FORCE 9 ENERGY

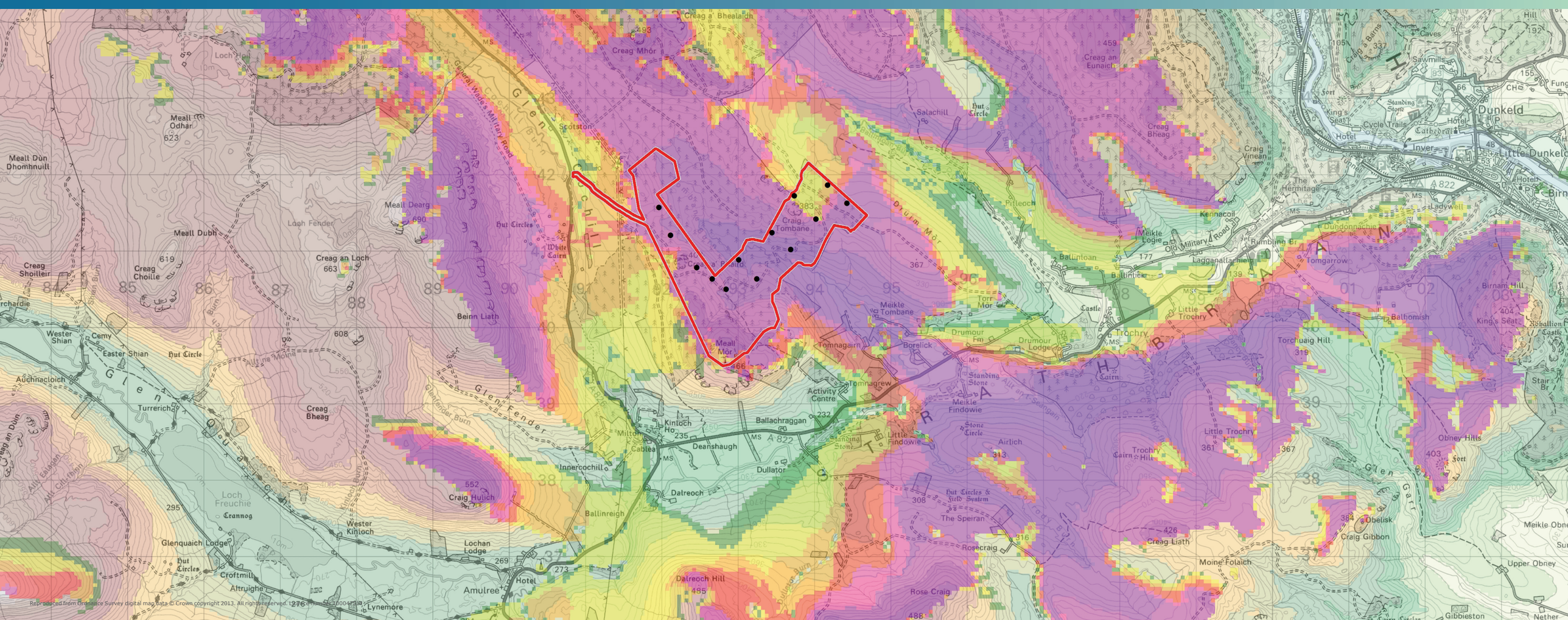
LUC

www.landuse.co.uk

Creag a’ Bhàird Wind Farm Environmental Statement

Volume I: Main Text and Figures

December 2013



Creag a’ Bhàird Wind Farm
Environmental Statement

Prepared by LUC
on behalf of
Force 9 Energy

December 2013

Preface

This Environmental Statement (ES) has been prepared in support of an application for planning permission to construct and operate the thirteen turbine Creag a' Bhàird Wind Farm. The wind farm is located approximately 8.5km south-east of Aberfeldy and approximately 20km north-west of Perth, and lies wholly within the Perth and Kinross Council area.

The ES comprises the following documents:

- Volume I: Main Text and Figures
- Volume II: Appendices

The ES has been prepared by LUC and supporting sub-consultants. In addition, the ES is accompanied by a Non-Technical Summary, Planning Statement, Design and Access Statement and Pre-Application Consultation (PAC) Report.

Copies of the full ES and accompanying documents, or further information on the wind farm may be obtained from:

Force 9 Energy LLP and EDF Energy ER

c/o 272 Bath Street

Glasgow

G2 4JR

The Non-Technical Summary is available free of charge. A hard copy of the ES and accompanying documents costs £250. In addition, all documents are available in an electronic format (as PDFs for screen viewing only) on CD/DVD for £2.

The ES and accompanying documents are available for viewing by the public during normal opening hours at the following locations:

Development Management
Perth & Kinross Council
Pullar House
35 Kinnoull Street
Perth
PH1 5GD

Birnam Arts Centre
Station Road
Birnam
Dunkeld
PH8 0DS

Breadalebane Community Library
Crieff Road
Aberfeldy
PH15 2DU

The documents will also be made available online through the Perth and Kinross planning portal at http://www.pkc.gov.uk/article/2299/Viewing-and-commenting-on-planning-applications

Comments in relation to the Planning Application should be forwarded to the Perth and Kinross Council Development Management department at the address above. Alternatively, comments can be made via Perth and Kinross Council's online planning portal.

Main Text

Figures

Appendices

Appendix 4.1: Borrow Pit Assessment

Appendix 6.1: Residential Visual Amenity Assessment

Appendix 6.2: Visualisation Methodology

Appendix 7.1 Noise Technical Report

Appendix 8.1: Accompanying Photographs and Diagrams

Appendix 8.2: Peat Stability Assessment

Appendix 8.3: Watercourse Crossing Guidance

Appendix 9.1: Phase 1 Habitat Survey Report

Appendix 9.2: NVC Survey Report

Appendix 9.3: Protected Species Survey Report

Appendix 9.4: Bat Survey Report

Appendix 9.5: Fisheries Survey Report

Appendix 9.6: Species Protection Plan

Appendix 9.7: Habitat Regulations Appraisal (Ecology)

Appendix 10.1: Ornithological Study and Annex A: Legal Protection

Appendix 10.1 Annex B: Bird Survey Methodologies

Appendix 10.1 Annex C: Survey Effort and Related Information and Annex D: Survey Results

Appendix 10.1 Annex E: Collision Risk Assessments

Appendix 10.1 Annex F: Confidential Scarce Breeding Bird Survey Results (Confidential)

Appendix 10.2: Habitat Regulations Appraisal (Ornithology)

Appendix 11.1: Heritage Assets within the Study Areas Scoped out of the Assessment

Appendix 11.2: Aerial Photographs

Appendix 12.1: Traffic Management Plan

Appendix 14.1: Carbon Balance Report

Non-Technical Summary

Introduction

1.1 Force 9 Energy is applying to Perth and Kinross Council for planning permission to construct and operate Creag a' Bhàird Wind Farm. The site is located approximately 8.5km south-east of Aberfeldy and approximately 20km north-west of Perth as shown on **Figure 1.1**.

1.2 As Creag a' Bhàird Wind Farm will have a maximum generating capacity of less than 50 megawatts (MW), Force 9 Energy is applying to Perth and Kinross Council for planning permission under the Town and Country Planning (Scotland) Act 1997, as amended by The Planning etc. Act (Scotland) 2006[i]. The application is categorised as a 'Major Development' application under the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009[ii] on the basis that the total installed capacity of the wind farm will be over 20MW.

1.3 Force 9 Energy is a dedicated wind farm development company with offices in Scotland and England and with a focus on the UK market. To date, and at the time of writing, Force 9 Energy has taken eight developments through the planning/consenting process, four of which will have been consented without appeal or public inquiry, one of which was consented on appeal, and one of which was refused after public inquiry. Two developments are currently at appeal. Two of the consented developments are now in operation, one is in the final stages of construction, one is in pre-construction and work is on-going to discharge planning conditions on the remaining consented project. Force 9 Energy is continuing to expand its wind farm development portfolio in response to the Government's targets for energy generation from renewable sources and is currently awaiting determination of a further three wind farm planning applications.

1.4 Force 9 Energy has a joint development agreement with EDF Energy Renewables (EDF). Through the agreement Force 9 Energy leads on the development process of wind farm proposals up to the start of construction. Should a wind farm be consented, EDF will take the lead during construction and subsequently own and operate the wind farm.

1.5 The application is accompanied by this Environmental Statement (ES) which has been undertaken in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011[iii] ('the EIA Regulations'). The ES presents information on the identification and assessment of the likely positive and negative environmental effects of the proposed development. Further details of the statutory requirements for Environmental Impact Assessment (EIA) are set out in **Chapter 2: Approach to the EIA**.

1.6 This Non-Technical Summary (NTS) summarises the findings and conclusions of the ES.

1.7 The ES has been prepared by LUC on behalf of Force 9 Energy. LUC produced the following ES chapters:

- Chapter 1: Introduction;
- Chapter 2: Approach to the EIA;
- Chapter 3: Site Selection and Design Strategy (with input from Force 9 Energy);
- Chapter 4: Scheme Description (with input from Grontmij, Force 9 Energy and Mouchel);
- Chapter 5: Planning Policy Context;
- Chapter 6: Landscape and Visual Amenity;
- Chapter 13: Socio-Economics;
- Chapter 14: Other Issues (with input from The Wind Consultancy Service, Force 9 Energy and Mouchel);
- Chapter 15: Summary.

1.8 A number of sub-consultants undertook specialist assessments as follows:

- **Hoare Lea** undertook the noise assessment;
- **Mouchel** undertook the geology, hydrology and hydrogeology assessment, borrow pit assessment, peat stability assessment and carbon balance assessment;
- **MacArthur Green** undertook the ecology and ornithology assessments;
- **CgMs** undertook the archaeology and cultural heritage assessment;
- **Grontmij** undertook the access, traffic and transport assessment.

Environmental Impact Assessment

1.9 EIA involves the compilation, evaluation and presentation of any potentially significant environmental effects resulting from a proposed development, to assist the consenting authority, statutory consultees, and wider public in considering an application. Early identification of potentially adverse environmental effects also leads to the identification and incorporation of appropriate mitigation measures into the scheme design to avoid, reduce and, if possible, remedy potentially significant adverse environmental effects. The ES presents information on the identification and assessment of the likely environmental effects of Creag a' Bhàird Wind Farm. **Major** or **moderate** effects are considered to be significant in the context of the EIA Regulations[1].

1.10 The scope of the EIA was informed by the Scoping Opinion provided by Perth and Kinross Council in May 2013, and includes responses from Scottish Natural Heritage (SNH), the Scottish Environment Protection Agency (SEPA), Historic Scotland and Transport Scotland. These responses have been presented in **Chapter 2: Approach to the EIA**.

Site Selection and Design Strategy

1.11 The Creag a' Bhàird Wind Farm site was selected by Force 9 Energy for a number of reasons, including the following:

- there are no international or national natural heritage or landscape designations within the site;
- there are no Local Plan or Structure Plan policies which, in principle, preclude wind energy development;
- the site is at distance from the nearest residential receptors;
- it has a good wind resource and is available for wind energy development;
- there are potential connection options to the electrical grid system;
- there is no obvious radar or other technical constraints;
- there is good access to the site for construction traffic and turbine deliveries;
- with appropriate mitigation and proposed compensation measures there was no indication of likely significant bird or other environmental concerns on site;
- the landscape is, in part, defined by the existence of the nearby Griffin Wind Farm.

1.12 Wind farm design must balance technical, economic and environmental considerations, with the iterative EIA process acting as a tool to further refine the design process to achieve the most appropriate balance. In addition the design of a wind farm is driven by the key objective of positioning turbines so that they capture the maximum energy possible within a suitable area determined by environmental and technical constraints.

1.13 The overall aim of the design strategy was to create a wind farm with a cohesive design that relates to the surrounding landscape, and exiting Griffin Wind Farm, in line with appropriate published guidance[iv]. The inherent nature of wind turbines as tall, modern structures means that the form of the wind farm as

[1] This is the case for all topic chapters with the exception of: Chapter 7: Noise; Chapter 12: Access, Traffic and Transport; and Chapter 14: Other Issues.

a whole is important, and a clear design strategy is necessary. The strategy therefore considered the appearance of the wind farm as an object or composition in the landscape as the primary factor in generating the layout.

1.14 The objectives of the design strategy were as follows:

- to produce a layout that would relate well to its landscape setting and appear contained within its extents;
- to develop a layout that would appear cohesive and well considered from all aspects;
- to develop a layout that seeks to match the perceived scale of the turbines, and the scale of the overall wind farm, with the scale of the landscape;
- to develop a layout that relates well to other wind farms in the local area; including the adjacent Griffin Wind Farm, as well as being coherent it its own right;
- to develop a layout that fulfils the above objectives whilst respecting other environmental and technical constraints including ecological, hydrological and ground conditions (including peat) related constraints identified during the EIA process.

1.15 An early 19 turbine (125m to blade tip) wind farm design, based purely on technical and operational efficiency criteria, was developed by the applicant prior to specialist landscape design advice being sought in 2011. This led to a 15 turbine layout design and though the EIA process, there have been further modifications (culminating in the final 13 turbine layout) to avoid or minimise environmental effects without compromising the overall design strategy. These modifications have been made as a result of the findings of the baseline survey work and consultation undertaken with consultees and the public and have included the relocation and reduction in the number of turbines to:

- ensure that predicted wind farm noise levels from the wind farm operating do not exceed acceptable noise limits;
- avoid construction activity in areas of potentially deeper peat and in the vicinity of steep slopes;
- ensure appropriate buffer distance (minimum 50m buffer) between wind farm infrastructure and the site boundary;
- minimise the number of watercourse crossings required and ensure appropriate buffer distances between surface waters and GWDTEs zones and turbine bases and associated infrastructure;
- minimise the visual effects of the wind farm in views from Strathbraan.

1.16 Design changes made as a consequence of the key constraints to site design are considered to be mitigation which is 'embedded' in the design. Further details of the design strategy can be found in **Chapter 3: Site Selection and Design Strategy**.

Scheme Description

1.17 As shown on **Figure 4.1**, the main components of the wind farm are:

- thirteen wind turbines (including external transformers) of up to 115m (to blade tip) height, with a maximum combined output of up to 29.9 megawatts (MW);
- crane hardstandings;
- onsite underground electrical cables;
- a control building;
- two permanent meteorological masts;
- a temporary site construction compound/laydown area;
- two areas within which it is proposed to win rock for wind farm construction (borrow pits);
- approximately 8km of onsite access tracks.

1.18 Two permanent freestanding meteorological masts will be erected to aid performance monitoring of the wind turbines and to gather meteorological data throughout the lifetime of the wind farm. The masts will be of a lattice design and will have a maximum height of 70m. The proposed location of the masts is shown in **Figure 4.1**.

1.19 The site will be accessed via the existing site access track which connects to the A826 to the west. Full details of the assessment of effects on the local road network are provided in **Chapter 12: Access, Traffic and Transport.**

1.20 All forestry within the site boundary is to be clear felled prior to commencement of construction activity. Replanting on site will primarily involve commercial conifers (Sitka Spruce) with no planting within a 100m radius of each of the turbines. This forest would be felled within the lifetime of the wind farm upon reaching 10m in height. Small areas of open ground and mixed native broadleaf trees will be included (in accordance with contemporary forestry design standards).

1.21 New sections of access track, branching-off from the existing track (which will be upgraded to accommodate wind farm construction traffic) will be constructed to facilitate access to the turbines and other infrastructure locations as shown on **Figure 4.1**. In total, approximately 3km of new onsite access track will be constructed.

1.22 Creag a' Bhàird Wind Farm will be connected to the national electricity grid. The grid connection will be subject to a separate consenting process and will be made via underground cables in roadside verges.

1.23 Electrical power from the turbine transformers will be transferred to the electricity distribution system through a switchgear unit, housed within the control building. The control building will be located in the centre of the site as shown on **Figure 4.1**.

1.24 Subject to the granting of planning permission, it is anticipated that the construction of Creag a' Bhàird Wind Farm will take place over 20 months, including forestry clearance. The operational life of the wind farm is 25 years. At the end of the 25 year operational period, the wind farm will either be decommissioned, or an application made for consent to extend its operational life. It is estimated that decommissioning the wind farm will take approximately 12 months.

Landscape and Visual Amenity

1.1 The landscape and visual amenity assessment considers the potential effects of Creag a' Bhàird Wind Farm on the landscape and visual resources of the site and the surrounding study area during construction and operation of the wind farm. More details on the assessment are provided in **Chapter 6: Landscape and Visual Amenity**.

1.2 The study area for the assessment covers a radius of 35km from the outermost turbines of the wind farm in all directions, as recommended in current guidance for turbines of 100 m to blade tip or higher[i] and in agreement with Perth and Kinross Council and Scottish Natural Heritage (SNH). In accordance with SNH guidance, the cumulative assessment initially considers wind farms within a 60km radius study area from the wind farm site. The assessment of effects focuses on developments that are likely to give rise to significant cumulative effects, and therefore concentrates on a more localised set of operational and proposed developments. To assess the likely effect of the wind farm on visual amenity, nineteen viewpoints have been identified across the 35km study area, and agreed through consultation with Perth and Kinross Council and SNH.

1.3 The method for assessment included field survey, computer modelling, mapping and photography. Field survey work was carried out between April 2013 and October 2013, and records were made in the form of field notes and photographs. Evaluation of the theoretical extent to which the wind farm would be visible across the study area was undertaken by establishing a Zone of Theoretical Visibility (ZTV) using specific computer software designed to calculate the theoretical intervisibility between the wind farm and its surroundings. The ZTV was calculated to show the number of turbines visible to blade tip or hub height.

1.4 The study area comprises a number of landscape character types (LCTs), from the highland summits and plateau in the central and north-western part of the study area, dissected by broad glens and linear water bodies, to the lowland hills and farmed valley lowlands in the more settled south-eastern part of the study area. The north-eastern tip of the Loch Lomond and The Trossachs National Park is within the study area, approximately 27km south-west of the site at its closest point, and the southern boundary of the Cairngorms National Park is approximately 20km to the north of the site. There is no theoretical visibility from the Loch Lomond and The Trossachs National Park, and visibility from the Cairngorms

National Park is limited to hill tops. There are four National Scenic Areas (NSAs) within the 35km study area, the closest of which is the River Tay (Dunkeld) NSA, with theoretical visibility from all four being limited. There are also five Areas of Great Landscape Value (AGLV) within the study area, though these are more distant from the site. Settlements in the study area tend to be located in the straths and glens, along minor or major transportation routes where there will be limited theoretical visibility. The main settlements in the study area include Perth, Crieff, Pitlochry, Auchterarder, Aberfeldy, Blair Atholl, Dunkeld and Blairgowrie. Smaller settlements closer to the site, within Strathbraan, include Milton, Trochry and Amulree. Theoretical visibility from key routes through the study area is also limited, with no visibility from the Rob Roy Way long distance footpath.

1.5 In terms of landscape effects, during construction it is predicted that there will be a major and significant landscape effect on the site relating to excavations and track construction, the presence of tall cranes and partially built towers whilst turbines are being erected. In addition, it is anticipated that there will be a significant effect on the local area of LCT 3: Highland Summits and Plateaux during construction. However, this effect will be limited to within 2km of the site and as such is not considered to equate to a significant effect on the LCT. It is also predicted that there will be major and significant effects on the site during operation of the wind farm, as well as significant effects on the local area of LCT 3: Highland Summits and Plateaux. Again this effect will be limited to within 3km of the site, and is not therefore considered to equate to a significant effect on the LCT. No effects are anticipated upon the special qualities of the River Tay (Dunkeld) NSA, or those of any of the other designated landscapes in the study area.

1.6 Visual amenity will be affected during construction at locations from which construction activity will be noticeable. These areas are very localised in extent, and likely receptors are residents in Strathbraan and Glen Cochill, road users travelling on the A826 and A822, and hill walkers in the local area, including Druim Mor, the hills on the south side of Strathbraan and on the west side of Glen Cochill. Effects on views will be moderate and significant in the short term. During the operational phase, effects may occur where the turbines are visible, as shown by the ZTV. Significant visual effects are predicted for six of the 19 representative viewpoints during operation of the wind farm. The findings of the viewpoint assessment indicate that significant effects on views will be experienced by viewers who are susceptible to change, at locations up to 6km from the proposed turbines, where there are open views towards the wind farm.

1.7 No significant cumulative landscape and visual effects are predicted, since the wind farm has been designed to relate to the existing presence of Griffin Wind Farm, and does not introduce turbines into landscapes and views where they are not already a feature.

1.8 Measures to reduce landscape and visual effects were largely achieved through the design of the wind farm, although effects during construction will be further minimised through site restoration measures in accordance with good practice.

Noise

1.9 Once operational, wind farms may emit two types of noise. Aerodynamic noise relates to the movement of the rotating blades through the air, and mechanical noise may emanate from components within the nacelle of a wind turbine, where the rotor blades meet. However, modern turbine designs have evolved to ensure that mechanical noise radiation from wind turbines is negligible. Aerodynamic noise is usually only perceived when wind speeds are fairly low; in higher winds, aerodynamic noise is generally masked by the normal sound of wind blowing through trees and around buildings.

1.10 Noise will also be generated during the construction phase of the wind farm from the operation of a range of construction plant and machinery and from construction traffic. This will be temporary in nature, during the 20 month construction period. Details of the noise assessment are provided in **Chapter 7: Noise**.

1.11 The study area for the assessment extends up to 2km from the wind farm, for the purposes of assessing operational and cumulative noise effects, and also includes residential dwellings along the construction traffic route in relation to construction traffic noise. Reference was made to the baseline noise surveys undertaken as part of the EIA for Griffin Wind Farm.

1.12 The consideration of potential noise effects was an integral part of the wind farm's design. The layout of the wind farm has been designed so that predicted wind farm noise levels from the wind farm operating do not exceed noise limits derived in accordance with best practice guidance.

1.13 The noise assessment concluded that noise levels at the nearest residential properties will not exceed accepted limits during both the construction period and all operational conditions. Cumulative noise effects will not exceed acceptable limits. Therefore, it is predicted that noise effects of the wind farm will not be significant.

1.14 To further limit the effects of noise during construction, good practice measures will be implemented and set out in a site specific Environmental Management Plan (EMP) and relevant Construction Method Statements.

Geology, Hydrology and Hydrogeology

1.15 The geology, hydrology and hydrogeology assessment considers the potential effects of pollution incidents, erosion and sedimentation and modification of surface water drainage patterns, in addition to modification to groundwater levels and flows, compaction of soils and peat instability during construction and operation of Creag a' Bhàird Wind Farm. More details on the assessment are provided in **Chapter 8: Geology, Hydrology and Hydrogeology**.

1.16 The study area comprised the area dominated by the hills known as Creag a' Bhaird, Meall Mor and Craig Tombane. The assessment was informed by consultation with Perth and Kinross Council, SEPA and SNH. Field surveys were undertaken between February and October 2013.

1.17 The Tombane Burn (and tributaries) drain the main area of the site, flowing generally south east towards the River Braan. An unnamed tributary of the Ballinloan Burn drains the north-east of the site, with the Cochill Burn draining the western fringe of the site adjacent to the A826.

1.18 There are no designated sites which relate to hydrology, geology and hydrogeology within 5km of the site. The River Tay SAC is approximately 5.3km downstream of the Ballinloan Burn and River Braan confluence, and is of European importance with several fish species, mammals and rare vegetation. The average peat depth across the site is 0.3m. The site is not within a source zone for public water supply, with the nearest public water supply assets in the Dunkeld area. There are a number of private water supplies within the vicinity of the site which provide water to local properties or businesses.

1.19 The hydrology, hydrogeology and peat distribution within the site influenced the design of the turbine and infrastructure layout to avoid and/or minimise potential effects on these receptors where possible. The application of a minimum distance for the location of infrastructure from watercourses is the principal means by which surface hydrology can be protected (and therefore any dependent ecology or water supplies). 50m buffers were applied around water features shown on OS mapping 1:10,000. The presence of peat within the site also formed a key design layout consideration. Informed by the peat probing survey, the design process minimised the location of turbines and infrastructure within areas of deeper peat. The design process also sought to minimise the number of watercourse crossings required and avoid steep slope angles.

1.20 The assessment predicted the potential for a moderate pollution effect on private water supplies during the construction of Creag a' Bhàird Wind Farm. With the implementation of mitigation proposals, such as surface water monitoring downstream of site and at abstraction locations this effect will be reduced to minor. No significant cumulative effects are predicted in relation to geology, hydrology and hydrogeology.

Ecology

1.21 The ecology assessment considers the potential construction and operational effects of the wind farm on designated areas, terrestrial habitats, aquatic habitats and protected species. More details of the assessment are provided in **Chapter 9: Ecology**.

1.22 Field surveys were carried out to establish habitat type and distributions and the presence of badgers, bats, fish, fresh water pearl mussel, otter, wildcat, pine marten, red squirrel and water vole.

1.23 There are no designated sites of nature conservation within the site. The River Tay Special Area of Conservation (SAC)/Site of Special Scientific Interest (SSSI) is located approximately 5km to the east of the site, and is designated for its importance to atlantic salmon, river lamprey, brook lamprey, sea lamprey, otter and clear-water lakes or lochs with aquatic vegetation.

1.24 Sitka spruce coniferous plantation forestry is the dominant habitat type within the site and covers approximately 80% of the site. Dry dwarf shrub heath is present across much of the unplanted parts of the site and occupies approximately 12% of the site. In relation to protected species, no signs of badger were recorded during field surveys, with the site considered generally unsuitable for the species. No bat roosts were identified during surveying and no significant potential for roosting was noted. The otter survey revealed the presence of otter along the length of the Tombane Burn and tributaries. No signs of water vole or wildcat presence were recorded during surveying. Pine marten surveys identified suitable habitat on site for foraging and breeding, although no dens were found. No signs of red squirrel were recorded and the woodland within the site is considered to be unattractive for red squirrel. No records of freshwater pearl mussel were found during the desk study and fish surveys found that brown trout was the main species on the site.

1.25 No significant effects on designated sites, habitats or protected species during construction and operation of Creag a' Bhàird Wind Farm are predicted.

1.26 A Species Protection Plan (SPP) is proposed to be implemented during construction, and will be agreed with Perth and Kinross Council and SNH. The SPP will detail measures to protect otter, wildcat, pine marten, water vole, red squirrel and badgers, and will include pre-construction surveys and good practice measures. An Ecological Clerk of Works (ECoW) will be present onsite during construction. Pollution Prevention Measures will be implemented, in consultation with Perth and Kinross Council and SNH, and will ensure that any potential effect on the River Tay SAC is avoided. During operation, it is proposed that enhancement measures will be incorporated into the forest re-planting design. These measures will benefit both red squirrel and pine marten.

1.27 No significant cumulative effects in relation to ecology are predicted.

Ornithology (Birds)

1.28 The assessment of potential effects on ornithology (birds) considers direct habitat loss during construction, displacement of birds as a result of indirect habitat loss, habitat modification, death or injury through collision and cumulative effects. Particular attention has been paid to species of high or moderate conservation status ('target species') including hen harrier, short-eared owl and black grouse. More details on the assessment are provided in **Chapter 10: Ornithology**.

1.29 The study area for the assessment comprises the site and appropriate survey buffers as recommended by SNH Guidance[v]. In addition, the assessment has also been informed by a Collision Risk Analysis Area (CRAA) which comprised a survey buffer of 500m in all directions from each turbine. The purpose of the CRAA was to inform collision risk modelling. A desk study was undertaken to collate existing bird records and/or data, along with consultation with Perth and Kinross Council and SNH, and field surveys were undertaken. All field surveys were undertaken between March 2011 and August 2012.

1.30 There are no statutory designations relating to birds within the site. Within 20km of the site, there are nine designations with ornithological qualifying features.

1.31 Hen harrier was the most frequently occurring target species during field surveys with 11 flights being recorded between March 2011 and August 2012. 10 of these flights passed through the CRAA, with the majority during the 2011 and 2012 breeding seasons. Black grouse was the second most frequently recorded target species during surveys; 10 flights were recorded during the survey period, although these flights were below the potential collision height (PCH). Black grouse are present throughout the year within the site and wider area. Black grouse surveys and other records in 2011 and 2012 suggested that four lek (communal courtship ground) locations are present within 1.5km of the site, with lekking activity recorded at two of these locations in 2011 and at three locations in 2012. In addition, a total of four peregrine flights were recorded during surveys, of which three were 'at-risk', being within the CRAA at PCH. The species was not recorded during any breeding bird surveys, and no breeding behaviour was observed. A possible but unconfirmed short-eared owl breeding attempt was recorded adjacent to the access track and around 580m from the site boundary in 2011. No flight activity was recorded for the species. Greylag goose was the only goose species recorded during baseline surveys. No breeding evidence was observed, and activity was confined to two flocks of 4 and 20 individuals that traversed the CRAA at PCH in winter 2011-12. Observations of other raptors on site and within the survey area included red kite, goshawk, white-tailed eagle, merlin, buzzard, kestrel and sparrowhawk.

1.32 During construction, it is considered likely that activities will displace black grouse from foraging areas, and this is considered to represent an effect of minor-moderate significance. It is proposed therefore that black grouse lekking surveys will be undertaken during the construction phase. If any leks are identified, it is proposed that a 500m disturbance buffer shall be implemented, and no work shall be undertaken in these areas for a period of one hour before or after dawn. It is predicted that the implementation of this mitigation shall result in a residual minor effect. The assessment has also identified a minor-moderate displacement effect on short-eared owl during construction. It is anticipated that a minor residual effect will remain once committed mitigation is implemented, including the commencement of construction works prior to the breeding season, visual deterrents to exclude breeding attempts and pre-construction surveys on the site to determine breeding and the implementation of a 500m exclusion zone around construction activities until breeding is complete.

1.33 During operation of the wind farm, it is predicted that there will be a moderate collision effect on hen harrier. To mitigate this effect, it is proposed that a cutting regime will be implemented within the site boundary with the aim of keeping grass sward low to prevent increases in prey utilisation and ultimately the attraction of hen harriers. In conjunction with this, post-construction prey and bird surveys will be undertaken to record any changes in activity levels. The implementation of this mitigation will result in a residual minor effect.

1.34 No significant cumulative effects are predicted on target species during construction and operation of the wind farm.

1.35 It is proposed that a Breeding Bird Protection Plan will be agreed in consultation with SNH in advance of construction of the wind farm. This plan will ensure that all reasonable measures are taken to avoid disturbance to breeding birds and to avoid damage to, or destruction of, nest sites.

Archaeology and Cultural Heritage

1.36 An archaeology and cultural heritage assessment has been carried out to investigate the potential physical and setting effects on archaeological and cultural heritage assets during construction and operation of the wind farm. More details on the assessment are provided in **Chapter 11: Archaeology and Cultural Heritage**.

1.37 Archaeology and cultural heritage assets include sites, features and areas with statutory and non-statutory designations, including Scheduled Monuments; Listed Buildings; Conservation Areas; Gardens and Designed Landscapes (Inventory and Non Inventory status); Non Statutory Register sites and other historic environment interests.

1.38 For the site study area, data has been gathered to identify any potential physical effects on assets. Data has been gathered for the wider study area to identify potential setting effects on all designated assets within 5km of the turbine locations, including Scheduled Monuments and Listed Buildings.

1.39 The method of assessment has included desk based data collection and field surveys. Field surveys of the site were undertaken in April 2013. Relevant assets in the wider study area were visited to assess potential effects on their setting in September 2013.

1.40 There are no designated assets or previously recorded undesignated assets within the site. Within the wider area, there are 11 scheduled monuments and eight listed buildings; five of which are category A listed and three of which are category C listed. There are no inventory battlefields, world heritage sites, inventory gardens and designed landscapes (GDL) or conservation areas within the wider study area.

1.41 There is potential for construction effects upon previously unrecorded heritage assets, currently obscured by forestry, resulting in major and significant effects. It is proposed that a programme of archaeological recording would offset the loss of any unrecorded assets, resulting in a residual minor effect. A residual beneficial effect on previously unrecorded assets is anticipated, as their baseline condition may degrade if the 'do nothing scenario' continues.

1.42 During operation of the wind farm, it is predicted that there will be minor effects on the setting of the stone circle at Meikle Findowie; the settlement, field system and cairn at St Louis, the mill at Meikle Tombane and on the settlement at Salachill.

1.43 The assessment has found that there will be minor cumulative effects on the setting of the stone circle at Meikle Findowie; the settlement, field system and cairn at St Louis and the mill at Meikle Tombane. It is likely that a moderate and significant cumulative effect on the setting of the Salachill settlement will occur.

Access, Traffic and Transport

1.44 The access, traffic and transport assessment considers the potential effects of construction and operational traffic, associated with the wind farm, on the local road network. It identifies the likely volume of traffic that will be generated during construction (including forestry traffic) and operation and the subsequent effect this will have on the local road network. More details on the assessment are provided in **Chapter 12: Access, Traffic and Transport**.

1.45 The study area for the assessment has been defined as the public road network in the vicinity of the wind farm, which will be used as access routes by traffic bound for the site, and includes the M90, A9, A822 and A826. The method of assessment included a combination of desk-based study, field surveys and consultation with statutory consultees.

1.46 Although the M90 motorway and the A9 were included in the study area, the likely effects have not been considered within the assessment as it is not anticipated that the effect of the additional traffic generated by the wind farm on these roads will be significant.

1.47 The A826 is a typical rural road which accommodates a two-way flow, although HGVs may have to slow to pass each other. The road is generally well maintained – the geometry is of a mixed standard with a number of relatively sharp bends. The A826 connects to the A822 approximately 3.5km south of the site. The A822 is relatively lightly trafficked and comprises a standard single carriageway suitable for HGVs. The M90 motorway and A9 are strategic routes in Scotland and form part of the Scottish Trunk Road Network.

1.48 During construction of Creag a' Bhàird Wind Farm, turbine components and materials will be delivered to the site. Some materials will be transported by HGVs and turbine components will need to be transported on vehicles capable of carrying 'abnormal loads' (vehicles longer than 17m and/or more than 4m wide). Turbine components will arrive into the Port of Rosyth.

1.49 The assessment has determined that there will be no significant effects on the local road network during construction of the wind farm. However, a Traffic Management Plan (TMP) will be implemented, in agreement with the Police and Roads Authorities, for the construction works. The TMP will include a more detailed timetable of works including how traffic associated with the site will be managed including, permitted delivery times, traffic control measures and any mitigation measures required to accommodate the passage of abnormal loads.

1.50 Once operational, wind farms typically generate very low levels of traffic. It is estimated that the wind farm will generate no more than two vehicle movements per week for the purposes of maintenance, repairs and servicing, and therefore this does not represent a significant effect.

1.51 No cumulative effects have been identified in terms of other construction projects that could run concurrently with the wind farm. Should such circumstances arise, liaison will take place between the contractors appointed for the affected project(s) and the police and the Roads Authority in the development of the construction TMP.

Socio-Economics

1.52 This assessment considers the potential effects of construction and operation of Creag a' Bhàird Wind Farm on direct employment and indirect economic benefits, public access and recreation and tourism. More details on the assessment are provided in **Chapter 13: Socio-Economics**.

1.53 With respect to potential effects of the wind farm on employment and indirect economic benefits and tourism, the assessment considers potential effects at the Perth and Kinross Council administrative level. In addition, the assessment focuses on the site in terms of direct effects on public access and the site and surrounding area with regard to effects on recreation. The cumulative assessment of effects considers the socio-economic effects of the construction and operation of schemes within 35km of the site, as identified in **Chapter 6: Landscape and Visual Amenity**.

1.54 The Perth and Kinross area had an estimated population of 147,740, which accounted for 2.8% of Scotland's population as a whole[vi].

1.55 From April 2012 to March 2013 4,600 people within the Perth and Kinross area were unemployed, equating to 5.9% of the population. Over the same period, the employment rate for Perth and Kinross was 80.4% and the sector which employed the highest proportion of workers in the area was 'Professional Occupations' (employing 20.2% of people aged 16+).

1.56 There are no Rights of Way (RoW), core paths or formal recreational facilities within the site. The closest RoW is approximately 1.2km to the south of the site. This RoW (also designated as a core path) runs for 3.9km from Strathbraan, off the A822, to Little Glenshee via Aldmad Bridge.

1.57 The Amulree to Aberfeldy section (24.75km) of the Rob Roy Way (also designated as a RoW and core path) lies within the wider area and comes within approximately 4km of the site at its closest point.

1.58 An outdoor activity centre, based at Tomnagrew Farm, is located approximately 1km south-east of the site and is accessed from the A822. A quad biking centre is located approximately 1km east of the site.

1.59 Tourist destinations within the wider area include Beatrix Potter Exhibition Centre in Birnam, which is approximately 10km north-east of the site, Highland Safaris; located approximately 12km north-west of the site and Castle Menzies which is approximately 12.5km north-west of the site.

1.60 During construction of the wind farm it is anticipated that 2-4 FTE (full-time equivalent) jobs will be created. This is considered to represent a temporary minor (positive) effect to the local economy.

1.61 It is likely that there will be some local employment generated as an indirect result of the construction of Creag a' Bhàird Wind Farm. It is considered that indirect employment as a result of the wind farm will result in a temporary minor (positive) effect to the local economy.

1.62 It is anticipated that there will be no access to the site for informal recreational purposes for the duration of the construction period, and the existing access track is likely to be closed to pedestrians. Users of the nearest RoW and core paths and visitors to the outdoor activities and quad biking centres may be adversely affected in terms of visual amenity, noise and dust nuisance during construction, however, this effect will be temporary and intermittent. The visual amenity of users of the Rob Roy Way, Amulree to Aberfeldy section, and corresponding RoW and core path may also be adversely affected during construction, however, this effect will again be temporary and intermittent. Given the extensive scope for informal recreation in the surrounding area, the informal nature of recreational activity, as well as the proposed measures to control dust and noise emissions from construction activities, it is not anticipated that Creag a' Bhàird Wind Farm will directly affect public access, or recreational activity in the wider area, therefore, a temporary negligible residual effect on access and recreation is predicted during construction.

1.63 The wind farm will not prevent visitors accessing the identified attractions and popular points of interest during construction or operation, and the effects on tourism will be negligible.

1.64 Once operational, the wind farm will require a small team of personnel to service, maintain and operate it. It is predicted that 1 FTE job will be created during the lifetime of the wind farm (25 years), resulting in a negligible (positive) effect to the local economy. It is likely that there will be some indirect economic benefits as an indirect result of the operation of Creag a' Bhàird Wind Farm. This represents a negligible (positive) effect.

1.65 The effect that changes in views will have on recreational activity will depend on the personal opinion of the viewer, however, there will be no restrictions on access to the site during operation of the wind farm. Therefore, the effect on public access and recreation during operation is assessed as negligible.

1.66 No significant cumulative effects in relation to socio-economic aspects are predicted.

Other Issues

1.67 The assessment of the potential effects of the wind farm on aviation and defence, telecommunications, television reception and dust has been undertaken primarily through desk based study and consultation. Further details of the assessment are provided in **Chapter 14: Other Issues** which also presents a summary of the findings of the carbon balance assessment.

Aviation and Defence

1.68 The Ministry of Defence (MOD) was consulted on the scoping stage wind farm design by Force 9 Energy in February 2011. The MOD responded confirming no objections to the project in February 2011. Force 9 Energy consulted for a second time in August 2012 and, again, no objection was raised. The Civil Aviation Authority (CAA) and NATS En Route have raised no concerns about the wind farm. The predicted effect of the operation of the wind farm on radar is therefore considered not significant.

Telecommunications

1.69 Consultation with The Office of Communications (Ofcom) , Atkins and the Joint Radio Company (JRC) found that there are four communications links (two from MLL Telecom, one each from BT and Orange) located in the vicinity of the site which may have had the potential to be affected by the development. The early identification of these links allowed for them to be mapped and setback distances applied to site turbines away from them.

1.70 The predicted effect of operation of the wind farm on telecommunications is considered not significant as the paths of the links were identified in order to design out any link/turbine interactions.

Television Reception

1.71 The online BBC Windfarm Tool (which provides an estimate of the population numbers potentially affected by the installation of wind turbines) indicated in December 2010 there is unlikely to be interference with local transmitters, with the result that no homes are expected be affected.

1.72 Effects on television reception will be confirmed following an onsite survey should issues arise. Installation of satellite television or upgrades of the current antenna systems will be the most appropriate form of mitigation, if required.

1.73 The predicted operational effect of the wind farm on television reception is considered not significant.

Dust

1.74 The movement of vehicles as they transport equipment, goods and timber to and from the site is the most likely source of dust during the construction period. The level and distribution of emissions will vary according to factors such as the duration of dust-generating activity and weather conditions.

1.75 Force 9 Energy is committed to adopting good practices for dust management during construction, thereby controlling and reducing any potential effects. With adherence to these good practice measures, the predicted dust effects on the nearest residential receptors will be temporary and will not be significant.

1.76 No significant cumulative effects are predicted in relation to aviation and defence, telecommunications, television reception and dust effects.

Carbon Balance

1.77 The purpose of Creag a' Bhàird Wind Farm is to generate electricity from a renewable source of energy, offsetting the need for power generation from the combustion of fossil fuels. Consequently, the electricity that will be produced by the wind farm results in a saving in emissions of carbon dioxide (CO_2) with associated environmental benefit.

1.78 The carbon balance assessment (see **Appendix 14.1**) has calculated that the expected payback time (the length of time for the wind farm to become a 'net avoider', rather than a 'net emitter' of carbon dioxide emissions) will be approximately 29 months. This is based on the assumption that backup generation capacity of 5% from non-renewable sources will be required. With a 25 year operational life, this would mean that the wind farm would save over ten times the carbon emissions generated, making a positive net contribution to reducing carbon dioxide emissions.

Summary

1.79 The EIA for the proposed development been carried out in accordance with regulatory requirements and guidance on good practice. The findings of the surveys undertaken, in addition to extensive consultation, have informed the design process and, as a result, design changes have been introduced to reduce effects on the surrounding landscape, hydrological regime and taking into account local ground conditions.

1.80 Prior to committed mitigation, significant effects are predicted in relation to: landscape and visual amenity; geology, hydrology and hydrogeology; ornithology; and archaeology and cultural heritage. However, there is scope to mitigate many of the predicted significant effects and several effects are therefore considered not significant following the proposed mitigation. With the exception of temporary effects during construction, significant residual effects are associated with landscape and visual amenity and archaeology and cultural heritage, and cannot be avoided in their entirety given the inherent nature of wind farm development.

1.81 Overall, this EIA shows that, given the iterative design process, and with the committed good practice measures and proposed mitigation in place, most potential environmental effects associated with the construction and operation of the development can be avoided or minimised.

---

[i] The Town and Country Planning (Scotland) Act 1997, as amended by The Planning Act (Scotland) 2006

[ii] The Town and Country Planning (Hierarchy of Development) (Scotland) Regulations 2009

[iii] The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011, Available [online] at: http://www.legislation.gov.uk/ssi/2011/139/contents/made, Last accessed on: 12/12/2012

[iv] Scottish Natural Heritage. (2009). Siting and Designing windfarms in the landscape (Version 1), Chapter 5

[i] Scottish Natural Heritage. (2006). Visual Representation of Windfarms: Good Practice Guidance

[v] Scottish Natural Heritage. (2010). Survey methods for use in assessing the impacts of onshore windfarms on bird communities. SNH.

[vi] General Register Office (GRO) for Scotland, (2013), 'Perth and Kinross Council Area – Demographic Factsheet', Available [online] at: http://www.gro-scotland.gov.uk/files2/stats/council-area-data-sheets/perth-and-kinross-factsheet.pdf, Last accessed on: 02/10/2013

1 Introduction

Introduction

1.1 This Environmental Statement (ES) has been prepared by LUC on behalf of Force 9 Energy to accompany an application for planning permission to construct and operate a wind farm development known as Creag a' Bhàird Wind Farm in the Perth and Kinross Council area. Creag a' Bhàird Wind Farm is located approximately 8.5km south-east of Aberfeldy and approximately 20km north-west of Perth (see **Figure 1.1** showing the application boundary and wider land ownership boundary).

1.2 As Creag a' Bhàird Wind Farm will have a maximum generating capacity of less than 50 megawatts (MW), Force 9 Energy will submit an application for planning permission to Perth and Kinross Council under the Town and Country Planning (Scotland) Act 1997, as amended by The Planning etc. Act (Scotland) 2006[i] . The application has been prepared as a 'Major Development' application under the Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009[ii] on the basis that the total installed capacity of the wind farm is anticipated to be 20MW or over.

1.3 The application is accompanied by this Environmental Statement (ES) which has been prepared in accordance with the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ('the EIA Regulations')[iii]. The ES presents information on the identification and assessment of the likely environmental effects of Creag a' Bhàird Wind Farm. Further details of the statutory requirements for Environmental Impact Assessment (EIA) are set out in **Chapter 2: Approach to the EIA**.

The Proposal

1.4 The development is described in detail in **Chapter 4: Scheme Description** of this ES. In summary, it will comprise:

- up to 13 turbines of up to 115m (to tip) height, with a maximum combined output of 29.9 megawatts (MW);
- an electrical substation;
- onsite underground electrical cables;
- onsite access tracks;
- crane hardstandings;
- two permanent meteorological masts;
- a temporary site construction compound/laydown area;
- a control building;
- two borrow pits;
- site signage.

1.5 The operational life of the development will be 25 years. In addition, 20 months are required for construction and, following the 25-year operational period, 12 months are set aside for decommissioning. Decommissioning would involve the removal of the turbines and all above ground components. Alternatively, subject to further consent, the life of Creag a' Bhàird Wind Farm could be extended.

The Applicant

1.6 Force 9 Energy is a dedicated wind farm development company with offices in Scotland and England and with a focus on the UK market. To date, and at the time of writing, Force 9 Energy has taken eight developments through the planning/consenting process, four of which will have been consented without appeal or Public Inquiry, one of which was consented on appeal, and one of which was refused after public inquiry. Two developments are currently at appeal. Two of the consented developments are now in operation, one is in the final stages of construction, one is in pre-construction and work is on-going to discharge planning conditions on the remaining consented project. Force 9 Energy is continuing to expand its wind farm development portfolio in response to the Government's targets for energy generation from renewable sources and is currently awaiting determination of a further three wind farm planning applications.

1.7 Force 9 Energy has a joint development agreement with EDF Energy Renewables (EDF). Through the agreement Force 9 Energy leads on the development process of wind farm proposals up to the start of construction. Should a wind farm be consented, EDF will take the lead during construction and subsequently own and operate the wind farm. Force 9 Energy is supported by EDF both financially and with staff resources requested by Force 9 on issues such as grid studies, access studies and public relations.

1.8 Further details of Force 9 Energy's approach to wind farm development are provided in **Chapter 3: Site Selection and Design Strategy**.

Legislative Requirements for Environmental Impact Assessment

1.9 As Creag a' Bhàird Wind Farm exceeds the thresholds for wind farms set out within Schedule 2 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011[1], and as it is considered that the scheme could potentially result in significant impacts, an Environmental Impact Assessment (EIA) is required. Where an EIA is required, the information must be provided to the determining authority by the applicant in the form of an ES. This ES presents the findings of the EIA undertaken for Creag a' Bhàird Wind Farm.

Climate Change and Renewable Energy

1.10 The impacts of climate change are widely recognised as being one of the greatest global environmental and social challenges facing the world today. A major cause of climate change is a rise in the concentration and volume of greenhouse gases in the atmosphere, a major contributor to which is the growing use of fossil fuels to generate power.

1.11 The European Commission's Green Paper, '*Towards a European Strategy for the Security of Energy Supply (2000)*[iv]', highlights the importance of diversity of energy supply and of energy generation within the European Union (EU), along with an emphasis on increasing energy from renewable sources[iv].

1.12 Renewable sources of energy ('renewables') are those that are not based on finite reserves. Using wind to generate electricity creates very little carbon dioxide (CO_2) or other air pollutants, and therefore is a cleaner form of electricity generation than fossil fuels. It is also recognised that the development of a diverse range of electricity generating technologies contributes to reducing the risks related to the supply and cost of electricity. In March 2007, the Heads of Government of the EU agreed to adopt a new European Climate and Energy Policy. In December 2008, the package of measures comprising the European Climate and Energy Policy were agreed by the member states. As part of this, a binding target to generate 20% of the energy consumed in the EU from renewables by 2020 was agreed. This has been given legal effect by Directive 2009/28/EC on the promotion of the use of energy from renewable sources[v]. This target includes all energy consumption and is not restricted to electricity. The UK is committed to the generation of 15% of energy from renewable sources by 2020.

1.13 The UK Government set a domestic goal of reducing CO_2 emissions to 20% below 1990 levels by 2010, and in 2006 launched the UK Climate Change Programme. This programme outlines the target areas and policies through which it aims to achieve this domestic target. Renewable sources of energy are a major element of this climate change programme. Government energy policy recognises that UK renewable energy generation contributes to the diversity and security of the UK electricity supply.

[1] 1 (i) the installation of more than 2 turbines; (ii) the hub height of any turbine or height of other structure exceeds 15m.

1.14 On 26 November 2008, three statutes received Royal Assent that, together, provide a framework for UK climate and energy policy: the Climate Change Act 2008[vi], the Planning Act 2008[vii] and the Energy Act 2008[viii].

1.15 The Climate Change Act 2008 sets a target to reduce the emission of greenhouse gases in the UK by 80% of 1990 levels by 2050. Within Scotland, the Climate Change (Scotland) Act 2009[ix] received assent on 4 August 2009. The Act creates the statutory framework for greenhouse gas emissions and reductions in Scotland by setting an interim 42% reduction target for 2020, with power for this to be varied on expert advice, and an 80% reduction target for 2050.

1.16 To meet these ambitious targets, the Scottish Government Climate Change Delivery Plan[x] has been prepared to target investment and effort across a range of relevant sectors, and renewable energy has an essential place in the strategy.

1.17 The Scottish Government issued the Renewables Action Plan (RAP)[xi] in June 2009 that identifies what is required in the renewable energy sector to achieve Government objectives. The RAP refers to the necessary actions to address climate change (demonstrated by Scotland's world leading carbon reduction target of 42%) and mentions that this imperative is driving development across a range of policy interests. It makes reference to the Scottish Government's commitment to achieve a headline target of 20% of Scottish energy use coming from renewable sources by 2020. The RAP sets out the framework for action in the specific area of renewable energy. Key objectives include:

- to establish Scotland as a UK and EU leader in the field;
- to ensure maximum returns for the Scottish domestic economy;
- to meet targets for energy from renewables, and for emissions reductions, to 2020 and beyond.

1.18 Scotland's current renewable energy target is to deliver the equivalent of 100% gross annual electricity demand from renewable sources by 2020[2]. Following announcement of the new renewables targets, the Scottish Government published the 2020 Routemap for Renewable Energy in July 2011[xii]. This is an update and extension to the RAP. An update to the Routemap was published in October 2012 which set out an interim renewable energy target of 50% by 2015[xiii]

1.19 Scottish Planning Policy (SPP) (February 2010)[xiv] maintains the importance of tackling climate change and, in particular, addresses the need to reduce greenhouse gas emissions and continue to develop renewable energy resources. Further detail on SPP is provided in **Chapter 5: Planning Policy Context**.

1.20 The Development has been proposed in response to these requirements for renewable energy production.

Scotland's Wind Resource

1.21 Scotland has a significant wind resource according to a report on the regional renewable energy assessments commissioned by the Department of Trade and Industry[xv].

1.22 The Scottish Executive report, '*Scotland's Renewable Resource 2001*'[xvi], considered a range of available renewable energy technologies, examining associated development constraints and costs. The key conclusion relating to onshore wind development was that the resource is widespread and is the cheapest of the technologies considered. On that basis, onshore wind energy can be expected to contribute to the bulk of the short-term government targets on renewable energy production.

1.23 The UK Government and the Scottish Government are committed to ensuring that an increasing proportion of electricity is generated from wind power and other renewable energy sources. Improvements in technology and rising fossil fuel costs have also resulted in the cost of wind power converging towards the costs of conventional sources of electricity.

[2] Target announced by First Minister Alex Salmond on 18th May 2011.

Benefits of Wind Power

Avoided Pollutant Emissions

1.24 The principal atmospheric pollutants produced by burning fossil fuels are CO_2, sulphur dioxide (SO_2), and oxides of nitrogen (NO_X). In contrast, the harnessing of wind energy is non-consumptive and produces no gases or other by-products. The key environmental benefit of Creag a' Bhàird Wind Farm will be the generation of electricity from a renewable energy source that will reduce or avoid the use of fossil fuels through the displacement of electricity generated from other sources of energy.

Energy Balance

1.25 The comparison of the energy used during the manufacture and construction of a power station with the energy generated during its operation is known as the energy balance. The energy balance can be expressed in terms of energy pay-back time, which is the time needed to generate the equivalent amount of energy used in manufacturing and constructing the power station.

1.26 An Economic Development Committee of The Welsh Assembly Government Review of Energy Policy in Wales[xvii] states that wind power has the shortest energy pay-back time, typically taking only a few months of operation for a wind turbine to pay for itself in energy terms. The energy invested in manufacturing a wind turbine is typically paid off within six to nine months of operation[3][xviii].

CO_2 Emissions

1.27 The purpose of Creag a' Bhàird Wind Farm is to generate electricity from a renewable source of energy, offsetting the need for power generation from the combustion of fossil fuels. Consequently, the electricity that will be produced by the development results in a saving in emissions of carbon dioxide (CO_2) with associated environmental benefit. The 'payback time' is defined as the length of time (in months) required for the development to be considered a net avoider of emissions rather than a net emitter. The calculation of payback time includes a consideration of emissions resulting from the construction and operational phases of the development, and the quantification of the carbon storage loss as a result of loss of peat and forestry within the site (expressed as CO_2 emissions).

1.28 Assuming a requirement for backup generation capacity of 5%, the expected payback time is calculated to be approximately 29 months. With a 25 year operational life, this would mean that the development would save over ten times the carbon emissions generated.

Environmental Statement

1.29 This ES reports the findings of the assessment of the likely environmental effects of Creag a' Bhàird Wind Farm during construction and operation. The assessment forms part of the wider process of EIA, which is undertaken to ensure that the likely significant effects, both positive and negative, of certain types of development are considered in full by the decision maker prior to the determination of an application for development consent or planning permission. Whilst an assessment of effects during the decommissioning phase has not been undertaken, a method statement will be prepared and agreed with the relevant statutory consultees prior to decommissioning of the site.

1.30 The objectives of the ES are summarised as follows:

- to establish the existing environmental conditions of the site and surrounding area;
- to identify both positive and negative potential effects that may arise from the construction and operation of Creag a' Bhàird Wind Farm, taking account of its size and location, the sensitivity of the local environment, the concerns of interested parties and the requirements of statutory consultees;
- to predict and evaluate the extent and significance of potential effects;
- to identify and evaluate possible mitigation measures to reduce any adverse effects;
- to identify residual effects.

[3] The figure of six to nine months relates only to the manufacture of the wind turbines. The assessment of pay-back time also takes into several other factors associated with construction of the Development including transportation and carbon loss through felling.

1.31 The general methodology for the ES is detailed in **Chapter 2**. The ES has been prepared by LUC with input from specialists as outlined in **Table 1.1** below:

Table 1.1: Structure of the Environmental Statement and Responsibilities

Chapter Number	Description	Organisation Responsible
Chapter 1	**Introduction** provides a brief introduction to the Development, the legislative requirements and outlines the structure of the ES.	LUC
Chapter 2	**Approach to the EIA** provides more detail on the EIA process including consultation.	LUC
Chapter 3	**Site Selection and Design Strategy** summarises the reason for selection of the chosen site. The approach to the design strategy and layout modifications is also detailed.	LUC and Force 9 Energy
Chapter 4	**Scheme Description** provides a detailed description of Creag a' Bhàird Wind Farm.	LUC, Force 9 Energy, Grontmij and Mouchel
Chapter 5	**Planning Policy Context** summarises the national, regional and local planning policy relevant to Creag a' Bhàird Wind Farm.	LUC
Chapter 6	**Landscape and Visual Amenity**	LUC
Chapter 7	**Noise**	Hoare Lea
Chapter 8	**Geology, Hydrology and Hydrogeology**	Mouchel
Chapter 9	**Ecology**	MacArthur Green
Chapter 10	**Ornithology**	MacArthur Green
Chapter 11	**Archaeology and Cultural Heritage**	CgMs
Chapter 12	**Access, Traffic and Transport**	Grontmij
Chapter 13	**Socio-Economics**	LUC
Chapter 14	**Other Issues**	LUC, Force 9 Energy, The Wind Consultancy Service and Mouchel
Chapter 15	**Summary**	LUC

1.32 Chapters 6 to 14 are structured in a consistent way, as far as possible, as follows:

- *Introduction*: provides a description of the study area and outlines the effects which have been assessed in full, and those which have been 'scoped out' of the EIA;
- *Assessment Methodology*: summarises the key methods used in the assessment (desk based study, field survey, consultation and consideration of significance of effect);
- *Planning Policy*: cross refers to the relevant planning policy detailed in **Chapter 5**;
- *Existing Conditions*: summarises the baseline situation, including field survey results where appropriate. A description of how the baseline situation might change if Creag a' Bhàird Wind Farm were not to be built is also provided;
- *Wind Farm Layout Considerations*: describes the constraints taken account of in designing the layout and any modifications to it as part of the iterative design process;
- *Assessment of Effects*: provides an overview of the type of effects considered in the assessment;
  - *Construction Effects*: describes the predicted effects, proposed mitigation and residual effects associated with construction of Creag a' Bhàird Wind Farm;
  - *Operational Effects*: describes the predicted effects, proposed mitigation and residual effects associated with operation of Creag a' Bhàird Wind Farm;
  - *Cumulative Impact Assessment*: describes the incremental construction/operation effects associated with adding Creag a' Bhàird Wind Farm to the other wind farms being considered in the cumulative assessment, i.e. the additional effects resulting from Creag a' Bhàird Wind Farm if all other developments are assumed to be constructed or operational. Proposed mitigation measures and residual cumulative effects are also described;
- *Further Survey Requirements and Monitoring*: describes any additional survey work or monitoring proposed;
- *Summary of Effects*: includes a table summarising the significance of effects including mitigation measures and residual effects.

1.33 The ES is prefaced by a Non-Technical Summary (NTS) of its findings. A stand-alone NTS has also been produced to accompany the application.

1.34 The planning application is also supported by two mandatory stand-alone reports which are required for applications for Major Developments:

(i) A Pre-Application Consultation Report, which sets out the steps which have been taken to comply with the requirements for consultation;

(ii) A Design and Access Statement, which sets out the design principles and concepts that have been applied in developing the wind farm layout and explain how issues relating to access for the disabled have been taken into account.

1.35 In addition, a separate Planning Statement has been prepared by LUC. The Planning Statement does not form part of the ES. Its purpose is to assess the Development in the context of the relevant Development Plan and other material considerations that.

[i] The Town and Country Planning (Scotland) Act 1997, as amended by: (2006) The Planning Act (Scotland) 2006
[ii] The Town and Country Planning (Hierarchy of Development) (Scotland) Regulations 2009
[iii] The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011
[iv] European Commission (2000), Green Paper: Towards a European strategy for the security of energy supply
[v] The European Parliament and the Council of the European Union (2009), Directive 2009/28/EC on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC
[vi] OPSI (2008), Climate Change Act 2008
[vii] OPSI (2008), Planning Act 2008
[viii] OPSI (2008), The Energy Act 2008
[ix] OPSI (2009), The Climate Change (Scotland) Act 2009
[x] The Scottish Government (2009), Climate Change Delivery Plan: Meeting Scotland's Statutory Climate Change Targets
[xi] The Scottish Government (2009), Renewables Action Plan
[xii] 2020 Routemap for Renewable Energy in Scotland (2011)

[xiii] The Scottish Government, (2012), 'Update to 2020 Routemap for Renewable Energy', Available [online] at: http://www.scotland.gov.uk/Topics/Business-Industry/Energy/UpdateRenewableRoutemap, Last accessed on: 23/11/2012.
[xiv] The Scottish Government (2010), Scottish Planning Policy
[xv] OXERA (2002) Regional Renewable Energy Assessments, 2002: A report to the DTI and DTLR by OXERA Consulting Ltd
[xvi] Scottish Executive (2001). Scotland's Renewable Resource 2001, Garrad Hassan and Partners Limited
[xvii] Welsh Assembly Government (2003), Economic Development Committee (2003) Review of Energy Policy in Wales
[xviii] Vestas Wind Systems (2005), Life Cycle Assessment of Offshore and Onshore sited wind power plants based on Vestas V90-3.0MW Turbines, Vestas Wind Systems A/S

2 Approach to the EIA

Introduction

2.1 Environmental Impact Assessment (EIA) is a process which identifies the environmental effects (both positive and negative) of development proposals to assist the consenting authority in considering and determining an application. Early identification of potentially adverse environmental effects also leads to the identification and incorporation of appropriate mitigation measures into the project design to avoid, reduce, and if possible, remedy potentially significant adverse environmental effects.

2.2 This chapter sets out the broad methodology that has been used in the EIA for the wind farm. It provides an overview of the key stages that have been followed, in line with EIA good practice.

The EIA Process

EIA Regulations and Good Practice Guidance

2.3 The ES has been prepared in accordance with the latest regulations and advice on good practice, comprising:

- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ('The EIA Regulations')[i];
- Scottish Planning Circular 3 2011 Guidance on The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011[ii];
- The Scottish Government Online Onshore Wind Turbines Information, modified June 2013)[iii];
- Planning Advice Note 1/2013 (PAN 1/2013) Environmental Impact Assessment (2013)[iv]
- Institute of Environmental Management and Assessment (IEMA) (2004) Guidelines for Environmental Impact Assessment[v];
- Scottish Natural Heritage (SNH) (updated and extended in 2009 and published in 2009) A Handbook on Environmental Impact Assessment: Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland (3rd Edition)[vi].

2.4 Schedule 4 Part 1 of the EIA Regulations[vii] sets out the information "*reasonably required to assess the environmental effects of the development and which the applicant can, having regard in particular to current knowledge and methods of assessment, reasonably be required to compile*". This includes the following:

- A description of the development including information on the physical characteristics of the whole development and land use requirements during construction. A description of the nature and quantity of materials used is also suggested for inclusion along with consideration of any emissions from the development (including water, soil, noise etc.).
- An outline of the main alternatives considered by the applicant and an indication of the reason for the choices made.
- A description of the aspects of the environment likely to be significantly affected by the development.
- A description of the likely significant effects of the development (including direct, indirect, secondary, cumulative, short, medium and long term, permanent and temporary, positive and negative).
- A description of the measures envisaged to avoid, reduce and, if possible, prevent potentially significant adverse environmental effects (mitigation measures).
- A non-technical summary of the above information.
- An indication of any difficulties encountered during compilation of the ES.

2.5 Largely based on Schedule 4 Part 1, Schedule 4 Part 2 of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011[viii] requires that an Environmental Statement should include as a minimum:

- a description of the development comprising information on the site, design and size of the development;
- a description of the measures envisaged in order to avoid, reduce and, if possible, prevent significant adverse impacts (mitigation measures);
- the data required to identify and assess the main impacts[1] which the development is likely to have on the environment;
- an outline of the main alternatives studied by the applicant or appellant and an indication of the main reasons for this choice, taking into account the environmental impacts;
- a non-technical summary of the above information.

EIA and Design Process

2.6 EIA is an iterative process which aims to ensure early consideration of environmental issues at all stages of project development[iv]. In this way, the findings from the EIA can be fed into the design process, to avoid, reduce and if possible, remedy environmental effects. This approach has been followed in the design of Creag a' Bhàird Wind Farm. Where potentially adverse significant environmental effects were identified through preliminary investigations as part of feasibility work, or later in the detailed EIA, consideration was given as to how the scheme design should be modified to design out adverse significant environmental effects, or where this was not possible, to determine appropriate mitigation. This process is explained further in **Chapter 3: Site Selection and Design Strategy** and in the subsequent assessment chapters (**Chapters 6** to **14**).

Scope of the Environmental Statement

2.7 To determine which aspects of Creag a' Bhàird Wind Farm are likely to give rise to environmental effects and to inform the requirements for the ES, a Scoping Request accompanied by a Scoping Report was submitted to Perth and Kinross Council in March 2013.

2.8 The purpose of scoping is to ensure that the EIA focuses on potentially significant environmental issues. Therefore, the Scoping Report sought to focus the EIA on the main effects, with each of the topic-based chapters within the Report setting out a provisional list of potential effects and a second provisional list of non-significant effects to be 'scoped out' of full assessment. These were drafted on the basis of the findings of the preliminary survey work undertaken, the professional judgement of the EIA team, experience from other projects of a similar nature and policy guidance and standards of relevance to the topic area in question.

2.9 On this basis, whilst a range of possible positive and negative effects has been investigated as part of the EIA process, only effects identified as being of potential significance prior to the implementation of the proposed mitigation measures have been addressed fully in the ES.

2.10 Perth and Kinross Council responded to the submission of the Scoping Request in May 2013 and provided a Scoping Opinion. The Scoping Opinion included comments received from a number of consultees. A summary of the issues raised in response to the Scoping Report is provided in **Table 2.1**.

2.11 In addition to the consultees contacted during the formal scoping process, a number of other stakeholders were contacted by both LUC and topic specialists to obtain background information to further inform the EIA and allow them the opportunity to raise any concerns that they might have in relation to Creag a' Bhàird Wind Farm. Details of these consultations are provided in **Chapters 6** to **14**.

[1] Section 11.2 of the IEMA EIA Guidelines states that whilst distinguishing between the characteristics of an 'impact' and the significance of the 'effect' can be helpful, the distinction between 'impact' and 'effect' may not necessarily be appreciated by the public and requires a high level of rigour to ensure that the two terms are used in a consistent fashion. For simplicity, the term 'effect' has been used throughout this ES.

Topic Areas Scoped Out

2.12 Planning Circular 3/2011[ii] (paragraph 94) provides advice on the general requirements relating to the preparation and content of an ES and states:

2.13 "Whilst every ES should provide a full factual description of the development, the emphasis of Schedule 4 [of the EIA Regulations] is on the 'main' or 'significant' environmental effects to which a development is likely to give rise. Other impacts may be of little or no significance for the particular development in question and will need only very brief treatment to indicate that their possible relevance has been considered."

2.14 In line with this guidance, where no significant effects have been identified for a particular topic these have been 'scoped out' and given only brief treatment in the relevant topic chapters. The topics scoped out of the EIA are listed below, and further details are provided in each of the topic chapters:

- effects on landscape character over 35km from the turbines;
- effects on viewers at greater distances than 35km from the turbines;
- effects on character and views from locations, including settlements and routes, which are outside the ZTV;
- effects of vibration during operation of the wind farm on receptors in the area surrounding the site;
- the level of light vehicle traffic accessing the site during its operation is limited such that its noise effect would be negligible, and it is therefore not considered further;
- cumulative construction noise effects as the nearby wind farms considered will already be operational prior to construction of the proposed wind farm;
- effects on otter, wildcat, water vole, badger and roosting bats;
- effects associated with disturbance to pine marten dens or red squirrel dreys during construction;
- effects on wider-countryside fisheries interests and running water;
- effects on Valued Ecological Receptors including, marshy grassland, blanket bog, wet modified bog, fen and wet dwarf shrub heath as they occupy such small areas within the site that the loss of habitat is considered to be imperceptible;
- effects on all species of Low Nature Conservation Importance;
- effects upon the Cairngorms Massif SPA qualifying interest (golden eagle) due to the distance at which the site lies from the SPA (15-20km), and because golden eagle was not recorded during baseline surveys or historic information;
- effects upon all passerine species as it has been assumed, following SNH guidance[ix], that collision risk for small passerine birds (e.g. pipits, finches, buntings, thrushes) is negligible and would have no effect on their populations because survival rates of small passerines in Britain are naturally low;
- effects upon greylag goose because records were restricted to a small number of birds overflying the site (two flocks, comprising a total of 24 individuals.
- effects upon goshawk due to the very low levels of activity recorded for this species during surveys;
- effects upon merlin due to the very low levels of activity recorded for this species during surveys;
- effects upon peregrine due to the very low levels of activity recorded for this species during surveys;
- effects upon white-tailed eagle due to the very low levels of activity recorded for this species during surveys;
- effects upon red kite due to the very low levels of activity recorded for this species during surveys;
- effects upon Lochs of Butterstone, Craiglush and Lowes SSSI (greylag goose and breeding bird assemblage), Shingle Islands SSSI (breeding bird assemblage), Ben Chonzie SSSI (breeding bird assemblage), Ben Vrackie SSSI (breeding bird assemblage), Lochs Clunie and Marlee SSSI (greylag goose), Meiklour Area SSSI (greylag goose) because of the species for which these sites have been designated, the distance at which the wind farm lies from these designated sites (5-20km) and therefore the lack of connectivity for any species;
- effects on the settings of scheduled monuments within 5km of the site that were considered unlikely to be susceptible to impacts on their setting as a result of their location in relation to the proposed wind farm and/or their cultural significance;
- indirect effects on the settings of designated heritage assets resulting from the operation of the wind farm;
- effects on the M90 Motorway and A9 trunk road as the additional number of vehicles generated by the wind farm will be insignificant against the existing very large base flow on the M90 and A9;
- disruption of services such as electricity , gas and public water supply during construction and operation of Creag a' Bhàird Wind Farm as none of these services will be affected;
- direct effects on 'formal' recreation (i.e. activities which require purpose built facilities such as pitches, tracks etc.) during construction and operation of Creag a' Bhàird Wind Farm, as no such facilities exist within the vicinity of the wind farm;.
- construction effects on telecommunications, shadow flicker, television and aviation and defence as these effects solely relate to operational turbines;
- shadow flicker effects during operation as effects occur only within 130 degrees of north and within ten rotor diameters of a turbine (i.e. 900m in the case of the wind farm). There are no properties within 130 degrees of north and within 900m of the wind farm;
- NATS En Route Radar and navigation beacons: Review of the NATS self-assessment maps have identified that no issues associated with construction or operation of the wind farm are likely;
- effects on Civil Aerodromes and Heliports and Civil Airport Air Traffic Control (ATC) radar during construction and operation: there are no civil aerodromes, heliports, airports or ATC radars located within 30km of the centre of the site;
- effects on military Air Surveillance and Control Systems (ASACS) Radar, Military Precision Approach Radar (PAR) and Military Aerodromes during construction and operation: There are no ASACS Radar or PAR radars within 50km of the site;
- effects on Military Low Flying during construction and operation: the site is located within a "Low priority military low flying area less likely to raise concerns" and no effects are predicted;
- effects on radio broadcasting;
- effects of turbine icing;
- dust effects during operation of the wind farm: during operation there will be limited dust raising maintenance activities being undertaken and transport will be limited;
- cumulative effects on aviation and defence, telecommunications, television reception and dust.

Table 2.1: Creag a' Bhàird Wind Farm Scoping Responses

Consultee	Issue Raised	Response/Action Taken
Perth and Kinross Council (Planning)	**Introduction and Background**	
	Advised that the ES Introduction section should include an overview of the site.	**Chapter 4: Scheme Description** provides details of the proposed wind farm. **Chapter 3: Site Selection and Design Strategy** and **Chapter 6: Landscape and Visual Amenity** both provide an overview of the site.
	Suggested that it should also set out the relevant qualifications and experience of those involved in the EIA.	**Chapter 1: Introduction** presents the structure of the EIA team and who was responsible for undertaking each assessment.
	Recommended that the history of other nearby schemes (Griffin and Calliachar) would be useful for setting the scene for the development.	**Chapter 6: Landscape and Visual Amenity** provides details of Griffin and Calliachar Wind Farms.
	Approach to the Environmental Impact Assessment Regulations	
	Stated that the ES should include an overview of the Environmental Impact Assessment (EIA) Regulations.	**Chapter 1: Introduction** and the accompanying Planning Statement provide an overview of the EIA Regulations.
	Site Selection and Rationale	
	Advised that it should be demonstrated that the design of the development has taken into account a range of economic and environmental parameters before arriving at the final design layout.	**Chapter 3: Site Selection and Design Strategy** and the accompanying Design and Access Statement set out the design strategy for the wind farm and discuss the objectives and considerations which have been taken into account in developing the final design layout.
	The ES should highlight the site selection process and the justification for the selection of the site.	The rationale for the selection of the site is presented in **Chapter 3: Site Selection and Design Strategy** and in the accompanying Design and Access Statement.
	The ES should detail how the design of the development has responded to key environmental constraints through the discussion of the design iteration process.	This information is presented in **Chapter 3: Site Selection and Design Strategy** and in the accompanying Design and Access Statement.
	The final scheme layout should be presented in this section of the ES.	As above. The final design layout is presented in **Figure 4.1**.
	Proposed Development	
	Stated that the development components should be presented in the ES including turbine locations and specifications, access tracks, borrow pits and grid connection.	This information has been provided in **Chapter 4: Scheme Description**.
	This section of the ES should detail the phases and timescales for constructing, operating, and decommissioning the development.	This information has been provided in **Chapter 4: Scheme Description**.
	Policy Framework	
	Stated that the ES should include a section which details the planning policies and guidance of relevance to the determination of the application.	**Chapter 5: Planning Policy Context** sets out the main policies and guidance of relevance and the accompanying Planning Statement assesses compliance against the relevant planning policy framework.

Consultee	Issue Raised	Response/Action Taken
	Recommended that the ES should detail national policy and guidance of relevance to the development including National Planning Framework (NPF) 2, PAN 1/2013 Scottish Planning Policy (SPP), Scottish Government web based advice on Renewable Technologies for Onshore Wind Turbines and the Scottish Government's Policy on Control of Woodland Removal.	An overview of these policies and guidance is given in **Chapter 5: Planning Policy Context**.
	Provided information on other guidance documents which should be considered in the EIA including *Siting and Designing Windfarms in the Landscape* (SNH, 2009), and *Guidelines on the Environmental Impacts of Windfarms and Small Scale Hydroelectric Schemes* (SNH, 2002).	The EIA has been carried out in accordance with the latest wind farm siting and design guidance.
	Landscape and Visual Assessment	
	The design strategy should explain the design principles behind the final layout in a rational way.	The design strategy (see **Chapter 3: Site Selection and Design Strategy**) sets out the objectives which have been followed to create a wind farm with a cohesive design that relates to the surrounding landscape.
	The design strategy should be expressed through a Design Statement.	A Design and Access Statement accompanies the ES.
	Advised that the assessment of landscape and visual effects should be carried out in accordance with guidance produced by the Landscape Institute and Institute of Environmental Management and Assessment (IEMA).	The Landscape and Visual Amenity Assessment (see **Chapter 6: Landscape and Visual Amenity**) has been carried out in accordance with the principles contained within the latest Landscape Institute and IEMA guidance.
	Stipulated that visual information should be presented in a way which realistically portrays the actual visual effects of the development.	**Chapter 6: Landscape and Visual Amenity** is accompanied by maps and visualisations which represent the theoretical visibility of the wind farm.
	Stated that the viewpoints selected to aid the landscape and visual assessment shall be agreed with the Council and SNH in advance of the preparation of the ES.	Viewpoints used in the landscape and visual amenity assessment (LVIA) have been agreed with Perth and Kinross Council and SNH.
	A cumulative zone of theoretical visibility (ZTV) to 60km should be produced.	Cumulative information to 60km would not normally be presented on a ZTV, and is shown in **Figure 6.5**. The cumulative ZTV is shown in **Figures 6.7 – 6.9**.
	A residential visual amenity study should be undertaken for all properties within 2.6km of the site and within the ZTV. Wirelines and detailed ZTVs should be produced and should consider views approaching each property, garden, front and back facing rooms.	The residential visual amenity study is presented in **Appendix 6.1**.
	Recommended that the residential visual amenity study shall also detail the visual effects and cumulative effects on towns and villages and settlements within the study area.	The LVIA has considered the visual effects on settlements and towns.
	The LVIA should consider both cumulative and non-cumulative sequential views along the key routes.	The LVIA has considered the cumulative and non-cumulative effects on routes.
	Noise	
	Stated that a noise impact assessment shall be included within the EIA and should include the assessment of noise effects during construction, operation and decommissioning.	**Chapter 7: Noise** presents likely noise effects during construction and operation of the wind farm. Noise effects during decommissioning have not been considered, however, a decommissioning method statement will be prepared and agreed with the relevant statutory consultees prior to decommissioning of the site.

Consultee	Issue Raised	Response/Action Taken
	Advised that the Council's Environmental Health team should be contacted prior to undertaking the EIA.	Consultation with the Environmental Health team was undertaken, the findings of which were used to inform the noise assessment methodology.
	Hydrology and Ground Conditions	
	Stated that the ES should detail all known private water supplies and necessary mitigation measures within the catchments impacted by the development. Details of how the development has responded to hydrological constraints shall be given.	All known private water supplies have been detailed in **Chapter 8: Geology, Hydrology and Hydrogeology**, and those which have hydrological connectivity with the site have been included in the assessment. **Chapter 8: Geology, Hydrology and Hydrogeology** also details the way in which the design of the wind farm has responded to hydrological constraints.
	Heritage and Archaeology	
	The ES should include an assessment on the historic environment, and should detail the mitigation necessary to offset any predicted significant effects. The identification of cultural heritage assets shall feed in to the site selection process.	As assessment of the effects of the wind farm on the historic environment is provided in **Chapter 11: Archaeology and Cultural Heritage**.
	Traffic and Transport	
	Advised that the ES should include details of the preferred route option during the construction phase of the development. The ES should also address likely access issues.	**Chapter 4: Scheme Description** and **Chapter 12: Access, Traffic and Transport** provide details of the construction traffic route, and the latter provides an assessment of the likely effects on access during construction and operation of the wind farm.
	Volumes of predicted traffic associated with the development shall also be included in the ES.	This has been provided in **Chapter 12: Access, Traffic and Transport**.
	Stated that it is likely that a Construction Traffic Management Plan will be required if the development is approved. The traffic and transport chapter should bear consideration to this.	A Traffic Management Plan is included at **Appendix 12.1** and will be included within an overarching Environmental Management Plan (EMP). The EMP will be prepared prior to the start of construction, detailing measures to avoid or mitigate potential effects associated with key construction activities.
	Socio Economic (Landuse, Recreation and Tourism)	
	The ES should include relevant socio economic information relating to the project, including the projected job creation and economic activity figure associated with construction, operation and decommissioning.	**Chapter 13: Socio-Economics** presents the likely direct employment generation and any likely indirect economic benefits as a result of the proposed wind farm. It also considers potential effects in relation to public access and recreation and tourism during construction and operation of the wind farm.
	Impacts on recreation (especially core paths) and tourism should be included within this section of the ES.	This has been included in **Chapter 13: Socio-Economics**.
	Emphasised that the chapter should take the potential impact on forestry into account. In addition, it should identify the felling and extraction methods, identify and assess the re-stock site as well as assessing the potential impact of fell to waste.	Information relating to forestry clearance is included in **Chapter 4: Scheme Description** and is taken into account in the relevant topic chapters. An indicative forestry design plan is included as **Figure 4.10**.
	If timber is to be felled, then **Chapter 12: Traffic and Transport** should include details on this.	The implications of forestry felling on traffic has been taken into account in **Chapter 12: Access Traffic and Transport**.

Consultee	Issue Raised	Response/Action Taken
	Other Issues (Air and Climate, Existing Infrastructure, Telecommunications, Utilities, Aviation Safeguarding/Safety, Electromagnetic Safety and Shadow Flicker/Reflectivity	
	Air and Climate	
	Stated that an assessment of carbon emissions shall be undertaken for the development.	**Chapter 14: Other Issues** (informed by **Appendix 14.1**: Carbon Balance Assessment Report) provides a carbon balance assessment. The carbon balance assessment quantifies the sources of emissions resulting from construction of the wind farm and balances this against the predicted emissions avoided once the wind farm is operational.
	Telecommunications	
	Provided details on the consultees who should be contacted to inform the EIA.	**Chapter 14: Other Issues** provides details of the consultation which has been undertaken with the relevant telecommunication organisations.
	Aviation	
	Recommended that early communication is made with the appropriate authorities.	**Chapter 14: Other Issues** provides details of the consultation which has been undertaken with the relevant aviation bodies.
	Shadow Flicker	
	Stated that shadow flicker on nearby properties should be assessed in the ES.	Shadow flicker effects occur only within 130 degrees of north and within ten rotor diameters of a turbine (i.e. 900m in the case of the wind farm). As there are no properties within 130 degrees of north and within 900m of the wind farm, shadow flicker effects have been scoped out of this assessment.
	Summary of Impacts	
	The ES should include a summary chapter which draws on all the predicted significant effects of the development.	**Chapter 15: Summary** of the ES consolidates the findings of the EIA and presents the predicted significant effects of the wind farm.
	A Schedule of Environmental Commitments should also be included which will outline the proposed mitigation measures. This is to be used as the basis for planning conditions if the development receives consent.	Should the wind farm receive planning permission, then it is proposed that a Schedule of Environmental Commitments will be submitted. This will include mitigation measures set out in the ES as well as those relating to conditions placed on the permission.
Perth and Kinross Council (Biodiversity Officer)	**Ecology**	
	Advised that the close proximity of Griffin Wind Farm could have an adverse cumulative effect with the development on species.	Cumulative effects on species are considered in **Chapter 9: Ecology**.
	Ornithology	
	Confirmed that there is at least one pair of breeding barn owls within 500m of the site boundary which has not been mentioned within the scoping report.	Species covered by scarce breeding bird surveys are detailed in **Appendix 10.1**. All suitable locations within 1km of site were surveyed for scarce species, however, no evidence of barns owls was found within 500m of the site.

Consultee	Issue Raised	Response/Action Taken
Scottish Natural Heritage (SNH)	**Nature Conservation Designations**	
	The EIA should include an assessment of effects on designated sites close to the development site.	**Chapter 9: Ecology** has assessed the likely direct and indirect effects on designated sites within 5km of the site.
	The ES should propose mitigation measures to address effects on the interests of Special Areas of Conservation (SAC), Special Protection Areas (SPA), Ramsar sites and the features of Sites of Special Scientific Interest (SSSIs).	**Chapter 9: Ecology** details the likely mitigation required to protect the special interests of designated sites.
	Ecology	
	Bats	
	Bats surveys should be sufficient to allow for an assessment of potential effects and possible mitigation. Impacts and proposed mitigation measures should be presented in a species protection plan.	Field survey methods were based on best practice guidelines (adapted as appropriate for the site) and are detailed within **Appendix 9.4**. As no bat roosts were identified during surveying and no significant potential for roosting was noted, effects on bats has been scoped out of the assessment.
	Otter	
	Stated that a species protection plan would be required if otter is present on site.	A Species Protection Plan (SPP) is presented at **Appendix 9.6** and will ensure that all reasonably practicable measures are taken to ensure that provisions of the relevant wildlife legislation are complied with in relation to protected species, including otter.
	Details of the surveyors, methods used, results and proposed mitigation should be detailed in the ES for protected species surveys.	Protected species survey reports are presented in **Appendices 9.3** and **9.4**, and where necessary, mitigation has been proposed within **Chapter 9: Ecology**.
	Other Protected Species	
	Highlighted that if any further protected species are identified, then a species protection plan should be implemented.	To ensure all reasonable precautions are taken to avoid effects on protected species, the draft SPP has provided measures to protect otter, wildcat, pine marten, water vole, red squirrel and badgers.
	Where mitigation is proposed, the ES should detail how the effectiveness of these measures will be monitored.	The implementation and effectiveness of mitigation measures will be monitored by an Ecological Clerk of Works (ECoW).
	Stated that any UK Biodiversity Action Plan (UKBAP) species should be given due consideration.	**Chapter 9: Ecology** has given consideration to UKBAP and Local BAP (LBAP) species.
	Stated that all survey results should be presented in the ES and where surveys were not undertaken, full justification must be provided.	All survey details are provided in **Appendices 9.1-9.5**.
	For mammals, the ES should present the key species which may be adversely affected by the development, reasons for this, indicative timescales for field work and survey methodologies used.	This information is presented within **Chapter 9: Ecology** and **Appendices 9.1-9.5**.
	Impact on Habitats and Vegetation	
	Stipulated that the findings of the planned Phase 1 and NVC surveys should be used to inform any mitigation presented in the ES.	A Phase 1 Habitat Survey Report is provided as **Appendix 9.1** and **Appendix 9.2** provides an NVC Report. Findings of the

Consultee	Issue Raised	Response/Action Taken
		surveys are also presented in **Figures 9.1a** and **9.2a-c** respectively. Based on the findings of the surveys, mitigation has been considered in **Chapter 9: Ecology**.
	Stated that secondary effects on vegetation should be considered.	Secondary effects are considered within the ES, including changes in management practices under forestry planting scheme.
	NCV results should be presented clearly and in a coherent way.	NVC surveys results are presented in **Appendix 9.2** and illustrated in **Figures 9.2a to 9.2c**
	Bird Ecology	
	Highlighted that the number of Vantage Point (VP) hours to be recorded should be in-line with SNH guidance.	**Appendix 10.1 Annex C** provides details of VP surveys undertaken, and these have been done in accordance with SNH Guidance.
	VP location and viewsheds to be included in the ES.	VP locations and viewsheds are presented in **Figure 10.3**.
	Recommended that any displaced survey work as a result of the activities associated with Griffin Wind Farm should be presented in the ES.	**Appendix 10.1, Annex A** details survey limitations.
	Advised that collision risk calculations be undertaken along with an assessment of cumulative effects.	**Appendix 10.1 Annex E** presents the results of the collision risk assessments. **Chapter 10: Ornithology** includes an assessment of cumulative effects and discusses the findings of the collision risk assessments.
	Survey findings for Annex 1 species should be treated and presented as confidential.	Protected species survey results are presented in **Appendix 10.1 Annex F** which is confidential and this will have limited distribution. **Figure 10.17** also shows confidential information.
	Full survey details, including raw data, should be presented in the ES.	**Chapter 10: Ornithology** is supported by raw survey data presented in **Appendix 10.1 Annexes C-F**.
	Direct and indirect effects, as well as mitigation, should also be presented.	Direct and indirect effects on birds as well as proposed mitigation are presented in **Chapter 10: Ornithology**.
	Stipulated that all bird surveys shall be undertaken with SNH guidance, *Survey Methods for Use in Assessment of the Impacts of Proposed Onshore Wind Farms on Bird Communities (2010)*.	The ornithology assessment and surveys has been undertaken in accordance with the latest good practice guidance.
	Stated that the ES should present any mitigation measures required for breeding birds.	A Breeding Bird Protection Plan will be agreed in consultation with SNH in advance of construction.
	Soil and Water	
	Remnants of peat on the development site should be mapped and used to inform the design of the development. Areas of deep peat should be avoided.	The wind farm design and layout has been informed by the findings of peat depth survey (see **Figure 8.5**) Consequently the wind farm footprint avoids areas of deeper peat.
	Fresh Water	
	Stated that designated watercourses and waterbodies should be assessed in the EIA.	Effects on surface water and groundwater have been considered in **Chapter 8: Geology, Hydrology and Hydrogeology**.

Consultee	Issue Raised	Response/Action Taken
	Habitat surveys to be undertaken for all areas directly or indirectly affected by the development.	**Chapter 9: Ecology** has assessed the effects on terrestrial and aquatic habitats.
	Fresh water pearl mussel surveys should be undertaken where appropriate.	A fresh water pearl mussel survey for a distance of 500m up and downstream of crossing points on site has been undertaken. **Appendix 9.3** presents the survey results for this species.
	Recreation and Access	
	Advised that all recreational activities within the local areas should be identified, and an assessment made as to the likelihood of positive or negative effects.	**Chapter 13: Socio-Economics** includes an assessment of the likely effects of the wind farm on recreation within and surrounding the site.
	The ES should consider the effect on enjoyment and appreciation of strategic access routes and viewpoints.	**Chapter 6: Landscape and Visual Amenity** includes an assessment of the effects of the wind farm on visual amenity on key routes and viewpoints.
	The EIA should consider the temporary and permanent effect on recreation and access.	**Chapter 13: Socio-Economics** presents the likely temporary and permanent effects on recreation and access during construction and operation of the wind farm.
	Infrastructure	
	Recommended that any infrastructure changes shall be assessed for potential effects.	Infrastructure including proposed access tracks has been considered within the assessment of effects for all environmental topic areas.
	Decommissioning	
	Recommended that the decommissioning section of the ES is brief.	A brief description of the proposed decommissioning work is provided in **Chapter 4: Scheme Description**.
	The EIA should consider the decommissioning and redevelopment of the site.	A decommissioning method statement will be prepared and agreed with the relevant statutory consultees prior to decommissioning of the site.
	Stated that if consent is granted, then additional consultation is to be undertaken approximately 1 year prior to decommissioning.	Noted.
	Further Advice	
	The ES should include a draft Habitat Management Plan.	Due to the limited predicted effects on habitats of local or regional importance, a Habitat Management Plan is not proposed. However, a Species Protection Plan is included as **Appendix 9.7**.
	Landscape and Visual	
	The Site and Study Area	
	Stated that a 60km cumulative radius search area is appropriate for this scheme, and should include current schemes, those consented, and those at application and scoping where appropriate. Smaller schemes shall also be considered.	Cumulative wind farms within 60km are shown in **Figure 6.5**.
	The cumulative assessment should be focused and proportionate.	Wind farms included within the cumulative assessment are provided in **Chapter 6: Landscape and Visual Amenity** and

Consultee	Issue Raised	Response/Action Taken
		shown in **Figure 6.6**.
	The cumulative search should include schemes at scoping.	Projects at scoping have been included in **Figure 6.5**. Single turbines greater than 60m height to tip have been included within 25km.
	The ES should detail how the development design 'fits' with Griffin Wind Farm, and if it should be seen as separate or an extension.	**Chapter 3: Site Selection and Design Strategy** of the ES details how the wind farm design has been developed to have a positive relationship with Griffin Wind Farm, as well as being coherent it its own right.
	Recommended that the 4 National Scenic Areas (NSA) identified in the scoping report should be considered in the ES.	**Chapter 6: Landscape and Visual Amenity** considers the visual effects on designated landscapes.
	Stated that effects on wild land should be addressed.	An assessment on wild land has been undertaken in **Chapter 6: Landscape and Visual Amenity** in accordance with SNH guidance.
	Viewpoints, Visibility Mapping and Visualisations	
	The selection of viewpoints should be informed by a CZTV with Griffin and Calliachar Wind Farms.	Viewpoints were selected (including representative viewpoints, specific viewpoints and illustrative viewpoints), in consultation with SNH and PKC.
	Suggested the following viewpoints: • Ben Chonzie; • Farragon Hill; • Minor Road by Newtyle.	As above.
	All visualisations and wireframes should show all schemes within the current landscape baseline.	All relevant schemes within the landscape baseline have been included in the visualisations and wireframes which accompany **Chapter 6: Landscape and Visual Amenity.**
	Cumulative Landscape and Visual Impact Assessment	
	The cumulative assessment should focus on the most relevant schemes and should be based on CZTVs and wireframe analysis.	Wind farms included within the cumulative assessment are listed in **Chapter 6: Landscape and Visual Amenity** and shown in **Figure 6.6**.
Scottish Environment Protection Agency (SEPA)	**Carbon Balance**	
	Preventative mitigation measures to be detailed in the ES to avoid drying of peat. Stated that a Peat Management Plan (PMP) may be required as a condition to consent.	Preventative mitigation measures are set out in **Chapter 4: Scheme Description**.
	Disruption to Wetlands including Peatlands	
	Stated that the ES should detail how the design of the scheme has responded to the presence of wetlands/peatlands onsite.	**Chapter 8: Geology, Hydrology and Hydrogeology** provides details of how wetlands and peatlands have been taken into account in the final design layout.
	Phase 1 Habitat survey and NVC surveys should be carried out for the site. Results of these surveys to be presented in the ES and overlain on the turbine layout maps.	The results of the Phase 1 Habitat and NVC Surveys are presented in **Appendices 9.1** and **9.2** respectively and shown in **Figures 9.1a** and **9.2a, b and c**.
	Highlighted that the results of the NVC surveys should indicate whether wetlands are Ground Water Dependent Terrestrial Ecosystems (GWDTE).	Potential GWDTEs identified onsite through NVC surveys. **Figures 8.8** and **9.2d-f** show GWDTE survey results.

Consultee	Issue Raised	Response/Action Taken
	Advised that tracks, roads and trenches should not be within 100m of GWDTEs. Borrow pits should not be within 250m of the same.	The primary source of water is not considered to be groundwater but rainfall and surface water run-off. Consequently no mitigation is proposed.
	Stated that the ES should detail the measures proposed to mitigate adverse effects on wetlands/peatlands.	**Chapter 8: Geology, Hydrology and Hydrogeology** details the proposed mitigation to reduce effects on wetlands/peatlands.
	Disturbance and Re-Use of Excavated Peat	
	If the development infrastructure will affect peatlands, then a detailed peat depth map should be submitted.	**Figure 8.5** shows peat depths within the site.
	ES should detail volumes of surplus peat generated and how it will be re-used or disposed of.	Peat surveys have indicated very shallow depth of soil/peat throughout the site, and this is shown in **Figure 8.5**, with additional details provided in **Chapter 8: Hydrology, Geology and Hydrogeology** and **Appendix 8.2.** Whilst the wind farm has been designed to minimise disturbance to peatland, it has not been possible to avoid areas of peatland entirely. Consequently peat will require to be excavated during construction. Materials removed from the site will be handled in accordance with relevant waste and environmental regulations.
	Attention to be given to the waste management implications of surplus peat – landscaping with surplus peat may not be of ecological benefit and a waste management exemption may not apply.	As above
	An overall approach to minimise peatland disruption should be employed.	The wind farm layout has been designed to avoid areas of deeper peat.
	Forest Removal and Forest Waste	
	Stated that 'key-holing' is encouraged for the site.	All forestry within the site boundary is to be clear felled prior to commencement of construction activity.
	Felling on areas proposed to be restored to peatland may be encouraged and should be detailed in the ES and HMP.	Replanting on site will be undertaken and will primarily involve commercial conifers (Sitka Spruce).
	Stated that the ES should detail how the waste hierarchy has been adhered to if forestry is to be felled to waste.	All waste materials will be identified, classified, quantified and, where practicable, appropriately segregated. Any materials that cannot be reused will be disposed of according to relevant waste management legislation which will serve to address a number of possible environmental effects.
	The ES should fully justify fell to waste proposals. Fell to waste proposals will be considered whereby it results in the improvement of peatland habitats.	Waste forestry material will be removed from site and the felled area will be replanted in accordance with forestry design standards. An indicative forest design plan is presented at **Figure 4.10**.
	Existing Groundwater Abstractions	
	Advised that a list groundwater abstractions within 100m of tracks, roads and trenches and 250m from borrow pits and foundations to be provided.	No groundwater abstractions identified on or adjacent to site.
	If groundwater abstractions are identified within these buffers then engineering operations are to avoid these areas. Alternatively further investigation will be necessary to show that effects on abstractions are acceptable.	As above.

Consultee	Issue Raised	Response/Action Taken
	Engineering Activities in the Water Environment	
	Engineering works in the water environment should be avoided where possible. Culverts, bridges, watercourse diversions, bank modifications or dams should be avoided unless there is no practicable alternative.	As part of the layout design strategy, watercourse crossings have been minimised. This approach has resulted in two crossing locations which have existing culverts in place.
	A Flood Risk Assessment (FRA) should be undertaken and incorporated into ES if required.	Flood risk has been considered in the assessment described in **Chapter 8: Geology, Hydrology and Hydrogeology**.
	The ES should include details of site survey of all water features and a map of locations of all engineering activities should be included together with a table detailing justification for the activity an how adverse impacts	**Chapter 8: Geology, Hydrology and Hydrogeology** presents a description of the existing hydrological conditions and features are shown in **Figure 8.6**. Proposed stream crossings are shown in **Figure 8.7**
	Where a watercourse crossing cannot be avoided, bridging solutions or bottomless or arched culverts should be employed. A photograph and dimensions of the waterbody should also be included.	**Appendix 8.1** provides illustrations and photographs of the hydrological characteristics of the site. A range of good practice measures and mitigation measures are also set out in **Chapter 8: Geology, Hydrology and Hydrogeology and Appendix 8.3.**
	Measures to avoid or offset environmental impacts to be considered and may include: the removal of redundant weirs, creation of buffer strips, and provision of fencing along watercourses.	See above.
	Water Abstraction	
	ES to detail if a private or public water supply will be used if water abstraction is proposed.	No onsite water abstraction required.
	Cumulative effects to be considered.	As water abstraction is not proposed, cumulative effects have not been assessed.
	Pollution Prevention and Environmental Management	
	All aspects of site work that might impact upon the environment, potential pollution risk associated with the proposals and principals of preventative measures and mitigation should be identified, and a draft Schedule of Mitigation produced. This will form the Construction Environmental Management document which should be included in the ES.	Construction Method Statements and an Environmental Management Plan (EMP) will be prepared prior to the start of construction.
	Advised to look at best practice guidance prepared by SEPA and SNH titled, '*Good Practice During Windfarm Construction*' and Highland Council guidance titled, '*Construction Environmental Management Process for Large Scale Projects*'.	A range of good practice guidance, including the suggested titles, has been considered during the iterative design process and EIA.
	Borrow Pits	
	The need for and assessment of impacts from borrow pits should be included in the ES and information regarding location, size, and nature should be detailed. The impact of borrow pits, including dust, blasting and impact on water to be assessed.	Two borrow pit search areas have been identified (described in **Chapter 4: Scheme Design** and shown in **Figure 4.1**) and have been considered in the effects assessment for all relevant environmental topics. A Borrow Pit Assessment is presented at **Appendix 4.1**.

Consultee	Issue Raised	Response/Action Taken
	Flood Risk	
	The site should be assessed for flood risk from all sources in line with Scottish Planning Policy (SPP).	Flood risk has been assessed and is confined to the immediate vicinity of the Tombane Burn channel and its confluence with River Braan at Drumour.
	If a flood risk is identified then a Flood Risk Assessment should be undertaken following SEPA guidance.	
Royal Society for the Protection of Birds (RSPB)	No comments were given.	No action required.
Historic Scotland	**Potential Direct Impacts**	
	Advised that it is unlikely that the site contains any assets within Historic Scotland's remit, however the development may have effects on the settings of these sites outwith the site.	Cultural heritage assets not within Historic Scotland's Annex have been scoped out of the assessment (subject to no significant changes to the ZTV and consultation with Historic Scotland and Perth and Kinross Council.)
	Potential Indirect Impacts	
	Stated that an assessment of heritage assets within the vicinity of the site is necessary, as well as a cumulative assessment.	**Chapter 11: Archaeology and Cultural Heritage** has assessed the effects of the wind farm on assets within 5km of the site, and a cumulative assessment has been undertaken which is accompanied by cumulative visualisations where appropriate.
	Recommended that the following Scheduled Monuments be considered in the EIA: • Meikle Findowie • Airlich Hill • Tochrie Castle	These assets have been included in the assessment presented in **Chapter 11: Archaeology and Cultural Heritage**.
Perth and Kinross Heritage Trust	Agreed with scope of proposed cultural heritage assessment.	No action required.
	Advised that the ES details the likely mitigation measures required to offset any adverse impacts in cultural heritage assets.	Proposed mitigation is described in **Chapter 11: Archaeology and Cultural Heritage**.
JMP	**Abnormal Loads Route and Site Access**	
	The ES should identify the Port of delivery and assess the likely effects of the route to the site in terms of its ability to accommodate abnormal loads.	Details of the proposed vehicle movements during construction and operation of the wind farm are provided in **Chapter 12: Access, Traffic and Transport.**
	Assessment of Impacts	
	The ES should fully detail and assess the effects of the anticipated traffic and travel generation on the trunk road network during construction.	This has been assessed in **Chapter 12: Access, Traffic and Transport.**
	The ES should fully assess the effects on traffic and travel during operation of the development.	

Consultee	Issue Raised	Response/Action Taken
	Noise and Vibration	
	Stated that the ES should assess the effect of increased construction and operational traffic generation on noise.	**Chapter 7: Noise** assesses the potential impact of noise and vibration during construction of the wind farm (including construction traffic noise). The noise effects of traffic generation during operation is considered negligible and has been scoped out of the noise assessment.

Identification of Effects

2.15 To ensure the identification of key effects arising from Creag a' Bhàird Wind Farm, the following principles were applied throughout the EIA process.

Significant Effects

2.16 The assessment of the significance of effects arising from Creag a' Bhàird Wind Farm is a key stage in the EIA process. This judgement is vital in informing the decision-making process.

2.17 As the significance of effects will differ depending on the context and the 'receptors' affected by Creag a' Bhàird Wind Farm, there is no general definition of what constitutes significance. In EIA, the term significance reflects both its literal meaning of 'importance' and its statistical meaning where there is an element of quantification. This combination of judgemental/subjective and quantifiable/objective tests has become the standard approach to understanding and applying the test of 'significance'.

2.18 Specific significance criteria have been defined for the majority of topic areas, and these are detailed in the topic chapters. As the specialists undertaking each element of the assessment have defined these criteria based on guidance/professional judgement, there is some variation. However, each of the sets of criteria is based on the following aspects:

- type of effect (adverse/beneficial);
- extent and magnitude of effect;
- nature of effect: reversible, irreversible, long term, short term;
- sensitivity of receptor;
- comparison with legal requirements, policies and standards;
- comparison with environmental thresholds.

2.19 Using the criteria in each chapter, the significance of the effects arising from Creag a' Bhàird Wind Farm has been categorised, where possible and unless otherwise stated within the chapter, as follows:

- major;
- moderate;
- minor;
- negligible.

2.20 Effects of 'major' or 'moderate' significance are considered to be 'significant' in the context of the EIA Regulations.

Interrelationships between Effects

2.21 For the purposes of the ES, the potential effects of Creag a' Bhàird Wind Farm are considered in terms of effects on each of the discrete environmental topic areas. In reality, topic areas such as ecology and hydrology are interrelated. In accordance with the EIA Regulations, indirect and secondary effects resulting from the interaction of separate direct effects arising both within a topic area and interrelated with other topics areas are addressed within the ES.

Cumulative Effects

2.22 The EIA Regulations state that types of effect identified "should cover direct effects and any indirect, secondary, cumulative, short, medium and long-term, permanent and temporary, positive and negative effects." It is also important to consider the possible effects that the proposal may have in combination with existing, consented or other proposed developments or activities. Likely cumulative effects have been defined as the likely effects that Creag a' Bhàird Wind Farm may have in combination with other developments which are at application stage, consented, under construction or operational (i.e. the incremental effects resulting from Creag a' Bhàird Wind Farm if all other developments are assumed to be constructed/operated)[2]. Within the assessment chapters, a two stage approach to assessment has been adopted, with the second stage comprising the cumulative assessment:

Stage 1: construction and operational effects of Creag a' Bhàird Wind Farm in isolation;

Stage 2: cumulative effects assessment of Creag a' Bhàird Wind Farm with other nearby schemes. The schemes included in the cumulative assessment for each topic area are set out in the relevant chapters.

Mitigation and Enhancement

2.23 Part I (5) of Schedule 4 of the EIA Regulations states that the ES should include "a description of the measures envisaged to prevent, reduce and where possible offset any significant adverse effects on the environment." These measures have been termed 'mitigation' measures for the purposes of the Creag a' Bhàird Wind Farm ES.

2.24 The EIA has identified, and assessed, likely significant effects prior to mitigation, and, where mitigation measures are proposed, their likely effectiveness has been examined and the significance of the 'residual' effect assessed. Force 9 Energy is committed to implementing all the mitigation measures identified in this ES.

2.25 It is important to note that given both Force 9 Energy and EDF's commitment to, and prior experience of, implementing accepted good practice during construction and operation of schemes such as this, and the current regulatory context, a number of measures are not considered 'mitigation' as such but rather an integral part of the design/construction process, and have been taken into account prior to assessing the likely effects of Creag a' Bhàird Wind Farm. Where relevant, these good practice measures are described in the relevant topic chapters.

Monitoring

2.26 The ES sets out details of any post-consent monitoring which is proposed. This includes, where appropriate, proposals to measure the effectiveness of the identified mitigation measures.

Data Gaps and Uncertainty in Assessment

2.27 The EIA process is designed to assist informed decision-making, based on sound information about the environmental implications of a proposed development.

2.28 It is considered that the ES contains adequate information to enable Perth and Kinross Council to review and form a judgement on the likely significant environmental effects of Creag a' Bhàird Wind Farm.

[2] A 'cut-off' date of 9 November 2012 was selected as a timescale for the inclusion of other developments in the cumulative assessment.

Consultation

2.29 Consultation has formed an integral part of the EIA process and the EIA team and Force 9 Energy contacted a number of interested parties to determine their views on the scheme and to collect baseline information. Replies received from consultees in response to Scoping are detailed in **Table 2.1** and responses from other consultees who were contacted for further information to inform the EIA are detailed in the relevant topic chapters.

2.30 The responses received indicated that, generally, the scope of the ES had been defined appropriately. However, a number of consultees did highlight issues where further investigation or clarification was required. This has been highlighted and addressed where appropriate within the ES.

Consultation with Statutory and Non-Statutory Consultees

2.31 On-going consultations, including discussions relating to the landscape and visual effects assessment, cultural heritage, noise, ecology and ornithology assessments, were undertaken by the relevant specialists throughout the EIA process. Further details of these consultations are provided in the relevant specialist topic assessment **Chapters 6** to **14** and in **Table 2.1**.

Public Consultation and Public Exhibitions

2.32 Public consultation formed a key component of the EIA process and has been undertaken in accordance with The Town and Country Planning (Development Management Procedure (Scotland) Regulations 2013[x] and the relevant provisions of the Town and Country Planning (Scotland) Act 1997[xi] as amended by the Planning etc. (Scotland) Act 2006[xii]. The consultation undertaken by Force 9 consisted of two public exhibitions that were advertised in The Courier and Perthshire Advertiser on the 26th April 2013. Addressed letters were also sent to 73 households and businesses within a 5km radius of the wind farm site, as well as to 9 Community Councils whose area is within or neighbouring the site.

2.33 Full details of the public consultation undertaken for the wind farm is provided in the Pre-Application Consultation Report (PAC) which accompanies the application for planning permission.

---

[i] The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 (The EIA Regulations)

[ii] Scottish Government, 2011, Planning Circular 3 2011: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011

[iii] Scottish Government, 2011, 'Onshore Wind Turbines', Scottish Government Renewable Energy Policy Subject, Available [online] at: www.scotland.gov.uk/Resource/Doc/212607/0114118.pdf, Last accessed on: 12/12/2012

iv Scottish Government, 2013, Planning Advice Note 1/2013: Environmental Impact Assessment

v Institute of Environmental Management and Assessment (2004) Guidelines for Environmental Impact Assessment

vi SNH (2009 Draft 2) A Handbook on Environmental Impact Assessment: Guidance for Competent Authorities, Consultees and others involved in the Environmental Impact Assessment Process in Scotland (3rd Edition)

vii The Town and Country Planning (Environmental Impact Assessment (Scotland) Regulations 2011, 'Schedule 4 Part 1', Available [online] at: http://www.legislation.gov.uk/ssi/2011/139/schedule/4/made, Last accessed on: 12/09/2012

viii The Town and Country Planning (Environmental Impact Assessment (Scotland) Regulations 2011, 'Schedule 4 Part 2', Available [online] at: http://www.legislation.gov.uk/ssi/2011/139/schedule/4/made, Last accessed on: 12/09/2012

[ix] Scottish Natural Heritage. (2013). Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH.

[x] The Town and Country Planning (Development Management Procedure) (Scotland) Regulations 2013

[xi] The Town and Country Planning (Scotland) Act 1997

[xii] Planning etc. (Scotland) Act 1997

3 Site Selection and Design Strategy

Introduction

3.1 This chapter provides details of the approach to the design of the proposed wind farm and how, and why, the turbine layout and associated infrastructure has been modified during the iterative EIA process. This chapter also outlines the site selection process that was undertaken by Force 9 Energy.

Site Selection

3.2 Scottish Planning Policy (February 2010) provides support for wind development in principle and encourages local authorities to guide developments towards appropriate locations. It states that "*Development plans should support all scales of development associated with the generation of energy and heat from renewable sources, ensuring that an area's renewable energy potential is realised and optimised in a way that takes account of relevant economic, social, environmental and transport issues and maximises benefits*."

3.3 Emerging Scottish Planning Policy 2013 states, *"the planning system should support the transformational change to a low carbon economy and be consistent with national objectives and targets, including deriving:*

- *the equivalent of 100% of electricity demand from renewable sources by 2020;*
- *11% of heat demand from renewable sources by 2020; and*
- *30% of overall energy demand from renewable sources by 2020*".

3.4 The site was selected by Force 9 Energy for a number of reasons, including the following:

- there are no international or national natural heritage or landscape designations within the site;
- there are no Local Plan or Structure Plan policies which, in principle, preclude wind energy development;
- the site is at distance from the nearest residential receptors which planning practice has determined as likely to be acceptable;
- it has a good wind resource and is available for wind energy development;
- there are potential connection options to the electrical grid system;
- there is no obvious radar or other technical constraints;
- there is good access to the site for construction traffic and turbine deliveries;
- with appropriate mitigation and proposed compensation measures there was no indication of likely significant bird or other environmental concerns on site;
- the landscape is, in part, defined by the existence of the nearby Griffin Wind Farm.

3.5 Following on from this, more detailed feasibility work was undertaken, such as to inform the understanding of ornithological interests and possible landscape and visual effects as well as considering in more detail the potential wind yield. Much of this early work provided the foundation for the EIA. Further details on the iterative design process are provided below.

The 'Do-Nothing' Scenario

3.6 The 'do-nothing' scenario can be considered as the existing conditions, taking account of only clearly foreseeable changes over the lifespan of the development. Effects of the development have been assessed relative to this baseline. If the development did not proceed, it is reasonable to assume that the management of the site would be likely to continue as at present, as an area of coniferous plantation woodland.

The Design Strategy

3.7 Preliminary feasibility work was undertaken by landscape architects from LUC for the proposed development site in July 2011, which explored the potential landscape and visual constraints related to development of a wind farm within an agreed land option boundary. This preliminary review identified objectives for avoiding and reducing potential landscape and visual effects, and would shape the proposed design strategy for the proposed wind farm.

3.8 The overall aim of the design strategy was to create a wind farm with a cohesive design that relates to the surrounding landscape, and existing Griffin Wind Farm, in line with appropriate published guidance[i] . The inherent nature of wind turbines as tall, modern structures means that the form of the wind farm as a whole is important, and a clear design strategy is necessary. The strategy therefore considered the appearance of the wind farm as an object or composition in the landscape as the primary factor in generating the layout.

Objectives of the Design Strategy

3.9 The objectives of the design strategy were as follows:

- to produce a layout that would relate well to its landscape setting and appear contained within its extents;
- to develop a layout that would appear cohesive and well considered from all aspects;
- to develop a layout that seeks to match the perceived scale of the turbines, and the scale of the overall wind farm, with the scale of the landscape;
- to develop a layout that relates well to other wind farms in the local area; including the adjacent Griffin Wind Farm, as well as being coherent it its own right;
- to develop a layout that fulfils the above objectives whilst respecting other environmental and technical constraints including ecological, hydrological and ground conditions (including peat) related constraints identified during the EIA process.

Scope of the Strategy

3.10 The design strategy sets out the overall approach to the development of the design of the wind farm. It describes the starting point for the wind farm design, and subsequent alterations to the layout that were made in response to landscape and visual, hydrological, archaeological, ecological, wind yield and ground conditions considerations as information emerged through the EIA process. During each design iteration, careful consideration was given to minimising effects on natural and heritage features whilst maintaining the objectives of the overall design strategy.

3.11 In the development of the designed layout, computer modelling was used as a tool to aid design. In particular, Zone of Theoretical Visibility (ZTV) models were created for the proposed Force 9 Energy layout and wireframes were generated for views from key locations around the site and used to 'test' the design in views from the surrounding area.

3.12 The key considerations in the iterative design process have been to relate the scale of the proposed wind farm to the scale of the landscape; to ensure that there is a positive relationship with the adjacent Griffin Wind Farm; to consider the effect of the development alongside the existing wider pattern of wind farm development and the proposed future pattern of development in the locality; and to develop a layout which appears well-composed.

Topography

3.13 The proposed site covers an area of predominantly coniferous woodland, with small pockets of semi-improved grassland and enclosed moorland (heathland), around Creag a' Bhàird (AOD 408m) and Craig Tombane (AOD 383m), and to the north of Meall Mor (AOD 466m) and to the east of Glen Cochill. The

site has a relatively elevated position within the landscape, being located at the edge of a wide upland plateau between Glen Cochill to the west, Strathbraan to the south and Ballinloan Burn to the east.

3.14 The site is visually contained within its wider setting, with most theoretical visibility occurring within 5km or from more distant hills and ridges, as shown by **Figures 6.1** and **6.2** and discussed further in **Chapter 6: Landscape and Visual Amenity**. Within 5km there is visibility from parts of Strathbraan to the south and Glen Cochill to the west, with extensive conifer plantation likely to provide screening from the north-east. Beyond 5km, most visibility of the site is from the uninhabited upland summits and plateaus, including Meall nan Fuaran and Meall nan Caorach to the south, Birnam Hill and Newtyle Hill above Dunkeld to the east, and Weem Hill on the edge of the Loch Tummel NSA to the north.

Design Approach

3.15 Best practice guidance, including SNH's *Siting and Designing Wind Farms in the Landscape*[i] was considered throughout the design process.

3.16 The approach to the design of the site has been to achieve a cohesive layout which appears carefully composed from all directions, and works positively with the adjacent Griffin Wind Farm. This is so that the turbines appear well spaced, with minimal overlapping. Composition was especially important from the most sensitive receptors, including residential properties within the valley of Strathbraan to the south, the A822 and A826 to the south and west of the site respectively, the River Tay (Dunkeld) NSA to the east, and recreational receptors using the network of footpaths over higher ground to the south, east and west of the site.

3.17 Early design iterations demonstrated that turbines located across the higher ground of the site would increase visibility from Strathbraan, including sensitive residential receptors on both sides of the valley. Turbines located close to the western boundary of the site would increase visibility from the A826 and Glen Cochill to the west. It was also found that land ownership boundaries could result in a gap between the most south-westerly turbines of Griffin and the northern Creag a' Bhàird turbines. Design iterations have aimed to reduce the appearance of this gap in views, although it remains apparent from some close proximity viewpoints. From the more distant viewpoints this gap was found to be less pronounced, with the two developments generally reading as one.

3.18 The eastern part of the layout aims to tie into the layout of Griffin, with turbines located in distinct rows over Craig Tombane (383m AOD) to the south-east of Creag na Tainge. The western extent of the layout comprises a single row of 5 turbines to the east of Creag a' Bhàird (408m AOD). The final layout is relatively compact, with minimal stacking from the Creag a' Bhàird layout when viewed on its own. Some stacking does occur between turbines in the east of the site and the Griffin turbines, in some viewpoints. The Creag a' Bhàird Wind Farm generally complements Griffin in terms of layout and scale, and would appear as an extension to Griffin in the majority of views.

3.19 The composition of the two groups is variable, with the Creag a' Bhàird turbines appearing alongside, in front of, or behind the Griffin turbines depending on the location of the viewer. Very few locations within the study area will experience views of all 13 turbines at their full extent (turbine towers, hubs and blades), with many views limited to visibility of blades tips and hubs, or only parts of the development. Further detail is provided in **Chapter 6: Landscape and Visual Amenity**.

Infrastructure

3.20 The access route to the site, from the nearest public road (the A826 running through Glen Cochill to the west of the site), utilises the existing access track leading to the site which was previously also used to facilitate access to Griffin Wind Farm. This access track was partially upgraded (up to the intersection s with overhead power lines) as part of the Griffin project but is no longer used for access to Griffin Wind Farm. This modified section will require to be resurfaced as part of the development with the remainder of the existing track, including that within the site boundary, also requiring to be widened to accommodate construction vehicles. New branches of access track will be constructed to link the main access track to turbines, met masts and the control building.

3.21 The access route was chosen to: minimise the length of new track to be constructed as well as the number of water crossings required; avoid deposits of deeper peat; and avoid steep slopes thereby reducing the extent of earthworks. The control building will be sited to follow the contours, to avoid interrupting the skyline in key views.

3.22 Modifications to the public road between Dunkeld (via the A822) and the entrance to Griffin Wind Farm (approximately 500m to the north of the entrance to the Creag a' Bhàird access track, on the A826) prior to the delivery of turbines to Griffin Wind Farm, means that minimal modifications will be required to accommodate turbine delivery vehicles for the proposed development. The route chosen will involve road delivery of turbines from Port of Rosyth northwards via the A90/M90 and A9 to Dunkeld before following the A822 west to Milton and from there northwards via the A826, through Glen Cochill, to the site entrance. This involves the least public road modifications and disruption to road users. The delivery of turbines for Griffin Wind Farm has previously been undertaken using this route.

Scale

3.23 The site is located within the Highland Summits and Plateaux Landscape Character Type (LCT), a large scale, remote and relatively wild landscape, with a distinct, craggy landform. The site is on the fringes of the LCT, where it meets the more settled and smaller scale Mid Highland Glen LCT. Human influence is evident in the form of roads, settlement, coniferous plantation, overhead lines and existing wind farm developments, including Griffin and Calliachar.

3.24 Siting and Designing Wind Farms in the Landscape[i] states that "*Generally speaking, large wind turbines may appear out of scale and visually dominant in lowland, settled, or smaller-scale landscapes, often characterised by the relatively 'human scale' of buildings and features*."

3.25 An important design consideration was therefore to ensure that the scale of the Creag a' Bhàird Wind Farm, in terms of both height and spread, reflected the smaller scale strath to the south of the Highland Summits and Plateaux LCT . A small group of 13 turbines is therefore proposed, located in the north of the site, close to the operational Griffin turbines, and furthest from the settlements and roads within Strathbraan to the south. The final layout of 13 turbines is considered an appropriate number to be comfortably accommodated in this transitional landscape, between the operational Griffin Wind Farm on the edge of the expansive Highland Summits and Plateaux LCT, and the more settled strath to the south.

3.26 The proposed turbine height of 115m to tip has been guided by the turbine height of the adjacent operational Griffin Wind Farm turbines, which range between 110m and 125m to tip. Due to the elevated nature of the Creag a' Bhàird site on the edge of Strathbraan it was considered that a turbine size towards the lower end of this range would be more appropriate, to minimise visibility from within Strathbraan and maintain a consistent turbine elevation with the Griffin Wind Farm turbines.

Turbine Colour

3.27 The Scottish Natural Heritage (SNH) guidance paper, *Siting and Designing Windfarms in the Landscape (2009),* states that *"As a general rule for most rural areas of Scotland, a single colour of turbine is generally preferable ...a light grey colour generally achieves the best balance between minimising visibility and visual impacts when seen against the sky ... paint reflection should be minimised ... for multiple windfarm groups or windfarm extensions, the colour of turbines should generally be consistent"*. The turbines proposed for the development are to be a non-reflective pale grey colour, to be consistent with other proposed wind farms in consultation with SNH.

Outcome

3.28 The application layout is based on the design strategy described above. In particular, the strategy seeks to create a design that reads coherently with the landscape, taking account of cumulative issues. The predicted landscape and visual effects of the wind farm are considered further in **Chapter 6: Landscape and Visual Amenity**.

Modifications to Scheme Design

3.29 An early 19 turbine (125m to blade tip) wind farm design, based purely on technical and operational efficiency criteria, was developed by the applicant prior to specialist landscape design advice being sought in 2011. This led to the 15 turbine layout design which was refined further as described below.

3.30 As a consequence of the EIA process, there have been a number of modifications to the design, to avoid or minimise environmental effects without compromising the overall design strategy. These modifications have been made as a result of the findings of the baseline survey work and consultation undertaken with consultees and the public.

3.31 A summary of the modifications to the design of the wind farm is provided in **Table 3.1** below and these are illustrated in **Figure 3.1**. These modifications have included the relocation and reduction in the number of turbines to:

- ensure that predicted wind farm noise levels from the wind farm operating in an unconstrained mode do not exceed noise limits derived in accordance with ETSU-R-97[ii];
- avoid construction activity in areas of potentially deeper peat and in the vicinity of steep slopes (see **Chapter 8: Geology, Hydrology and Hydrogeology**);
- ensure appropriate buffer distance (minimum 50m buffer) between wind farm infrastructure and the site boundary;
- minimise the number of watercourse crossings required and ensure appropriate buffer distances between surface waters and Groundwater Dependent Terrestrial Ecosystems (GWDTEs) zones and turbine bases and associated infrastructure (see **Chapter 8: Geology, Hydrology and Hydrogeology**);
- minimise the visual effects of the development in views from Strathbraan.

Table 3.1: Modifications to Scheme Design

Layout Number	No. of Turbines	Purpose of Modification
Layout 1	15 turbines	-
Layout 2 (Scoping Layout)	13 turbines	Reduction in the number of turbines from 15 turbines to 13 turbines (removal of the two northernmost turbines) to ensure that operational noise levels lie below derived noise limits.
Layout 3 (Application Layout)	13 turbines	Minor adjustments (between 13m (T6) and 179m (T3)) to all but one (T13) of the turbine positions following peat probing survey, hydrological walkover and National Vegetation Classification (NVC) survey in order to establish an appropriate buffer in relation to watercourses, GWDTEs zones and to avoid areas of deeper peat and steeper slopes. Adjustments were made in the context of minimising visual effects in the views from the wider landscape, in particular views from Strathbraan, whilst ensuring that a buffer of at least 50m from the site boundary to the proposed infrastructure locations was maintained.

[i] Scottish Natural Heritage. (2009). Siting and Designing Windfarms in the Landscape (Version 1)
[ii] ETSU-R-97, The Assessment and Rating of Noise from Wind Farms, Report for the Department of Trade and Industry. The Working Group on Noise from Wind Turbines 1997.

4 Scheme Description

Introduction

4.1 This chapter describes the components of the wind farm for which planning permission is being sought and which have been assessed in the ES. It includes details about the construction of the development as well as its operation, and includes measures proposed for the protection of the environment during these stages.

Description of the Site and Surrounding Area

4.2 The site, including the land occupied by the access track and construction compound, occupies a total area of approximately 311 hectares (ha.). However, the actual development will only occupy a small percentage of this area. The turbines are proposed to be located on elevations between 287m-385m Above Ordnance Datum (AOD).

4.3 The site comprises an area of predominantly coniferous plantation woodland to the north of Strathbraan, approximately 8km west of Dunkeld and 8.5km south-east of Aberfeldy. It lies wholly within the Perth and Kinross Council area.

4.4 The site has an elevated position within the landscape, being located at the edge of a wide upland plateau between Glen Cochill to the west, Strathbraan to the south and Ballinloan Burn to the east. There are several small watercourses within the site draining into the Tombane Burn which flows south to Strathbraan.

4.5 The site is accessed via an entrance directly off the A826. There are few properties within Glen Cochill, with the exception of the small hamlet of Milton at the southern end of the glen, and Scotston, a large detached property on the west side of the A826, near the entrance to Griffin Wind Farm. An overhead power line runs along the eastern side of the road, along the valley side.

4.6 The A822 passes through Strathbraan to the south of the site, parallel to the River Braan. There are several clusters of properties and farmsteads located on both sides of the A822. These include Little Findowie and Meikle Findowie on the north facing valley slopes, and Tomnagrew, Meikle Tombane, Borelick, Drumour and Trochry on the south facing slopes. There are also several isolated farmsteads to the east of the site, along the valley of the Ballinloan Burn.

4.7 There are areas of coniferous plantation to the north, east and west of the site, extending into the Craigvinean Forest to the north-east. Coniferous plantations to the north and west partially screen views into the interior of the site from nearby roads and properties within Glen Cochill.

4.8 Immediately to the north-east of the site is Griffin Wind Farm, an operational wind farm comprising 68 turbines which extends north and east towards the Craigvinean Forest.

Project Components

4.9 As outlined in **Chapter 1: Introduction**, the main components of the development comprise:

- thirteen wind turbines (including external transformers) of up to 115m (to blade tip) height, with a maximum combined output of up to 29.9 megawatts (MW);
- crane hardstandings;
- onsite underground electrical cables;
- a control building;
- two permanent meteorological masts;
- a temporary site construction compound/laydown area;
- two areas within which it is proposed to win rock for wind farm construction (borrow pits);
- approximately 8km of onsite access tracks.

4.10 The proposed layout of the development is shown in **Figures 4.1 and 4.1a**. Each component is described in further detail later in this chapter.

4.11 **Table 4.1** details the locations of the turbines and the permanent meteorological mast.

Table 4.1: Proposed Turbine Locations

Turbine ID	Easting	Northing
T1	291962	741570
T2	292116	741209
T3	292457	740786
T4	292664	740635
T5	293011	740885
T6	293445	741241
T7	293736	741725
T8	294175	741862
T9	292842	740501
T10	293248	740636
T11	293691	741022
T12	294022	741421
T13	294429	741628
Meteorological Mast No.1	291818	741439
Meteorological Mast No.2	294191	741276

Wind Turbines

4.12 Permission is being sought for the erection of thirteen three bladed horizontal axis turbines. The Siemens VS93 is the candidate wind turbine used for the purpose of the assessment (except where identified specifically in chapters, for example, in the noise assessment where the Vestas V90 turbine has been used as a worst case scenario, given it has higher published noise output than the Siemens option) has an individual maximum capacity up to 2.3MW, although the installed turbine may have a greater or lesser maximum capacity depending on commercial considerations at the time of turbine procurement. The turbine hub height and rotor (blade) diameter will depend on the model of turbine selected, although all of the turbines will have a maximum height to blade tip of 115m. For the purpose of preparing the EIA, the indicative turbine dimensions used have been a hub height of 70m and rotor diameter of 90m.

4.13 The dimensions of the indicative turbines are illustrated on **Figure 4.2**. The blades will be made from glass fibre/carbon spar with glass fibre airfoil shells and the tower will be constructed from steel. The finish and colour of the turbines and blades are likely to be semi-matt and pale grey respectively.

4.14 Blades will rotate at approximately 6 to 16 revolutions per minute, generating power at all wind speeds between approximately 4 to 25 metres per second (m/s) (8.9 to 55.9 miles per hour (mph)). At wind speeds greater than 25 m/s, the turbines will shut down for self-protection.

Turbine Foundations and Crane Hardstandings

4.15 The turbines will be installed on foundations comprising both stone and steel-reinforced concrete. These typically measure 19m diameter in plan with a concrete depth of between approximately 3m and 4.5m and overlay of depth approximately 1m dressed back with topsoil to allow re-vegetation (**Figure 4.3**). Each foundation will require between approximately 400 and 500 cubic metres (m^3) of concrete. The detailed design, sizing and specification for each foundation will depend on the finally selected turbine type and the specific ground conditions encountered at each turbine location. The working area at each turbine will be up to 30m x 30m depending on ground conditions.

4.16 Adjacent to each turbine, an area of hardstanding approximately 20m x 40m will be constructed for use as a crane pad. The exact geometry and position of the crane pad will depend on the turbine suppliers standard procedures and the specific crane selected for erection. These areas will be levelled using cut and fill operations and surfaced in crushed stone to provide a durable surface. These hardstandings are used during the erection process as a platform for the cranes to lift the turbine components into position. During operation, the hardstanding provides safe access for maintenance and repairs which may also require the use of a crane. An indicative hardstanding arrangement is shown in **Figure 4.3.**

Transformers and Cables

4.17 Depending on the manufacturer selected, should the transformer not be located within the nacelle or tower, each turbine will require the installation of an external transformer close to the base of the tower. This will normally be placed within steel or glass reinforced plastic housing. The size of housing will depend on the type of transformer selected but in general it will be approximately 3 metres by 2.5 metres in plan and 2.5 metres in height above surrounding ground level.

4.18 The transformers will be either oil-filled with a bunded footing to remove any risk of spillage or a solid cast resin type which is effectively non-polluting. The transformers will increase the electrical voltage to 33 kilovolts (kV) and will be connected to the control building via underground high voltage (HV) cables.

4.19 Approximately 6.8km of cable trenches will be required for the 33kV cabling that will connect the turbine transformers to the control building. To minimise ground disturbance cable trenches will be excavated along the side of the access tracks where possible. Typical cable trench details are shown in **Figure 4.4.**

4.20 A Supervisory Control and Data Acquisition (SCADA) system will be installed to gather information from the individual wind turbines and provide the facility to control them from a central location. A fibre optic communications cable will run alongside the power cables to link the turbines to the SCADA system. The wind turbines can be monitored remotely via a telephone or data connection to the SCADA system.

4.21 An underground power supply and SCADA cable will connect the meteorological masts to the nearest turbine, allowing data to be transmitted onwards to the control building. It is anticipated that this will run alongside the access tracks and 33kV cable.

Grid Connection and Control Building

4.22 The development will be connected to the national electricity network ('grid'). The grid connection will be subject to a separate consenting process. For the purposes of the planning application it is assumed that the grid connection will be via underground cables in roadside verges.

4.23 Electrical power from the turbine transformers will be transferred to the electricity distribution system through a switchgear unit, housed within the control building. The control building will be located in the north of the site as shown on **Figure 4.1.**

4.24 An indicative plan and elevation of the control building is shown in **Figure 4.5**. The compound will comprise the control building and a fenced hardstanding area for vehicle access and parking. The single storey control building will have a pitched roof and measure 16.6m x 10.6m. The fenced compound will measure 33m x 17m. Subject to grid operator requirements, the building will house welfare facilities for visiting maintenance staff. Rainwater will be collected from the roof of the building via a gutter and inlet pipe to fill a header tank. Waste will be held in a closed system and removed by a licensed contractor at regular intervals. The building will be constructed in keeping with the local built environment. Any associated fencing would be either moorland green/brown or dark grey to blend with the existing landscape colours.

Meteorological Masts

4.25 Two permanent freestanding meteorological mast s will be erected to aid performance monitoring of the wind turbines and to gather meteorological data throughout the lifetime of the development. The masts will be located at NGR 291818, 741439 and NGR 294191, 741276 (the locations are shown on **Figure 4.1**). The masts will be of a lattice design and will have a maximum height of 70m (**Figure 4.6**).

Temporary Construction Compound/Laydown Area

4.26 A temporary construction compound of 50m x 30m will be located at NGR 291919E, 741283N, as shown on **Figure 4.1**.

4.27 The construction compound will consist of a hardstanding area upon which will be accommodated temporary site offices, car parking, storage, and welfare facilities for site staff. A temporary laydown area approximately 30m x 7.5m in size will also be established at this location. This laydown area would be used to store turbine components, plant and materials, for the duration of the works.

4.28 An indicative construction compound is shown in **Figure 4.7**.

4.29 The compound will contain provision for fuel storage, an electrical generator and a temporary septic tank. The fuel storage area will be above ground with necessary secondary containment in accordance with the Scottish Environment Protection Agency (SEPA) standards (PPG7 and PPG8) and will be situated a minimum of 50m from watercourses to reduce the risk of pollution to watercourses.

4.30 The compound site will be restored to its current condition once construction is complete and turbines are operational.

Borrow Pits

4.31 It is estimated that approximately 38,500m^3 of stone aggregate will be required for construction of the development (including permanent and temporary access tracks, structural fill beneath turbine foundations and crane hardstandings). Two potential borrow pit areas ('search areas') are proposed. The location of the borrow pit search areas has been influenced by the likely availability of stone and by onsite environmental characteristics, including topography, soil/peat depth, ecology (habitats), surface hydrology and potential visibility from surrounding areas, and which will allow successful restoration measures to be put in place as appropriate. The two search areas for the potential borrow pits are shown on **Figure 4.1**.

4.32 Further details are presented in **Appendix 4.1**: Borrow Pit Assessment which identifies preferred borrow pit locations.

4.33 Based on the rock type anticipated to be encountered, it is unlikely that the crushed rock would be suitable for use as concrete aggregate. The volume of concrete required for the construction of the turbine foundations is estimated to be 430m^3 per turbine (or a total of 5590m^3 for 13 turbines). For the purposes of assessment, it has been assumed that concrete will be delivered by lorry from a local off-site concrete batching plant.

Site Access from Public Road Network

4.34 It is proposed that the site will be accessed via the existing site access track entrance on the A826 to the west of the site.

4.35 Details of the proposed vehicle movements during construction and operation of the development are provided in **Chapter 12: Access, Traffic and Transport**.

Onsite Access Tracks

4.36 New sections of access track, branching-off from the existing access track, which will be upgraded to accommodate windfarm construction traffic, will be constructed to facilitate access to the turbines and other infrastructure locations as shown on **Figure 4.1**. In total, approximately 3km of new onsite access track will be constructed.

Track Design

4.37 The design of the access track layout was based on the following objectives:

- to facilitate safe access to each turbine, avoiding deeper areas of peat and maintaining a sufficient buffer from watercourses;
- to minimise water course crossings;
- to minimise requirements for passing places and turning areas;
- to minimise environmental effects, including effects on protected species and habitats, areas of archaeological interest and the local hydrological regime;
- to keep overall new track length to a minimum, thus reducing stone requirements and associated potential environmental effects;
- to follow the existing ground topography as much as possible, minimising the necessity for slope cuttings and embankments and associated visual effects.

4.38 Passing place construction will be minimised through consideration of the layout of junctions or turbine hardstandings which can generally be used by traffic as an alternative to dedicated passing places. The passing places are not shown on any of the figures accompanying this ES as their locations will be established during construction. They will, however, be sited to avoid ecological, archaeological and hydrological features on site.

4.39 The tracks will generally be limited to a running surface width of 5m (depending on the turbine supplier specifications), except at bends where surface width will be widened as required to accommodate the 'swept path' of vehicles carrying long and wide loads. An indicative track design is shown in **Figure 4.4.**

4.40 The exact details of track construction methodologies will vary depending on local topographic and ground conditions but the approximate balance of construction types expected is explained below under 'Construction Details'.

Water Crossings

4.41 Tracks have been designed to minimise watercourse crossings, however, two bridge crossings will be installed. In-channel works are planned to be avoided by using the existing structures as support for a wider bridge to enable turbine delivery access (see **Figure 4.8**). In addition there will be a requirement for a number of small circular culvert crossings for smaller watercourses, typically artificial forestry drainage channels, as shown in **Figure 4.9**.

4.42 Monitoring of water quality and water flow will be undertaken during construction of the development and a water quality monitoring plan will be devised. Further information in relation to watercourse crossings and water quality monitoring is provided in **Chapter 8: Geology, Hydrology and Hydrogeology**.

Micro-Siting

4.43 Prior to construction of the Development, micro-siting may take place to allow adjustment within a defined radius of the proposed turbine locations, and a similar tolerance either side of indicative access track locations. This will ensure that the final position of the turbines and associated infrastructure are not varied to such a degree as to cause a notable change in the predicted environmental effects outlined in the ES but allows flexibility should unfavourable or unforeseen ground conditions be encountered.

4.44 It is anticipated that an agreed micro-siting distance will form a condition accompanying permission for the development. Beyond this distance, any relocation of development components will require either written approval from Perth and Kinross Council or will be treated as a formal variation to the application. In line with recent wind farm planning decisions, it is proposed that a 50m micro-siting distance from turbines and the centreline of access tracks is applied to this site.

Construction Details

4.45 The construction period for the development will last for approximately 20 months. It is estimated the number of people employed at site during the construction period will range from 20-40 people with an average of approximately 30 people employed at site at any one time.

4.46 The construction phase will consist of the following principal activities:

- forest clearance;
- construction of temporary compound, laydown area, offices and car parking;
- upgrading the existing access routes to be used for the development;
- construction of site access tracks, including drainage, to connect turbine locations to the route of the existing access track;
- construction of turbine foundations and external transformer bases (if required) at each turbine location;
- construction of crane hardstandings at each turbine base location and also at the permanent meteorological mast locations;
- delivery to site and erection of wind turbines and permanent meteorological masts;
- excavation of trenches and laying of electrical and control cables adjacent to the site tracks connecting the turbines to the control building;
- testing and commissioning of site equipment including wind turbines;
- site restoration and implementation of habitat management measures.

Forest Clearance

4.47 All forestry within the site boundary will be clear felled prior to commencement of construction activity. Approximately 228.1ha of forestry (equating to approximately 43,800 tonnes of timber) will be removed from the site over a period of 12 months.

4.48 Replanting on site will primarily involve commercial conifers (Sitka Spruce) with no planting within a 100m radius of each of the turbines. Small areas of open ground and mixed native broadleaf trees will be included (in accordance with contemporary forestry design standards). An indicative forest design plan is provided at **Figure 4.10**.

4.49 This forest would be clear felled within the lifetime of the windfarm if it reaches 10m in height.

4.50 Opportunities for off-site compensatory planting will be explored, in consultation with Forestry Commission Scotland, to compensate for any net loss of forestry.

4.51 The pollution prevention techniques discussed elsewhere in this chapter will apply to forestry clearance related activities (for example, many of the fuel storage, erosion and sediment control measures).

4.52 In addition, there are a number of good practice publications available from the Forestry Commission, including Forest and Water Guidelines[i] that shall be adhered to during forestry activities. Specific measures that shall be applied to forestry activities include:

- only licensed felling to occur;
- felling is to be undertaken by experienced contractors, having undertaken awareness training for environmental sensitivities such as local watercourses;
- felling over an extended period of time, rather than concentrating activities over shorter time frame, with the aim to minimise any 'spike' in watercourse sediment loading;
- felling is to be undertaken using the most appropriate equipment for local forest and ground conditions, such as low ground pressure vehicles;
- felling and extraction shall be planned to minimise stream and drain crossings. At locations where this is unavoidable temporary crossing structures, such as log bridges, shall be installed and maintained appropriately;
- extraction in dry conditions reduces compaction issue (wet soils have lower bearing capacity);
- brash mats shall be constructed and maintained on harvesting routes to minimise ground disturbance, log steps on sloping ground shall be constructed to avoid creation of preferential pathways for surface water flow;
- monitoring operations and modify procedures should environmental damage be apparent.

Construction of Temporary Compound

4.53 The compound will be formed by stripping organic and soft surface material and laying geotextile and crushed rock to create a firm regular surface. Perimeter drainage will intercept rainfall and then channel water to temporary filtration and dispersion structures, utilising where possible the natural contours of the landscape. The stripped surface material will be stockpiled nearby for reinstatement.

Construction of Tracks

4.54 As there is limited peat onsite, a cut track design will be used and will be constructed by excavating through to a suitable formation. During construction, vegetation, topsoil and subsoil will be placed to the sides of the tracks. A layer of stone will be compacted on top of the base formation to a thickness of around 150-250 millimetres (mm) dependent upon ground conditions. The total track thickness will depend on the strength of the base formation and the gradient of the slope being traversed but is typically 450 to 800mm thick. Drainage ditches will then be constructed (as described below). Surplus soil will be placed and dressed alongside the track to blend in with the surrounding landscape and finally topsoil will be placed on the track shoulders and seeded to promote vegetation.

4.55 The tracks will have adequate crown or cross-slope to allow rainwater to be shed and, where gradients are present, lateral drainage will intercept flow. A drainage ditch will be formed on the upslope side of the track, dependent on a detailed drainage design. Cross pipes will be laid as required in areas where the position of the site track could lead to ponding on one side. As far as possible these will coincide with naturally occurring drainage channels. Experience at other sites has shown that cross pipes simply placed at regular intervals are often ineffective and unnecessary. When the track slopes downhill, 'waterbars' will be placed to divert the flow into naturally occurring channels. The advice of the Ecological Clerk of Works (ECoW) will be sought to ensure that the location and outfall of cross pipes and waterbars minimises vegetation damage or change.

4.56 Final track drainage design will be determined prior to the commencement of construction of the relevant track section. The design of track and ancillary drainage will comply with Sustainable Drainage Systems (SuDS) standards and be agreed with SEPA. Further details of measures which will be taken to manage run-off and avoid erosion are provided in **Chapter 8: Geology, Hydrology and Hydrogeology**.

Construction of Turbines

4.57 Construction of turbine bases will require the excavation of surface organic and soft surface material through to underlying rock. This excavated material may be used to partially backfill the excavation and provide material for landscaping and surfacing reinstatement. As such, this material will be stored near to the excavation until required. The underlying rock will be levelled to provide a workable platform for the assembly of reinforcing bars and formwork used to contain the poured concrete.

4.58 During construction, dewatering may be required to keep the construction area dry (for example, if rainwater gets into construction areas). Suitable filtration systems will be employed to ensure that silt laden water does not contaminate surface watercourses and that extracted water is returned to the surrounding area with a limited effect on local hydrology (see **Chapter 8: Geology, Hydrology and Hydrogeology**).

4.59 The area around the turbine will be back filled with selected excavated material. Should an external transformer be required at the base of each turbine, the fill beneath the transformer slab will be of such a nature as to provide sufficient structural support.

Installation of Cabling

4.60 The cabling connecting each turbine to the control building will be laid in a trefoil arrangement. Detailed construction and trenching specifications will depend on ground conditions encountered. Typically cables would be laid in a trench 1m deep and 0.65m wide. To minimise ground disturbance cables will be routed along the side of the access tracks where practicable.

4.61 Cables will be laid within a sand or granular bedding to prevent damage to the cables from sharp stones. Trenches will be backfilled with excavated material and the surface redressed. If sand bedding is used, clay bunds will be placed at intervals within the bedding to prevent unnatural flows of ground water.

Construction Programme

4.62 An indicative programme for the construction activities is shown in **Table 4.2**.

Table 4.2: Indicative Construction Programme

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Forest Clearance																				
Construction Compound																				
Access Tracks																				
Turbine Foundations																				
Hardstandings																				
Control Building																				
Onsite Cabling																				
Turbine Erection																				
Commission-ing																				
Site Restoration																				

4.63 Many of these operations will be carried out concurrently, although predominantly in the order identified, reducing the overall length of the construction programme. Site restoration will be programmed and carried out to allow the restoration of disturbed areas as early as possible and in a progressive manner.

4.64 Depending on the month of commencement of construction, pre-construction surveys and construction timing constraints may be required to reduce potential effects on breeding birds. Appropriate exclusion zones will be marked out around sensitive archaeological and ecological sites where necessary. An ECoW will be on site during construction in certain areas/months as agreed with Perth and Kinross Council.

4.65 Further specific measures proposed to avoid or minimise effects during construction are discussed on a topic-by-topic basis in **Chapters 6** to **14**.

Working Hours

4.66 In general, working hours for construction will be from 07.00 to 19.00 Monday to Friday and 07.00 to 13.00 on Saturday. No working is proposed on Sundays and public holidays.

4.67 Exceptions to the proposed working hours will be made for foundation pours and turbine erection. Concrete pouring for an individual turbine foundation must take place continuously and so activity will only cease when the pour has been completed. Turbine erection can only occur during periods of low wind speeds and so to minimise the construction programme, lifting operations may need to be scheduled out with the above hours. In addition, it may be necessary to complete a particular lifting operation in order to ensure the structure is left safe.

Reinstatement

General Approach

4.68 Following construction, the site will be reinstated by the contractor. The anticipated type and extent of reinstatement is outlined below.

4.69 Where a re-turfing method is appropriate, such as along track verges, the surface layer of soil and vegetation will be stripped and stored separately from the lower soil layers, and replaced as intact as possible once construction is complete.

4.70 Local reinstatement will be carried out to retain the structure and composition of the original plant communities, as well as forming a stable area over reformed ground, thus reducing erosion by rain, run-off and wind.

4.71 Bare soil areas will be allowed to re-vegetate naturally in combination with reseeding using a low density (~20kg per hectare) seed mix which mirrors local vegetation to help bind the soil more quickly.

Site Tracks

4.72 Site tracks are required throughout the operational phase of the Development to permit access for maintenance and repair operations. They will also be necessary to allow access during the decommissioning stage.

4.73 Generally the sloping verges of access tracks will be dressed with site sourced turf or seed bank material. If suitable material is generated during the construction of the track, this material can be used to form a low lying bund along the downhill side of the track, to be dressed as per the track verges. This will assist in reducing the visibility of the track.

Turbine Bases and Crane Hardstandings

4.74 Turbine foundations will be capped with a minimum of 150mm of soil material, which may form a raised mound between 300 and 500 mm above the existing ground level. These will be re-turfed with the removed material, but where vegetation is sparse or unlikely to regenerate, reseeding with an appropriate local seed mix may be undertaken as outlined above.

4.75 The condition of turfs will be monitored regularly during the first two months following reinstatement. If necessary, water will be imported to the site to ensure the re-establishment of this vegetation.

4.76 Hard-standing areas at each turbine location will be retained for use during operation and decommissioning, however the edges will as far as possible be blended to the adjacent contours and natural vegetation allowed to re-establish.

Construction Compound and Laydown Area

4.77 The temporary construction compound and laydown area will be reinstated into the surrounding landscape, and restored to their original condition.

Good Practice Measures

4.78 Good practice measures will be employed as standard techniques during the construction and operation of Creag a' Bhàird Wind Farm. Therefore, these are not considered to be mitigation as such, but an integral part of the design, construction and operation of the wind farm. This is considered a realistic scenario given the current regulatory context and accepted good practice across the industry.

4.79 All good practice measures are clearly stated below and any further specific mitigation measures are identified in the assessment of likely construction and operational effects.

4.80 Good practice measures to minimise the effects of the development on geology, hydrology, hydrogeology and soil have been provided below. A list of good practice documents were provided in the Assessment Methodology section of this chapter (**Chapter 8: Geology, Hydrology and Hydrogeology**), many of the items proposed are taken from these publications.

4.81 During construction, there will be a suitably qualified environmental manager appointed with responsibilities including training, liaison with SEPA and ensuring applicable licences held. This role will have authority for halting works if necessary. Emergency procedures to be detailed and subsequently agreed with SEPA, including contact lists and the personnel responsible.

4.82 The proposed development will be constructed in accordance with a site Environmental Management Plan (EMP) and relevant Construction Method Statements (CMS), the content of which will be agreed with Perth and Kinross Council and relevant statutory bodies in advance of work commencing on site. The EMP will include measures to prevent, reduce and, where appropriate, offset environmental effects, this will include measures which seek to mitigate against the risk of pollution or environmental damage. Measures will be implemented to ensure that activities are carried out in such a manner as to minimise waste generation. Where waste is generated, appropriate disposal practices will be identified. Systems employed will conform to all appropriate waste management regulatory controls and adhere to the SEPA 'Waste Hierarchy'.

Pollution Incidents

4.83 Pollution prevention planning prioritises prevention at source, followed by mitigation measures local to source. Pollution incident management will operate on two main principles:

- reducing the likelihood of an incident occurring;
- minimising the magnitude (or severity) of an incident that does occur.

4.84 In tandem, these measures will limit the potential for contamination of surface and groundwater, soil and associated habitats. To achieve this, the following measures will be implemented:

- The construction compound will be located at NGR 291919E, 741283N, which is over 100 m from any Ordnance Survey 1:10,000 mapped watercourses on an impermeable surface and out with SEPA's 1:200 year flood risk zone. This will be the default storage location for all chemical, fuel and oil requirements. The borrow pit will also be sited at least 50m from all surface watercourses. Construction activities in sensitive locations (including those within 50m of hydrological features) will be carefully considered and also supervised by suitably qualified environmental specialists.
- Oil and chemical storage will meet the minimum requirements of SEPA's PPG2 and PPG26, i.e. good practice secondary containment (bund) volumes. This will apply to all temporary storage locations. All chemical, fuel and oil stores will be sited on impermeable bases within an appropriately-sized secure bund, suitable to contain at least 110% of the contents (for a single tank) or 110% of the contents of the largest container (for multiple tank storage), with default location within the construction compound. Materials will be stored in accordance with applicable COSHH (Control of Substances Hazardous to Health Regulations) requirements. Empty chemical/fuel containers will be retained within the construction compound (bunded area) until collected from site. No underground storage devices will be employed.
- Site compounds will be secure environments, with locked storage containers to prevent unauthorised releases (including via theft or vandalism).
- Storage of chemicals and/or fuel will be limited to the minimum required to serve immediate need, in order to minimise the volumes of chemicals and fuels stored on site. Biodegradable oils will be used as a substitute for standard oil/grease, wherever practical.
- Substations and other areas of hardstanding planned to store hazardous materials or to have equipment installed containing such materials, (for example transformers), will have appropriate pollution prevention measures incorporated in their design.
- Delivery and refuelling of vehicles and machinery will be carried out in specific designated impermeable and bunded areas such as construction compounds or other suitably equipped sites and will be carried out under supervision. Associated equipment such as refuelling hoses, vent pipes, delivery pipes and sight gauges will be contained within bunded areas.
- Contingency measures will contain items identified in PPG21 and will include emergency plans for different pollution incidents, fire procedures, emergency contact telephone lists, spill kits located at appropriate locations on site and staff trained and equipped to deal with incidents effectively.
- Standing machinery will have drip trays placed underneath to prevent oil and fuel leaks causing pollution. Vehicle maintenance and repairs will be undertaken in the construction compound. Exceptionally, vehicles or other equipment that has broken down will require maintenance at the point of breakdown. Special precautions will be taken in this eventuality, including the use of drip trays and spill kits to prevent pollution.

- Runoff from the construction compound areas carries a higher risk of being contaminated and will be treated appropriately, such as by oil interception and/or neutralisation of high alkalinity.
- No pesticides, detergents or rock salt will be applied to access tracks or any other site infrastructure during any phase of the project. Should exceptional circumstances occur which may necessitate the use of such materials, advice will be sought from SEPA regarding good practice and required volumes.
- There will be no onsite water abstraction, with ready-mix cement brought to the site rather than using a concrete batching plant. This reduces the potential for pollution but will require clear procedures for offloading cement. Pre-cast concrete structures will be considered for all appropriate locations. Use of wet concrete in the vicinity of watercourses will be minimised and carefully controlled. Competent personnel will confirm that details such as rainwater removal and good quality shuttering are *in situ* prior to pour. Particular care will be taken to develop robust procedures where concrete will be used between cables and stream beds (to protect the cable from scour) at excavated cable stream crossing locations. Geochemical testing will be undertaken to establish the likelihood of sulphate attack on concrete. If necessary, sulphate resistant concrete will be used.
- The washing out of concrete mixing plant, if deemed necessary to be carried out on site, will be carried out in a contained area and a settlement and re-circulation system for water reuse will be discussed with SEPA. Wash water will be adequately treated to deal with suspended solids and high alkalinity before discharge. Wash out activities for the plant and vehicles will be carried out in accordance with a clear procedure developed in consultation with SEPA, with a key element being clarity of process for operators. A lined settlement pond will be provided to prevent infiltration of alkaline runoff into soils, groundwater and adjacent watercourses. If a discharge licence is required under the CAR Regulations, consultations will be carried out with SEPA at the earliest practical stage in the detailed design process.
- A ground investigation will be undertaken for any location where directional drilling is deemed necessary, such as, should cables require to be drilled below stream beds, to ensure ground conditions are suitable. If grout or any drilling lubricants are to be used, these will have appropriate protocols developed and communicated for storage, use and collection.
- Should any contaminated groundwater or surface water be identified, work will cease, enabling investigation of the source of contamination and development of measures to contain and/or remove pollutant (this will include any water within cable trench).
- All sewage and waste water will be collected on site in an appropriately designed and located tank and will be tankered from site at an appropriate frequency or, with Scottish Water agreement, removed via direct connection to Scottish Water sewer systems. Disposal of sewage from the site will be carried out by methods recommended in PPG04. In all cases, final disposal will be into the local sewer system at a location agreed with Scottish Water.

Erosion and Sedimentation

4.85 Erosion control is recognised as being more effective than sediment control in preventing water pollution, i.e. minimising generation of sediment and control 'at source'. This 'prevention-led' philosophy will be applied to this project. Careful construction project programming will take account of interactions between construction, erosion and sedimentation, thus reducing the potential for adverse effects.

4.86 All construction work will be undertaken to meet current good practice standards, including recommendations in CIRIA guidance documents such as Control of Water from Linear Construction Projects[ii] and Handbook for Construction of SUDS[iii]. Specific measures that will be employed include:

- Where practicable, vehicles will use existing tracks or prepared surfaces rather than disturbing unprepared ground. Where plant movement is necessary off track, low ground pressure vehicles will be utilised, particularly at locations where ground conditions are considered sensitive.
- Areas recently disturbed and cleared of vegetation are prone to sediment wash-off, even in low intensity rainfall. In consequence, vegetation clearance will be scheduled only as needed ('just in time' principle). Specific erosion control precautions will be taken at stream crossing locations and other areas where construction work is required within 50m of watercourses. In areas identified as at increased risk of sediment contamination, a double line of sediment containment measures will be considered.
- Buffer strips will be retained as vegetated features between development features and watercourses, acting as filters, minimising sediment transport, attenuating flows and maximising infiltration. These will preferentially be placed on flat ground. Location and distance of buffer strips from watercourses will be determined taking into account geology, topography and vegetation characteristics. A vegetated buffer of at least 20m will be retained around all water features in order to protect these features from sediment contamination, with the exception of stream crossing locations where specific controls will be put in place.
- Sediment-laden water can reduce the efficiency of SuDS features through clogging and reduction in channel capacity. All discharges with heavy sediment load will be routed through balancing tanks and one or more suitable filters or silt busters, in series as necessary, to reduce the sediment load. The resulting supernatant water will be discharged onto vegetated surfaces and directed away from burns and ditches to avoid direct entry into watercourses. Sediment slurry will be stored appropriately prior to being tankered offsite for appropriate further treatment and disposal.
- Silt traps and sediment settlement tanks will be inspected and cleared regularly to ensure they remain fully operational and effective. Removed sediment will be collected for offsite disposal. All silt traps and settlement tanks will be designed and constructed to accommodate 1-in-200 year rainfall events, to minimise the potential for sediment-laden water overflowing into local watercourses. 'Splashboards' will be fitted on any temporary bridging structures, prior to their use as crossings, in order to reduce the splash/wash of sediment-laden surface water directly into watercourse channels below.
- Site tracks will be designed and constructed to good practice standards. The tracks will be constructed with sufficient camber or crossfall to minimise the ponding of surface water on the track surface, to minimise track erosion and reduce the risk of downstream sediment deposition. There shall be a need for some new sections of track and widening of existing sections of forestry access.
- Temporary interception bunds, sheet piles and/or drainage ditches will be constructed upslope of excavations such as borrow pits to minimise surface runoff ingress and in advance of excavation activities. These cut-off ditches will be of the minimum required length, depth and gradient. The same approach will be applied to interception of surface water around soil stockpiles.
- Soil removed during excavation activities will be stored nearby and battered or otherwise protected such that it will not dry out or be liable to erosion, and can be used subsequently to reinstate the excavated area. Protective coverings (such as jute, coir or geotextiles) will be considered as temporary measures to protect the stockpiles from rainfall and wind erosion. Where bare ground exhibits rough external characteristics these are less prone to erosion than smooth slopes and will re-vegetate faster. This approach is likely to be most applicable to areas adjacent to track construction whereas individual stockpiles adjacent to turbines or borrow pits may be more suitable for covering.
- Excavated material or other forms of loading will not be placed on or close to breaks in slope or other potentially unstable slopes.
- Re-vegetation will be encouraged to minimise sediment loss. Techniques such as replacement of turves, protection of in situ seed bank, reseeding with native vegetation can be used, all with an aim to encourage viable vegetation cover within 12 months (with particular focus on riparian vegetation regeneration at locations adjacent to watercourses where fluvial erosion may be expected).
- Care will be taken to remove turves of vegetation with minimal damage using suitable equipment. In order to retain good quality turves storage time will be minimised, with an aim of no longer than 6 weeks from lift to replacement at track side. Longer timescales are anticipated at turbine and hardstanding areas due to areas involved and construction programme requirements. The aim is a maximum of 12 weeks from lift to replacement at such sites. Watering of stored and recently replaced turves will occur during prolonged weather conditions that could lead to desiccation (dry windy conditions for example), to encourage successful re-establishment.
- Cable trenches will be laid in the disturbed material adjacent to tracks. Where conditions are suitable, that is on deeper subsoil, cable can be laid using a plough 'lift and turn' process which lifts and turns the required depth of material over, exposing the trench. The cable is immediately laid and the overlying material turned back to its original position, burying the cable. This method is effective and swift and produces very little damage to the surface.

- Where cable watercourse crossing requirements are not adjacent to track crossings suitable conduits will be placed below drain channels to minimise disturbance and erosion potential. The laying of such conduits will be undertaken using construction industry good practice techniques, with reference to SEPA CAR Guidance on engineering activities near watercourses.
- Wheelwash plants will be set up at agreed locations for vehicles coming offsite, consideration will be given to the application of dry wheel cleaning systems. A road sweeping vehicle will be employed on site to maintain the site access area in order to minimise accumulation and transport of dust, mud and other loose debris.
- Borrow pits will have appropriate and specific drainage treatment, likely to involve a series of settlement lagoons during borrow pit operation to remove particulates, with monitoring to ensure that the quality of final output is suitable for discharge to the local environment (with no direct connection to natural watercourses). Specification of treatment will be confirmed at the detailed design stage. These lagoons would be removed on restoration of the borrow pit following confirmation of runoff being of suitable quality for direct discharge.
- All excavation and earthworks will be suspended during and immediately following periods of heavy rainfall in order to minimise sediment generation and soil damage. Rainfall forecasts will be used as an early warning system.

4.87 Due to the large number of artificial watercourses draining the slopes of the site, including a number of watercourse crossings anticipated on the access track, it will be important to ensure that, in addition to the good practices measures discussed above, a number of further mitigation measures are employed to adequately manage erosion and sedimentation in the riparian zone (adjacent to watercourses), these will include:

- gathering detailed characteristics of watercourse crossing locations, to ensure optimum final crossing locations are identified;
- ensuring appropriate site-specific crossing structures will be employed, including use of existing culvert structures to support bridges on existing track;
- suitably qualified environmental staff will observe watercourse crossing construction, taking account of flow conditions, erosion and sedimentation processes and use of sediment management measures;
- channel conditions will be restored to former state, with photographic evidence of pre-construction and post-construction condition;
- all excavated areas (including turbine bases and borrow pits) and soil storage zones will be carefully managed, with sediment management techniques monitored for efficacy;
- environmental personnel will monitor watercourses downstream of construction activity and have the authority to postpone or halt activities, as appropriate;
- monitoring surface water quality and provision of mobile potable water, as for pollution incident mitigation.

Modification of Surface Water Drainage Patterns

4.88 The principles on which the surface water management strategy will be devised are:

- minimised locations and extents where engineering works are planned in the riparian zone;
- runoff from the developed area will not be significantly different from runoff prior to development;
- runoff from the developed area will not result in any downgrading in the status or quality of downstream watercourses or habitat.

4.89 To achieve this, the following measures will be implemented:

- Artificial drainage will be installed only where necessary. The individual lengths, depths and gradients of these drains will be minimised to avoid intercepting large volumes of diffuse overland flow and generating high velocity flows during storm events.
- Drainage features will, wherever practical, be installed in advance of ground being cleared of vegetation, with sustainable drainage techniques specifically targeted at the substation location to mitigate any increases in flows due to the impermeable surface area of the substation.
- Cross-drains will be constructed at appropriate intervals to conduct surface flow across the track to discharge it from the drainage system. Frequent discharge points will limit the concentration of surface runoff and diversion of flows between sub-catchments.
- In-channel works will be minimised and carefully managed where necessary will reduce the potential for impediments to flows.
- SEPA will be fully consulted regarding the requirements for registration or licensing of elements of the drainage system such as discharges and stream crossings under the *Water Environment (Controlled Activities) (Scotland) Regulations 2011* (known as CAR).
- All watercourse crossing structures will be designed and constructed using good practice techniques and will be of sufficient capacity to receive 1:200 year storm flows, with an allowance for increased flows due to climate change.
- Watercourse crossings will not restrict water flow, hinder the passage of mammals along the banks, where mammals are present, or form a barrier to suspected fish migration. They will be designed and constructed following guidance published by the Scottish Executive, River Crossings and Migratory Fish: Design Guidance[iv] and will be engineered in accordance with CIRIA[v] and SEPA[vi] river crossing guidance.
- Additional data has been provided for the two CAR-applicable stream crossings, which are on the Tombane Burn and one of the Tombane Burn tributaries, as shown on the OS 1:50,000 mapping. This data includes channel characteristics, watercourse photographs, theoretical flow values, catchment area and suggested crossing types. This is provided at **Appendix 8.3**, Watercourse Crossing Guidance.
- The crossing of all smaller watercourses will follow the SEPA General Binding Rules under CAR. **Appendix 8.3** provides details of typical smaller watercourse crossing locations (not shown on OS 1:50,000 mapping and hence non-CAR) and representative site photographs of hydrological features.

Modification of Groundwater Levels and Flows

4.90 The key concerns for good groundwater management involve careful decisions involving locations of drainage and dewatering activity and ensuring such activities are undertaken sympathetically and minimised in terms of extent and time to avoid excessive influence on groundwater levels and flows. To achieve this, the following measures will be employed:

- where necessary, a permanent drainage system, typically consisting of french drains (using a gravel layer as water conduit, rather than pipework, running downhill to a soakaway zone designed to enable water to percolate back into soil), will be installed at hardstanding locations;
- any necessary dewatering activity will be limited to the minimum necessary duration, with removed water returned locally to minimise hydrological regime alteration, such discharges will be discussed with SEPA to establish appropriate level of licence;
- clay bunds will be installed to divert groundwater flow from cable laying trenches on cross-slope sections, where this is appropriate.

4.91 The above measures will also minimise any effect upon groundwater dependent terrestrial ecosystems.

Compaction of Soils

4.92 This issue is closely aligned to erosion and sedimentation mitigation, discussed above.

- Prior to the availability of tracks for heavy vehicles, limiting movements to specific corridors avoiding sensitive receptors such as deep peat will reduce any effect considerably.
- Low pressure vehicles will be employed where vehicles are required to cross sensitive soil/peat locations.
- Where possible topsoil will be stripped in reasonably dry conditions and stored in a mound no more than 2m high.
- Stored topsoil will be kept from the passage of vehicles and will be prevented from intermixing with other materials.
- Where distinct soil layers are identified, excavated sub-soils will be stored separately from topsoil to enable successful restoration of the soil profile.

- Soil reinstatement will be undertaken under reasonably dry conditions to limit compaction. Soil loosening may be required in areas where heavy load traffic has occurred.

Peat Stability

4.93 Early identification of areas of deep peat and/or peat stability concern were an integral part of the design stage but were necessarily limited to locations where access was possible. Peat depths were typically very shallow.

4.94 The combination of peat and steep slopes on this site led to the instruction to undertake a Peat Stability Assessment as a Technical Appendix (**Appendix 8.2**), this involved a peat depth survey across the general site area, where access was possible through the forestry, followed by assessment of stability.

4.95 Where activities are close to areas of concern, a number of good practice measures will be employed, these include:

- avoidance of removal of slope support;
- avoidance of heavy loading on slopes, particularly avoiding breaks of slope;
- good drainage practice to ensure flows not concentrated onto slopes or into excavations;
- earthmoving activities will be restricted during and immediately after intense and prolonged rainfall events;
- re-establishing vegetation cover on exposed ground to anchor soil;
- on-going monitoring of key areas of concern for signs of slope instability;
- review of site conditions post-forestry clearance, to confirm indicative peat depth and for visual evidence of instability;
- creation and management of geotechnical risk register or similar management system throughout the detailed design and construction phases.

4.96 Further details are available in **Appendix 8.2**.

Environmental Management

4.97 Construction Method Statements and an Environmental Management Plan (EMP) will be prepared prior to the start of construction, detailing measures to avoid or mitigate potential effects associated with key construction activities. These will reflect and expand upon measures identified in the ES, and will be agreed with Perth and Kinross Council, SEPA, SNH and other stakeholders where appropriate.

Peat Management

4.98 Whilst the development has been designed to minimise disturbance to peatland, it has not been possible to avoid areas of peatland entirely. Consequently, small volumes of peat will require to be excavated during the construction of turbine foundations, site access tracks, crane hardstandings, the control building and compound.

Prior to construction and on completion of ground investigations and micro-siting, a site waste management plan shall be produced, including for site soil and peat management good practice. It will ensure that excavated peat is appropriately managed and re-used within the site. It is anticipated that all excavated peat can be reused within the site for reinstatement of ground, at both the point of excavation as well as in the landscaping of track shoulders and hardstandings.

4.99 In accordance with Scottish Government Guidance[vii], the Development has been designed to avoid peat landslide hazard. A Peat Stability Assessment has been carried out and a copy of the report is included at **Appendix 8.2** with further consideration in **Chapter 8: Geology, Hydrology and Hydrogeology**.

Waste Management

4.100 Materials will be generated, and will require management, during construction, in particular the topsoil removed and stockpiled prior to construction area activities, and construction waste such as packaging and used formwork.

4.101 Measures to reduce potential environmental effects associated with the storage and transportation of waste will include:

- the careful location of stockpiles and other storage areas;
- the use of good practice in the design of storage areas and the use of suitable containers;
- the use of sheeting, screening, and damping where appropriate and practicable;
- the control and treatment of runoff from soil and soil stockpiles;
- minimising storage periods;
- minimising haulage distances.

4.102 All materials will be identified, classified, quantified and, where practicable, appropriately segregated. Any materials that cannot be reused will be disposed of according to relevant waste management legislation which will serve to address a number of possible environmental effects. This includes:

- the Duty of Care imposed by Section 34 of the Environmental Protection Act 1990;
- the Waste Management Licensing Regulations 1994 (as amended), particularly provisions relating to registered exemptions from waste management licensing.

4.103 All materials removed from site will be handled in accordance with relevant waste and environmental regulations. Waste will be transferred using a registered waste carrier to a licensed waste disposal site or recycling centre.

Health and Safety

4.104 All construction activities will be managed within the requirements of the Construction (Design and Management) Regulations 2007 and will not conflict with the Health and Safety at Work etc. Act 1974. The design of the development has taken full account of these regulations. To further reduce possible health and safety risks, a Health and Safety Plan for the project will also be drawn up. All staff and contractors working on the construction of the Development will be required to comply with the safety procedures and work instructions outlined in the Plan at all times.

4.105 To ensure that hazards are appropriately managed, risk assessments will be undertaken for all major construction activities, with measures put in place to manage any hazards identified.

Ice Throw

4.106 In certain weather conditions, one potential hazard relates to ice forming on turbine blades. This may result in ice fragments being thrown from the rotor when operating and in ice falling from the rotor when shut down. The Scottish Government web based renewables advice for onshore wind turbines states *"The build-up of ice on turbine blades is unlikely to present problems on the majority of sites. When icing occurs, the turbines' own vibration sensors are likely to detect the imbalance and inhibit the operation of the machines[viii]"*. In addition, the operator would implement measures to ensure the safety of workers and the general public in relation to ice throw and ice fall.

4.107 The design of the development has taken into account the possibility of ice throw occurring and turbines have been sited in locations to ensure that the rotor blades do not oversail any public roads or recreational routes to minimise the risk from ice fall. The low risk of ice throw is further minimised by the turbine's vibration sensors (or other ice detection measures) which detect any imbalance which might be caused by icing. The turbines which are affected by icing would be temporarily shut down until normal balance is restored. Operational procedures would also be put in place to ensure the safety of both workers and the public in relation to ice throw and ice fall. Procedures would include turbine shutdown and warning signage.

Operation Details

4.108 The development has been designed to have an operational lifespan of up to 25 years.

4.109 Once operational, the development is not manned and it is envisaged that the amount of traffic associated with the development would be minimal. Traffic generated would comprise routine service and maintenance team visits, together with the occasional need for more extensive maintenance, repair or management purposes. Wind turbine operations will be overseen by suitably qualified contractors.

4.110 Routine maintenance and servicing will take place two to four times per year. Servicing will include the performance of tasks such as maintaining bolts to the required torque, adjustment of blades, inspection of blade tip brakes and inspection of welds in the tower. Other visits to the site will take place more frequently to ensure that the turbines are operating at their maximum efficiency. In the event of any unexpected events onsite appropriate repair works will be carried out.

4.111 The vehicle used for the majority of these visits is likely to be a small four wheel drive vehicle, although there may be an occasional need for an HGV or crane to access the site for heavier maintenance and repairs.

4.112 On-going track maintenance will generally be undertaken in the summer months when tracks are dry. Safe access will be maintained all year round.

Decommissioning

4.113 At the end of the 25 year operational period, the development will either be decommissioned, or an application made for consent to extend its operational life. It is estimated that decommissioning the development, given its size, will take approximately 12 months.

4.114 Decommissioning will involve the removal of all above ground infrastructure. Demolition of the control building will involve the removal of the equipment followed by demolition of the building. All demolition waste will be removed to a licensed waste disposal site. The plinth and the top surface of the wind turbine foundation bases will be broken out and removed to approximately 1 m below ground level and all cabling will be cut out at the same depth. The area will then be reinstated with a final layer of topsoil over the foundations. Roads will either be left for use by the landowner or covered in topsoil. No stone will be removed from the site during decommissioning. This approach is considered to be less environmentally damaging than seeking to remove all foundations, underground cables and roads entirely.

4.115 All material arising from decommissioning and demolition will be disposed of responsibly and in accordance with the relevant waste management regulations at the time.

4.116 A decommissioning method statement will be prepared and agreed with the relevant statutory consultees prior to decommissioning of the site.

---

[i] Forestry Commission (2011). Forests and water guidelines, 5th Edition. Forestry Commission. Edinburgh

[ii] CIRIA (2006). Control of water pollution from linear construction projects: technical guidance. Publication C648; Construction Industry Research and Information Association, London.

[iii] CIRIA (2007). Site handbook for Construction of SUDS. Publication C698: Construction Industry Research and Information Association, London.

[iv] Scottish Executive (2000). River crossings and migratory fish: design guidance.

[v] CIRIA (2010). Culvert design and operation guide. Publication C689; Construction Industry Research and Information Association, London.

[vi] SEPA (2010). Engineering in the water environment, good practice guide: construction of river crossings, 2nd Edition. Scottish Environment Protection Agency.

[vii] The Scottish Government (2006), Peat Landslide Hazard and Risk Assessments: Best Practice Guide for Proposed Electricity Generation Developments.

[viii] The Scottish Government (2011). 'Onshore Wind Turbines' Web Based Renewables Advice (http://www.scotland.gov.uk/Resource/Doc/212607/0113777.pdf).

5 Planning Policy Context

Introduction

5.1 This chapter of the Environmental Statement (ES) outlines the main policies of relevance to the determination of the Creag a' Bhàird Wind Farm planning application and sets out a summary of the planning and regulatory context in relation to the key topics covered in the ES. It also looks at the wider policy context in relation to climate change and renewable energy. References are included to the national, regional and local policy and guidance frameworks where appropriate, and other relevant material considerations are also identified.

5.2 To maintain the impartiality of the ES, this chapter does not present an assessment of the acceptability of the proposed Creag a' Bhàird Wind Farm in planning terms. A separate Planning Statement has been prepared to accompany the application for consent. The Planning Statement assesses the compliance of the proposed Creag a' Bhàird Wind Farm against the relevant planning policy framework and reaches conclusions on the acceptability of the development of the same.

Legislative Background

5.3 As Creag a' Bhàird Wind Farm will have a maximum generating capacity of less than 50MW, an application for planning permission is being submitted to the planning authority, Perth and Kinross Council, and will be determined under The Town and Country Planning (Scotland) Act 1997[i], as amended[ii].

5.4 The application is categorised as a 'Major Development' under The Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009[iii] on the basis that the total installed capacity of the wind farm is anticipated to be greater than 20MW.

5.5 Sections 25 and 37(2) of the 1997 Act require that applications for planning permission are determined in accordance with the development plan, unless material considerations indicate otherwise. In accordance with this principle, this chapter sets out:

- the key policies of relevance in the development plan; and,
- material considerations, including:
  - supplementary planning guidance;
  - national planning policy;
  - energy and climate change policy; and,
  - the emerging development plan.

The Development Plan

5.6 Creag a' Bhàird Wind Farm lies within the administrative boundary of Perth and Kinross Council, therefore the relevant Development Plan for the area comprises:

- **TAYplan Strategic Development Plan 2012-2032**[iv] (Approved June 2012); and
- **Highland Area Local Plan**[v] (Adopted 2000).

5.7 Perth and Kinross Council is currently in the final stages of the process of producing its Local Development Plan (LDP). Until the LDP is formally adopted, the existing Highland Area Local Plan remains in effect.

TAYplan Strategic Development Plan 2012-2032 Aims and Objectives

5.8 **TAYplan Strategic Development Plan 2012-2032** provides a spatial strategy for the Perth and Kinross, Dundee, Angus and North Fife areas by recognising existing development commitments and promoting a sustainable pattern of growth. It focuses on high-level policies on issues of regional significance.

5.9 The vision for the area set out in the plan states that *"By 2032 the TAYplan region will be sustainable, more attractive, competitive and vibrant without creating an unacceptable burden on our planet. The quality of life will make it a place of first choice where more people choose to live, work, study and visit, and where businesses choose to invest and create jobs"* (p.6).

5.10 The following objectives of TAYplan are considered relevant to Creag a' Bhàird Wind Farm:

- to strengthen the economic base to support the renewable energy and low carbon technology sectors;
- to protect and enhance the quality of the TAYplan area's built and water environments, landscape, biodiversity and natural resources;
- to design-in at the outset;
- to promote prosperous and sustainable rural communities;
- to support the switch to a low carbon economy by providing for appropriate infrastructure and improvements in the resilience to climate change and other potential risks; and
- to ensure that new development makes best use of existing networks of infrastructure, movement corridors and ecosystems.

Highland Area Local Plan (Adopted 2000) Aims and Objectives

5.11 The **Highland Area Local Plan** adopted in November 2000, is the current Local Plan covering the application site. It should be noted that the Local Plan pre-dates the Strategic Development Plan, Scottish Planning Policy and the current suite of renewable energy policy at EU, UK and Scottish levels. Under the requirements of the Act, this plan can be considered to be significantly out of date.

5.12 The application site is detailed as lying within the Landward Area of the Local Plan with no specific Local Plan allocation.

5.13 The key aims of the Plan are to promote sustainable economic development and to maintain and enhance the quality of the area's natural heritage and built environment (Paragraph 4.2, p.11). The following are the principal components of the Local Plan of most relevance to the Creag a' Bhàird Wind Farm application:

- to direct most development to appropriate locations;
- to protect and enhance the landscape and natural and built heritage of the area;
- to protect the best quality agricultural land in the plan area; and
- to ensure development does not take place on areas exposed to frequent or extensive flooding (Paragraph 4.4, p.11-12).

The Emerging Local Development Plan

5.14 Perth and Kinross Council is currently in the final stages of the process of producing its Local Development Plan (LDP)[vi] which will replace the six adopted Local Plans, including the Highland Area Local Plan. In January 2012, the Proposed LDP was published setting out the proposed vision, strategy, policies and supplementary guidance of the final Local Development Plan. Following a period of representation on the Proposed Plan (30 January 2012 - 10 April 2013), the Plan was submitted on 15 February 2013 for examination. On 11 October 2013 the Directorate for Planning and Environmental Appeals (DPEA) concluded their examination and submitted their Examination Report to Perth and Kinross Council. Examination reports are largely binding on planning authorities and the Council has a three month period to consider the Reporters' recommendations.

5.15 Perth and Kinross Council aim to publish and adopt the modified Plan by 11 January 2014. As previously stated, the existing Highland Area Local Plan will continue to be valid until the formal adoption of the new LDP.

5.16 However, as the emerging Local Development Plan is suitably advanced, it has the potential to be a material consideration in the determination of this application and is considered in this chapter under 'Material Considerations'.

Review of Development Plan Policy

5.17 The most relevant policy in the determination of the Creag a' Bhàird Wind Farm application within TAYplan Strategic Development Plan is contained within the section 'Energy and Waste/Resource Recovery Infrastructure' and is ***Policy 6*** entitled ***Energy and Waste/Resource Management Infrastructure***. ***Renewable Energy Policy 11*** is considered to be the key policy of relevance within the Highland Area Local Plan. The remaining relevant Development Plan policies against which the application will be assessed are also detailed in the following paragraphs.

5.18 To aid understanding, these are arranged by theme, reflecting chapter divisions within the ES. The full wording of certain policies is provided where this provides clarity to the text.

Design & Sustainability

5.19 The design considerations for Creag a' Bhàird Wind Farm are provided in **Chapter 3: Site Selection and Design.**

TAYplan Strategic Development Plan

5.20 ***Policy 2: Shaping better quality places*** states that Local Development Plans, masterplans and development proposals are encouraged to design-in at the outset whilst *"incorporating and enhancing present natural and historic assets"*, and ensuring *"high resource efficiency is incorporated"* within the development through the design, choice of materials and use of low and zero carbon energy generating technologies to reduce carbon emissions and energy consumption to meet the Scottish Government's standards (p.11).

5.21 A key focus for ***Policy 2: Shaping better quality places*** is *"ensuring new development mitigates and adapts to climate change and becomes an integral part of its surroundings rather than exclusive from them"* (p.10).

Highland Area Local Plan 2000

5.22 ***Design Policy 5*** requires high standards of design for all new developments. In particular encouragement will be given to:

(a) "The use of appropriate and high quality materials

(b) Innovative modern design incorporating energy efficient technology and materials

(c) Avoidance of the use of extensive underbuilding on steeply sloping sites

(d) Ensuring that the proportions of any building are in keeping with its surroundings

(e) Ensuring that the development fits its location" (p.24).

5.23 ***Sustainable Development Policy 1*** sets out guiding principles used by Perth and Kinross Council to assess if development proposals demonstrate a commitment to sustainable development:

(a) "The consumption of non-renewable resources should be at levels that do not restrict the options for future generations.

(b) Renewable resources should be used at rates that allow their natural replenishment.

(c) The quality of the natural environment should be maintained or improved.

(d) Where there is great complexity or there are unclear effects of development on the environment, the precautionary principle should be applied.

(e) The costs and benefits (material and non-material) of any development should be equitably distributed.

(f) Biodiversity is conserved.

(g) The production of all types of waste should be minimised thereby minimising levels of pollution.

(h) New development should meet local needs and enhance access to employment, facilities, services and goods" (p.23).

5.24 ***Development Criteria Policy 2*** is a multi-criteria policy and only those parts relating to design and sustainability are provided here. In relation to landscape and visual amenity, the policy states that *"All developments within the plan area will be judged against the following criteria: … (b) In the case of built development, regard should be had to the scale, form, colour and density of development within the locality"* (p.23).

Renewable Energy

TAYplan Strategic Development Plan

5.25 In relation to the renewable energy theme, the following objectives in achieving the TAYplan vision are considered relevant to the proposed development:

- strengthen the economic base to support the renewable energy and low carbon technology sectors;
- support the switch to a low carbon and zero waste economy by providing for appropriate infrastructure and improvements in our reliance to climate change and other potential risks.

5.26 As previously mentioned, ***Policy 6: Energy and Waste/Resource Management Infrastructure*** is the most relevant policy within TAYplan against which the development should be assessed.

A. Local Development Plans should identify areas that are suitable for different forms of renewable heat and electricity infrastructure and for waste/resource management infrastructure or criteria to support this; including, where appropriate, land for process industries (e.g. the co-location/proximity of surplus heat producers with heat users).

B. Beyond community or small scale facilities waste/resource management infrastructure is most likely to be focussed within or close to the Dundee and/or Perth Core Areas (identified in Policy 1).

C. Local Development Plans and development proposals should ensure that all areas of search, allocated sites, routes and decisions on development proposals for energy and waste/resource management infrastructure have been justified, at a minimum, on the basis of these considerations:

- *The specific land take requirements associated with the infrastructure technology and associated statutory safety exclusion zones where appropriate;*
- *Waste/resource management proposals are justified against the Scottish Government's Zero Waste Plan and support the delivery of the waste/resource management hierarchy;*
- *Proximity of resources (e.g. woodland, wind or waste material); and to users/customers, grid connections and distribution networks for the heat, power or physical materials and waste products, where appropriate;*
- *Anticipated effects of construction and operation on air quality, emissions, noise, odour, surface and ground water pollution, drainage, waste disposal, radar installations and flight paths, and, of nuisance impacts on of-site properties;*
- *Sensitivity of landscapes (informed by landscape character assessments and other work), the water environment, biodiversity, geo-diversity, habitats, tourism, recreational access and listed/scheduled buildings and structures;*
- *Impacts of associated new grid connections and distribution or access infrastructure;*
- *Cumulative impacts of the scale and massing of multiple developments, including existing infrastructure;*
- *Impacts upon neighbouring planning authorities (both within and outwith TAYplan); and,*
- *Consistency with the National Planning Framework and its Action Programme"* (p.19).

Highland Area Local Plan 2000

5.27 ***Renewable Energy Policy 11*** highlights that Perth and Kinross Council will encourage renewable energy developments *"in appropriate locations".* Renewable energy development will be assessed against the following criteria:

(a) "The development will not have a significant detrimental effect on sites designated at national, regional or local level for nature conservation interest or archaeological interest;

(b) The development will not result in an unacceptable intrusion into the landscape character of the area;

(c) The development will not result in an unacceptable loss of amenity to neighbouring occupiers by reasons of noise emission, visual dominance, electromagnetic disturbance or reflected light" (p.26).

5.28 The policy also states that an agreement shall be entered into to secure the removal of infrastructure and restoration of a development site once a development has reached the end of its working life.

Landscape and Visual Amenity

5.29 A comprehensive assessment of Creag a' Bhàird Wind Farm's likely impacts on landscape and visual amenity are outlined in **Chapter 6: Landscape and Visual Amenity**.

TAYplan Strategic Development Plan

5.30 TAYplan recognises that the TAYplan region is *"characterised by some of the UK's most dramatic and attractive landscapes"* (p.5) which play a strong role in the regional distinctiveness of the area. TAYplan also acknowledges that the protection, promotion and enhancement of the TAYplan region's landscapes are important factors in encouraging tourism and economic growth, which will contribute to the achievement of the TAYplan vision.

5.31 A key focus of ***Policy 3: Managing TAYplan's Assets – Natural and Historic Assets*** is the safeguarding of landscapes from unsuitable development. The policy states that it will allow development where it does not adversely impact upon or preferably enhances this asset.

Highland Area Local Plan 2000

5.32 ***Landscape Policy 3*** states *"Development proposals should seek to conserve landscape features and sense of local identity, and strengthen and enhance landscape character"* [sic] (p.24). It highlights that developments likely to have significant landscape and visual effects will be assessed against the principles within the Tayside Landscape Character Assessment[vii].

5.33 ***Landscape Policy 4*** stipulates that *"Details of landscape treatment should be submitted with development proposals including, where appropriate, boundary treatment, treatment of settlement edges, and impact on key views"* (p.24). Developers will also be required to demonstrate that arrangements for the maintenance of areas of landscaping have been made.

5.34 ***Designated Landscapes Policy 18*** aims to protect the landscape and visual quality of the National Scenic Areas: *"The Council will oppose developments which would have an adverse impact on the landscape character and visual amenity of the National Scenic Areas identified on Proposals Map 1"* (p.27).

5.35 ***Designated Landscapes Policy 19*** seeks to protect and enhance the Historic Gardens and Designed Landscapes identified within the Plan area, as well as any others as advised by Historic Scotland and Scottish Natural Heritage (SNH) during the Plan period.

5.36 ***Trees Policy 22*** seeks to protect native woodland from development and encourages the protection and expansion of existing native woods and the creation of new ones in appropriate locations.

5.37 ***Trees Policy 23*** states that *"existing tree cover should be protected as far as is practicable in any development proposals and the Council will seek the implementation of appropriate planting schemes"* (p.28).

5.38 ***Hill Tracks Policy 57***[1] discourages any new or extended hill tracks for vehicular traffic: *"All proposals with a proven need should be designed to fit into the landscape having regard to natural features and the principles set out in Policies 3 & 4"* (p.39).

5.39 ***Development Criteria Policy 2*** is a multi-criteria policy and only those parts relating to landscape and visual amenity are provided here. In relation to landscape and visual amenity, the policy states that *"All developments within the plan area will be judged against the following criteria: (a) The site should have a landscape framework capable of absorbing, and if necessary screening the development, and where appropriate opportunities for landscape enhancement will be sought...(c) The development should be compatible with its surroundings in land use terms and should not result in a significant loss of amenity to the local community"* (p.23).

[1] **Hill Tracks Policy 57** applies in the landward area of the Local Plan only. All other policies detailed are applicable to the entire plan area unless otherwise specified.

Geology, Hydrology, Hydrogeology and Peat

5.40 The potential impacts of Creag a' Bhàird Wind Farm on geology, peat and the water environment are discussed in **Chapter 8: Geology, Hydrology, Hydrogeology, and Peat**.

TAYplan Strategic Development Plan

5.41 One of the objectives of the overall vision of TAYplan is to *"protect and enhance the quality of the TAYplan area's…water environments"* (p.6).

5.42 ***Policy 2A: Shaping better quality places*** ensures that climate change resilience is built into the natural and built environments through:

i. "a presumption against development in areas vulnerable to coastal erosion, flood risk and rising sea levels; including the undeveloped coast. To ensure flood risk is not exacerbated, mitigation and management measures; such as those envisaged by Scottish Planning Policy, should be promoted;

ii. reducing surface runoff including through use of sustainable drainage systems;

iii. protecting and utilising the water and carbon storage capacity of soils, such as peatlands, and woodland/other vegetation; and,

iv. identifying, retaining and enhancing existing green infrastructure and spaces whilst making the best use of their multiple roles" (p.11).

5.43 ***Policy 3: Managing TAYplan's Assets – Finite Resources*** seeks to protect finite resources such as carbon rich soils and prime agricultural land where the advantages of development do not outweigh the loss of productive land.

Highland Area Local Plan 2000

5.44 ***Flood Risk Policy 7*** emphasises that developments will not be supported in areas liable to flood, or where remedial measures would adversely affect flood risk elsewhere. Flood risk sites will be those which are judged to lie within:

(a) "Areas which flooded in January 1993.

(b) Sites which lie within a flood plain.

(c) Low lying sites adjacent to rivers, or to watercourses which lead to categories a and b above" (p.25).

5.45 ***Nature Conservation Policy 17*** emphasises that Perth and Kinross Council will seek to enhance habitats of local importance to nature conservation including peatlands: *"The Council will seek to protect and enhance habitats of local importance to nature conservation including grasslands, wetlands and peatlands and habitats which support rare or endangered species"* (p.27).

5.46 ***Agriculture Policy 46***[2] stipulates that prime quality agricultural land, generally MLCA Class 3 and above, will be protected from irreversible development.

5.47 ***Development Criteria Policy 2*** is a multi-criteria policy and the policy states that *"All developments within the plan area will be judged against the following criteria: … (e) Where applicable, there should be sufficient spare capacity in drainage, water…to cater for the new development".*

Ecology and Ornithology

5.48 A comprehensive assessment of Creag a' Bhàird Wind Farm's likely impact on species and habitats is outlined in **Chapter 9: Ecology** and the potential impacts on birds are considered in **Chapter 10: Ornithology**.

TAYplan Strategic Development Plan

5.49 An objective to *"protect and enhance the quality of the TAYplan area's…biodiversity and natural resources"* is cited as integral in achieving the overall TAYplan vision (p.6).

5.50 ***Policy 3: Managing TAYplan's Assets – Natural and Historic Assets*** states that development which is likely to have a significant effect on a designated or proposed Natura 2000 site will be subject to appropriate assessment.

[2] **Agriculture Policy 46** applies in the landward area of the Local Plan only. All other policies detailed are applicable to the entire plan area unless otherwise specified.

5.51 A key focus of this policy is the safeguarding of habitats, sensitive green spaces, forestry, watercourses, wetlands, floodplains, carbon sinks, species and wildlife corridors, etc. from inappropriate development. Development which *"does not adversely impact upon or preferably enhance these assets"* will be allowed (p.13).

Highland Area Local Plan 2000

5.52 ***Nature Conservation Policy 13*** stipulates that development on land designated under the Habitats or Birds Directives (Special Areas of Conservation and Special Protection Areas) or Ramsar Sites will only be permitted where an appropriate assessment identifies that:

(a) "The development will not adversely affect the integrity of the site

(b) There are no alternative solutions.

(c) There are adequate reasons for overriding public interest" (p.26).

5.53 ***Nature Conservation Policy 14*** states a presumption against development which would have an adverse effect on:

(a) "Sites supporting species mentioned in Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 as amended; Annex II or IV of the European Community Habitats Directive; or Annex 1 of the European Community Wild Birds Directive.

(b) Those habitats listed in Annex 1 of the European Community Habitats Directive" (p.27).

5.54 ***Nature Conservation Policy 15*** highlights that support or consent for developments which could compromise the integrity and conservation objectives of Sites of Special Scientific Interest (SSSIs) and National Nature Reserves (NNRs) will not be granted unless there is an overriding proven public interest.

5.55 ***Nature Conservation Policy 16*** supports sites of local nature conservation or geological interest and states that Perth and Kinross Council will seek to protect the integrity of such sites.

5.56 ***Nature Conservation Policy 17*** emphasises that Perth and Kinross Council will seek to enhance habitats of local importance to nature conservation including wetlands, grasslands, peatlands and any areas which support rare or endangered species.

Archaeology and Cultural Heritage

5.57 A detailed assessment of the potential impacts on cultural heritage is provided in **Chapter 11: Archaeology and Cultural Heritage**.

TAYplan Strategic Development Plan

5.58 ***Policy 2: Shaping Better Quality Place*** states that development should understand, incorporate and enhance historic assets such as ancient monuments, archaeological sites and landscapes, historic buildings, gardens and other designated landscapes.

5.59 ***Policy 3: Managing TAYplan's Assets – Natural and Historic Assets*** highlights that the protection of archaeology, historic buildings and monuments is crucial to ensure that TAYplan area's assets are managed in a sustainable way which will retain the regions distinctiveness and scenic value.

Highland Area Local Plan 2000

5.60 ***Archaeology Policy 25*** affords protection to the setting and archaeological landscapes associated with Scheduled Ancient Monuments unless there is an overriding proven public interest.

5.61 ***Archaeology Policy 26*** states that Perth and Kinross Council will also afford protection to the setting of unscheduled but locally significant historical assets. The Council will seek to ensure that assets are preserved in situ; however where this is not possible the developer will be responsible, through planning conditions, to excavate and record features prior to development commencing.

5.62 ***Archaeology Policy 27*** stipulates that where there is doubt that archaeological remains may exist on a development site, the developer will be obliged to provide a full archaeological investigation undertaken by a professional archaeological organisation. This will be required prior to the determination of the application.

5.63 ***Listed Buildings Policy 28*** seeks to protect Listed Buildings and their settings against works detrimental to their essential character.

Access, Traffic and Transportation

5.64 The likely impacts of Creag a' Bhàird Wind Farm in relation to traffic, transport and access are assessed in **Chapter 12: Access, Traffic and Transport.**

Highland Area Local Plan 2000

5.65 ***Development Criteria Policy 2*** is a multi-criteria policy and only those parts relating to transport are provided here. In relation to traffic the policy states that *"All developments within the plan area will be judged against the following criteria: … (d) The local road network should be capable of absorbing the additional traffic generated by the development and a satisfactory access onto that network provided"* (p.23).

Socio-Economics

5.66 The potential social and economic impacts of Creag a' Bhàird Wind Farm are considered in **Chapter 13: Socio-Economics**.

TAYplan Strategic Development Plan

5.67 Strengthening the economic base to support and encourage tourism in the TAYplan region is one of the fundamental objectives highlighted to meet the TAYplan vision. In addition, the vision is also supported by the objective to enhance the condition and connectivity of the network of green spaces to support walking and cycling.

Highland Area Local Plan 2000

5.68 ***Sustainable Development Policy 1*** states that new developments should meet local needs and enhance access to employment facilities, services and goods.

5.69 ***Public Access and Informal Recreation Policy 34*** relates to improving public access to the countryside and informal recreation provision for a wide range of users including people with disabilities, cyclists, walkers and horse riders.

5.70 ***Public Access and Recreation Policy 35*** seeks *"to provide car parks to facilitate access to cultural and recreational facilities including popular mountains"* (p.30).

Other Considerations

TAYplan Strategic Development Plan

5.71 ***Policy 8: Delivering the Strategic Development Plan*** seeks developer contributions for new development *"to mitigate any adverse impact on infrastructure, services and amenities brought about by development including contributions towards schools, affordable housing, transport infrastructure and facilities (including for road, rail, walking, cycling and public transport), and other community facilities in accordance with the Scottish Government Circular 1/2010"* (p.22).

Highland Area Local Plan 2000

5.72 ***Development Criteria Policy 2*** is a multi-criteria policy and states that all developments within the Plan area will be judged against the following criteria: *"(f) The site should be large enough to accommodate the impact of the development satisfactorily in site planning terms"* (p.23-24).

National Planning Policy

The National Planning Framework for Scotland 2 (NPF2)

5.73 The second **National Planning Framework for Scotland (NPF2)**[viii], published in June 2009, represents a spatial expression of the Scottish Government's aspirations for sustainable development in Scotland to 2030. Tackling climate change through the development of renewable energy technologies is strongly supported in this document, reflecting the commitments of the Scottish and UK Governments in relation to emissions reduction and energy generation targets, highlighting the important role that onshore wind farms have played, and will continue to play.

5.74 Paragraphs 16 to 26 refer to the challenges relating to tackling climate change and notes that substantial reductions in greenhouse gas emissions will be necessary to minimise the impacts of climate change.

Energy is specifically referred to in paragraph 25: *"Tackling climate change and reducing dependence on finite fossil fuels are two of the major global challenges of our time…addressing these challenges will demand profound changes in the way we produce, distribute and use energy over the coming decades"* (p.8).

5.75 Paragraph 53 sets out the main elements of the spatial development strategy including to *"promote development which helps to reduce Scotland's carbon footprint and facilitates adaption to climate change"*; and *"realise the potential of Scotland's renewable energy resources and facilitate the generation of power and heat from all clean, low carbon sources"* (p.19).

5.76 In relation to promoting sustainable growth, paragraph 65 states "*Energy is a major resource for rural areas. The Government is committed to realising the power generating potential of all renewable sources of energy"* (p.23).

5.77 Paragraph 145 tacitly acknowledges the importance of onshore wind farms in meeting this, and future, targets. The Government commitment to *"establishing Scotland as a leading location for the development of renewable energy technology and an energy exporter over the long term"* is also highlighted (p.56).

5.78 Paragraph 146 states that *"The harnessing of renewable sources of energy is effecting a radical change in Scotland's energy economy, and the location of many of these resources means that rural areas are well placed to benefit". In addition, it advises that "Hydro-power and onshore wind are the renewable technologies likely to make the largest contributions"* to Scotland's energy mix over the next 25 years (p.56).

5.79 Overall therefore, the NPF2 sets out the Government's commitment to the further development of renewable energy in Scotland and confirms the importance of this resource as a key element to tackle climate change, reduce greenhouse gases and increase sustainable economic growth.

Scottish Planning Policy (SPP)

5.80 **Scottish Planning Policy (SPP)**[ix] was published in February 2010.

5.81 This document emphasises the importance of tackling climate change and, in particular, addresses the need to reduce greenhouse gas emissions and to continue to develop renewable energy projects. The following paragraphs set out the policy issues which are most relevant to the proposed Creag a' Bhàird Wind Farm development.

Sustainable Development and Climate Change

5.82 One of the over-arching aims of the SPP is to achieve Sustainable Development. In its overview of the planning system, it states in paragraph 33 that *"the planning system should proactively support development that will contribute to sustainable economic growth and to high quality sustainable places"* (p.6).

5.83 Paragraph 35 states that *"The fundamental principle of sustainable development is that it integrates economic, social and environmental objectives. The planning system should promote development that supports the move towards a more economically, socially and environmentally sustainable society".*

5.84 Paragraph 37 advises that *"the planning system has an important role in supporting the achievement of sustainable development through its influence on the location, layout and design of new development"* (p.7). In addition, it states that decision making in the planning system should:

- contribute to the reduction of greenhouse gas emissions in line with the commitment to reduce emissions by 42% by 2020 and 80% by 2050; and
- contribute to reducing energy consumption and provide more opportunities for the production of renewable energy.

Renewable Energy

5.85 Paragraph 182 states that the *"commitment to increase the amount of electricity generated from renewable sources is a vital part of the response to climate change and that renewable energy generation will contribute to more secure and diverse energy supplies and support sustainable economic growth"* (p.37).

5.86 Paragraph 187 specifically refers to policy on wind farms. It states that *"Planning Authorities should support the development of wind farms in locations where the technology can operate efficiently and environmental and cumulative impacts can be satisfactorily addressed. Development plans should provide a clear indication of the potential for development of wind farms of all scales, and should set out the criteria that will be considered in deciding applications for all wind farm developments including extensions. The criteria will vary depending on the scale of development and its relationship to the characteristics of the surrounding area, but are likely to include:*

- *landscape and visual impact;*
- *effects on the natural heritage and historic environment;*
- *contribution of the development to renewable energy generation targets;*
- *effect on the local and national economy and tourism and recreation interests;*
- *benefits and disbenefits for communities;*
- *aviation and telecommunications,*
- *noise and shadow flicker, and*
- *cumulative impact"* (p.38).

5.87 Paragraph 187 goes on to state that *"the design and location of any wind farm development should reflect the scale and character of the landscape. The location of turbines should be considered carefully to ensure that the landscape and visual impact is minimised"* (p.38).

Landscape and Natural Heritage

5.88 The SPP provides guidance for the conservation, enhancement and sustainable use of Scotland's landscape and natural heritage, identified as including flora, fauna, geological and physiographical features, its natural beauty and amenity (Natural Heritage (Scotland) Act 1991)[x].

5.89 Paragraph 131 of the SPP states that *"while the protection of the landscape and natural heritage may sometimes impose constraints on development, with careful planning and design the potential for conflict can be minimised and the potential for enhancement maximised".* While *"statutory natural heritage designations are important considerations where they are directly or indirectly affected by a development proposal"* the SPP states that *"designation does not necessarily imply a prohibition on development"* (p.26-27).

5.90 However, paragraph 134 states that where a development is likely to result in significant adverse effects on the designation of Natura 2000 sites it must be subject to an *"appropriate assessment by the planning authority"* (p.27) (i.e. an assessment under Regulation 48 of The Conservation (Natural Habitats, &c.) Regulations 1994[xi], as amended[xii]).

Historic Environment

5.91 Paragraph 110 states that the Scottish Government's policy on the historic environment and guidance on relevant legislation is set out in the Scottish Historic Environment Policy (SHEP)[xiii].

5.92 Paragraph 111 advises that *"in most cases, the historic environment (excluding archaeology) can accommodate change which is well informed and sensitively managed, and can be adapted to accommodate new uses whilst retaining its special character"* (p.23).

Economic Development

5.93 Paragraph 45 states that *"the planning system should support economic development in all areas by:*

- *taking account of the economic benefits of proposed development in development plans and development management decisions; and*
- *promoting development in sustainable locations"* (p.9).

Rural Development

5.94 The SPP places emphasis on supporting sustainable economic growth within rural areas.

5.95 Paragraph 95 states that *"all new development should respond to the specific local character of the location, fit in with the landscape and seek to achieve high design and environmental standards, particularly in relation to energy efficiency"* (p.19).

Flooding and Drainage

5.96 Paragraph 197 advises that *"development which would have a significant probability of being affected by flooding or would increase the probability of flooding elsewhere should not be permitted"* (p. 40).

5.97 Paragraph 209 requires all surface water from new development to be treated by a sustainable drainage system (SUDS) before it is discharged into the water environment.

Material Considerations

Introduction

5.98 There are a number of additional material considerations relevant to the Creag a' Bhàird Wind Farm application. These include:

- Emerging Local Development Plan - Perth & Kinross Local Development Plan;
- Supplementary Planning Guidance; Planning Advice Notes (PANs);
- Scottish Government Web Based Renewables Guidance;
- Emerging National Planning Policy:
  - The National Planning Framework 3: Main Issues Report & Draft Framework;
  - Scottish Planning Policy (Consultation Draft 2013); and,
- Energy and Climate Change Policy.

Emerging Local Development Plan - Perth and Kinross Proposed Local Development Plan

5.99 The most relevant policy to Creag a' Bhàird Wind Farm within the proposed LDP[xiv] is **Policy ER1A Renewable and Low Carbon Energy Generation –New Proposals**. This policy and other policies of relevance are detailed below. To aid understanding, these are arranged by theme, reflecting chapter divisions within the ES.

5.100 As previously outlined in Paragraph 5.14, DPEA concluded the examination of the Proposed Plan on 11 October 2013 and submitted an Examination Report to Perth and Kinross Council. Where quoted text has been amended by the Reporter, this has been included directly after the Proposed Plan policies. It should be noted that not all changes suggested by the Reporter have been included in the table, only those that relate to quoted policies.

Table 5:1 Summary of Relevant Policies from the Proposed Local Development Plan

Theme	Policy	Summary
Design & Sustainability	**Policy PM1A:** Placemaking	The policy stresses that developments should fit positively within the existing built and natural environment. As a matter of contingency, the policy emphasises that all developments should be designed and planned with reference to climate change adaptation and mitigation. The policy further state: *"The design and siting of development should respect the character and amenity of the place, and should create and improve links within and, where practical, beyond the site. Proposals should also incorporate new landscape and planting works appropriate to the local context and the scale and nature of the development"* (p.23).
	Policy PM1B: Placemaking	The policy sets out the placemaking criteria with which all development proposals shall be in accord. Of points a-g, points b and c are most relevant to Creag a' Bhàird Wind Farm and state that all proposals: *"(b) Consider and respect site topography and any surrounding important landmarks, views or skylines.* *(c) The design should complement its surroundings in terms of appearance, height, scale, massing, materials, finishes and colours"* (p.23). **Reporter's recommendations:** *"(b) Consider and respect site topography and any surrounding important landmarks, views or skylines, as well as the wider landscape character of the area".*
	Policy PM2: Design Statements	The policy sets out the criteria of development for which Design Statements will be required: *(a) "comprises five or more dwellings; or* *(b) is a non-residential use greater than 0.5 ha in area; or* *(c) affects the character and/or appearance of a Conservation Area, Historic Garden, Designed Landscape, or the setting of a Listed Building or Scheduled Monument"* (p.24).
	Policy EP1: Climate Change, Carbon Reduction and Sustainable Reduction	The policy emphasises that *"sustainable design and construction will be integral to new development in Perth and Kinross"* (p.50). It states that a Sustainability Statement shall be required to demonstrate that new developments uphold sustainable construction principles and are capable of contributing and adapting to climate change as well as meeting carbon dioxide (CO_2) reduction targets.

Theme	Policy	Summary
Renewable Energy	**Policy ER1A:** Renewable and Low Carbon Energy Generation: New Proposals	In assessing proposals for renewable energy, the following factors will be considered: *(a) "The individual or cumulative effects on biodiversity, landscape character, visual integrity, the historic environment, cultural heritage, tranquil qualities, wildness qualities, water resources and the residential amenity of the surrounding area.* *(b) The contribution of the proposed development towards meeting carbon reduction targets.* *(c) The connection to the electricity distribution or transmission system.* *(d) The transport implications, and in particular the scale and nature of traffic likely to be generated, and its implications for site access, road capacity, road safety, and the environment generally.* *(e) The hill tracks and borrow pits associated with any development.* *(f) The effects on carbon rich soils.* *(g) Any positive or negative effects they may have on the local or Perth & Kinross economy either individually or cumulatively.* *(h) The reasons why the favoured choice over other alternative sites has been selected"* (p.47). Supplementary Guidance will provide a spatial framework for wind energy developments and further explain the locational, technological, environmental and design requirements for developers to consider in making their applications. **Reporter's recommendations:** *"Proposals for the utilisation, distribution and development of renewable and low carbon sources of energy will be supported subject to the following factors being taken into account:* *(a) The individual or cumulative effects on biodiversity, landscape character, visual integrity, the historic environment, cultural heritage, tranquil qualities, wildness qualities, water resources, aviation and telecommunications and the residential amenity of the surrounding area.* *(b) The individual or cumulative effects on biodiversity, landscape character, visual integrity, the historic environment, cultural heritage, tranquil qualities, wildness qualities, water resources, aviation and telecommunications and the residential amenity of the surrounding area.* *(c) The contribution of the proposed development towards meeting carbon reduction targets.* *(d) The effects on the elements listed in criterion (a) of the connection to the electricity distribution or transmission system.* *(e) The transport implications, and in particular the scale and nature of traffic likely to be generated, and its implications for site access, road capacity, road safety, and the environment generally.* *(f) The hill tracks and borrow pits associated with any development.* *(g) Any positive or negative effects they may have on the local or Perth & Kinross economy, including tourism and recreation interests, either individually or cumulatively.* *(h) In the case of large-scale onshore wind energy developments, their fit with the spatial framework for wind energy developments".*
Landscape and Visual Amenity	**Policy ER6:** Managing Future Landscape Change to Conserve and Enhance the Diversity and Quality of the Area's Landscapes	Policy ER6 relates to landscape resources. New developments will be required to conserve and enhance the landscape qualities of Perth and Kinross. A number of criteria are required to be met in achieving this: *(a) "they do not erode local distinctiveness, diversity and quality of Perth and Kinross's landscape character areas, the historic and cultural dimension of the area's landscapes, visual and scenic qualities of the landscape, or the quality of landscape experience;* *(b) they safeguard views, viewpoints and landmarks from development that would detract from their visual integrity, identity or scenic quality;* *(c) they safeguard the tranquil qualities of the area's landscapes;* *(d) they safeguard the relative wildness of the area's landscapes;* *(e) they provide high quality standards in landscape design, including landscape enhancement and mitigation schemes where there is an associated impact on a landscape's qualities;* *(f) they incorporate measures for protecting and enhancing the ecological, geological, geomorphological, archaeological, historic, cultural and visual amenity elements of the landscape; and* *(g) they conserve the experience of the night sly in less developed areas of Perth and Kinross through design solutions with low light impact"* (p.49).
Noise	**Policy EP8:** Noise Pollution	Noise generating developments shall not be located in close proximity to existing or proposed noise sensitive land uses. In exceptional circumstances the Council may use conditions attached to the granting of permission to permit noisy land uses near noise sensitive uses. The policy states that a Noise Impact Assessment will be required where it is predicted that high levels of noise will occur.
Ecology and Ornithology	**Policy NE1A:** Environment and Conservation Policies: International Nature Conservation Sites	*"Development which could have a significant effect on a site designated or proposed under the Habitats or Birds Directive (Special Areas of Conservation and Special Protection Areas) or a Ramsar Site, will only be permitted where the Appropriate Assessment indicates that:* *(a) it will not adversely affect the integrity of the site;* *(b) there are no alternative solutions; and* *(c) there are imperative reasons of overriding public interest"* (p.41). **Reporter's recommendations:** *"Development which could have a significant effect on a site designated or proposed under the Habitats or Birds Directive (Special Areas of Conservation and Special Protection Areas) or Ramsar site, will only be permitted where:* *(a) an appropriate assessment has demonstrated that it will not adversely affect the integrity of the site, or* *(b) there are no alternative solutions, and* *(c) there are imperative reasons of overriding public interest, including those of social or economic nature."*
	Policy NE1B: Environment and Conservation Policies: National Designations	*"Development which would affect a National Scenic Area, Site of Special Scientific Interest or National Nature Reserve, will only be permitted where the Council as Planning Authority is satisfied that:* *(a) the proposed development will not adversely affect the integrity of the area or the qualities for which it has been designated; or* *(b) any such adverse effects are clearly outweighed by social, environmental or economic benefits of national importance"* (p.41). **Reporter's recommendations:** *"Development which would affect a National Park, National Scenic Area, Site of Special Scientific Interest or National Nature Reserve, will only be permitted where the Council as Planning Authority is satisfied that:"*
	Policy NE1C: Environment and Conservation Policies: Local Designations	*"Development which would affect an area designated as being of local nature conservation or geological interest will not normally be permitted, except where the Council as Planning Authority is satisfied that:*

Theme	Policy	Summary
		(a) *the objectives of designation and the overall integrity of the designated area would not be compromised; or* (b) *any locally significant adverse effects on the qualities for which the area has been designated are clearly outweighed by social and economic benefits"* (p.41). **Reporter's recommendations:** *"Development which would affect an area designated by the Planning Authority as being of local conservation or geological interest will not normally be permitted, except where the Council as Planning Authority is satisfied that:"*
	Policy NE1D: Environment and Conservation Policies: European Protected Species	Planning permission will not be granted for development that would have an adverse impact on European protected species (listed in Annex IV of the Habitats Directive) and species protected under the Wildlife and Countryside Act 1981 (as amended) unless: • The development is required for preserving public health or safety or other imperative reasons of public interest; • There is no other satisfactory alternative. **Reporter's recommendations:** Delete the policy. Insert text on European Protected Species after requirement (d) in **Policy NE3:** Biodiversity.
	Policy NE2B: Forestry, Woodland and Trees	The policy states that Perth and Kinross Council will require tree surveys to be undertaken and to accompany planning applications for developments which are located on sites with trees. Where the loss of small groups of trees is unavoidable, Perth and Kinross Council will require developers to implement appropriate mitigation measures.
	Policy NE3: Biodiversity	*"The Council will seek to protect an [sic] enhance all wildlife and wildlife habitats, including grasslands, wetlands and peat-lands and habitats that support rare or endangered species.* *The Council will apply the principles of the Tayside Biodiversity Partnership Planning Manual and will take account of the Tayside Local Biodiversity Action Plan (LBAP) when making decisions about all applications for development".* *Proposals that have a detrimental impact on the ability to achieve the guidelines and actions identified in these documents will not be supported unless clear evidence can be provided that the ecological impacts can be satisfactorily mitigated. In particular developers may be required to:* *(a) ensure a detailed survey is undertaken by a qualified specialist where one or more protected or priority species is known or suspected. Large developments that will have an impact on the environment may require an Environmental Impact Assessment;* *(b) demonstrate all adverse effects on species and habitats have been avoided wherever possible. A Landscape Plan may be required to demonstrate the impact of the development and how good design and site layout can enhance the existing biodiversity;* *(c) include mitigation measures and implementation strategies where adverse effects are unavoidable;* *(d) enter into a Planning Obligation or similar to secure the preparation and implementation of a suitable long-term management plan or a site Biodiversity Action Plan, together with long-term monitoring"* (p.43). **Reporter's recommendations:** *"The Council will seek to protect and enhance all wildlife and wildlife habitats, whether formally designated/protected or not, taking into account the ecosystems and natural processes in the area.* *The Council will apply the principles of the Tayside Biodiversity Action Partnership Planning Manual and will take account of the Tayside Local Biodiversity Action Plan (LBAP) and relevant national and European legislation relating to protected species when making decisions about applications for development.*

Theme	Policy	Summary
		Proposals that have a detrimental impact on the ability to achieve the guidelines and actions identified in these documents will not be supported unless clear evidence can be provided that the ecological impacts can be satisfactorily mitigated. In particular developers may be required to: *(a) ensure a detailed survey is undertaken by a qualified specialist where one or more protected or priority species is known or suspected. Large developments that will have an impact on the environment may require an Environmental Impact Assessment;* *(b) demonstrate all adverse effects on species and habitats have been avoided wherever possible. A Landscape Plan may be required to demonstrate the impact of the development and how good design and site layout can enhance the existing biodiversity;* *(c) include mitigation measures and implementation strategies where adverse effects are unavoidable;* *(d) enter into a Planning Obligation or similar to secure the preparation and implementation of a suitable long-term management plan or a site Biodiversity Action Plan, together with long-term monitoring* *European Protected Species* *Planning permission will not be granted for development that would, either individually or cumulatively, be likely to have an adverse effect upon European protected species (listed in Annex IV of the Habitats Directive (Directive 92/43/EEC)) unless the Council as planning authority is satisfied that:* *(a) there is no satisfactory alternative, and* *(b) the development is required for preserving public health or public safety or for other imperative reasons of overriding public interest including those of a social or economic nature and beneficial consequences of primary importance for the environment.* *In no circumstances can a development be approved which would be detrimental to the maintenance of the population of a European protected species at a favourable conservation status in its natural range.* *Other protected species* *Planning permission will not be granted for development that would be likely to have an adverse effect on protected species unless it can be justified in accordance with the relevant protected species legislation (Wildlife and Countryside Act 1981 (as amended) and the Protection of Badgers Act (1992.)"*
Geology, Hydrology, Hydrogeology and Peat	**Policy EP2:** New Development and Flooding	The policy aims to ensure that developments are not located on functional flood plains or land liable to flooding. It states that where developments are considered to be at risk of flooding, Perth and Kinross will utilise the flood risk framework to establish whether development on a particular site is feasible. In order to allow for adaption to increased flood risk associated with climate change, developments should not: *(a) "Increase the rate of surface water run-off from any site;* *(b) Reduce the naturalness of the river;* *(c) Add to the area of land requiring flood protection measures;* *(d) Affect the flood attenuation capability of the functional flood plain; nor* *(e) Compromise major options for future shoreline or river management"* (p.51).
	Policy EP3A: Water Environment and Damage: Water Quality	*"Proposals will need to have regard to the Scotland River Basin Management Plan and any associated Area Management Plans; specifically they must ensure that they result in sustainable improvements to a water body's status over time, or, alternatively, no deterioration in the water body status occurs, unless the activity proposed is of significant specified benefit to society or the wider environment"* (p.54).

Theme	Policy	Summary
Archaeology and Cultural Heritage		**Reporter's recommendations:** Policy EP3A should be re-titled "Water Environment". Replace text with: *"The Scottish River Basin Management Plan has protection and improvement objectives which aim to ensure that there is no deterioration of water body status and where possible secure long term enhancements to water body status. Proposals for development which do not accord with the Scotland River Basin Management Plan and any relevant associated Area Management Plans will be refused planning permission unless the development is judged by the Council to be of significant specified benefit to society and/or the wider environment."*
	Policy EP3C: Water Environment and Damage: Surface Water Drainage	*"All new developments will be required to employ Sustainable Urban Drainage Systems (SUDS) measures"* (p.54).
	Policy EP3D: Water Environment and Damage: Reinstatement of Natural Watercourses	*"The Council will not support development over an existing culvert or the culverting of watercourses as part of a new development unless there is no practical alternative. Where deemed necessary it will be essential to provide adequate access for maintenance. Existing culverts should be opened and redundant water engineering structures removed whenever possible to benefit wildlife and improve amenity"* (p.54).
	Policy HE1A: Scheduled Monuments and Non-Designated Archaeology: Scheduled Monuments	*"There is a presumption against development which would have an adverse effect on the integrity of a Scheduled Monument and its setting unless there are exceptional circumstances"* (p.38).
	Policy HE1B: Scheduled Monuments and Non-Designated Archaeology: Non-Designated Archaeology	The policy affords protection to the setting of unscheduled but locally significant historical assets. The Council will seek to ensure that assets are preserved in situ; however where this is not possible the developer will be responsible, through planning conditions, to excavate and record features prior to development commencing.
	Policy HE2: Listed Buildings	Policy HE2 relates to Listed Buildings. *"The layout, design, materials, scale, siting and use of any development which will affect a listed building or its setting should be appropriate to the buildings character, appearance and setting"* (p.38). **Reporter's recommendations:** *"Enabling development may be acceptable where it can be shown to be the only means of retaining a listed building. The layout, design, materials, scale, siting and use of any development which will affect a listed building or its setting should be appropriate to the building's character, appearance and setting".*
	Policy HE4: Gardens and Designed Landscapes	*"The Council will seek to protect and enhance the integrity of those sites included on the current Inventory of Gardens and Designed Landscapes"* (p.39). **Reporter's recommendations:** *"Gardens and designed landscapes make a significant contribution to the character and quality of the landscape in Perth and Kinross. The Council will seek to manage change in order to protect and enhance the integrity of those sites included on the current Inventory of Gardens and Designed Landscapes. The Council may require the submission of a management plan with any application for development within areas included in the current Inventory. As resources permit, the Council will continue with the process of identification of non-Inventory sites in Perth and Kinross and the associated task of devising an approach to their future management".*
	Policy HE5: Protection, Promotion and Interpretation of Historic Battlefields	Policy HE5 affords protection to battlefields listed on the Inventory of Historic Battlefields.
	Policy HE3A: Conservation Areas: New Development	*"The design, materials, scale and siting of new development within a conservation area, and development outwith an area that will impact upon its special qualities should be appropriate to its appearance, character and setting"* (p.39).

Theme	Policy	Summary
Access, Traffic and Transportation	**Policy TA1B:** Transport Standards and Accessibility Requirements: New Development Proposals	The policy sets out the transportation and access requirements for new developments and states that proposals should: *(a) be designed for the safety and convenience of all potential users;* *(b) incorporate appropriate mitigation on site and/or off site, provided through developer contributions where appropriate, which might include improvements and enhancements to the walking/cycling network and public transport services, road improvements and new roads;* *(c) incorporate appropriate levels of parking provision to the maximum parking standards laid out in SPP;* *(d) fit with the strategic aims and objectives of the Regional Transport Strategy;* *(e) apply maximum on-site parking standards to help encourage and promote a shift to the more sustainable modes of travel of walking, cycling and public transport"* (p.35). The policy emphasises the importance of outdoor activities and highlights that development proposals which promote cycling and walking will be supported. **Reporter's recommendations:** *(b) "incorporate appropriate mitigation on site and/or off site, provided through developer contributions where appropriate, which might include improvements and enhancements to the walking/cycling network and public transport services including railway and level crossings, road improvements and new roads".*
Socio -Economics	**Policy ED3**: Rural Business and Diversification	The policy states that Perth and Kinross Council will give favourable consideration to the expansion of businesses and the creation of new ones within rural areas, with a preference of this occurring adjacent or within existing settlements. Of points a-g in the policy, the following are relevant to Creag a' Bhàird Wind Farm: *(a) "The proposed use is compatible with the surrounding land uses and will not detrimentally impact on the amenity of residential properties within or adjacent to the site.* *(b) The proposal can be satisfactorily accommodated within the landscape capacity of any particular location.* *(c) The local road network must be able to accommodate the nature and volume of the traffic generated by the proposed development in terms of road capacity safety and environmental impact"* (p.27).
	Policy CF2: Public Access	*"Development proposals that would have an adverse impact upon any (proposed) core path, asserted right of way or other well used route, or that would otherwise unreasonably affect public access rights will be refused, unless those impacts are adequately addressed in the plans and suitable alternative provision is made"* (p.37). **Reporter's recommendations:** *"Development proposals that would have an adverse impact upon the integrity of any (proposed) core path, disused railway line, asserted right of way or other well used route will be refused. Development proposals that would affect unreasonably public access rights to these features will be refused unless these adverse impacts are adequately addressed in the plans and suitable alternative provision is made".*
Other Considerations	**Policy EP11:** Air Quality Management Areas	The policy highlights that certain developments, within or adjacent to designated Air Quality Management Areas, which could have a negative impact on air quality and the overall objectives of the Areas may not be permitted. Where development proposals are likely to adversely affect air quality or require a transport assessment, applicants will be required to identify the extent of the air quality impact and implement appropriate mitigation measures.
	Policy PM3: Infrastructure Contributions	*"Where the cumulative impact of new developments will exacerbate a current or generate a future need for additional infrastructure provision or community facilities, planning permission will only be granted where contributions which are reasonably related to the scale and nature of the proposed development are secured"* (p.24).

Supplementary Planning Guidance

5.101 The **Supplementary Planning Guidance (SPG) for Wind Energy Proposals in Perth & Kinross**[xv], approved in May 2005, provides supporting guidance to the policies within the Development Plan documents.

5.102 The SPG identifies 'Sensitive Areas' and 'Broad Areas of Search' for wind farm developments. Diagram 1 confirms that Creag a' Bhàird Wind Farm is within the 'Broad Areas of Search' identified for wind energy developments. Whilst a proposal may be more readily supported if located within one of the 'Broad Areas of Search', it will still be necessary to demonstrate adherence to the detailed policies and guidelines within the SPG which include:

- Wind Energy Policy 1;
- Wind Energy Policy 2;
- Guideline 1 – Landscape Impact;
- Guideline 2 – Visual Impact;
- Guideline 3 – Cumulative Landscape and Visual Impacts;
- Guideline 4 – Impact on Biodiversity;
- Guideline 5 – Cumulative Ornithological Interests;
- Guideline 6 – Operational Impacts;
- Guideline 7 – Water Resources;
- Guideline 8 – Aviation;
- Guideline 9 – Maintaining Carbon Sinks;
- Guideline 10 – Decommissioning and Site Reinstatement; and
- Guideline 11 – Protection of Wind Energy Developments.

5.103 Although the SPG contains encouragement for renewable energy projects, recent years have seen changes in national planning policy and guidance which makes this guidance document significantly out of date.

5.104 Perth and Kinross Council are preparing new Supplementary Guidance (SG) called **Spatial Framework and Guidelines for Wind Energy Development**. This will replace the existing SPG for wind energy above. It will apply to all developments although the spatial strategy will only apply to schemes of greater than 20MW. The SG will be divided into two parts; Part 1 will contain a spatial strategy for wind energy development (based on the capacity of the built environment to accommodate it) and Part 2 will provide guidance on addressing environmental, social and economic effects when preparing wind energy proposals. The SG remains a work in progress and a draft version is not yet available.

Planning Advice Notes (PANs)

5.105 **Planning Advice Notes (PANs)** are intended to supplement the SPP at the national level in providing good practice advice and policy guidance. PANs are material considerations to renewable energy development projects as they help to define methodology for the assessment process by providing advice on good practice.

5.106 The following PANs are identified as relevant to Creag a' Bhàird Wind Farm:

Table 5:2 PANs relevant to Creag a' Bhàird Wind Farm

Guidance	Title	Summary
Planning Advice Note 1/2013[xvi]	Environmental Impact Assessment (August 2013)	Planning Advice Note 1/2013 explains the role of individual planning authorities and that of Consultation Bodies in EIA, as well as providing guidance on the ways in which EIA can be integrated into the overall development management process.
Planning Advice Note 2/2011[xvii]	Planning and Archaeology (July 2011)	Planning Advice Note 2/2011 provides advice to planning authorities and developers on dealing with archaeological remains. This PAN is intended to inform the day-to-day work of a range of local authority advisory services and other organisations that have a role in the handling of archaeological matters within the planning process.
Planning Advice Note 1/2011[xviii]	Planning and Noise (March 2011)	Planning Advice Note 1/2011 provides advice on the role of the planning system in helping to prevent and limit the adverse effects of noise. It supersedes PAN 56 *Planning and Noise.* Information and advice on noise impact assessment (NIA) methods is provided in the associated Technical Advice Note. It includes details of the legislation, technical standards and codes of practice for specific noise issues.
Planning Advice Note 3/2010[xix]	Community Engagement (August 2010)	Planning Advice Note 3/2010 provides advice to communities on how they can get involved and provides advice to planning authorities and developers on ways of effectively engaging with communities on planning matters. It advises that Community Engagement must be meaningful and proportionate, and must happen at an early stage to influence the shape of plans and proposals.
PAN 51[xx]	Planning, Environmental Protection and Regulations (Revised 2006)	The central purpose of PAN 51 is to support the existing policy on the role of the planning system in relation to the environmental protection regimes. This PAN also summarises the statutory responsibilities of the environmental protection bodies, as well as informing these bodies about the planning system.
PAN 61[xxi]	Planning and Sustainable Urban Drainage Systems (SUDS) (August 2005)	PAN 61 gives good practice advice for planners and the development industry complementing the Sustainable Urban Drainage Systems Design Manual for Scotland.
PAN 75[xxii]	Planning for Transport (August 2005)	PAN 75 aims to create greater awareness of how linkages between planning and transport can be managed. It highlights the roles of different bodies and professions in the process and points to other sources of information.
PAN 60[xxiii]	Planning for Natural Heritage (2000)	PAN 60 provides advice on how development and the planning system can contribute to the conservation, enhancement, enjoyment and understanding of Scotland's natural environment and encourages developers and planning authorities to be positive and creative in addressing natural heritage issues.
PAN 50[xxiv]	Controlling the Environmental Effects of Surface Mineral Workings (1996)	PAN 50 provides advice on the more significant environmental effects arising from mineral working operations.

Scottish Government Web Based Renewables Guidance

5.107 In February 2011, PAN 45 *Renewable Energy Technologies*[xxv] was superseded by Scottish Government web based advice on renewables. Of particular relevance are the ***'Onshore Wind Turbines***[xxvi]*'* and ***'Process for Preparing Spatial Frameworks for Wind Farms***[xxvii]*'* guidance documents.

Onshore Wind Turbines

5.108 ***'Onshore Wind Turbines'*** suggests areas of focus for planning authorities, and lists opportunities within the planning system for compiling data bases and laying down clear planning procedures.

5.109 The guidance (last updated in July 2013) provides that the suggested areas of focus for planning authorities should include:

- *"provide greater clarity on where groups of wind turbines can be located by ensuring that a spatial framework for wind farms >20 MW has been set out in the development plan and addressing the potential below 20 MW where appropriate;*
- *detail criteria to be applied in assessing wind turbine applications;…and*
- *ensure planning conditions and agreements for wind turbine approvals are reasonable and proportionate".*

5.110 The guidance also outlines a number of typical planning considerations in determining planning applications for onshore wind turbine developments. These include:

- ***Landscape impact*** – wind turbines can impact upon the landscape by virtue of their number, size or layout, how they impact on the skyline, their design and colour, any land form change, access tracks and ancillary components anemometers, substations and power lines. The ability of the landscape to absorb development will depend largely on features of landscape character such as landform, ridges, hills, valleys and vegetation;
- ***Landscape assessment*** – an analysis of the landscape impact should be carried out which will identify where the wind farm may be seen from, a viewpoint analysis based on key viewpoints throughout the surrounding area, and photomontages;
- ***Impacts on wildlife and habitat, ecosystems and biodiversity*** – wind turbine developments have the capacity to have both positive and negative effects on the wildlife, habitats, ecosystems and biodiversity of an area. These effects should be considered and mitigation implemented if appropriate;
- ***Assessing impacts on wildlife and habitat, ecosystems and biodiversity*** – in carrying out an assessment of effects on habitats and wildlife, risks need to be quantified. Examples include wind farm bird collision, displacement and disturbance risk, and a calculation of carbon release from the Proposed Development on peat;
- ***Buffer zones*** – should not be established around areas designated for their natural heritage importance;
- ***Impact on communities*** – consideration should be given to the impact on communities including shadow flicker, noise, electro-magnetic interference, and ice throw;
- ***Separation distances*** – the 2km separation distance outlined in the SPP is a guide and decisions on individual developments should take account of specific local circumstances and geography;
- ***Aviation matters*** – the impact on aviation should be considered in order to ensure there are no unsafe implications for airport radar and communications systems;
- ***Military aviation and other defence matters*** - consideration should be given to the impact wind energy development has on military aviation, particularly within low flying zones;
- ***Road traffic impacts*** – the impact on road traffic should be considered in the design of the wind farm;
- ***Cumulative impacts*** – an assessment of the cumulative impact should be carried out. There is no guide distance between established and proposed groups of wind turbines;
- ***Good practice during construction*** – in order to ensure that agreed designs and construction techniques are followed; and
- ***Decommissioning*** – the guidance provides advice on decommissioning the site at the end of the operational life of the wind farm.

Process for Preparing Spatial Frameworks for Wind Farms

5.111 The Advice Sheet ***'Process for Preparing Spatial Frameworks for Wind Farms'*** was last updated in August 2012.

5.112 This latest version of this advice removed Step 3 from PAN 45, Annex 2, which removes the distinction between *Areas of Search – Minor Constraints* and *Areas of Search*. Therefore, the approach to developing spatial frameworks includes three stages:

- Stage 1 – Identify areas requiring significant protection;
- Stage 2 – Identify areas with potential constraints; and
- Stage 3 –Identify areas of search.

5.113 In terms of cumulative effects, the guidance states that *"it may be appropriate to plan for the clustering of wind farms within areas of search"* (p.3). This is the first time in policy guidance that the Scottish Government has been clear in proactively acknowledging the benefits of clustering wind farm developments.

Emerging National Planning Policy

The National Planning Framework 3 (NPF3): Main Issues Report & Draft Framework

5.114 The **NPF3 Main Issues Report & Draft Framework**[xxviii] was issued for consultation on 30 April 2013 and is due to be adopted by 2014. NPF3, like its two predecessors, will be the spatial expression of the Government Economic Strategy, informed by plans and policies in areas such as transport, energy, health and wellbeing, climate change, and land use.

5.115 The development of onshore wind is strongly supported in this document, reflecting the commitments of the Scottish and UK Governments in relation to emissions reduction and energy generation targets. Paragraph 1.12 states that the NPF3 spatial strategy should *"support the further deployment of onshore wind farms"* to help make Scotland a more low carbon place.

5.116 Paragraph 2.14 explicitly states that *"onshore wind will play a significant role in achieving the target"* of generating the equivalent of at least 100% of gross electricity consumption from renewables by 2020, with an interim target of 50% by 2015 (p.13). In addition, it advises that *"whilst we increasingly see the development of offshore renewable energy generation, the further deployment of onshore wind remains a key strand in our efforts to reduce greenhouse gas emissions and achieve a balanced energy supply"* (Paragraph 2.14, p.13).

5.117 While there is continued support for renewable energy there is also an increased focus in the emerging NPF3 on balancing this commitment with protecting nationally important landscapes and residential amenity, particularly in relation to onshore wind.

5.118 One of the key tools that the Scottish Government proposes to use to strike this balance is to increase the level of protection currently afforded to National Parks and National Scenic Areas. Paragraph 2.18 states *"The draft Scottish Planning Policy makes clear that the Scottish Government does not wish to see new wind farms in these areas"* (p.13).

5.119 In addition, it is proposed that core areas of 'wild land' as identified in the SNH wild land map should be brought within the spatial planning process for planning authorities to take account of and included within 'areas of significant protection'.

Scottish Planning Policy (Consultation Draft 2013)

5.120 A review of the **Scottish Planning Policy**[xxix] was announced in September 2012 with a subsequent draft of the updated SPP being published for consultation on 30 April 2013 ('the Draft SPP'). The document continues to emphasise the merits of sustainable development and the need to tackle climate change and develop renewable energy resources through supportive Development Plans.

5.121 In its overview of the planning system it states in paragraph 208 that "*the planning system should support the transformational change to a low carbon economy and be consistent with national objectives and targets, including deriving:*

- *the equivalent of 100% of electricity demand from renewable sources by 2020;*
- *11% of heat demand from renewable sources by 2020; and*
- *30% of overall energy demand from renewable sources by 2020*" (p.48).

5.122 In order to achieve this, the planning system must ensure that *"development plans should support all scales of development associated with the generation of electricity and heat from renewable sources with a view to realising the renewable energy potential of the areas they cover"* (Paragraph 210, p.48).

5.123 Perhaps the most significant change proposed from the existing process is the change from the current 'three stage approach' to preparing onshore wind spatial frameworks to the requirement to provide a single map which consolidates information on capacity and the following groupings:

- Group 1 – Areas where wind farms will not be acceptable (National Parks and National Scenic Areas);
- Group 2 – Areas of significant protection (Areas designated for international or national heritage value, areas where the cumulative impact of existing and consented wind farms limits further development, areas safeguarded by planning policies [e.g. scheduled monuments, conservation areas, etc.], aviation and defence consultation zones, land covered by broadcasting installations; flood risk areas, areas of high quality unaltered peat);
- Group 3 – Areas where planning constraints are less significant, where opportunities for wind farm development can be realised through good design or mitigation; and

- Group 4 – Areas where wind farm proposal are likely to be supported subject too detailed consideration.

5.124 In addition to the areas awarded significant protection as outlined above, core areas of wild land will also be included within this category. Paragraph 129 states that Development Plans should identify and safeguard areas of wild land character. *"This should be based on Scottish Natural Heritage mapping of core wild land, published in 2013"* (Paragraph 129, p.34).

5.125 Regarding onshore wind energy developments, paragraph 216 states that, *"development plans should support the development of wind turbines at locations where impacts on the environment and communities can be satisfactorily addressed. Strategic development plan spatial strategies should identify capacity for strategic onshore windfarm developments as well as cumulative impact pressures. Local development plans should clearly set out the potential for wind turbine and windfarm development of all scales as part of the spatial framework"* (p.50).

5.126 The Draft SPP includes a consultation question seeking opinions on whether the recommended separation distances between wind farms and cities, towns and villages should be increased from 2km to 2.5km. However, consistent with the current SPP the recommended buffer is provided to reduce visual impacts and not to place a restriction upon wind farm development in general and is not applicable to individual dwellings: *"Decisions on individual developments should take into account specific local circumstances and geography"* (Paragraph 218, p.51).

5.127 The Draft SPP also seeks to ensure that communities are able to share in the benefits of renewable energy and encourages *"all commercial wind farm developers to voluntarily offer community benefits and record these on the Scottish Government's Register of Community Benefit from Renewables"* (Paragraph 222, p.54).

5.128 Following consultation on the Draft SPP in summer 2013, the Scottish Government is now seeking views on replacing the Draft SPP principal policies on 'sustainable economic growth' and 'sustainable development' with one principal policy on 'Sustainability and Planning' and introducing a presumption in favour of sustainable development into the SPP[xxx]. The consultation paper states that the planning system should enable development that creates sustainable places across Scotland and to do this, decisions should be guided by the following principles (only those of relevance to the application are listed):

- to give due weight to net economic benefit;
- to make efficient use of existing capacities of land;
- to support climate change mitigation and adaptation;
- to protect and enhance cultural heritage, including the historic environment; and
- to protect, enhance and promote access to natural heritage.

5.129 It is proposed that the updated SPP will be published alongside NPF3 in June 2014.

Energy and Climate Change Policies and Renewable Energy Targets

5.130 International, European, National and Scottish Government renewable energy policies recognise the importance of renewable energy in reducing carbon emissions and tackling climate change. This section of the chapter highlights statutory renewable energy generation targets and reviews relevant climate change and energy policies, setting out the context and rationale for Creag a' Bhàird Wind Farm.

International Agreements

5.131 The United Nations Framework Convention on Climate Change (UNFCCC) is the principal international forum for action aiming to reduce reliance on fossil fuels and bring about a reduction in greenhouse gas emissions. At its Kyoto conference in December 1997, developed nations agreed to reduce emissions of the six main anthropogenic greenhouse gases to 5.2% below 1990 levels over the period of 2008-2012, thus forming the ***Kyoto Protocol***[xxxi].

5.132 The European Union agreed to jointly undertake an 8% reduction in greenhouse gas emissions at Kyoto, with the UK agreeing to take on a reduction target of 12.5% over the period 2008-2012.

5.133 At the United Nations Climate Change Conference in December 2009, nations agreed to move towards immediate global action on climate change. The UK made a commitment to reduce emissions by at least 34% by 2020.

5.134 In Doha, Qatar, on 8 December 2012, the ***Doha Amendment***[xxxii] to the Kyoto Protocol was adopted. This launched a second commitment period (CP2), starting on 1 January 2013 until 2020. The Doha Amendment requires The European Union, as a whole, to reduce its emissions by 20 per cent with each country required to review their commitments by the end of 2014 with a view of increasing their level of mitigation ambition.

5.135 The most recent announcement from the United Nations Intergovernmental Panel on Climate Change (IPCC) on 27th September 2013[xxxiii] noted that *"warming in the climate system is unequivocal"* (p.2) and that *"limiting climate change will require substantial and sustained reductions of greenhouse gas emissions"* (p.17). This announcement provides an overwhelming and strengthened body of evidence that man-made greenhouse gas emissions are the dominant cause of recent warming. It also reinforces existing policy and indicates the requirement for even more stringent policy in support of reducing greenhouse gas emissions.

European Policy and Renewable Energy Targets

5.136 The EU's **Renewable Energy Directive** (2009/28/EC)[xxxiv] on the promotion of the use of energy from renewable sources sets ambitious targets for all member states. This introduces the requirement for 20% of all energy used (electricity, heat and transport) to come from renewable sources by 2020, split between the member states. The national target for the UK set out in the Directive is for 15% of all energy use to come from renewable sources by 2020.

5.137 The European Commission's **Roadmap for Moving to a Low Carbon Economy in 2050**, published in March 2011, describes the cost-effective decarbonisation pathway to reach the EU's objective of cutting greenhouse gas emissions by 80-95% of 1990 levels by 2050 (25% in 2020, 40% in 2030 and 60% in 2040 compared to 1990 levels).

5.138 On 01 July 2013, the European Renewable Energy Council published three reports under the 'Keep on Track!' project, namely the **EU Tracking Roadmap 2013**[xxxv], **Analysis of Deviations and Barriers Report 2013**[xxxvi], and **2013 Policy Recommendations Report**[xxxvii].

5.139 The EU as a whole is on track to reaching its 20% renewable energy target by 2020, with a renewable energy share of 13% in 2011. However, the **EU Tracking Roadmap 2013** ranked the UK 25th out of 27 member states on progress towards 2020 renewable energy targets. Although some good progress has been made in recent years, the UK did not achieve the 4% interim target for 2011 set by the Department for Energy and Climate Change in its National Renewable Energy Action Plan (NREAP), albeit by a small amount (the outcome was 3.8%). In addition the UK was the only Member State in the 'Keep on Track!' project which had not achieved by the end of 2011 its first interim target under the Directive (4.04% for 2011 to 2012). In 2011 and 2012, the UK achieved an average of 3.94% confirming that the UK has missed the target. Furthermore, the UK is classified as one of four countries in the project expected not to achieve its 2020 target.

UK Policy and Renewable Energy Generation Targets

Climate Change Programme

5.140 In addition to commitments under the Kyoto Protocol, the Doha Amendment and EU obligations, the UK Government has also set a separate domestic goal of reducing CO_2 emissions by 20% below 1990 levels by 2010. In an effort to deliver these targets, **Climate Change: The UK Programme**[xxxviii] was launched in November 2000 and then updated in 2006[xxxix].

Climate Change Act 2008

5.141 Following a UK Government Energy Review published as a White Paper in 2007[xl], the UK Climate Change Act[xli] received Royal Assent in 2008. The **Climate Change Act 2008** created a legal framework for the UK to achieve a reduction of carbon emissions through both domestic and international action. The key provisions of the Act as it relates to the energy sector are as follows:

- Introducing a legally binding target of an 80% reduction in carbon dioxide emissions by 2050, and at least 26% by 2020, against the 1990 baseline.

5.142 Of additional significance in this Act is the banding which requires all UK electricity suppliers to provide 10% of their electricity from new renewable sources by 2010 and 15% by 2015. The banding regime came into effect in April 2009, and generators that fail to meet their targets will be forced to pay a 'buy-out price', which is effectively a financial penalty.

Energy Act 2008

5.143 The **Energy Act 2008**[xlii] brings into law the legislative content of the Energy Review 2006: The Energy Challenge[xliii] and the Energy White Paper 2007: Meeting the Energy Challenge[xliv]. In terms of renewable energy, the key provisions centre on:

- Strengthening the Renewables Obligation to drive greater, and more rapid, development of renewables in the UK. This will increase the diversity of the UK's electricity mix, thereby improving the reliability and security of supply and reducing carbon emissions from the generating sector.
- Introducing 'feed-in' tariffs. This will enable the Government to introduce a tailor-made scheme to financially support low carbon generation projects up to 5MW.

UK Renewable Energy Strategy

5.144 In July 2009, the UK Government published **The UK Renewable Energy Strategy**[xlv], which implements the EU Directive 2009/28/EC on Renewable Energy and supports the UK Climate Change Programme. The Strategy sets out the path to be followed for the UK to meet its legally binding target to ensure that 15% of UK energy comes from renewable sources by 2020. The lead scenario suggests that more than 30% of the UK's electricity could be generated from renewables, with more than two thirds of this coming from wind power, both on and offshore. However, it is recognised that such a scenario will only be possible with strong, co-ordinated efforts from central, regional and local government and the devolved administrations, as well as other public groups, the private sector and community groups and individuals.

5.145 Along with The UK Renewable Energy Strategy, the UK Government published the **UK Low Carbon Transition Plan**[xlvi] as a White Paper in July 2009. The plan seeks to deliver greenhouse gas emission cuts of 18% on 2008 levels by 2020 (and over a third reduction on 1990 levels), and emphasises that the UK will need to drive major changes to the way energy is used and supplied. It seeks to ensure that the UK will generate 40% of electricity from low carbon sources by 2020, with policies to produce approximately 30% of UK electricity from renewables by 2020, by substantially increasing the requirement for electricity suppliers to sell renewable electricity.

5.146 The White Paper explains that the UK Government has put in place the world's first legally binding target to cut emissions by 80% by 2050 and it has set five year "carbon budgets" to 2022 to 'keep the UK on track' which provide a clear pathway for reducing emissions in the future. The White Paper for the first time sets out how these budgets will be met.

2010 Annual Energy Statement and 2050 Pathways Analysis Report

5.147 In the Coalition Programme for Government, the Government committed to producing an Annual Energy Statement (AES)[xlvii] to provide market direction, set strategic energy policy and help guide investment. The first statement was delivered to Parliament on 27 June 2010. In setting the strategic direction of energy policy and guiding investment, the statement sets out the full secure and low carbon energy context, covering climate change and energy efficiency as well as supply-side issues, international security and liabilities.

5.148 The **2010 Annual Energy Statement** was accompanied by the **2050 Pathways Analysis Report**[xlviii], which presents a framework through which to consider some of the choices and trade-offs to be made in the UK by 2050. The Pathway Analysis covers all parts of the economy and all greenhouse gas emissions released in the UK and will be revised and updated regularly to provide an evidence base for decision-making.

National Renewable Energy Action Plan

5.149 In July 2010, the UK Government submitted the UK's **National Renewable Energy Action Plan**[xlix] (NREAP) to the European Commission under Article 4 of the European Renewable Energy Directive (2009/28/EC). The NREAP is based on a template set by the European Commission, which asks for the trajectory and measures that will enable the UK to reach its legally binding target for 15% of energy consumption in 2020 to be from renewable sources.

Carbon Plan & Carbon Budgets

5.150 The Climate Change Act 2008 established the principle of five year carbon budgets. The first three budgets were set in 2009 and cover 2008-12, 2013-17 and 2018-22. The fourth budget, 2023-2027 was legislated in June 2011.

5.151 In December 2011, the UK Government published its first **Carbon Plan**[l] which sets out the Government's plans for achieving the emissions reductions committed to in the first four Carbon Budgets, on a pathway consistent with meeting the 2050 target. The Carbon Plan brings together the Government's strategy to curb greenhouse gas emissions and deliver climate change targets, as well as an updated version of the actions and milestones for the next five years.

5.152 Paragraph 46 of the 2011 Carbon Plan states that over the next decade:

"We need to continue reducing emissions from electricity generation through increasing the use of gas instead of coal, and more generation from renewable sources. Alongside this, we will prepare for the rapid decarbonisation required in the 2020s and 2030s by supporting the demonstration and deployment of the major low carbon technologies that we will need on the way to 2050" (p.9).

5.153 In early October 2013 the Government's Response to the **Fifth Annual Progress Report of the Committee on Climate Change: Meeting the Carbon Budgets – 2013 Progress Report to Parliament**[li] was published. The Response made clear that the latest projections suggest the UK is on track to meet the first three legally-binding carbon budgets provided that current planned policies are undertaken. This means that by 2020, greenhouse gas emissions in the UK will have fallen by at least 34% relative to 1990 baseline levels.

5.154 As set out in the Carbon Plan in 2011, there is more to do to meet the legally-binding target to reduce the UK's greenhouse gas emissions by at least 80% by 2050. Based on current policies there is an expected shortfall of 215 $MtCO_2e$[3] over the fourth carbon budget. To meet the statutory commitments, the Government has made a number of recommendations to increase the rate of decarbonisation in a number of areas across the economy.

Renewable Energy Review

5.155 In May 2011 the Committee on Climate Change, which is the independent body established under the Climate Change Act 2008 to advise the UK Government on setting and meeting carbon budgets and on preparing for the impacts of climate change, published its **Renewable Energy Review**[lii]. The Review forecasts a major role for renewables (alongside nuclear and Carbon Capture and Storage) in decarbonising power, heat and transport.

UK Renewable Energy Roadmap

5.156 On 27 July 2011, the UK Government published the **UK Renewable Energy Roadmap**[liii], which sets out a comprehensive action plan to accelerate the UK's deployment and use of renewable energy, to put the UK on the path to achieve the 2020 target, while driving down the cost of renewable energy over time. It identifies onshore wind as one of the eight technologies that have either the greatest potential to help the UK meet the 2020 target in a cost-effective and sustainable way, or offer great potential for the decades that follow.

5.157 The latest iteration of the government's renewable energy roadmap, the **UK Renewable Energy Roadmap Update 2013**[liv], was published in November 2013. The 2013 Update suggests that the UK is on track to make its country-specific target of generating 15% of its energy from renewables by the end of the decade. It calculates that 4.1% of UK energy consumption came from renewable sources in 2012 – greater than the EU interim target of 4.04%. In 2011 and 2012, the UK achieved an average of 3.94%. This is within the margin of error for the interim target, according to the government.

5.158 The amount of electricity generated from renewables has increased by a factor of four over the last decade and nearly doubled in the three years since 2010. In particular, between the period July 2012 and June 2013, there has been a significant increase in renewable energy generation with the overall capacity growing by 38% to 19.5 gigawatts (GW). In the second quarter of 2013, the UK generated 15.5% of its electricity – or more that 4% of overall energy supply – from renewable energy.

[3] $MtCO_2e$ means millions tonnes of carbon dioxide equivalent.

5.159 Since the publication of the last Update in 2012 there has been steady growth in the deployment of onshore wind. In the 12 months to June 2013, onshore wind generation increased by 25% on the previous 12 months, with capacity up 30%.

The Energy Act 2011

5.160 In October 2011, the Energy Bill received Royal Assent and became the **Energy Act 2011**[lv]. The flagship policy in the Act is the 'Green Deal', a scheme whereby householders, private landlords and businesses would be given finance upfront to make energy efficiency improvements, which would then be paid for by energy bill savings.

2012 and 2013 Annual Energy Statements

5.161 The **2012 Annual Energy Statement**[lvi] continued to drive the strategic UK energy policy in a strategic direction whilst guiding investment. The Statement emphasises the key focus areas in order to meet the UK's energy objectives, including the investment in new energy infrastructure and cleaner technologies, giving householders greater power over their energy bills through the 'Green Deal', and Electricity Market Reform (EMR).

5.162 On the 31 October 2013, the DECC published the **2013 Annual Energy Statement**[lvii]. The Government has set three clear priorities in delivering the UK's energy policies in the near term. Firstly, to help householders and businesses keep energy costs down (through the EMR), secondly to unlock investment in the UK's energy infrastructure that will support economic growth and thirdly, to play a lead role in efforts to secure international action to reduce greenhouse gas emissions and tackle climate change.

Electricity Market Reform Delivery Plan

In July 2013, the Government published the draft **Electricity Market Reform Delivery Plan**[lviii] for consultation. Electricity Market Reform (EMR) is currently a key component of the proposed Energy Bill 2012-13 to 2013-14. The draft Plan discusses the need for major investment in the UK electricity sector and outlines key clauses which will be implemented by the Energy Bill to encourage EMR including, 'Contracts for Difference' (CfD), to support investment in low-carbon generation, and a 'Capacity Market', to ensure security of supply.

Energy Bill 2012-13 to 2013-14

5.163 The **Energy Bill** completed Commons passage with overwhelming majority in June 2013, and is currently making its way through the House of Lords (HM Government, 2013)[lix], with its third reading scheduled for the 19 November 2013. This Bill will establish a legislative framework for delivering secure, affordable and low carbon energy. The Bill includes provisions on:

- Electricity Market Reform: Establishes measures to attract the £110 billion investment which is needed to replace the current generating capacity and upgrade the grid by 2020, and to cope with a rising demand for electricity;
- Strategy and Policy Statement (SPS): Introduction of a SPS to improve regulatory certainty by ensuring that Government and Ofgem are aligned at a strategic level;
- Government Pipelines and Storage System (GPSS): Provisions to enable the sale of the GPSS; and
- Offshore transmission: Change to the Electricity Act 1989 to aid the construction of the UK offshore grid for exporting power.

Scottish Government Policy and Renewable Energy Generation Targets

Climate Change (Scotland) Act 2009

5.164 While the UK Government has responsibility for setting the direction of energy policy for the entire UK, the devolved Scottish Government introduced the **Climate Change (Scotland) Act 2009**[lx] as Scotland's policy framework for addressing climate change. This mirrors the UK target of reducing greenhouse emissions by 80% by 2050, but with a higher interim target for a 42% cut in emissions by 2020 and a 50% reduction by 2030. The Act also set targets for renewable energy to meet 80% of Scottish electricity demand from renewable sources by 2020.

Climate Change Delivery Plan 2009: Meeting Scotland's Statutory Climate Change Targets

5.165 To meet these highly ambitious targets, the Scottish Government **Climate Change Delivery Plan: Meeting Scotland's Statutory Climate Change Targets**[lxi] has been prepared to target investment and effort across a range of relevant sectors, and renewable energy has a fundamental place in this strategy. Scotland's current renewable energy targets are to deliver 50% gross electricity generation from renewable sources by 2015 and the equivalent of 100% by 2020.

The Scottish Government Renewables Action Plan 2009

5.166 In July 2009, the Scottish Government launched a **Renewables Action Plan** (RAP) 2009[lxii], to drive the development of renewable energy and derive maximum economic benefit from this by identifying collective actions by government, its agencies and partners.

5.167 The RAP's vision in relation to onshore wind is for the *"continued expansion of portfolio of onshore wind farms to help meet renewables target, with robust planning framework supporting timely processing of consents applications and ensuring wind farms are consented where they are environmentally acceptable".* One of the RAP's headline ambitions is to *"support the development of onshore wind farms in locations where it is environmentally acceptable, and hence contributes most effectively to sustainable economic growth"* (p.77).

5.168 The RAP states that onshore wind currently makes up about half of all renewables installed capacity in Scotland and that the Scottish Government is committed to supporting the deployment of appropriately sited onshore wind energy developments.

5.169 Given the proven status of the technology, and the known and anticipated quantity of applications in the system, the RAP notes that onshore wind is expected to provide the majority of capacity in the timeframe of the interim and 2020 renewable electricity targets. The Action Plan was updated in February 2010, August 2010, February 2011 and March 2011.

5.170 **The 2020 Routemap for Renewable Energy in Scotland** is an update and extension to the Renewables Action Plan and is discussed in further detail below.

The Energy Efficiency Action Plan

5.171 **Conserve and Save: The Energy Efficiency Action Plan**[lxiii], published on 06 October, 2010, sets out in detail the actions the Scottish Government is taking to achieve a step change in energy use.

A Low Carbon Economic Strategy for Scotland: 'Scotland – A Low Carbon Society'

5.172 **A Low Carbon Economic Strategy for Scotland**[lxiv], published on 15 November, 2010, sets the policy direction for low carbon economic opportunities, aims to strengthen business confidence in exploiting those opportunities. In respect of onshore wind the Strategy states that: *"It is important to recognise that onshore wind is still the technology that can make the most immediate positive impact on our low carbon economy, and therefore the Scottish Government will continue to encourage large, medium and small scale developments that are sited appropriately"* (Section 2.2, p.49).

Low Carbon Scotland: Meeting the Emissions Reduction Targets

5.173 **Low Carbon Scotland: Meeting the Emissions Reduction Targets 2010-2022**[lxv], published on 14 March 2011, describes the measures identified to meet the emissions reduction targets established by the Climate Change (Scotland) Act 2009, over the period 2010-2022. By 2020 renewable electricity generation must account for at least 80% of gross electricity consumption.

5.174 On 27 June 2013 the Scottish Government published the **Low Carbon Scotland: Meeting the Emissions Reduction Targets 2013-2027: The Second Report on Proposals and Policies (RPP2)** [lxvi]. The report sets a decarbonisation target of 50 gCO2/kWh by 2030 to meet overall emissions targets. The Ministerial Foreword notes that the target set is challenging and that the decarbonisation of electricity is a key driver in the progress towards a low carbon economy. The report highlights that Scotland missed its annual carbon reduction target for 2011 by 0.8 million tonnes of carbon dioxide equivalent (CO_{2e}) having also missed its targets in 2010 by 1.1 million tonnes of CO_{2e}.

The 2020 Routemap for Renewable Energy in Scotland

5.175 On 30 June 2011, the **2020 Routemap for Renewable Energy in Scotland**[lxvii] was launched to drive forward the renewables revolution, and to meet the Scottish Government's world-leading green energy targets. As mentioned in Paragraph 5.170, the Routemap is an update and extension to the Renewables Action Plan 2009.

5.176 The updated Routemap reflects the challenge of a new target to meet an equivalent of 100% of demand for electricity from renewable energy by 2020 (equating to approximately 16 Gigawatts of installed renewable generation capacity), as well as the target of 11% renewable heat. With regards to onshore wind, the Routemap acknowledges the *"scale of the challenge"* (p.19) to meet the revised 2020 targets and identifies five main challenges to achieving this outcome: Scale of Overall Challenge; Electricity Market Reform; Transmission Boundary and Interconnection; Consents and Planning; and Supply Chain & Infrastructure.

5.177 In the Sectoral Routemaps, the onshore wind vision is the *"continued expansion of portfolio of onshore wind farms to help meet renewables target, with robust planning framework supporting timely processing of consents applications and ensuring wind farms are consented where they are environmentally acceptable"* (p.68). The Government's ambition is that by 2020, *"onshore wind developments ranging from small and community-scale to large power utility scale maximise engagement with communities; contribute electricity to renewables targets; and, through displacement of fossil fuel generation, help to reduce fossil fuel consumption"* (p.68).

5.178 To ensure the momentum of onshore wind deployment is kept, the Government identifies *"a key action will be to provide the right kind of financial support alongside a supportive planning system which provides clear spatial and policy direction, continues to engage local communities, and balances the need to protect the environment alongside the need to continue to make progress to renewable electricity targets"* (p.72).

5.179 Given the proven status of the technology, and the known and anticipated quantity of applications in the system, the Routemap notes that onshore wind is expected to provide the majority of capacity in the timeframe of the interim and 2020 renewable electricity targets.

5.180 An update report entitled **2020 Renewable Routemap for Scotland – Update**[lxviii] was issued on 30 October 2012 to report on the progress of the Routemap for Renewable Energy in Scotland. According to the Update, the Government estimates[4] that approximately 35% of Scotland's electricity needs are likely to have come from renewables in 2011, exceeding the 2011 interim target of 31%.

5.181 The Update further states that a new interim renewable electricity target of **50%** has been set for **2015**. Paragraph 1.4 of the update states that the Government is formally adopting this new interim target "as the next vital milestone in our journey towards the 2020 target of 100%". The Update states:

"the success of onshore wind, coupled with hydro and other renewables, remains a necessary precursor to our developing Scotland's huge offshore renewable potential. Without that success, without the 3GW plus of onshore renewables, we would not have succeeded as we have and would not be where we are poised to play the lead role in Europe in taking forward new forms of renewable energy as a world leader" (p.3).

5.182 The update also refers to the various challenges affecting the sector and deployment. Section 2.4 states: *"contrary to some claims by detractors, we estimate that less than 2% of Scotland's land mass will be required as a contribution by onshore wind towards meeting the 2020 target. Onshore wind – in the right areas – will also play a vital role in strengthening the grid, supply chain and other infrastructural components which emerging technologies, such as offshore wind, wave and tidal energy, will depend upon"* (p.10).

Electricity Generation Policy Statement 2013

5.183 In March 2012, the Scottish Government published its Draft Electricity Generation Policy Statement (EGPS) for consultation. The draft document builds on the Draft EGPS issued in 2010. The final version of the **Electricity Generation Policy Statement 2013**[lxix], published in June 2013, is constructed around a number of targets and requirements including:

- delivering the equivalent of at least 100% of gross electricity consumption from renewables by 2020;
- sourcing 11% of heat demand and 10% of transport fuels from renewables by 2020;
- ensuring a largely decarbonised electricity system by 2030;
- enabling local and community ownership of over 500MW of renewable energy by 2020;
- lowering energy consumption in Scotland by 12%
- demonstrating the possibility of carbon capture and storage at commercial scale by 2020; and
- providing interconnection and transmission upgrades to support the projected growth of renewable energy.

5.184 EGPS 2013 discusses the way in which Scotland currently generates electricity, and examines the changes which will be necessary to meet the Scottish Government's electricity generation target: *"Achieving the 100% target will require Scottish installed generation capacity to almost double over the 10 year period to 2020 – with wind (offshore and onshore) playing a critical role"* (Paragraph 107, p.35).

Renewable Energy – Audit Scotland Report

5.185 In September 2013, Audit Scotland published a new report entitled **Renewable Energy**[lxx]. The report highlights that *"the Scottish Government has made steady progress towards its renewable energy targets for 2020"* (Paragraph 41, p.24). and that *"meeting the renewable electricity target by 2020 relies on the continued expansion of wind technology"* (Paragraph 42, p.24)

5.186 According to the report, between 2000 and 2012 the average annual increase in the installed capacity of renewable electricity projects was 371MW. However, installed capacity has increased more rapidly in recent years. The average annual capacity addition in the five years to 2012 was 634MW per year. Paragraph 45 states, *"If it continues to increase at the rate it has over the last five years, we estimate that there will be enough installed capacity in 2015 to generate the renewable electricity needed to meet the Scottish Government's interim target of 50 per cent of electricity demand from renewable sources"* (p.26).

5.187 However, the report also states that this growth rate will deliver only about 10,900MW of installed capacity by 2020, which is at least 3,100MW short of what is required to meet the 2020 target. *"Achieving the 2020 target requires average annual increases in installed capacity of at least 1,250MW between 2015 and 2020 – double the rate achieved over the last five years"* (Paragraph 45, p.26).

5.188 To meet the 2020 target, the Scottish Government estimates that renewable energy projects with a total installed capacity of between 14,000MW to 16,000MW are needed. If all the 293 projects under consideration or with planning permission at March 2013 reach completion before 2020, meeting the target would still require at least a further 3,733MW of installed capacity. The report also highlighted that at March 2013, there were a further 369 projects, with a total installed capacity of 8,639MW. However, it is unlikely that all of these projects will proceed, as they may fail to secure planning permission or finance.

Conclusion

5.189 This chapter sets out the national, strategic and local planning policies and guidance considered relevant to the application for Creag a' Bhàird Wind Farm.

5.190 It provides an impartial summary of the planning considerations to be taken into account in determining the planning application for Creag a' Bhàird Wind Farm. It presents the relevant policies in the approved Development Plan, examines the emerging policy position and identifies relevant material considerations. It also presents the legislative and strategic policy position to provide the renewable energy and planning policy context for proposed development.

5.191 This chapter does not assess whether Creag a' Bhàird Wind Farm will comply with the identified policies, or the weight to be given to the material considerations. This is undertaken in a separate Planning Statement which accompanies the planning application.

[4] Consumption figures will not be published until December 2013.

[i] The Town and Country Planning (Scotland) Act 1997. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/ukpga/1997/8/contents [Accessed 10 November 2013].
[ii] The Planning etc. (Scotland) Act 2006. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/asp/2006/17/contents [Accessed 05 November 2013].
[iii] The Town and Country Planning (Hierarchy of Developments) (Scotland) Regulations 2009. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/ssi/2009/51/contents/made [Accessed 05 November 2013].

[iv] Strategic Development Planning Authority for Dundee, Angus, Perth and North Fife, 2012. *TAYplan Strategic Development Plan 2012-2032*. Dundee: Strategic Development Authority.

[v] Perth and Kinross Council, 2000. *Highland Area Local Plan 2000.* Perth: Perth and Kinross Council.
[vi] Perth and Kinross Council, 2012. *Proposed Plan: Local Development Plan.* Perth: Perth and Kinross Council.

[vii] Land Use Consultants, 1999. *Tayside Landscape Character Assessment.* Scottish Natural Heritage Review No. 122. Perth: Scottish Natural Heritage.

[viii] Scottish Government, 2009. *National Planning Framework for Scotland 2.* Edinburgh: Scottish Government.

[ix] Scottish Government, 2010. *Scottish Planning Policy*. Edinburgh: Scottish Government.

[x] Natural Heritage (Scotland) Act 1991. London: Her Majesty's Stationery Office. [online] Available at: http://www.legislation.gov.uk/ukpga/1991/28/contents [Accessed 07 November 2013].

[xi] The Conservation (Natural Habitats, &c.) Regulations 1994. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/uksi/1994/2716/regulation/3/made[Accessed 10 November 2013].
[xii] The Conservation (Natural Habitats, &c.) Regulations 2007. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/ssi/2007/80/contents/made [Accessed 05 November 2013].

[xiii] Historic Scotland, 2009. *Scottish Historic Environment Policy.* Edinburgh: Historic Scotland.

[xiv] Perth and Kinross Council, 2012. *Proposed Plan: Local Development Plan.* Perth: Perth and Kinross Council.
[xv] Perth and Kinross Council, 2005. *Supplementary Planning Guidance for Wind Energy Proposals in Perth and Kinross.* Perth: Perth and Kinross Council.
[xvi] Scottish Government, 2013. *Planning Advice Note 1/2013: Environmental Impact Assessment.* Edinburgh: Scottish Government.

[xvii] Scottish Government, 2011. *Planning Advice Note 2/2011: Planning and Archaeology.* Edinburgh: Scottish Government.

[xviii] Scottish Government, 2011. *Planning Advice Note 1/2011: Planning and Noise*. Edinburgh: Scottish Government.

[xix] Scottish Government, 2010. *Planning Advice Note 3/2010: Community Engagement*. Edinburgh: Scottish Government.

[xx] Scottish Executive, 2006. *PAN 51: Planning, Environmental Protection and Regulations (Revised 2006).* Edinburgh: Scottish Executive.

[xxi] Scottish Executive, 2005. *PAN 61: Planning and Sustainable Urban Drainage Systems.* Edinburgh: Scottish Executive.

[xxii] Scottish Executive, 2005. *PAN 75: Planning for Transport.* Edinburgh: Scottish Executive.

[xxiii] Scottish Executive, 2000. *PAN 60: Planning for Natural Heritage.* Edinburgh: Scottish Executive.

[xxiv] Scottish Executive, 1996. *PAN 50: Controlling the Environmental Effects of Surface Mineral Workings*. Edinburgh: Scottish Executive.

[xxv] Scottish Executive, 2006. *Planning Advice Note 45: Renewable Energy Technologies.* Edinburgh: Scottish Executive.

[xxvi] Scottish Government, 2013. *Onshore Wind Turbines.* [pdf] Edinburgh: Scottish Government. Available at: http://www.scotland.gov.uk/Resource/0042/00427805.pdf [Accessed 07 November 2013]
[xxvii] Scottish Government, 2012. *Process for Preparing Spatial Frameworks for Wind Farms.* [pdf] Edinburgh: Scottish Government. Available at: http://www.scotland.gov.uk/Resource/0040/00400726.pdf [Accessed 07 November 2013]
[xxviii] Scottish Government, 2013. *NPF3 Main Issues Report & Draft Framework.* Edinburgh: Scottish Government.
[xxix] Scottish Government, 2013. *Scottish Planning Policy Consultation Draft.* Edinburgh: Scottish Government.
[xxx] Scottish Government, 2013. *Draft Scottish Planning Policy: 'Sustainability and Planning' Consultation*. Edinburgh: Scottish Government

[xxxi] United Nations Framework Convention on Climate Change, 1997. *United Nations Framework Convention on Climate Change – Kyoto Protocol.* [pdf] Available at: http://unfccc.int/resource/docs/convkp/kpeng.pfd [Accessed 17 November 2013].

[xxxii] United Nations Framework Convention on Climate Change, 2012. *Doha Amendment to the Kyoto Protocol.* [pdf] Available at: http://unfccc.int/files/kyoto_protocol/application/pdf/kp_doha_amendment_english.pdf [Accessed 10 November 2013].
[xxxiii] United Nations Intergovernmental Panel on Climate Change, 2013. *Working Group I Contribution to the IPCC Fifth Assessment Report Climate Change 2013: The Physical Science Basis: Summary for Policymakers.* [pdf] Available at: http://www.climatechange2013.org/images/uploads/WGIAR5-SPM_Approved27Sep2013.pd [Accessed 10 November 2013].

[xxxiv] European Union, 2009. *Directive 2009/28/EC of the European Parliament and of the Council on the promotion of the use of energy from renewable sources and amending and subsequently repealing Directives 2001/77/EC and 2003/30/EC*. [pdf] Available at: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=Oj:L:2009:140:0016:0062:en:PDF [Accessed 10 November 2013].

[xxxv] European Renewable Energy Council, 2013. *EU Tracking Roadmap 2013: Keeping Track of Renewable Energy Targets Towards 2020*. Brussels: European Renewable Energy Council.
[xxxvi] Najdawi, C., Banasiak, J., Spitzley, J. B., & Steinhilber, S., 2013. *Keep-On-Track! Project: Analysis of Deviations and Barriers 2013*. Brussels: European Renewable Energy Council.
[xxxvii] European Renewable Energy Council, 2013. *2013 Policy Recommendations Report.* Brussels: European Renewable Energy Council.

[xxxviii] Her Majesty's Government, 2000. *Climate Change: The UK Programme.* London: The Stationery Office.

[xxxix] Her Majesty's Government, 2006. *Climate Change: The UK Programme 2006.* London: The Stationery Office.

[xl] Department of Energy and Climate Change, 2007. *Energy White Paper 2007: 'Meeting the Energy Challenge'.* London: Department of Energy and Climate Change.

[xli] Climate Change Act 2008. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/ukpga/2008/27/contents [Accessed 10 November 2013].

[xlii] Energy Act 2008. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/ukpga/2008/32/contents [Accessed 12 November 2013].

[xliii] Department of Energy and Climate Change, 2006. *Energy Review 2006: 'The Energy Challenge'.* London: Department of Energy and Climate Change.

[xliv] Department of Energy and Climate Change, 2007. *Energy White Paper 2007: 'Meeting the Energy Challenge'.* London: Department of Energy and Climate Change.

[xlv] Department of Energy and Climate Change, 2009. *The UK Renewable Energy Strategy*. London: Department of Energy and Climate Change.

[xlvi] Department of Energy and Climate Change, 2009. *The UK Low Carbon Transition Plan.* London: Department of Energy and Climate Change.

[xlvii] Department of Energy and Climate Change, 2010. *Annual Energy Statement*. London: Department of Energy and Climate Change.

[xlviii] Department of Energy and Climate Change, 2010. *2050 Pathways Analysis Report.* London: Department of Energy and Climate Change.

[xlix] Department of Energy and Climate Change, 2010. *National Renewable Energy Action Plan for the United Kingdom*. London: Department of Energy and Climate Change.

[l] Department of Energy and Climate Change, 2011. *Carbon Plan*. London: Department of Energy and Climate Change.
[li] Committee on Climate Change, 2013. *Fifth Annual Progress Report of the Committee on Climate Change: Meeting the Carbon Budgets – 2013 Progress Report to Parliament.* London: Committee on Climate Change.

[lii] Committee on Climate Change, 2011. *Renewable Energy Review.* London: Committee on Climate Change.

[liii] Department of Energy and Climate Change, 2011. *UK Renewable Energy Roadmap*. London: Department of Energy and Climate Change.

[liv] Department of Energy and Climate Change, 2013. *UK Renewable Energy Roadmap Update 2013.* London: Department of Energy and Climate Change.
[lv] Energy Act 2011. London: The Stationery Office. [online] Available at: http://www.legislation.gov.uk/ukpga/2011/16/contents/enacted [Accessed 05 November 2013].
[lvi] Department for Energy and Climate Change, 2012. *Annual Energy Statement 2012*. London: Department of Energy and Climate Change.
[lvii] Department for Energy and Climate Change, 2013. *Annual Energy Statement 2013*. London: Department of Energy and Climate Change.
[lviii] Department for Energy and Climate Change, 2013. *Consultation on the draft Electricity Market Reform Delivery Plan*. London: Department of Energy and Climate Change.
[lix] Energy Bill 2012-13 to 2013-14. London: The Stationery Office. [online] Available at: http://services.parliament.uk/bills/2013-14/energy.html[Accessed 13 November 2013].

[lx] Climate Change (Scotland) Act 2009. London: Her Majesty's Stationery Office. [online] Available at: http://www.legislation.gov.uk/asp/2009/12/contents [Accessed 14 November 2013].

[lxi] Scottish Government, 2009. *Climate Change Delivery Plan 2009: Meeting Scotland's Statutory Climate Change Targets*. Edinburgh: Scottish Government.

[lxii] Scottish Government, 2009. *Renewables Action Plan.* Edinburgh: Scottish Government.

[lxiii] Scottish Government, 2010. *Conserve and Save: The Energy Efficiency Action Plan.* Edinburgh: Scottish Government.
[lxiv] Scottish Government, 2010. A *Low Carbon Economic Strategy for Scotland: 'Scotland – A Low Carbon Society'.* Edinburgh: Scottish Government.
[lxv] Scottish Government, 2011. *Low Carbon Scotland - Meeting the Emissions Reduction Targets 2010-2022.* Edinburgh: Scottish Government.
[lxvi] Scottish Government, 2013. *Low Carbon Scotland: Meeting the Emissions Reduction Targets 2013-2027: The Second Report on Proposals and Policies (RPP2).* Edinburgh: Scottish Government.

[lxvii] Scottish Government, 2011. *2020 Routemap for Renewable Energy in Scotland.* Edinburgh: Scottish Government.

[lxviii] Scottish Government, 2012. *Update to 2020 Routemap for Renewable Energy.* Edinburgh: Scottish Government.
[lxix] Scottish Government, 2013. *Electricity Generation Policy Statement 2013.* Edinburgh: Scottish Government.
[lxx] Audit Scotland, 2013. *Renewable Energy.* Edinburgh: Audit Scotland.

6 Landscape and Visual

Introduction

6.1 This chapter considers the potential effects of the proposed Creag a' Bhàird Wind Farm on:

- the landscape as a resource in its own right (caused by changes to the constituent elements of the landscape, its specific aesthetic or perceptual qualities and the character of the landscape); and
- views and visual amenity as experienced by people (caused by changes in the appearance of the landscape).

6.2 This chapter deals with landscape and visual effects separately, followed by an assessment of cumulative effects.

6.3 The assessment has been undertaken by chartered Landscape Architects at LUC.

6.4 This chapter should be read in conjunction with the following chapters: **Chapter 3: Site Selection and Design Strategy**, **Chapter 4: Scheme Description**, **Chapter 11: Archaeology and Cultural Heritage**, **Chapter 9: Ecology**, **Chapter 13: Socio-Economics**.

Study Area Description

6.5 The site is located in Perth and Kinross, around 8km west of Dunkeld, at the south-west edge of Griffin Wind Farm. The site location is shown in **Figure 1.1**. Creag a' Bhàird Wind Farm comprises 13 turbines, 115m to tip, and is described in detail in **Chapter 4**. The study area for the LVIA was agreed with Perth and Kinross Council (PKC) and Scottish Natural Heritage (SNH) to be a 35km radius from the proposed turbine locations. The landscape and visual study area is shown in **Figure 6.1**.

6.6 A zone of theoretical visibility (ZTV) map was generated, illustrating areas from where the proposed wind turbines may be visible in the landscape. The turbines will not be visible from locations outside the ZTV, and these locations are therefore not considered further. The ZTV to turbine tip height is shown in **Figure 6.1** and the ZTV to turbine hub height is shown in **Figure 6.2**.

6.7 In line with SNH guidance, the cumulative assessment initially considers wind farms within a 60km radius study area from the wind farm site, to identify the distribution of wind energy development in the wider area. The assessment of effects focuses on developments that are likely to give rise to significant cumulative effects, and therefore concentrates on a more localised set of operational and proposed developments, including the operational Griffin and Calliachar wind farms, and the proposed Calliachar North and Crossburns Wind Farms, the latter of which is currently at scoping stage. Single turbines in the area were given consideration where it was judged that cumulative effects had the potential to be significant, due to proximity and inter-visibility. Cumulative effects on landscape character and on viewers are assessed.

6.8 A more detailed examination of effects on views from residential properties was carried out. This focused on all dwellings within 2.6km of the proposed turbine locations, again as agreed with PKC and SNH. The residential assessment is presented in **Appendix 6.1**.

Effects Assessed in Full

6.9 The following effects have been assessed in full, as agreed with PKC and SNH, and in accordance with the principles contained within the Guidelines for Landscape and Visual Impact Assessment, 3rd Edition[i] (hereafter referred to as GLVIA3):

- effects of Creag a' Bhàird Wind Farm on landscape elements within the site boundary;
- effects of Creag a' Bhàird Wind Farm on landscape character within 35km of the turbines, and within the ZTV;
- effects of Creag a' Bhàird Wind Farm on viewers which are within 35km of the turbines, and which are within the ZTV; and
- cumulative effects of Creag a' Bhàird Wind Farm in the context of other existing and proposed wind farm and wind turbine developments.

Effects Scoped Out

6.10 The following effects have been scoped out, as agreed with PKC and SNH and in accordance with established practice:

- effects on landscape character over 35km from the turbines;
- effects on viewers at greater distances than 35km from the turbines; and
- effects on character and views from locations, including settlements and routes, which are outside the ZTV.

Constraints/Assumptions

6.11 Properties included within the residential assessment presented in **Appendix 6.1** were generally viewed from publically accessible locations. It was therefore not possible to verify the orientation or primary outlook of every property, and assumptions have been made regarding these aspects.

Assessment Methodology

Assessment Structure

6.12 The remainder of the chapter is structured as follows:

- Methodology;
- Planning Policy;
- Existing Conditions (Landscape Baseline);
- Wind Farm Layout Design Considerations;
- Landscape Assessment;
- Implications for Designated Areas;
- Existing Conditions (Visual Baseline);
- Visual Assessment;
- Cumulative Effects Assessment;
- Further Survey Requirements and Monitoring; and
- Statement of Significance.

Methodological Overview

6.13 The key steps in the methodology for assessing both landscape and visual effects were as follows:

- the landscape of the study area was analysed and landscape receptors identified;
- the area in which the development may be visible was established through creation of a ZTV covering a distance of up to 35km from the proposed turbines;
- the visual baseline was recorded in terms of the different groups of people who may experience views of the development, the places where they will be affected and the nature of views and visual amenity;
- viewpoints were selected (including representative viewpoints, specific viewpoints and illustrative viewpoints), and agreed with PKC and SNH;
- likely significant effects on landscape and visual resources were identified; and
- the level and significance of landscape and visual effects were judged with reference to the sensitivity of the resource/receptor (its susceptibility and value) and magnitude of effect (a combination of the scale of effect, geographical extent and duration/reversibility).

Data Sources

- Ordnance Survey (OS) Maps.
- OS Mastermap Address Layer 2 data.
- OS 'Panorama' Digital Terrain Model.
- Land Use Consultants (1999) Tayside Landscape Character Assessment. Scottish Natural Heritage Review No.122[ii].
- Ash Consulting Group (1999) Central Region Landscape Character Assessment. SNH Review No.123[iii].
- Alison Grant (2009) Cairngorms National Park Landscape Character Assessment[iv]; and
- David Tyldesley and Associates (2004) Landscape Study Windfarm Development in the Ochil Hills and part of Southern Highland Perthshire. Perth and Kinross Council and Clackmannanshire Council[v].

Guidance

6.14 The landscape and visual impact assessment (LVIA) has been carried out in accordance with the principles contained in:

- Landscape Institute and the Institute of Environmental Management & Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition[i];
- Landscape Institute Advice Note 01/11 Photography and photomontage in landscape and visual impact assessment[vi];
- Scottish Natural Heritage (2003) Wildness in Scotland's Countryside, Policy Statement No. 02/03[vii];
- Scottish Natural Heritage (2005) Constructed Tracks in the Scottish Uplands[viii];
- Scottish Natural Heritage (2006) Visual Representation of Windfarms, Good Practice Guidance. Prepared by Horner & Maclennan / Envision[ix];
- Scottish Natural Heritage (2007) Assessing the Impacts on Wild Land, Interim Guidance Note[x];
- Scottish Natural Heritage (updated 2009) Policy Statement No 02/02: Strategic Locational Guidance for Onshore Windfarms in Respect of the National Heritage[xi];
- Scottish Natural Heritage (2009) Siting and Designing Windfarms in the Landscape[xii];
- Scottish Natural Heritage (2010) Good Practice During Windfarm Construction[xiii];
- Scottish Natural Heritage (2011) A Handbook on Environmental Impact Assessment, Appendix 1: Landscape and Visual Impact Assessment[xiv];
- Scottish Natural Heritage (2012) Assessing the cumulative impact of onshore wind energy development[xv];
- The Countryside Agency and Scottish Natural Heritage (2002) Landscape Character Assessment: Guidance for England and Scotland[xvi];
- Perth and Kinross Council Guidance for the Preparation and Submission of Photographs and Photomontages to illustrate the impacts of Wind Energy Development for inclusion in Planning Applications and Environmental Statements[xvii]; and
- Perth and Kinross Council Landscape and Ecological Mitigation of Renewable Energy On-site Infrastructure[xviii].

Method for Visualisations and Modelling

6.15 The methodology for production of the visualisations was based on current SNH guidance[xix]. Further information about the approach is provided in **Appendix 6.2**.

Field Survey

6.16 Site visits were undertaken in April, July and October 2013.

Consultation

6.17 Initial consultation with PKC and SNH, on the scope of the LVIA, was undertaken in August 2012. A Scoping Report was subsequently sent to PKC, who issued a Scoping Opinion in May 2013. Further consultation to confirm the detailed scope of the LVIA took place in August, September and October 2013. Details of specific issues raised during consultation relating to the LVIA are set out in **Table 6.1** below.

Table 6.1: Consultation Responses

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
PKC	LVIA consultation response, 24 August 2012	Lists guidance documents to be referred to.	Noted, these are listed where appropriate.
		Concerned that there are no viewpoints to the north of the site.	Creag a' Bhàird Wind Farm will be behind Griffin when viewed from the north. Further viewpoint locations have been added.
		Requirement to demonstrate rationale for site and turbine selection and site design.	Set out in **Chapter 3**.
		Residents, road users on tourist routes, visitors to tourist attractions/view points and hill walkers are of High sensitivity. General road users are considered to be of Medium sensitivity.	Noted.
SNH	LVIA consultation response, 9 September 2012	The relationship between Craig a' Bhàird, Griffin and Calliachar wind farms will be important.	Noted.
		Suggest viewpoints at Ben Vrackie and Schiehallion	These viewpoints have been included.
		Effects on the Cairngorms National Park should be considered.	Views from the NP are represented by Viewpoint 17 – Carn Liath.
		Views from settlements to the east (Coupar Angus / Newtyle) should be represented by viewpoints.	Additional viewpoints included.
		Note emerging cluster of wind farms around Drumderg in Angus.	Noted.
		Highlight need for sequential assessment along tourist routes within 60km.	Noted.
PKC	Scoping Opinion issued 13 May 2013	Draws attention to relevant guidance, including PKC guidance on photography.	Noted.
		Requests a ZTV to 60km detailing locations of operational, consented, in planning and scoped wind farms.	Cumulative information to 60km would not normally be presented on a ZTV, and is shown in **Figure 6.5**. The cumulative ZTV is shown in **Figures 6.7 – 6.9**.

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		Requests a residential study be carried out for all properties within 2.6km and within the ZTV. To be supported by wirelines.	The residential study has been carried out and it presented in **Appendix 6.1**.
SNH	Scoping Opinion issued 7 May 2013	Advises the site is within Zone 2 of SNH's Strategic Locational Guidance (medium natural heritage sensitivity).	Noted.
		Suggests a 60km search area, but requests the cumulative assessment be focused and proportionate.	Cumulative wind farms within 60km are shown in **Figure 6.5**. Wind farms included within this assessment are shown in **Figure 6.6**.
		Highlights need for wind farm design to reflect Griffin Wind Farm.	Noted, refer to **Chapter 3.**
		Draws attention to recently published draft Core Areas of Wild Land Character.	Noted. Discussed in Paragraph 6.26 Landscape Value.
		Agrees 35km study area. Notes all viewpoints should be considered cumulatively.	The potential for cumulative effects has been considered from all viewpoints.
		Suggests viewpoints at Ben Chonzie, Farragon Hill and the minor road by Newtyle.	Additional viewpoints at Ben Chonzie and the minor road by Newtyle included. Wireline only included from Farragon Hill.
		Advises need for clear photographs, and micrositing of viewpoint locations to show "worst case".	Viewpoint photography has been undertaken in clear weather conditions.
		Advise that projects at scoping should be shown on the 60km map, and included in the assessment where relevant. Also recommends smaller turbines in the local area be considered. Notes that the cumulative assessment should focus on the most relevant schemes.	Projects at scoping have been included in **Figure 6.5**. Single turbines greater than 60m height to tip have been included within 25km.
SNH	LVIA consultation response, 29 August 2013	Suggests viewpoints at A9, Farragon Hill and Newtyle could be illustrated with wireframes.	Wireframes from Farragon Hill and the minor road near Newtyle have been included. There are no viewpoints on the A9 as visibility is limited to 1-2 turbines theoretically visible from a very short section of the A9 to the west of Perth, approximately 22.5km from Creag a' Bhàird Wind Farm.
		Suggests additional viewpoints at Meall nan Fuaran and Carn Liath.	Additional viewpoints included.
		Advises that the cut-off date for inclusion of relevant schemes is the date of submission.	Noted.
		Highlights that the Perthshire Tourist Route includes the A826 and A822. Recommend consideration of the A94 and the Rob Roy Way.	Noted. A826 and A822 are considered in the sequential assessment. There is very limited theoretical visibility from the Rob Roy Way, and no significant effects are anticipated from the A94 therefore these routes have not been included in the assessment.
PKC	LVIA consultation response, 30 September 2013	Suggests additional viewpoints at Meall nan Fuaran and Carn Liath.	Additional viewpoints included.
SNH	LVIA consultation response, 2 October 2013	Suggest Ben Chonzie and possibly Carn Liath should also be used as a photomontage location.	Noted, however wirelines only have been provided.
		Recommend using a full frame camera with a 50mm fix focal length lens for all viewpoint photography	Noted.
PKC	LVIA consultation response, 3 October 2013	List of cumulative sites provided.	Wind farms included within this assessment are shown in **Figure 6.6**.
SNH	LVIA consultation response, 8 October 2013	Request that hard copies of single frame images are submitted with the ES.	Noted.

Assessing Significance of Effects on the Landscape

6.18 Judging the significance of landscape effects requires consideration of the nature of the landscape receptors (sensitivity) and the nature of the effect on those receptors (magnitude).

6.19 GLVIA3 states that the nature of landscape receptors, commonly referred to as their sensitivity, should be assessed in terms of the susceptibility of the receptor to the type of change proposed, and the value attached to the receptor. The nature of the effect on each landscape receptor, commonly referred to as its magnitude, should be assessed in terms of its size and scale, geographical extent, duration and reversibility.

6.20 These six aspects are considered together, to form a judgement regarding the overall level and significance of effect (further information relating to this step is contained in paragraph 6.34). The following sections set out the methodology used to evaluate susceptibility, value, size and scale, geographical extent, duration and reversibility.

Susceptibility of the landscape receptor

6.21 Susceptibility means "*the ability of the landscape receptor (whether it be the overall character or quality/condition of a particular type or area, or an individual element and/or feature, or a particular aesthetic and perceptual aspect) to accommodate the proposed development without undue*[1] *consequences for the maintenance of the baseline situation and/or the achievement of landscape planning policies and strategies*" (GLVIA 3 para. 5.40).

[1] Undue can be interpreted as 'disproportionate'.

6.22 For wind energy development, a series of criteria are used to evaluate susceptibility of landscape character types to wind energy development. These criteria are drawn from a range of published sources relating to wind farm development, including Siting and Designing Windfarms in the Landscape and GLVIA3. The criteria are set out in **Table 6.2**.

Table 6.2: Criteria to Determine Susceptibility to Wind Turbines

Characteristic/ attribute	Aspects indicating lower sensitivity to wind energy development	↔	Aspects indicating higher sensitivity to wind energy development
Scale	Large scale	↔	Small scale
Landform	Absence of strong topographical variety Featureless, convex or flat	↔	Presence of strong topographical variety or distinctive landform features
Landscape pattern and complexity	Simple Regular or uniform	↔	Complex Rugged and irregular
Settlement and man-made influence	Presence of contemporary structures e.g. utility, infrastructure or industrial elements	↔	Absence of modern development Presence of small scale, historic or vernacular settlement
Skylines	Non-prominent /screened skylines Presence of existing modern man-made features	↔	Distinctive, undeveloped skylines Skylines that are highly visible over large areas or exert a large influence on landscape character Skylines with important historic landmarks
Inter-visibility with adjacent landscapes	Little inter-visibility with adjacent sensitive landscapes or viewpoints	↔	Strong inter-visibility with sensitive landscapes Forms an important part of a view from sensitive viewpoints
Perceptual aspects	Close to visible or audible signs of human activity and development	↔	Remote from visible or audible signs of human activity and development

6.23 Published landscape capacity or sensitivity studies were reviewed to inform the evaluation of susceptibility of the receptor. The review included an evaluation as to the relevance of the publication to the assessment (e.g. consideration of the purpose and scope of the published studies and whether they have become out of date).

6.24 The 2004 'Landscape Study Windfarm Development in the Ochil Hills and part of Southern Highland Perthshire' [v] included more detailed classification of landscape character across part of Perth and Kinross. This was primarily undertaken to inform an assessment of sensitivity to wind energy development, and its findings are therefore of some relevance to this LVIA (see Existing Conditions (Landscape Baseline) below).

6.25 Judgements on susceptibility of receptors (which may include individual features or areas) are recorded as **high**, **medium** or **low** according to the definitions in **Table 6.3** below.

Table 6.3: Susceptibility of Landscape Receptors

Susceptibility	Description
High	Attributes that make up the character of the landscape offer very limited opportunities for the accommodation of change without key characteristics being fundamentally altered, leading to a different landscape character
Medium	Attributes that make up the character of the landscape offer some opportunities for the accommodation of change without key characteristics being fundamentally altered
Low	Attributes that make up the character of the landscape are resilient to being changed by wind energy development

Value of the landscape receptor

6.26 Value of receptors is determined with reference to:

- review of designations and the level of policy importance that they signify (such as landscapes designated at international, national or local level); and/or
- application of criteria that indicate value (such as scenic quality, rarity and recreation value) as described in GLVIA3 para. 5.44-5.47.

6.27 Judgements on value are recorded as **high**, **medium** or **low**, guided by the table below.

Table 6.4: Definitions of Landscape Value

Value	Description
High	A rare or unique landscape character type (LCT), which may be of high scenic quality, it may be a designated landscape with international or national policy level protection
Medium	A landscape with some rarity or scenic quality, it may be a regionally or locally designated landscape.
Low	A widespread or 'common' LCT without high scenic quality, it is likely to be an area without formal designation.

Size and Scale of Effect

6.28 For landscape elements/features this depends on the extent of existing landscape elements that will be lost or changed, the proportion of the total extent that this represents and the contribution of that element to the character of the landscape.

6.29 In terms of landscape character, this reflects the degree to which the character of the landscape will change by removal or addition of landscape components, and how the changes will affect key characteristics.

6.30 In this assessment of size/scale is described as being **imperceptible**, **small**, **medium** or **large**.

Geographical Extent of Effect

6.31 Geographical extent over which the landscape effect will be felt is described as being at the **site level**, at the level of the **immediate surroundings** of the site, at the scale of the **landscape type/character area**, or on a **larger scale** affecting several landscape types or character areas.

Duration of Effect

6.32 GLVIA3 states that "*Duration can usually be simply judged on a scale such as short term, medium term or long term*." For the purposes of this assessment, duration has been determined in relation to the phases of the proposed development, as follows:

- **short-term** effects are those that occur during construction, and may extend into the early part of the operational phase, e.g. construction activities;
- **medium-term** effects are those that occur during part of the operational phase, e.g. relating to mitigation planting, where effects may cease on maturation of planting; and

- **long-term** effects are those which occur throughout the operational phase, e.g. presence of turbines, or are permanent effects which continue after the operational phase, e.g. relating to the turbines.

Reversibility of Effect

6.33 In accordance with the principles contained within GLVIA3, reversibility is reported as **reversible**, **partially reversible** or **not reversible** (i.e. permanent), and is related to whether the change can be reversed at the end of the phase of development under consideration (i.e. at the end of the construction or at the end of the operational lifespan of the development).

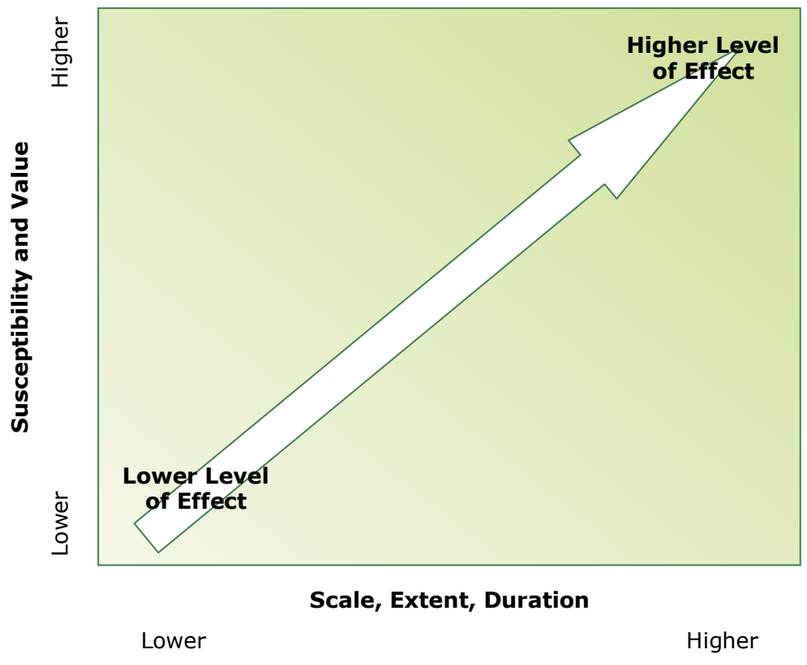
Judging Levels of Effect and Significance

6.34 The evaluations of the individual aspects set out above (susceptibility, value, size and scale, geographical extent, duration and reversibility) were considered together to provide an overall profile of each identified effect, in accordance with the principles contained within GLVIA3. An overview was then taken of the distribution of judgements for each aspect, to make an informed professional assessment of the overall level of each effect.

6.35 Although a numerical or formal weighting system was not applied, consideration of the relative importance of each aspect was made to feed into the overall decision. Levels of effect are identified as **negligible, minor, moderate** or **major** where moderate and major effects are considered **significant** in the context of the EIA Regulations.

6.36 The determination of levels of impact requires the application of professional judgement and experience to take on board the many different variables which need to be considered, and which are given different weight according to site-specific and location-specific considerations in every instance. Judgements are made on a case by case basis, guided by the principles set out in **Diagram 6.1**. A rigid matrix-type approach, which does not consider professional judgement and experience, and where level of impact is defined simply based on the level of sensitivity combined with the magnitude of change, is not used. As such, the conclusion on level of impact is not always the same.

Diagram 6.1: Judging the significance of the effect



Direction of Effects

6.37 The direction of effect (**positive**, **negative** or **neutral**) is determined in relation to the degree to which the proposal fits with landscape character and the contribution to the landscape that the development makes, even if it is in contrast to existing character.

6.38 For the purposes of this assessment, potential landscape impacts are considered to be adverse (negative) due to the nature and scale of the proposal mainly comprising the introduction of a wind farm into a forested upland landscape. It is noted that the compatibility of the proposed development with the operational Griffin Wind Farm will be a key factor in determining how it is accepted into the landscape. Some elements of the development may be beneficial (e.g. the re-establishment of forestry within the site to current design standards), and this has been indicated in the text where applicable.

Assessing Significance of Visual Effects

6.39 Visual effects are experienced by people at different locations around the study area. Visual receptors are the people who will be affected by changes in views of visual amenity at different places, and they are usually grouped by what they are doing at that place (residents, motorists, recreational users etc).

6.40 Judging the significance of visual effects requires consideration of the nature of the visual receptors (sensitivity) and the nature of the effect on those receptors (magnitude).

Assessment of Effects

6.41 GLVIA3 states that the nature of visual receptors, commonly referred to as their sensitivity, should be assessed in terms of the susceptibility of the receptor to change in views/ visual amenity and the value attached to particular views. The nature of the effect should be assessed in terms of the size and scale, geographical extent, duration and reversibility of the effect.

6.42 These six aspects are considered together, to form a judgement regarding the overall significance of effect (further information relating to this step is contained in paragraph 6.34). The following sections set out the methodology used to evaluate susceptibility, value, size and scale, geographical extent, duration and reversibility.

Susceptibility of the Receptor

6.43 The susceptibility of visual receptors to changes in views/ visual amenity is a function of the occupation or activity of people experiencing the view and the extent to which their attention is focussed on views (GLVIA3, para 6.32). This is recorded as **high**, **medium** or **low** according to the table below.

Table 6.5: Susceptibility of Visual Receptors

Susceptibility	Receptor Group
High	Viewers whose attention or interest is focussed on their surroundings, including: • communities where views contribute to the landscape setting enjoyed by residents[2]; • people engaged in outdoor recreation (including users of public rights of way whose interest is likely to be focussed on the landscape); • visitors to heritage assets or other attractions where views of surroundings are an important contributor to experience; and • travellers on scenic routes where attention is focussed on the surrounding landscape.
Medium	Travellers on road, rail or other transport routes where attention is not focussed on the surrounding landscape; people at their place of work whose attention is not on their surrounding but where setting is important to the quality of working life.
Low	People engaged in outdoor sport or recreation which does not involve or depend upon appreciation of views of the landscape; people at their place of work whose attention is not on their surrounding (and where setting is not important to the quality of working life).

[2] Residents at home are also considered to have high sensitivity and these are included in the Residential Visual Amenity Assessment in Appendix 6.1.

Value of the view

6.44 Recognition of the value of a view is determined with reference to:

- planning designations specific to views;
- whether it is recorded as important in relation to designated landscapes (such as views specifically mentioned in the special qualities of a National Scenic Area);
- whether it is recorded as important in relation to heritage assets (such as designed views recorded in citations of Registered Parks and Gardens, or views recorded as of importance in Conservation Area Appraisals);
- the value attached to views by visitors, for example through appearances in guide books or on tourist maps, provision of facilities for their enjoyment and references to them in literature and art.

6.45 Judgements on value of views are recorded as **high**, **medium** or **low**, according the table below.

Table 6.6: Definitions of Value Attached to Views

Value	Description
High	A designated viewpoint or scenic route advertised on OS maps and in tourist information, or which is a significant destination in its own right, such as a Munro summit. It may be recognised in relation to the special qualities of a designated landscape or heritage asset, or it may be a view familiar from photographs or paintings.
Medium	A viewpoint which may be marked on OS maps or tourist information, but which is less well recognised in special qualities or artworks. Or, a viewpoint not advertised but which is a destination, such as a hill summit, or a location provided with interpretation which indicates its value.
Low	Viewpoints or routes not recognised formally or advertised in tourist information, or which are not provided with interpretation or, in some cases, formal access.

Size and Scale of Effect

6.46 This depends on:

- the scale of the change in view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the proposed development;
- the degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture;
- the nature of the view of the proposed development, in terms of whether views will be full, partial or glimpses.

6.47 All effects are assumed to be during winter, being the 'worst case' situation with minimal screening by vegetation and deciduous trees.

6.48 In this assessment size/scale is described as being **imperceptible**, **small**, **medium** or **large**.

Geographical Extent of Effect

6.49 This records the extent of the area over which the changes would be visible e.g. whether there is only one point from where the development can be glimpsed, or whether it represents a large area from which similar views are gained.

6.50 The geographical extent is considered in terms of whether it will be **widespread** or **localised**, i.e. at a regional or local level, or associated with the more immediate setting of the site.

Duration of Effect

6.51 Duration is reported as **short term**, **medium term** or **long term**, as defined at paragraph 6.32.

Reversibility of Effect

6.52 Reversibility is reported as **reversible**, **partially reversible** or **not reversible** (i.e. permanent), and is related to whether the change can be reversed at the end of the phase of development under consideration (i.e. at the end of the construction or at the end of the operational lifespan of the development).

Judging the Level of Effect and Significance

6.53 The evaluations of the individual aspects set out above (susceptibility, value, size and scale, geographical extent, duration and reversibility) were considered together to provide an overall profile of each identified effect. An overview of the individual aspects was then undertaken, to make an informed professional assessment of the overall level of effect, drawing on guidance provided in GLVIA3. Although a numerical or formal weighting system was not applied, consideration of the relative importance of each aspect was made to feed into the overall decision. Levels of effect were identified as **negligible, minor, moderate** or **major** where moderate and major effects are considered **significant** in the context of the EIA Regulations.

6.54 The direction of effect (**positive**, **negative** or **neutral**) is determined in relation to the degree to which the proposal fits with the view and the contribution to the view that the development makes, even if it is in contrast to the existing character of the view.

6.55 With regard to wind energy development there is a broad spectrum of response from the strongly positive to the strongly negative. However, to cover the 'maximum case' situation, and in the context of the existing views across the area, potential impacts are assumed to be adverse unless otherwise specifically stated in the text.

Planning Policy

6.56 Planning policies of relevance to this assessment are discussed in **Chapter 5: Planning Policy Context**.

Wind Farm Layout Design Considerations

6.57 Landscape and visual considerations, including the appearance of Creag a' Bhàird Wind Farm from key viewpoint locations, played a major role in the progression of the layout design. Best practice guidance, including *Siting and Designing Wind Farms in the Landscape*[xx] was considered throughout the design process. The development of the layout is discussed in detail in **Chapter 3: Site Selection and Design**.

6.58 The relationship with the existing Griffin Wind Farm to the north-east of the site has been a key consideration in the design process, and the proposed development aims to present a simple and balanced image, both on its own and when viewed with Griffin. The turbines of Griffin form a distinct pattern of rows, following the topography of the site from north-west to south-east towards Creag na Tairnge. The eastern extent of the Creag a' Bhàird Wind Farm layout ties in with the Griffin layout, with turbines following the same distinct rows over Craig Tombane (383m AOD) to the south-east of Creag na Tairnge. The western extent of the layout locates turbines across high ground, with a single row of five turbines running south-easterly from Car Dow (413m AOD) to Meall Mòr (466m AOD), tying in with the general pattern of Griffin.

6.59 The composition of the layout was considered especially important as viewed from the most sensitive receptors, including residential properties within the valley of Strathbraan to the south, the A822 and A826 to the south and west of the site respectively, the River Tay (Dunkeld) NSA to the east, and recreational receptors using the network of footpaths over higher ground to the south, east and west of the site. The layout has been designed to avoid, as far as possible, overlapping turbines or distinct gaps between turbines.

6.60 The scale of the wind farm is considered to be appropriate to the scale of the site, which is a large-scale upland landscape. The turbine size is similar to those already deployed at Griffin Wind Farm within this same landscape.

Existing Conditions (Landscape Baseline)

6.61 This section presents an overview of the landscape baseline including current day landscape character (including constituent landscape elements), current landscape condition and any designation attached to the landscape.

The Site and Context

6.62 The site is located to the north of Strathbraan, approximately 8km west of Dunkeld and 8.5km south-east of Aberfeldy, in the Perth and Kinross Council area.

6.63 The site is approximately 311 hectares in size and covers an area of predominantly coniferous forestry, with small pockets of semi-improved grassland and enclosed moorland (heathland). The site is on steeply sloping land between Car Dow (413m AOD), Meall Mòr (466m AOD) and Craig Tombane (383m AOD), on the south-east facing side of Strathbraan. Turbines in the west of the site are located to the east of the ridge between Car Dow, Creag a' Bhàird (408m AOD) and Meall Mòr. Turbines in the east of the site are on the lower slopes between Craig Tombane and the rounded hill of Druim Mòr (368m AOD). There are several small watercourses within the site draining into the Tombane Burn which flows south to Strathbraan.

6.64 The site has an elevated position within the landscape, being located at the edge of a wide upland plateau between Glen Cochill to the west, Strathbraan to the south and Ballinloan Burn to the east.

6.65 The A826, which is part of the Perthshire Tourist Route, is approximately 1km to the west of the site at its closest point, running alongside the Cochill Burn through Glen Cochill, between Milton and Aberfeldy. There are few properties within Glen Cochill, with the exception of the small hamlet of Milton at the southern end of the glen, and Scotston, a large detached property on the west side of the A826, near the entrance to Griffin Wind Farm. An overhead power line runs along the eastern side of the road, along the valley side.

6.66 The A822, also part of the Perthshire Tourist Route, passes through Strathbraan to the south of the site, parallel to the River Braan. There are several clusters of properties and farmsteads located on both sides of the A822. These include Little Findowie and Meikle Findowie on the north facing valley slopes, and Tomnagrew, Meikle Tombane, Borelick, Drumour and Trochry on the south facing slopes. There are also several isolated farmsteads to the east of the site, along the valley of the Ballinloan Burn.

6.67 There are large areas of coniferous plantation to the north, east and west of the site, extending into the Craigvinean Forest to the north-east. Coniferous plantations to the north and west partially screen views into the interior of the site from nearby roads and properties within Glen Cochill.

6.68 Immediately to the north-east of the site is Griffin, an operational wind farm comprising 68 turbines which extends north and east towards the Craigvinean Forest.

6.69 In terms of Natural Heritage Sensitivity as outlined in SNH's Strategic Locational Guidance, the site is a combination of the lowest sensitivity and medium sensitivity. [xxi]

The Study Area

6.70 The study area for the LVIA extends to 35km from the outermost turbines. The study area is located in central Scotland, broadly between the Trossachs and Cairngorm mountain ranges, and extends from Auchterarder in the south, to the southern hill ranges of the Cairngorm National Park in the north, and from Glen Lyon in the west to Coupar Angus and Newtyle in the east, as shown on **Figure 6.1**.

6.71 The landscape character of the study area is varied, from the highland summits and plateau in the central and north-western part of the study area, dissected by broad glens and linear water bodies, to the lowland hills and farmed valley lowlands in the more settled south-eastern part of the study area. The Highland Boundary Fault runs through the study area, to the south of the site, dividing Highland and Lowland landscapes.

6.72 The highest mountain ranges are in the west and north of the study area, and include the peaks of Ben Chonzie (931m AOD) to the south-west, Schiehallion (1083m AOD) to the north-west and Carn Liath (975m AOD) in the Cairngorms National Park to the north. Lowland hill ranges include the Ochil Hills in the south of the study area, and the Sidlaw Hills in the east.

6.73 The Highland mountain and hill ranges are divided by broad straths and glens. Strath Tay, which runs from Loch Tay in the west of the study area to the Firth of Tay in the south-east, contains major roads, including the A827 and A9, and principal settlements including Aberfeldy, Dunkeld and Perth. Other straths and glens include Glen Errochty, Glen Almond, Strathearn and Strathardle. There are a number of inland lochs including part of Loch Rannoch, Loch Tummel, Loch Tay and Loch Earn. To the east of Perth is the broad lowland of Strathmore.

6.74 Settlements in the study area tend to be located in the straths and glens, along minor or major transportation routes. The main settlements in the study area include Perth, Crieff, Pitlochry, Auchterarder, Aberfeldy, Blair Atholl, Dunkeld and Blairgowrie. Smaller settlements closer to the site, within Strathbraan, include Milton, Trochry and Amulree.

6.75 The main transport corridor in the study area is the A9 that runs from northwest to south-east through Glen Garry, past Pitlochry and Dunkeld and onto Auchterarder via Perth. The Highland Main Line railway runs parallel to the A9. Also present are the A85 between Lochearnhead and Perth, and the A93 between the Cairngorm National Park and Perth. There are several National Cycle Routes and long distance footpaths within the study area. These include NCN 7, NCN 77 and NCN 775, in addition to the Cateran Trail, between the Spittal of Glenshee and Blairgowrie, and the Rob Roy Way, between Drymen and Pitlochry.

6.76 There are no designated or previously recorded undesignated cultural heritage assets within the site. There are 11 scheduled monuments within 5km of the outermost turbines, and eight listed buildings. Further information on these is provided in **Chapter 11: Archaeology and Cultural Heritage**.

6.77 There are a number of operational wind farms in the study area, which are listed in **Table 6.7**. All of these wind farms are included as part of the baseline for the assessment. These wind farms are shown on **Figure 6.7**.

Table 6.7: Operational Wind Farms Included in the Assessment

Wind farm	Status	Number of turbines	Blade tip height	Distance[3]
Griffin	Operational	68	109.8 - 124	366m
Calliachar	Operational	14	109.8	6.7km
East Gormack	Operational	1	66.62	21.4km
Drumderg	Operational	16	107	26.4km
Lochelbank	Operational	12	91	32.2km
Green Knowes	Operational	18	95	33.1km
Braes of Doune	Operational	36	100	35.4km
Burnfoot Hill	Operational	13	102	36.8km

Landscape Character

6.78 This section provides a description of the landscape character of the study area (including constituent landscape elements) – drawing on published studies where relevant.

6.79 The landscape character of the majority of the study area is described in the Tayside landscape character assessment (LCA) [ii], published by SNH as part of their national programme of character assessment. The landscape character of the Cairngorms National Park in the north of the study area is described within the Cairngorms National Park LCA.[iv]

6.80 A small part of the study area between Loch Tay and Loch Earn is described within the Central Region LCA[iii] and the Loch Lomond and The Trossachs National Park Landscape Character Assessment.[xxii] . This

[3] Distance between the turbines of the development and the turbines of the other wind farm (closest).

area is not within the ZTV and has not been considered further. LCTs are shown in **Figure 6.3**, and are shown overlaid onto the ZTV in **Figure 6.3a**.

6.81 The landscape character baseline for Perth and Kinross has not been updated since 1999. The 2004 'Landscape Study Windfarm Development in the Ochil Hills and part of Southern Highland Perthshire'[v] included more detailed classification of landscape character across part of Perth and Kinross. This was primarily undertaken to inform an assessment of sensitivity to wind energy development, and its findings are therefore of some relevance to this LVIA. The study classifies the area in which the proposed development is located as the Cochill-Tay-Braan landscape, within the Highland Summits and Plateaux LCT. It finds that this area has higher potential to accommodate wind farms, but is also of high visual sensitivity. The study concludes that this area is one where "Commercial windfarm proposals may be accommodated", subject to six "assumptions". Of these, Creag a' Bhàird Wind Farm complies with five. The one exception is the requirement that "no more than one windfarm location is permitted in each landscape". Since publication of the study in 2004, several large wind farm developments have been introduced into the Highland Summits and Plateaux LCT, including Griffin and Calliachar, changing the baseline against which the 2004 study was assessed. In addition, Creag a' Bhàird Wind Farm has been designed to tie into Griffin Wind Farm, and is unlikely to be perceived as a second wind farm in this landscape. As such, the proposed development is considered to be fully compliant with the recommendations of the Landscape Study.

6.82 **Table 6.8** lists the Landscape Character Types (LCT) and character areas which are found within the 35km study area. The table discusses the level of potential visibility of Creag a' Bhàird Wind Farm from each LCT or character area, with reference to the ZTV (**Figure 6.3a**). In order to focus on potentially significant effects, those LCTs/areas from which the turbines will not be visible, or will be visible only intermittently at a distance, are not considered further in the assessment, since there is no likelihood that their intrinsic character will be affected to a significant degree. Effects on landscape character occur where the presence of wind turbines alters perceptions of the landscape, and begins to subvert other key characteristics. This would not occur in an area where turbines are viewed as distant features in a limited number of views. Effects on views may still occur, and may still be significant, and these are examined further in the **Visual Assessment** below.

Table 6.8: Landscape Character Types

Landscape Character Type/Character Area	Potential visibility of Creag a' Bhàird Wind Farm (ZTV coverage)
Tayside LCA (1999)	
1a Upper Highland Glens	Theoretical visibility of the turbines is very limited due to the narrow and enclosed nature of these glens. There is no potential for significant effects, and this LCT is not considered further.
1b Mid Highland Glens	There is theoretical visibility of the turbines from the Strathbraan area, within 5km and bordering the site to the south. Considered in the assessment.
1c Lower Highland Glens	Theoretical visibility is very limited due to the low lying valley nature of these glens. There is no potential for significant effects, and this LCT is not considered further.
2b Mid Highland Glens with Lochs	No theoretical visibility, not considered further.
2c Lower Highland Glens with Lochs	No theoretical visibility, not considered further.
3 Highland Summits and Plateaux	Part of the site, including the proposed turbine locations, lies within this LCT. Extensive theoretical visibility within 5km, intermittent throughout study area. Considered in the assessment.
5 Highland Foothills	Intermittent theoretical visibility from locations which are mostly over 20km from the site. Where theoretically visible the turbines will be distant elements in views across a settled agricultural landscape, and will not significantly affect the key characteristics of the landscape. Therefore this LCT is not considered further.
6 Lowland Hills	Very limited theoretical visibility of 1-2 turbines from the southern fringes of the LCT, which are around 20km from the site. There is no potential for significant effects, and this LCT is not considered further.
7 Lowland River Corridors	Very limited theoretical visibility from a small area of these broad, lowland landscapes, near Blairgowrie. There is no potential for significant effects, and this LCT is not considered further.
8 Igneous Hills	Theoretical visibility is limited to the western fringes of the Sidlaws and north-eastern end of the Ochils, at distances of over 25km. Turbines will be visible in distant views across a settled agricultural landscape, in the context of Griffin Wind Farm. There is no potential for significant effects, and this LCT is not considered further.
10 Broad Valley Lowlands	There is intermittent theoretical visibility from Strathmore in the vicinity of Coupar Angus. Turbines will be distant elements seen at 20-35km across a settled agricultural landscape, with vegetation providing localised screening. There is no potential for significant effects, and this LCT is not considered further.
11 Firth Lowlands	No theoretical visibility, not considered further.
Lochs (South West Loch Tay)	No theoretical visibility, not considered further.
Cairngorms National Park LCA	
65 Glen Shee: Upper Glen	No theoretical visibility, not considered further.
66 Glen Shee: Head of Glen Shee	No theoretical visibility, not considered further.
67 Glen Beag: Lower Glen	No theoretical visibility, not considered further.
71 Glen Fender	There is very limited theoretical visibility, restricted to hill tops in the vicinity of Carn Liath, at a distance of over 25km. The turbines will be a distant element in panoramic views across the landscape, beyond Griffin Wind Farm. There is no potential for significant effects, and this LCT is not considered further.
72 Glen Garry: Lower Glen / Blair Atholl	No theoretical visibility, not considered further.
73 Glen Garry: Mid Glen	No theoretical visibility, not considered further.
74 Glen Garry: Upper Glen	No theoretical visibility, not considered further.
The Angus Glens Uplands	No theoretical visibility, not considered further.
South Eastern Glens	There is theoretical visibility from high peaks, including Carn Liath, Carn nan Gabhar and Ben Earb, at a distance of over 25km. The turbines will be a distant element in panoramic views across the landscape, beyond Griffin Wind Farm. There is no potential for significant effects, and this LCT is not considered further.
South Western Glens	There is limited theoretical visibility from high points in the vicinity of Beinn a' Chait at a distance of over 25km. The turbines will be a distant element in panoramic views across the landscape, and will be seen beyond Griffin Wind Farm. There is no potential for significant effects, and this LCT is not considered further.

6.83 Based on the analysis in **Table 6.8**, effects on the following LCTs are considered in further detail in the assessment:

- Tayside 1b Mid Highland Glens; and
- Tayside 3 Highland Summits and Plateaux.

6.84 Baseline descriptions of each LCT are contained in the Landscape Assessment section below.

Designated Landscapes

6.85 The landscapes within the study area which are designated for their scenic or landscape value, or which are identified for their wild land character, are listed below and shown on **Figure 6.4**. The site itself is not within any designated landscapes.

6.86 The north-eastern tip of the Loch Lomond and The Trossachs National Park is within the study area, approximately 27km south-west of the site at its closest point. There is no theoretical visibility of the turbines from this National Park, and it has therefore not been considered further.

6.87 The southern boundary of the Cairngorms National Park is approximately 20km to the north of the site, at its closest point. Theoretical visibility from within the National Park is limited to hill tops and ridges, from where the development will be seen as a small, distant element in panoramic views, and will be viewed beyond Griffin Wind Farm. No significant effects on the special qualities of the National Park landscape are therefore anticipated. Effects on visual receptors are considered in the assessment of views from Carn Liath in the **Visual Assessment** section.

6.88 There are four National Scenic Areas (NSAs) within the study area.

6.89 There is no theoretical visibility from the River Earn (Comrie to St Fillans) NSA which is 20km south-west of the site. There is intermittent and distant theoretical visibility from both the Loch Tummel NSA, 15km north of the site, and the Loch Rannoch and Glen Lyon NSA, 18km north-west of the site, from where the turbines will be seen in the context of Griffin Wind Farm. The limited theoretical visibility will not affect the special qualities of these NSAs, the focus of each of which is the loch or glen feature and its setting, not views out from the fringes of the NSA. Effects on visual receptors within the two closer NSAs are considered in the assessment of views from Meall Tairneachan (Viewpoint 13) and Schiehallion (Viewpoint 16).

6.90 The River Tay (Dunkeld) NSA is located approximately 4.5km to the north-east of the site, at its closest point. The citation for the NSA[xxiii] states "*The beauty of the Dunkeld area derives from the presence of the river between the rugged hills of the highland edge, which are clothed with a variety of different kinds of woodland, and the presence of a small and ancient ecclesiastical settlement*." The Special Qualities of the NSA include "*the beauty of cultural landscapes accompanying natural grandeur*", "*the 'Gateway to the Highlands'* " and "*the iconic view from King's Seat*".

6.91 Theoretical visibility of the turbines from the NSA is very limited, with views towards the site only being available from the hills above Dunkeld and Birnam, including Birnam Hill, King's Seat and Newtyle Hill. Effects on visual receptors at Birnam Hill and Newtyle Hill are considered in the assessment of views from Viewpoints 10 and 11, respectively.

6.92 There are five Areas of Great Landscape Value (AGLVs) within the study area, one south-east of Killin in the Trossachs, and four encircling Perth, approximately 18km to the south-east. There is no theoretical visibility from the AGLV in The Trossachs, and visibility from around Perth is very limited, therefore these designated landscapes have not been considered further.

6.93 Search areas for wild land (SAWL) were defined in the SNH policy statement Wildness in Scotland's Countryside (2003). These areas have no statutory recognition, although SPP does refer to "wild land" generally:

"*Areas of wild land character in some of Scotland's remoter upland, mountain and coastal areas are very sensitive to any form of development or intrusive human activity and planning authorities should safeguard the character of these areas in the development plan.*" (paragraph 128).

6.94 SNH has revised and updated the map of "core areas of wild land character", which has been published for consultation. Until this consultation is complete, SNH advise that the established SAWLs will be applied.

6.95 The closest SAWL is approximately 25km to the north of the site, and is broadly coincident with the boundary of the Cairngorms National Park, as shown on **Figure 6.4**. As discussed in relation to the Cairngorms National Park, theoretical visibility is limited to hill tops and ridges, where the development will be a small, distant element in panoramic views, beyond Griffin Wind Farm. It is therefore considered that the wild land characteristics of the Cairngorms SAWL will not be affected, and it is not considered further.

Future in the absence of the proposal

6.96 In the absence of Creag a' Bhàird Wind Farm, it is likely that the land will continue under the same land use, and the character of the site is therefore unlikely to change significantly. Felling of the forestry on site will be phased over a period of 20 years, with some small areas retained long-term, and trees may or may not be replanted.

6.97 However, the landscape and visual amenity of the study area is likely to be influenced by a number of '*forces for change'*. Forces for change are those factors affecting the evolution of the landscape and which may, consequently, affect the perception of the study area in the near or distant future. Although prediction of these is necessarily speculative, those of particular relevance are discussed briefly below.

6.98 Wind farm development is a clear force for change and is likely to continue within the study area. There are currently eight wind energy developments in the study area which are operational or under construction, and consent has been granted for another two wind energy developments. There are also a considerable number of planning applications and scoping proposals for further wind farms in proximity to Creag a' Bhàird, including Calliachar North and Crossburns. In addition, there are an increasing number of operational, consented and proposed domestic and feed in tariff wind turbines of varying heights and rotor diameters, located within agricultural fields, as farmers diversify income and seek opportunities to generate energy for domestic and commercial use, and it is likely that interest in this type of development will continue.

6.99 Climate can be viewed as having been a highly influential factor in the development of today's landscapes and it is widely accepted that mainly due to anthropological activities and the burning of fossil fuels, climates are changing. Whilst there appears to be no certainty of what the impacts of such climatic changes will be in the future, it is clear that these changes will affect the landscape, including the landscape of the study area.

6.100 These concerns have been recognised in a number of papers in recent years. Scottish Natural Heritage state on their website that

"*Climate change is one of the biggest challenges for Scotland's nature and landscapes. The unprecedented rate of human-induced climate change threatens plants and animals that are unable to adapt quickly enough to its effects. This is happening now, and how we choose to respond will affect not only individual species and our distinctive landscapes, but also our lifestyles, our economy and our culture. Climate change threatens the species and spaces that make Scotland distinctive; from the snow bunting, whose habitat is receding with the snow cover on Scotland's mountains each year, to the myriad of species that depend on the peat bogs that are predicted to dry out. The loss of such species will leave our nature and landscapes poorer, but they will leave Scotland poorer as well."*[4]

Landscape Assessment: Introduction

6.101 The assessment of effects on the landscape follows the methodology presented in this chapter, and is based upon the project description outlined in **Chapter 4.** The assessment reports on construction and decommissioning effects, and operational effects, separately.

The Development Proposal

6.102 Creag a' Bhàird Wind Farm is described in detail in **Chapter 4**. The elements of the development which may potentially affect the landscape are set out below:

- 13 wind turbines (including external transformers) of up to 115m tip height, with a hub height of 70m and rotor diameter of 90m;
- crane hardstandings;
- onsite underground electrical cables;
- a control building;
- two permanent meteorological masts, 70m high;
- a temporary site construction compound/laydown area;

[4] http://www.snh.gov.uk/climate-change/impacts-in-scotland/ [accessed September 2013]

- two areas within which it is proposed to win rock for wind farm construction (borrow pits);
- approximately 3km of onsite access tracks; and
- felling of forestry and replacement with conifers and small areas of broadleaf woodland and open ground.

6.103 The grid connection will be the subject of a separate application, but is likely to be made via a new line, which would typically be a wooden pole type line running from the location of the control building to the grid connection point.

Landscape Assessment: Construction Effects

Potential Sources of Effects

6.104 The construction of Creag a' Bhàird Wind Farm is described in detail in **Chapter 4**. The changes to the landscape arising from the **construction** of the development (lasting approximately 20 months) will include:

- forest clearance;
- construction of temporary compound, laydown area, offices and car parking;
- excavation of borrow pits;
- construction of site access tracks, including drainage, to connect turbine locations to the route of the existing access track;
- construction of turbine foundations and external transformer bases at each turbine location;
- construction of crane hardstandings at each turbine base location and also at the permanent meteorological mast locations;
- erection of cranes, and delivery to site and erection of wind turbines and permanent meteorological masts;
- excavation of trenches and laying of electrical and control cables adjacent to the site tracks connecting the turbines to the control building;
- testing and commissioning of site equipment including wind turbines; and
- site restoration.

6.105 In addition, some limited construction related effects will occur offsite, along public highways in order to enable large vehicles carrying abnormal loads to reach the site. Further information is set out in **Chapter 12: Access, Traffic and Transport**.

6.106 At the end of the operational phase, the wind farm will either be decommissioned, or an application made for consent to extend its operational life. As described in **Chapter 4**, decommissioning will take approximately 12 months and will involve the removal of all above ground infrastructure, including the turbines. Access tracks will either be left for use by the landowner or covered in topsoil. The changes to the landscape arising from the decommissioning of the development will be very similar to those arising from construction. Decommissioning is therefore not considered separately, and the effects of decommissioning on the landscape are assumed to be the same as the effects of construction.

Predicted Effects

6.107 Potentially significant landscape effects during construction are:

- changes in landcover/vegetation across the site as a result of felling and construction activity; and
- changes to the character of local LCTs as a result of disturbance to the landscape, and the presence of partially constructed turbines and cranes.

6.108 These effects are assessed for their significance below.

Proposed Mitigation (During and Post-Construction)

6.109 Construction Method Statements and an Environmental Management Plan (EMP) will be prepared prior to the start of construction, detailing measures to avoid or mitigate potential effects associated with key construction activities. These will reflect and expand upon measures identified in the ES, and will be agreed with Perth and Kinross Council, SEPA, SNH and other stakeholders where appropriate, see **Chapter 4.**

6.110 Following construction, a number of restoration measures will be implemented. These will include:

- the temporary construction compound and laydown area will be reinstated into the surrounding landscape, and restored to their original condition;
- disturbed areas, including borrow pits, will be restored by re-turfing or re-planting, and bare soil areas will be allowed to re-vegetate naturally in combination with reseeding;
- turbine foundations will be capped with soil and re-turfed or re-seeded, as appropriate;
- the majority of the site will be replanted with commercial conifers (Sitka Spruce), except within a 100m radius of each of the turbines. Small areas of open ground and mixed native broadleaf trees will be included (in accordance with forestry design standards).

Residual Effects (During Construction)

6.111 This section sets out the assessment of the significance of the predicted landscape effects that will occur during the construction phase.

Effect on the Site

6.112 The site contains coniferous woodland, with small patches of semi-improved grassland and enclosed moorland on craggy, steeply sloping land, rising to 466m AOD at Meall Mòr. These characteristics are typical of the wider LCT, however the site does not display the wild, remote qualities which may characterise other parts of the LCT, due to the presence of modern human artefacts including extensive coniferous forestry, tracks and drainage ditches, and notably the influence of the neighbouring Griffin Wind Farm to the north and overhead lines to the west.

6.113 The site is relatively small scale, with rugged features, however the presence of the neighbouring wind farm and other human influences reduces its susceptibility to change of the nature proposed. The susceptibility of the site to construction activity is considered to be **high-medium**.

6.114 The site is not within any designated landscapes, but is likely to be valued at a community level. Forested upland is not considered to be rare, nor is it of remarkable scenic quality, though the rugged crags are local features of interest. The landscape of the site is therefore of **medium** value.

6.115 Construction activity will directly affect the physical landscape of the site. The main activities with the potential to affect the site include, but are not limited to, felling of the existing coniferous forestry, vehicular/personnel movements, disturbance of land and vegetation at the location of the borrow pits, introduction of access tracks and works compounds and the construction of the turbines and control building. Construction activity will result in a **large scale** change to the site.

6.116 The majority of construction activities will be **short term** and the majority of resulting changes will be **reversible**. The creation of borrow pits and removal of forestry and other vegetation will be **non-reversible** changes, although the mitigation measures outlined in **Proposed Mitigation** will help to reduce effects over time. These effects will be **medium term** since they will continue until the mitigation measures are complete and vegetation is mature.

6.117 Overall the effect of construction on the site will be **major** and **significant**, arising from the loss of forestry and its replacement with a commercial wind farm. Construction effects will be **short term** or **medium-term**, and will cease once construction activities and site restoration is complete.

Effect on the Character of LCT 3: Highland Summits and Plateaux

6.118 The landscape character of the site is within the wider Highland Summits & Plateaux LCT, which covers a large proportion of the study area to the north of the Highland Boundary Fault. The LCT is subdivided into the West Highlands and the Mounth Highlands – the site is located within the former.

Key characteristics include:

- *"areas of upland separating the principal glens;*

- *West Highland comprises distinct summits and ranges, separated by fault line lochs; the hills are sharply defined and often craggy;*
- *vegetation patterns closely reflect altitude and exposure and include heather, grassland, blanket bog, and artic alpine plant communities; variations reflecting the underlying geology;*
- *most of the area managed as open moorland;*
- *little or no settlement;*
- *some extensive plantations; and*
- *one of the remotest and wildest landscapes in the UK."*

6.119 Overall the Highland Summits and Plateaux LCT is a large, remote and wild landscape, with a distinct, craggy landform, although the site is on the fringes of the LCT, where human influence is felt in the form of existing wind farm development, roads, settlement, coniferous plantation and overhead power lines. The presence of Griffin Wind Farm and the associated loss of forestry reduce the susceptibility of the LCT to development of the nature proposed, which is therefore assessed as **high-medium**.

6.120 Parts of this large LCT are designated at a national level, being located within the Loch Rannoch and Glen Lyon NSA and Loch Tummel NSAs. The unit of the LCT directly affected by the development is not designated, nor is it a rare landscape, being widespread across this part of the Highlands. The LCT is scenic in nature, comprising large scale rugged upland. It is therefore considered to be of **medium** value.

6.121 A small part of the LCT will experience a direct effect as a result of the construction activity, including, but not limited to, felling of the existing coniferous forestry, vehicular/personnel movements, disturbance of land and vegetation at the location of the borrow pits, introduction of access tracks and works compounds and the construction of the turbines and control building.

6.122 This construction activity will result in a **small scale** change to the overall LCT. This change will be perceived at the **site level**, and also in the local area, mainly between Meall Mòr and Druim Mòr, and extending north-west towards Creag Mhòr and into parts of Glen Cochill. Coniferous forestry decreases inter-visibility from the wider LCT to the north, and significant effects are not anticipated from within the Griffin site or beyond it.

6.123 The majority of construction activities will be **short term** and the majority of resulting changes will be **reversible**. The creation of borrow pits and removal of forestry and other vegetation will be **non-reversible** changes, although the mitigation measures outlined in **Proposed Mitigation** will help to reduce effects over time. These effects will be **medium term** since they will continue until the mitigation measures are complete and vegetation is mature.

6.124 The effect on the Highland Summits and Plateaux LCT will be, for a very limited local area, **major** and **significant**. There will be a perceived change in character resulting from forestry removal and construction activity, affecting the area immediately surrounding the site and extending beyond the site boundary, broadly between Creag Mhòr, Meall Mòr and Druim Mòr. Construction effects will be **short term** or **medium-term**, and will cease once construction activities and site restoration is complete. The wider LCT will be unaffected by the development, and the overall effect on the Highland Summits and Plateaux LCT will be **negligible** and **not significant**.

Effect on the Character of LCT 1b: Mid Highland Glens

6.125 There are several units of the Highland Glens LCT throughout the study area, dissecting the Highland Summits and Plateaux LCT. A distinction is made between the upper, mid and lower sections of the glens. Strathbraan is classified as Mid Highland Glen, the boundary of which is approximately 300m south of the site at its closest point.

6.126 Key characteristics include:

- *"Concentration of agricultural activity on narrow, but distinct valley floor;*
- *Predominance of rough grazing, bracken, heather moorland on valley slopes;*
- *Rapids, gorges and waterfalls where bands of harder rocks occur;*
- *Glacial and post glacial features including morainic deposition;*
- *Native birch and oak woodland;*
- *Moderately settled;*
- *Proliferation of forts and castles; and*
- *Substantial areas of commercial coniferous forestry."*

6.127 The Mid Highland Glens LCT is a relatively small scale landscape, but one which is moderately settled, with road corridors and settlements typically located on the valley floors. The susceptibility of the LCT to construction activity associated with the development is considered to be **high-medium**.

6.128 Parts of the LCT are designated at a national level, including the Loch Rannoch and Glen Lyon NSA designation to the west of the site, and the River Earn (Comrie to St Fillans) NSA to the south-west. The Strathbraan unit of the LCT is not designated. It is not a rare landscape, but does have scenic quality in contrast between the green valleys and the large scale hills which frame it. It is therefore considered to be of **medium** value.

6.129 The Strathbraan unit of the LCT will be indirectly affected by construction activity in the neighbouring LCT, and also directly affected by construction traffic travelling on the A822 and A826. This will result in a **small scale** change to the overall LCT.

6.130 The change in character will be perceived in the local area, between Milton and Trochry, and will not extend to the scale of the character area, as the remaining units of the LCT, located throughout the study area, have no inter-visibility with the site.

6.131 Construction activities perceived within this LCT will be **short term**. The resulting indirect and direct changes to character will be **reversible**.

6.132 Overall the effect on the character of the local area of this LCT will be **minor** and **not significant**, as changes to the LCT will be very localised, short term and reversible. Construction activities will not affect the overall LCT.

Landscape Assessment: Operational Effects

Potential Sources of Effects

6.133 Creag a' Bhàird Wind Farm is described in detail in **Chapter 4: Scheme Description**. The changes to the landscape arising from the **operational** development, with a lifespan of 25 years, will include:

- the introduction of 13 wind turbines of up to 115m tip height, and two anemometer masts, and their presence in the landscape for 25 years;
- the introduction of tracks, turbine foundations and external transformers ;
- the introduction of the control building;
- the re-planting of the site with coniferous forestry and some broadleaved trees, restoration of areas of disturbed ground;
- the presence of a new site entrance from the A826 in Glen Cochill; and
- the introduction of occasional maintenance activity and vehicular/personnel movements around the site and on local roads.

6.134 The operational phase of the wind farm will last for 25 years, which is the development consent period. During this time the turbines will operate according to wind conditions, and regular maintenance will be carried out.

Predicted Effects

6.135 Potentially significant effects on the landscape during operation may arise as a result of:

- changes in landcover/vegetation across the site as a result of the introduction of turbines and ancillary development, and replanting with commercial conifers (Sitka Spruce), with some small areas of open ground and mixed native broadleaf trees across the site; and
- changes to the character of local LCTs as a result of the introduction of turbines and other new landscape elements.

Proposed Mitigation

6.136 All mitigation is designed into the scheme and is presented in **Chapter 3: Site Selection and Design**.

Residual Effects

6.137 This section sets out the assessment of the significance of the predicted landscape effects that will occur during the operational phase.

Effect on the Site

Nature of Receptor (sensitivity)

The site is relatively small scale, with rugged features, but the proximity to Griffin and other human influences decreases its susceptibility to wind farm development, which is considered to be **high-medium** overall.

As noted in the **Landscape Assessment: Construction Effects** section, the landscape of the site is considered to be of **medium** value.

Source of Effect

The elements of the development with the greatest potential to change the character of the site are the turbines themselves, and the ancillary infrastructure of external transformers, access roads, hardstandings and the control building. The replanting of the site will largely be with commercial conifers, though some small areas of open ground and mixed native broadleaf trees will be established. This change in landcover will not substantially change the character of the site, but could present localised landscape and ecological benefits.

Nature of Effect (magnitude)

The operational development will result in a **large scale** change in relation to the site. The landscape of the site will change from a predominantly coniferous forested upland, to a wind farm landscape of turbines and access tracks, with replanted coniferous forestry and some broadleaf. The loss of forestry will be noticeable, until replacement planting reaches maturity.

The operational phase of the development will be **long term**. The presence of turbines will be **reversible** at the end of the operational phase. Tracks will remain in place at the discretion of the landowner and are therefore **non-reversible**.

Level of Effect

Overall the development will have a **major** and **significant** effect on the landscape of the site. Forestry will be replaced by a wind farm landscape of turbines, access tracks and other ancillary development, which will be present in the landscape for up to 25 years. In the long term, proposed replanting of the site with commercial conifers and some mixed native broadleaf trees will help to integrate the development with the landscape, in part mitigating the loss of forestry, but not altering the presence of the turbines and other infrastructure.

Effect on the Character of LCT 3: Highland Summits and Plateaux

Nature of Receptor (sensitivity)

The Highland Summits and Plateaux LCT is a large, remote and wild landscape, although the site is on the fringes of the LCT, where human influence is more apparent. The susceptibility of the LCT to wind farm development is considered to be **high-medium**.

The landscape guidelines within the Tayside LCA discourage wind turbines, as they are considered likely to "*impact on the harsh, undeveloped character of the Highland Summits and Plateaux*" although the operational Griffin and Calliachar wind farms are both located within this LCT and are visible from much of the LCT, particularly within 15km.

As noted in the **Landscape Assessment: Construction Effects** section, the landscape of the Highland Summits and Plateaux is considered to be of **medium** value.

Source of Effect

The operational effects may arise from the introduction of 13 turbines and associated infrastructure into a small part of the LCT, and the replacement of removed forestry with a commercial crop and some mixed native broadleaf trees. Indirect effects may also arise from views of the turbines within this LCT. The area in which the turbines are theoretically visible, and in which effects on character may occur, can be seen in Figure 6.3a.

Nature of Effect (magnitude)

The operational development will result in a **small scale** change in relation to the overall LCT.

The change in character will be experienced at the **site level**, and also in the local area, from an area broadly between Meall Mòr, Creag Mhòr and Druim Mòr, and to a lesser extent from the north-west facing slopes of Strathbraan and west to Meall Dearg. Forestry, which is not characteristic of the wider LCT, will be removed, and wind turbines and ancillary development will be introduced. Over time, the commercial crop will mature, helping to integrate the development with the site. The turbines will slightly enlarge the existing footprint of wind development, extending wind energy development to the boundary of the LCT, where it joins the Mid Highland Glens LCT.

The operational phase of the development will be **long term**. The presence of turbines will be **reversible** at the end of the operational phase. Tracks will remain in place at the discretion of the landowner and are therefore **non-reversible**.

Level of Effect

Overall the development will have a locally **major** and **significant** effect on a small part of the LCT. The area in which significant effects on character are anticipated can be approximately defined as extending: north and north-east to Griffin Wind Farm; south-east as far as Druim Mòr; south to the boundary of this LCT with the Mid Highland Glens; south-west to Meall Mòr; west to Meall Dearg; and north-west to Creag Mhòr. The loss of forestry will be mitigated by the re-planting of a predominantly coniferous forest with some areas of broadleaved woodland, although this will not conceal the presence of the turbines. The effect on the LCT will be very localised, and the characteristics of the wider LCT, which occupies the majority of the northern half of the study area, will not be affected. The area immediately east of the site, in which Griffin Wind Farm is located, will also be unaffected. The overall effect on the Highland Summits and Plateaux LCT will be **minor** and **not significant**.

Effect on the Character of LCT 1b: Mid Highland Glens

Nature of Receptor (sensitivity)

The LCT is a relatively small scale but moderately settled landscape. The Tayside LCA describes the LCT as being "*largely free from tall structures such as pylons and masts. Although better able to absorb development than the simpler and smaller upper glens, the landscape type would be quite sensitive to any proposals for tall structures, be they pylons, masts or wind turbines, and be they within the glen itself or visible from within it.*" It is noted that several turbines of Griffin Wind Farm are visible from within Strathbraan.

The susceptibility of the LCT to the operational development is considered to be **high-medium**.

As noted in the **Landscape Assessment: Construction Effects** section, the landscape of the Mid Highland Glens is considered to be of **medium** value.

Source of Effect

A part of the Strathbraan unit of the LCT will be indirectly affected by the introduction of the turbines and ancillary development in the neighbouring LCT, at a distance of approximately 300m at its closest point. The area in which the turbines are theoretically visible, and in which effects on character may occur, can be seen in **Figure 6.3a**.

Nature of Effect (magnitude)

The operational development will result in a **small scale** change in relation to the overall LCT.

The change in character will be experienced in the **immediate surroundings of the site**, on both sides of Strathbraan but in particular the north-west facing slopes. Over time, the replanted forestry will mature, helping to integrate the development with the site, but not screening views of the turbines.

The operational phase of the development will be **long term**. The presence of turbines will be **reversible** at the end of the operational phase.

Level of Effect

Overall the development will have a **minor** and **not significant** effect on the landscape character of part of this LCT, resulting from the introduction of a wind farm development into a landscape which forms the setting of Strathbraan. The introduction of wind farm development into forested upland on the edge of the Highland Summits and Plateaux LCT will be inter-visible with part of the Strathbraan unit, but will be perceived as part of the neighbouring upland, rather than as part of the valley. The loss of forestry in views will be mitigated by its replacement with a coniferous woodland with some mixed broadleaved areas. The wider LCT, which occurs across the northern and western parts of the study area, will not be affected. The overall effect on the Mid Highland Glens LCT will be **negligible** and **not significant**.

Implications for Designated Areas

6.138 As demonstrated by the ZTV in **Figure 6.4a**, visibility from designated landscapes within the study area is limited and distant. Of the designated areas discussed in the **Existing Conditions (Landscape Baseline)** section, it is considered that the only designated landscape that has the potential to be significantly affected by the proposed development is the River Tay (Dunkeld) NSA, which lies some 4.5km from the proposed turbines. However, views of the turbines are restricted to the area of the NSA east of King's Seat, between around 6km and 9km from the turbines, and on Newtyle Hill, 10km from the turbines.

6.139 Although the development will be visible from King's Seat, described as an "iconic view" in the NSA citation, this is a panoramic view from which several other existing wind farm developments are visible, including Griffin. From King's Seat the development will appear as an extension to Griffin, viewed to the west. The focus of this view, which is north and east into and across the Tay valley and the heart of the NSA, will not be affected by the presence of the proposed development. Effects upon the special qualities of the NSA are not anticipated.

Summary of Landscape Effects

6.140 **Table 6.9** below summarises the predicted effects of the wind farm on the landscape.

Table 6.9: Summary of Effects

Predicted Effect	Mitigation	Significance of Residual Effect
Construction effects on the site	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Major, significant
Construction effects on LCT 3: Highland Summits and Plateaux	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Major and significant across a small area, no more than 2km from the site.
		Negligible and not significant effect on the overall LCT.
Construction effects on LCT 1b: Mid Highland Glens	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Minor, not significant
Operational effects on the site	In built design mitigation.	Major, significant
Operational effects on LCT 3: Highland Summits and Plateaux	In built design mitigation.	Major and significant across a small area, no more than 3km from the site. Minor and not significant effect on the overall LCT.
Operational effects on LCT 1b: Mid Highland Glens	In built design mitigation.	Minor, not significant.

Existing Conditions (Visual Baseline)

6.141 This section identifies the extent of potential visibility of the proposal, and identifies visual receptors that will be assessed. This section also introduces the viewpoints that will be used to assess effects on receptors, including reasons for their selection.

6.142 Cumulative effects on views/visual amenity are assessed in a separate section later in the chapter and effects on residential visual amenity are assessed in **Appendix 6.1**.

Analysis of Visibility of the Development

6.143 The ZTVs in **Figure 6.1** and **Figure 6.2** show the theoretical visibility of the wind farm to blade tip and hub height respectively. The site is visually contained, with most theoretical visibility within 5km or from more distant hills and ridges.

6.144 The following observations can be made about views of Creag a' Bhàird Wind Farm from across the study area, based on examination of the ZTV and field surveys:

Within 5km

- visibility within 5km will be concentrated on Strathbraan to the south, particularly from the north facing slopes of the valley, and will include farmsteads and dwellings north and south of the A822;
- visibility from the north-east will be limited by the extensive coniferous forestry (Craigvinean Forest) in this area, and where visible, turbines will be seen behind Griffin Wind Farm;
- there will be some visibility from Glen Cochill to the west, between Milton and Scotston, with coniferous forestry on the east side of the A826 screening views from the A826 north of Scotston; and
- no visibility is indicated from the hamlet of Milton and there is limited visibility from the A822 east of Trochry.

Between 5-15km

- in the north, visibility between 5km and 15km will be limited to the higher ground to the south of the Loch Tummel NSA, including Weem Hill;
- in the south, visibility will be limited to the hills above Glen Almond and Strathbraan, including Meall nan Fuaran and Meall nan Caorach;

- in the east, visibility will be limited to hill summits, and includes Birnam Hill and Newtyle Hill above Dunkeld; and
- elsewhere within 15km visibility will be screened by the surrounding topography of the hills above Logiealmond, Glen Quaich and Aberfeldy.

Between 15-35km

- in the north, visibility beyond 15km will be limited to the higher ground on the southern edges of the Loch Tummel NSA, including Meall Tairneachan and Farragon Hill, and long distance views from summits within the Cairngorms National Park, including Carn Liath;
- in the west, visibility will be limited to long distant views from the mountain tops in the Loch Rannoch and Glen Lyon NSA, including Schiehallion;
- in the east, there will be extensive theoretical visibility from the Blairgowrie and Coupar Angus area of Strathmore, extending to the fringes of the Sidlaws at the edge of the study area, including many of the settlements and minor roads in this area, although localised vegetation and distance to the site will limit visibility; and
- in the south visibility will be very limited, with turbine tips being theoretically visible from some locations in the Ochil Hills.

6.145 There are a number of operational wind farms and wind farms under construction in the study area, which are listed in **Table 6.7**. All of these wind farms are included as part of the baseline for the assessment, since they are already present in views. These wind farms are shown on **Figure 6.7**.

Key Visual Receptors

6.146 Potential visual receptors include:

- local residents in Strathbraan and Glen Cochill;
- road users travelling on the A822 and A826; and
- hill walkers throughout the study area.

6.147 As demonstrated by the limited ZTV, relatively few visual receptors will be affected by the development, including many of the main settlements and transport routes within the study area.

Selection of Viewpoints for Assessment

6.148 This section sets out the viewpoints that will be used to represent and assess the visual effects of the proposal that will be seen by the visual receptors. The viewpoint list is a representative selection of locations agreed with the statutory consultees; it is not an exhaustive list of locations from which the development will be visible.

6.149 A total of 19 viewpoints were selected through desk study, site work and discussions with SNH and PKC. These viewpoints are all publicly accessible, with the exception of Viewpoint 2 for which access with the operators of Griffin Wind Farm had to be agreed. The viewpoints include:

- representative viewpoints selected to represent the experience of different types of receptor;
- specific viewpoints selected because they are key and sometimes promoted viewpoints within the landscape; and
- illustrative viewpoints chosen specifically to demonstrate a particular effect of specific issue (which could include restricted visibility to certain locations).

6.150 The viewpoints used to assess the visual effects are listed in **Table 6.10** and their locations are shown in **Figure 6.1.** The viewpoints have been numbered according to geographical distance from the site.

Table 6.10: Viewpoint locations

Location	Approximate Grid Reference	Distance from Nearest Turbine	Receptor type represented by the viewpoint	Reason for Selection
VP01 Druim Mòr	295321, 740883	1.2km	Recreational walkers	Track on ridge to east of site.
VP02 Ben Salachill	294479, 743381	1.5km	Workers at Griffin Wind Farm, recreational walkers	Forestry track overlooking the site from the north-east.
VP03 A826 within Glen Cochill	290795, 740097	1.7km	Road users	On main road in adjacent glen. Viewpoint 1 in the Griffin ES.
VP04 General Wade's Military Road, Glen Cochill	289939, 742230	2.1km	Recreational walkers	Historic route on side of Glen Cochill.
VP05 A822 near Borelick	295591, 739506	2.4km	Road users	On main road in Strathbraan. Viewpoint 2 in the Griffin ES.
VP06 A822 near Ballinreigh	291409, 737301	3.5km	Road users	On main road looking towards the proposed wind farm.
VP07 Creag Liath (426m AOD)	298644, 737298	6.0km	Recreational walkers	High point to the south of Strathbraan.
VP08 Meal nan Caorach	292871, 733888	6.6km	Recreational walkers	High point to the south of Strathbraan. Viewpoint 6 in the Griffin ES.
VP09 A822 near Corrymuckloch	289201, 733696	7.7km	Road users	Viewpoint 9 in the Griffin ES.
VP10 King's Seat, Birnam (404m AOD)	303203, 740174	8.9km	Recreational walkers	High point at the west edge of the River Tay NSA. Viewpoint 4 in the Griffin ES.
VP11 Newtyle Hill (317m AOD)	304601, 741870	10.2km	Recreational walkers	High point east of Dunkeld, within the River Tay NSA.
VP12 Meall nam Fuaran	282612, 736188	10.7km	Recreational walkers	Requested by SNH and PKC.
VP13 Meall Tairneachan (787m AOD)	280775, 754337	17.0km	Recreational walkers	Proposed as an alternative to a viewpoint at Farragon Hill (requested by SNH). Representative of views of hill walkers.

Location	Approximate Grid Reference	Distance from Nearest Turbine	Receptor type represented by the viewpoint	Reason for Selection
VP14 Ben Chonzie (931m AOD)	277324, 730863	18.1km	Recreational walkers	Requested by SNH. Representative of views of hill walkers.
VP15 Ben Vrackie (841m AOD)	295067, 763249	21.4km	Recreational walkers	Requested by SNH. Representative of views of hill walkers.
VP16 Schiehallion (1083m AOD)	271402, 754743	24.4km	Recreational walkers	Requested by SNH. Representative of views of hill walkers in the Loch Rannoch and Glen Lyon NSA.
VP17 Carn Liath	293595, 769800	27.9km	Recreational walkers	Requested by SNH and PKC. Representative of views of hill walkers in the Cairngorms NP.
VP18 Dunsinane Hill	321367, 731675	28.7km	Recreational walkers	Hill fort on the edge of the Sidlaws with long views north-west.
VP19 Minor road, Newtyle	326444, 738869	32.1km	Road users Residential receptors	Requested by SNH. Representative of views of road users as well as other potential viewers in Strathmore.

Settlements

6.151 Settlements within 5km of the Creag a' Bhàird Wind Farm are located within Strathbraan to the south, on both sides of the lower valley slopes, and include the hamlets of Amulree, Milton and Trochry. There are a number of dispersed farmsteads and individual or small groups of residential properties located along or above the A822, including Balachraggan, Tomnagrew and Borelick, on the north side of the road, and Dullator and Little Findowie on the south side of the road. Views from residential properties within 2.6km of the outermost turbines are further discussed in **Appendix 6.1**.

6.152 Between 5km and 15km settlements are concentrated within the low lying Tay Valley to the north and east, along the main transportation routes, these include Aberfeldy, Dunkeld and Bankfoot and a number of smaller settlements in between.

6.153 Larger settlements between 15km and 35km are located along the A9 corridor, and include Blair Atholl, Pitlochry and Perth. Settlement is also concentrated in Strathearn in the south of the study area, including the settlements of Crieff and Auchterarder, and in the east of the study area where settlements include Blairgowrie, Rattray and Coupar Angus.

6.154 The table below lists the settlements within the study area, and identifies, with reference to the ZTV **Figure 6.1**, which have theoretical visibility and therefore require further assessment. The ZTV does not include for screening of views by buildings, which will substantially reduce visibility from most settlements. In order to focus on potentially significant effects, settlements from which there is no theoretical visibility are not considered further, since there will be no effect on their view. Settlements with limited visibility from a longer distance, where it is unlikely that significant effects could occur, are not considered further in the assessment.

Table 6.11: Settlements

Settlement	Theoretical Visibility of Development (ZTV coverage)
Within 5km	
Milton	None, not considered further.
Trochry	Very limited theoretical visibility, likely to be screened by the low lying nature of the settlement and existing vegetation which surrounds it. There is no potential for significant effects, and effects on views are not considered further.
Amulree	None, not considered further.
5-15km	
Aberfeldy	None, not considered further.
Dunkeld	None, not considered further.
Bankfoot	None, not considered further.
15-35km	
Pitlochry	None, not considered further.
Blair Atholl	None, not considered further.
Blairgowrie and Rattray	Limited, at a distance of over 20km. There is no potential for significant effects, and effects on views are not considered further.
Alyth	None, not considered further.
Coupar Angus	Limited, at a distance of over 25km. There is no potential for significant effects, and effects on views are not considered further.
Perth	None, not considered further.
Crieff	None, not considered further.
Auchterarder	None, not considered further.
Burrelton	Limited, at a distance of over 25km. There is no potential for significant effects, and effects on views are not considered further.

6.155 Based on the findings of **Table 6.11**, there are no settlements in the study area which may potentially experience significant effects on views, and effects on settlements are not considered further. Effects on individual residential properties are considered in **Appendix 6.1**.

Routes

6.156 Visual effects on roads, railways and recreational routes (long distance footpaths and cycle routes) located across the study area are listed in the table below (**Table 6.12**). In order to focus on potentially significant effects, routes with no, or very limited, theoretical visibility of the turbines as indicated by the ZTV (**Figure 6.1**) are not considered further.

Table 6.12: Routes

Route	Theoretical visibility of Development (ZTV coverage)
Roads	
A822	Yes. Considered in the assessment.
A826	Yes. Considered in the assessment.
A823	None, not considered further.
A827	None, not considered further.
A85	None, not considered further.
A9	None, not considered further.
A90	None, not considered further.
A912	None, not considered further.
A923	Very limited, over 20km away. There is no potential for significant effects, and effects on views are not considered further.
A924	Very limited, over 20km away. There is no potential for significant effects, and effects on views are not considered further.
A926	Very limited, beyond 20km. There is no potential for significant effects, and effects on views are not considered further.
A93	Limited, beyond 20km. There is no potential for significant effects, and effects on views are not considered further.
A94	There is intermittent theoretical visibility from this route between Balbeggie, 25km from the site, and Meigle, 35km from the site. Trees and buildings will decrease the potential for views of the turbines. There is no potential for significant effects, and effects on views are not considered further.
A984	None, not considered further.
M90	None, not considered further.
Railways	
Perth-Dunkeld-Pitlochry (Highland Main Line)	None, not considered further.
Dunblane – Perth	None, not considered further.
Recreational Routes	
NCN 7 Killin to Dalnacardoch	None, not considered further.
NCN 77 Perth to Pitlochry	None, not considered further.
NCN 775 Perth to Glenfarg	None, not considered further.
Regional Route 83 Logierait to Dunkeld	None, not considered further.
Cateran Trail	Very limited, isolated areas of theoretical visibility in the vicinity of Ben Earb, Hill of Alyth and north side of Blairgowrie, between 20 and 30km. There is no potential for significant effects on the route, and effects on views are not considered further.
Rob Roy Way	Very limited theoretical visibility from a short section of the route near Amulree, at the eastern end of Glen Quaich. No visibility from the majority of the route. There is no potential for significant effects on the route, and effects on views are not considered further.

6.157 Based on the findings of **Table 6.12**, the only routes in the study area which may potentially experience significant effects on views are the A822 and A826, which are both part of the Perthshire Tourist Route. Effects on individual residential properties are considered in **Appendix 6.1**.

Visual Assessment: Introduction

6.158 The assessment of effects on views follows the methodology presented in this chapter, and is based upon the project description outlined in **Chapter 4: Scheme Description.** The assessment reports on construction and decommissioning effects, and operational effects, separately.

The Development Proposal

6.159 Creag a' Bhàird Wind Farm is described in detail in **Chapter 4**. The elements of the development which may potentially affect views are set out below:

- 13 wind turbines of up to 115m tip height, with a hub height of 70m and rotor diameter of 90m;
- two permanent meteorological masts, 70m high; and
- felling of forestry and replacement with conifers and small areas of broadleaf woodland and open ground.

6.160 Other elements of the development which may affect local views include a control building, access tracks and site entrance, crane hardstandings, and borrow pits.

6.161 The grid connection will be the subject of a separate application, but is likely to be made via a new line, which would typically be a wooden pole type line running from the location of the control building to the grid connection point.

Visual Assessment: Construction Effects

Potential Sources of Effects

6.162 The construction of Creag a' Bhàird Wind Farm is described in detail in **Chapter 4**. The changes to views arising from the **construction** of the development (lasting approximately 20 months) will include:

- forest clearance;
- construction of temporary compound, laydown area, offices and car parking;
- construction of site access tracks, including drainage, to connect turbine locations to the route of the existing access track;
- construction of turbine foundations and external transformer bases at each turbine location;

- construction of crane hardstandings at each turbine base location and also at the permanent meteorological mast locations;
- erection of cranes, and delivery to site and erection of wind turbines and permanent meteorological masts;
- excavation of trenches and laying of electrical and control cables adjacent to the site tracks connecting the turbines to the control building;
- testing and commissioning of site equipment including wind turbines; and
- site restoration.

6.163 In addition, some limited construction related effects will occur offsite, along public highways in order to enable large vehicles carrying abnormal loads to reach the site. Further information is set out in **Chapter 12: Access, Traffic and Transport**.

6.164 At the end of the operational phase, the wind farm will either be decommissioned, or an application made for consent to extend its operational life. As described in **Chapter 4: Scheme Description**, decommissioning will take approximately 12 months and will involve the removal of all above ground infrastructure, including the turbines. Access tracks will either be left for use by the landowner or covered in topsoil. The changes in view arising from the decommissioning of the development will be very similar to those arising from construction. Decommissioning is therefore not considered separately, and the effects of decommissioning on visual amenity are assumed to be the same as the effects of construction.

Predicted Effects

6.165 Potentially significant effects on visual receptors may include:

- effects on local residents in Strathbraan and Glen Cochill, as a result of forestry removal, construction activity within the site and construction traffic in the local area;
- effects on road users travelling along the A822 and A826, as a result of forestry removal, the introduction of construction activity and the construction of the site entrance and access track off the A826; and
- effects on local hill walkers as a result of as a result of forestry removal and construction activity within the site.

Proposed Mitigation

6.166 All mitigation is designed into the scheme and is presented in **Chapter 3: Site Selection and Design** and **Chapter 4: Scheme Description**.

Residual Effects

6.167 This section sets out the assessment of the significance of the predicted visual effects that will arise as a result of construction activity. Construction effects will cease once the wind farm becomes operational.

6.168 Construction will affect visual amenity at locations from where construction activity and ground conditions will be discernible. These areas are very localised in extent, and likely receptors are residents in Strathbraan and Glen Cochill, road users travelling on the A826 and A822, and hill walkers in the local area, including Druim Mòr, on the south side of Strathbraan, and on the west side of Glen Cochill.

6.169 Residential receptors with theoretical visibility within Strathbraan include Meikle Findowie and Little Findowie on the south side of the valley, and Meikle Tombane, Borelick and nearby properties on the north side. Residents are considered to be of high susceptibility. Local residents are likely to see the forestry removal (and associated traffic), construction of high level elements within the site (i.e. cranes and turbines), and general construction traffic on the A822. Residents at Scotston, in Glen Cochill, may see the turbine construction and also the construction of the site entrance / access. Taking into account the scale, extent and duration of views, the level of effect on views from Strathbraan and Scotston in Glen Cochill will be **moderate** and **significant**, in the short term.

6.170 Road users on the A822 and A826, both part of the Perthshire Tourist Route, will also have views of the construction activity, including views of high level elements within the site (i.e. cranes and turbines) and there will be views of the construction of the site entrance and access tracks from the A826. The main works will be screened by retained forestry. Road users on the Perthshire Tourist Route are considered to be of medium susceptibility to construction activity, whilst the value of the view is medium, due to its inclusion as part of the Perthshire Tourist Route. Views from the roads towards the site are generally oblique and transient, only occurring for short sections of the route, and the majority of construction activity within the site will not be visible. Taking into account the scale, extent and duration of views, the level of effect of the construction activity on road users will be **minor** and **not significant**.

6.171 Local hill walkers will have views into the site from elevated locations, and will therefore see forestry removal, turbine construction and possibly the construction of low level elements within the site (e.g. access tracks and the control building), dependant on location. Walkers are generally focussed on their surroundings and considered to be of high susceptibility. There are relatively few walkers making use of the hills around Strathbraan, with few waymarkers or other evidence of regular use, and the value of these views is considered to be low. Taking into account the scale, extent and duration of views, the level of effect of the construction activity on walkers will be **moderate** and **significant** in the short term.

Visual Assessment: Operational Effects

Potential Sources of Effects

6.172 Creag a' Bhàird Wind Farm is described in detail in **Chapter 4: Scheme Description**. The changes to views arising from the **operational** development, with a lifespan of 25 years, will include:

- the introduction of 13 wind turbines of up to 115m tip height, and two anemometer masts, and their presence in views for 25 years;
- the introduction of tracks, external transformers, and the control building into local views;
- the planting and maturation of coniferous forestry and some broadleaved trees;
- the presence of a new site entrance on the A826 in Glen Cochill; and
- the introduction of occasional maintenance activity and vehicular/personnel movements around the site and on local roads.

6.173 The operational phase of the wind farm will last for 25 years, which is the development consent period. During this time the turbines will operate according to wind conditions, and regular maintenance will be carried out.

Predicted Effects

6.174 Potentially significant effects on views during operation may arise as a result of:

- visibility of ground level structures in views of the site from local hill tops, as viewed by hill walkers;
- visibility of tall moving structures (turbines and masts) from local residential receptors, road users and hill walkers in locations across the ZTV; and
- visual relationship of the development with Griffin, from all viewpoints.

Proposed Mitigation

6.175 All mitigation is designed into the scheme and is presented in **Chapter 4: Scheme Description**.

Residual Effects

6.176 This section sets out the assessment of the significance of the predicted visual effects that will occur during operation. Judging the significance of visual effects requires consideration of the nature of the visual receptors (susceptibility, value) and the nature of the effect on those receptors (size and scale, geographical extent, duration and reversibility), in line with the methodology set out in this Chapter.

6.177 The assessment of visual effects considers the appearance of the wind farm, and how it will change existing views. Visual effects are assessed by examining effects on views from static locations (viewpoints) and also considering views from settlements, or when travelling through the area along routes.

Effects on Viewpoints

6.178 The predicted operational effects on views and visual amenity as experienced from specific representative viewpoints are detailed in the following tables. The viewpoints, as agreed with statutory consultees, are listed in **Table 6.10** and are shown on **Figure 6.1**. **Figures 6.13** - **6.32** illustrate the change in view from each viewpoint by means of a photograph of the existing view, a wireframe illustrating the wind farm and for select viewpoints, a photomontage.

Viewpoint 1 - Druim Mòr			
Grid Reference	295321, 740883	**Figure Number**	Figure 6.13
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	West	**Distance to nearest turbine**	1.2km
Number of hubs theoretically visible	13	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	Druim Mòr is a small rounded hill to the east of the site, reaching a peak of 367m AOD. The hill is blanketed in heather moorland, which obscures the track which crosses the hill, passing through forestry between Creag Mhòr to the north-west, through the Creag a' Bhàird site and on to Drumour Lodge on the A822 to the south-east. This viewpoint is representative of local hill walkers. There are views north-west over the conifer plantation within the site boundary and extending to the north, with the moorland hills above Glen Cochill rising beyond. Views north look towards the Griffin turbines which are approximately 1.8km away at their closest point. They occupy approximately 110° of the view, and are backclothed by land and sky. The Griffin turbines form two large, visually separate groups from this viewpoint, and the rows of turbines are clearly visible. The tips of some of the Calliachar turbines are just visible, on the horizon to the west of Griffin, seen beyond the site.		
Nature of Receptor (sensitivity)	Local hill walkers are considered to be of **high** susceptibility, as they are likely to be focused on the surrounding landscape. Views will be experienced by a small number of potential viewers, and the view is not within a designated landscape or of recognised importance, therefore the value of the view is considered to be **low**.		
Source of Effect	The main sources of effect at this viewpoint, which overlooks the site, are likely to be the forestry removal and replanting, creation of borrow pits and access tracks, and the introduction of turbines and met masts.		
Nature of Effect (magnitude)	The viewpoint is at a higher elevation than the site, and the Creag a' Bhàird turbines will be visible in close and open views to the west. The turbines will appear as an extension to Griffin Wind Farm. Turbines in the east of the site (T7, T8 and T13) are closer to the viewpoint and will be visible in front of the Griffin turbines, backclothed by both land and sky. Turbines in the west of the site are at a lower elevation and form a separate group, backclothed mainly by land. The scale of change to the view will be **large**. The geographical extent over which changes will be visible is **localised**, as the viewpoint represents views from a small hill of local importance, not views from the wider area.		

Viewpoint 1 - Druim Mòr	
	Operational effects will be **long term**. The turbines and access tracks are likely to be the most visible elements of the development and are **reversible**. The removal of forestry from within the site and creation of borrow pits may also be visible, and these are **non-reversible** elements. The forestry will be replaced over time with a coniferous plantation, with some small areas of broadleaved woodland.
Level of Effect	Overall, the level of effect is considered to be **major**, due to the high susceptibility of the viewers, and the close proximity of the viewer to the development. The Creag a' Bhàird turbines will extend the influence of wind energy development to the west, replacing the existing view of coniferous forestry on the rolling hills towards Glen Cochill. Over time, the mixed coniferous and deciduous planting will help to screen the ground level infrastructure, but will not screen the turbines themselves.
Significance of Effect	Significant

Viewpoint 2 – Ben Salachill			
Grid Reference	294479, 743381	**Figure Number**	Figure 6.14
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	South-west	**Distance to nearest turbine**	1.5km
Number of hubs theoretically visible	10	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	The viewpoint is located on a track within Griffin Wind Farm, and is representative of workers within the wind farm, as well as recreational walkers in the local area who may use these tracks. There are open views across rolling moorland, with the Ballinloan Burn in the foreground, towards the coniferous forestry within the site, with the upland hills on the south side of Strathbraan and west of Glen Cochill visible beyond. Griffin Wind Farm is visible to the north and west. The Griffin turbines are mainly backclothed by land, including the ridge on the western side of Glen Cochill.		
Nature of Receptor (sensitivity)	Workers within Griffin Wind Farm are of **low** susceptibility. Local hill walkers are considered to be of **high** susceptibility, as they are likely to be focused on the surrounding landscape. Views will be experienced by a small number of potential viewers, and the view is not within a designated landscape or of recognised importance, therefore the value of the view is considered to be **low**.		
Source of Effect	The main sources of effect at this viewpoint will be forestry removal and replanting, and the introduction of turbines and met masts. Ground level infrastructure including borrow pits and access tracks may also be visible to a lesser extent.		
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible in close and open views to the south-west of the viewpoint. The turbines will mainly be visible behind the existing Griffin turbines, with the exception of the three most easterly turbines which will extend the angle of view occupied by turbines to the south. Turbines in the west of the		

Viewpoint 2 – Ben Salachill	
	site will be at a lower elevation than those in the east, and partially screened by the intervening landform. The turbines will be backclothed by both land and sky, and will appear as an extension to Griffin in terms of scale and extent. The scale of change to the view will be **large**. The geographical extent over which changes will be visible is **localised**, as the viewpoint represents views from a track which is not readily accessible. Operational effects will be **long term**. The turbines, met masts and access tracks are likely to be the most visible elements of the development and are **reversible**. The removal of forestry from within the site and creation of borrow pits may also be visible, these are **non-reversible** elements. The forestry will be replaced over time with a commercial Sitka forest and some small areas of broadleaved woodland.
Level of Effect	Overall, the level of effect is considered to be **major**, due to the close proximity to the development, extending the influence of wind energy development attributable to Griffin southwards, towards Strathbraan, and sitting behind and between the existing Griffin turbines.
Significance of Effect	Significant

Viewpoint 3 - A826 within Glen Cochill			
Grid Reference	290795, 740097	**Figure Number**	Figure 6.15
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	North-east	**Distance to nearest turbine**	1.7km
Number of hubs theoretically visible	4	**Number of turbine blade tips theoretically visible**	5
Viewpoint location and existing view:	The viewpoint is located on the A826, within Glen Cochill, to the west of the site. The viewpoint is representative of road users travelling in both directions on the A826. There are views east from the road, across moorland and coniferous forestry on the low lying ridge formed by Creag a' Bhàird and Meall Mòr. A row of electricity pylons runs along the side of the glen, parallel to the road and backclothed by land and sky. The most westerly row of turbines within Griffin Wind Farm is visible to the north-east, against the skyline, with the turbines running parallel to the road. There are also views west to the steeper moorland slopes on the more dramatic east facing side of Glen Cochill, including the peaks of Craig Hulich (552m AOD) and Meall Dearg (690m AOD).		
Nature of Receptor (sensitivity)	Road users travelling on the A826 are of **medium** susceptibility. The value of the view is **medium**, due to the inclusion of the A826 as part of the Perthshire Tourist Route.		
Source of Effect	The main sources of effect from this viewpoint will be the introduction of turbines and met masts, and the site entrance to the north.		

Viewpoint 3 - A826 within Glen Cochill	
Nature of Effect (magnitude)	The four most westerly turbines (T1 – T4) will be visible in close views on the far side of Creag a' Bhàird, against the sky and beyond the forestry and pylons between the viewpoint and the western site boundary. Turbines 1 and 2 will be visible in front of Griffin, appearing closer and larger in scale that the more distant Griffin turbines. Turbine 3 will be visible near the top of Creag a' Bhàird hill, and along with turbine 4 will extend the visual influence of wind development to the south, further into Glen Cochill. The site entrance may be visible to the north, although most of the ground level infrastructure will be screened by the intervening topography and forestry. The overall scale of change to the view will be **medium**. The geographical extent over which changes will be visible is **localised**, as the viewpoint represents views from a short section of the A826 as it passes the site. Operational effects will be **long term**. The turbines, met masts and site entrance are likely to be the only visible elements of the development and are **reversible**. Existing forestry in the view, between the A826 and the site boundary, will not be removed as part of the development.
Level of Effect	Overall, the level of effect is considered to be **moderate**, as the A826 is part of the Perthshire Tourist Route, and the development is in close proximity to the viewpoint and will extend the influence of wind energy development south along Glen Cochill. Only four turbines will be visible and they will appear as an extension to Griffin, although the turbines will be closer and appear larger in scale.
Significance of Effect	Significant

Viewpoint 4 - General Wade's Military Road, Glen Cochill			
Grid Reference	289939, 742230	**Figure Number**	Figure 6.16
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	South-east	**Distance to nearest turbine**	2.1km
Number of hubs theoretically visible	6	**Number of turbine blade tips theoretically visible**	11
Viewpoint location and existing view:	The viewpoint is located on a footpath which runs along the western side of Glen Cochill, on the slopes below Meall Dearg. The footpath is a historic route which forms a loop off the A826. The viewpoint is representative of recreational walkers within Glen Cochill. There are views east across Glen Cochill, across moorland slopes and coniferous forestry on the eastern side of the glen, rising to a peak at Creag Mhòr (493m AOD) within the Griffin Wind Farm site. Griffin occupies a wide angle of view to the east, and the turbines are a dominant landscape element, appearing in the middle distance and in the background of the view, against the skyline. A row of electricity pylons passes along the eastern side of the glen, in front of the turbines. The A826 and Cochill Burn are visible on the valley floor. The property at Scotston and its coniferous shelterbelt is visible, on the western side of the A826.		
Nature of Receptor	Recreational walkers on the military road are of **high** susceptibility, as they are likely to be focused on the surrounding landscape.		

Viewpoint 4 - General Wade's Military Road, Glen Cochill	
(sensitivity)	The view is not within a designated landscape or of recognised importance, and the view therefore the value of the view is considered to be **low**.
Source of Effect	The main sources of effect from this viewpoint will be the introduction of turbines and met masts, and the site entrance and access track from the A826.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will appear as an extension to Griffin from this viewpoint, and being broadly equidistant will appear similar in scale. The tips of the most north-westerly turbines will be visible adjacent to the tips of Griffin turbines, and six turbines will be visible at hub height to the south, forming a more visible group of the slopes of Creag a' Bhàird hill. The turbines will all appear against the skyline and some stacking will occur. Turbines in the east of the site are partially or fully screened by landform from this viewpoint. The majority of turbines will be visible from this elevated location within Glen Cochill, and the scale of change to the view will therefore be **large**. The geographical extent over which changes will be visible is relatively **localised**, as the viewpoint represents views from the east facing slopes and elevated ridge on the western side of Glen Cochill. Operational effects will be **long term**. The turbines, met masts, site entrance and part of the access track are likely to be the most visible elements of the development and are **reversible**. Existing forestry in the view, between the A826 and the site boundary, will not be removed as part of the development.
Level of Effect	Overall, the level of effect is considered to be **major**, as recreational receptors are of high susceptibility to the development and the majority of turbines will be visible, extending the influence of the Griffin turbines further south along Glen Cochill. The turbines will appear as an extension to Griffin, being adjacent and similar in scale to the Griffin turbines.
Significance of Effect	Significant

Viewpoint 5 - A822 near Borelick			
Grid Reference	295591, 739506	**Figure Number**	Figure 6.17
LCT	Mid Highland Glens	**Landscape Designation**	None
Direction of view	North	**Distance to nearest turbine**	2.4km
Number of hubs theoretically visible	9	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	The viewpoint is located on the A822 within Strathbraan, at the entrance to the Borelick group of properties. The viewpoint is representative of road users. Views from Borelick are assessed in **Appendix 6.1**. There are views north, across a settled agricultural landscape of pasture, shelterbelt trees, forestry, dwellings and farmsteads on the lower slopes of Strathbraan between Meall Mòr and Druim Mòr. Turbines in the south-west of Griffin Wind Farm are visible against the sky, on either side of Craig Tombane, becoming screened to the east by Druim Mòr. These turbines are partially		

Viewpoint 5 - A822 near Borelick	
	screened from this viewpoint location by the group of properties and mature vegetation at Borelick. Open views south are also available, across the flat pastoral plain of the River Braan, towards the range of hills beyond, of between approximately 400m and 600m in height.
Nature of Receptor (sensitivity)	Road users on the A822 are of **medium** susceptibility. The value of the view is **medium**, due to the inclusion of the A822 as part of the Perthshire Tourist Route.
Source of Effect	The main sources of effect from this viewpoint are the removal of forestry and the introduction of turbines and met masts.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will appear on the slopes between Meall Mòr and Druim Mòr, and will appear to form three separate groups of turbines, seen against the sky. The two groups of turbines in the east of the site will appear as an extension to the existing rows of Griffin turbines, but will be closer and appear larger in scale. Turbines in the west of the site will form a separate group, partially screened by the lower slopes of Meall Mòr. The majority of turbines will be visible from this location, and the scale of change to the view will therefore be **large**. The geographical extent over which changes will be visible is **localised**, as the viewpoint represents views from the short section of the A822 with theoretical visibility, between Ballachraggan and Drumour. Operational effects will be **long term**. The turbines and met masts are likely to be the most visible elements of the development and are **reversible**. The forestry removal from within the site may also be visible, and this is **non-reversible**. However, the forestry will be replaced with a commercial Sitka forest and some small areas of broadleaved woodland, mitigating its loss over time.
Level of Effect	Overall, the level of effect is considered to be **major**, as the majority of turbines will be visible, extending the influence of the Griffin turbines further into Strathbraan. The turbines will appear as an extension to Griffin, however they will also appear closer and larger in scale.
Significance of Effect	Significant

Viewpoint 6 - A822 near Ballinreigh			
Grid Reference	291409, 737301	**Figure Number**	Figure 6.18
LCT	Mid Highland Glens	**Landscape Designation**	None
Direction of view	North-east	**Distance to nearest turbine**	3.5km
Number of hubs theoretically visible	2	**Number of turbine blade tips theoretically visible**	4
Viewpoint location and existing view:	The viewpoint is located on the A822 near Ballinreigh, between the small settlements of Amulree and Milton. The viewpoint is representative of road users on the A822.		

Viewpoint 6 - A822 near Ballinreigh	
	Views towards the site from this section of the road are restricted by topography and roadside vegetation. The viewpoint is therefore located above the road, adjacent to the base of an electricity pylon. From here there are views across a settled, pastoral, wooded and forested landscape of rolling hills, rising to peaks at Craig Hulich (522m AOD) to the east and Meall nan Caorach (623m AOD) to the south-east. A line of electricity pylons extends from the viewpoint north along Glen Cochill. The Griffin turbines are visible on the horizon, around Creag Mhòr, and extending east behind Druim Mòr.
Nature of Receptor (sensitivity)	Road users on the A822 are of **medium** susceptibility. The value of the view is **medium**, due to the inclusion of the A822 as part of the Perthshire Tourist Route.
Source of Effect	The main source of effect from this viewpoint will be the introduction of turbines.
Nature of Effect (magnitude)	The hubs of two Creag a' Bhàird turbines will appear in front of the visible Griffin turbines, and the tips of two more will be visible to the east, partially screened by the intervening landform. The turbines will appear to be part of the Griffin group of turbines and will be of a similar scale. Only four turbines will be visible from this location, and the scale of change to the view will therefore be **small**. The geographical extent over which changes will be visible is **localised**, as the viewpoint represents views from a single location above the A822, which does not have clear views towards the site in this section. Operational effects will be **long term**. The turbines are likely to be the only visible elements of the development and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the four visible turbines will appear as a small extension to the visible turbines at Griffin, and views from the road are filtered and screened by roadside trees and vegetation in the wider landscape.
Significance of Effect	Not Significant

Viewpoint 7 - Creag Liath (426m AOD)			
Grid Reference	298644, 737298	**Figure Number**	Figure 6.19
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	North-west	**Distance to nearest turbine**	6.0km
Number of hubs theoretically visible	13	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	The viewpoint is located at the summit of Creag Liath, a moorland hill which is one of a series of hills on the southern side of Strathbraan, ranging between approximately 400m and 600m AOD. The hill can be accessed via a right of way from Ballachraggan on the A822. The viewpoint is representative of recreational walkers in the hills above Strathbraan.		

Viewpoint 7 - Creag Liath (426m AOD)	
	There are views north into Strathbraan, with settled farmland on the lower slopes, rising to moorland and forestry on the upper hill slopes, including the forested site. Griffin occupies approximately 40° of the view, and appears as three separate compact turbine groups. The Griffin turbines are in rows, backclothed by land, and a high degree of stacking occurs, particularly in the western part of the site. The operational Drumderg Wind Farm is also visible in wider views to the north-east, at a distance of approximately25km.
Nature of Receptor (sensitivity)	Recreational walkers are of **high** susceptibility, as they are likely to be focused on the surrounding landscape. This summit view is not within a designated landscape or of recognised importance, therefore the value of the view is considered to be **medium**.
Source of Effect	The main sources of effect from this viewpoint are likely to be the removal of forestry and the introduction of turbines and met masts. Some ground level infrastructure may also be visible, e.g. the access tracks.
Nature of Effect (magnitude)	All 13 Creag a' Bhàird turbines will be visible, backclothed by land. The turbines will appear at the same scale as Griffin, and turbines in the east of the site will appear as extensions to the southern end of the Griffin rows. Some additional stacking will occur as a result. Turbines in the west of the site will form a small, separate group. The overall scale of change to the view will be **medium**. The geographical extent over which changes will be visible is moderately **widespread**, as the viewpoint represents views from the range of hill tops on the southern side of Strathbraan. Operational effects will be **long term**. The turbines, met masts and access tracks are likely to be the most visible elements of the development and are **reversible**. The loss of forestry from within the site will also be visible, and this is **non-reversible**. The forestry will be replaced over time with a commercial Sitka forest and some small areas of broadleaved woodland.
Level of Effect	Overall, the level of effect is considered to be **moderate**, as all of the turbines will be visible, but will appear as an extension to Griffin, extending the extent of wind farm visibility by approximately 10° to the west.
Significance of Effect	Significant

Viewpoint 8 - Meal nan Caorach			
Grid Reference	292871, 733888	**Figure Number**	Figure 6.20
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	North	**Distance to nearest turbine**	6.6km
Number of hubs theoretically visible	6	**Number of turbine blade tips theoretically visible**	12
Viewpoint location and existing view:	The viewpoint is located at the summit of Meal nan Caorach, the highest of a series of moorland hills on the south side of Strathbraan. The viewpoint is representative of recreational walkers.		

Viewpoint 8 - Meal nan Caorach	
	There are panoramic views from this hill top, across a foreground of undulating moorland with rocky outcrops, north towards Glen Cochill and north-east across Strathbraan. Griffin is visible approximately 8km to the north, and appears as one large, single turbine group, on the edge of the extensive Craigvinean forest, occupying approximately 35° of the view. The turbines are backclothed by land, with the mountains of the Cairngorms National Park rising on the distant horizon.
Nature of Receptor (sensitivity)	Recreational walkers are of **high** susceptibility, as they are likely to be focused on the surrounding landscape. This summit view is not within a designated landscape or of recognised importance, therefore the value of the view is considered to be **medium**.
Source of Effect	The main sources of effect from this viewpoint are likely to be the removal of forestry and the introduction of turbines and, to a lesser degree, the met masts.
Nature of Effect (magnitude)	Up to 12 Creag a' Bhàird turbines will be visible, in front of the much larger Griffin group, and backclothed by land. The site is partially screened by the intervening rolling landform extending north from Meal nan Caorach towards Dalreoch Hill. The turbines will appear at the same scale as Griffin and from this viewpoint will appear relatively evenly spaced. The scale of change to the view will therefore be **small**. The geographical extent over which changes will be visible is moderately **widespread**, as the viewpoint represents views from the range of hill tops on the southern side of Strathbraan. Operational effects will be **long term**. The turbines and met masts are likely to be the most visible elements of the development and are **reversible**. The loss of forestry from within the site will also be visible, and this is **non-reversible**. The forestry will be replaced over time with a commercial Sitka forest and some small areas of broadleaved woodland.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the majority of the turbines will be visible, but will appear as an extension to Griffin, and will not extend the angle of view occupied by existing wind development.
Significance of Effect	Not Significant

Viewpoint 9 - A822 near Corrymuckloch			
Grid Reference	289201, 733696	**Figure Number**	Figure 6.21
LCT	Mid Highland Glens	**Landscape Designation**	None
Direction of view	North-east	**Distance to nearest turbine**	7.7km
Number of hubs theoretically visible	3	**Number of turbine blade tips theoretically visible**	5
Viewpoint location and existing view:	The viewpoint is located on the A822 near Corrymuckloch, between Amulree and Newton. The viewpoint is representative of road users travelling north on the A822.		

Viewpoint 9 - A822 near Corrymuckloch	
	There are views across rolling moorland slopes and craggy hill tops, with small pockets of deciduous woodland and conifer plantation. The road corridor and the recently constructed Beauly-Denny overhead line are notable human elements in the landscape. A number of turbines within Griffin Wind Farm are visible approximately 9km to the north, backclothed by land and sky, and partially screened by a conifer plantation in the middle distance of the view.
Nature of Receptor (sensitivity)	Road users on the A822 are of **medium** susceptibility. The value of the view is **medium**, due to the inclusion of the A822 as part of the Perthshire Tourist Route.
Source of Effect	The main source of effect from this viewpoint is the introduction of turbines.
Nature of Effect (magnitude)	Up to 5 Creag a' Bhàird turbines will be visible, sitting in front of the larger Griffin group, partly backclothed by land. The turbines will be partially screened by the intervening landform and vegetation, and will be visible beyond an overhead power line. The turbines will appear slightly larger than those of Griffin, though the visible turbines will not widen the angle of view occupied by the Griffin turbines. The scale of change to the view will therefore be **small**. The geographical extent over which changes will be visible is **localised**, as the viewpoint represents road users travelling north on a short section of the A822 which has theoretical visibility. Operational effects will be **long term**. The turbines are likely to be the only visible element of the development and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **minor**, as only a small number of turbines will be visible, and the turbines will appear in the context of Griffin, and will be perceived as part of the same wind farm.
Significance of Effect	Not Significant

Viewpoint 10 - King's Seat, Birnam			
Grid Reference	303203, 740174	**Figure Number**	Figure 6.22
LCT	Highland Summits and Plateaux	**Landscape Designation**	River Tay (Dunkeld) NSA
Direction of view	West	**Distance to nearest turbine**	8.9km
Number of hubs theoretically visible	12	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	The viewpoint is located by the cairn on King's Seat, Birnam Hill, above the town of Dunkeld. The viewpoint is representative of recreational walkers. There are panoramic views from King's Seat, filtered and screened by woodland surrounding the hill top. There are views west along Strathbraan, including of Griffin Wind farm extending across the slopes above Glen Cochill. Griffin is wide in		

Viewpoint 10 - King's Seat, Birnam	
	extent and the majority is backclothed by land. Calliachar is visible on the skyline beyond Griffin. There are also views north and south into Strath Tay, which form the most scenic part of the view.
Nature of Receptor (sensitivity)	Hill walkers are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. King's Seat is within the River Tay (Dunkeld) NSA and the "iconic view from King's Seat" is listed as one of the special qualities of the River Tay NSA. The value of the view is therefore considered to be **high**.
Source of Effect	The main sources of effect from this viewpoint are the introduction of turbines and, to a lesser degree, met masts and removal of forestry.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible to the south of the existing Griffin turbines, on the near side of Meall Dearg, rising above Glen Cochill. The turbines will appear to form an extension to this wind farm, extending the angle of view occupied by the turbines southward by around 10°. Intervening landform will partially screen some of the turbines, as for Griffin. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is **localised,** as views from Birnam Hill and King's Seat are filtered and screened by woodland cover, with only occasional openings in the vegetation affording views towards the site. Operational effects will be **long term**. The turbines are likely to be the most visible elements of the development and are **reversible**. The loss of forestry from within the site will be barely perceptible in this view, and is **non-reversible**. The forestry will be re-planted and improved, mitigating this loss over time.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the turbines will be visible and will widen the angle of view currently occupied by turbines, but will be relatively distant elements in an overall panoramic view, and will appear as a small extension to an existing wind farm.
Significance of Effect	Not Significant.

Viewpoint 11 - Newtyle Hill			
Grid Reference	304601, 741870	**Figure Number**	Figure 6.23
LCT	Highland Foothills	**Landscape Designation**	River Tay (Dunkeld) NSA
Direction of view	West	**Distance to nearest turbine**	10.2km
Number of hubs theoretically visible	9	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	The viewpoint is located near to the summit of Newtyle Hill, above Dunkeld. The summit itself is fenced off. There is a mast to the south of the viewpoint. Access to the hill is provided by a steep switchback forestry track from the A984. The viewpoint is representative of recreational hill walkers.		

Viewpoint 11 - Newtyle Hill	
	There are views west towards the site, along Strathbraan, across a foreground of recently felled plantation on the steep slope down into the valley below. Dunkeld is visible on the valley floor, with the wooded slopes of Birnam Hill and King's Seat rising above the town and to the west of the viewpoint. The blade tips of the Griffin turbines are visible beyond an intervening ridge, extending in a wide angle of view below and above the horizon line. Calliachar is also visible on the skyline, beyond Griffin.
Nature of Receptor (sensitivity)	Hill walkers are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. Newtyle Hill is within the River Tay (Dunkeld) NSA, though the viewpoint is not advertised or marked, and the value of the view is therefore considered to be **medium**.
Source of Effect	The main source of effect from this viewpoint will be the introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible to the south of the existing Griffin turbines, on the near side of Meall Dearg, rising above Glen Cochill. The turbines will appear in the context of Griffin and also the more distant Calliachar Wind Farm, extending the angle of view occupied by the turbines. Intervening landform will partially screen some of the turbines, as for Griffin. The turbines will be backclothed by land. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is **localised**. Operational effects will be **long term**. The turbines are likely to be the most visible elements of the development and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the turbines will be visible and will widen the angle of view currently occupied by turbines, but will appear as an extension to an existing wind farm in the background of wider views across Strath Tay and along Strathbraan.
Significance of Effect	Not Significant.

Viewpoint 12 - Meall nam Fuaran			
Grid Reference	282612, 736188	**Figure Number**	Figure 6.24
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	North-east	**Distance to nearest turbine**	10.7km
Number of hubs theoretically visible	6	**Number of turbine blade tips theoretically visible**	11
Viewpoint location and existing view:	The viewpoint is located at the summit of a hill above Glen Quaich and Loch Freuchie, which lie to the north-east. The summit, at 805m AOD, can be accessed from the Glen Quaich / Glen Shervie / Glen Lochan circuit, which includes part of the long distance Rob Roy Way. The viewpoint is representative of recreational hill walkers.		

Viewpoint 12 - Meall nam Fuaran	
	There are panoramic views from the summit across Glen Quaich to the elevated ridge above Glen Cochill, and the Craigvinean forest beyond. Griffin Wind Farm is visible on the edge of the forest to the north-east, below the horizon and partially screened by intervening landform. Calliachar Wind Farm is visible in closer views to the north.
Nature of Receptor (sensitivity)	Hill walkers are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. Meall nam Fuaran is not within any designated landscapes and the value of the summit view is therefore considered to be **medium**.
Source of Effect	The main source of effect from this viewpoint will be the introduction of turbines, and some forestry removal will also be visible.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible to the south of the existing Griffin turbines, and will appear to form an extension to this wind farm. Intervening landform will partially screen some of the turbines, as for Griffin. The turbines will be backclothed by the forested slopes of the Craigvinean Forest. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is **localised**, as there is only theoretical visibility from a small area around the summit of Meall nam Fuaran. Operational effects will be **long term**. The turbines are likely to be the most visible elements of the development and are **reversible**. The loss of forestry from within the site may also be visible, and is **non-reversible**.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the turbines will be visible and will widen the angle of view currently occupied by turbines, but will appear as an extension to an existing wind farm, in distant and panoramic views.
Significance of Effect	Not Significant.

Viewpoint 13 - Meall Tairneachan			
Grid Reference	280775, 754337	**Figure Number**	Figure 6.25
LCT	Highland Summits and Plateaux	**Landscape Designation**	Loch Tummel NSA
Direction of view	South-east	**Distance to nearest turbine**	17.0km
Number of hubs theoretically visible	10	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	The viewpoint is located at the summit of Meall Tairneachan, a Corbett which is one of a series along a ridge above Aberfeldy and Loch Tay, on the edge of the Loch Tummel NSA. Farragon Hill is another summit along this ridge to the east. The summit is accessed from the west via a track from the B846, which passes alongside the Foss barite mine. The viewpoint is representative of recreational hill walkers.		

Viewpoint 13 - Meall Tairneachan	
	There are panoramic views across farmland and woodland on the lower slopes of Strath Tay, below to the viewpoint, across expansive coniferous forestry towards the site. Griffin Wind Farm is visible to the south-east, backclothed by land and occupying a wide angle of view, including one large group of turbines and three smaller groups, in which the rows of turbines can be seen. Calliachar is visible to the south, on the upper slopes above Glen Cochill.
Nature of Receptor (sensitivity)	Hill walkers are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. Meall Tairneachan is a summit destination on the edge of the Loch Tummel NSA and the value of the view is therefore considered to be **high**.
Source of Effect	The main source of effect from this viewpoint will be the introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible in separate groups. Turbines in the east of the site will sit at the end of the rows of existing Griffin turbines, with turbines in the west of the site forming a separate group. The turbines will appear as an extension to Griffin, backclothed by land and partially screened by the intervening landform. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is moderately **widespread**, as the viewpoint represents views from the wider ridge which extends north-east along the edge of the NSA, including Farragon Hill. Operational effects will be **long term**. The turbines are likely to be the most visible elements of the development and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the development will widen the angle of view occupied by turbines, but will be distant elements in wider panoramic views, partially screened by landform, and will appear as an extension to an existing wind farm.
Significance of Effect	Not Significant.

Viewpoint 14 - Ben Chonzie			
Grid Reference	277324, 730863	**Figure Number**	Figure 6.26
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	North-east	**Distance to nearest turbine**	18.1km
Number of hubs theoretically visible	8	**Number of turbine blade tips theoretically visible**	12
Viewpoint location and existing view:	The viewpoint is located at the summit of Ben Chonzie, a Munro on the south side of Glen Almond. The summit is marked by a cairn, located at the north-eastern end of a broad, flat ridge. There are several routes of ascent; the most popular is from Coishavachan up Glen Lednock from the south-west. The viewpoint is representative of recreational hill walkers.		

Viewpoint 14 - Ben Chonzie	
	There are panoramic views across the rounded, moorland hills above Glen Almond, dissected by narrow valleys. Griffin Wind Farm is visible to the north-east at the end of views along Glen Lochan, backclothed by land, occupying a wide angle of view and partially screened by the intervening rounded hills.
Nature of Receptor (sensitivity)	Hill walkers are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. Ben Chonzie is not within any designated landscapes but is a Munro summit and the value of the view is therefore considered to be **high**.
Source of Effect	The main source of effect from this viewpoint is the introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible to the south of the operational Griffin turbines, partially screened by the intervening landform. The turbines will appear as an extension to Griffin and will be backclothed by land. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is **localised,** as there is only theoretical visibility from a small area around the summit of Ben Chonzie. Operational effects will be **long term**. The turbines are likely to be the most visible elements of the development and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the turbines will be distant elements in wider panoramic views, will be partially screened by landform, and will appear as an extension to an existing wind farm.
Significance of Effect	Not Significant.

Viewpoint 15 - Ben Vrackie			
Grid Reference	295067, 763249	**Figure Number**	Figure 6.27
LCT	Highland Summits and Plateaux	**Landscape Designation**	None
Direction of view	South	**Distance to nearest turbine**	22.0km
Number of hubs theoretically visible	9	**Number of turbine blade tips theoretically visible**	12
Viewpoint location and existing view:	The viewpoint is located near the trig point at the summit of Ben Vrackie, a scenic viewpoint above Pitlochry. The summit is most commonly accessed from the south, via a path from a car park north-west of Moulin on the edge of Pitlochry. The path passes through woodland, open moorland and past Loch a' Choire. The viewpoint is representative of recreational hill walkers. From the summit of this popular peak, there are panoramic views in all directions. Pitlochry and the A9 road corridor are visible in the valley below. Looking south towards the site, there are long views over the southern Highlands as they descend toward the Highland Boundary Fault. Griffin Wind Farm is visible below the horizon.		

Viewpoint 15 - Ben Vrackie	
Nature of Receptor (sensitivity)	Hill walkers at this popular hill are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. The summit of Ben Vrackie is a destination viewpoint and the value of the view is therefore considered to be **high**.
Source of Effect	The main sources of effect are the loss of forestry and introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible in clear weather beyond the operational Griffin turbines, and partially screened by landform. The turbines will all appear as part of the same development as Griffin. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is **localised**. Operational effects will be **long term**. The turbines are likely to be the most visible elements of Creag a' Bhàird Wind Farm and are **reversible**. The removal of forestry from within the site may also be visible, and is **non-reversible**, though it will be mitigated by replacement planting.
Level of Effect	Overall, the level of effect is considered to be **negligible**, as the turbines are distant, partially screened by landform, will appear as an extension to an existing wind farm and will only be visible in clear weather.
Significance of Effect	Not Significant.

Viewpoint 16 - Schiehallion			
Grid Reference	271402, 754743	**Figure Number**	Figure 6.28
LCT	Highland Summits and Plateaux	**Landscape Designation**	Loch Rannoch and Glen Lyon NSA
Direction of view	South-east	**Distance to nearest turbine**	24.4km
Number of hubs theoretically visible	13	**Number of turbine blade tips theoretically visible**	13
Viewpoint location and existing view:	The viewpoint is located at the summit of Schiehallion (1083m AOD), a distinctive and popular Munro within the Loch Rannoch and Glen Lyon NSA. The summit is most commonly accessed from a car park at Braes of Foss to the north-east. The viewpoint is representative of recreational hill walkers. There are panoramic and distant views from the summit, encompassing the Grampian mountains, a large scale upland landscape extending from Loch Lomond and the Trossachs National Park in the south-west to the Cairngorms National Park in the north-east. To the south, the landscape is of rugged upland moorland, incised by burns. To the west and north there is settled agriculture and coniferous forestry on the lower slopes and in the glens between the upland areas, including at Glen Lyon to the south, and Loch Rannoch and Loch Tummel to the north. The recently constructed Beauly – Denny line is visible to the north and east, crossing the lower lying parts of the landscape. Griffin and Calliachar Wind Farms are both visible to the east. Griffin is wide in extent and forms two visually separate groups, backclothed by land. Calliachar forms a separate, closer group, and similarly backclothed by land.		

Viewpoint 16 - Schiehallion	
Nature of Receptor (sensitivity)	Hill walkers are considered to be of **high** susceptibility, as their attention is focussed on the surrounding landscape. Schiehallion lies at the eastern edge of the Loch Rannoch and Glen Lyon NSA and its 'long symmetrical mass' is one of the special qualities of the NSA. It is a Munro summit, and the value of the view is considered to be **high**.
Source of Effect	The main source of effect from this viewpoint is the introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible at the southern end of Griffin Wind Farm, backclothed by land. The most easterly turbines will be visible beyond Griffin, with the westerly turbines extending the angle of view occupied by turbines. Intervening landform in Glen Cochill will screen parts of the development. The scale of change to the view will be **small**. The Creag a' Bhàird turbines will be visible from the summit and from much of the path down to the Braes of Foss car park. The geographical extent over which changes will be visible is therefore moderately **widespread**. Operational effects will be **long term**. The turbines are likely to be the only visible elements of Creag a' Bhàird Wind Farm and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **minor**, as the turbines will be visible from the summit and much of the path when descending Schiehallion, but will be distant elements, will appear as an extension to an existing wind farm, and will form a small part of much wider panoramic views.
Significance of Effect	Not Significant.

Viewpoint 17 - Carn Liath			
Grid Reference	293595, 769800	**Figure Number**	Figure 6.29
LCT	South Eastern Glens	**Landscape Designation**	Cairngorms National Park
Direction of view	South	**Distance to nearest turbine**	27.9km
Number of hubs theoretically visible	9	**Number of turbine blade tips theoretically visible**	12
Viewpoint location and existing view:	The viewpoint is at the summit of Carn Liath (975m AOD), the lowest of Beinn a'Ghlo's three summits, all of which are Munros within the Cairngorms National Park. The summit is most commonly accessed by the path which runs up the south-western flank from Loch Moraig, and continues along the summit ridge to Braigh Coire Chruinn-Bhalgain and Carn nan Gabhar. The viewpoint is representative of recreational hill walkers. There are panoramic views from the rounded moorland summits of the Beinn a'Ghlo range, including the hills and upland Glens of Strathardle, Glen Shee, Glen Isla and Glen Clova to the east. The Highland Boundary Fault is clearly perceptible from this location, with views across the hills and valleys to the south-east and beyond to the broad lowlands of Strathmore and the Sidlaw Hills.		

Viewpoint 17 - Carn Liath	
	Griffin Windfarm is visible to the south, below the horizon to the south of the Craigvinean Forest and occupying a wide angle of wide. Calliachar is also visible, below the horizon to the south-south-west.
Nature of Receptor (sensitivity)	Hill walkers are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. The viewpoint is located within the Cairngorms National Park and is a Munro summit. The value of the view is considered to be **high**.
Source of Effect	The main source of effect from this viewpoint will be the introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will be visible in clear weather, beyond the operational Griffin turbines, and partially screened by landform. The turbines will all appear as part of the same development as Griffin, and will not widen the angle of view occupied by the Griffin turbines. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is **localised**, as the viewpoint represents visibility from the summits of the Beinn a'Ghlo range, below which visibility is reduced. Operational effects will be **long term**. The turbines are likely to be the only visible elements of Creag a' Bhàird Wind Farm and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **negligible**, as the turbines are distant elements in panoramic views, partially screened by landform, will appear behind Griffin Wind Farm and will not increase the presence of turbines in the view.
Significance of Effect	Not Significant.

Viewpoint 18 - Dunsinane Hill			
Grid Reference	321367, 731675	**Figure Number**	Figure 6.30
LCT	Igneous Hills	**Landscape Designation**	None
Direction of view	North-west	**Distance to nearest turbine**	28.7km
Number of hubs theoretically visible	6	**Number of turbine blade tips theoretically visible**	10
Viewpoint location and existing view:	The viewpoint is located at a hill fort on the edge of the Sidlaw Hills, above the B953. Dunsinane Hill is located at the end of a ridge running north-east, including the summits of Black Hill (360m AOD) and King's Seat (377m AOD). The hill is commonly accessed from the small settlement of Collace to the north-west. The viewpoint is representative of recreational walkers and visitors to the fort. There are distant, panoramic views in all directions, with the exception of views to the north-east which are contained by Black Hill and King's Seat. To the south, there are long views across a rolling landscape of coniferous forestry and pasture in the Sidlaw Hills, to the Firth of Tay and beyond to Fife. To the west there are distant views across a foreground of rolling moorland, deciduous woodland and		

Viewpoint 18 - Dunsinane Hill	
	conifer plantations across to Strathmore, a settled agricultural landscape which contains major transport routes and settlements including the city of Perth. The distant backdrop of the view is formed by the Grampian mountains. A small working quarry is located at the foot of Bandirran Hill to the west. In the direction of the site, Griffin Wind Farm is visible at a distance of approximately 27km, with the distinctive peak of Schiehallion visible beyond. Griffin occupies a wide angle of view, seen against a backdrop of land and sky. Calliachar is visible on the horizon beyond Griffin. Drumderg Wind Farm is also visible to the north.
Nature of Receptor (sensitivity)	Hill walkers and visitors to the fort are considered to be of **high** susceptibility, as they are focussed on the surrounding landscape. Dunsinane Hill is of cultural importance, as it is mentioned in Shakespeare's play Macbeth, and of archaeological importance as an Iron Age Hill Fort. The location is provided with interpretation, and the value of the view is considered to be **high**.
Source of Effect	The main source of effect from this viewpoint will be the introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will only be visible in clear weather and will be partially screened by the intervening landform. The most easterly turbines will appear to sit within the Griffin Wind Farm; the remainder will form a small visually separate group, immediately to the west of Griffin. The scale of change to the view will be **small**. The geographical extent over which changes will be visible is moderately **widespread**, as the viewpoint represents views from the fringes of the Sidlaw Hills. Operational effects will be **long term**. The turbines are likely to be the only visible elements of Creag a' Bhàird Wind Farm and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **negligible**, as the turbines are distant elements in panoramic views, partially screened by landform, and will appear as an extension to an existing wind farm.
Significance of Effect	Not Significant.

Viewpoint 19 - Minor road, Newtyle			
Grid Reference	326444, 738869	**Figure Number**	Figure 6.31
LCT	Broad Valley Lowland	**Landscape Designation**	None
Direction of view	West	**Distance to nearest turbine**	32.1km
Number of hubs theoretically visible	3	**Number of turbine blade tips theoretically visible**	5
Viewpoint location and existing view:	The viewpoint is located on a minor road to the west of the small settlement of Newtyle, at the access to Drumsuldry Wood. The minor road occupies an elevated position on the edge of the Sidlaw Hills. The viewpoint is representative of road users, as well as cyclists and visitors to the woodland.		

Viewpoint 19 - Minor road, Newtyle	
	There are open views from the minor road to the north across Strathmore, a settled agricultural landscape of pasture, polytunnels, shelterbelt trees, small woodlands, small settlements and farmsteads. Views south are contained by the rising slopes of the Sidlaw Hills, comprising pasture and forestry. Wind turbines and wind farms are visible in the landscape, including Griffin at a distance of approximately 32km to the north-west, backclothed by land and sky, with Calliachar also visible beyond. To the north, Drumderg is visible, at a distance of approximately 17km.
Nature of Receptor (sensitivity)	Users of the minor road are considered to be of **medium** susceptibility, as they are transient and their attention is not generally focussed on the surrounding landscape. The susceptibility of walkers accessing the woodland and cyclists on the road is **high**. The view is not within a designated landscape or of recognised importance, therefore the value of the view is considered to be **low**.
Source of Effect	The main source of effect at this viewpoint will be the introduction of turbines.
Nature of Effect (magnitude)	The Creag a' Bhàird turbines will only be visible in clear weather. The majority of turbines are screened by the intervening landform and up to five turbines will be visible. The turbines will form a short extension to the south of Griffin, backclothed by land, and will appear part of the same wind farm at this distance. The scale of change to the view will therefore be **imperceptible**. The geographical extent over which changes will be visible is moderately **widespread**, as the viewpoint represents views from the fringes of the Sidlaw Hills. Operational effects will be **long term**. The turbines are likely to be the only visible element of Creag a' Bhàird Wind Farm and are **reversible**.
Level of Effect	Overall, the level of effect is considered to be **negligible**, as the turbines are distant elements in panoramic views, partially screened by landform, will appear as an extension to an existing wind farm, and will only be visible in clear weather.
Significance of Effect	Not Significant.

Effects on views from routes

A822

6.179 The A822 crosses the study area from south-west to north-east, between the junction with the A85 at Crieff, and the junction with the A9 at Dunkeld. Effects on road users at static viewpoints on the A822 are described under Viewpoint 5 (A822 near Borelick), Viewpoint 6 (A822 near Ballinreigh) and Viewpoint 9 (A822 near Corrymuckloch).

6.180 Road users on the A822 are of **medium** susceptibility, as they are transient and not generally focused on the surrounding landscape. The value of views from the A822 is **medium**, as the road is part of the Perthshire Tourist Route, a scenic route between Dunblane and Ballinluig, near Pitlochry.

6.181 The main source of effect perceived by road users will be the introduction of turbines.

6.182 Theoretical visibility from the A822 occurs within 8km of the site. From south-west to north-east, there is patchy theoretical visibility of up to 6 turbines between Newton and Amulree and in the vicinity of Ballinreigh. Between Tomnagrew and Trochry there is theoretical visibility of up to 13 turbines. Griffin Wind Farm is also visible from these sections of the route. Localised roadside vegetation and woodland in the wider landscape filters and screens views from some of the areas with theoretical visibility, including Ballinreigh and Trochry. There are open views towards the site in the vicinity of Borelick, although road users will view the site obliquely as they pass through this section of the route.

6.183 Ground level activity and infrastructure will be difficult to perceive from the A822, due to distance, the elevated nature of the site above the road, filtering and screening by roadside vegetation and the sometimes oblique nature of the view, e.g. as the road passes to the south of the site at Borelick. The turbines will be visible from parts of the route, either in direct or oblique views, and visible on the skyline in front of the Griffin turbines. Views of Creag a' Bhàird Wind Farm will often be framed or partially screened by Meall Mòr and Druim Mòr. The scale of change to the view from the road will be **small**.

6.184 The geographical extent over which changes will be visible is **localised**, as theoretical visibility is limited to short sections of the route.

6.185 Operational effects will be long term. The turbines are likely to be the only visible element of Creag a' Bhàird Wind Farm and are **reversible**.

6.186 Overall, the level of effect on the A822 is considered to be **minor**, as generally only a small number of turbines will be visible in direct but glimpsed, or oblique views. The majority of the route has no theoretical visibility or views towards the site are screened by vegetation, and these areas will experience **no effect**.

A826

6.187 The A826 passes to the west of the site, between the junction with the A822 at its southern end, and the junction with the A827 at its northern end. Static views from the A826 are represented by Viewpoint 3 (A826 within Glen Cochill).

6.188 Road users on the A822 are of **medium** susceptibility, as they are transient and not generally focused on the surrounding landscape. The value of views from the A826 is **medium**, as the road is part of the Perthshire Tourist Route.

6.189 The main source of effect perceived by road users will be the introduction of turbines.

6.190 Theoretical visibility of the Creag a' Bhàird turbines occurs within 5km of the site, however the northern end of the route passes through coniferous forestry, therefore actual visibility will only occur from the edge of the forestry and the edge of the woodland to the north of Milton. From most of this section of the route up to six turbines in the west of the site will be visible in open views across moorland and forested slopes. From the southern end of the A826, between the woodland north of Milton and Scotston, Griffin Wind Farm is visible to the east. Calliachar Wind farm is also visible to the west, from the A826 between Scotston and the edge of the forestry to the north. The scale of change to the view will therefore be **small**.

6.191 The geographical extent over which changes will be visible is **localised**, as theoretical visibility is limited to short sections of the route, and the surrounding forestry will screen the turbines from the northern end of the route.

6.192 Operational effects will be long term. The turbines are likely to be the most visible element of Creag a' Bhàird Wind Farm and are **reversible**.

6.193 Overall, the level of effect on the A826 is considered to be **minor**, as generally only turbines in the east of the site will be visible, on the skyline, extending the angle of view occupied by the Griffin turbines to the south. The turbines will mainly be seen in oblique views, as the road passes to the west of the site.

Summary of Visual Effects

6.194 **Table 6.13** below summarises the predicted effects of the wind farm on views, taking into account the mitigation measures described in **Chapter 4: Scheme Description**.

Table 6.13: Summary of Effects

Predicted Effect	Receptor	Significance of Residual Effect
VP01 Druim Mòr	Recreational walkers	Major, significant
VP02 Ben Salachill	Workers in Griffin Wind Farm, recreational walkers	Major, significant
VP03 A826 within Glen Cochill	Road users	Moderate, significant
VP04 General Wade's Military Road, Glen Cochill	Recreational walkers	Major, significant
VP05 A822 near Borelick	Road users	Major, significant
VP06 A822 near Ballinreigh	Road users	Minor, not significant
VP07 Creag Liath (426m AOD)	Recreational walkers	Moderate, significant
VP08 Meal nan Caorach	Recreational walkers	Minor, not significant
VP09 A822 near Corrymuckloch	Road users	Minor, not significant
VP10 King's Seat, Birnam (404m AOD)	Recreational walkers	Minor, not significant
VP11 Newtyle Hill (317m AOD)	Recreational walkers	Minor, not significant
VP12 Meall nam Fuaran	Recreational walkers	Minor, not significant
VP13 Meall Tairneachan (787m AOD)	Recreational walkers	Minor, not significant
VP14 Ben Chonzie (931m AOD)	Recreational walkers	Negligible, not significant
VP15 Ben Vrackie (841m AOD)	Recreational walkers	Negligible, not significant
VP16 Schiehallion (1083m AOD)	Recreational walkers	Minor, not significant
VP17 Carn Liath	Recreational walkers	Negligible, not significant
VP18 Dunsinane Hill	Recreational walkers	Negligible, not significant
VP19 Minor road, Newtyle	Road users Residential receptors	Negligible, not significant
A822	Road users	Minor, not significant
A826	Road users	Minor, not significant

Cumulative Effects Assessment

6.195 This section considers the cumulative landscape and visual effects of Creag a' Bhàird Wind Farm, in addition to other proposed wind farms in the area. The aim of the cumulative landscape and visual impact assessment (CLVIA) is to "*describe, visually represent and assess the ways in which a proposed windfarm would have additional impacts when considered together with other existing, consented or proposed windfarms*" (SNH 2012, paragraph 55[xv]).

6.196 As with the LVIA, the CLVIA deals with cumulative effects on landscape and visual receptors separately.

Scope and Definitions

6.197 The scope of this CLVIA was agreed with statutory consultees (SNH, PKC). The CLVIA provides a review of patterns of development for wind farms in the wider area to 60km from the application site, in accordance with guidance from SNH.[xxiv] This is shown on **Figure 6.5**. However, the cumulative assessment aims to focus on the likely significant effects arising from the proposed wind farm in combination with other wind farms, which is more likely to occur where these lie close to Creag a' Bhàird Wind Farm, or close to landscape and visual receptors. For this reason the CLVIA focuses on a more localised set of operational and proposed developments.

6.198 Operational wind farms are already present in the landscape of the study area, as set out in the baseline sections of this chapter. The assessment of the 'stand-alone' effects of Creag a' Bhàird Wind Farm (the LVIA) has already taken these operational developments into consideration. Operational wind farms considered as part of the LVIA baseline are listed in **Table 6.7**. This is considered to be **Scenario 1** of the CLVIA. The CLVIA is primarily designed to address additional effects in relation to unbuilt developments, but considers issues of visual compatibility with operational developments.

6.199 Given the varied status, and therefore certainty, associated with unbuilt wind farms across the study area, the CLVIA is structured so as to report on two further potential development scenarios:

- **Scenario 2**: The introduction of Creag a' Bhàird Wind Farm to a landscape with operational wind farms, as well as consented wind farms, included in the baseline; and
- **Scenario 3**: The introduction of Creag a' Bhàird Wind Farm to a landscape with operational wind farms, consented wind farms as well as proposed wind farms included in the baseline. This scenario is of a more speculative nature, as it includes undetermined proposals.

6.200 Proposed wind farms in scenarios 2 and 3 are listed in **Table 6.14**. All the wind farms considered in the cumulative assessment are mapped on **Figure 6.6**.

6.201 The wind farms included in the CLVIA include all consented developments, and valid planning applications, within 25km of the application site. Turbines of less than 50m to tip height are not considered in the CLVIA. Beyond 25km, single turbine schemes have not been considered, unless they are for turbines of 80m to tip height or greater. SNH guidance suggests that consideration of scoping-stage proposals is not normally required. Of the scoping-stage proposals within the study area, only Crossburns has been included, since it is within 10km of Creag a' Bhàird Wind Farm.

Methodology for Assessment of Cumulative Effects

6.202 The SNH guidance distinguishes between several types of cumulative impact (SNH 2012, paragraphs 48-50):

- landscape impacts, including:
  - impacts on the physical fabric of the landscape;
  - impacts on landscape character; and
  - impacts on landscapes of special value (i.e. designated landscapes); and
- impacts on views, including:
  - combined impacts, where several developments are within the observer's arc of vision at the same time;
  - successive impacts, where the observer has to turn to see the various developments; and
  - sequential impacts, when the observer has to move to another viewpoint to see different developments.

6.203 The methodology for the assessment of cumulative landscape and visual effects considers the criteria set out in the LVIA methodology of this chapter. In addition, attention was paid to the following:

- the arrangement of wind farms in the landscape or view;
- the relationship between the scale and layout of the wind farms, including turbine size and proportion and number of turbines;
- the position of the wind farms within the landscape, e.g. in similar landscape or topographical context; or within the view, e.g. on the skyline, against the backdrop of land;
- the distances between wind farms, and their distances and direction from the receptor; and
- the cumulative effect of ancillary development, e.g. access tracks.

6.204 The assessment of cumulative effects considered how the effect of Creag a' Bhàird Wind Farm changes if the baseline is altered in the cumulative scenarios. It is therefore based on judgements made in the LVIA, and considers the contribution that Creag a' Bhàird Wind Farm will have, if introduced in the context of other cumulative schemes. Observations were also made regarding the changes in landscape and visual amenity should all schemes progress to operation (total effect).

6.205 In order to avoid excessive repetition, and to focus on the identification of potentially significant effects, not all landscape and visual receptors are examined in detail. The CLVIA first considers broad patterns of cumulative visibility, with reference to the cumulative ZTVs (CZTVs) which were produced. The CLVIA examines the potential for cumulative effects on individual receptors where significant 'stand-alone' effects have already been identified in the LVIA, and/or where the CZTVs indicate the potential for significant effects.

Cumulative Baseline

6.206 For the purposes of the cumulative assessment, the judgements made in the LVIA regarding the 'nature of the receptor' remain the same: that is, the assessments of susceptibility and value of each landscape and visual receptor are unchanged.

6.207 For the assessment of cumulative effects, the consented and/or proposed wind farms are assumed to be part of the baseline in each of the two development scenarios. The wind farms included in the baselines for scenarios 2 and 3 are set out in **Table 6.14** below. These are in addition to the existing wind farms listed in **Table 6.7**.

Table 6.14: Consented and Proposed Wind farms

Windfarm	Status	Number of turbines	Blade tip height	Distance[5]
Scenario 2 considers operational wind farms (**Table 6.7**) and the following consented developments:				
Mains of Pittendriech	Operational	1	66.6 m	19.4km
Welton of Creuchies	Consented	4	99.5 m	26.4km
Burnfoot Hill Extension	Consented	2	102 m	36.5km
Scenario 3 considers operational and consented wind farms and the following proposed developments:				
North Calliachar	Application	7	109.8 m	6.8km
Crossburns	Scoping	40	115 m	8.7km
Mull Hill	Appeal	9	104 m	12.5km
Innernyte Farm	Application	1	88.5 m	18.7km
Ardlebank	Appeal	3	84 m	21.8km
Netheraird of Glasclune	Application	1	67 m	22.2km
Corb	Appeal	1	84 m	26.8km
Tullymurdoch	Appeal	7	120 m	28.9km
Bamff	Appeal	7	111 m	28.8km
East Blair Farm	Application	2	64 m	35.2km
Temple Hill	Application	1	84 m	35.9km
Rhodders	Appeal	6[6]	102 m	37.4km

[5] Minimum distance between the turbines of the development and the turbines of the other wind farm.
[6] Reduced from the original 9-turbine proposal.

6.208 All operational and proposed wind farms within 60km of the application site are shown in **Figure 6.5**. The developments listed in **Table 6.7** and **Table 6.14** are mapped in **Figure 6.6**. These maps indicate an emerging 'cluster' of development centred on the operational Griffin and Calliachar wind farms, on the hills between Strath Tay and Strathbraan, and including the proposed Calliachar North, Crossburns and Creag a' Bhàird Wind Farms. The proposed Mull Hill Wind Farm is slightly further afield to the south. A second cluster of proposed development can be observed to the east, grouped around the operational Drumderg Wind Farm on the hills to the north of Strathmore. Smaller single turbine proposals are located nearby, and in Strathmore itself. Further afield are the operational and proposed developments on the Ochils and adjacent hills, from Braes of Doune in the west to Lochelbank in the east. In terms of the wider pattern of development, almost all the developments mapped on **Figure 6.5** and **Figure 6.6** are located to the east or south of the application site. There are no operational or proposed developments located to the north and west of the emerging cluster around Griffin and Calliachar.

Broad Patterns of Cumulative Visibility

6.209 The CZTV for scenario 1 (operational schemes), is shown in **Figure 6.7**. The CZTV indicates that operational wind farms are theoretically visible across large parts of the study area, particularly in the south and east. Areas shaded yellow/orange/red on **Figure 6.7** indicate where Creag a' Bhàird Wind Farm will be theoretically visible in addition to operational schemes. In the immediate vicinity of the application site, Creag a' Bhàird will always be viewed with Griffin, and from higher ground within 10km Calliachar and Drumderg may also be visible. From Strathmore, where Creag a' Bhàird is visible it will be seen along with Griffin, and Drumderg, East Gormack closer at hand. Areas where Creag a Bhàird will be seen with the Ochil wind farms are limited to the peaks to the south of Strathbraan, and the higher ground around Perth including Kinnoull Hill, where woodland will screen most views. Green areas on the figure indicate where Creag a' Bhàird Wind Farm alone will be theoretically visible. The latter areas are very limited, with green shading covering small areas of Strathbraan and a distant area east of Rattray.

6.210 **Figure 6.10** presents a CZTV of Creag a' Bhàird Wind Farm and Griffin (operational) only. A similar pattern is shown, with extremely limited areas where only Creag a' Bhàird will be seen. This confirms that, from almost all locations, Creag a' Bhàird will be viewed alongside Griffin and is likely to be interpreted by viewers as an extension to the existing scheme. The CZTV in **Figure 6.11** adds Calliachar (operational), indicating that all three local wind farms will be seen in some views: from high ground 5-10km to the south; from hilltops 15km or more to the north and north-east; and from areas of Strathmore 20-25km to the east. There will be some views of all three developments from within part of Glen Cochill.

6.211 The CZTV for scenario 2 (operational and consented schemes) is shown in **Figure 6.8**. This scenario adds only the single turbine at Mains of Pittendriech and the four turbines at Welton of Creuchies, both of which are located at the north edge of Strathmore, close to Drumderg; and the two additional turbines at Burnfoot Hill. The additional schemes in Strathmore will be visible along with Creag a' Bhàird where the latter is visible, but the overall pattern of cumulative visibility is unchanged in this scenario.

6.212 The CZTV for scenario 3 (operational, consented and proposed) is shown in **Figure 6.9**. Within 10km of the application site, Creag a' Bhàird will be visible alongside Griffin, with some views of Calliachar, Calliachar North and Crossburns. Schemes to the east around Drumderg will be visible from Strathmore, with up to 12 schemes potentially visible, including Creag a' Bhàird to the west. Woodland and buildings within Strathmore will filter many views in this area. The peaks to the south of Strathbraan may enable views of the greatest number of developments, with Creag a' Bhàird, Griffin and their neighbours to the north, Mull Hill to the south-west, schemes on the Ochils to the south, and developments around Drumderg to the east.

6.213 **Figure 6.12** focuses on the emerging cluster of operational and proposed developments around Griffin and Calliachar. Again it shows very limited visibility of Creag a' Bhàird only. Areas where all five of these developments will be visible are also limited, and are mainly high points within 5-15km of the application site including King's Seat Hill to the east, Meall nan Fuaran to the south-west, and Meall Tairneachan and Farragon Hill to the north. Further afield, all five schemes are theoretically visible from Schiehallion, Ben Vrackie and Carn Liath.

Assessment of Cumulative Landscape Effects during Construction

6.214 Cumulative effects will only arise in the event that other construction activity is ongoing over the same period that Creag a' Bhàird Wind Farm is being constructed. It is possible that, should either Calliachar North or Crossburns receive consent, then this situation would arise, although the likelihood is low.

6.215 The LVIA concludes that effects of construction activity on the landscape may be significant but will be localised, and will not affect the landscape beyond the immediate vicinity of the site. Calliachar North and Crossburns will be located at 6.8km and 8.6km from Creag a' Bhàird Wind Farm. In the case that there is simultaneous construction activity, there would be disturbance of the landscape affecting separate areas within the *Highland Summits and Plateaux* LCT. However, due to separation from the application site, this is unlikely to give rise to a cumulative effect on the landscape.

6.216 It is also possible that other felling activity, unrelated to wind energy development, may be ongoing over the same period that Creag a' Bhàird Wind Farm is being constructed. However, since it is not possible to predict the construction date for the wind farm, in relation to felling plans for the area, it is not possible to assess the likely effects.

Assessment of Operational Cumulative Landscape Effects

6.217 This section sets out the assessment of cumulative landscape effects on the landscape receptors during the operational phase. The cumulative changes to the landscape arising from the operational development, with a lifespan of 25 years, will include the presence of Creag a' Bhàird Wind Farm in the same landscape as other wind energy development.

6.218 All mitigation is designed into the scheme and is presented in **Chapter 4: Scheme Description**. Given the proximity of the operational Griffin Wind Farm, similarities in design and turbine size were considered. Griffin comprises 68 turbines in a distinctive layout of parallel rows of turbines. Creag a' Bhàird Wind Farm has been designed to be compatible with the Griffin layout, with turbine positions chosen to be 'in-line' with the arrangement of Griffin.

Cumulative Effect on the Highland Summits and Plateaux LCT

Scenario 2	**Scenario 3**
Other developments in LCT: • Griffin (operational) • Drumderg (operational) • Calliachar (operational)	Other developments in LCT: • Griffin (operational) • Drumderg (operational) • Calliachar (operational) • Calliachar North (application) • Crossburns (scoping) • Mull Hill (appeal) • Netheraird of Glasclune (application) • Ardlebank (appeal) • Corb (appeal) • Tullymurdoch (part) (appeal)
Cumulative relationships Of the schemes listed above, only Griffin and Calliachar are within the local area of this LCT. Creag a' Bhàird Wind Farm is located directly adjacent to Griffin Wind Farm. Griffin comprises 68 turbines in a distinctive layout of parallel rows of turbines. Creag a' Bhàird Wind Farm has been designed to be compatible with the Griffin layout, being arranged along the same alignments as the operational scheme. It is sited on areas of similar forested moorland landcover to Griffin. The addition of Creag a' Bhàird Wind Farm to this baseline would not extend the influence of wind turbines into parts of the LCT unaffected	**Cumulative relationships** Of the schemes listed above, only Griffin, Calliachar, Calliachar North and Crossburns are within the local area of this LCT. As discussed under scenario 2, Creag a' Bhàird Wind Farm has been designed to be compatible with the Griffin layout and landscape. The addition of Creag a' Bhàird Wind Farm to this baseline, that is assuming the presence of Crossburns and Calliachar North, would not extend the influence of wind turbines into parts of the LCT unaffected by such development. While the presence of Crossburns and Calliachar North would mean

by such development. Large areas of this LCT would remain unaffected by wind turbines, including parts of the local area.	a greater baseline presence of turbines, a development of the scale proposed at Creag a' Bhàird would not affect the landscape to the extent that the character of the LCT would change. Large areas of this LCT would remain unaffected by wind turbines, including parts of the local area.
Level of cumulative landscape effect in Scenario 2 Since there are no consented developments which would potentially affect this LCT, there will be no cumulative effect in this scenario, in addition to the effects already assessed in the LVIA.	**Level of cumulative landscape effect in Scenario 3** The level of the additional cumulative effect on this LCT, in addition to the effects already assessed in the LVIA, will be **negligible**.

Assessment of Cumulative Visual Effects during Construction

6.219 Cumulative effects on views will only arise in the event that other construction activity is ongoing over the same period that Creag a' Bhàird Wind Farm is being constructed, and where multiple construction sites are visible from a single viewpoint. It is possible that, should either Calliachar North or Crossburns receive consent, then this situation would arise, although the likelihood is low.

6.220 The potential for significant effects on views arising from construction activity are predicted to be limited, since there are few locations where construction activity at Creag a' Bhàird and Calliachar North/Crossburns would be seen together, apart from more distant viewpoints where effects would be reduced.

Assessment of Operational Cumulative Visual Effects

6.221 This section sets out the assessment of cumulative landscape effects on the landscape receptors during the operational phase. The cumulative changes to views arising from the operational development, with a lifespan of 25 years, will include the presence of Creag a' Bhàird Wind Farm in the same or successive views as other wind energy development.

6.222 All mitigation is designed into the scheme and is presented in **Chapter 4: Scheme Description**. Given the proximity of the operational Griffin Wind Farm, similarities in design and turbine size were considered. Griffin comprises 68 turbines in a distinctive layout of parallel rows of turbines. Creag a' Bhàird Wind Farm has been designed to be visually compatible with the Griffin layout, with turbine positions chosen to be 'in-line' with the arrangement of Griffin.

6.223 Based on the analysis of the CZTVs, different scenarios may give rise to potential effects on different groups of viewpoints. Wireline views of cumulative developments are presented for selected assessment viewpoints. Examination of these wirelines has allowed further focusing of the CLVIA, to concentrate on potentially significant effects. This indicates that consented developments (scenario 2) are few in number and distant from most of the viewpoints. Proposed developments (scenario 3) are more likely to be seen either close to Creag a' Bhàird, or close to viewpoints, or will be seen in the wider landscape from hill summits. Scenario 2 effects are therefore considered for fewer viewpoints, while scenario 3 effects are considered for several summit locations.

6.224 Scenario 1 effects are covered in the LVIA assessment, since these developments are already present in the landscape. Scenario 2 effects are assessed for the following viewpoints:

- VP10 King's Seat, Birnam; and
- VP18 Dunsinane Hill.

6.225 Scenario 3 effects are assessed for the following viewpoints:

- VP01 Druim Mòr;
- VP08 Meal nan Caorach;
- VP10 King's Seat, Birnam;
- VP12 Meall nam Fuaran;
- VP16 Schiehallion; and
- VP18 Dunsinane Hill.

Viewpoint 1 Druim Mòr

6.226 The LVIA considers scenario 1 effects, and there are no consented (scenario 2) wind farms which would alter the assessment. The following section considers scenario 3 effects.

Scenario 3

Cumulative developments visible:

- Griffin (operational, 1.6km north-west and north)
- Calliachar (operational, 10km west)
- Calliachar North (application, 10km north-west)

Cumulative relationships

The relationship of Creag a' Bhàird Wind Farm with the operational Griffin and Calliachar schemes is discussed in the LVIA. The addition of Calliachar North to the baseline view would introduce two blade tips, which would be seen adjacent to the blade tips of Calliachar, above the shoulder of Meall Dearg.

Significance of cumulative effect in Scenario 3

The effect in scenario 3 will be the same as in scenario 1 and 2, since the addition of Calliachar North makes no substantive difference to the baseline view.

Viewpoint 8 Meall nan Caorach

6.227 The LVIA considers scenario 1 effects, and there are no consented (scenario 2) wind farms which would alter the assessment. The following section considers scenario 3 effects.

Scenario 3

Cumulative developments visible:

- Griffin (operational, 8km north)
- East Gormack (operational, 25km north-east)
- Green Knowes (operational, 26km south)
- Burnfoot Hill (operational, 30km south)
- Braes of Doune (operational, 30km south-west)
- Drumderg (operational, 32km north-east)
- Calliachar (operational, 11km north-west)
- Welton of Creuchies (consented, 31km north-east)
- Mull Hill (appeal, 7km south-west)
- Rhodders (appeal, 30km south)
- Corb (appeal, 33km north-east)
- Tullymurdoch (appeal, 34km north-east)
- Bamff (appeal, 34km north-east)
- Crossburns (scoping, 13km north-west)

Cumulative relationships

The relationship of Creag a' Bhàird Wind Farm with the operational Griffin Wind Farm is discussed in the LVIA. Crossburns would be visible as blade tips only behind the operational Calliachar, in combined views with Creag a' Bhàird and Griffin, though with clear separation between the two groups across Glen Cochill. A group of proposed developments would be visible clustered around Drumderg to the north-east, also in combined views. At between 25km and 35km, these developments will clearly be a separate group, associated with an operational scheme. Existing and proposed wind farms on the Ochils will be seen at similar distances to the south in successive views. Mull Hill (appeal) is closer, but is largely screened from view behind Meall Reamhar.

Significance of cumulative effect in Scenario 3

Overall, the presence of the additional wind farms does not substantively change the baseline of the view. The pattern of wind farm development in the view will not change, and Creag a' Bhàird Wind Farm will remain as a relatively small development visually associated with Griffin Wind Farm.

Viewpoint 10 King's Seat, Birnam

6.228 The LVIA considers scenario 1 effects. The following section considers scenario 2 and scenario 3 effects.

Scenario 2

Cumulative developments visible:

- Griffin (operational, 7km north-west)
- East Gormack (operational, 13km north-east)
- Drumderg (operational, 20km north-east)
- Lochelbank (operational, 27km south)
- Green Knowes (operational, 33km south)
- Burnfoot Hill (operational, 38km south)
- Calliachar (operational, 18km west)
- Mains of Pittendriech (consented, 11km east)
- Welton of Creuchies (consented, 18km north-east)

Cumulative relationships

The relationship of Creag a' Bhàird Wind Farm with the operational Griffin and Calliachar schemes is discussed in the LVIA. Looking in this direction, no consented schemes will be present in the view. Turning to the north-east, there will be successive views of Drumderg and the consented Welton of Creuchies, 18-20km away, with the single turbines at East Gormack and Pittendriech further south. Turning again, there are southward views to operational schemes on the Ochil Hills.

Significance of cumulative effect in Scenario 2

The consented schemes are viewed successively with Creag a' Bhàird Wind Farm, in a direction where wind turbines are already present. The addition of Creag a' Bhàird to this baseline will not have substantively different effects than those assessed in the LVIA.

Scenario 3

Cumulative developments visible as for scenario 2 above, as well as:

- Innernyte (application, 10km south-east)
- Netheraird of Glasclune (application, 15km north-east)
- Calliachar North (application, 18km west)
- Corb (appeal, 21km north-east)
- Tullymurdoch (appeal, 22km north-east)
- Bamff (appeal, 22km north-east)
- Rhodders (appeal, 30km south)
- Crossburns (scoping, 20km west)

Cumulative relationships

Looking towards Creag a' Bhàird, the proposed Calliachar North and Crossburns schemes will be barely perceptible, as a small number of hubs and blade tips seen alongside Calliachar and partly behind Griffin. Turning to the north-east, there will be successive views of several proposed schemes clustered around Drumderg and Welton of Creuchies, though the proposed developments will not greatly extend the angle of view where turbines are seen in this quarter. To the south, Rhodders will be a barely perceptible addition to Burnfoot Hill.

Significance of cumulative effect in Scenario 3

The pattern of development seen from this viewpoint will not change, even if all developments are built. Creag a' Bhàird will be seen as an addition to Griffin in the west, with views in this direction not altered by the presence of Calliachar North or Crossburns. There will be successive views with the group of developments to the north-east, and those to the south, as in the LVIA. No additional significant effect is therefore predicted.

Viewpoint 12 Meall nam Fuaran

6.229 The LVIA considers scenario 1 effects, and there are no consented (scenario 2) wind farms which would alter the assessment. The following section considers scenario 3 effects.

Scenario 3

Cumulative developments visible:

- Griffin (operational, 11km north-east)
- Braes of Doune (operational, 26km south-west)
- Drumderg (operational, 32km north-east)
- Green Knowes (operational, 32km south)
- Burnfoot Hill (operational, 33km south)
- East Gormack (operational, 34km north-east)
- Lochelbank (operational, 36km south-east
- Calliachar (operational, 7km north)
- Welton of Creuchies (consented, 39km north-east)
- Calliachar North (appeal, 8km north)
- Innernyte (application, 30km east)
- Rhodders (appeal, 33km south)
- Netheraird of Glasclune (application, 35km north-east)
- Corb (appeal, 40km north-east)
- Tullymurdoch (appeal, 42km north-east)
- Bamff (appeal, 42km north-east)
- Crossburns (scoping, 6km north)

Cumulative relationships

The relationship of Creag a' Bhàird Wind Farm with the operational Griffin Wind Farm, and Drumderg in the distance, is discussed in the LVIA. Looking in this direction (north-east), several proposed wind farms will be visible in the distance, at between 30 and 45km. This distant cluster will appear broader in the view than at present, where only Drumderg and East Gormack are operational. However, it will be distinctly separate from the Griffin and Creag a' Bhàird turbines, viewed together in the middle distance (11-16km away). Turning northwards, there will be combined views of Griffin and Creag a' Bhàird with Calliachar, Calliachar North and Crossburns. Crossburns in particular will extend the presence of this latter group, occupying a similar angle of view to Griffin, but will be partly hidden by intervening topography. Looking southwards, proposed wind farms on the Ochils will not alter the outlook of turbines in this direction.

Significance of cumulative effect in Scenario 3

The addition of proposed wind farms will expand the presence of the distant cluster of development around Drumderg, and the less certain addition of Crossburns will add further turbines closer at hand. Creag a' Bhàird will remain a relatively small-scale addition to this view, closely related to Griffin Wind Farm. No additional significant effect is predicted as a result of Creag a' Bhàird Wind Farm.

Viewpoint 16 Schiehallion

6.230 The LVIA considers scenario 1 effects, and there are no consented (scenario 2) wind farms which would alter the assessment. The following section considers scenario 3 effects.

Scenario 3

Cumulative developments visible:

- Griffin (operational, 22km south-east)
- Braes of Doune (operational, 43km south)
- Drumderg (operational, 45km east)
- Green Knowes (operational, 53km south-east)
- Burnfoot Hill (operational, 54km south-east)
- Lochelbank (operational, 57km south-east)
- Calliachar (operational, 17km south-west)
- Mains of Pittendriech (consented, 44km east)
- Welton of Creuchies (consented, 48km east)
- Calliachar North (application, 17km south-east)
- Ardlebank (appeal, 40km east)
- Netheraird of Glasclune (application, 45km east)
- Corb (appeal, 45km east)
- Tullymurdoch (appeal, 49km east)
- Bamff (appeal, 49km east)
- Rhodders (appeal, 54km south-east)
- Crossburns (scoping, 14km south-east)

Cumulative relationships

From this hill summit, almost all the operational and proposed wind farms will be visible in combined views, since all are within the south-east quadrant of the panoramic outlook. Creag a' Bhàird is at the centre of this view, seen to the right (south) of Griffin, and appearing as an extension to that scheme. Slightly closer, Crossburns and Calliachar North will be seen in front of and below Calliachar. To the east, the proposed schemes around Drumderg will be seen as a distant cluster, over 40km away, while schemes on the Ochils are even more distant.

Significance of cumulative effect in Scenario 3

The addition of Creag a' Bhàird to the scenario 3 baseline will add to the angle of view occupied by the Griffin turbines. When considered in addition to Calliachar North and Crossburns, Creag a' Bhàird will have the effect of narrowing the apparent 'gap' which currently lies between Calliachar and Griffin. However, Creag a' Bhàird is at a greater distance. Due to underlying topography the form of Creag a' Bhàird, seen as a row of turbines behind a ridge, is distinct from that of Calliachar North, which appears as an open arrangement across a north-west-facing slope. As such, the addition of Creag a' Bhàird is unlikely to have the effect of merging these two groups of turbines, and will be perceived as part of Griffin Wind Farm. The additional cumulative effect in scenario 3 is judged to be **minor** and **not significant**.

Viewpoint 18 Dunsinane Hill

6.231 The LVIA considers scenario 1 effects. The following section considers scenario 2 and scenario 3 effects.

Scenario 2

Cumulative developments visible:

- East Gormack (operational, 15km north)
- Lochelbank (operational, 20km south-west)
- Drumderg (operational, 22km north)
- Griffin (operational, 27km north-west)
- Green Knowes (operational, 33km south-west)
- Burnfoot Hill (operational, 41km south-west)
- Braes of Doune (operational, 52km south-west)
- Calliachar (operational, 37km north-west)
- Mains of Pittendriech (consented, 13km north-west)
- Welton of Creuchies (consented, 17km north)

Cumulative relationships

Creag a' Bhàird will be viewed at around 28km to the north-west, alongside Griffin. The two consented developments that will be visible are located further west, and are closer to the viewpoint. Welton of Creuchies will be viewed adjacent to Drumderg across Strathmore, with the single turbine at Mains of Pittendreich within the lowland. Although seen in combined views with Creag a' Bhàird, the consented schemes have no visual relationship with Creag a' Bhàird Wind Farm.

Significance of cumulative effect in Scenario 2

The addition of Creag a' Bhàird to the scenario 2 baseline will not give rise to any additional cumulative effects.

Scenario 3

Cumulative developments visible as for scenario 2 above, as well as:

- Innernyte (application, 10km north-west)
- Netheraird of Glasclune (application, 17km north)
- Bamff (appeal, 21km north)
- Tullymurdoch (appeal, 22km north)

- Ardlebank (appeal, 25km north)
- Corb (appeal, 26km north)
- Mull Hill (appeal, 33km west)
- Calliachar North (application, 37km north-west)
- Rhodders (appeal, 43km south-west)

Cumulative relationships

In views towards Creag a' Bhàird, turbine tips of Calliachar North will appear adjacent to Calliachar, while the single turbine at Innernyte will be seen in a lowland context, distinctly separate from the more distant turbines on the upland behind. There will be combined views of Creag a' Bhàird with Mull Hill to the west, and with the emerging cluster of developments around Drumderg to the north.

Significance of cumulative effect in Scenario 3

The addition of Creag a' Bhàird to this baseline will be a small-scale change in the view, seen in the context of the larger operational Griffin Wind Farm. No additional cumulative effects are predicted.

Sequential Effects

6.232 Where developments are seen separately, one after another over the course of a route, sequential effects may occur.

6.233 The **Existing Conditions (Visual Baseline)** confirms that the only routes where views may potentially be significantly affected by Creag a' Bhàird Wind Farm are the A822 and A826, which form part of the Perthshire Tourist Route. Predicted effects on views from these routes are set out in the Visual Assessment.

6.234 Since Creag a' Bhàird Wind Farm will almost always be seen from these routes in the context of Griffin Wind Farm, there will be no significant sequential effects on views. There are no consented or proposed developments which would be so visible from these routes as to substantially change the visual baseline. Therefore sequential effects in scenarios 2 and 3 will be the same as in scenario 1, with the additional effect of Creag a' Bhàird Wind Farm being negligible in each case, due to it always being seen alongside Griffin.

Summary of Cumulative Effects

6.235 The assessed cumulative effects are summarised in **Table 6.15**.

Table 6.15: Summary of Cumulative Effects

Cumulative Effect	Receptor	Level of effect
Operational effects on the landscape	Highland Summits and Plateaux LCT	Negligible (scenario 2) Negligible (scenario 3)
Operational effects on views	VP01 Druim Mòr	Negligible (scenario 3)
	VP08 Meall nan Caorach	Negligible (scenario 3)
	VP10 King's Seat, Birnam	Negligible (scenario 2) Negligible (scenario 3)
	VP12 Meall nam Fuaran	Negligible (scenario 3)
	VP16 Schiehallion	Minor (scenario 3)
	VP18 Dunsinane Hill	Negligible (scenario 2) Negligible (scenario 3)
	A822	Negligible (scenario 2) Negligible (scenario 3)
	A826	Negligible (scenario 2) Negligible (scenario 3)

Further Survey Requirements and Monitoring

6.236 No additional survey or monitoring requirements have been identified.

Statement of Significance

6.237 Landscape and visual effects have been minimised by the mitigation measures outlined in this chapter and in **Chapter 4: Scheme Description**, and through the design process described in **Chapter 3: Scheme Design and Development**. Most importantly, Creag a' Bhàird Wind Farm has been designed to be compatible, both in landscape and visual terms, with the operational Griffin Wind Farm. The location of Creag a' Bhàird Wind Farm immediately adjacent to Griffin seeks to minimise effects on the wider landscape and views, and the layout of the turbines has been developed to reflect the distinctive layout of Griffin.

6.238 The assessment identified a significant residual effect on the landscape of the site and the character of its immediate surroundings. This will arise as a result of the felling of forestry on site, and the introduction of the 13 turbines, masts, tracks and ancillary features. The area where significant effects on the landscape are predicted to occur can be approximately defined as extending: north and north-east to Griffin Wind Farm; south-east as far as Druim Mòr; south to the boundary of this LCT with the Mid Highland Glens; south-west to Meall Mòr; west to Meall Dearg; and north-west to Creag Mhòr. This area includes the site itself and a localised part of the Highland Summits and Plateaux LCT. There will be no significant effects on any of the landscape character types which cover the site and its vicinity, since these extend across very large parts of the study area.

6.239 The significant effects on the landscape around the site will not extend to effects on any designated areas. The site is not designated, and the closest designated area is the River Tay (Dunkeld) NSA, where views of the turbines are theoretically available from King's Seat and Newtyle Hill. The majority of the NSA will be unaffected by Creag a' Bhàird Wind Farm, and no effect is predicted on the special qualities of this or any other designated landscape.

6.240 The assessment also identifies that there will be some significant effects on visual receptors, particularly those close to the site, as a result of the addition of turbines, tracks and ancillary features at close proximity which will inevitably change views. These include views likely to be experienced by walkers on Druim Mòr, Ben Salachill, General Wade's Military Road within Glen Cochill, and Creag Liath, as well as road users on the A826 and A822 in the local area.

6.241 The findings of the viewpoint assessment indicate that significant effects on views will be experienced by viewers who are susceptible to change, at locations up to around 6km from the proposed turbines where there are open views towards the wind farm. Beyond this distance, even viewers of the highest sensitivity, at highly-valued viewpoints, will experience effects which are not significant, as at King's Seat for example. The distance at which significant effects cease will depend in part upon the direction of view, as this influences how Creag a' Bhàird is perceived in relation to Griffin. However, in all the representative views considered the two developments will be seen as a coherent grouping of turbines. Creag a' Bhàird will only extend the influence of wind turbines into one view which is currently unaffected, on the A822 near Borelick (viewpoint 5).

6.242 From longer distance views, for example from summits such as Schiehallion and Ben Vrackie, Creag a' Bhàird will form a minor element in broad views, merging with the adjacent Griffin turbines in the wider panorama. Effects on such views will be minor or negligible, and not significant.

6.243 The assessment has not identified any settlements where views will be significantly affected by Creag a' Bhàird Wind Farm. Similarly, no significant effects are predicted on views from routes through the area. In each case, this is largely due to the siting of the wind farm in a location where turbines will not be seen from the great majority of settlements and routes in the area. There is almost no visibility at all, for example, from the Rob Roy Way or the A9, key routes through the area. Minor effects are predicted on a short section of the Perthshire Tourist Route. There are a relatively small number of individual residential properties, largely within Strathbraan, where significant effects on views are predicted. These are examined in further detail in **Appendix 6.1**.

6.244 The location of Creag a' Bhàird Wind Farm adjacent to Griffin also limits the extent of cumulative effects on the wider landscape. The wind farm has been designed to be compatible with Griffin in landscape and visual terms, and as such does not give rise to any significant cumulative effect as a result of contrasting design or layout. There is very limited visual interaction between Creag a' Bhàird Wind Farm and the other operational and proposed wind farms in the local area (Calliachar, Calliachar North and Crossburns), which are located on the western side of Meall Dearg. Even considering the prior presence of all these wind farms, the addition of a relatively modest development in the context of Griffin Wind Farm is not predicted to give rise to significant cumulative effects on the landscape or on views.

6.245 All the operational effects identified will be long-term and will be reversible at the end of the 25 year lifespan of the development.

6.246 The existing forestry on the site will be felled and, once construction is complete, will be replanted with coniferous cover to better design standards than the current plantations. The replanting will incorporate areas of native broadleaf woodland and open ground, which will provide a minor landscape and visual benefit that will continue beyond the lifespan of the wind farm.

6.247 Overall, Creag a' Bhàird Wind Farm will result in very localised effects on the landscape and on views. Significant effects are not predicted to occur on the landscape beyond 3km from the turbines, and on views beyond around 6km. The siting and design of Creag a' Bhàird Wind Farm ensures that it will be compatible with the adjacent Griffin Wind Farm and, with the exception of very localised areas close to the site, will not extend the influence of wind turbines into currently unaffected landscapes or views. Creag a' Bhàird Wind Farm will have very limited effects on the landscapes of the study area, and similarly limited effects on views from the many scenic viewpoints within the study area.

6.248 **Table 6.16** below summarises the predicted effects of the wind farm.

Table 6.16: Summary of Effects

Predicted Effect	Mitigation	Level of Residual Effect	Significance of Residual Effect
Construction effects on the landscape of the site	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Major	Major, significant
Construction effects on LCT 3: Highland Summits and Plateaux	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Locally major No effect on the overall LCT	Significant across a small area, no more than 2km from the site. Not significant on the overall LCT
Construction effects on LCT 1b: Mid Highland Glens	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Minor	Not significant
Operational effects on the landscape of the site	In built design mitigation.	Major	Significant
Operational effects on LCT 3: Highland Summits and Plateaux	In built design mitigation.	Locally major No effect on the overall LCT	Significant across a small area, no more than 3km from the site. Not significant on the overall LCT
Operational effects on LCT 1b: Mid Highland Glens	In built design mitigation.	Minor	Not significant.
Effects on views from VP01 Druim Mòr	In built design mitigation.	Major	Significant
Effects on views from VP02 Ben Salachill	In built design mitigation.	Major	Significant
Effects on views from VP03 A826 within Glen Cochill	In built design mitigation.	Moderate	Significant
Effects on views from VP04 General Wade's Military Road, Glen Cochill	In built design mitigation.	Major	Significant
Effects on views from VP05 A822 near Borelick	In built design mitigation.	Major	Significant
Effects on views from VP06 A822 near Ballinreigh	In built design mitigation.	Minor	Not significant
Effects on views from VP07 Creag Liath (426m AOD)	In built design mitigation.	Moderate	Significant
Effects on views from VP08 Meal nan Caorach	In built design mitigation.	Minor	Not significant
Effects on views from VP09 A822 near Corrymuckloch	In built design mitigation.	Minor	Not significant
Effects on views from VP10 King's Seat, Birnam (404m AOD)	In built design mitigation.	Minor	Not significant
Effects on views from VP11 Newtyle Hill (317m AOD)	In built design mitigation.	Minor	Not significant
Effects on views from VP12 Meall nam Fuaran	In built design mitigation.	Minor	Not significant
Effects on views from VP13 Meall Tairneachan (787m AOD)	In built design mitigation.	Minor	Not significant
Effects on views from VP14 Ben Chonzie (931m AOD)	In built design mitigation.	Negligible	Not significant

Predicted Effect	Mitigation	Level of Residual Effect	Significance of Residual Effect
Effects on views from VP15 Ben Vrackie (841m AOD)	In built design mitigation.	Negligible	Not significant
Effects on views from VP16 Schiehallion (1083m AOD)	In built design mitigation.	Minor	Not significant
Effects on views from VP17 Carn Liath	In built design mitigation.	Negligible	Not significant
Effects on views from VP18 Dunsinane Hill	In built design mitigation.	Negligible	Not significant
Effects on views from VP19 Minor road, Newtyle	In built design mitigation.	Negligible	Not significant
Effects on views from the A822	In built design mitigation.	Minor	Not significant
Effects on views from the A826	In built design mitigation.	Minor	Not significant

[i] Landscape Institute and the Institute of Environmental Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Routledge.
[ii] Land Use Consultants (1999) Tayside landscape character assessment. Scottish Natural Heritage Review No.122
[iii] Ash Consulting Group (1999) Central Region Landscape Character Assessment. SNH Review No.123
[iv] Alison Grant (2009) Cairngorms National Park Landscape Character Assessment
[v] David Tyldesley and Associates (2004) Landscape Study Windfarm Development in the Ochil Hills and part of Southern Highland Perthshire. Perth and Kinross Council and Clackmannanshire Council
[vi] Landscape Institute Advice Note 01/11 Photography and photomontage in landscape and visual impact assessment
[vii] Scottish Natural Heritage Wildness in Scotland's Countryside, Policy Statement No. 02/03
[viii] Scottish Natural Heritage (2005) Constructed Tracks in the Scottish Uplands
[ix] Scottish Natural Heritage (2006) Visual Representation of Windfarms, Good Practice Guidance. Prepared by Horner & Maclennan / Envision
[x] Scottish Natural Heritage (2007) Assessing the Impacts on Wild Land, Interim Guidance Note
[xi] Scottish Natural Heritage (2002, updated 2009) Policy Statement No 02/02: Strategic Locational Guidance for Onshore Windfarms in Respect of the National Heritage
[xii] Scottish Natural Heritage (2009) Siting and Designing Windfarms in the Landscape
[xiii] Scottish Natural Heritage (2010) Good Practice During Windfarm Construction
[xiv] Scottish Natural Heritage (2011) A Handbook on Environmental Impact Assessment, Appendix 1: Landscape and Visual Impact Assessment
[xv] Scottish Natural Heritage (2012) Assessing the cumulative impact of onshore wind energy development
[xvi] The Countryside Agency and Scottish Natural Heritage (2002) Landscape Character Assessment: Guidance for England and Scotland
[xvii] Perth and Kinross Council Guidance for the Preparation and Submission of Photographs and Photomontages to illustrate the impacts of Wind Energy Development for inclusion in Planning Applications and Environmental Statements
[xviii] Perth and Kinross Council Landscape and Ecological Mitigation of Renewable Energy On-site Infrastructure
[xix] Scottish Natural Heritage (2006) Visual Representation of Windfarms, Good Practice Guidance. Prepared by Horner & Maclennan / Envision
[xx] Scottish Natural Heritage (2009) Siting and Designing Windfarms in the Landscape
[xxi] Scottish Natural Heritage (2002, updated 2009) Policy Statement No 02/02: Strategic Locational Guidance for Onshore Windfarms in Respect of the National Heritage
[xxii] Scottish Natural Heritage (2009), Loch Lomond and The Trossachs National Park Landscape Character Assessment
[xxiii] Scottish Natural Heritage (2010). The special qualities of the National Scenic Areas. SNH Commissioned Report No.374.
[xxiv] Scottish Natural Heritage (2012) Assessing the cumulative impact of onshore wind energy development

7 Noise

Introduction

7.1 This chapter presents an assessment of the potential construction and operational noise impacts of the proposed Creag a' Bhàird Wind Farm on the residents of nearby dwellings. An assessment of the potential cumulative impact of the proposed Creag a' Bhàird Wind Farm with other nearby wind farms is also included. The assessment has been undertaken by Hoare Lea Acoustics. Full details of the noise assessment, as well as a detailed glossary of terms, can be found in the Hoare Lea Acoustics Technical Report which is included as **Appendix 7.1**. This chapter represents a summary of the findings of that report.

7.2 Planning policies of relevance to this assessment are presented in **Chapter 5: Planning Policy Context.**

Study Area Description

7.3 The study area for the assessment effectively extends up to 2 km from the proposed turbines for operational noise, including cumulative impacts and also includes residential dwellings along the construction traffic route in relation to construction traffic noise. The locations of residential dwellings included within the study area, for which the assessment has been undertaken, are shown on **Figure 7.1**. The noise impacts at more distant properties will be less than those for the properties considered.

Effects Assessed in Full

7.4 The following impacts have been assessed:

- potential impact of noise and vibration during construction of the wind farm (including construction traffic noise);
- potential impact of noise during operation of the wind farm;
- cumulative impacts of noise during operation with other nearby wind farms: the Griffin and Calliachar Wind Farms (both assumed to be operational for the purpose of this assessment).

Effects Scoped Out

7.5 On the basis of the desk based and survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects and policy guidance or standards, the following topic areas have been 'scoped out', as proposed in the Scoping Report:

- the effects of vibration during operation of the site on receptors in the area surrounding the site are considered negligible and will not be considered further in this chapter;
- cumulative construction impacts are not considered relevant as the nearby wind farms considered will already be operational prior to construction of the proposed wind farm;
- the level of light vehicle traffic accessing the site during its operation is limited such that its noise effect would be negligible, and it is therefore not considered further in this chapter.

Assessment Methodology

Assessment Structure

7.6 The assessment is structured around the consideration of potential construction, operational and cumulative operational impacts on nearby residential dwellings.

Data Sources and Guidance

7.7 The following data sources have been used in the compilation of this assessment:

- Ordnance Survey information concerning the locations of residential dwellings in the vicinity of the proposed wind farm;
- British Standard (BS) 5228-1 'Code of practice for noise and vibration control on construction and open sites. Part 1 Noise' reference material for the sound emission characteristics of various construction activities associated with the proposed wind farm;
- manufacturer data for the Vestas V90 3MW as candidate turbine for the purposes of the noise assessment of the proposed Development;
- currently available information for Griffin and Calliachar Wind Farms including manufacturer data for the Siemens VS93m 2.3MW turbine;
- Scottish Planning Policy (SPP);
- Planning Advice Note 1/2011: Planning & Noise;
- ETSU-R-97, the Assessment and Rating of Noise from Wind Farms, Report for the Department of Trade & Industry. The Working Group on Noise from Wind Turbines, 1997;
- A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, M. Cand, R. Davis, C. Jordan, M. Hayes, R. Perkins, Institute of Acoustics, May 2013;
- PAN1/2011 Technical Advice Note – Assessment of Noise;
- BS 5228, 2009 Noise and Vibration Control on Construction and Open Sites;
- Design Manual for Roads and Bridges, Volume 11, section 3, Part 7, Traffic Noise and Vibration, The Highways Agency, Transport Scotland;
- Planning Advice Note 50: Controlling The Environmental Effects of Surface Mineral Workings;
- BS 6472 2:2008: Guide to evaluation of human exposure to vibration in buildings - Part 2: Blast-induced vibration;
- Calculation of Road Traffic Noise, HMSO Department of Transport, 1988;
- ISO 9613-2:1996 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation', International Standards Organisation;
- Griffin Wind Farm, Environmental Statement (ES), April 2004 and ES Amendment August 2005, Green Power;
- Consent and deemed planning permission by the Scottish Ministers for the construction and operation of the Griffin wind powered electricity generating station in Perth and Kinross, 31 January 2008. (Amended with letter 19/02/2008 enclosing table of limits for condition 6.29).

Field Survey

7.8 Reference was made to the baseline noise surveys undertaken as part of the Environmental Impact Assessment of the Griffin Wind Farm. Surveys were undertaken over a period of 14 days in November and December 2004.

7.9 The total survey period was in excess of the minimum of one week required by ETSU-R-97 'The Assessment and Rating of Noise from Wind Farms' (further details on ETSU-R-97 are provided in the section on 'Assessing Significance – Operational Noise' below) and two weeks indicated in the Institute of Acoustics 'Good Practice Guide (GPG) to The Application Of ETSU-R-97 For The Assessment And Rating Of Wind Turbine Noise'. Details of the monitoring location and equipment used can be found in **Appendix 7.1**. The survey also accorded with the recommendation of the GPG.

7.10 This data remains representative as no significant changes to factors affecting the background noise environment in the area are understood to have occurred in the meantime. A possible exception would be the contribution of the Griffin Wind Farm at some locations, as this scheme has become operational since the 2004 survey; but as discussed below, ETSU-R-97 explicitly precludes the inclusion of wind turbine noise in the baseline noise environment to prevent unreasonable cumulative increases, so the 2004 baseline data remains a suitable basis for the current assessment.

7.11 The assessment has considered the impacts of the wind farm at seven residential dwellings as detailed in **Table 7.1** below (see also Sections 4 and 5 of **Appendix 7.1).** These locations are shown on **Figure 7.1**. The list of residential dwellings to be included in the noise assessment is not intended to be

exhaustive but sufficient to be representative of those receptors closest to the proposed Creag a' Bhàird Wind Farm. However the Upper Pitleoch property is derelict and it is therefore not considered further in this chapter. It should be noted that the residential dwelling coordinates listed in **Table 7.1** have been selected to be representative of outside amenity (i.e. garden) areas associated with the various properties.

Table 7.1: Residential Dwellings Assessed

Residential Dwelling Assessed	Easting	Northing	Approximate Distance to Closest Turbine (m)	Closest Turbine (ID)
Scotston*	290562	742602	1739	1
Meikle Tombane*	294774	740230	1342	11
Upper Pitleoch (derelict)	296545	741712	2118	13
Ballachraggan	293597	738688	1964	9
Kinloch House	292008	738733	1955	9
Tomnagrew	294324	739198	1796	10
Ballinloan	297149	740837	2833	13

**Denotes a location which was surveyed for Griffin Wind Farm*

Consultation

7.12 Account has been taken of the scoping responses and other consultation undertaken, as set out in **Table 7.2**.

Table 7.2: Consultation Responses

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Perth and Kinross Council	Formal Scoping Consultation	Advised that potential impacts from construction and operation noise should be addressed in the ES.	Potential construction and operational noise has been assessed and presented in this chapter and accompanying technical report.
Perth and Kinross Council Environmental Health Department	Other Consultation	Discussed noise impact assessment methodology in further detail	Approach used in referencing previously measured baseline data and general cumulative assessment approach was agreed, and sites to consider in cumulative assessment agreed.

Assessing Significance

7.13 The following summarises the significance criteria that have been defined for the assessment. A full description of the derivation of significance criteria is provided in **Sections 3.3 and 3.4 of Appendix 7.1.**

Construction Noise and Vibration

7.14 The analysis of construction noise impacts has been undertaken in accordance with BS 5228-1. This indicates that a number of factors are likely to affect the acceptability of construction noise including site location, existing ambient noise levels, duration of site operations, hours of work, attitude of the site operator and the noise characteristics of the work being undertaken.

7.15 BS 5228-1 Annex E provides example criteria that may be used to consider the significance of any construction noise impacts. The criteria do not represent mandatory limits but rather a set of example approaches intended to reflect the type of methods commonly applied to construction noise. The example methods are presented as a range of possible approaches according to the ambient noise characteristics of the area in question, the type of development under consideration, and the expected hours of construction activity. In broad terms, the example criteria are based on a set of fixed limit values which, if exceeded, may result in a significant impact unless ambient noise levels (i.e. regularly occurring levels without construction) are sufficiently high to provide a degree of masking of construction noise.

7.16 Based on the range of guidance values set out in BS 5228 Annex E, and other reference criteria provided by the World Health Organization (WHO), the significance criteria presented in **Table 7.3** have been derived. The values have been chosen in recognition of the relatively low ambient noise typically observed in rural environments. The presented criteria have been normalised to noise levels averaged over a time period T equal to the duration of a working day on site ($L_{Aeq,T,}$ see **Appendix 7.1, Annex A** for a full glossary of terms). BS 5228-1 Annex E provides varied definitions for the range of day time working hours which can be grouped for equal consideration. The values presented in **Table 7.3** (and **Table 1 of Appendix 7.1**) have been chosen to relate to day time hours from 07:00 to 19:00 on weekdays, and 07:00 to 13:00 on Saturdays.

Table 7.3: Significance Criteria

Impact Significance	Definition
Major	Construction noise is greater than 72dB $L_{Aeq,T}$ for any part of the construction works or exceeds 65dB $L_{Aeq,T}$ for more than 4 weeks in any 12 month period
Moderate	Construction noise is less than or equal to 65dB $L_{Aeq,T}$ throughout the construction period.
Minor	Construction noise is generally less than or equal to 60dB $L_{Aeq,T}$, with periods of up to 65dB $L_{Aeq,T}$ lasting not more than 4 weeks in any 12 month period
Negligible	Construction noise is generally less than or equal to 55dB $L_{Aeq,T}$, with periods of up to 60dB $L_{Aeq,T}$ lasting not more than 4 weeks in any 12 month period

7.17 Major or moderate construction impacts are considered 'significant' in the context of the EIA Regulations.

7.18 When considering the impact of short-term changes in traffic, associated with the construction activities, on existing roads in the vicinity of the Project, reference can be made to the criteria set out in the Design Manual for Roads and Bridges (DMRB). A classification of magnitudes of changes in the predicted traffic noise level calculated using the CRTN methodology is set out: for short-term changes such as those associated with construction activities, changes of less than 1 dB(A) are considered negligible, 1 to 3 dB(A) is minor, 3 to 5 dB(A) moderate and changes of more than 5 dB(A) constitute a major impact. This classification can be considered in addition to the criteria of **Table 7.3**.

7.19 The nature of works and distances involved in the construction of a wind farm are such that the risk of significant impacts relating to ground borne vibration are very low. This is true for general construction activities. Occasional momentary vibration can arise when heavy vehicles pass residential dwellings at very short separation distances, but this is not sufficient to constitute a risk of significant impacts.

Mitigation of potential vibration impacts associated with blasting is best achieved through restrictions on working hours and best practice measures as set out in the proposed mitigation section below. Accordingly, vibration impacts (other than blasting) do not warrant detailed assessment and have not been considered further in this chapter.

Operational Noise and Vibration

7.20 The limits for wind turbine operational noise are clearly defined in ETSU-R-97. Consequently, the test applied to operational noise is whether or not the calculated wind farm noise immission[1] levels at nearby noise sensitive properties lie below the noise limits derived in accordance with ETSU-R-97. Depending on the levels of background noise, the satisfaction of the ETSU-R-97 derived limits can lead to a situation whereby, at some locations under some wind conditions and for a certain proportion of the time, the wind farm noise may be audible. However, noise levels at the properties in the vicinity of the wind farm will still be within levels considered acceptable under the ETSU-R-97 assessment method.

7.21 The day time noise limit is derived from background noise data measured during so called 'quiet periods of the day', comprising weekday evenings (18:00 to 23:00), Saturday afternoons and evenings (13:00 to 23:00) and all day and evening on Sundays (07:00 to 23:00). Multiple samples of ten minute background noise levels using the $L_{A90,10min}$ measurement index are measured contiguously over a wide range of wind speed conditions (a definition of the $L_{A90,10min}$ index is given in **Appendix 7.1, Annex A**). The measured noise levels are then plotted against the simultaneously measured wind speed data and a 'best fit' curve is fitted to the data to establish the background noise level as a function of wind speed. The ETSU-R-97 day time noise limit is then set at a level 5dB(A) above the best fit curve to the background noise data over a 0 - 12 m/s wind speed range. For wind speeds where the best fit curve to the background noise data lies below a level of 30dB(A) to 35dB(A), the limit is set at a fixed level in the range 35dB(A) to 40dB(A). The precise choice of fixed limit within the range 35dB(A) to 40dB(A) depends on a number of factors: the number of noise affected properties, the likely duration and level of exposure and the consequences of the choice on the potential power generating capability of the wind farm.

7.22 The night time noise criterion curve is derived from background noise data measured during the night time periods (23:00 to 07:00) with no differentiation being made between weekdays and weekends. The ten minute $L_{A90,10min}$ noise levels measured over these night time periods are again plotted against the concurrent wind speed data and a 'best fit' curve is established. As with the day time limit, the night time noise limit is also based on a level 5dB(A) above the best fit curve over the 0-12 m/s wind speed range. Where the night time criterion curve is found to be below 43dB(A) it is fixed at 43dB(A).

7.23 In addition, ETSU-R-97 offers an alternative, simplified assessment methodology: wind turbine noise levels are considered acceptable if limited to levels of L_{A90} 35dB(A) up to wind speeds of 10 m/s, regardless of measured background noise levels at the property.

7.24 The noise limits defined in ETSU-R-97 relate to the total noise occurring at a dwelling due to the combined noise of all operational wind turbines. The assessment will therefore need to consider the combined operational noise of the Development with the other wind farms in the area to be satisfied that the combined cumulative noise levels are within the relevant ETSU-R-97 Criterion. ETSU-R-97 also requires that the baseline levels on which the noise limits are based do not include a contribution from any existing turbine noise, to prevent unreasonable cumulative increases.

7.25 Further discussion of the derivation of appropriate noise limits under ETSU-R-97 is included in **Appendix 7.1 (sections 4.2 and 5.7).** The relevant noise limits considered are based on a fixed limit of 40 dB(A) for day-time periods, at the upper end of the range of 35 to 40dB(A): this is consistent with the Environmental Statement and consent for the Griffin Wind Farm. Furthermore , this can be justified by the generating capacity of the wind farm developments considered, and the relatively low number of dwellings in the area, and their relative location which means that the properties considered would be upwind[2] of the wind farms (and therefore experience reduced turbine noise levels) under the prevailing south-westerly winds. When considering the assessment of cumulative wind farm in light of the above requirements, a reduced noise limit applicable to the Development was considered, as set out below.

[1] The term 'noise emission' relates to the sound power level actually radiated from each wind turbine, whereas the term 'noise immission' relates to the sound pressure level (the perceived noise) at any receptor location due to the combined operation of all wind turbines on the proposed wind farm.

[2] Upwind means the wind blowing from receiver to source and the actual levels which occur in practice would be considerably lower (10 dB(A) to 15 dB(A)) than under downwind conditions (wind blowing from source to receiver).

7.26 For more distant properties, the simplified assessment criteria of 35 dB(A) set out in ETSU-R-97 was referenced.

7.27 If predicted noise levels are within the ETSU-R-97 derived noise limits, operational noise is considered acceptable, if predicted noise levels are above the ETSU-R-97 noise limits, operational noise is considered unacceptable. Unacceptable noise levels are considered 'significant' in the context of the EIA Regulations.

Planning Policy

7.28 Planning policies of relevance to this assessment are provided in **Chapter 5: Planning Policy Context**.

Existing Conditions

7.29 The background noise environment in the area surrounding the Development is generally characterised by 'natural' sources, such as wind disturbed vegetation, water courses, birds and farm animals. Other sources of noise include intermittent local and distant road and agricultural vehicle movements.

7.30 The background noise measurement survey for the Griffin Wind Farm was undertaken in in November and December 2004. The resulting derived background noise conditions at Scotston and Meikle Tombane are represented in **Figures C1 to C4** of **Appendix 7.1 (Annex C)**. This shows that background levels during quiet day-time or night-time periods typically varied between 25-35dB $L_{A90,10min}$ at low wind speeds and 35–45dB $L_{A90,10min}$ at the highest wind speeds. ETSU-R-97 specifies that the noise limit can be set at 5dB above these background noise levels or at the fixed limit, whichever is greater. For the avoidance of doubt, the resulting total ETSU-R-97 limits, set out in **Tables 3 and 4 of section 4.2** of **Appendix 7.1,** were derived as follows:

- the ETSU-R-97 daytime limit of 40 dB(A), or 5dB above the prevailing background noise level, whichever is greater;
- the minimum ETSU-R-97 night-time fixed lower limit of 43dB(A), or 5dB above the prevailing background noise level, whichever is greater.

7.31 These limits are identical to those set out in the conditions attached to the consent for the Griffin Wind Farm. The consent noise limits for the Griffin Wind Farm are therefore set on the basis the maximum levels advised in ETSU-R-97, which are considered applicable based on the above considerations (see 7.25). In accordance with the requirements of ETSU-R-97 (see above), it is these same noise limits that apply to the cumulative effects of all wind farms.

7.32 The operation of the Development would necessarily introduce a theoretical increase in wind turbine noise, but this would be acceptable if the increase is negligible or result in noise levels which remain within the limits of ETSU-R-97. In these situations, the approach generally adopted is to consider the available "headroom" between consented noise limits for already operational wind farms and the actual operational noise levels of those wind farms when assessing cumulative noise impacts. These considerations are set out in detail in the IoA Good Practice Guide.

7.33 After consideration of the predicted turbine noise levels from the Griffin Wind Farm, it is possible to develop individual noise limits applicable to the proposed Development alone. These limits are defined so that, in practical terms, the operation of the Proposed Development (within the noise limits proposed for that development) when operating together with the Griffin Wind Farm (within the noise limits proposed for that development), will not cause the ETSU-R-97 overall cumulative noise limits to be exceeded. These limits were obtained by subtracting 10 and 3 dB from the total ETSU-R-97 limits for the properties of Scotston and Meikle Tombane respectively. The resulting limits are set out below in **Tables 7.4 and 7.5** (or **Tables 10 and 11** of **Section 5.7** of **Appendix 7.1**). These represent stringent limits, which, when added to the contribution of the Griffin Wind Farm, result in cumulative levels which either represent a negligible increase or remain compliant with the ETSU-R-97 criteria.

7.34 The potential for wind shear effects, and differences between the wind experienced at both the Griffin and the Creag a' Bhàird Wind Farm sites, were taken into account in line with current good practice, in that they accounted for the potential maximum noise levels from Griffin Wind Farm regardless of shift in wind speeds which may result from such effects (see discussion in **Section 5.7 and Annex D** of **Appendix 7.1**).

Table 7.4: Derived Creag a' Bhàird Day-Time Noise Limits.

Property	Wind Speed at Ten Metres Height, m/s								
	4	5	6	7	8	9	10	11	12
Scotston	30	30	30	30	30	30	30	30	32
Meikle Tombane	37	37	37	37	38	40	41	43	45

Table 7.5: Derived Creag a' Bhàird Night-Time Noise Limits.

Property	Wind Speed at Ten Metres Height, m/s								
	4	5	6	7	8	9	10	11	12
Scotston	33	33	33	33	33	33	33	33	33
Meikle Tombane	40	40	40	40	40	40	40	40	40

The 'Do Nothing' Scenario

7.35 In the absence of the proposed wind farm, environmental noise levels in the area are likely to remain largely similar to those currently experienced, including the influence of the Griffin Wind Farm, barring any substantial development which would affect these levels.

Wind Farm Layout Design Considerations

7.36 The consideration of potential noise effect was an integral part of the scheme's design development. The layout of the development has been iteratively developed from an initial layout. During the design iteration process, detailed noise calculations were undertaken and these noise immissions were compared against the criteria derived above in accordance with ETSU-R-97. Advice was provided to the design team, resulting in predicted noise levels compliant with the derived criteria. Further information on the design evolution of the scheme is provided in **Chapter 3: Site Selection and Design Strategy**.

Effects Assessment

7.37 The assessment of effects is based upon the project description outlined in **Chapter 4: Scheme Description** and is structured as follows:

- construction effects;
- operational effects;
- cumulative effects.

Construction Effects

Predicted Effects

7.38 Predicted noise levels at the closest noise sensitive receptors for each of the key activities during construction of the proposed wind farm are presented in **Appendix 7.1.** For the majority of the construction period, activities will occur at large distances of more than 1 km from nearby residential dwellings.

7.39 The different construction activities proposed, such as site track construction, foundation construction, turbine erection, etc. were considered, and the associated types of plant normally involved were assessed. Using the above assumptions, upper collective sound emission over the working day of 110 to 120 dB(A) were determined. The separation distances of between 1 km to more than 1.5 km between almost all construction activities and the nearest residential dwellings were then determined. On this basis, using the BS 5228 methodology, assuming 50% soft ground cover and neglecting screening effects, noise levels of less than **45 dB L_{Aeq}** were predicted. Works to upgrade the site access track would occur at a closer distance of no less than 600 m from the Scotston property, which corresponds to noise levels of no more than **50 dB L_{Aeq}**. Therefore in accordance with the criteria of **Table 7.3**, noise effects from all the construction activities considered will be negligible.

7.40 In addition to on-site activities, construction traffic passing to and from the site will also represent a potential source of noise to surrounding dwellings. The impact of construction traffic movements on the access road to site was also assessed, based on the traffic changes presented in Chapter 12: Access, Traffic and Transport. A maximum potential increase of no more than 1.2 dB(A) was calculated in the day time average traffic noise level along some sections of the A822 during particular phases of the construction programme, which corresponds to a minor impact. A lower level of noise increase was predicted on the A826 (1 dB), which would also represent a minor impact.

7.41 When taking into consideration the different phases and aspects of the proposed construction programme, and the short term nature of some of the noisiest activities predicted, the temporary impacts of constructions are considered to be of **negligible to minor significance.**

7.42 It is difficult to predict vibration and air overpressure resulting from blasting operations, but given the separation distances between the location of borrow pits and the nearest noise sensitive receptors (approximately 2.7 kilometres as a minimum) it is very unlikely that these activities would cause significant adverse impacts. These activities will in any case be undertaken in strictly controlled conditions, during specific periods only, following the mitigation measures set out below.

Proposed Mitigation

7.43 To reduce the potential impacts of construction noise, the following mitigation measures are proposed. These will be included in the Construction Method Statement (CMS).

- Construction activities and heavy goods vehicle deliveries to the site that may give rise to audible noise at the surrounding properties will be limited to the hours 07:00 to 19:00 Monday to Friday and 07:00 to 13:00 on Saturdays. Turbine deliveries may take place outside these times, with the prior consent of the local authority, as they will be dependent on route timings being approved by the local authority and the Police, and depend on weather conditions.
- All construction activities shall adhere to good practice as set out in BS 5228.
- A Traffic Management Plan will be put into place with prior approval from Perth and Kinross Council and other relevant roads authorities, developed to control the movement of vehicles to and from the proposed Creag a' Bhàird Wind Farm.

7.44 The potential noise and vibration impacts of blasting operations will be reduced according to the guidance set out in the relevant British Standards and PAN50 annex D and discussed below:

- Blasting will take place under strictly controlled conditions with the agreement of the relevant authorities, at regular times within the working week, that is, Mondays to Fridays, between the hours of 10.00am and 16.00pm. Blasting on Saturday mornings will be a matter for negotiation between the contractor and Perth and Kinross Council.
- Vibration levels at the nearest sensitive properties are best controlled through on site testing processes carried out in consultation with the Local Authorities. This site testing based process would include the use of progressively increased minor charges to gauge ground conditions both in terms of propagation characteristics and the level of charge needed to release the requisite material. The use of onsite monitoring at neighbouring sensitive locations during the course of this preliminary testing can then be used to define upper final charge values that will ensure vibration levels remain within the criteria set out in PAN50 Annex D.
- Blasting operations will adhere to good practice as set out in BS 5228 2, and in PAN50, Annex D, Paragraph 95, in order to control air overpressure.
- A scheme will be submitted Perth and Kinross Council, for approval of blasting details, which will outline the mitigation measures to be adopted.

Residual Effects

7.45 The construction noise assessment has determined that associated levels are expected to be audible at various times throughout the construction programme, but remain within acceptable limits such that their impacts are considered **temporary and of negligible to minor significance**.

Operational Effects

Predicted Effects

7.46 Predicted noise immission levels for the proposed wind farm operating alone at the residential dwellings listed in **Table 7.1** are set out in **Table 7.6** (or see **Appendix 7.1, Section 5.5, Table 8)**. Predictions are shown for each standardised ten metre height wind speed from 4 m/s to 12 m/s inclusive. For the purpose of the noise assessment undertaken in the present chapter, a Vestas V90 3.0 MW candidate turbine, with a 70 m hub height and a 90 m rotor diameter, was used as this was considered to represent the upper end of the range of noise emissions from turbines which may be installed at the proposed wind farm. The prediction methodology (based on the ISO 9613-2:1996 standard) and the prediction parameters used (conservative emission levels, G=0.5, 4m height, 10°C and 70% relative humidity) are fully in accordance with the recommendations of the GPG. These predictions correspond to favourable propagation conditions, i.e. when the wind is blowing from the turbines to the dwellings, and lower noise levels are expected in other conditions.

7.47 The predicted noise immission levels vary between 17 and 22 dB(A) at low wind speeds and 26 to 36 dB(A) at high wind speeds. The predictions are also shown graphically in **Figures C1 to C4 of Appendix 7.1 (Annex C)**.

Table 7.6: Predicted L_{A90} Wind Farm Noise Immission Levels at each of the Dwellings of Table 7.1 as a Function of Standardised Wind Speed, for the Creag a' Bhàird Wind Farm alone.

Property	Standardised Wind Speed at Ten Metres Height, m/s								
	4	5	6	7	8	9	10	11	12
Scotston	22	25	28	29	30	30	30	30	30
Meikle Tombane	28	31	34	35	36	36	36	36	36
Ballachraggan	22	25	28	29	30	30	30	30	30
Kinloch House	22	25	27	29	30	30	30	30	30
Tomnagrew	23	26	29	30	31	31	31	31	31
Ballinloan	17	20	23	25	26	26	26	26	26

7.48 As the predictions of **Table 7.6** are at or below the specific noise limits detailed in **Tables 7.4 and 7.5,** compliance is predicted to be achieved at all wind speeds and at all residential dwellings. The analysis presented in the section below discussing cumulative effects demonstrates why this results in compliance with the derived ETSU-R-97 noise limits in the cumulative case (as this represents the relevant criteria), and therefore why these individual noise limits are appropriate.

Proposed Mitigation

7.49 The selection of the final turbine model will take into consideration the relevant noise limits (**Tables 7.4 and 7.5**) to be achieved at the residential dwellings considered. It is noted that the emission levels of the candidate turbine used in this assessment are at the upper end of the range for turbines in the 2 to 3 MW range, and the above assessment demonstrates that the proposed Creag a' Bhàird Wind Farm can operate within derived ETSU-R-97 limits without the requirement for operational curtailment.

Residual Effects

7.50 Based upon the assessment undertaken, predicted wind farm noise levels from the wind farm operating in an unconstrained mode do not exceed the ETSU-R-97 criteria. Therefore, noise impacts associated with the operation of the wind farm are considered to be acceptable and not significant.

Cumulative Effect Assessment

7.51 The cumulative assessment included the assessment of operational noise from the Griffin and Calliachar Wind Farms.

7.52 No other wind farms have been included as there are none which contribute in an acoustically significant way to overall cumulative noise immission levels. When the separation distance from the proposed wind farm is more than 10 km, their noise contribution would be more than 10 dB below that of Creag a' Bhàird Wind Farm and therefore negligible.

Predicted Cumulative Effects

7.53 Predictions for the Griffin Wind Farm were based on the turbine model installed on this site (Siemens VS 93 m 2.3 MW). It was also established that the source noise emissions levels assumed for Griffin Wind Farm could not be significantly higher than assumed without the relevant predicted noise immission levels exceeding its consent noise limits at the location Scotston. These levels therefore clearly represent a robust basis for the purposes of the assessment of cumulative noise level, in line with current good practice.

7.54 Predictions for the Calliachar scheme, assuming the same candidate turbine as for Griffin Wind Farm, are of less than 21 dB L_{A90} at the closest location (Scotston) and therefore represent a negligible contribution to the predicted levels of the other wind farms.

7.55 The detailed assessment set out in **Appendix 7.1, Section 5.5 to 5.7** presents a detailed cumulative noise assessment. This shows that, with negligible[3] exceptions, the predicted cumulative noise levels from all the wind farms considered (**Table 7** of **Appendix 7.1**) comply with the derived ETSU-R-97 noise limits referenced in the consent for the Griffin Wind Farm (**Table 3 and 4** of **Appendix 7.1)** at Scotston or Meikle Tombane, or with the simplified criterion of 35 dB(A) proposed in ETSU-R-97 (for the other dwellings considered). At Scotston for example, the predicted levels from Creag a' Bhàird are 10 dB below the contribution from Griffin Wind Farm and therefore negligible. This is illustrated graphically in **Figures C1 to C4 in Annex C of Appendix 7.1.**

Proposed Mitigation

7.56 Based on the above assessment no further mitigation measures are required. Satisfactory control of cumulative noise immission levels would therefore be achieved through enforcement of the respective individual limits for each of the individual wind farms. For the Creag a' Bhàird development, these limits are set out in **Tables 7.4 and 7.5**.

Residual Cumulative Effects

7.57 Based upon the assessment undertaken, predicted cumulative operational noise levels from the Griffin Wind Farm, Calliachar Wind Farm and the proposed Creag a' Bhàird Wind Farm operating in an unconstrained mode do not exceed the applicable ETSU-R-97 criteria. Therefore, cumulative noise impacts are considered to be acceptable and not significant.

Further Survey Requirements and Monitoring

7.58 It is proposed that conditions attached to the planning consent should include the requirement that, in the event of a noise complaint, noise levels resulting from the operation of Creag a' Bhàird Wind Farm are measured to demonstrate compliance with the conditioned noise limits. These noise limits should be based on the values set out in **Tables 7.4 and 7.5**. Such monitoring would be carried out in accordance with ETSU-R-97.

[3] If a new source of noise is 10 dB below an existing source of noise, then the cumulative effect of the two sources operating together is commonly assumed to be negligible (see IoA GPG). This is because the theoretical effect would be imperceptible in practice.

Summary of Effects

7.59 A summary of impacts during construction and operation of the proposed wind farm is provided in **Table 7.7**.

Table 7.7: Summary of Effects

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Construction (including construction traffic)	Negligible to minor	Restriction on working hours, best practice measures, blasting in controlled conditions	Negligible to minor
Operational (including cumulative)	Not significant	Final turbine selection determined to achieve compliance with ETSU-R-97 noise limits.	Not significant

8 Geology, Hydrology and Hydrogeology

Introduction

8.1 This chapter considers the potential effects of the proposed Creag a' Bhàird Wind Farm on geology, hydrology, hydrogeology, soils and peat. It details each of these items in turn, including a baseline description, followed by the identification of specific effects on particular receptors. The assessment was undertaken by the Land & Water Team at Mouchel, based in Glasgow.

8.2 There are links between this chapter and **Chapter 9: Ecology**, specifically on issues such as aquatic ecology and groundwater dependent terrestrial ecosystems.

Study Area Description

8.3 The study area focussed on the region within the red line site boundary which includes the existing site entrance from the A826 and forestry track into the plantation area. The area where the main fieldwork was undertaken comprises the area dominated by the hills known as Creag a' Bhàird, Meall Mor and Craig Tombane.

8.4 The Tombane Burn (and tributaries) drain the main area of the site, flowing generally south east towards the River Braan. An unnamed tributary of the Ballinloan Burn drains the north-east of the site, with the Cochill Burn draining the western fringe of the site adjacent to the A826.

8.5 An aerial photograph of the site is provided as **Figure 8.1**. This shows the dominant conifer plantation, forestry rides, areas of open ground and watercourse corridors.

Effects Assessed in Full

8.6 The following effects have been assessed in full:

- pollution incidents;
- erosion and sedimentation;
- modification of surface water drainage patterns;
- modification of groundwater levels and flows;
- compaction of soils;
- peat instability.

Effects Scoped Out

8.7 No potential effects were scoped out of the assessment.

Assessment Methodology

Assessment Structure

8.8 The assessment is structured around the consideration of potential effects on the following:

- Geology – changes to geological structures or effects on designated sites.
- Hydrology – changes to drainage regime and associated alteration to surface water runoff rates and volumes, erosion/sedimentation and water quality characteristics across the local area and the catchment as a whole, including designated sites. Also changes to water resources such as water supplies.
- Hydrogeology – changes to groundwater infiltration and groundwater levels, water quality and wetland characteristics.
- Peat – changes to soil and peat characteristics related to erosion, compaction and soil quality, changes to peat stability within and immediately adjacent to the site.

Data Sources and Guidance

8.9 The following data sources have been used during this assessment:

- Ordnance Survey digital mapping, 1:50,000 and 1:10,000 scale (OS Open Data);
- Ordnance Survey Landform Profile 10m Digital Terrain Model (DTM) data (OS Open Data);
- British Geological Survey Geoindex Onshore Bedrock 1:50,000(interactive web map);
- British Geological Survey Geoindex Onshore Superficial Deposits 1:50,000 (interactive web map);
- British Geological Survey Hydrogeological Map of Scotland, 1:625,000 scale;
- SNIFFER (2004) Map of Vulnerability of Groundwater in the Uppermost Aquifer, Scotland;
- Soil Survey of Scotland 1:250,000 Sheet 5, mapping of soil types and land capability for agriculture;
- Centre for Ecology & Hydrology (CEH) Flood Estimation Handbook (FEH) CD-ROM v3;
- ISIS hydrological software;
- Wallingford Hydro Solutions LowFlows 2000 software;
- SEPA Flood Risk Map of Scotland (interactive web map);
- SEPA River Basin Management Planning Map (interactive web map);
- National Vegetation Classification survey of site, undertaken by MacArthur Green (2013).

8.10 The following legislation, policies and guidance have been taken into consideration during this assessment:

- Environmental Impact Assessment (Scotland) Regulations 2011;
- Water Environment and Water Services (Scotland) Act 2003;
- Water Environment (Controlled Activities) (Scotland) Regulations 2011;
- Private Water Supplies (Scotland) Regulations 2006;
- CIRIA Report C532, Control of water pollution from construction sites: Guidance for consultants and contractors;
- CIRIA Report C648, Control of water pollution from linear construction projects: Technical guidance;
- CIRIA Report C649, Control of water pollution from linear construction sites: Site guide;
- CIRIA Report C697, The SUDS Manual;
- Forestry Commission (2011) Forests & water guidelines, 5th Edition;
- Scottish Executive (2000) River crossings & migratory fish: Design guidance;
- Scottish Executive (2006) Peat landslide hazard and risk assessments: Best practice guide for proposed electricity generation developments;
- Scottish Natural Heritage (2009) A handbook on environmental impact assessment;
- Scottish Natural Heritage (2002) Guidelines on the environmental impacts of windfarms and small scale hydroelectric schemes;
- Scottish Environment Protection Agency Policy No. 19, Groundwater protection policy for Scotland;
- Scottish Environment Protection Agency Policy No. 26, Policy on the culverting of watercourses;
- Scottish Environment Protection Agency Position Statement WAT-PS-06-02, Culverting of watercourses;
- Scottish Environment Protection Agency WAT-SG-25, Good practice guide - river crossings;
- Scottish Environment Protection Agency WAT-SG-31, Special requirements for civil engineering contracts for the prevention of pollution;

- Scottish Environment Protection Agency/CIRIA (2006) Small environmental guide for construction workers;
- Scottish Renewables Good Practice During Windfarm Construction (co-authored by Scottish Natural Heritage, Scottish Environment Protection Agency and Forestry Commission Scotland);
- SEPA (2010) Regulatory Position Statement – Developments on Peat.

8.11 The following Scottish Environment Protection Agency (jointly with the Environment Agency and the Northern Ireland Environment Agency) Pollution Prevention Guidelines have also been considered:

- PPG1 General guide to the prevention of pollution;
- PPG2 Above ground oil storage;
- PPG3 The use and design of oil separators in surface water drainage systems;
- PPG4 Treatment and disposal of sewage where no foul sewer is available;
- PPG5 Works and maintenance in or near water;
- PPG6 Working at construction and demolition sites;
- PPG7 Safe operation of refuelling facilities;
- PPG8 Storage and disposal of used oils;
- PPG13 Vehicle washing and cleaning;
- PPG18 Managing fire water and major spillages;
- PPG21 Pollution incident response planning;
- PPG22 Incident response - dealing with spills;
- PPG26 Safe Storage – Drum and intermediate bulk containers.

Field Survey

8.12 Field surveys were undertaken by a two-person team with experience of assessing geology, hydrology, soil and peat issues on onshore wind farms in upland environments. These visits were undertaken in February 2013 (weather conditions were dry and cold with snow on the ground), July 2013 (dry and warm), and September 2013 (wet, cloudy and mild). These combined visits equate to approximately 80 person hours on site, all visits were undertaken by a team of two staff operating under safe working practices.

8.13 The visits focused on gaining a good overall understanding of the hydrological regime of the area, evaluating outcrops of bedrock and undertaking initial peat probing to feed into the layout constraints for both peat depth and stability. The field techniques used for the peat probing were in line with the Scottish Government's Peat Landslide Hazard and Risk Assessment Best Practice Guide[i] and Floating Road on Peat guidance[ii].

Consultation

8.14 **Table 8.1** details the consultation responses to the Scoping Report and information requested from Perth and Kinross Council.

Assessing Significance

8.15 The predicted significance of the effect was determined through a standard method of assessment based on professional judgement, taking into account three key factors:

- sensitivity of the receiving environment;
- potential magnitude of the effect;
- probability of that effect occurring.

8.16 This approach is based on guidance given in the Scottish Natural Heritage (SNH) publication 'A Handbook on Environmental Impact Assessment'[iii].

8.17 The receptor sensitivity represents its ability to absorb the anticipated effect without perceptible change resulting. Three levels of sensitivity have been used, as shown in **Table 8.2**. Evaluation of sensitivity of soils and water can be difficult to quantify. A considerable degree of judgement, based on defined characteristics and values and calling on professional experience, is accordingly applied during evaluation.

Table 8.1: Consultation Responses

Consultee	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
Perth and Kinross Council	Scoping	Water resources and private water supplies should be identified and appropriate protective/mitigation measures considered	Data requested from PKC Supplies reviewed against provided location and source information to identify potential for source-pathway-receptor relationships Included in assessment of effects
		Carbon sinks should be maintained	Carbon Report provided
Scottish Environment Protection Agency	Scoping	Carbon balance should be investigated	Assessed in Carbon Report
		Disruption to wetlands including peatlands	Included in assessment of effects, with good practice measures specified
		Disturbance and re-use of excavated peat	Peat survey undertaken to locate infrastructure away from disturbing deeper peat. Peat Stability Report and Carbon Report provided
		Forestry clearance	Included in assessment of effects and also in Carbon Report
		Impact on existing groundwater abstractions	No groundwater abstractions identified on or adjacent to site
		Engineering activities in the water environment	Included in assessment of effects, with stream crossing details specified
		Water abstraction	No onsite water abstraction identified
		Pollution prevention and environmental management	Included in assessment of effects, with good practice measures specified
		Borrow pits	Included in assessment of effects
		Flood risk	Included in assessment of effects
Scottish Water	Scoping	None, no assets in this area	

Consultee	Scoping/ Other Consultation	Issue Raised	Response/Action Taken
Scottish Natural Heritage	Scoping	River Tay SAC is considered to have connectivity to the development Peat depth mapping for peat found on site Potential for watercourses to be impacted by structures or sediment	Identified as a designated area in baseline Included in assessment of effects and in Peat Stability Assessment Included in assessment of effects and in Watercourse Crossing Assessment

Table 8.2: Sensitivity

Sensitivity	Definition
High	The receptor has little ability to absorb change without fundamentally altering its present character, is of high environmental value, or of national or international importance, for example waterbodies of at least good status under the Water Framework Directive (WFD) and/or with designated status such as SAC or SSSI.
Medium	The receptor has moderate capacity to absorb change without significantly altering its present character, has some environmental value, or is of regional importance, for example waterbodies with moderate status under the WFD.
Low	The receptor is tolerant of change without detriment to its present character, is of low environmental value, or of local importance, for example waterbodies with poor or bad status under the WFD.

8.18 The magnitude of the effect takes into account the timing, scale, size and duration of the potential effect. Four levels of magnitude have been adopted, as shown in **Table 8.3**, using hydrology as an example.

Table 8.3: Magnitude of Effect

Magnitude	Definition
Major	There would be fundamental changes to the hydrology, for example a pollution event resulting in downgrading of a watercourse WFD status, or leading to an acute ecological issue such as a fish kill.
Moderate	There would be material but non-fundamental changes to the hydrology, such as a pollution incident with defined short term effect on a watercourse, returning to previous condition within a number of months without an acute effect upon aquatic ecology.
Minor	There would be detectable but non-material changes to the hydrology, such as a small scale pollution incident with very short term effect on a watercourse, returning to previous condition within a number of weeks.
Negligible	There would be no perceptible changes to the hydrology.

8.19 The probability of occurrence of an effect has been evaluated as being low, medium or high.

Table 8.4: Significance Matrix

Sensitivity	Magnitude	Probability	Significance of Effect
High	Major	High	Major
		Medium	Major
		Low	Moderate
	Moderate	High	Moderate
		Medium	Moderate
		Low	Minor
	Minor	High	Minor
		Medium	Minor
		Low	Minor
	Negligible	High	Minor
		Medium	Negligible
		Low	Negligible
Medium	Major	High	Major
		Medium	Moderate
		Low	Minor
	Moderate	High	Moderate
		Medium	Minor
		Low	Minor
	Minor	High	Minor
		Medium	Minor
		Low	Negligible
	Negligible	High	Negligible
		Medium	Negligible
		Low	Negligible
Low	Major	High	Moderate
		Medium	Minor
		Low	Negligible
	Moderate	High	Minor
		Medium	Minor
		Low	Minor
	Minor	High	Minor
		Medium	Negligible
		Low	Negligible
	Negligible	High	Negligible
		Medium	Negligible
		Low	Negligible

8.20 The findings of the three criteria considered in the evaluation of the effects have been used via a matrix for each potential effect (see **Table 8.4**) to form a judgement on the significance of the effect.

8.21 Potential effects are concluded to be of major, moderate, minor or negligible significance (before and after proposed mitigation measures have been taken into account).The assessment concludes with a review to determine if the anticipated effects would be significant in terms of the EIA regulations.

8.22 Major and moderate effects are considered to be significant in the context of the EIA Regulations.

Planning Policy

8.23 Planning policies of relevance to this assessment are provided in **Chapter 5: Planning Policy Context**.

Existing Conditions

8.24 The current land use of the Creag a' Bhàird site is coniferous woodland plantation, with this being the dominant feature of the site. The site is on a ridge connecting Creag a' Bhàird, Meall Mor and Craig Tombane, with relatively small upland streams draining the site, including the Tombane Burn and its tributaries, before joining the River Braan, approximately 2.5km to the south-east. Open ground is typically covered by a mixture of upland moorland vegetation.

Designations

8.25 This section details the designations relating to hydrology, geology or soils which are of regional, national or international importance.

8.26 No sites designated for nature conservation are present within 5km of the site, however the River Tay SAC is sited approximately 5.3km downstream of the Ballinloan Burn and River Braan confluence. The River Tay SAC is of European (International) importance with several fish species, mammals and rare vegetation protected.

8.27 Waters from the River Braan flow over a natural waterfall at NN 9960 4120 which marks the designation's nearest point to the site. The SAC is approximately 9.5km² and covers the River Tay and numerous tributaries. The site is designated as SAC due to the qualifying interests listed in **Table 8.5**.

Table 8.5: Summary of Designated Sites

Designation Name	Designation	Category	Location Relative to Site	Linkage to Site
River Tay	SAC	International qualifying features Fish: River Lamprey Brook Lamprey Sea Lamprey Atlantic Salmon Mammals: Otter Standing Open Water and Canals (clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels) Fresh Water Pearl Mussel	5km south-east	Runoff from site streams flows to River Braan, discharging into the River Tay

Climate

8.28 This section details:

- the climate characteristics for Creag a' Bhàird Wind Farm and the surrounding region;
- the historic rainfall data for the surrounding region.

8.29 The Creag a' Bhàird Wind Farm site is within the Met Office's Eastern Scotland climatic region[iv]. Areas of higher ground which include the Creag a' Bhàird site are likely to experience a higher level of precipitation compared with lower areas nearby to the east, with air cooling at altitude causing more cloud and precipitation. Much of Eastern Scotland includes high ground exposed to rain-bearing westerly winds.

8.30 The standard average annual rainfall (SAAR) has been estimated from the Flood Estimation Handbook (FEH) CD-ROM[v] as varying between 1101mm and 1419mm across the site. To put this in perspective, annual average rainfall across Scotland varies from over 4000mm in the north-west Highlands, to less than 700mm along the Fife coast.

8.31 The long term average monthly rainfall is shown on **Diagram 8.1** in **Appendix 8.1** using details from the Braemar Met Office station[vi](327mAOD and located approximately 54km NE of the site at NO 1520 9190). Further local data has been obtained from stations based at Loch Tay[vii] and Glen Turret[viii], however due to incomplete datasets, has not been presented.

8.32 The elevation of the site ranges from approximately 462mAOD at the highest point at Meall Mor to 258mAOD at the lowest point on the banks of the Tombane Burn. This range is consistent with the elevation at Braemar Met Office station. This precipitation data provides an understanding of seasonal variations that would be anticipated in the region, but the higher altitude and more westerly location of the site may lead to an expectation of greater rainfall than at Braemar.

8.33 Climate change projections for 2050 suggest that a medium emissions scenario would yield a slight increase in temperatures within Eastern Scotland of up to approximately 3.1°C[ix]. Furthermore, projections suggest an increase of 19-20% in autumn and winter precipitation, potentially increasing flood risk and frequency.

Geomorphology

8.34 This section details

- the geomorphological characteristics of the site; and
- topographic cross-sections of the site.

8.35 The site boundary is roughly v-shaped, with the summit of Meall Mor located at the base of the 'v'. One arm of the 'v' extends north-west along the undulating ridge and upper slopes between the summit of Meall Mor, Creag a' Bhàird and Car Dow. Isolated peat pockets are found in the shallow saddles between these summits. Both Creag a' Bhàird and Meall Mor have steep upper slopes with exposed bedrock and craggy morphology characterising their peaks. The other arm of the 'v' extends north-east between Meall Mor and Craig Tombane, crossing the incised stream valley of the Tombane Burn between the two summits. Craig Tombane is characterised by an exposed craggy peak with gentler lower slopes. The headwaters of a Ballinloan Burn tributary rise on the very gentle slopes to the north-east of Craig Tombane, where a pocket of moderate depth peat has formed.

8.36 **Photographs 8.1** and **8.2** show the site from two viewpoints within site, with **Photograph 8.3** looking north to the site from Strath Braan (from the A822 roadside), highlighting upland features (with all photographs in **Appendix 8.1**).

8.37 **Figure 8.2** shows site elevation data, including three cross section transects, with **Diagrams 8.2, 8.3** and **8.4** (in **Appendix 8.1**) providing elevation details of these cross sections.

Geology

8.38 This section details:

- bedrock geology;
- superficial geology; and
- other geological faults or features found onsite and in the immediate surroundings.

8.39 Geological mapping[x] indicates the underlying bedrock geology consists of semipelite geology of the Southern Highland Group (Mid Cambrian Age), which is derived from sedimentary siltstone deposits subjected to mid to high metamorphism. A single unit of metamorphosed igneous intrusion of the Dalradian Supergroup, consisting metagabbro and metamicrogabbro is mapped across the Tombane Burn valley adjacent to the site boundary. Although geological mapping indicates the presence of semipelite only, site visit observations indicate that psammites of the Southern Highland Group and metamorphosed sandstone of the Ben Ledi Grit Formation may also be present within the site.

8.40 Superficial geology mapping[x] covering the site shows that the majority of deposits are unclassified. However, based on reconnaissance site survey it is considered that superficial deposits consist primarily of glacial till predominantly found in the lower and mid slopes. Alluvium and river terrace deposits of undifferentiated sediments are confined to the immediate area surrounding the Tombane Burn. Small pockets of peat are found on upper slopes and hill tops, however superficial deposits are generally very thin in these areas with bedrock at or near the surface.

8.41 There are no significant faults or other significant geological features within the site. However, the Highland Boundary Fault lies approximately 7km to the south. This fault zone separates the Southern Highlands and Midland Valley geological regions[xi].

8.42 Further information summarising the bedrock and superficial geology on site are presented in **Figures 8.3 and 8.4**, respectively.

Soil

8.43 This section details:

- the soils present at the site and their characteristics, including peat; and
- peat stability.

8.44 The following information is summarised from Macaulay Land Use Research Institute (MLURI) soil mapping[xii], soil handbook[xiii] and website[xiv], with reference to information gathered on site.

8.45 **Table 8.6** identifies the soil units present, many of which include peat in their composition. However, the descriptions are general and do not provide information on soil depths and engineering properties.

8.46 Podzols: typically form in acid, coarse textured, well drained materials. Surface vegetation is usually coniferous woodland or heather moorland. Podzols are generally nutrient deficient and heavily leached in the upper horizons resulting in a bleached appearance, with an accumulation of thin layers of iron/aluminium oxides or organic material at lower levels within the soil profile, with an orange-brown or black colour respectively. Peaty podzols have a peat-rich surface horizon; Humus-iron podzols have a surface horizon of humified (or decomposed) organic material. In areas with low slope angles, waterlogging may occur above the ironpan; this can produce a soil intermediate between a podzol and a gley.

8.47 Gleys: naturally poorly drained soils that develop under conditions of intermittent or permanent waterlogging. Soils are typically greyish or blue-grey with orange mottling. Peaty gleys have a peat rich surface horizon. They are highly extensive soils, particularly in northern and western districts and are listed among principle soils, generally together with peat, in a large number of map units. Non-calcareous gleys are naturally poorly drained soils that develop under conditions of intermittent or permanent waterlogging. Humic gleys are loamy or clayey with a surface horizon of decomposed organic material.

8.48 Rankers: predominant in mountain or hilly terrain or on glacially eroded rocky terrain with underlying solid or fragmented non-calcareous rocks within 30cm depth. An organic or organo-mineral surface horizon present but generally lacks subsoil.

8.49 Brown forest soils: fertile, often deep soils, rich in nutrients and organic matter. Soil is free draining and often not very distinctive visually, although usually lightens in colour with depth as organic content decreases. Texture and level of fertility depend on parent material and degree of alteration that the soil has undergone.

Table 8.6: Summary of Associated Soils and Their Properties Within Site

Soil Association/ Parent Materials	Soil Unit	Component Soils	Landforms	Typcial Associated Vegetation
Strichen Drifts derived from areneceousschists and strongly metamorphosed argillaceous schists of the Dalradian Supergroup	506	Peaty podzols, humus-iron podzols; some peaty gleys and rankers	Hills and valley sides with strong and very steep slopes; moderately rocky	Boreal and Atlantic heather moor Heath rush – fescue grassland Bent fescue grassland
	499	Peaty podzols, humus-iron podzols; some gleys	Hills and valley sides with strong and steep slopes; non-rocky	Boreal and Atlantic heather moor Bog heather moor Blanket and upland blanket bog
	497	Non-calcareous gleys, humicgleys; some peaty gleys and humus-iron podzols	Undulating lowlands and valley sides with gentle and strong slopes; non-rocky	Rush pastures and sedge mires Arable and permanent pastures Acid bent-fescue grassland
	498	Humus-iron podzols; some brown forest soils and gleys	Undulating lowlands and hills with strong and steep slopes; non-rocky	Arable and permanent pastures Boreal and Atlantic heather moor Acid bent-fescue grassland

Peat

8.50 Peat is a soft to very soft, highly compressible, highly porous organic material which can consist of up to 90% water by volume. Unmodified peat typically has two layers, a surface layer or acrotelm which is usually 0.1 to 0.3 m thick, highly permeable and receptive to rainfall. The acrotelm layer generally has a high proportion of fibrous material and often forms a crust under dry conditions. The second layer, or catotelm, lies beneath the acrotelm and forms a stable colloidal substance which is generally impermeable. As a result, the catotelm usually remains saturated with little groundwater flow. Peat is thixotropic, meaning that its viscosity decreases under applied stress. This property may be considered less important where the peat has been modified through artificial drainage and is drier, but will be significant when the peat body is saturated.

8.51 Given the presence of peat, or peat containing soils, as aforementioned, Mouchel was requested by the developer to undertake further peat-specific work, including peat probing for use in a site-specific peat stability assessment and which will also be used in evaluating carbon emissions. Soil and peat depths were sampled at representative locations across the site.

8.52 **Table 8.7** shows the range of results gathered during peat depth surveys. A total of 400 soil and peat depth records were gathered at the site and the surrounding areas, with measured depths averaging 0.3m. The record locations were determined by planned infrastructure positions and also by availability of access through the dense plantation.

Table 8.7: Peat/Soil Depths

Peat/Soil Depth Range (m)	Number of locations surveyed	Percentage of locations surveyed	Average depth in range (m)
0.0 to <0.5	345	86.2	0.22
0.5 to <1.0	40	10.0	0.59
1.0 to <1.5	8	2.0	1.21
1.5 to <2.5	7	1.8	1.83
2.5 to <4.0	0	0.0	0
4.0 and deeper	0	0.0	0
Total / Aggregate	**400**	**100**	**0.3**

8.53 96.2% of recordings were less than 1.0m and 98.2% less than 1.5m. Deeper deposits were located on the lower altitude, shallower gradient ground such as at the north-eastern edge of the site within the Ballinloan Burn catchment boundary. There were no depths greater than 2.5m recorded.

8.54 The Scottish Executive (now Scottish Government) guidance document on peat landslide hazard and risk assessments[xv] defines peat as a soil greater than 50cm in depth, with an organic matter content of more than 60%. The probing data records that the vast majority (approximately 86%) of the sampled points are less than 0.5m depth and are not therefore not formally considered as peat.

8.55 Peat or organic soils are located mainly near the north-east site boundary within the Ballinloan Burn catchment boundary and in isolated depressions, such as immediately north-west of Creag a' Bhàird, within the Tombane Burn catchment boundary.

8.56 The results of the peat/soil depth survey were extrapolated to produce an indicative peat depth map as a 50m x 50m grid for the site. This map and the results of the peat depth survey are shown on **Figure 8.5**.

8.57 It is recognised that the equipment employed by Mouchel to determine peat depth will also pass through other soil types before 'refusal depth', thus peat depth results incorporate all soil through which probing rods pass, such as peaty podzols and gleys at this site. This is a conservative approach to ensure soil depths are accurately gauged, but is anticipated to provide an overestimate of peat depths, given visual evidence from the site and the fact that the mapping indicates peat overlying other soil types.

8.58 The exposed bank of the Tombane Burn is provided as **Photograph 8.4** (**Appendix 8.1**).

Peat Stability

8.59 Due to the presence of areas of peat on the site, a peat stability assessment has been undertaken. This assessment used peat depth data in combination with slope information to initially determine areas considered of greatest risk of slope failure, based on factor of safety slope stability calculations. These specific areas were then considered further, with further site visits, geotechnical information and interpretation of aerial photography used to refine the initial desktop assessment for each location.

8.60 No evidence of peat instability was recorded on the site, with much of the peat comprising a very shallow surface layer, with exposures providing evidence of glacial till underlying the peat horizon.

8.61 Further details on peat stability methodology, interpretation and results are provided in **Appendix 8.2**.

Hydrogeology

8.62 This section details:

- hydrogeological features present at the site and their characteristics;
- groundwater vulnerability;
- groundwater body characterisation and water quality; and
- groundwater dependent terrestrial ecosystems (GWDTEs).

8.63 The semipelite geology of the Southern Highland Group is classified as a low productivity aquifer. Groundwater may be present in the near surface and secondary weathered zone, fractures and low superficial geology cover[xvi]. Springs will typically have small yields and groundwater infiltration is estimated to be less that 100mm/year.

8.64 The glacial till deposits present on the mid and lower slopes are likely to be highly variable in composition and may contain lenses of sand and gravel which can support perched water tables. These are likely to be discontinuous and limited in extent and as such can have limited groundwater potential. The variable composition of the till indicated that it may act as a confining layer to the underlying bedrock geology in some areas.

Groundwater vulnerability

8.65 Groundwater vulnerability varies across the site with class 5, 4a and 4b all present[xvii]. Both the far north-western and north-eastern extents of the site are assigned class 5, which is defined as "vulnerable to most pollutants, with rapid impact in many scenarios". This increasing vulnerability is likely to be due to the generally decreasing depth of superficial material protecting the underlying bedrock towards the top of the slope.

8.66 The northern slopes of Creag a' Bhàird and slopes that surround Meall Mor are classified as 4a while the valley of the Tombane Burn and eastern slopes of Glen Cochill are classified as 4b. Both 4a and 4b are sub-classifications of class 4, which is defined as "areas where groundwater is vulnerable to those pollutants not readily adsorbed or transformed".

Groundwater Body Characterisation and Water Quality

8.67 The Water Framework Directive (WFD) (EU, 2000) came into force in December 2003 and is implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003 (Scottish Executive, 2003). A key objective of this Directive is the achievement of 'good ecological status' (as a minimum) of all natural waterbodies by 2015. This involves a move towards a risk based classification system (SEPA, 2005). This risk based system highlights such issues as over abstraction, in addition to chemical water quality.

8.68 Under the terms of the WFD, all river basin districts are required to be characterised. The characterisation process required SEPA to produce an initial assessment of the impact of all significant pressures acting on the water environment. Groundwater bodies have been identified to reflect the main aquifer types. For areas above low productivity aquifers, groundwater bodies have been defined using surface water subcatchments as a surrogate. Areas above high productivity aquifers have been defined using geological and major catchment boundaries. The main purpose of identifying waterbodies is so that their status can be described accurately and compared with environmental objectives.

8.69 The entire site falls within one WFD groundwater body: the Upper Tay bedrock and localised sand and gravel aquifers waterbody[xviii]. The classification results of these waterbodies, and SEPA's confidence in the classification result, are summarised in **Table 8.8**. SEPA provide a confidence rating for each classification result which gives an indication of the robustness of the monitoring data upon which the classification status is based.

Table 8.8: Water Framework Directive Groundwater Classification

Groundwater Body	Groundwater Body SEPA ID (area)	Overall classification (2008)	Anticipated Classification (2015)	Relevant Associated Waterbody	Summary of Pressures
Upper Tay bedrock and localised sand and gravel aquifers	150290 1673.86 km²	Chemistry: Good Confidence : High Quantitative: Good Confidence: High	Chemistry: Good Quantitative: Good	Including: River Braan Cochill Burn Tombane Burn Ballinloan Burn	No current pressures identified

Groundwater Dependent Terrestrial Ecosystems

8.70 During preparation of **Chapter 9: Ecology**, MacArthur Green surveyed the site against the National Vegetation Classification (NVC) system and produced an associated map **(Figures 9.2a, 9.2b and 9.2c)**. This map was reviewed for groundwater dependent terrestrial ecosystems (GWDTE) using SEPA guidance[xix] which indicates which NVC areas could potentially be GWDTE-applicable.

8.71 The vegetation within the site boundary is a matrix of species including those which are identified as GWDTE that have the potential to be moderately or highly dependent on groundwater, such areas cover approximately 7% of the site.

8.72 Much of the habitat immediately surrounding the Tombane Burn and its tributaries on the northern slopes of Meall Mor have been identified, using SEPA guidance, as GWDTE with high groundwater dependence, such as NVC M6, M10 and M23. GWDTE with potentially high groundwater dependence cover approximately 3% of the site. The north-eastern area of the site features moderately dependant ecosystems, such as NVC M15, MG9 and MG10, covering approximately 4% of the site.

8.73 Further regions identified as having high dependencies are located near or at the site boundary and immediately adjacent to an unnamed tributary of the Ballinloan Burn. Other areas of moderately dependent ecosystems have been identified on the upper slopes of Creag a' Bhàird.

8.74 However, based on local site conditions it is judged that the vegetation present is dependent on wet conditions but groundwater is not considered as the primary source of water. Given that most of these locations are close to the higher altitude regions of the site it is considered unlikely that groundwater is the primary source of water for these communities, with the primary source of water more likely to be direct rainfall and the associated surface runoff from the slopes of Creag a' Bhàird, Meall Mor and Craig Tombane, often forming wet flush zones on the hillsides leading to better defined channels on the lower slopes.

8.75 **Photograph 8.5** (**Appendix 8.1**) shows a wetland area on the site near to a GWDTE survey area.

Hydrology

8.76 This section details:

- hydrological description of the characteristics of the site and downstream area;
- surface water flows and flooding;
- water quality;
- water supplies;
- fisheries.

8.77 By evaluating the hydrology of the site using a catchment-based system, judgements can be made regarding potential influences that onsite activities may have downstream and on other waterbodies within the catchment. Maps displaying the hydrological overview and more detailed site-specific hydrology are provided in **Figures 8.6** and **8.7**, respectively.

Hydrological Description

8.78 The site is located within the headwaters of the River Braan catchment, part of the extensive River Tay catchment which covers over 4,700km^2 and is the largest catchment in Scotland.

8.79 An overview of site catchments is shown on **Figure 8.6**, with more detailed site hydrology provided as **Figure 8.7**.

8.80 The Cochill Burn drains the western area of the site and its headwaters on the upper slopes of Monadhnam Mial, at approximately 600mAOD, collects runoff from these south-western slopes as well as the north-eastern slopes of Meall Odhar.

8.81 The Tombane Burn drains the majority of the site with its source at around 450mAOD, with a small waterbody in the upper reaches, Loch Creagh. The outflow stream from Loch Creagh flows south-east, meeting a tributary at NN 9226 4203. Numerous smaller tributaries drain the northern slopes of Creag a' Bhàird and northern slopes of Meall Mor. There are also a number of forestry drainage channels contributing to the Tombane Burn. The Tombane Burn has a catchment area of 12.7km^2, meeting the River Braan at NN 9590 3956, near Drumour Farm.

8.82 The Ballinloan Burn drains the north-east of the site. This watercourse covers a much larger catchment area than the Tombane Burn, draining an area of 36.1km^2, with a source zone around Loch Kennard, also approximating to 450mAOD. A small, short unnamed tributary (with a source at NN 9387 4196) drains the northern edge of the site, from the northern slopes of Craig Tombane, meeting the Ballinloan Burn at NN 9458 4264. The Ballinloan Burn meets the River Braan at NN 9779 4048, near to the Ballinloan property.

8.83 Collectively, these burns drain upland areas containing extensive areas of commercial conifer forestry and flow generally south-east, to converge with the River Braan. There are no standing waterbodies on the site. Main channels are not considered modified, however extensive modification is evident on forestry drains and there are a number of existing stream crossing structures located across the site, enabling forestry operation access.

8.84 Photographs of a variety of representative water features are provided in **Appendix 8.1, as Photographs 8.6, 8.7, 8.8** and **8.9**.

Surface Water Flows and Flooding

8.85 Theoretical runoff rates have been estimated for the full extent of each defined stretch of catchment, i.e. for the flow of the Tombane Burn upstream of meeting the River Braan. Peak flows have been estimated using the Flood Estimation Handbook[xx]. Catchment characteristics have been used with the 'FEH Rainfall-Runoff' method to derive a range of peak flow return periods[xxi]. Low flow measurements have been determined by the 'Low Flow' method[xxii] and are quoted as Q_{95} (i.e. the flow exceeded 95% of the time). These data are shown in **Table 8.9**.

8.86 The Hydrology of Soil Types (HOST) is a hydrologically-based classification of soils on the basis of their physical properties and their effects on the storage and transmission of water[xxiii]. It makes use of the fact that the physical properties of soils have a major influence on the hydrological response of a catchment. Other parameters can then be derived from the HOST classification. For the purposes of hydrological assessment the Baseflow Index (BFI) and Standard Percentage Runoff (SPR) are the most useful parameters.

8.87 BFI is the long-term ratio of baseflow to total stream flow, where baseflow represents the contribution to total flow from groundwater[xxiv]. BFI values range from 0.1 in relatively impermeable clay catchments to 0.99 in highly permeable chalk catchments. A very low BFI of 0.15 represents a flashy catchment with minimal storage, low BFI values (e.g. 0.3) indicate a catchment with little storage and active runoff, a BFI of 0.7 (or greater) indicates a significant contribution to flow from a major aquifer.

8.88 SPR is the average percentage of rainfall that causes the short-term increase in flow seen at a catchment outflow following a storm event[xxv].

8.89 Using FEH[xxvi] the Tombane and Ballinloan Burn have BFI-HOST values of 0.44 - 0.45, indicating moderate contribution from stored water sources. These values would be expected given the underlying geological conditions with little groundwater infiltration leading to low aquifer productivity. This has led to the upland moorland landform formation exhibited on the site. Local watercourses will respond fairly quickly to rainfall events, with a moderate lag time between rainfall occurring and increased stream flow values. The SPR value for the Tombane and Ballinloan Burn ranges 37 - 40%, indicating a moderately flashy response to rainfall, attenuated by local conditions and possibly forestry cover. To put site data into perspective, the catchment of the River Braan (upstream of the Hermitage), has a BFI-HOST value of 0.44 and SPR value of 40%, thus the site stream characteristics are broadly equivalent to that found in the surrounding area.

Table 8.9: Estimated Surface Water Flow Characteristics

Catchment	Area (km^2)	Mean Annual Flow (m^3/s)	Low Flow Q_{95} (m^3/s)	Estimated Peak Runoff (m^3/s) for each return period (years)					
				5	10	25	50	100	200
River Braan, upstream of Hermitage NO 0125 4205	210.72	6.998	0.597	117.2	140.4	173.1	201.2	228.3	264.9

Catchment	Area (km^2)	Mean Annual Flow	Low Flow Q	Estimated Peak Runoff (m^3/s) for each return period (years)					
Cochill Burn, upstream from NN 9122 3968	21.93	0.750	0.060	18.0	21.2	26.7	31.3	35.7	41.7
Tombane Burn, at Braan confluence NN 9584 3961	12.68	0.389	0.04	8.539	10.0	12.7	14.9	17.1	20.0
Tombane Burn, upstream of stream crossing (SC02) NN 9347 4098	9.452	0.298	0.03	7.1	8.3	10.5	12.4	14.2	16.7
Ballinloan Burn, at Braan confluence NN 9780 4048	36.05	0.988	0.166	24.3	28.6	36.0	42.2	48.2	56.3
Ballinloan Burn tributary, draining northern site area NN 9429 4235	0.71	0.02	0.002	0.9	1.0	1.3	1.5	1.7	2.0

8.90 Flood risk data provided by SEPA[xxvii] shows flooding risk limited to the immediate area adjacent to the Tombane Burn channel, widening upstream of the confluence with the River Braan at Drumour. Similar flood risk characteristics are noted for the Ballinloan Burn and respective confluence with the River Braan.

8.91 The River Braan has a fairly extensive flood risk area, particularly at such confluences with burns transferring runoff from higher ground. Downstream of the site, there is a wider flooding area noted at Inver (NO 017 422), where there is a weir and a bridge, close to the confluence of the River Braan with the River Tay. The River Tay has an extensive flood plain downstream from the confluence with the River Braan, widening substantially in areas such as Caputh and to a lesser geographical extent in Perth.

Water Quality

8.92 As discussed in the groundwater water quality section, the Water Framework Directive (WFD) is a risk based classification system. This highlights such issues as stream morphology and existing artificial structures in addition to chemical water quality and ecological diversity. Heavily modified waterbodies, which can no longer be considered to be natural, are classified on the basis of 'ecological potential'.

8.93 As for the groundwater section, SEPA have characterised surface water quality under the WFD.

8.94 The WFD applies to all surface waters, but for practical purposes, SEPA has defined a size threshold above which a river or loch qualifies automatically for characterisation. For lochs, the threshold is a surface area of $0.5km^2$ and rivers must have a catchment area of $10km^2$ or more. In addition to these larger waterbodies, smaller waters have been characterised where there is justification by conservation interests and to meet the requirements of regulatory legislation such as for drinking water supplies. **Table 8.10** summarises the Water Framework Directive classification for the River Braan, plus the site streams: Cochill Burn, Tombane Burn and Ballinloan Burn[xxviii].

Table 8.10: Water Framework Directive Surface Water Classification

Catchment	Waterbody Name	Waterbody SEPA ID	Overall Classification Data for 2008 / 2010	Anticipated Classification for 2015	Summary of Pressures
River Tay	River Braan	6576	High / High	High	No existing pressures
River Tay	Cochill Burn (Braan tributary)	6577	High / High	High	No existing pressures
River Tay	Tombane Burn (Braan tributary)	6580	Good / Good	Good	No existing pressures
River Tay	Ballinloan Burn (Braan tributary)	6579	Good / Good	Good	No existing pressures

8.95 For waterbodies that have not been classified, the normal convention is to assume a classification based on downstream or adjacent waterbodies unless there are specific indications to the contrary. Given the location of the site and the status of nearby watercourses, all waterbodies within the wind farm site should be assumed to have 'good status'.

8.96 In relation to this assessment it is considered that the higher the WFD status, the higher the sensitivity of the waterbody. To prevent any deviation from 'good status' for receiving watercourses, the objective is to keep construction phase and post development runoff to pre-development levels, in terms of both quality and quantity, whilst recognising that natural variability in flow values and water quality do occur. Measures to ensure this are discussed in the assessment sections below.

Water Supplies

8.97 The site area is not a source zone for public water supply, with the nearest public water supply assets in the Dunkeld area, nor are there any distribution assets within 5km. Water supplies in this area are provided by private supply. Therefore, public water supplies are not considered further.

8.98 Private water supply information was sought from Perth and Kinross Council, who provided a list of identified supplies within the Strath Braan area. **Figure 8.6** shows the location of local private water supplies.

8.99 Following review of supply source locations relative to site infrastructure, taking account of local catchments and intervening distances, a number of supplies were not considered to have hydrological connectivity to the site and therefore not considered further. These were as follows (identification codes matching those shown on Figure 8.6) :

- Girreon (1);
- Glenfender Cottage, Amulree (2);
- Dalreoch Amulree (5);
- Newton of Ballinloan (17);
- Ballinlick Cottage (18);
- Outfields of Logie (19);
- Meikle Logie (20);
- Little Trochry Farm (21);
- Kennacoil (22);
- Tarfuack Farm (23);
- Tomgarrow Cottage (24);

- Dundonnachie House (25);
- Balhomish Farm (26);
- Polney Loch (27).

8.100 The remaining supplies, where it was judged that there were potential hydrological linkages to site activities, warranted further attention. These were as follows:

- Kinloch House (3);
- Deanshaugh Borehole (4);
- Wester Ballachraggan (6);
- Ballachraggan (7);
- Tomnagairn (8);
- Little Tombane Farmhouse (9);
- Tombane Smithy (10);
- Aldville (11);
- Corbenic (12);
- Drumour Schoolhouse (13);
- Drumour Farmhouse (14);
- Trochry Borehole 15);
- Trochry (16).

8.101 There are two categories of private water supply, Type A supplies are typically larger and generally supply more than $10m^3$ per day or serve more than 50 people or supply a commercial or public activity (regardless of volume). Type B supplies are more common, this categorises the remaining supplies which do not meet the Type A criteria[xxix].

8.102 Type B supplies are predominant, but there are Type A supplies at Tomnagairn, Deanshaugh Borehole, Tombane Smithy, Corbenic and Trochry. A number of these sources supply multiple properties, for example the Trochry source supplies 17 properties. Generally these are for residential properties, with the exception of Deanshaugh Borehole which is a commercial supply to the Strath Braan Brewery.

8.103 Further details regarding these supplies of ongoing concern are provided in the effects assessment section.

Fisheries

8.104 The River Tay is recognised as one of the major salmon spawning and nursery areas in Scotland, with inherent environmental and commercial interests. The River Tay is categorised by SEPA under the freshwater fish directive as 'salmonid waters' (reference UKS78659102 and SEPA catchment ID 90)[xxx]. Atlantic salmon, river, brook and sea lamprey species are qualifying features of the River Tay SAC designation.

8.105 The River Braan falls within the Tay's salmonid watercourse status, with its smaller tributaries potentially providing spawning and/or nursery grounds for atlantic salmon, trout and other species.

Wind Farm Layout Design Considerations

Constraint Identification

8.106 Mouchel provided detailed constraints advice during the iterative layout design process for both the turbine and associated infrastructure features. At various stages during the iterative design process, fieldwork was undertaken in order to provide feedback to the development design team. This approach minimised a number of potential effects (such as minimising development infrastructure close to or crossing water features and undertaking initial peat depth and stability studies to avoid deeper peat areas).

8.107 The hydrology and ground condition constraints that were taken into account in the design of the wind farm are listed below:

- 50m buffer around water features shown on OS 1:10,000 mapping (other than where access tracks required incursion) – to protect from physical damage, pollution or flood inundation;
- avoidance of areas where peat depths anticipated to be 1.5m or deeper – to protect from physical damage and minimise excavation and transportation of peat;
- avoidance of slope angles greater than 8°- to minimise soil loss and potential instability;
- avoidance of areas where initial peat stability concern was identified (factor of safety values less than 1.4) – to avoid areas with possible instability issues and associated indirect effects on surface water;
- minimisation of watercourse crossing structures and identification of best locations for necessary crossings – to protect from physical damage or pollution;
- identification of private water supply source locations – to protect from physical damage or pollution;
- identification of best local location for final turbine positions to take account of peat depth, peat stability and water features – to minimise impact from turbine base.

8.108 As part of the layout design strategy, watercourse crossings were minimised. Where access necessitates stream crossings, construction features have been limited in these buffers as far as possible, for example minimising tracks running parallel to streams and trying to avoid track junctions being constructed in these zones. This approach has resulted in two crossing locations (NGR NN 9312 4054, NN 9347 4098) that are mapped on OS 1:50,000 scale map. Both of these locations are on forestry track routes, with existing culvert structures in place. In-channel works are planned to be avoided by using the existing structure as a support for a wider bridge to enable turbine delivery access, with **Figure 4.8** in **Chapter 4: Scheme Description** providing specimen design details. During the detailed design and construction phases, sections of track will be surveyed and microsited to optimise the distances from the waterbodies, taking into account local micro-topography.

8.109 A number of additional, smaller watercourse crossings were also been identified during fieldwork, these watercourses are not mapped on OS 1:10,000 scale mapping. These comprise crossings of flush zones, forestry drainage ditches and small headwater channels. These crossings will have structures installed appropriate to local conditions and are likely to be designed as over-sized culverts or layers of pipes for flush zones.

8.110 Aggregate material will be won on site by a combination of reusing existing track material and gathering suitable surface outcrop at planned infrastructure locations. For contingency, two borrow pit search areas were identified and a defined borrow pit excavation design has been prepared to supplement site sources, to be opened if necessary.

8.111 Land, flooding and drainage related aspects within Scottish Planning Policy (2010) were considered, including avoidance of better quality agricultural land, risk-based assessment of individual catchments with regard to SEPA Flood Mapping, use of sustainable drainage techniques and appropriate design of stream crossing structures.

Effects Assessment

8.112 The assessment of effects is based upon the project description outlined in **Chapter 4: Scheme Description** and is structured as follows:

- construction effects;
- operational effects;
- cumulative effects.

8.113 There are a number of effects which are specific to the construction phase assessment, with a reduced number of effects in the operational and cumulative assessments. The assessment assumes the integral good practice measures described in **Chapter 4: Scheme Description** have been incorporated into the scheme design (including forestry activities) and these do not form mitigation measures.

Receptor Sensitivity

8.114 All watercourses and groundwater receptors have been rated as of **high** sensitivity, given water quality, groundwater vulnerability classifications and direct hydrological linkage to the River Tay SAC. This high sensitivity grading also includes surface drainage patterns, given downstream flooding concerns on the River Braan.

8.115 The presence of downstream surface water abstractions from the River Braan for private water supplies in the Trochry area leads to these receptors also holding a **high** sensitivity value.

8.116 There are a number of groundwater dependent terrestrial ecosystems known as GWDTE[xxxi] on the site, these habitats can be particularly sensitive to changes in groundwater regime and include some areas judged as of high or moderate groundwater sensitivity[xxxii]. Taking a conservative approach, the entire site has been considered as being of **high** hydrogeological sensitivity regarding groundwater levels, flows and GWDTE.

8.117 Soils, where infrastructure is planned, have been rated as of **medium** sensitivity, based on soil characteristics. Higher value areas of deeper peat (deeper than 1.5m) have been avoided following the constraint mapping exercise. Soils are also considered of **medium** sensitivity for peat stability, given no evidence of previous failures on the site.

Construction Effects

8.118 The potential for effects to occur is greatest during the construction phase due to the high levels of activity onsite, including the requirement for clear felling of the site forestry. This is when there is the greatest rate of change to the existing conditions of the local environment.

Predicted Effects

Pollution Incidents

8.119 During the construction phase a number of potential pollutants will be present onsite to facilitate forestry clearance and civil engineering activities, including oil, fuels, chemicals, unset cement and concrete and waste and wastewater from construction activities. With chemicals and oil being stored and used on site, there is the potential for an incident, however the adoption of the applicable good practice measures (provided in **Chapter 4: Scheme Description**) will reduce the probability of an incident occurring and also reduce the magnitude of any incident due to a combination of good site environmental management procedures, including minimised storage volumes, staff training, contingency equipment and emergency plans. Any pollution incident occurring on the site may have a detrimental effect on the water quality of the nearby surface waters, groundwater and/or soil, thereby also indirectly affecting ecology.

Creag a' Bhàird Wind Farm is approximately 5km upstream from the River Tay SAC. It is proposed to implement good practice measures 'at source' to prevention pollution of site watercourses as part of the project design, these are employed to reduce both the likelihood of an incident occurring and the magnitude of any incident that should occur. It is also important to consider the dilution factor, noted in **Table 8.9**, when comparing site watercourse mean flow values (0.298 m^3/s) with those downstream, where the River Braan becomes designated as part of the River Tay SAC (6.998 m^3/s). This represents a 23-fold dilution factor. Thus, there is a combination of on-site good practice measures plus the substantial downstream dilution factor, would be expected to reduce any potential sedimentation effect.

8.120 The private water supply information provided by Perth and Kinross Council is included in **Table 8.11;** supply name, source, type of supply (Type A - larger domestic or commercial supply, Type B - small domestic supply), grid reference location, names of properties and number of properties served. These supply locations were evaluated for location relative to site and for potential site influence (taking account of source type and location, distance from site and the intervening topography and water features) to determine if there were potential pollutant source-pathway-receptor relationships. Most private water supplies in the local area are not considered to hold any potential linkage to site activities during construction, however, taking a precautionary approach, it has been considered that there could be potential influence on a small number of supplies, where these may use groundwater sources close to channels of watercourses draining the site or where a secondary supply may abstract directly from such watercourses.

8.121 The magnitude of pollution effect on surface water is considered **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

8.122 The magnitude of pollution effect specifically on the River Tay SAC is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.123 The magnitude of pollution effect on private water supplies is considered **major** and of **low** probability to occur, giving an overall significance of **moderate (significant)**.

8.124 The magnitude of pollution effect on groundwater is considered **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

8.125 The magnitude of pollution effect on soil is considered **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

Table 8.11: Summary of Private Water Supplies

Supply Name Figure 8.6 ID	Source	Type A or B supply	Grid Ref	Number of Properties Served	Location relative to infrastructure and comments	Potential Site Influence
Kinloch House 3	Spring	B	NN 9195 3885	5	1.8 km south-west Located on southern slopes of Meall Mor. Not in site catchment. No pathway identified.	No
Deanshaugh Borehole 4	Borehole	A	NN 9245 7385	2	1.9 km south Serving commercial property of Strath Braan Brewery Located on southern slopes of Meall Mor. Not in site catchment. No pathway identified.	No
Wester Ballachraggan 6	Spring	B	NN 9365 3885	2	1.7 km south-east Located on south-eastern slopes of Meall Mor. Not in site catchment. No pathway identified.	No
Ballachraggan 7	Surface	B	NN 9375 3925	1	1.4 km south-east Upstream surface water runoff from south-eastern slopes of Meall Mor. Not in site catchment. No pathway identified.	No
Tomnagairn 8	Spring	A	NN 9405 4015	2	0.9 km south-east Located on eastern slopes of Meall Mor. Not in site catchment. No pathway identified.	No

Supply Name Figure 8.6 ID	Source	Type A or B supply	Grid Ref	Number of Properties Served	Location relative to infrastructure and comments	Potential Site Influence
Little Tombane Farmhouse 9	Borehole	B	NN 9535 3995	1	1.6 km south-east Located on the lower southern slopes of Druim Mor. Tombane Burn catchment, downstream of site. Groundwater source is likely to be from hillside to north. No site infrastructure located in this area.	Yes; possible Tombane Burn influence due to relative location of borehole
Tombane Smithy 10	Borehole	A	NN 9545 3995	7	1.8 km south-east Details as for Little Tombane Farmhouse supply	Yes; possible Tombane Burn influence
Aldville 11	Spring	B	NN 9605 3995	1	2.3 km south-east Spring located on south-eastern slopes of Druim Mor, River Braan catchment. Groundwater source is likely to be from hillside to north. No site infrastructure located in this area. Previous local studies and local authority information suggests the potential of a secondary source from the River Braan.	Yes; secondary water surface source
Corbenic 12	Spring	A	NN 9607 4029	9	2.1 km south-east Details as for Aldville supply	Yes; secondary surface source
Drumour Schoolhouse 13	Spring	B	NN 9635 4035	1	2.3 km south –east Details as for Aldville supply	Yes; secondary surface source
Drumour Farmhouse 14	Spring	B	NN 9625 4015	1	2.4 km south-east Details as for Aldville supply	Yes; secondary surface source
Trochry Borehole 15	Borehole	B	NN 9775 4005	1	3.6 km south-east Borehole adjacent to River Braan, downstream of site. Location in close proximity of River Braan with potential interaction between river and groundwater. Previous local studies and local authority information suggests the potential of a secondary source from the River Braan.	Yes; secondary surface source
Trochry 16	Borehole	A	NN 9785 3995	17	3.8 km south-east Details as for Trochry Borehole supply	Yes; secondary surface source

Erosion and Sedimentation

8.126 Soil erosion and sediment generation may occur in areas where the ground has been disturbed, such as during forestry clearance and log transit, where engineering activities occur close to watercourses, such as at watercourse crossings and where surface water flows have been concentrated. Given the high velocities of surface water passing through the drainage network and increasing the potential for bank erosion, drainage ditches are particularly prone to this problem.

8.127 Sediment transport in watercourses can result in high turbidity levels which affect the ecology, particularly fish stocks, by reducing the light and oxygen levels in the water. Sediment deposition can further effect watercourses by potentially smothering plant life, invertebrates and spawning grounds and can reduce the flood storage capacity of channels and block culverts, resulting in an increased flood risk.

8.128 Requirements for soil excavation, transport and storage may lead to additional sedimentation issues at locations where new track, crane hardstandings or foundation construction activities are necessary. Borrow pits have the potential to release sediment-laden runoff if measures are not taken to minimise surface water input into such areas and to adequately treat flows from the borrow pit.

8.129 As for the Pollution Incident effects on the River Tay SAC, the site good practice measures and the dilution factor involved would be expected to reduce any potential sedimentation effect.

8.130 Downstream private water supplies, that abstract directly from surface water, could be adversely influenced by higher sediment loading during the construction phase, requiring additional treatment or alternative source during such occasions.

8.131 The magnitude of an erosion effect on soil is considered to be **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

8.132 With the implementation of the mitigation measures, the magnitude of sedimentation effect on surface water is considered to be **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

8.133 The magnitude of sedimentation effect specifically on the River Tay SAC is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.134 With the implementation of the mitigation measures, the magnitude of sedimentation effect on private water supplies is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

Modification of Surface Water Drainage Patterns

8.135 The local watercourses on the site have been identified as having a flashy response to rainfall events, as demonstrated by rapid response times and high peak flows. In addition, very low flows may be recorded in site watercourses during dry periods, such as in summer months. It is recognised that changes in river siltation, land drainage, water quality, the presence of river obstructions and river flow reductions can have a detrimental effect on the populations of fish, freshwater invertebrates and species dependent on the water environment.

8.136 Forestry clearance and log transit activities can lead to flow impediments in watercourse channels. Turbine bases and other constructed impermeable surfaces will restrict the infiltration of rainfall into the soil and underlying superficial deposits, resulting in localised increased volumes of surface runoff. The area of impermeable surface created will be very small in comparison with the Tombane Burn or Ballinloan Burn catchment areas, as only the turbine, substation and compound bases will be designed as impermeable, with the unbound tracks likely to act as semi-permeable features with limited infiltration potential.

8.137 The interception of diffuse overland flow by new tracks and their drains may disrupt the natural drainage regime of the site by concentrating flows and influencing drainage in soils. This effect will be incremental during the construction phase and the main effect may only become apparent during the operational phase of the wind farm.

8.138 Surface flows can be impeded by construction activity in or adjacent to stream channels, poor choice of crossing locations and inadequately designed crossing structures. Blockages can be caused by inadequate control of earthmoving plant, sedimentation and poor waste management, all of which could lead to flooding upstream. Downstream of the site, there are a number of flood-sensitive locations, such as at the confluence of both the Tombane Burn and the Ballinloan Burn with the River Braan, plus at Inver where the River Braan meets the River Tay.

8.139 The magnitude of effect on surface water drainage patterns is considered **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

Modification of Groundwater Levels and Flows, including Groundwater Dependent Terrestrial Ecosystems

8.140 Deep excavations, such as those required for the turbine foundations, can disrupt shallow groundwater systems. Groundwater controls, such as physical cut-offs or dewatering, will be utilised to prevent the excavations filling with water. This is likely to result in the lowering of groundwater levels in the immediate vicinity of the excavations and alterations to flow paths during dewatering activities.

8.141 Access tracks may interrupt shallow groundwater flow. There may be some infiltration of water through the access tracks, but the majority of the water will enter the surface water drainage system and will be discharged downslope of the access track at discrete points.

8.142 Cable trenches, particularly if backfilled with more permeable material than surrounding soil, can create preferential pathways for groundwater flow, resulting in local lowering of groundwater level.

8.143 GWDTE may be adversely affected by local changes in the groundwater regime, potentially resulting in altered vegetation in corridors close to infrastructure. Soil water conditions at Creag a' Bhàird are likely to be primarily influenced by surface water and direct rainfall, with groundwater having minimal influence, with this influence decreasing at higher altitude. The underlying geology at the site is generally considered as impermeable with potential groundwater present in near surface weathered zones and fractures, as per the hydrogeological baseline information, which corroborates this judgement.

8.144 As stated in the baseline section, approximately 3% of the site is situated on areas identified as GWDTE which have the potential to be highly dependent on groundwater sources. There are 8 relatively small distinct areas, within 100m of track and construction compound and/or within 250m of foundations (including turbines, control building and borrow pit), these are primarily rush-pasture and mire areas (NVC M23, M6). There are no potentially high dependency groundwater dependent terrestrial ecosystems (GWDTE) adjacent to the2 proposed borrow pit search sites, although potential moderate dependency areas are nearby to both. Specific details of these GWDTE areas are provided in **Table 8.12** for these 8 areas, some of which comprise several NVC survey regions. The GWDTE areas are illustrated on **Figure 8.8**. A number of the areas described follow rides in forestry.

8.145 The effects of dewatering are likely to be local and temporary with groundwater expected to return to former levels quickly following cessation of such construction activities. It is possible that there will be local lowering of the water table close to track corridors. The result of lowering of the water table may be a localised corridor of altered vegetation and ecology. Turbine foundations and borrow pit excavations will permanently alter groundwater flows at the coincident locations, however it would be expected that natural conditions of groundwater level and flow will recur close to these locations.

8.146 The key concerns for good groundwater management involve careful decisions involving locations of drainage and dewatering activity and ensuring such activities are undertaken sympathetically and minimised in terms of extent and time to avoid excessive influence on groundwater levels and flows. Good groundwater practice measures will also minimise any effect upon groundwater dependent terrestrial ecosystems. The application of standard good practice groundwater measures will reduce any adverse effect upon both the potentially high and moderate dependency GWDTE at the site.

8.147 The magnitude of effect on groundwater levels, flows and upon GWDTE is considered **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

Compaction of Soils

8.148 Compaction may damage the vegetation and result in a reduction in soil permeability and rainfall infiltration, particularly on peat, thereby increasing the potential for longer-term erosion from surface water runoff. Stockpiled and exposed areas of soils could be at risk of desiccation and erosion.

8.149 The combination of very shallow soils and the majority of vehicle movements being restricted to existing or new site tracks or hardstanding areas will result in any notable effect being very localised and temporary in nature, restricted to the earliest phases of construction. Site monitoring will identify any areas where effects are noted and enable a fast response to minimise effect.

8.150 The magnitude of effect of compaction of soil is considered **minor** and of **low** probability to occur, giving an overall significance of **negligible**.

Table 8.12: Groundwater Dependent Area Screening (Potential High Dependency)

GWDTE Area	NGR (Centre)	Area (km^2)	NVC Class	Location Relative to Infrastructure	Comment
1	NN 9093 4196	0.036	M23	Site entry from the A826 and access track into the site	The site entry and access track passes through Area 1, with this area parallel to the Cochill Burn on the north western site boundary. No peat records are held. Slope angles are gentle in this area and range between 0^{o} - 10^{o}. Soil water in this area is likely to come from a combination of surface water, direct rainfall and groundwater sources. M23 Rush-Pasture communities occur over a variety of moist, moderately acid to neutral, peaty and mineral soils in the cool and rainy lowlands of western Britain. It is a community of gently-sloping ground around the margins of soligenous flushes, as a zone around topogenous mires and wet heaths, and especially widespread in ill-drained, comparatively unimproved or reverted pasture[xxxiii]. M23 is considered widespread in Scotland. Existing track is already present in this area and so minimal influence on groundwater is expected for this region.

GWDTE Area	NGR (Centre)	Area (km^2)	NVC Class	Location Relative to Infrastructure	Comment
2	NN 9147 4144	0.003	MG10 M23	On existing access track south east of the site entry	Area 2 comprises two small regions, one of which is outside the site boundary, in the north west of the site. No peat depth records are held. Slope angles are gentle and range between 6° - 9°. Soil water in this area is likely to primarily come from surface water source and also direct rainfall. See M23 comment against GWDTE Area 1. MG10 is also present which is considered potentially moderately dependent on groundwater. This damp grassland is found on gentle to sloping ground, widespread in lowland Britain. Existing track is already present in this area and so minimal influence on groundwater is expected for this region.
3	NN 9183 4144	0.002	M23	Immediately adjacent to track spur to T1 125m SW of T1	Area 3 is on the north-western region of the site. Measured peat depths in this area are typically 0.3m. Slope angles are gentle and range from 5° – 7°. Soil water in this area is likely to primarily come from surface water source and also direct rainfall. See M23 comment against GWDTE Area 1.
4	NN 9200 4179	0.001	M23	180m N of T1	Area 4 is on the north-western extent of the site. No peat depth records are held within this region. Slope angles are gentle and range from 5° – 10°. Soil water in this area is likely to primarily come from surface water source and also direct rainfall. See M23 comment against GWDTE Area 1.
5	NN 9177 4125	0.007	M6 M23	50m W of track 60m W of existing track	Area 5 comprises two small adjoining regions on the western site boundary. No peat records are held for this region. Slope angles are gentle and range from 0° – 4°. M6 *Sphagnum recurvum* mire is the major soligenous community of peats and peaty gleys irrigated by base poor waters in the sub-montane zone of northern and western Britain. It is commonly found in tracts of unenclosed pasture on upland fringes and is ubiquitous in the upland fringes of Britain[xxxiv]. This mire is generally not considered to be highly sensitive to changes in groundwater supply and is often dependent on a combination of surface water, rainwater and groundwater. This information is based on previous SEPA correspondence. The application of standard good practice measures would reduce any influence on groundwater levels and the associated M6 community. See M23 comment against GWDTE Area 1. Soil water in this area is likely to primarily come from surface water source and direct rainfall.
6	NN 9227 4124	0.002	M23 M23 M23a	140m NE of T2 (at nearest)	Area 6 comprises a corridor of three separate regions all identified as M23. Area 6 is situated in the west of the site adjacent to the site boundary at the base of a steep craggy slope, with slope angles ranging from 1° – 19°. The corridor includes two watercourse channels that are shown on OS 1:10,000 mapping, flowing east to Tombane Burn. Peat depths in this area range from 0.2m – 0.6m. Soil water in this area is likely to primarily come from these surface water sources and direct rainfall. See M23 comment against GWDTE Area 1.

GWDTE Area	NGR (Centre)	Area (km^2)	NVC Class	Location Relative to Infrastructure	Comment
7	NN 9244 4067 to NN 9408 4099	0.073	M23 M10 M6 MG9 MG10	110m S of T3 70m SW of T4 70m SW of T9 90m W of T10 70m E of T5 80m S of T11	Area 7 is a linear area which extends adjacent to the channel of the Tombane Burn and associated tributaries. These watercourse channels are shown on OS 1:10,000. Peat depths range from 0.2m – 0.6m. Slope angles vary in this area between 0^{o} – 32^{o}, though generally decline gently towards Tombane Burn with occasional very steep slopes present. These corridors are predominantly classed as M23 and M6 communities with either or both present in every individual region. M10 is present and is also potentially highly groundwater dependent but is only found adjacent to the flood plain of the Tombane Burn. M10 *Pinguicula vulgaris* mire community is typically a soligenous mire of mineral soils and shallow peats kept very wet by base rich, calcareous and oligotrophic waters. It is predominantly a community of north-west Britain, developed in the cool wet climate[xxxv]. MG9 and MG10 are considered potentially moderately dependent on groundwater. See M23 comment against GWDTE Area 1. See M6 comment against GWDTE Area 6. Wet conditions in this area are considered to be primarily dependent upon the adjacent surface watercourses.
8	NN 9441 4171 and NN 9428 4133	0.015	M6 MG10 M23 U6 M19	Three narrow areas fall within 100m of track 130m SE of T12 50m NE of T13 50m NE T8	Area 8 comprises three narrow regions positioned on the north-eastern extent of the site, along the forest edge. One narrow region extends east from the track to the site boundary with the other in line with the north-eastern site boundary. Peat depths range between 0.2m to 0.5m, with gentle slope angles between 0^{o} – 7^{o}. See M23 comment against GWDTE Area 1. See M6 comment against GWDTE Area 6. MG10, U6 and M19 are considered potentially moderately dependent GWDTE. Wet conditions in this area are considered to be primarily dependent upon direct rainfall.

Peat Stability

8.151 Peat slides are a natural occurrence that can occur without human interference, but issues such as removal of slope support or increased loading upon slopes can either increase the likelihood of an event occurring or can increase the scale of the failure.

8.152 The combination of peat and steep slopes on this site led to the instruction to undertake a Peat Stability Assessment as a Technical Appendix (**Appendix 8.2**), this involved a peat depth survey across the general site area, where access was possible through the forestry, followed by assessment of stability. No evidence of peat slides within the study area was identified during the desk study or site surveys, however, there are steep slopes and peat recorded on these provides potential for their occurrence.

8.153 The Peat Stability Assessment highlighted 7 areas of initial stability concern (4 high risk and 3 moderate risk), with further assessment undertaken involving additional peat depth probing, peat coring (providing decomposition and bulk density data), surface shear vane tests and photographs for those areas that were accessible. This information was gathered and interpreted to enhance understanding of ground characteristics, to identify appropriate mitigation and to re-evaluate peat stability. Following the Peat Stability Assessment (**Appendix 8.2**) and adherence to the suggested good practice measures therein, the risk at all 7 areas of concern was reduced to low.

8.154 Peat slides affect soil (and associated habitats) and potentially downstream water systems where soil inundation can lead to sedimentation reducing water quality and modification in drainage patterns. The various receptors of a peat stability failure have been separated for this evaluation.

8.155 Downstream private water supplies, that abstract directly from surface water, could be adversely influenced by higher sediment loading following peat instability during the construction phase, requiring additional treatment or alternative source during such occasions.

8.156 The magnitude of effect of a peat stability failure on soil loss is considered **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

8.157 The magnitude of effect of a peat stability failure on surface water sedimentation is considered **moderate** and of l**ow** probability to occur, giving an overall significance of **minor**.

8.158 The magnitude of peat stability failure on sedimentation specific to the River Tay SAC is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.159 The magnitude of effect of peat stability failure on sedimentation of private water supplies is considered to be **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.160 The magnitude of effect of a peat stability failure on surface water drainage patterns is considered to be **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

Proposed Mitigation

8.161 The good practice measures, integral to the design, that are discussed in **Chapter 4: Scheme Description,** establish good environmental management procedures at the various phases of the proposed development. However, additional mitigation measures have been identified in order to monitor and further protect private water supply assets downstream of the site.

Pollution Incidents

8.162 The receptors of concern are downstream private water supplies that abstract directly from surface water. To ensure that supply sources are not degraded, a number of mitigation measures should be employed, in addition to the standard good practice measures discussed previously. These will include:

- Risk assessments for private water supplies listed in **Table 8.11** to establish likely surface water pathways from site to supply source and confirm any secondary surface water abstraction demand requirement. