.

The electric fishing surveys in 2011 identified found no Atlantic salmon in Reay Burn, but did find brown trout within this watercourse. European Eels were recorded in the lower reaches of Meur a Chrochain Ghill and Meur Fhraoich Ghill. Lamprey were absent from all watercourses, but sections of suitable larval lamprey habitat were found in Achvarasdal Burn.

3.5.3 POTENTIAL IMPACTS

Construction

During construction there is the potential of silt being introduced to the water environment, through direct routes i.e. creation of culverts and water crossings or through indirect results of poor silt management along access routes diffusing into the water courses as detailed within Limekiln WQMMP (Nevis, 2020). The introduction of silt, or other materials to the water environment can lead to a decrease in water quality and lead to the death, or reduction in fish movements within the watercourses present on site.

Other potential impacts are creating barriers to natural fish passage through the construction of culverts and water crossings or excessive light or noise can also affect fish behaviour.

Operation

Subject to inclusion of a sensitive lighting scheme, and maintenance of the access drainage, within site design no impacts to aquatic species during the operational phase of the development are predicted.

3.5.4 MITIGATION MEASURES

The following mitigation measures are proposed to minimise the impact of the development on the aquatic environment:

Table 8: Aquatic species protection plan

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
All works will be conducted in line with the relevant GPPs/PPGs, site Pollution Prevention Plan and WQMMP	Contractor	Completion	All times	
All refuelling operations shall take place a minimum of 30m from any watercourse or channel which acts as a conduit to a watercourse.	Contractor	Completion	All times	
Any culverts will be designed to ensure the correct size for the volume of water to prevent the creation of a barrier to fish movements.	Contractor	Completion	All times	
In channel construction of the water crossing points will avoid the sensitive seasons (October to Feb inclusive)	Contractor	Completion	All times	
Annual monitoring of fish populations to be undertaken from pre-construction to post-construction	Contractor	Completion	All times	
Any de-watering operations will be subject to a method statement, which will be agreed with the onsite ECoW and SEPA	Contractor	Completion	All times	
ECoW will conduct regular monitoring of turbidity levels upstream and downstream of each of the water crossing locations.	ECoW	Completion	All times	

3.5.5 EMERGENCY PROCEDURE

Should a pollution event, such as silt occur in or near a watercourse:

- ✔ Any activity should be stopped immediately and efforts to stop or contain the pollution should be undertaken for example using spill kit/sandbags etc
- ✔ The event should be reported to the site manager and the ECoW.
- ✔ SEPA must be notified on the pollution hotline – 0800 80 70 60 and a report on the event should be reported in writing.
- ✔ Spill must be cleaned up using appropriate kits.
- ✔ No works to continue until the source of the pollution has been identified and rectified.

3.6 REPTILES

3.6.1 LEGISLATION

Reptiles; including those which may be encountered on site; common lizard *Zootoca vivipara*, slow worm *Anguis fragilis* and adder *Vipera berus* are protected under the Wildlife and Countryside Act 1981 (as amended).

Under this legislation, it is an offence to intentionally or recklessly:

- ✓ kill, or injure; and
- ✓ trade, transport for sale or advertise for sale.

The reader should refer to the original legislation for the definitive interpretation.

All three species are listed on the SBL and are considered a species of principal importance.

3.6.2 SITE CONDITIONS

No specific reptile surveys were undertaken as the site is predominantly covered by coniferous plantation, which does not offer optimal habitat for any of the potential reptile species. Suitable habitats are limited to the woodland rides and the riparian habitats.

Small numbers of common lizard have been incidentally recorded on site.

3.6.3 POTENTIAL IMPACTS

Construction

Potential impacts on reptiles resulting from the development may result in death and/or injury from traffic within suitable habitat.

Other potential impacts may include loss of suitable habitat, although the majority of the site is currently unsuitable, and the felling of trees to make way for infrastructure will result in a likely increase in suitable habitat through opening up the canopy and providing areas of basking (e.g. hardstandings and tracks)

Operation

No impacts as a result of operation are expected on reptiles which may be using the site.

3.6.4 MITIGATION MEASURES

The following mitigation measures are proposed to minimise the impact of the development on reptiles:

Table 4: Reptile Species Protection Plan

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
Works within suitable reptile habitats e.g. grasslands, south-facing slopes, woodland edge or riparian habitats should include a pre-construction search for reptiles, especially during colder months, when reptiles move slower.	Ecologist	Completion	Prior to construction	.
Site inductions and toolbox talks should be used to ensure all staff on site are aware of the potential presence of reptiles.	Contractor	Completion	All times	Any sightings should be reported

Controls/Mitigation measures	Responsibility	Achievement Criteria	Completion date	Notes/further actions
				back to the ECoW or Site Agent.
The disturbance corridor should be kept to a minimum wherever practically possible and works within riparian corridors should be limited to watercourse crossings, where possible.	Contractor	Completion	All times	

3.6.5 EMERGENCY PROCEDURE

Should a reptile be identified unexpectedly during the works the following emergency procedure should be followed:

- ✔ Stop the activity being undertaken in the area of the reptile immediately.
- ✔ Allow reptile to safely leave the working area before resuming works.
- ✔ The ECoW and Site Agent or Project Manager will be informed.

4. DISCUSSION AND CONCLUSIONS

The proposed development may potentially result in the disturbance of otter, water vole, pine marten, bats and aquatic ecology during the construction phase of the development. It is anticipated any potential impacts on otter, pine marten and bats can be avoided or mitigated by following the SPPs outlined in the previous sections.

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FIGURES

Figure 1 – Otter Survey Results 2020

Figure 2 – Pine Marten Survey Results 2020


LIMEKILN WIND FARM


Legend


Protected species signs

 Otter


Infrastructure

 Turbine

 Access track

 Borrow pit

 Control building

 Hardstanding

 Survey boundary


 Site boundary

Figure 1 - Otter Survey 2020

nevis
ENVIRONMENTAL

Scale: 1:20000


Drawn by: LA
Checked by: RG
Approved by: KA
Ref Number: ENVd1017A
Project Number: 16266
Issue Date: 03/03/2020
Projection: OSGB 1936/British National Grid - EPSG 27700
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0100031673




LIMEKILN WIND FARM


Legend


Protected species signs

 Pine marten


Infrastructure

 Turbine


 Access track

 Borrow pit

 Control building

 Hardstanding

 Survey boundary

 Site boundary

**Figure 2 - Pine Marten Survey
2020**

nevis
ENVIRONMENTAL

Scale: 1:20000

Drawn by: LA
Checked by: RG
Approved by: KA
Ref Number: ENVd1018A
Project Number: 16266
Issue Date: 03/03/2020
Projection: OSGB 1936/British National Grid - EPSG 27700
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APPENDIX A - ENVIROCENTRE PRE PHASE 1 ECOLOGY SUMMARY

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30 August 2019

Dear Ken

**Limekiln Wind Farm
Phase 1 Ecology Support Summary**

Attached are the results and mitigation measures identified from the surveys conducted during the week commencing 12 August 2019, as detailed within proposal 672776/KA/001_R1.

