

Chapter 8: Ecology and Nature Conservation

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8 Ecology and Nature Conservation

8.1 Executive Summary

- 8.1.1 Vegetation and faunal surveys were undertaken in 2013 within the Development site of that time, with faunal surveys extending to appropriate buffer distances (as set by industry standards) beyond the boundary, according to species. Fish survey and further vegetation survey was undertaken in 2014, the latter to take into account a northward and westwards extension of the site boundary to include a borrow pit and existing access tracks.
- 8.1.2 Two statutorily designated sites lie within 5km of the Development site, Coir' an Eoin Site of Special Scientific Interest (SSSI) to the west, which is part of the Caithness and Sutherland Peatlands Special Area of Conservation (SAC), and Carrol Rock SSSI on the south-westerly shore of Loch Brora. Coir' an Eoin SSSI is designated for its upland wetland and peatland habitats and species, including blanket bog and otter. Carrol Rock is designated for its block scree birch woodland. The River Brora has been identified as a salmonid water under the Freshwater Fish Directive (78/659/EEC) requiring certain, mainly chemical, standards to be met for quality of water.
- 8.1.3 Habitat on site is dominated by blanket bog and wet heath, with lesser amounts of dry heath and wet modified bog, the latter where past drainage has occurred. Blanket bog and heath are both UK Biodiversity Action Plan (BAP), Local BAP and Annex 1 Habitats Directive habitats. Potential areas of Groundwater Dependent Terrestrial Ecosystem (GWDTE) were identified, but subsequent investigation showed that the majority of potential GWDTE habitat was considered to be sustained by surface rainfall runoff rather than groundwater, with the exception of areas of high GWDTE along watercourses and a small area to the west of the site. No habitats are hydrologically connected to the adjacent Coir' an Eoin SSSI. No nationally Rare or Scarce plant species were recorded. Two plant species of restricted distribution, the moss *Sphagnum fuscum* and Great sundew (*Drosera anglica*) were recorded in the blanket bog habitat. The Development site comprises a part of the upland management areas within the Gordonbush Estate Habitat Management Plan (HMP).
- 8.1.4 Five UK BAP animal species otter, water vole, bat, Atlantic salmon and brown trout were identified within the Development site or its environs. Otter signs, including shelters, were restricted to the two watercourses just beyond the Development site boundaries, the Allt a'Mhuilinn and the Allt Smeorail, and the lower part of the Allt nan Nathraichean in the north-west of the site. No natal (breeding) holts were identified. Apart from the Baden Burn in the east of the site, water vole evidences were restricted to tributaries on the western and south eastern site boundaries. No bat roosts were recorded on site, the nearest being a ruined cottage just beyond the south-east corner of the site, with several potential roosts identified in buildings in the Strath below. Bat activity on site was very low, with most bat flights occurring in the tributary valleys and edges of plantation blocks beyond the site boundaries. The other mammal species recorded on site was pine marten, with activity recorded from the plantation blocks in the south-east corner of the site and the Allt Smeorail valley, but with no dens recorded. A reptile survey was not required by SNH, provided appropriate mitigation is put in place, although one was carried out prior to the scoping response. The site was not found to support good reptile habitat and few sightings were made, although this may be partly due to the poor weather at time of survey.

- 8.1.5 No evidence of freshwater pearl mussel (FWPM) was recorded on site or its environs. The only fish species identified in the streams draining directly from the Development site was brown trout. Access to the Development by migratory fish species is prevented by obstacles on both the Allt a' Mhuilinn and Allt Smeorail. Waterfalls and a dam restrict migratory salmonids to the lower 1.2 km of Allt a' Mhuilinn, some 2km downstream of the nearest proposed wind turbine, while a waterfall restricts migratory salmonids to the lower 0.6 km of Allt Smeorail. Downstream of these obstacles both streams support populations of Atlantic salmon, brown/sea trout and eels. Lampreys, most probably the brook lamprey, are also present in the accessible reaches. Salmonid spawning gravels were reported in the 2003 Gordonbush Wind Farm Environmental Statement (ES) to occur on the Allt a' Mhuilinn near Ascoile, downstream of the current Development site.
- 8.1.6 Assessment of effects showed that, after mitigation is taken into account, residual effects are Not Significant, except for habitat loss and damage to blanket bog and wet heath, which is of Minor Significance (and therefore not significant in terms of the EIA Regulations). Cumulative effects are also not considered to be significant, with total combined loss / damage of bog and heath habitat for the Development and Gordonbush Wind Farm amounting to 0.003% and 0.0008% of the national peatland and heath resource respectively. Effects on the Gordonbush Estate HMP management objectives are assessed as Not Significant.

8.2 Introduction

- 8.2.1 The aim of this Chapter is to assess the effects of the Development on the terrestrial and freshwater ecology. This is undertaken by identifying and assessing potential construction, operational and decommissioning effects.
- 8.2.2 Plant names given in the text follow Stace (2010).

8.3 Scope Of Assessment

Study Area

- 8.3.1 The study area for the habitat and faunal surveys is shown by the Phase 1 survey area in Figure 8.7. The mammal and fish surveys were also undertaken within this study area, and extended beyond to appropriate species specific buffer distances, to allow full assessment of effects.

Scoping and Consultation

- 8.3.2 A scoping report was issued in September 2013. Table 8.1 below summarises the scoping and consultation responses received from statutory and non-statutory consultees that responded on ecology and nature conservation issues.

Table 8.1: Scoping Responses

Consultee	Summary Response	Comment / Action Taken
SNH	SNH is broadly content with the scope of proposed EIA for other natural heritage interests within SNH remit.	No action required
	SNH advises that additional protected species and sensitive habitats are likely to be affected by the proposal. Careful design and mitigation will be required to reduce these impacts to a minimal level and the applicant is referred to SNH general scoping advice and ES format advice on the SNH website.	Impacts on protected species are assessed and mitigation recommendations are given (see Section 8.8 and 8.9).
	Provided appropriate mitigation measures are put in place pre- and during construction, a reptile survey is not required prior to application submission. A mitigation plan should be provided in this ES.	Reptiles had already been surveyed prior to receiving SNH's scoping response. Mitigation recommendations are given in Section 8.8.
Highland Council	The Highland Council (THC) advised that impacts on nature conservation interests of designated sites in the vicinity of proposal should be included. The ES should provide proposals for any mitigation that is required to avoid these impacts or to reduce them to a level where they are not significant.	Impacts on designated sites are assessed in Section 8.9.
	The Environmental Statement (ES) must identify rare and threatened habitats and those protected by EU or UK legislation or identified in national or local Biodiversity Action Plans.	Such habitats are identified and detailed in Section 8.6.
SEPA	Layout of scheme should avoid impacts on highly groundwater dependant terrestrial ecosystems (GWDTE) such as M6c (even if species poor) and minimise impacts on those habitats that are generally considered moderately groundwater dependant such as M15b and U6 (see Appendix 2 of SEPA Planning guidance on wind farm developments).	This and the other issues raised by SEPA on GWDTEs, are dealt with in Chapter 9: Hydrology, Hydrogeology and Geology of this ES.
	SEPA requires a map to be provided with all proposed infrastructure overlain on the vegetation maps to clearly show how important habitats have been avoided and where impacts are likely.	This has been provided (see Figure 8.7, 8.8a and 8.8b).
	SEPA encourage submission of a Habitat Management Plan for the area which could identify areas of wetland improvement post construction.	GWDTEs are dealt with in Chapter 9: Hydrology, Hydrogeology and Geology of this ES.
Marine Scotland	If a District Salmon Fisheries Board (DSFB) is in place it should also be consulted.	Association Salmon Fishery Contacted. No response received.
	Marine Scotland recommends that construction avoids water bodies wherever possible and a buffer of at least 50m should be established.	This and other Marine Scotland comments on water quality and pollution issues are covered in Chapter 9: Hydrology, Hydrogeology and Geology of this ES.

Consultee	Summary Response	Comment / Action Taken
	Marine Scotland requires information on all species and abundance of fish within the development area and on fisheries which depend on these to be provided in the ES. Onus is on the developer to provide adequate information on which to base an assessment of the risk as Marine Scotland may not have local knowledge of the site.	This has been provided (see Section 8.6 and Appendix 8.3).
	Marine Scotland requests where local salmonid and eel populations are present and the development has the potential to have an impact on the freshwater environment, a baseline study be carried out at least one year prior to construction to assess all species and abundance of fish and water quality in standing and running waters likely to be affected by the proposal. Particular attention to be paid to species of high economic and or conservation value: Atlantic salmon, trout (ancestral forms and sea trout), European eel, river lamprey, sea lamprey, Artic charr, European eel. See SAC, JNCC and NASCO guidance.	See Section 8.6, Appendix 8.3 and Appendix 4.1: draft CEMP.
	Ensure all fish work complies with Animal (Scientific Procedures) Act (1986) and Animal Health and Welfare (Scotland) Act (2006) where required.	This has been done.
	Marine Scotland advises the combined effect on water quality and fisheries from all existing and proposed construction developments in the area should be addressed in the ES in addition to angling as a recreation interest and the impact that the proposal may have on it.	Combined effects with Gordonbush Wind Farm have been considered in Chapter 9 (Hydrology, Hydrogeology & Geology) of this ES.
	Where it is demonstrated the development is at low risk to fish populations the developer should still draw up site specific mitigation plans to minimise any impact to fish and their inhabiting waters.	Water quality mitigation is covered in Chapter 9 (Hydrology, Hydrogeology & Geology) of this ES.
	If the developer considers there will be no significant impact from the development and no need for monitoring this should be clearly presented in the ES with supporting data and information.	Baseline water quality monitoring has been undertaken and detailed in Chapter 9 (Hydrology, Hydrogeology & Geology) of this ES. Water monitoring protocols would be included in the CEMP (see Appendix 4.1).

8.4 Policy, Legislation And Guidance

Legislation

- 8.4.1 The legislative framework that provides protection for wildlife in the UK is derived from European directives and national law. It is relevant to the evaluation of ecological features

(habitats and species in need of legal protection are generally highly valued) and legal obligations. The overarching directives and statutory instruments are indicated in Table 8.2.

Table 8.2 Key Protective Legislation offered to Habitats and Species

Legislation	Brief description
International	
The Birds Directive (79/409/EEC)	The Directive aims to maintain the favourable conservation status of all wild bird species (Article 2). It establishes a general scheme for the protection of all wild birds (Article 5). The Directive also requires the identification and classification of Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive and regularly occurring migratory species.
The Habitats Directive (92/43/EEC)	Annexes I and II of the Directive lists the European protected habitats and species respectively that are afforded special protection under this Directive. See the Habitat Regulations section below for the implications of this Directive in the UK context.
Convention on Biological Diversity	Conservation of biodiversity (the variety of life on earth) is an essential element of sustainable development. The UK Biodiversity Action Plan (BAP) provides the framework for fulfilling the UK's responsibilities towards the Convention on Biological Diversity via the NERC Act.
UK and Scotland	
Wildlife and Countryside Act, 1981, as amended (WCA)	The WCA sets out the protection offered to various species of plants, birds and animals. Bird species listed in Schedule 1, animal species listed in Schedule 5 and plant species listed in Schedule 8 of the WCA are protected. The WCA has since been strengthened and updated by subsequent UK and Scottish legislation (see below).
Protection of Badgers Act 1992	Offences under the Act include: (1) taking, injuring or killing badgers; (2) cruelty to badgers; (3) interference with badger setts; (4) selling and possession of live badgers and (5) marking and ringing. Exceptions and licences can apply.
The Conservation (Natural Habitats &c.) Regulations 1994, as amended (Habitat Regulations)	The provisions of the Habitats Directive were transposed into Scots law by the Conservation (Natural Habitats, &c) Regulations 1994 ("the Habitat Regulations"). Schedule 2 of the Habitat Regulations lists the European protected species of animals whilst Schedule 4 lists the European protected species of plants. Under the Habitat Regulations, it is illegal to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4 without a licence granted by the appropriate authority. Licences can only be granted for certain purposes and if a set of conditions have been met.
Nature Conservation (Scotland) Act 2004	Deals with conserving biodiversity by introducing a duty on all public bodies to further the conservation of biodiversity and requires under Section 2(4) publication of a list of habitats and species for conservation action. Amends the 1981 Wildlife & Countryside Act in respect of protecting Sites of Special Scientific Interest, and similarly strengthens protection of certain birds, animals and plants. Updates the 1992 Protection of Badgers Act.
The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2004	Amends the Habitats Regulations to bring the provisions for protection of European 'Natura 2000' sites into line with the protection regime set out in the Nature Conservation (Scotland) Act 2004, and affords protection to European candidate sites. Gives further protection to European protected species and introduces a new offence of 'reckless disturbance' in respect of European sites and species.
The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007	Significantly strengthened the regulations relating to European Protected Species of animals and enacting the requirement to assess developments plans (structure and local plans) with regard to effects on Natura 2000 (EC

Legislation	Brief description
	Directive) sites.
The Environmental Liability (Scotland) Regulations 2009	Transposes the EC Directive 2004/35/CE on environmental liability with regard to the prevention and remedying of environmental damage into Scottish law and requires the perpetrators of any pollution to prevent and repair damage to water systems, land quality, protected sites, species and their habitats.
Wildlife and Natural Environment (Scotland) Act 2011	Modernises game law and deer management legislation, badger licensing legislation, strengthens controls on invasive non-native species, improves Sites of Special Scientific Interest (SSSI) legislation and modifies muirburn regulations.

8.4.2 Proposed developments must be able to show that all reasonable measures have been taken to ensure that protected habitats and species are not disturbed.

8.4.3 Annex I of the Habitats Directive includes the following habitats that are potentially relevant to the site:

- Blanket bog;
- Acid dry heath; and
- Wet heath.

Species Legislation

8.4.4 The habitats of all Conservation Regulations (Habitats Directive) Schedule 2 species, WCA Schedule 1 and some WCA Schedule 5 species are also protected from disturbance and destruction. Again, all reasonable precautions should be taken to ensure that this does not happen.

8.4.5 Species' legal protection status covering those species that are potentially relevant for which surveys were undertaken at the study area site is summarised as follows:

8.4.6 Otter - Otters are protected through inclusion in Annex IV of the EC Habitats Directive as translated into UK law by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) as a European Protected Species (EPS), making it an offence to deliberately capture, disturb, injure or kill an otter or to damage or destroy a breeding site or resting place. As such, any development works which could affect an EPS, such as otters, may require a licence to legally proceed. They are also included Schedule 5 of the Wildlife and Countryside Act 1981 (as amended);

- **Water vole** - Water voles are protected through Schedule 5 of the Wildlife & Countryside Act 1981 (as amended), in respect of Section 9(4) only. Although the animals themselves are currently not protected in Scotland, it is illegal to intentionally or recklessly damage, destroy or obstruct access to any structure or place that water voles use for shelter or protection. It is also an offence to disturb water voles while they are using such a place;
- **Pine marten** - Pine martens and their dens are protected under the Wildlife and Countryside Act, 1981 (as amended), through inclusion on Schedules 5 and 6 to the Act. The pine marten is listed as a protected species in Appendix III of the 1979 Bern Convention on the Conservation of European Wildlife and Natural Habitats. It is also

listed on Annex V of the European Community's (EC) Habitats Directive, as a species "of community interest whose taking in the wild and exploitation may be subject to management measures". Pine marten is also a priority species in the UK BAP;

- **Wildcat** – Wildcats are protected through inclusion in Annex IV of the EC Habitats Directive as translated into UK law by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) as a European Protected Species (EPS), making it an offence to deliberately capture, disturb, injure or kill a wildcat, or to damage or destroy a den. As such, any development works which could affect an EPS, such as wild cat, may require a licence to legally proceed. They are also included Schedule 5 of the Wildlife and Countryside Act 1981 (as amended);
- **Badger** - Badgers are protected under the Protection of Badgers Act 1992. In Scotland, this legislation was updated by the Nature Conservation (Scotland) Act 2004, which makes it an offence to recklessly take, injure or kill a badger, or destroy or cause disturbance to its sett. Scottish Natural Heritage (SNH) interprets the legislation in such a way that any sett within an active badger territory is afforded legal protection, whether it shows signs of recent use or not. In addition, badgers are afforded protection from cruel ill-treatment. This has been defined to include preventing a badger access to its sett, as well as causing the loss of significant foraging resources within a badger territory. A licence from SNH is required in cases of potential disturbance of badgers or damage or destruction of a badger sett as a result of work activities;
- **Bat species** - Bats and their roosts are protected under the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (otherwise known as the Habitats Regulations). In summary, it is illegal to recklessly or deliberately kill, injure, or disturb bats, or to damage, disturb or obstruct access to bat roosts. Works that affect bats or their roosts, require a Habitats Regulations Licence issued by the Scottish Government;
- **Reptiles** - All native reptiles are protected under the Wildlife and Countryside Act (1981, as amended) and the Nature Conservation (Scotland) Act (2004) against intentional or reckless killing, injury and sale (or advertising for sale). Of the six reptile species native to the UK, adder, common lizard and slow worm are found in Scotland;
- **Atlantic salmon** - Atlantic salmon is a species of high conservation concern. It is listed on
- Annexes II and V of the EC habitats Directive and on Schedule 3 of the UK Habitats Regulations 1994. It is a priority species for conservation within the UKBAP and is also included on the Scottish Biodiversity List; and
- **Freshwater pearl mussel (FWPM)** – Freshwater pearl mussel is now fully protected under the Wildlife and Countryside Act (1981) of Great Britain. It is also listed on Annexes II and V of the EC Habitats Directive and Appendix III of the Bern Convention. Freshwater pearl mussel is also listed under the UK Biodiversity Action Plan as a 'Priority Species' requiring the implementation of a Species Action Plan dedicated to its survival (Biodiversity Steering Group 1995).

UK Biodiversity Action Plans (UK BAP)

- 8.4.7 Arising from the 1992 Convention on Biological Diversity, the national UK Biodiversity Action Plan (BAP), together with Local Biodiversity Action Plans (LBAP), provides information on conservation imperatives for listed habitats and species. In addition to the

UK national BAP, the local plan for the Development site is the Sutherland LBAP. The plan recognises the biodiversity value of a number of Sutherland habitats and makes recommendations for conservation action. There is also a Highland LBAP, although habitats and species identified in this are UK BAP habitats and species that occur in the Highland Council area.

8.4.8 Action plans for habitats (HAP) and species (SAP) contained in the UK national and Sutherland plans that are potentially relevant for the Development include:

- Heathland/wet heath (UK & LBAP);
- Blanket Bog (UK & LBAP);
- Purple moor grass & rush pasture (UK & LBAP);
- Upland flushes, fens and swamps (UK BAP);
- Rivers & burns (UK & LBAP);
- Water vole (UKBAP);
- Otter (UKBAP);
- Brown hare (UKBAP);
- Pipistrelle bat (UKBAP);
- Adder (UK BAP);
- Atlantic salmon (UKBAP);
- Brown trout (UK BAP);
- Arctic char (UK BAP); and
- Eel (UK BAP).

(N.B. The Sutherland LBAP does not include specific LBAP species not listed on the UK BAP)

8.4.9 Recent legislation requires all public bodies to have regard for the conservation of biodiversity in their public duties and the publication of the Scottish Biodiversity List under Section 2(4) of the 2004 Nature Conservation Act provides some legislative backing for the 1992 Convention.

Site Designations

8.4.10 Sites designated for nature conservation are protected under the legislation and planning policies outlined above. Table 8.3 shows the main statutory and non-statutory designations.

Table 8.3 Common Statutory and Non-Statutory Designations

Designation	Brief Description
Statutory Sites	
Ramsar Sites	Wetlands of international importance notified under the Ramsar Convention 1971. Ramsar Sites are effectively protected, through the planning system, under the Wildlife and Countryside Act 1981, as amended, and the Nature Conservation (Scotland) Act 2004 through their notification as Site of Special

Designation	Brief Description
	Scientific Interest (SSSIs) and through other regulatory systems addressing water, soil and air quality.
Special Protection Areas (SPAs)	SPAs are the most important habitats for rare and migratory birds within the European Union. The Birds Directive, adopted by the UK in 1979, provides for the protection, management and control of all species of naturally occurring wild birds in the European territory of Member States, including the UK. The provisions of the Birds Directive are transposed into UK law by the Conservation (Natural Habitats &c) Regulations 1994.
Special Areas of Conservation (SACs)	SACs are sites that are chosen to conserve the natural habitat types and species of wild flora and fauna listed in Annex I and II of the Habitats Directive. They are the best areas to represent the range and variety of habitats and species within the European Union. The provisions of the Habitats Directive were transposed into UK law by the Conservation (Natural Habitats &c) Regulations 1994.
National Nature Reserves (NNRs)	NNRs are nationally important areas of wildlife habitat and geological formations in Britain. NNRs are designated and protected under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981, as amended.
Sites of Special Scientific Interest (SSSIs)	SSSIs are nationally important sites for wildlife, geological and geomorphological features in the UK. They are designated and protected under the National Parks and Access to the Countryside Act 1949 and the Wildlife and Countryside Act 1981, as amended. They receive additional protection under the Nature Conservation (Scotland) Act 2004.
Local Nature Reserves (LNRs)	LNRs are similar to NNRs but they apply to the local context. They are sites of value to nature conservation and are designated under the National Parks and Access to the Countryside Act 1949. They are managed for the benefit of nature conservation.
Nature Conservation Sites protected through Planning Policy	
Ancient Woodland	Ancient woodlands in Scotland are those that have been established since or before 1750AD. The Scottish Natural Heritage (SNH) inventory also lists "Long-established woodlands of semi-natural origin" and "Long-established woodlands of plantation origin" identified on the first OS maps of 1860. They are non-statutory sites and are not legally protected but they may be afforded some protection in, for example, structure and local plans.
Local Nature Conservation Sites or Wildlife Sites	These non-statutory sites are sites designated by local authorities and protected through the planning system by a presumption against disturbance from development.
Wildlife Trust Reserves	These are nature reserves managed by the Wildlife Trusts for wildlife conservation and education.

Policy

8.4.11 Scottish Planning Policy (2014) consolidates and supersedes previous policy. Guidance is given on valuing the natural environment through the planning system by a number of overarching policies listed in paragraph 194:

- *to facilitate positive change while maintaining and enhancing distinctive landscape character;*
- *to conserve and enhance protected sites and species, taking account of the need to maintain healthy ecosystems and work with the natural processes which provide important services to communities;*
- *to promote protection and improvement of the water environment, including rivers, lochs, estuaries, wetlands, coastal waters and groundwater, in a sustainable and co-ordinated way;*

- *to seek to protect soils from damage such as erosion or compaction;*
- *to protect and enhance ancient semi-natural woodland as an important and irreplaceable resource, together with other native or long-established woods, hedgerows and individual trees with high nature conservation or landscape value;*
- *seek benefits for biodiversity from new development where possible, including the restoration of degraded habitats and the avoidance of further fragmentation or isolation of habitats; and*
- *to support opportunities for enjoying and learning about the natural environment.*

8.4.12 Paragraph 195 re-iterates the duty of all public bodies to further the conservation of biodiversity as required under the Nature Conservation (Scotland) Act 2004. Subsequent paragraphs deal with development planning and management, legal protection to sites and species, wild land and woodland policies, green infrastructure, resource management and flood risk and drainage issues.

8.4.13 The Sutherland Local Plan has been superseded by the Highland-wide Local Development Plan (HwLDP) published in April 2012. Elements of the Local Plan that remain in force are listed in Appendix 7 of the HwLDP.

8.4.14 The HwLDP contains a number of policies relevant to ecological issues that may arise from the Development. The most pertinent of the policies are:

- Policy 55 Peat and Soils: includes measures to protect peat and soils from unacceptable disturbance;
- Policy 57 Natural, Built and Cultural Heritage, Policy 58 Protected Species, and Policy 59 Other Important Species: consistent with national legislation and policy, they state the requirement to protect national and internationally protected sites and species, and those species listed as Priority species in the UK and Local Biodiversity Action Plans and those included on the Scottish Biodiversity List;
- Policy 60 Other Important Habitats and Article 10 Features seeks to safeguard the integrity of features of the landscape which provide habitat corridors or “stepping stones” for the movement of wild fauna and flora and states the intention of the Council to seek to create new habitats which support this concept. The policy also states the intention to protect those habitats listed in Annex I of the EC Habitats Directive, habitats of priority and protected bird species, priority habitats listed in the UK and Local Biodiversity Action Plans, and habitats included on the Scottish Biodiversity List that fall outside protected areas; and
- Policy 63 Water Environment deals with securing the objectives of the Water Framework Directive (2000/60/EC).

Guidance

8.4.15 The following key documents have guided the approach to the field survey, evaluation and assessment:

- Handbook of EIA: Guidance for Competent Authorities, Consultees and others involved in the EIA process in Scotland (SNH, 4th Ed. 2013);

- Guidelines on the environmental impacts of wind farms and small-scale hydroelectric schemes (SNH, 2002);
- Guidelines for Ecological Impact Assessment in the United Kingdom (IEEM, 2006);
- Handbook for Phase I Habitat Survey - a technique for environmental audit. England Field Unit, Nature Conservancy Council (JNCC, 1994);
- Scottish Executive Guidance on: European Protected Species, Development Sites and the Planning System (Scottish Executive 2001); and
- Guidance on European Protected Species, Development Sites and the Planning System, Interim Guidance for Local Authorities on Licensing Arrangements, October 2001 (updated in December 2006) (Scottish Executive, 2006).

8.5 Methodology

Desk Study

- 8.5.1 A desk study was conducted to search for existing ecological information within the study area and within a 10km radius for statutory designations.

Designations

- 8.5.2 Web-based sources of information have been examined for information on statutory sites which is available on the SSSI Register on the Registers of Scotland website (<http://www.ros.gov.uk/sssi/index.html>) and the Sitelink facility on the SNH website.

Habitat

- 8.5.3 Existing habitat data sources were identified and consulted prior to undertaking field work for the Development, as follows:
- A Phase 1 Habitat map of the locality undertaken for the 2003 Gordonbush Wind Farm Environmental Statement (SSE, 2003), covering the existing wind farm site and approximately two thirds of the Development site;
 - A more detailed Phase 1 habitat map of the Gordonbush Estate produced in 2009 for the Gordonbush Estate Habitat Management Plan (HMP) and which included the Development site. This map was produced from aerial photographs and ground truthed during vegetation monitoring for the HMP in 2010 to produce the final version;
 - A National Vegetation Classification (NVC) summary description of the upland area of the Gordonbush Estate, given in the Site Condition Monitoring (SCM) baseline report, produced for the HMP in 2010 (NES 2011a);
 - Site Condition Monitoring (SCM), grazing impact assessment and sward heterogeneity assessment, which were undertaken across the upland part of the Gordonbush Estate, including the Development site, in 2010 as part of the baseline monitoring for the Gordonbush Estate HMP (NES 2011a and 2011b). (The survey was repeated in 2014, but the results are not yet available); and
 - Transect monitoring undertaken annually from 2010 to 2013 across the Gordonbush Estate, including the Development Area, as part of the HMP monitoring programme. Data from the 2014 survey is also available (NES 2015).

Terrestrial Fauna

- 8.5.4 The following sources of terrestrial faunal data were consulted prior to fieldwork:
- Pre-construction mammal surveys undertaken in the locality prior to construction of the Gordonbush Wind Farm in 2008 and 2010 respectively (NES 2008 and 2010);
 - A pre-construction mammal survey undertaken in 2013 prior to removal of the old hydro dam wall on the Allt a'Mhuilinn (GR NC8313112417) (NES 2013);
 - Species records were identified on the National Biodiversity Network (NBN) Gateway database within the 10km grid square that covers the Development site (NC 81); and
 - The Highland Biological Recording Group database - covering faunal species only (not including birds).

Freshwater Fauna

- 8.5.5 The following sources of water quality and freshwater fauna species data were consulted prior to fieldwork:
- The SEPA River Water Quality Classification scheme; and
 - A pre-construction freshwater pearl mussel survey and freshwater habitat assessment undertaken in March 2013 prior to removal of the old hydro dam wall on the Allt a'Mhuilinn (HED 2013). Consultations with SNH and The River Brora Fisheries Trust were undertaken to obtain data as part of this study.

Field Study

Site Surveys and staffing

- 8.5.6 Habitat and faunal surveys were undertaken during the optimum survey seasons from spring to autumn 2013. Fish surveys were undertaken in early autumn 2014 and further habitat surveys were undertaken in November 2014. All surveys were undertaken by experienced ecologists and fish biologists.

Habitat Survey

- 8.5.7 An NVC survey (Rodwell 1991a, 1991b, 1992, 1995) of the study area was carried out during August 2013. Vegetation community maps, quadrat data and target notes were produced to show the distribution and extent of each community over the site. The communities were also assigned the appropriate Phase 1 alpha-numeric code for the purposes of producing a Phase 1 habitat map (JNCC 2007). Survey methodology is described in more detail in the Report of Survey in Appendix 8.1a. Further NVC and Phase 1 survey was undertaken in November 2014 in several locations immediately adjacent to the original study area to assist the site layout design fix.
- 8.5.8 GWDTE habitats that may be sensitive to hydrological disturbance were identified during the fieldwork using the document 'A Functional Wetland Typology for Scotland – Field Survey Sheet' (SNIFFER 2009) to assist in the identification of these vulnerable habitats. Such habitats are fully described by the Phase 1 Habitat and NVC survey methodologies and brief correlations are provided in the results section of this chapter (Section 8.6), where these GWDTE communities are identified according to their corresponding Phase 1 habitats and NVC communities.

Faunal Survey

Mammals, Reptiles and Amphibians

- 8.5.9 A survey of protected faunal species was undertaken during a seven month period from April to October 2013, covering otter, water vole, badger, pine marten, wild cat, bat and reptiles. Following a data search and habitat review of the site, Great crested newt were scoped out of the assessment because of lack of suitable habitat. Survey was concentrated on the study area and extended beyond to appropriate buffer distances, according to species, to allow full assessment of effects. The survey methodologies used were based on current best practice guidance, knowledge of the site and practical experience of undertaking similar surveys nearby. They are described in detail in the Report of Protected Species Survey in Appendix 8.2b: Faunal Survey Report, and are summarised as follows;

Otter (Lutra lutra)

- 8.5.10 The watercourses and land within 250m of the study area were searched for signs of otter, based on the methodology by Chanin (2003), which included spraints, footprints, lying-up sites, potential holts or couches, and meal remains. A section of the Allt a' Mhuilinn to the south west of the study area was covered by an otter survey earlier in March 2013, for the removal of the former hydro dam, and was therefore not re-surveyed.

Water vole (Arvicola amphibius)

- 8.5.11 All pools, streams and ditches in the study area were surveyed, with searches extended to 100m beyond the study area boundary where appropriate. Water vole signs, including burrows, runs, footprints, feeding stations, latrines and faeces, were recorded.

Badger (Meles meles)

- 8.5.12 The study area and 100m beyond the boundary were surveyed for badger evidences, as follows:
- Setts – either a concentration of holes and tunnels or single hole;
 - Faeces – typically badgers use latrines close to the setts and dung pits to mark their territory;
 - Paths or trails leading to and from foraging areas – well trodden paths leading from setts; and
 - Other field signs – footprints, scratches on trees or posts, hairs and snuffle holes (feeding signs).

Pine marten (Martes martes) and wildcat (Felis sylvestris)

- 8.5.13 Scat survey and camera trapping was undertaken in the study area and at least 250m beyond the boundary. Suitable locations for camera traps were selected following a search of the area for wildcat and pine marten signs (footprints, scats, dens and scrape marks), and rabbit or hare signs (burrows or latrine sites). Wildcats have very similar habitat preferences to pine martens. Two camera traps, each with two cameras, were set up 1.5km apart, one pair on the edges of the small plantation blocks on the eastern side of the study area, and the other pair placed in tributary valleys on the western side of the study area

(see map in Appendix 6 of Appendix 8.2: Faunal Survey Report). Each station was baited on a post 20-150cm off the ground.

Bats

- 8.5.14 A scoping survey was undertaken to determine the likelihood of bats being present on the study area by identifying potential bat habitat and any known roosts on or near to the site. The Development site was categorised as a low risk site for bat presence due to the altitude and lack of ideal foraging habitat for bats. As a consequence, a minimum survey effort based on Bat Conservation Trust (BCT) Guidelines was deemed to be appropriate, with three monitoring transects undertaken per season (Spring, Summer and Autumn), static ground monitoring surveys (minimum five nights per month) and assessment of any structures on site, or adjacent, suitable to support a bat roost.

Reptiles

- 8.5.15 An initial walkover of the study area assessed any suitable habitat and refuge for reptile species, followed by a focussed survey to establish presence/absence of reptiles and species present. As there were few existing refugia on the site, artificial refugia were placed on site and inspected for reptiles over the animals' active season from April to October.

Fish

- 8.5.16 A walkover habitat survey and an electric fishing survey of streams potentially affected by construction were carried out during early autumn 2014. The surveys extended downstream of the study area into stream reaches that might receive runoff from the site. Full details of survey methodology are contained in Appendix 8.3: Fish and Fish Habitat Survey Report.

- 8.5.17 The objectives of the survey were to:

- Describe stream habitats in the various watercourses draining the Development site. In particular, to describe their suitability for the various fish species potentially present;
- Identify the main obstacles to migration in the above streams, in particular the likely upper limits for the distribution of salmon, sea trout or loch trout; and
- Carry out an electric fishing survey to describe species composition and distribution within target watercourses. In particular, to confirm the distribution of migratory salmonids.

- 8.5.18 The survey covered the following watercourses:

- Allt a' Mhuilinn from its confluence with the River Brora (NC 827 106) upstream to NC 840 142;
- Allt nan Nathraichean from its confluence with Allt a' Mhuilinn upstream to NC 848 141;
- Allt Smeorail from its inflow to Loch Brora (NC 844 093) upstream to NC 856 128;
- Ristocky Burn from its confluence with Allt Smeorail upstream to NC 848 132; and
- Badan Bun from its confluence with Allt Smeorail upstream to NC 856 135.

- 8.5.19 Reaches that were judged potentially accessible for migratory salmonids (salmon or sea trout) were surveyed quantitatively based on protocols described by Hendry and Cragg-Hine (1997), Summers *et al.* (1996) and SEPA (2010). On reaches that were clearly inaccessible to migratory salmonids an experienced fish biologist carried out linear inspections during the walkover survey to identify any key areas such as spawning habitats requiring particular protection.
- 8.5.20 An electric fishing survey was carried out to provide data on fish species presence and abundance, focussing on reaches potentially accessible to sea trout or salmon and incorporating a representative range of habitat types. Brief, qualitative assessments were also made upstream of waterfalls to confirm the presence of trout or other fish species.
- 8.5.21 No quantitative assessment of lamprey habitats was carried out, but the presence of suitable habitats was recorded during the walkover survey. Lamprey numbers were assessed at one site on each of the Allt a' Mhuilinn and Allt Smeorail by semi-quantitative, timed electric fishing.

Freshwater pearl mussel (Margaritifera margaritifera)

- 8.5.22 A freshwater pearl mussel survey was undertaken in September 2013 on the two rivers adjoining the Development site, the Allt a' Mhuilinn to the west and the Allt Smeorail to the east. Both surveys also included tributaries where they could be affected by the Development. The methodology followed the SNH's "Freshwater mussels survey protocol for use in site-specific projects".
- 8.5.23 This involved conducting a general survey of the river and its substrate types, by walking the banks and/or by wading in the water with the aim of identifying specific areas most likely to harbour mussels. Once suitable habitat was identified, careful and systematic wading of representative stretches of the river was undertaken, using a bathyscope. Full detail of survey methodology is given in the Report of Survey in Appendix 8.4: Freshwater Pearl Mussel Report.

Ecological Evaluation

- 8.5.24 In the UK, approaches to the setting of criteria for the assessment of the nature conservation value of a defined area of land commenced with the publication 'A Nature Conservation Review' (Ratcliffe 1977). A range of primary qualities were identified: size, diversity, naturalness, rarity, fragility and typicalness. These, together with the secondary criteria, recorded history, position in an ecological or geographical unit, potential value and intrinsic appeal, provide a framework for the selection of national sites for statutory protection and has been used as a basis for ecological evaluation.
- 8.5.25 In parallel to this process of evaluation of ecological interest for nature conservation objectives, the UK Department of Transport developed guidance for the assessment of ecological value as one of the sub disciplines of environmental impact assessment (EIA) for transport schemes in the New Approach to Appraisal (DETR 1998). This approach was adopted by CIEEM in its guidelines on assessing ecological impacts (IEEM 2002, IEEM 2006), using geographically scaled criteria to assess the biodiversity value of sites, habitats and species, a summary of which is given in Appendix 8.5: Geographical Assessment Criteria.
- 8.5.26 The following geographical scale is used for this assessment;

- International importance;
- UK/National importance (England / Northern Ireland / Scotland / Wales);
- Regional importance - The Highland Council area;
- County - Sutherland;
- Local - within 10km radius of the study area; and
- Site - limited to within the site boundary.

8.5.27 The scale is intended to provide a gradation of areas but exceptions can arise, e.g. the Highlands are both a unitary authority (normally District level) but with the geographical extent of a Region. On the basis of ecological scale and landscape character similarity, the Highland Council area is therefore classed as a Region. The accuracy of the evaluation is also dependent on the availability of area-based biological information and, therefore, where data is lacking, it may be difficult to attribute the correct scale of importance. The SNH Natural Heritage Futures Zones (NHZ) can provide a measure of geographical scale at a subregional level with the advantages of some measure of ecological cohesion and a broad database of habitat types. Zone 5, The Peatlands of Caithness and Sutherland is the appropriate zone for the Development proposals. LBAPs can also provide a source of data on a County level.

Assessment of Effects

8.5.28 This section details how the significance of effects on ecological receptors is assessed. The assessment of ecological effects follows the Institute of Ecology and Environmental Management (IEEM) 2006 Guidelines.

8.5.29 Each effect is assessed as being significant or not significant upon each valued ecological feature. An ecologically significant effect is defined as an effect on the integrity of a defined site or ecosystem and/ or the conservation status of habitats or species (IEEM, 2006). The effect is assessed within a specific geographic context i.e. "significant" or "not significant" at the scale at which it was valued (e.g. local/ national/ international).

Magnitude of Effect

8.5.30 Magnitude criteria given in 'A Handbook on Environmental Assessment', SNH 2002 (1st Edition), are used to determine a 'significant' effect. These criteria are as follows:

- **Severe** – Wholesale change of the majority of a site/habitat or species population;
- **Moderate** – Substantial but partial change to a site/habitat or species population; or
- **Slight** – Minor change to part of a site/habitat or species population, or loss of a very small proportion of a site/habitat or population (<1%).

8.5.31 Other factors included in the consideration of magnitude are;

- **Duration and Reversibility** – Timescale of effect (days/ weeks/ months/ years) until recovery. Permanent impacts are described as such, and likelihood of recovery is detailed where appropriate;
- **Frequency** – Frequency of effect (if appropriate; described as low to high and quantified where possible);

- **Complexity** – Whether the effect will directly or indirectly affect the feature or ecological receptor; and
- **Negative/ Positive** – If the effect will be beneficial or detrimental to the ecological receptor.

8.5.32 Where necessary the assessment also includes an indication of the confidence level that the change will take place. The following terminology is used:

- **Certain**: probability estimated to exceed 95%;
- **Likely**: probability estimated to be 50-95%;
- **Unlikely**: probability estimated to be 5-49%; and
- **Extremely Unlikely**: probability estimated to be less than 5%.

8.5.33 On the basis of the above criteria, an effect of Slight magnitude can be considered as 'Not Significant', and Moderate and Severe as 'Significant'. These categories apply equally to adverse and beneficial effects.

Significance of Effect

8.5.34 The assessment of significance of effects on species caused by disturbance uses the definition of the threshold of deliberate disturbance used by The Conservation (Natural Habitats, &c.) Amendment (Scotland) Regulations 2007 (SI 2007/80). A significant effect of disturbance is assumed if the development significantly affects the ability of any significant group of animals of that species to survive, breed or rear or nurture their young or likely to significantly affect the local distribution or abundance of the species (see Paras 39 (b) v and vi in the above Regulations).

Residual Effect

8.5.35 The final prediction of significance is completed taking the mitigation measures into account. This requires an assessment on the likelihood of successful mitigation being achieved (Oxford, 2000) and the mitigation proposed needs to be qualified in terms of the probability of success. The assessment of success of mitigation can be based on both professional judgement and experience of other mitigation schemes. Where habitat processes or species requirements may not be fully understood, there may be uncertainty over the effectiveness of such mitigation and a precautionary approach is advisable in determining the outcome. It should also be noted that some habitat creation schemes may require a significant timescale for the objectives to be achieved, e.g. replacement woodland. Mitigation should therefore be qualified according to the following scheme shown in Table 8.4.

Table 8.4: Qualification of Mitigation

Probability of Success		Probable timescales		Habitat Examples
Very low	> 95%	Very long	> 100 years	Mature woodlands, raised mires, flushes and deep peat formations.
Low	70 – 95%	Long	50 – 100 years	Immature woodlands, some shallower peatlands
Moderate	30 – 70%	Moderate	10 – 50 years	Mature scrub, heathland
High	30 – 5%	Short	5 – 10 years	Grasslands
Very high	< 5%	Very short	< 5 years	Ponds

8.5.36 Residual effects are considered to be significant for the purposes of the EIA Regulations where the effect is classified as being of ‘major’ or ‘moderate’ significance.” Where;

- **Major:** These effects are likely to be important considerations at a regional or county scale but, if adverse, are potential concerns to the project, depending upon the relative importance attached to the issue during the decision making process;
- **Moderate:** These effects, if adverse, while important at a local scale, are not likely to be key decision making issues. Nevertheless, the cumulative effect of such issues may lead to an increase in the overall effects on a particular area or on a particular resource;
- **Minor:** These effects may be raised as local issues but are unlikely to be of importance in the decision making process. Nevertheless, they are of relevance in the detailed design of the project; and
- **Not significant:** negligible or no effect.

8.5.37 Table 8.5 below shows the derivation of significance of effect as determined by receptor value and effect magnitude, overlain to show the definition of significance as defined for EIA purposes.

Table 8.5: Calculation of Significance of Effects (Shaded area = significant effect for the purposes of EIA Regulations)

Conservation Value	Magnitude of Effect			
	Severe	Moderate	Slight	Negligible/No effect
International / National	Major	Major	Moderate	Not significant
Regional	Major	Moderate	Minor	Not significant
County	Major/Moderate	Moderate/Minor	Minor	Not significant
Local	Moderate	Minor	Not significant	Not significant
Site only	Minor	Not significant	Not significant	Not significant

Gordonbush Estate HMP

8.5.38 Assessment of effects of the Development on the Gordonbush Estate HMP is also considered by examining potential effects on the management objectives of the HMP (see Section 8.10).

Limitations to Assessment

8.5.39 With a whole calendar year available for the survey work, it was possible to ensure that surveys over the study area took place at the optimum time of year to facilitate the collection of data and hence there were no seasonal constraints to the main body of work. The further habitat and NVC survey undertaken in November 2014 of the additional areas for the site design fix is outwith the optimal time for vegetation survey. However, it is possible to adequately survey upland vegetation, as found on the site, outwith the growing season for purposes of habitat and community classification due to the identifiable presence of most key species out of season. Burning in some areas of the site has modified the species composition of the communities and has blurred community boundaries. This has made assignation of a definitive NVC community difficult in some areas, with some communities only showing loose associations with the published tables.

8.5.40 The continuous wet and windy weather that was prevalent during most of Spring 2013 could have resulted in fewer recordings of reptiles than in normal years.

8.5.41 The area between the boundary of the study area and the northern boundary of the Development site was not completely covered by the mammal survey due to the later expansion of the Development site boundary to cover the existing tracks that are proposed to provide access to the northern turbines of the Development. However, the 2010 Gordonbush Wind Farm pre-construction mammal survey allows a good idea of the interest of the area for mammals, which due to limitations of habitat and topography, is unlikely to have substantially increased since then, particularly in relation to impacts arising from the limited nature of works proposed in this area.

8.6 Baseline Conditions

8.6.1 This section details the baseline description of ecological receptors present in the study area and the vicinity.

Designations

Statutory Site Designations

8.6.2 Two SSSIs; Carrol Rock and Coir' an Eoin, lie with 5km of the site, as shown on Figure 8.1: Statutory Designation Sites. Carrol Rock SSSI lies to the south of the site, on the south-westerly shore of Loch Brora, and was designated in 1984 for its botanical importance, having the largest block scree birch wood in East Sutherland. The Coir' an Eoin SSSI lies north-west of the site, west of the Allt a' Mhuilinn, and was designated in 1996 primarily for its 'central watershed blanket bog' that contains a number of rare or scarce moss species, such as *Sphagnum fuscum* and *S. imbricatum*. It also contains the nationally scarce but locally abundant dwarf birch *Betula nana*. Four bird species are noted in the SSSI schedule for the site: red throated diver, golden plover, greenshank and dunlin.

8.6.3 The Coir' an Eoin SSSI is also part of the Caithness and Sutherland Peatlands Special Area of Conservation (SAC) designated for its upland wetland and peatland habitats and species. The Annex I habitats of the EC Habitats Directive that are a primary reason for site designation are:

- Blanket bogs (Priority feature);
- Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*; and
- Natural dystrophic lakes and ponds.

8.6.4 Other Annex 1 habitats present as a qualifying feature but not a primary reason for designation are:

- Northern Atlantic wet heaths with *Erica tetralix*;
- Transition mires and quaking bogs; and
- Depressions on peat substrates of the *Rhynchosporion*.

8.6.5 Annex II species that are a primary reason for site designation are:

- Otter; and

- Marsh saxifrage.

- 8.6.6 The SSSI is also part of the Caithness and Sutherland Peatlands Ramsar site for its wetland habitats and species, and also part of the Caithness and Sutherland Peatlands Special Protection Area (SPA) designated for its internationally important populations of raptors, wildfowl and waders, further detail on which is given in Chapter 10 (Ornithology) of this ES.
- 8.6.7 The River Brora has been identified as a salmonid water under the Freshwater Fish Directive (78/659/EEC) requiring certain, mainly chemical, standards to be met for quality of water.

Non-Statutory Site Designations

- 8.6.8 There are areas of ancient semi-natural woodland within Strath Brora and the lower parts of the Allt Smeorail valley (Figure 8.2: Non-Statutory Designation Sites). The Development would not directly affect any of these areas. There are no other non-statutory designated sites for nature conservation in the vicinity of the Development.

Habitats

Database records

- 8.6.9 No NBN Gateway records for key groups of plant species that are either protected by law or listed in the UK BAP or the Scottish Biodiversity List (SBL) are recorded from the Development site.

Desk Studies - Past Surveys

Phase 1 Habitat Survey and NVC survey

- 8.6.10 Figure 8.3 shows the Phase 1 habitat map produced for the entire Gordonbush Estate in 2010 as part of the HMP. This also shows the four upland management units of the estate on which the upland vegetation monitoring is based. These are based on differing topographical, vegetation and management characteristics. Areas 1 and 2 comprise the upland plateau to the east of the Allt Smeorail. Area 1 covers the Common Grazings on the eastern slopes down to the seaboard. Area 3 includes the operational Gordonbush Wind Farm area, whilst Area 4 includes the Development and the assessment study area.
- 8.6.11 Reasonable agreement was found between the Phase 1 habitat maps produced in 2003 (for the Gordonbush Wind Farm Environmental Statement) and 2010 respectively, with the main disparity being that, on both the Development and wind farm sites, large areas classified as modified bog in 2003 were classified as unmodified in 2010. This is because the 2003 survey was undertaken less than a year after large scale burning was undertaken across the estate in an attempt to control heather beetle.
- 8.6.12 Overall, these maps show that the predominant habitats of the Development site are wet heath and bog, with a smaller amount of dry heath. Bog habitat predominates in the northern end of the survey area, while wet and dry heath predominate in the southern end. Smaller areas of marshy grassland occur in the northern end of the site.
- 8.6.13 An NVC summary description of the upland area of the whole estate was given in the Site Condition Monitoring (SCM) baseline report, produced for the HMP in 2010. This found

the majority of blanket bog within the estate to comprise M17 *Scirpus cespitosus*-*Eriophorum vaginatum* blanket mire dominated by heather (*Calluna vulgaris*), cross-leaved heath (*Erica tetralix*), hare's-tail cotton grass (*Eriophorum vaginatum*), deer-grass (*Trichophorum germanicum*) and Sphagnum mosses; the most common being *Sphagnum capillifolium* and *Sphagnum papillosum*.

HMP Upland Management Area Monitoring

- 8.6.14 The results of the 2010 surveys across all of the Upland Management Areas are summarised below to allow the Development site to be placed into context of the rest of the estate.

Site Condition Monitoring

- 8.6.15 The standard SCM methodology was amended for the 2010 survey to allow all 28 plots to be sampled if more than six per habitat type failed. Full details of the methodology and the results can be found in NES (2011a). The results in the latter report were broken down by habitat rather than by Management Area, but are generally relevant to all the four Management Areas, including Area 4 where the Development site is mainly located, unless specifically indicated in the following summary:
- 8.6.16 In general, the blanket bog was in quite good condition, especially around Loch an Tubairnaich (NC 875 088) in Area 1 and over the majority of Area 3. The bog was wet underfoot and Sphagnum moss was frequent, with a good range of species occurring, including *Sphagnum magellanicum* and *Sphagnum fuscum*, which are characteristic of relatively undisturbed blanket bog with deep peat deposits. Although there were active grips in the north west of the estate, including the northern end of the Development site, their effect appeared quite localised and many were infilling naturally.
- 8.6.17 Burning caused the majority of sample point failures for blanket bog, which is regarded as a sensitive habitat for burning (however, burning in sensitive areas of blanket bog was least prevalent in Area 4). In certain areas, this has caused the exposure of bare peat and a disturbed bryophyte/lichen layer and is starting to favour the dominance of graminoids (grass and related species), especially deer-grass, over ericoid (dwarf shrub) species. However, burning had not yet led to widespread drying of the bog surface, as much was still wet underfoot and is rich in Sphagnum species. Erosion was not deemed to be a major problem, and was limited to some natural gullying along river channels and some of the grips in Areas 3 and 4.
- 8.6.18 Wet heath was found to be the habitat in the least favourable condition and most affected by burning, probably due to the fact that it occurs on steeper, more exposed slopes with thinner peat. Burning has led to the over-dominance of deer grass and an impoverished bryophyte and lichen layer, especially sphagnum, which can be absent altogether.
- 8.6.19 The dry heath was generally in good condition but was species-poor and lacking structural diversity. Much of it was overwhelmingly dominated by heather, with a little bell heather (*Erica cinerea*) and an impoverished bryophyte, forb and graminoid layer. It also tended to be the most heavily grazed of the ericoid dominated habitats as it occurred on steeper, sheltered slopes, which deer prefer. Evidence of heather beetle (*Lochmaea suturalis*) was frequently encountered, especially in older stands of heather.

- 8.6.20 It was concluded that a cessation of burning on blanket bog and exposed wet heath communities, plus a more varied burning regime on dry heath to create a more diverse sward, would result in more sample points being regarded as being in 'favourable condition'.

Grazing Impact Assessment

- 8.6.21 The grazing impact assessment undertaken in 2010 followed the standard methodology using ¼ km square units. Full details of the methodology and the results can be found in NES (2011b), and the findings are summarised as follows:
- 8.6.22 In general, the impact of grazing and trampling was found to be Low to Low/Moderate over much of estate (see Figure 8.4), except Area 4, which was Moderate/High to High in the southern half and Moderate to Low/Moderate in the northern half. Potentially damaging grazing impact levels were localised to favoured spots in Area 4, which provide shelter and/or more nutritious grazing. No areas were observed where heavy grazing was threatening the survival of the heather community or facilitating its conversion to grassland. Trampling impact was conspicuous across the estate, but it was not apparent that trampling was causing erosion apart from localised, well worn deer tracks, especially on the slopes overlooking Strath Brora. These commuting routes between favoured areas were often heavily grazed and trampled with some erosion, but the impacts quickly decreased away from the path edges.
- 8.6.23 In the bog habitat to the north of Area 4, where it abuts Area 3, impacts were found to be relatively light, but with signs of browsing and disturbance increasing southwards, with the edges of the moorland grips generally quite heavily browsed and with heavy trampling on areas of deer congregation close to the small plantations on the eastern edge of the management area.
- 8.6.24 The wet and dry dwarf shrub heath was the habitat most heavily impacted by grazing and trampling in Area 4, with the majority of survey squares being in either Moderate or Moderate/High impact class. This was particularly the case along the banks of the Allt a'Mhuilinn to the west, where the heath exists in a mosaic with bracken and grassy flushes.

Sward Heterogeneity Assessment

- 8.6.25 Sward height and heterogeneity of structure of heath and blanket bog were assessed in 2010 across the upland estate on a ¼ km square scale. Full details of the methodology and the results can be found in NES (2011b) and the findings are summarised as follows:
- 8.6.26 Average sward height was estimated and structure was assessed as either 'uniform', if most heather was within one height class, or 'varied' if there were two or three height classes of heather. The results are shown in Figure 8.5.
- 8.6.27 The height of the heather sward was found to have been greatly influenced by the widespread burning for heather beetle control approximately 10 years previously. In Areas 1, 2 and 3 much of the heather averaged 20-25 cm across all habitats and was uniform in structure. Taller stands, reaching 50-60cm, were restricted to the sides of watercourses; around springs and close to the edges of plantations where burning has not taken place. The sward height was around 10-15 cm over the most heavily grazed areas, or on the higher summit ridges where small patches of wind-clipped heath occur.

- 8.6.28 Area 4, which includes the Development site, showed the greatest variability of the four areas in both sward height and structure. The heather sward height was fairly uniform over the blanket bog in the north, averaging 20-25cm tall, but was more varied towards the Allt a'Mhuilinn valley where old, unburnt stands could reach 60cm. There was also a contrast between areas of blanket bog with old, leggy heather and adjacent drier slopes where the heather had been preferentially grazed. The more heavily grazed areas to the south averaged 10-15cm tall.
- 8.6.29 Across the estate as a whole, heather beetle damage was conspicuous in places, especially where older heather stands occurred close to watercourses. In addition, most of the old, leggy stands of heather were infested with magpie moth (*Abraxas grossulariata*) larvae, with adult moths abundant in the summer months.

Annual Vegetation Transect Monitoring

- 8.6.30 As part of the vegetation monitoring programme for the HMP, four fixed transects have been monitored annually since 2010, one in each upland management area, to provide quantitative data of vegetation change across the estate (see Figure 8.6). The 2010 survey took place before the construction of Gordonbush Wind Farm. The 2011 survey took place when the wind farm was under construction and the 2012 survey took place after the wind farm had been in operation for one month. Monitoring also took place in 2013 and 2014. Each transect is 4km in length, with approximately 200 sample points in each, and covers mainly dwarf shrub habitat (i.e. dry and wet heath and blanket bog). Variables recorded include species and height of dwarf shrub, evidence of insect damage, grazing level, and obvious cutting and burning.
- 8.6.31 Full details of the methodology and the results can be found in NES (2015). The findings after five years of monitoring (2010-2014) are summarised as follows:
- 8.6.32 By 2014, high levels of grazing had substantially reduced and low levels increased on all four management areas. Dwarf shrub heath sward heterogeneity in 2014, in terms of height class distribution, was higher than in 2010, with less dominance of the 1-20cms class and a more even spread between this and the 21-40cms class. To this end, it would appear that the main aim of upland management of the HMP, which is to increase sward heterogeneity, is being met. However, despite this reduction in grazing pressure, sward height and heterogeneity decreased between 2012 and 2013 on Areas 2, 3 and 4, with increases in the 1-20cms height class and decreases in the two other classes. This was thought to be due to the effect of insect damage (heather beetle and magpie moth), the prevalence of which was also monitored, with peak infestation in 2011 causing dieback of taller heather between 2011 and 2013 and consequent growth of short, regenerating heather. In 2014, sward height and heterogeneity increased again as the insect infestation decreased to very low levels. Monitoring therefore identified how natural factors, in this case insect infestation, can over-ride the implementation of management objectives.

Field Studies

- 8.6.33 Figures 8.7, 8.8a and 8.8b show the results of the 2013 Phase 1 Habitat and NVC surveys, respectively, undertaken for the Development. The full report of the survey, plus Target Notes for the additional vegetation survey undertaken in 2014, is given in Appendix 8.1a and 8.1b respectively. Results are summarised in Table 8.6.

Table 8.6: Phase 1 Habitats & Principal NVC Communities of the Habitat Study Area

Phase 1 Habitat code	Phase 1 Habitat	Associated NVC communities	Hectares / % area of the Study Area
B1.1	Unimproved acid grassland	U4a <i>Festuca ovina</i> - <i>Agrostis capillaris</i> - <i>Galium saxatile</i> grassland, typical sub-community	5.74/1.22%
		U6 <i>Juncus squarrosus</i> - <i>Festuca ovina</i> grassland	
B5	Marsh/Marshy grassland	M25 <i>Molinia caerulea</i> – <i>Potentilla erecta</i> mire	0.71/0.15%
C1.1	Bracken	U20 <i>Pteridium aquilinum</i> – <i>Galium saxatile</i> community	0.84/0.18%
D1.1	Dry acid heath	H12a <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath, <i>Calluna vulgaris</i> sub-community	38.25/8.15%
		H10a <i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath, typical sub-community	
D2	Wet heath	M15b <i>Trichophorum germanicum</i> - <i>Erica tetralix</i> wet heath, typical sub-community	149.74/31.93%
D5	Dry heath/acid grassland	H10a <i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath, typical sub-community	1.43/0.30%
		H12a <i>Calluna vulgaris</i> – <i>Vaccinium myrtillus</i> heath, <i>Calluna vulgaris</i> sub-community	
		U4a <i>Nardus stricta</i> – <i>Galium saxatile</i> grassland, species-poor sub-community	
E1.6.1	Blanket bog	M17a <i>Trichophorum germanicum</i> - <i>Eriophorum vaginatum</i> blanket mire, <i>Drosera rotundifolia</i> - <i>Sphagnum spp.</i> sub-community	222.99/47.54%
E1.7	Wet modified bog	M17a <i>Trichophorum germanicum</i> - <i>Eriophorum vaginatum</i> blanket mire, <i>Drosera rotundifolia</i> - <i>Sphagnum spp.</i> sub-community	34.65/7.39%
E2.1	Acid/neutral flush	M6c <i>Carex echinata</i> - <i>Sphagnum recurvum/ auriculatum</i> mire, <i>Juncus effusus</i> sub-community	14.98/3.19%
I2.1	Quarry	N/A	0.25/0.05%
			Total Area: 469

8.6.36 The main findings were:

- The majority of the survey area supports the blanket bog community M17 *Trichophorum-Eriophorum* mire, but with M15 *Trichophorum-Erica* wet heath, H10 *Calluna-Erica* heath and H12 *Calluna-Vaccinium* heath more prevalent to the south and west, where the slope increases and the peat becomes thinner;

- Acid M6 *Carex-Sphagnum* mire marks out flush lines, typically along the fringes of watercourses. Other communities include small areas of U4 *Festuca-Agrostis-Galium* grassland, bracken and U6 *Juncus-Festuca* grassland;
- The blanket bog has been subject to historic draining (with moorland grips present in much of the habitat), peat cutting and, more recently, burning. This has modified the floristics in certain areas giving rise to a drier bog community largely dominated by deer grass and heather, particularly in the north-west of the Development site. In other, flatter areas, drainage has had a limited impact on floristics with good levels of *Sphagnum* still present;
- Burning has also created a hybrid wet/dry heath community with affinities to both the M15 *Trichophorum-Erica* wet heath and H10 *Calluna-Erica* dry heath;
- Species of interest include *Sphagnum fuscum* and Great sundew (*Drosera anglica*), both of which are found in the M17 mire. *S.fuscum* occasionally occurs in the least disturbed areas with the deepest peats, while *D.eanglica* is found relatively frequently across the community. *S.fuscum*, is a scarce plant of raised bogs in northern England and southern Scotland, but is more frequent in the Eastern and Northern Highlands, where it also occurs in flushes and blanket bogs above 400m (Hill, Preston and Smith 1992 and Smith 2004). *D.eanglica* is a scarce species in southern Scotland and England, but is more commonly found in the Central and Northern Highlands (Preston, Pearman and Dines 2002);
- No nationally Rare or Scarce species (i.e. occurring in 15 or fewer 10km squares, and 16-100 10km squares respectively) were recorded on the Development site; and
- There is no hydrological continuum of habitat with the Coir' an Eoin SSSI and SAC to the west.

Groundwater Dependent Terrestrial Ecosystem (GWDTE)

- 8.6.37 Potential areas of GWDTE were identified based on their Phase 1 Habitat and NVC classifications.
- 8.6.38 SEPA currently defines GWDTEs on the basis of specific NVC communities. SEPA Guidance Note 31 (SEPA 2014) and UKTAG (2009) provide a table detailing the definition of GWDTEs as per the NVC. The UKTAG list provides a scoring system, where a score of 1 is for highly groundwater dependent habitats; 2 for moderately dependent groundwater habitats and 3 is for habitats with a low groundwater dependency. The list gives different scoring for habitats occurring in Scotland.
- 8.6.39 Table 8.7 shows the Ground Water Dependency Scores (GWDS) for NVC communities recorded on the Development site and summarises their level of importance in terms of highest European and UK conservation legislation.

Table 8.7: Summary of GWDSs and Level of Importance

NVC Community	GWDS Scotland	Level of Importance	Location on site
U4a <i>Festuca ovina</i> - <i>Agrostis capillaries</i> - <i>Galium saxatile</i> grassland, typical sub-community Acidic grassland	3		Small stands restricted to river valleys
U6 <i>Juncus squarrosus</i> - <i>Festuca ovina</i> grassland Acidic grassland	2		Occurs on thinner, peaty soils with impeded drainage. Very limited occurrence
H12a <i>Calluna vulgaris</i> - <i>Vaccinium myrtillus</i> heath, <i>Calluna vulgaris</i> sub-community H10a <i>Calluna vulgaris</i> - <i>Erica cinerea</i> heath, typical sub-community Dry heath	3	European Dry Heath is an Annex 1 habitat under the EC Directive 92/43/EEC on the Conservation of Natural Habitats and Wildlife Fauna (The Habitats Directive). It is also a priority habitat in the UKBAP and LBAP, falling under Upland Heathland.	Common in steep river valleys and more freely drained slopes
M15b <i>Trichophorum germanicum</i> - <i>Erica tetralix</i> wet heath, typical sub-community Wet heath	2	Northern Atlantic wet heath with <i>Erica tetralix</i> is an Annex 1 habitat under the EC Directive 92/43/EEC on the Conservation of Natural Habitats and Wildlife Fauna (The Habitats Directive). It is also a priority habitat in the UKBAP and LBAP, falling under Upland Heathland.	Widespread over gently sloping ground and ridges. Not particularly ground water dependent on site.(Confirmed by later study – see Chapter 9: Hydrology, Hydrogeology and Geology).
M17a <i>Trichophorum germanicum</i> - <i>Eriophorum vaginatum</i> blanket mire, <i>Drosera rotundifolia</i> - <i>Sphagnum</i> spp. sub-community Blanket bog	3	Active blanket bog is an Annex 1 of the EC Directive 92/43/EEC on the Conservation of Natural Habitats and Wildlife Fauna (The Habitats Directive). It is also a priority habitat in the UKBAP and LBAP, falling under Blanket Bog.	Widespread over deeper, wetter peats.
M6c <i>Carex echinata</i> - <i>Sphagnum recurvum/auriculatum</i> mire, <i>Juncus effusus</i> sub-community Mire	1	A Priority Habitat in the UK BAP for upland flushes, fens and swamps.	Marks out drainage and seepage lines, but is restricted on site.

GWDS = Ground Water Dependency score (UKTAG 2009) 1= High, 2 = Moderate, 3 = Low

8.6.40 GWDEs are not common across the Development site. The M17 blanket bog is an ombrogenous (rain fed) community. Although certain sub-communities of M15 wet heath are more ground water dependent than others, especially the M15a sub-community (not present on site), the M15b sub-community was thought not to be especially dependent on

ground water on this site. The M6c community, which comprises acidic flushes along the fringes of water courses and valley bottoms, is a fairly species-poor community of limited floristic diversity.

- 8.6.41 The M15b wet heath and the M6c communities were further investigated to establish the degree of ground water dependency and these results are given in Chapter 9 (Hydrology, Hydrogeology and Geology). In this investigation, site visits were undertaken to take hand dug trials to assess areas of potential high GWDTE and water samples were obtained to analyse major ion chemistry. This demonstrated that the majority of potential GWDTE habitat was considered to be sustained by surface rainfall runoff rather than groundwater. The exception to this were areas of high GWDTE along watercourses and a small area to the west of the site, which are sustained at least in part by groundwater. Design of the wind farm has taken this into account and avoided areas of high and moderate dependency where possible, as detailed in Chapter 3: Site Selection, Design Evolution and Consideration of Alternatives and Chapter 9: Hydrology, Hydrogeology and Geology of this ES.

Fauna

Terrestrial fauna

Desk studies

Databases

- 8.6.42 The NBN Gateway records for the 10km grid square NC81, plus the Highland Biological Records Group (HBRG) records, for some of the key groups of animal species (that are either protected by law, or listed in the UK BAP or the Scottish Biodiversity List) that are recorded in the locality are shown in Tables 8.8 and 8.9 respectively.

Table 8.8: NBN Gateway Records for NC81

Species	Status
<i>Arvicola amphibius</i> - European water vole (recorded in one x 1km square in the upper Development site and in one x 1km square on the upper Smeorail to the east of the site)	UK BAP Priority Species, Scottish Biodiversity List, WCA
<i>Salmo salar</i> - Atlantic salmon	Annexes II and V Habitats Directive, Schedule 3 UK Habitats Regulations 1994, UK BAP Priority Species, Scottish Biodiversity List

Table 8.9: Designated Species Records for the Site and Environs obtained from HBRG

Species	Site	2km from site	10km from site (bats only)	Status
<i>Arvicola amphibius</i> - European water vole	Y	Y		UK BAP Priority Species, Scottish Biodiversity List, WCA
<i>Bufo bufo</i> - Common toad		Y		UK BAP Priority Species, WCA
<i>Martes martes</i> - Pine marten		Y		UK BAP Priority Species, WCA, Habitats Directive
<i>Coenonympha pamphilus</i> - Small heath butterfly		Y		UK BAP Priority Species, GB Red List Species
<i>Physocephala nigra</i> - insect - true fly (Diptera)		Y		GB Red List species
<i>Plecotus auritus</i> - Brown long-eared bat			Y	UK BAP Priority Species, Habitats Directive
<i>Pipistrellus</i> - Pipistrelle bat species			Y	UK BAP Priority Species, Habitats Directive

Past Surveys

- 8.6.43 Two mammal surveys were undertaken by NES prior to the construction of Gordonbush Wind Farm, one in 2008 and the other in 2010.
- 8.6.44 The 2008 survey concentrated on the Gordonbush Wind Farm site and the proposed borrow pit area within the Bullburn Plantation. Most of the major watercourses within the wind farm site contained sections of suitable water vole habitat, but many of the smaller watercourses and drainage ditches were considered to be unsuitable due to insufficient water levels, together with a lack of available good quality bank-side vegetation. Otter spraints were found at two locations, but no holts were found. Otter, pine marten and wild cat activity was confirmed in the Bullburn survey area, although no breeding or resting dens of these species were found.
- 8.6.45 The 2010 survey looked at otter and water vole on the whole length of the two main water courses bordering the wind farm site (the Allt a' Mhuilinn and the Allt Smeorail), as well as the wind farm plateau (see Appendix 8.2a for 2010 Mammal survey map). Otter activity was confirmed by the presence of 10 holts and four couches, together with spraints and prints. Of these, four holts and two couches were located on the Allt a' Mhuilinn, and six holts and two couches located on the Allt Smeorail. Sprainting activity was light and sporadic on all watercourses, with concentrations on the smaller burns and tributaries which support breeding amphibians. Water vole colonies were confirmed on the wind farm plateau, on the upper tributaries of the Allt nan Nathraichean, in the area between the current northern Development site boundary and the Habitat study area.

Field Studies

- 8.6.46 Full results of the 2013 faunal surveys are given in the Report of Survey in Appendix 8.2b and in the Report of Survey for the Allt a' Mhuilinn hydro dam removal in Appendix 8.6.

Otter

- 8.6.47 Otters are utilising the Allt a' Mhuilinn and the Allt Smeorail to the west and east of the Development site respectively, plus the Allt nan Nathraichean (tributary of the Allt a'

Mhuilinn) in the north-west of the site, with evidence of sprainting, couches and holts found (see Figure 8.9a). It is likely that the couch and holt on the Allt nan Nathraichean will be used intermittently or seasonally, perhaps in the spring. During this period otters are known to range into upland sites along smaller water courses in search of amphibians. None of the holts identified on the Allt a' Mhuilinn between the access track and Bullburn Plantation in the south-west corner of the Development site were assessed as being potential natal holts.

- 8.6.48 Otters using the Allt a' Mhuilinn may be part of the otter population of the adjacent Coir' an Eoin SSSI, the eastern boundary of which is intersected by tributaries of the Allt a' Mhuilinn.

Water vole

- 8.6.49 The presence of water vole was confirmed in three locations on the periphery of the study area (see Figure 8.10). These areas all comprise watercourses relatively high up the respective tributary catchments.

Pine marten

- 8.6.50 Evidence of pine marten was recorded on the edge of the study area near the Allt Smeorail burn to the east of the site and on a camera trap at the plantation edge (see Figure 8.10).

Bats

- 8.6.51 The study area offers only limited foraging habitat for bats, which were recorded in very low numbers by both the transects and static detectors within the site (see map in Appendix 1 of the Report of Survey in Appendix 8.2: Faunal Survey Report). Bats were recorded in higher numbers by the static detectors foraging on and just beyond the south east edge of the study area, close to the woodland areas and along stream sides, which are likely to provide foraging corridors into the site. Four species of bats were recorded by the static detectors - Soprano and Common pipistrelle bat (*Pipistrellus pipistrellus* and *P. pygmaeus*), Daubenton's bat (*Myotis daubentonii*) and Natterer's bat (*M.nattereri*). No bat roosts were found on the site. A single pipistrelle bat was found to be roosting nearby in the ruined cottage to the south-east of the site, and a number of buildings near to the public road to the south of the site were found to have the potential to support bat roosts.

Badger

- 8.6.52 No evidence was found of badger using the study area or environs.

Wildcat

- 8.6.53 No evidence of wildcat was recorded.

Reptiles

- 8.6.54 No reptiles were found under the placed refugia although were, however, recorded in the study area while carrying out other survey work, with lizards and adders seen in low numbers on site. The reptiles found were fairly widespread and were not confined to specific areas. The best reptile refuge on site is the old sheep pen (NC 8418 91357).

Freshwater

Desk studies

- 8.6.55 The Development site lies within the catchments of the Allt a' Mhuilinn to the west and Allt Smeorail to the east, and both watercourses are tributaries of the River Brora. The Allt a' Mhuilinn flows into the River Brora at NC 827 106, while Allt Smeorail flows into Loch Brora at NC 844 092. The Allt a' Mhuilinn and the Allt Smeorail, plus Loch Brora and the River Brora downstream of the loch, are classified by SEPA as 'Good' status, while the section upstream of Loch Brora to Balnacoil is classified as 'Moderate' due to abstraction upstream at Dalnessie to supply the Shin Hydropower scheme.

Fish

- 8.6.56 The River Brora sustains valuable fisheries and significant populations of Atlantic salmon (*Salmo salar*) and sea trout (*S. trutta*). Interrogation of fish data through the NBN Gateway found records of Arctic charr (*Salvelinus alpinus*) from Loch Brora and brook lamprey (*Lampetra planeri*) are also known to be present (Watt and Ravenscroft 2005) along with European eels (*Anguilla anguilla*) and three-spined sticklebacks (*Gasterosteus aculeatus*). Salmonid spawning gravels were reported in the 2003 Gordonbush Wind Farm ES to occur on the Allt a' Mhuilinn near Ascoile, downstream of the current Development site.

Freshwater Pearl Mussel

- 8.6.57 A survey for freshwater pearl mussel (FWPM), following SNH guidance, was undertaken in March 2013 as part of the assessment of the proposed removal of the old hydro dam wall on the Allt a' Mhuilinn (NC 83131, 12417). The dam had been redundant for many years and for most of the time the reservoir remained empty except in flood events. Consultations with SNH for the dam study revealed that a breeding population of FWPM exists further upstream on the River Brora, but no survey data exist for the Allt a' Mhuilinn.
- 8.6.58 No FWPM were found during the survey. Within the majority of sample transects there was a general lack of sand and finer sediments required by FWPM to burrow into, probably as a result of sediment trapping by the upstream dam. Many of the sections also had bedrock as the underlying substrate. Flow was, however, found to be good throughout the transects and capable of supporting a population of FWPM.

Field Studies

Fish

- 8.6.59 The only fish species identified in the streams draining directly from the Development site was brown trout. Access to the Development by migratory species is prevented by a dam and/or natural waterfalls on both the Allt a' Mhuilinn and Allt Smeorail. Waterfalls and a dam restrict migratory salmonids to the lower 1.2km of Allt a' Mhuilinn, some 2km downstream of the nearest proposed wind turbine, while a waterfall restricts migratory salmonids to the lower 0.6km of Allt Smeorail.
- 8.6.60 Downstream of these obstacles both streams support populations of Atlantic salmon, brown/sea trout and eels. Lampreys, most probably the brook lamprey, are also present in the accessible reaches.

- 8.6.61 On the Allt a' Mhuilinn tributaries, the presence of trout in Allt nan Nathreachan is considered near-certain as stream habitats are suitable and there are no obstacles preventing access to this stream from Allt a' Mhuilinn. On the Allt Smeorail tributaries, the Ristocky Burn and Badan Burn provide very poor quality habitat for trout and these streams may be fishless, but trout is present on the Allt a' Breac-achaidh, which has suitable habitat.

Freshwater Pearl Mussel

- 8.6.62 No FWPM, shells or shell fragments were found within either the Allt a' Mhuilinn or Allt Smeorail. Areas of suitable habitat were identified throughout the length of the watercourse of the Allt a' Mhuilinn. The middle and upper sections of the Allt Smeorail survey contained large amounts of bedrock which limited the potential for FWPM, however, the lower section was considered to provide excellent FWPM habitat, with many areas of finer sediment in between larger cobbles and boulders.
- 8.6.63 A number of trout (which are required by the FWPM to complete their life cycle), ranging from juvenile to adult, were observed throughout the survey and the presence of otter signs suggests a good fish population capable of supporting a viable FWPM population.

Survey Limitations

- 8.6.64 The incomplete baseline survey coverage between the respective northern boundaries of the study area and the Development site is not thought likely to be a limitation to the assessment of effects. The tracks and substation to be used in the area are already built and no new construction work is proposed. The water courses in this area are not suitable habitat for otter shelters, being too high up the catchment, and disturbance to the species due to a temporary increase in traffic is therefore highly unlikely to occur. However, water vole are known (from the pre and during construction surveys undertaken for Gordonbush Wind Farm) to be present in the area between the two boundaries. As works in this area would be limited to cabling and substation upgrade, and possibly access track upgrade, with no new watercourse crossings, potential impacts on water vole would be limited to water quality issues and the need for survey to identify any new colonies arising since 2010 is not imperative for assessment. The need for pre-construction surveys and appropriate mitigation is discussed in Section 8.8.

Modifying Influences

- 8.6.65 The recent woodland planting in the Allt a' Mhuilinn valley adjacent to the site will improve foraging habitat for bats in those areas in the medium to long term.
- 8.6.66 The five year transect monitoring results in Area 4 of the HMP upland management area has shown that grazing levels reduced between 2010 and 2014, with an associated increase in dwarf shrub sward height (as seen across all four areas). The 21-40cms sward height class is now dominant instead of the 1-20cms class, and there is a small increase in the 41-60cms and 61+ height classes. Grazing control over the next five years of the HMP will be decided this year, but it is envisaged that, at the least, maintenance of current grazing levels should allow the longest sward height classes to increase further (assuming that there is no heather beetle outbreak during this period).

8.7 Potential Effects

Key Development Issues

8.7.1 The key characteristics of the Development that are relevant to the assessment of effects are as follows:

- Turbine layout;
- Turbine and crane pad foundation dimensions;
- Track layout and dimensions;
- Borrow pit location and layout;
- Construction compound and operations building location;
- Concrete batching plant location;
- Construction activities;
- Construction programme; and
- Assumed design, management and mitigation measures.

Main Potential Effects

8.7.2 The following potential effects on non-avian ecology within and near to the Development include:

- Permanent habitat loss, damage and fragmentation by site infrastructure;
- Noise and visual disturbance to fauna during construction and operation;
- Faunal fatalities; and
- Freshwater sedimentation and pollution from surface runoff during construction .

8.7.3 There will be some loss of and damage to upland habitat due to the site infrastructure, plus the potential for impacts on freshwater ecology, including resident fish populations on the site and downstream salmonid populations from water pollution during construction. There is potential for impacts on otter and water vole populations on the site during construction through habitat loss, disturbance and water pollution, and on pine marten through disturbance. There is also potential for damage to reptile habitat during construction.

8.7.4 The potential effects on the HMP objectives in Management Area 4 are also examined in Section 8.9.

8.8 Mitigation

8.8.1 Mitigation of the potential effects of the Development on ecological receptors present within the site would be achieved through the management of the construction and operation phases of the development in order to avoid or minimise impacts.

8.8.2 All relevant mitigation measures would be implemented through a Construction Environment Management Plan (CEMP) (see Appendix 4.1: draft CEMP) and Construction Method Statements.

8.8.3 The following design, management and mitigation measures are proposed:

- Site infrastructure design minimises impacts on habitats of highest sensitivity as far as possible, including avoidance of all water crossings (visible on 1:50,000 OS Mapping) and locating turbines more than 50m from watercourses, woodland edges, areas of high GWDTE and moderate where possible, and areas of deep peat (see Chapter 3: Site Selection, Design Evolution and Consideration of Alternatives and Appendix 3.1: Design Statement).
- An Ecological Clerk of Works (ECoW) would be appointed during the construction period, as required (see Appendix 4.1: draft CEMP for specific ECoW tasks and responsibilities);
- Final locations of site infrastructure in or close to sensitive habitats to be micro-sited, in consultation with the ECoW, to minimise impacts;
- 50m exclusion zones will be maintained between working areas, machinery and watercourses (except watercourse crossing points). Exclusion zones will be demarcated where necessary by the ECoW;
- Demarcation of defined working areas during construction phase to prevent unnecessary entry to and disturbance of sensitive habitats, including otter and water vole habitat along the watercourses;
- The relevant Pollution Prevention Guidelines would be followed (see Appendix 4.1: draft CEMP);
- Adoption of best practice techniques of track and turbine base construction to ensure that drainage patterns and water quality within the Development site and environs are maintained; materials inappropriate to site geology are not used in the construction; and to minimise habitat take;
- Adoption of best practice techniques to ensure stored materials (including fuel, concrete etc.) do not contaminate soils or watercourses;
- Adoption of best practice techniques in borrow pits to ensure any pumped drainage water is settled prior to any discharge to water courses;
- Early restoration of all road batters, turbine bases, site compounds and borrow pits to minimise effects due to soil/peat exposure and erosion and to optimise the chances of successful use of rescued live plant material. Use of plant material native to and preferably collected in the locality (including lifting and replacement of turf where timescales allow) and avoidance of fertilisers and lime;
- Pre-construction otter, water vole, pine marten, wildcat, badger and reptile surveys will be undertaken within three months prior to works commencing (or during the suitable survey period prior to works commencing);
- Site specific mammal, reptile and bird protection protocols would be produced to be included in the CEMP; and
- Advance of works checks for reptiles and any necessary translocations would be undertaken.

8.9 Residual Effects

8.9.1 Residual effects are assessed for those habitats and species that have been scoped in to the assessment and are predicted to be affected by the construction and operation of the Development.

8.9.2 On the basis of the above mitigation measures, effects on bats are not considered further in this assessment as turbine siting away from the watercourses (which represent the only likely foraging habitat on the site) prevents the likelihood of collisions with turbine blades. Effects on badger, wildcat and fresh water pearl mussel, none of which are present on site, are also not considered further in this assessment, with the caveat that badger and wildcat should be included in pre-construction surveys.

Habitat Loss and Damage

8.9.3 Indirect effects on the potential GWDTEs are considered in Chapter 9: Hydrology, Hydrogeology and Geology of this ES. The flush community M6c, within the E2.1 habitat, is not directly impacted by construction works and is therefore not covered in the following assessment.

8.9.4 Habitat loss and permanent damage would occur during the construction phase. Table 8.10 shows the areas (in ha) of direct habitat loss for each habitat impacted, covering tracks, crane pads, turbine bases and the construction compound (also comprising the Operations Building), plus the percentage lost of each respective habitat, and overall habitat, within the study area. Borrow pit search areas are not included as these are very substantially greater than the area that would be lost to extraction. The batching plant is also not included, being outside of the Study Area and therefore excluded from the percentage calculations. However, using Phase 1 data from the 2010 survey it is found to result in 0.5ha loss of blanket bog (E1.6.1).

Table 8.10: Habitat Loss to Site Infrastructure

Habitat	Tracks (ha)	Crane pads & turbine bases(ha)	Construction compound (including Operations Building) (ha)	Met mast (ha)	Total area lost (ha)	Total area of habitat in Study Area (ha)	% of impacted habitats lost	% of total habitat in Study Area lost
B1.1 Acidic grassland	0.0005	0.0	0.0	0.0	0.0005	5.74	0.008	0.0001
D1.1 Dry heath	0.080	0.350	0.0	0.096	0.526	38.25	1.375	0.112
D2 Wet heath	0.908	0.574	0.566		2.047	149.74	1.367	0.436
E1.6.1 Blanket bog	1.836	1.493	0.434		3.764	222.99	1.688	0.803
E1.7 Modified bog	0.427	0.447	0.0		0.875	34.65	2.524	0.187
					7.212	451.37	1.577	1.538

8.9.5 The total area of habitat lost would be 7.212ha, representing 1.577% of impacted habitats and 1.577% of all habitats in the study area.

8.9.6 Table 8.11 shows the areas of habitat damage, plus the percentage damage of each respective habitat, and overall habitat, within the study area. Again, borrow pit search areas and batching plant are not included. This calculation makes the assumption of a 10m disturbance zone around all works. This takes account of the area used for road batters, cabling and indirect effects on peatland habitat such as drying, and should be considered a maximum figure.

Table 8.11: Habitat damage due to site infrastructure

Habitat	Tracks (ha)	Crane pads & turbine bases(ha)	Construction compound (including Operations Building) (ha)	Total area damaged (ha)	Total area of habitat in Study Area (ha)	% of impacted habitats damaged	% of total habitat in Study Area damaged
B1.1 Acidic grass-land	0.009	0.0	0.0	0.009	5.74	0.162	0.002
D1.1 Dry heath	0.397	0.320	0.0	0.717	38.25	1.874	0.153
D2 Wet heath	4.145	0.561	0.095	4.800	149.74	3.206	1.023
E1.6.1 Blanket bog	8.201	1.554	0.220	9.975	222.99	4.473	2.127
E1.7 Modified bog	1.877	0.419	0.0	2.296	34.65	6.626	0.490
				17.798	451.37	3.943	3.795

8.9.7 The total area of habitat damaged would be approximately 17.798ha, representing 3.94% of impacted habitats and 3.80% of all habitats in the study area.

8.9.8 Assessment of significance is undertaken by habitat type and considers habitat loss and damage together. This is because the works undertaken in the buffer zones of the infrastructure, covering track and crane pad/ compound batters, most usually have direct, long term effects on the heath and peatland habitats due to disturbance of the upper ground layers and/or covering the original ground layer. Re-establishment of fully functioning heath and bog vegetation is slow on these areas, even after restoration (the effect is shorter term on acidic grassland habitat, which re-establishes within the first season after restoration). Permanent, indirect effects can also occur in the buffer zone due to hydrological changes brought about by the adjacent excavation, which can result in localised drying of the adjacent peat (an effect not thought to extend beyond about 10m).

8.9.9 Effects on acidic grassland are negligible with 0.008% and 0.162% habitat loss and damage of the total area of the habitat in the study area respectively, and are not considered further.

8.9.10 Table 8.12 shows the conservation value of the remaining impacted habitats and the percentage area that would be lost of each respective habitat in the study area, plus equivalent percentages for the Caithness and Sutherland Peatlands Natural Heritage Futures zone and the overall Scottish peatland and heath habitats. For these latter

calculations, blanket bog and modified bog have been combined (totalling 257.64ha) as these categories are not distinguished in the two larger databases.

Table 8.12: Conservation Value of Affected Habitats and Percentage Loss

Phase 1 Habitat	Status	Bog habitat on site as % of peatland habitat in C&S NHFZ	Value of habitat on site	% of habitat lost & damaged in Study Area	lost & damaged bog as % of peatland habitat in C&S NHFZ ¹	lost & damaged bog as % of total Scottish peatland habitat	lost & damaged heath as % of Scottish heath habitat ²
D1.1 Dry acid heath	Undesignated Annex 1 Habitat, UKBAP and LBAP Priority habitat		Site	3.25%			0.0004%
D2 Wet heath (- rain fed)	Undesignated Annex 1 Habitat, UKBAP and LBAP Priority habitat		Local	4.57%			
E1.6.1 Blanket bog - good condition	Undesignated Annex 1 Habitat, UKBAP and LBAP Priority habitat	0.06%	Local	(6.16% of E1.6.1)	0.004%	0.0009%	
E1.7 Wet modified bog - poor condition	Undesignated Annex 1 Habitat, UKBAP and LBAP Priority habitat			(9.15% of E1.7))			

¹C&S NHFZ = Caithness & Sutherland Peatlands Natural Heritage Futures Zone

² Using the mean hectareage of area quoted in the UKBAP

Blanket Bog

- 8.9.11 Blanket bog is the most extensive habitat in the study area, with 47.5% of the total area comprising intact bog and 7.39% comprising degraded bog (see Table 8.6). Blanket bog is a globally restricted peatland habitat confined to cool, wet, typically oceanic climates and for this reason is an Annex 1 Habitat. It is the most extensive semi-natural habitat in Scotland (which accounts for around 10% of the world total), covering 1,800,000ha and about 23% of the land area (Bruneau, P.M.C & Johnson, S.M. 2014). Taken together, the peatlands within Caithness and Sutherland National Heritage Future zone comprise about a quarter of this area at 400,000ha.
- 8.9.12 350,000ha of blanket bog has been designated as a SAC in Britain (JNCC website – Habitat Account – Raised bogs and mires and fens), including much of the Caithness and Sutherland peatlands (in the Caithness and Sutherland Peatlands SAC), but not the

Development site. A value level of International is not therefore appropriate to the habitat in the study area. The combined area of bog and degraded bog in the study area comprises just 0.06% of the peatland area in the Caithness and Sutherland Peatlands Natural Heritage Future zone, and is therefore too small an area to be considered either of Regional or County value. The blanket bog is therefore assessed as being of Local value. Although affected by past drainage in the north-west of the study area, and therefore showing some signs of drying, the potential exists to restore the wet modified bog habitat through ditch blocking and it is therefore also assessed as Local Value.

8.9.13 Total loss and damage to the combined bog habitats amounts to 6.56% of the total bog habitat in the study area. This is assessed as being a permanent and, or long term negative effect of moderate magnitude, resulting in Minor significance.

8.9.14 The effect results in loss/damage to 0.004% of the peatland habitat in the Caithness and Sutherlands NHF zone and 0.0009% of the overall Scottish peatland area, neither of which are significant at these geographical scales.

Heath

8.9.15 Dwarf shrub heaths are recognised as being of international importance because they are largely confined within Europe to the British Isles and the western seaboard of mainland Europe. Upland heathland is the characteristic vegetation of podsolised, free-draining, acid mineral soils (dry heath) and also shallow peat up to about 50cm deep (wet heath). It is characterised by the presence of dwarf shrubs at a cover of at least 25%. The habitat is widespread in the cool, wet climate of the uplands, where it generally occupies land which was once woodland. It is common throughout the uplands of Scotland and covers between 21% and 31% of the area of Scotland, covering between 1,700,000 and 2,500,000ha (UK Biodiversity Action Plan Priority Habitat Descriptions Upland Heathland From: UK Biodiversity Action Plan; Priority Habitat Descriptions. BRIG (ed. Ant Maddock 2008).

Wet Heath

8.9.16 Wet heath is the second most extensive habitat in the Study Area, covering 31.93% of the area (see Table 8.6). The NVC community M15, as found in the study area, is the most extensive form of wet heath in Scotland. The 2010 Site Condition Monitoring undertaken across the Gordonbush Estate in 2010 survey showed wet heath to be in the least favourable condition of the habitats on the estate, being most affected by grazing and burning and it is thought that some areas are converting to dry heath. It is assessed as being of Local value.

8.9.17 Total loss and damage to the wet heath habitat amounts to 4.57% of the habitat type in the study area. This is assessed as being a permanent and, or long term negative effect of moderate magnitude, resulting in Minor significance.

Dry Heath

8.9.18 Dry heath is the third most extensive habitat in the study area, but only covers 8.15% of the area. The NVC communities found on site, H10a and H12a, are the most common forms of dry heaths in Scotland, and together they cover substantial areas of upland ground and are the predominant element in many upland landscapes. This is a species poor

habitat on the study area, affected by burning. Due to its small extent in the study area it is assessed as being of Site value.

- 8.9.19 Total loss and damage to the dry heath amounts to 3.25 of the habitat type in the study area. This is assessed as being a permanent and, or long term negative effect of moderate magnitude, resulting in a Not significant impact.

Construction Effects on Fauna

Otter

- 8.9.20 Otter is present on most suitable upland watercourses and many lowland watercourses in Scotland. The otter population of the adjacent Coir' an Eoin SSSI, which otters on the Development site might comprise a part of, can be considered to be part of a nationally important population. The Development site and surveyed environs site are assessed as being of Local value to otters.

Habitat Loss, Damage and Fragmentation

- 8.9.21 Figures 8.9a and 8.9b show that no otter shelters (holts or couches) will be directly impacted by the proposed works and, with the absence of any new water crossings, there will be no loss of foraging area or fragmentation of habitat.
- 8.9.22 Wind farm construction has the potential to negatively affect water quality through increased sedimentation and contamination with chemicals, such as fuel and hydraulic oils. Prolonged pollution of a watercourse can cause long term damage to the productivity and diversity of a habitat, adversely affecting otter and their food supply. However, with implementation of mitigation to prevent water pollution, as outlined in this Chapter and in Appendix 4.1: draft CEMP, the magnitude of any negative effects is expected to be no more than Slight, with no significant effects arising.

Disturbance

- 8.9.23 While otter in inland habitats generally adopt a nocturnal habit, some degree of direct disturbance by people and machinery to otter might occur during the construction phase. This may take the form of disruption of foraging behaviour, or noise and vibration disturbance to animals at their daytime resting sites.
- 8.9.24 Because of the distance of the shelters from the nearest turbine or track, it is unlikely that disturbance levels will affect the use of the shelters, as it is now accepted that otter will generally tolerate human activities close to their resting sites (Chanin 2003). The minimum legal distance for exclusion zones at shelters and holts is 30m. Larger buffer distances for natal holts, of between 200-250m, are required.
- 8.9.25 The turbine in closest proximity to a shelter is Turbine 7 (Figure 8.9a), which is approximately 220m from the holt on the Allt nan Nathraichean in the north-west of the Development site. The holt is assessed as being unlikely to be used for breeding. Figure 8.9b shows the cluster of holts and couches in the Allt a' Mhuilinn valley below the site compound and operations building. The nearest is 125m away in the small tributary valley below the compound, while the rest are over 200m away. None were identified as being potential natal holts.

8.9.26 Pedestrian access during construction into the tributary valley below the site compound is unlikely due to the steep slope below the access track, but, as an extra precaution, the area would be demarcated as out of bounds. In addition, exclusion zones along watercourses on and adjacent to the Development site would be in place during construction to minimise the risk of disturbance. Pre-construction survey within three months prior to start of construction works would be undertaken to identify any changes in the location of shelters and also any change in status to identify potential breeding sites.

8.9.27 Disturbance effects on otter during the construction phase are therefore predicted to be of either Negligible or Slight magnitude and therefore Not significant effects. Any effects on the otter population of the adjacent Coir' an Eoin SSSI are therefore also Not significant.

Fatalities

8.9.28 Otters are very inquisitive mammals and may investigate new holes and crevices and could become trapped in unused drainage pipes and open pits. With mitigation to avoid the creation of potential traps by capping all pipes and ramping pits for easy escape, no impact is predicted.

8.9.29 Road traffic would increase during wind farm construction, and there is therefore an increased risk of road traffic injury and mortality to otter during this period, particularly in the region of watercourse crossing points. However, the crossings at which otter activity was recorded on the site are limited to two (both in the locality of the borrow pit 2) and there would be no traffic at night when the animals are most active. The probability of the effect occurring is therefore extremely unlikely and magnitude of effect is therefore predicted as Negligible and therefore Not significant effects.

Water vole

8.9.30 After years of decline due to mink predation and habitat loss, water vole in Scotland are thought to be probably increasing due to concerted habitat creation, enhancement and management, in combination with sustained catchment-scale mink control which has led to localised range expansions (JNCC 2010). Water vole are present throughout much of the upper catchments in the Highlands where mink, their main predator, is unable to subsist, these areas now representing the stronghold of the Scottish water vole population. The Development site is assessed as being of Local Value for water vole.

Habitat Loss, Damage and Fragmentation

8.9.31 Figure 8.10 shows that no water vole colonies would be directly impacted by the proposed works due to the absence of any new water crossings and because all works would be more than 100m distant from areas of water vole activity. Further water vole survey will be undertaken within three months prior to start of construction and minimum exclusion zones of 30m demarcated on the ground. The probability of damage is therefore extremely unlikely and magnitude is assessed as Negligible, with a Not significant effect occurring.

8.9.32 Wind farm construction has the potential to negatively affect water quality through increased sedimentation and contamination with chemicals, such as fuel and hydraulic oils. Prolonged pollution of a watercourse can cause long term damage to the productivity and diversity of a habitat, adversely affecting water vole. Wind farm construction also has the potential to change the natural flow rates of water courses, either through disruption of

flow or through flooding by pumping, or diversion of flow, into water courses, both of which could negatively impact water vole. Tracks and turbines are generally more than 100m from watercourses (visible on 1:50,000 OS Mapping) which reduces the risk of polluted water entering the water courses and furthermore, the two colonies in the east and south of the study area are not downstream of works, making the likelihood of pollution in these locations very low. The colony on the western edge of the study area is about 250m downstream of Turbine 11 which is between 50-100m from the watercourse, and the risk would be greater. The magnitude of a pollution or flooding event on the water vole colony, which is assessed as being of Local value, might be anything from slight to severe.

- 8.9.33 With the adoption of best practice techniques of track and turbine base construction, as outlined in Section 8.8 (see also Appendix 4.1: draft CEMP) to ensure that drainage patterns and water quality within the Development site and environs are maintained, the magnitude of any negative effects are expected to be no more than Slight, with Not significant effects arising.

Pine marten

- 8.9.34 The pine marten was once found throughout Britain, but after a dramatic decline in the 19th century due to persecution its distribution was reduced substantially to relict populations in north-west Scotland. In the latter half of the 20th century, the population made a significant recovery with an expansion south and eastwards into the rest of Highland, Moray, Perth & Kinross, Argyll & Bute, much of Aberdeenshire, Angus, Stirling and parts of Fife. However, the species is still rare in the UK with population estimates ranging from 2,600 to around 3,500 adult pine martens in Scotland.
- 8.9.35 Pine martens spend a large part of their time in extensive mature conifer plantations, although sometimes do range on open ground. The study area is not optimal habitat for the species, and accordingly signs were only recorded in the south-east on the edge of one of the small conifer blocks, and just outside in the wooded Smeorail valley (Figure 8.10). The study area is therefore of no more than Site value for the species.

Habitat loss, damage and fragmentation

- 8.9.36 No effects of habitat loss or damage are predicted on the species.

Disturbance

- 8.9.37 No den sites were recorded in or near the study area, so disturbance to the species is not predicted to occur, with Not significant effects arising. However, pre-construction survey within three months prior to start of works would be undertaken to check for any den sites in the adjacent plantation in the south east, which might have been created in the interim period. Should there be any present, appropriate exclusion zones would be set up, within which works would require to be licensed by SNH.

Reptiles

- 8.9.38 The reptile species found in the study area, the adder and Common lizard and are both common and widespread across Scotland and any potential ecological impact arising from the works, in terms of the local population, is unlikely to be significant. However, they are

protected from intentional or reckless killing and injuring and measures have to be taken to ensure as far as possible that animals are moved out of the zone of works.

- 8.9.39 The bog and wet heath dominated habitat in the study area was not found to be particularly favourable for reptiles, and no animals were recorded in the artificial refuges, although some sightings were made during other surveys. No specific refuges were identified apart from the old sheep fold south of Turbine 8. The ECoW will carry out further checks during the construction period, including checks ahead of the construction front for the presence of any reptiles. Any reptiles encountered would be safely moved an appropriate distance away from the works by the ECoW to an area of suitable habitat. Known or suspected areas of importance for reptiles such as breeding and hibernating sites should have a minimum exclusion zone of 30m. If site works are likely to come within 30m of a suspected breeding or hibernating site, advice should be taken from a reptile specialist. Not significant effects are predicted.

Fish

- 8.9.40 Typical issues relating to wind farm developments and salmonid fish relate to the exposure of large quantities of soil and the potential for siltation. Inputs of silt and other fine material including peat can cause damage to fish habitats and direct mortality to fish and ova. Similar or greater impacts would be expected in the event of any peat slide resulting from the Development. Silt management will be one of the most significant mitigation issues relating to watercourses.
- 8.9.41 Sedimentation impacts on water courses can arise from construction of watercourse crossings, track construction and drainage and pumping out turbine bases. No new stream crossings are proposed during construction of the Development. Any watercourse crossings are already in place, having been created during construction of the existing track network for Gordonbush Wind Farm. Tracks and turbines are generally more than 100m from watercourses (visible on 1:50,000 OS Mapping) which reduces the risk of polluted water entering the watercourses, except for Turbines 10 and 11, where the risk would be greater. In addition, Turbines 2, 6, 7, 8 and 9 are located in an area of moorland grips (drainage ditches) where, again, water pollution risk might be greater. The construction compound and borrow pit 2 are in close proximity to watercourses, where the risk of pollution would be greatest.
- 8.9.42 Spawning habitat in the upper reaches of Allt a' Mhuilinn and Allt Smeorail and their tributaries appears to be very limited in extent and any loss or damage to suitable areas may be detrimental to trout populations. Given the relatively high gradients in these streams, any such impact might be short-lived as silts would likely be flushed downstream quite quickly. Nonetheless, short term impacts might be severe depending on the scale of any siltation event. This could constitute an effect of Moderate significance, on the assumption that the upper reaches of the Allt a' Mhuilinn and Allt Smeorail are of Local value. The River Brora salmon population as a whole is considered to be of Regional value, while the populations in the study area comprise a small part of this and can be considered to be of Local value on that basis.
- 8.9.43 The adoption of best practice for the prevention of water pollution, as outlined in Section 8.8 and Appendix 4.1: draft CEMP, would greatly reduce the risk and magnitude of sedimentation, and impact magnitude is predicted to be no more than Slight, resulting in a Not Significant effect.

- 8.9.44 Wider potential effects on water quality are outside the scope of this report. However, in the absence of felling, the site is not identified as being especially sensitive in terms of potential effects on soils and water. Monitoring of water quality during construction of Gordonbush Wind Farm identified few notable impacts (Dargie, 2012). Occasional (but minor) increases in levels of turbidity, suspended solids and phosphate were recorded. None appears to have been at levels that would threaten fish.

Operational Effects on Fauna

- 8.9.45 No potential operational effects on fauna are predicted except in the case where specific works might be required on the infrastructure, such as track re-grading or bridge/culvert repair, although it is not possible to predict precisely what activities would take place, or what animal populations would be present, at that time. In these cases, pre-construction works surveys would be undertaken to ensure that sensitive areas are identified and any necessary exclusion zones put in place, which should ensure that no significant effects result.

Decommissioning Effects on Fauna

- 8.9.46 Impacts during decommissioning are considered likely to be broadly similar to those in the construction phase (above), although it is not possible to predict precisely what activities would take place, or what animal populations would be present, at that time. Faunal surveys would be undertaken prior to decommissioning to identify any mitigation that would require to be put in place to minimise any potential effects of decommissioning on the populations.

8.10 Effects on Gordonbush Estate Habitat Management Plan

- 8.10.1 The Development is located within Upland Management Area 4 of the Gordonbush Estate HMP. Within Area 4, HMP management objectives comprise:
- diversification of sward structure by grazing management; and
 - restoration of degraded bog by ditch blocking in the north of Area 4 (see Figure 8.11).
 - Relevant HMP management objectives for land adjacent to the Development can be listed as follows:
 - creation of merlin foraging habitat by the felling of the majority of Bullburn Plantation (as compensation for foraging habitat lost to Gordonbush Wind Farm);
 - diversification and extension of native woodland by planting and regeneration on slopes in the Mhuilinn and Smeorail valleys; and
 - restoration of species-rich grassland by bracken control on the slopes of the Smeorail valley.
- 8.10.2 These objectives are being undertaken with the aim of enhancing bird habitat for the key species of the Existing HMP, namely golden eagle, golden plover and merlin, plus the secondary species, red grouse and black grouse in Areas 1, 2 and 4. In terms of sward diversification, particularly in relation to attracting golden plover and golden eagle, management is being concentrated in Areas 1 and 2 where existing conditions are thought to be most suited for the species. Additionally, Area 4 was shown in the 2010 baseline sward height survey to be most diverse of the four management areas in terms of sward

height and structure (see Figure 8.5), with a more even spread of height classes (the other three areas being dominated by the 20cms class) and a greater proportion of areas with varied sward structure. Enhanced management in this area is therefore thought likely to have a lesser effect than in Areas 1 and 2. For this reason, whilst the Development will result in a loss of habitat within Area 4 (as detailed and assessed in Section 8.9), none of the Gordonbush Estate HMP objectives in terms of habitat management and enhancement will be compromised by the Development.

8.10.3 The effect of the Development on the management objectives in terms of bird interest is discussed further in Chapter 10 (Ornithology).

8.11 Cumulative Effects

8.11.1 This section considers the potential cumulative effect of the Development on ecology and nature conservation taking into account other developments.

8.11.2 Cumulative effects are considered for operational Gordonbush Wind Farm and the Development.

8.11.3 Cumulative effects on fauna are not predicted as effects identified for the Development are all short term, occurring during the construction phase. Similarly, no long term operational affects on fauna were identified in the Gordonbush Wind Farm ES, nor were reported in the Gordonbush Wind Farm ECoW final report (NES, 2012).

8.11.4 Habitat loss and damage will be a cumulative impact and it is possible to calculate the combined total areas of habitat lost/permanently damaged on the two wind farm sites. Table 8.13 shows the area calculations of habitat lost/damaged on the wind farm site, using the Phase 1 habitat map produced for the 2010 HMP survey (NB this map was not as accurately ground truthed as the Development site Phase 1 map and the data are therefore more approximate, but are nevertheless likely to provide a reasonable estimation). Table 8.14 shows the combined data for the two sites, plus the percentage of relevant habitat lost/damaged in the Caithness and Sutherland peatlands NHF zone and of overall the Scottish resource. As for the Development site, the combined totals are not significant at either sub-regional or national level.

Table 8.13: Habitat Loss/Damage on Gordonbush Wind Farm Site (ha)

Phase 1 Habitat	Tracks	Crane pads & turbine bases	Borrow Pits	Substation & Control building	Construction Compound	Total Habitat Loss/Damage
A1.1.1	0.005	0	0	0	0	0.005
A1.2.2	0.089	0	0.734	0	0	0.823
A2.1	0.001	0	0	0	0	0.001
B1.1 Acid grassland	0.319	0.308	0	0	0	0.627
B1.2	0.159	0	0	0	0	0.159
B4	0.519	0	0	0	0	0.519
B5 Marshy grassland	0.601	0.011	0.119	0	0	0.731
C1.1 Bracken	1.527	0	0	0	0.539	2.066
D1.1 Dry heath	4.184	0	0.427	0	0.004	4.615
D2 Wet heath	9.630	1.127	2.208	0	0	12.965
D5 Dry heath / acid grassland	0.177	0.042	0	0	0	0.219
E1.6.1 Blanket bog	33.272	10.053	0.596	0.555	0	44.476
J3.6	0.394	0	0	0	0.031	0.425
	50.874	11.542	4.084	0.555	0.574	67.629

Table 8.14: Combined Heath and Bog Habitat Loss/Damage on Gordonbush Wind Farm and the Development Site

Phase 1 Habitat	Development site (ha)	Gordonbush Wind Farm (ha)	Total (ha)	Lost & Damaged bog as % of peatland habitat in C&S NHFZ ¹	Lost & Damaged bog as % of total Scottish peatland habitat	Lost & Damaged heath as % of Scottish heath habitat ²
D1.1 Dry heath	1.147	4.188	17.68			0.0008%
D2 Wet heath	6.847	10.757				
E1.6.1 Blanket bog	13.739	43.88	47.646	0.012%	0.003%	
E1.7 Modified bog	3.170	0				
	24.913	63.545				

¹C&S NHFZ = Caithness & Sutherland Peatlands Natural Heritage Futures Zone

² Using the mean hectareage of area quoted in the UKBAP

8.12 Monitoring

8.12.1 No specific monitoring requirements have been identified following this assessment. As significant impacts on fish populations are not predicted to occur, fish monitoring during construction or operation is not considered to be required. Best practice surface water quality monitoring is proposed, as detailed in Appendix 4.1: draft CEMP.

8.13 Conclusions

8.13.1 Table 8.15 summarises the effects assessed for each habitat and fauna receptors, the proposed mitigation and residual effect significance.

Table 8.15: Summary of Negative Effects, Mitigation and Residual Effect Significance

Effect	Recep-tor	Site Value	Mitigation	Probability of Mitigation Success	Effect Magnitude	Residual Significance
Construction						
Habitat loss and damage	Blanket bog	Local	-	-	Moderate	Minor
	Wet heath	Local	-	-	Moderate	Minor
	Dry heath	Site	-	-	Moderate	Not significant
Habitat loss and damage	Otter	Local	None required - no impact	-	-	No impact
	Water vole	Local	Pre-construction surveys, demarcation of exclusion zones	Very high	Negligible or Slight	Not significant
	Pine marten	Site	None required - no impact	-		No impact
Water pollution	Otter	Local	Implementation of best practice water quality management	High	Slight	Not significant
	Water vole	Local	Implementation of best practice water quality management	High	Slight	Not significant
	Fish	Local	Implementation of best practice water quality management	High	Slight	Not significant
Construction disturbance	Otter	Local	Pre-construction surveys, demarcation of exclusion zones	Very high	Negligible or Slight	Not significant
	Pine marten (no dens found, potential effects only if dens present in future)	Site	Pre-construction surveys, demarcation of exclusion zones	Very high	Negligible	Not significant
Faunal fatalities - works equipment etc.	Otter	Local	Cap pipes, ramp pits	Very high	No impact	No impact
Faunal fatalities - increased traffic	Otter	Local	-	-	Negligible	Not significant
Faunal fatalities	Reptiles	Site	Pre- construction works checks	High	Slight	Not significant

8.13.2 No significant impacts on designated sites or species are identified.

8.14 Statement of Significance

8.14.1 The definition of significance in terms of the EIA Regulations is a Residual Effect of either Moderate or Major significance. Table 8.15 shows that no residual effects are greater than Minor significance and it can therefore be concluded that there would be No Significant residual effects in terms of the EIA Regulations as a result of the Development.

8.15 References

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