As a consequence of the survey findings, the following work will be required prior to / during construction activity commences:

Further surveys required during 2019/2020

- Hibernation surveys on three identified structures, commencing December 2019.
- 12 bat activity surveys on four assessed buildings, commencing May 2020.

Mitigation Measures

Mitigation measures to be deployed during Phase 1 construction activities:

- Ecological Clerk of Works (ECoW) to check and agree all water crossing locations with on-site personnel prior to crossing.
- Buffer zone of the riparian habitat to be maintained (except at water crossing locations).
- No materials or equipment to be stored within 30m of the previously confirmed bat roost or within 30m of the other structures.

Yours sincerely
for EnviroCentre Ltd

(issued electronically)

**Karen Aldridge
Consultant Ecologist**

**Mike Coleman
Principal Ornithologist**

ECOLOGY SURVEYS

Water Vole

Method

A thorough survey of the five proposed water crossings was conducted on 15 August 2019 by Karen Aldridge and Mike Coleman, both experienced and qualified ecologists and members of the Chartered Institute of Ecology and Environmental Management (CIEEM). The survey included a search for field signs of water vole, including feeding remains, droppings and/or burrows, and followed the standard guidance for the species (Strachan, R., Moorhouse T. & Gelling M. (2011) *Water Vole Conservation Handbook. Third Edition. University of Oxford Press, Abingdon*).

Results

No signs of water vole were recorded within a 100m upstream and downstream buffer of the water crossings.

Mitigation Measures

- Tree felling activities should be limited to the woodland and should avoid encroaching on the riparian habitat (except at water crossing points).
- Water crossing points should be agreed and checked by onsite Ecological Clerk of Works (ECOW).
- Large, oversized culvert should be installed, to ensure water flows freely during periods of spate.

Bats

Method

A preliminary roost assessment (PRA) and a dusk activity survey were conducted on 15 August 2019 by Karen Aldridge and Mike Coleman, both experienced and qualified ecologists and members of the Chartered Institute of Ecology and Environmental Management (CIEEM). The survey was undertaken at a previously confirmed bat roost (from pre-application baseline surveys in 2011) – a small wooden shed within the plantation at approximately Ordnance Survey Grid Reference NC 97351 62833 (Photo 1, below)).

All buildings within 30m of any proposed activity were assessed for potential to host roosting bats, including structures which offer hibernation potential.

Both bat surveys followed current guidance (Collins, J. (ed) (2016). *Bat Surveys for Professional Ecologists: Good Practice Guidelines. Third Edition. Bat Conservation Trust, London*).

Results and Assessment

No bats were recorded using the shed during the activity survey, with one common pipistrelle (*Pipistrellus pipistrellus*) recorded foraging around the structure. The pipistrelle was recorded within 15 minutes of sunset, suggesting it did not travel far before reaching the development site. The shed was a confirmed roost in 2011, and further activity surveys will be required during the 2020 season to ascertain the current status of the roost.

Two other structures within the forested area (including the former limekiln) (see attached map for details, Photo 2 and Photo 3) were recorded as moderate to high potential to host over-wintering bats (hibernation roosts). These structures are thick walled with cracks and crevices offering dry roosting locations and offering the shelter of stable cool temperatures.

Three further buildings, located along the proposed access route at Milton, were also assessed for bat potential (see attached map, Photo 4 to Photo 6). The structures are not wind and water tight and have likely degraded since the original assessment in 2011. There are multiple entry/exit points on the three buildings offering the potential to host roosting bats during the bat activity season (approximately April to August). The current condition of the buildings, with missing windows and holes in the roof are unlikely to offer the cool, constant temperatures required to support hibernation.

Further Survey Requirements

Hibernation Surveys

Three static detectors will be deployed at each of the sites assessed as having hibernation potential. The detectors will be left *in situ* for a minimum of two weeks at a time during the months of December, January and February. The data will be analysed after the detector is collected in from the site to assess the presence and/or size of hibernation roost.

Activity Surveys

Four buildings (three at Milton and the identified roost) will require three activity surveys each between May and early September 2020 to confirm the presence or absence of roosting bats.

If any roosts are identified, a Scottish Natural Heritage (SNH) licence for disturbance will be required in order for works to proceed, and provision of compensatory roost sites (bat boxes) will be requested.

Photographs



Photo 1 Roost (Confirmed in 2011)



Photo 2 Building with hibernation potential



Photo 3 Building with hibernation potential



Photo 4 Moderate to High Potential Bat Building (Milton)



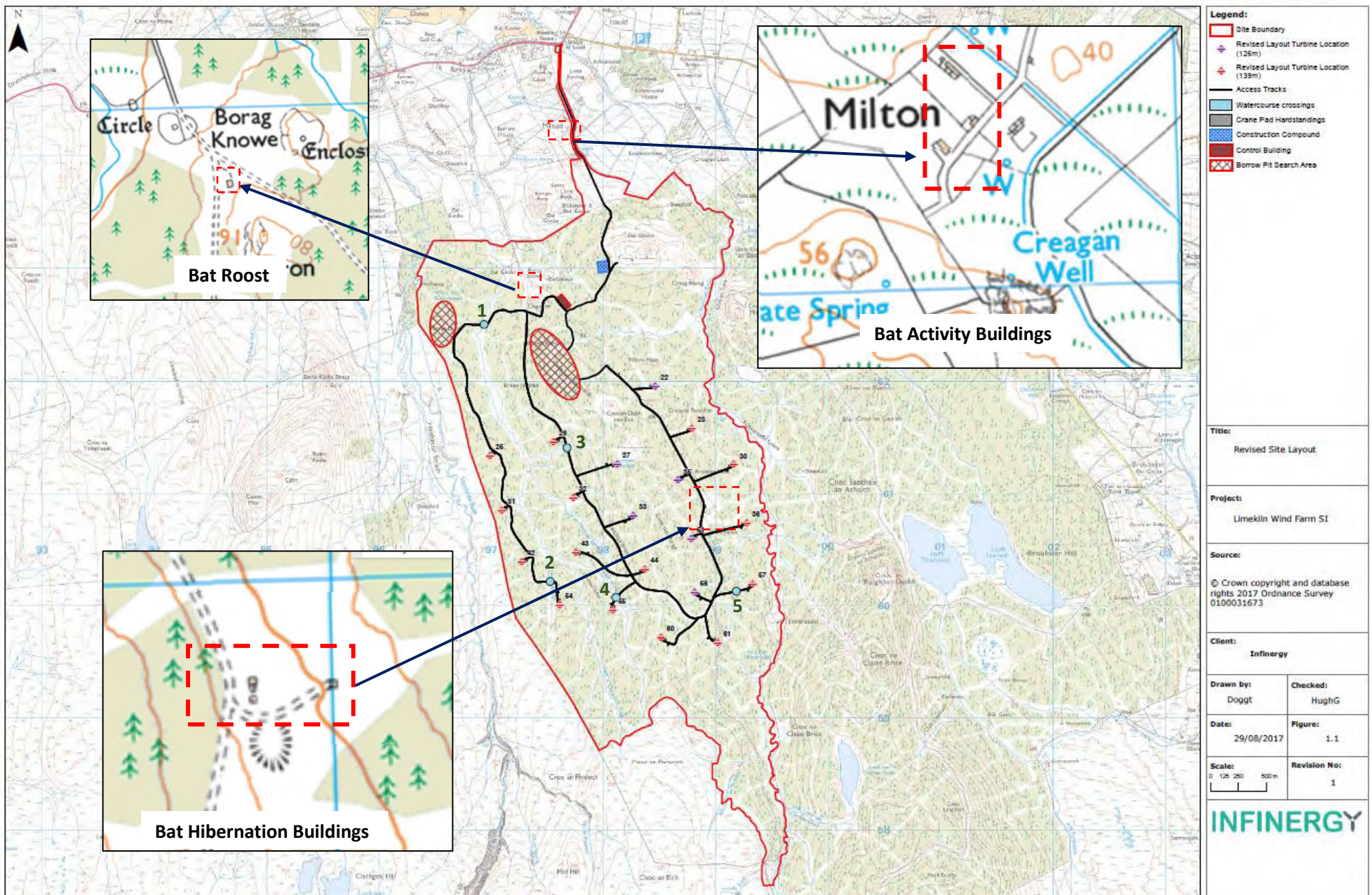
Photo 5 Moderate to High Potential Bat Building (Milton)



Photo 6 Moderate to High Potential Bat Building (Milton)

Map

Figure 1.1: Revised Site Layout



APPENDIX B - ENVIROCENTRE YEAR 1 PRE CONSTRUCTION ELECTROFISHING REPORT



Limekiln Windfarm

Year 1 Pre-Construction Electro-Fishing



September 2019

Limekiln Windfarm

Year 1 Pre-Construction Electro-Fishing

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EXECUTIVE SUMMARY

The Limekiln Windfarm development, Sandside Estate, Caithness, Scotland lies within the catchment of the Achvarasdal and Reay Burns, which flow directly into the Atlantic Ocean at Sandside Bay. In August 2019, the first year of pre-construction electro-fishing data was collected by EnviroCentre Ltd, with a second year of pre-construction surveys scheduled to be undertaken in August 2020. The data collected from these surveys will collectively form the baseline, against which any impacts of the Limekiln Windfarm development through both construction and post-construction (operational) phases upon these fish populations can be recorded. Results of these surveys are reported to Infinergy.

None of the sites recorded any presence of 0+ Salmon Fry, with four out of five sites recording the presence of 1++ Salmon Parr. Against the SFCC classification table for 1++ Salmon Parr densities, 2019 survey results recorded classifications between “Very Low” to “Moderate” between these four sites. Site AB3, situated above a suspected impassable waterfall, was the only site not to record the presence of any juvenile Salmon.

Access to both Achvarasdal and Sandside burns for migratory Salmonids is limited. Numbers of fish returning to these small watercourses annually are also not likely to be high. It is therefore not guaranteed that successful spawning from migratory Salmonids within these burns is an annual occurrence.

All five sites surveyed contained both 0+ and 1++ Brown Trout. Against the SFCC classification table for 0+ Brown Trout densities, 2019 survey results recorded classifications between “Very Low” to “Moderate”. Against the same classification for 1++ Brown Trout, recorded classifications were from “Moderate” to “Excellent”.

The majority of fish recorded at all sites, for both Salmon and Trout, were in the 1++ class, suggesting that at these sites in particular, the habitat is particularly suitable for Parr growth and development.

The 2019 baseline surveys also represent the beginnings of a biomass dataset for the site. Biomass comparisons are of more practical function as an indicator of the continuing long-term health of a watercourse and its fish population over a multi-year period.

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1 INTRODUCTION

1.1 Background

In June 2019, the application was approved to begin development of a 21-turbine windfarm site at Limekiln Forest, Caithness, Scotland. The development site extends to approximately 11 km² and is currently used mainly for commercial forestry. As part of the planning conditions of this development, it is required that fisheries monitoring be undertaken on both the Achvarasdal and Sandside burns, that run through, and adjacent to, the windfarm site respectively.

In July 2019, EnviroCentre Ltd (EC) was commissioned to undertake this monitoring on behalf of the developer, Infinergy Ltd. This report represents the results of the first year of baseline surveys, undertaken by EC in August 2019. The results of these surveys, when combined with data acquired from a second round of surveys to be undertaken in August 2020, will provide a baseline to refer to in order to monitor any impacts of the windfarm development on the local fish populations.

1.2 Site Location

Two main watercourses, which run south to north, the Achvarasdal Burn and the Reay Burn, drain the site. The Achvarasdal Burn runs along the eastern site boundary and the Reay Burn runs through the west side of the site. These burns are fed by several small tributaries that drain the wider catchment. A third watercourse, the Sandside Burn, lies approximately 250m to the west of the development site, out with the red line boundary.

The Achvarasdal Burn (via the Burn of Isauld), Sandside and Reay Burns drain directly into the Atlantic Ocean via Sandside Bay. Access to these burns for migratory Salmonids is reliant on a combination of both a high tide and good/high water conditions within the burns themselves, in order to bridge the gap over the beach at Sandside Bay (Figure 1).

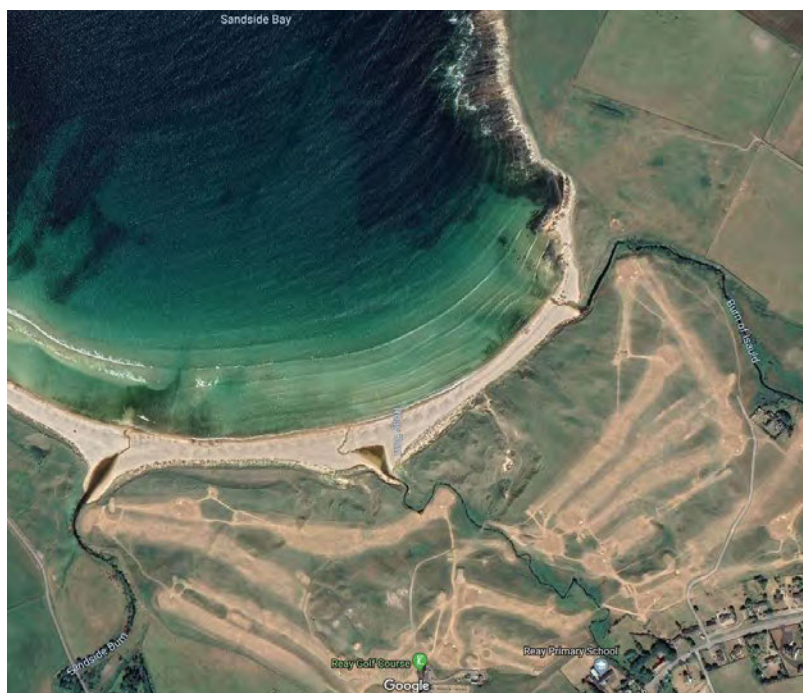


Figure 1: Outflow: Sandside, Reay and Achvarasdal (Burn of Isauld) Burns - Sandside Bay (Caithness)

1.3 Report Usage

The information and recommendations contained within this report have been prepared in the specific context stated above and should not be utilised in any other context without prior written permission from EnviroCentre.

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2 METHODS

2.1 Fieldwork

All electro-fishing surveys were conducted to Scottish Fisheries Co-ordination Centre (SFCC) standards (SFCC 2007a). The method of electro-fishing uses a battery powered backpack and three operatives wading upstream along the watercourse. A direct current of electricity flows between a submerged cathode and an anode; when a fish encounters a large enough potential gradient in its path this elicits a muscular convulsion and the fish swims towards the anode where it is stunned and can be easily and safely captured. Fish are briefly anaesthetised to enable identification and a length measurement is recorded. After a sufficient period of recovery in aerated water the fish are returned to the watercourse.

All surveys in the 2019 monitoring programme were conducted using quantitative sampling. This entails sectioning off a designated area of the watercourse with stop nets, preventing fish from either entering or exiting the survey area during the course of the electro-fishing period, and undertaking surveys based upon a depletion method of a series of successive fishing events. Surveying ceases once a run through the site produces <50% of the number of fish captured during the previous run. It produces an estimate of the total population size based on the number of fish caught at a specific site. The estimate of total population size is based on the rate at which the catches on successive runs drop off and the total number of fish caught. This method of surveying is more reliable than the alternative timed surveys (where a site is electro-fished for a prescribed length of time and the number of fish caught is regarded as a measure of abundance) due to the lack of free movement of fish in and out of the site during survey periods.

Quantitative sampling produces absolute numbers of fish in a contained area under the following assumptions:

1. Emigration and immigration by fish during the sampling period are negligible.
2. All fish within a specified sample group are equally vulnerable to capture during a pass.
3. Vulnerability to capture of fish in a specified sample group remains constant for each pass.
4. Collection effort and conditions which affect collection efficiency remain constant.

These assumptions are more comfortably met on small streams that are easily waded and with few refuges for fish to escape capture, such as those on this site.

In 2019, five locations were identified for survey for pre-construction baseline monitoring by EC. Three of these sites lie within the red line boundary of the site on the Achvarasdal Burn. Two additional sites for survey lie out with the site boundary on the Sandside Burn. For these locations a habitat survey was conducted following SFCC standards (SFCC 2007b). All of the five sites surveyed by EC used quantitative sampling and will be subsequently carried forward into successive years of the monitoring programme. A full layout of all the sites surveyed by EC in the 2019 baseline monitoring programme can be found in Appendix A.

2.2 Data Analysis

2.2.1 Scottish National Classification Scheme

The Scottish National Classification Scheme derived from Godfrey (2005¹) is a simple system for grading rivers based on their Salmonid populations and data from over 1600 sites surveyed between 1997 and 2002. In Scotland, regional variation in Salmonid population density is incorporated in the grading system. This system provides context for the results from the Limekiln Windfarm development in order to make comparisons within and between watercourses. The Limekiln Windfarm development is in the North region. Classification of both Salmon and Trout Fry and Parr densities for the North region are defined by the SFCC Scottish Classification for Salmon and Brown Trout, which can be found below (Tables 1 - 4). The results are presented as densities of fish per 100m² wetted area in Section 3.2.1. The first of three runs was used to derive the SFCC results classification and provide a comparison within the North region.

Table 1: SFCC North Region Salmon Fry Densities

	Salmon Fry Density/100m ²	
Width Class	<6m	6m>
A - Excellent	20.1+	32.7+
B - Good	<20.1-12.7	<32.7-28.4
C - Moderate	<12.7-9.3	<28.4-13.1
D - Low	<9.3-7.1	<13.1-4.5
E – Very Low	<7.1-1.0	<4.5-0.5
Absent	0.0	0.0

Table 2: SFCC North Region Salmon Parr Densities

	Salmon Parr Density/100m ²	
Width Class	<6m	6m>
A - Excellent	13.0+	19.1+
B - Good	<13.0-8.5	<19.1-13.3
C - Moderate	<8.5-4.6	<13.3-7.0
D - Low	<4.6-1.7	<7.0-4.4
E – Very Low	<1.7-1.2	<4.4-1.1
Absent	0.0	0.0

Table 3: SFCC North Region Trout Fry Densities

	Trout Fry Density/100m ²	
Width Class	<6m	6m>
A - Excellent	12.6+	4.2+
B - Good	<12.6-8.5	<4.2-2.9
C - Moderate	<8.5-5.2	<2.9-1.9
D - Low	<5.2-4.4	<1.9-0.8
E – Very Low	<4.4-1.0	<0.8-0.5
Absent	0.0	0.0

¹ Godfrey, J, D (2005). Site Condition Monitoring of Atlantic Salmon SACs. Report by the SFCC to Scottish Natural Heritage. Contract FA02AC608.

Table 4: SFCC North Region Trout Parr Densities

Width Class	Trout Parr Density/100m ²	
	<6m	6m>
A - Excellent	8.6+	1.6+
B - Good	<8.6-7.1	<1.6-1.1
C - Moderate	<7.1-4.4	<1.1-0.9
D - Low	<4.4-3.0	<0.9-0.6
E – Very Low	<3.0-1.2	<0.6
Absent	0.0	0.0

2.2.2 Population Density Estimates (Zippin)

Using quantitative sampling, where declines over two or more runs of electro-fishing were recorded, the depletion method, also known as the “Zippin” method, was used to calculate the estimates of population size density (Zippin 1958²).

The Zippin method is effective for small watercourses where data can be collected within one day and small populations of fish (<2,000 individuals) can be temporarily isolated. It is only applicable to quantitative survey results as migration in and out of the survey area during the sampling period must be negligible. Zippin population density estimate results are presented in Section 3.2.2.

2.2.3 Estimation of Biomass

During the course of analysing the results of an electro-fishing survey, it is possible to calculate the total fish biomass per species/per site by the use of a simple length to body mass conversion equation. This is an excellent way of demonstrating the relative health of a fish population and provides a more reliable long-term indicator of any impacts on a given watercourse, either negative or positive, from a development. The theory behind it is simple – any given area (survey site) will contain sufficient available nutrients within it to support and sustain a limited mass of fish. By converting the body length of each fish surveyed into a body mass figure and totalling these, it is possible to ascertain how well the site is performing over a long term period in relation to its average maximum biomass potential. So long as the size of the site surveyed each year remains constant, the biomass totals remain comparable, year-on-year. Biomass comparisons are preferable to fish densities as an indicator of watercourse health as numbers per year classes of each species in any given site year-on-year can be prone to greater variation than total biomass. Indeed, the total biomass density of juvenile Salmonids at a specific site varies less, year-on-year, than any other measure of site performance.

Body length values for individual fry are converted to body mass by using the following equation:

$$\text{Body Mass} = 2.8087 \times 10^{-6} \times \text{Body Length}^{3.3016}$$

The results of the biomass analysis for the five sites surveyed in 2019 are presented in Section 3.3.3.



² Zippin, C. 1958 The Removal Method of Population Estimation. Journal of Wildlife Management 22: 82 – 90.




3 RESULTS

3.1 Site Habitat Surveys

Table 5 below details the full list of the five sites on which survey work was undertaken in 2019 as part of the pre-construction phase monitoring programme for Limekiln Windfarm and provides a summary of their habitat. A full layout of all sites surveyed by EC in the 2019 monitoring programme can be found in Appendix A.

Table 5: Sites of Year 1 Pre-Construction Phase Monitoring (2019) Limekiln Windfarm (EnviroCentre)

Site Reference	Watercourse	Grid Ref	Site Reference Images	Habitat Summary
AB1	Achvarasdal Burn	E 298906 N 962642		Stable, compacted substrate primarily comprising of cobble and boulder. Areas of shallow glide and riffle with good instream cover.
AB2	Achvarasdal Burn	E 299465 N 960602		Stable, compacted substrate primarily comprising of cobble and boulder. Areas of deep glide and riffle with good instream cover.

AB3	Achvarasdal Burn	E 299481 N 958693		Stable, compacted substrate primarily comprising of cobble and boulder. Areas of both deep and shallow glide, with some deep pool and riffle. Good instream cover.
SB1	Sandside Burn	E 296253 N 962457		Stable, compacted substrate primarily comprising of cobble and boulder. Areas of deep pool, riffle and shallow glide with good instream cover.
SB2	Sandside Burn	E 296541 N 961587		Stable, compacted substrate primarily comprising of cobble and pebble with some boulder. Areas of deep glide and riffle with good instream cover.

3.2 Density Estimates

3.2.1 Scottish National Classification Scheme

Displayed in Table 6 below are the minimum estimated Salmon and Brown Trout densities per 100m², from the first electro-fishing run of each survey site, following the classification protocol. Colours applied to the figures indicate the grading of the watercourse based on the classification outlined in Tables 1 - 4.

Table 6: 2019 SNCS Classification (Quantitative Surveys) - Limekiln Windfarm

	Salmon minimum estimate (100m ²)		Trout minimum estimate (100m ²)	
	0+	1++	0+	1++
AB1	0.00	1.56	6.23	12.47
AB2	0.00	2.67	5.33	6.67
AB3	0.00	0.00	3.51	10.53
SB1	0.00	4.44	0.74	13.33
SB2	0.00	1.07	6.44	6.44

3.2.2 Population Density Estimates (Zippin)

For both two and multiple-run results, size group estimates and their variances are summed to provide a total estimation of population density, presented in Table 7 below. If the calculated confidence limits were within 10% of the estimated density then the results are reported. Where the calculated estimated density had a confidence interval greater than 10% the alternative minimum estimate derived from the total runs is quoted (marked with an *) as this is therefore the more accurate density estimate.

Table 7: Density Estimate (Zippin) Calculations & 3-Run Estimates (*)

Site	Salmon 0+	Salmon 1++	Brown Trout 0+	Brown Trout 1++
AB1	0	1.56*	10.91*	14.25
AB2	0	8.00*	6.67*	6.67*
AB3	0	0	3.51*	21.05*
SB1	0	6.83	0.74*	23.70*
SB2	0	4.29*	6.44*	9.66*

3.3 Biomass Estimates

The results of the biomass analysis for the five sites surveyed in 2019 are presented below. For the purpose of comparison, these have been presented as both a species-by-species figure, as well as a total biomass per site.

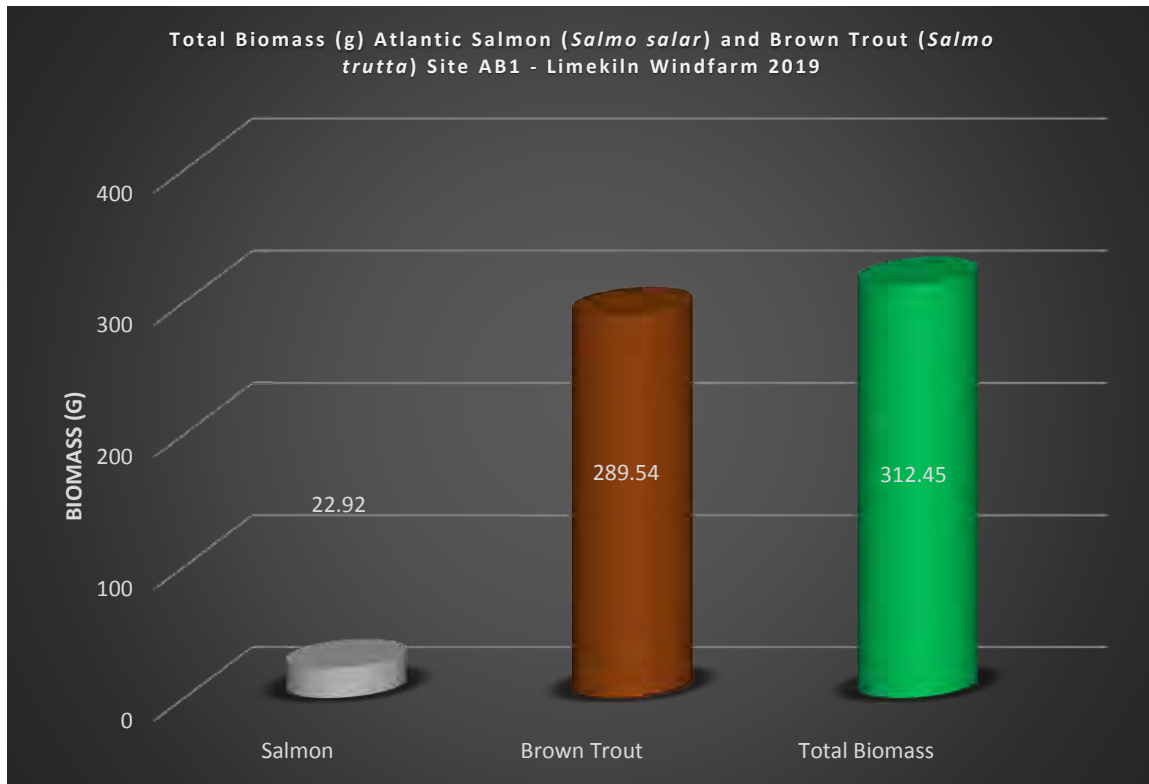


Figure 2: Biomass Estimates (g) Atlantic Salmon and Brown Trout - AB1 (2019)

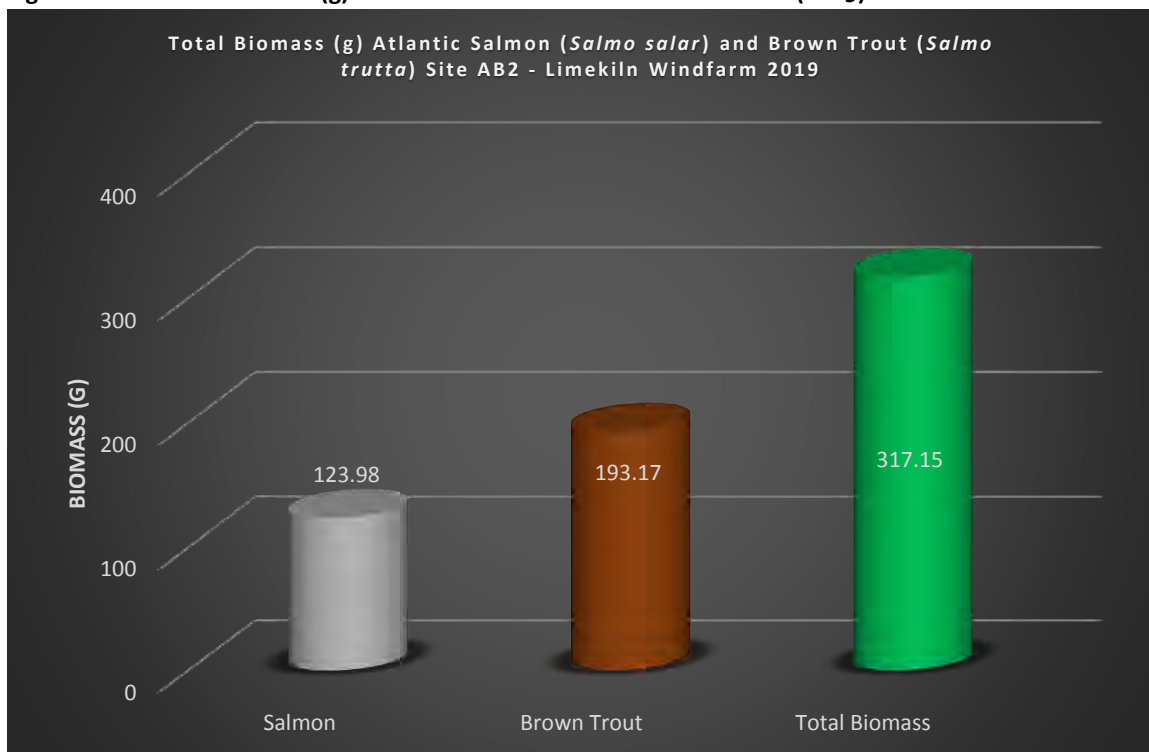


Figure 3: Biomass Estimates (g) Atlantic Salmon and Brown Trout - AB2 (2019)

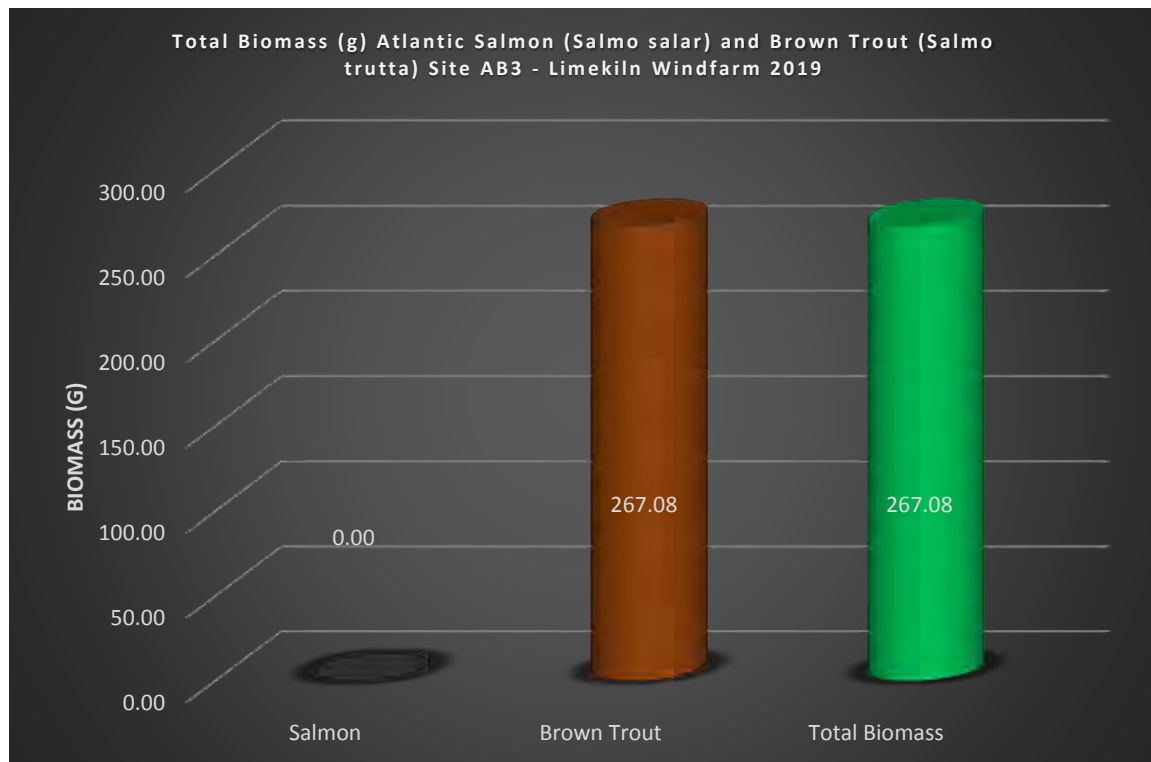


Figure 4: Biomass Estimates (g) Atlantic Salmon and Brown Trout - AB3 (2019)

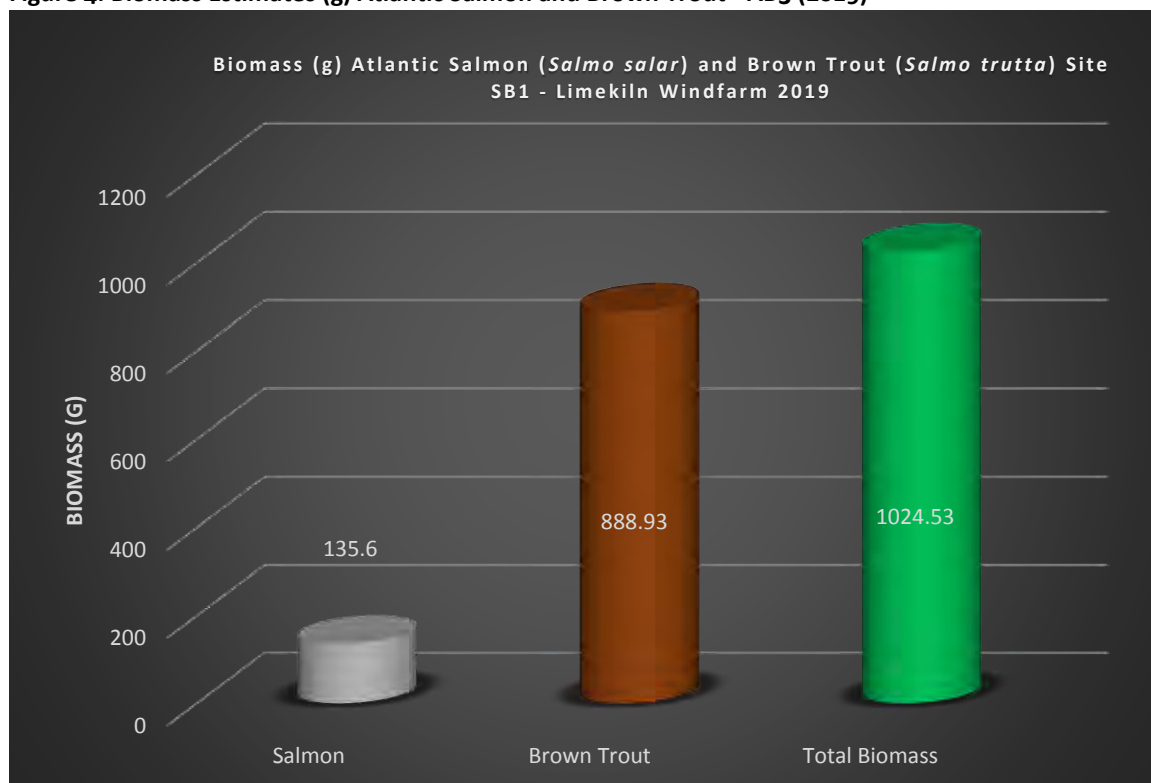


Figure 5: Biomass Estimates (g) Atlantic Salmon and Brown Trout - SB1 (2019)

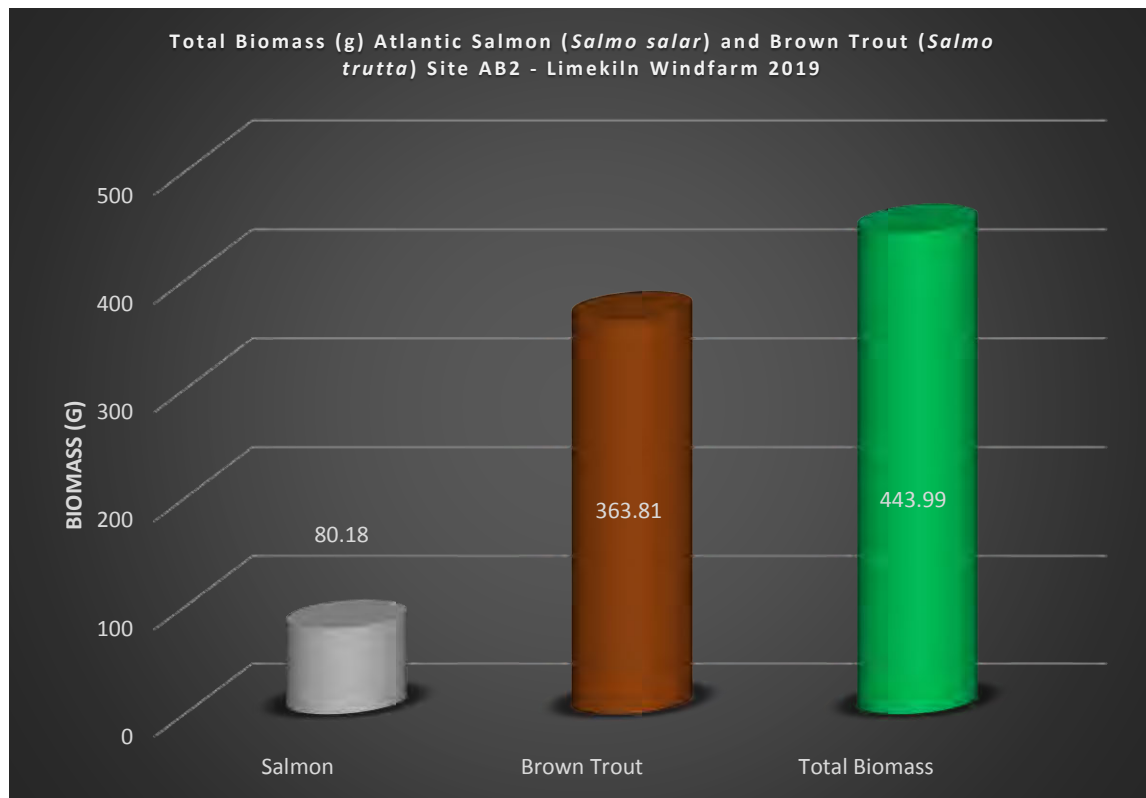


Figure 6: Biomass Estimates (g) Atlantic Salmon and Brown Trout - SB2 (2019)

4 DISCUSSION

EnviroCentre's pre-construction (Year 1) baseline electro-fishing surveys of Salmonid populations located both within and out with the red line boundary of the Limekiln Windfarm site successfully surveyed five sites identified as suitable for provision of baseline data, as well as continuous annual monitoring going forward. The aim of the programme is to establish a baseline for fish populations within the potential impact area of the site, against which any impacts of the windfarm upon these fish populations, during both its construction and operational phases, can be recorded.

Survey conditions in 2019 were perfect, with all watercourses holding adequate water. Access to all sites was facilitated by the use of an Argo which, combined with favourable weather conditions, ensured that the works were completed within a week.

None of the sites recorded any presence of 0+ Salmon Fry but four out of five sites recorded the presence of 1++ Salmon Parr. Against the SFCC classification table for 1++ Salmon Parr densities, two of these sites were classified as "Low" and two as "Very Low". Access to both Achvarasdal and Sandside burns for migratory Salmonids is limited, and reliant on a combination of both a high tide and high water conditions from within the watercourse to allow migratory fish to bridge the gap over the beach at Sandside Bay. Numbers of fish returning to these small watercourses annually are also not likely to be high, with three much larger rivers, the Thurso, Halladale and Naver, all situated within a few miles of these burns. It is very possible that successful spawning from migratory Salmonids within these burns is not an annual occurrence, and a combination of these factors would account for both the lack of 0+ Salmon Fry and the low densities of 1++ Salmon Parr found during the course of the 2019 surveys.

Only site AB3 failed to record the presence of any 0+ or 1++ Salmon. A 2012 survey of fish and fish habitats at the Limekiln Windfarm site³ identified a waterfall with a 2.3m drop and only a very shallow pool beneath it, located between sites AB2 and AB3 at grid reference NC 9955 5960, which is described in the report as "probably impassable to migratory Salmonids". This is therefore the likely explanation for the absence of juvenile Salmon at AB3.

All five sites surveyed contained both 0+ and 1++ Brown Trout. Against the SFCC classification table for 0+ Brown Trout densities, three sites were classified as "Moderate" and two as "Very Low". Against the same classification for 1++ Brown Trout, three sites were classified as "Excellent" and two as "Moderate". Results obtained from small-sample surveys such as these with a high variance co-efficient are not considered reliable in terms of providing overall population density estimates. However, as datasets progress from baseline through construction and post-construction phase monitoring, they do provide an overall demonstration of the health of a fish population and a strong indicator of the effects of any impacts from the windfarm development and its continuing operation.

The total numbers of fish recorded per site in 2019 ranged from 14 at site AB3 to 42 individuals at site SB1. The majority of fish recorded at all sites, for both Salmon and Trout, were in the 1++ class, suggesting that at these sites in particular, the habitat is particularly suitable for Parr growth and development.

From a biological point of view, the weight (biomass) of fish is a better measure of their population condition than the numbers of individual fish present. Biomass data directly shows the extent to which individuals have been able to assimilate stream resources (i.e. food) within the constraints imposed by the qualities of the site (levels of food availability), and by the presence of other fish (levels of competition) (Youngson 2017⁴). The 2019 baseline surveys have facilitated composition of the beginnings of a biomass dataset for the development site.

³ J.Watt (Waterside Ecology) (August 2012) *Limekiln Windfarm: Survey of Fish and Fish Habitats*.

⁴ Youngson, A.F (2017) Juvenile Salmonids in the Rivers of Caithness: 2017 Electric-fishing Survey (CDSFB).

Biomass comparisons are of more practical function as an indicator of the continuing long-term health of a watercourse and its fish population over a multi-year period. Fluctuations in results caused by natural variables such as; seasonal changes in accessibility to spawning grounds for migratory Salmonid species; temporary fish movement within the watercourse; destruction of eggs and availability of food resources during extreme high-water conditions, are progressively eliminated, the longer the data set is maintained. It is also worth noting that an individual survey site will not necessarily achieve its potential maximum biomass capacity if recruitment of young fish is in any way limited. Measurements of the biomass capacity of sites are therefore most accurate when fry abundance is high. As can be seen in the results recorded in 2019, no 0+ Salmon were found at any of the sites surveyed. It will only become fully apparent through future surveys as to whether this is symptomatic of variable annual recruitment through limited access to migratory Salmon, or if these sites are simply more suited from a habitat perspective to larger 1++ Salmon Parr.

In line with best practice, all the survey locations monitored by EC are quantitative (multi-run depletion) surveys. It is recommended that this continues throughout the duration of baseline, construction and post-construction phase monitoring, in order to both ensure the provision of the most accurate data possible with regard to the relative health of fish populations within the Limekiln Windfarm site, and to maintain the validity of the now existing data set. It is further recommended that additional surveys be undertaken in future surveying years, to incorporate sites within the Reay Burn, for additional impact assessment monitoring within the site boundary.

APPENDICES

A ELECTRO-FISHING SITES LIMEKILN WINDFARM 2019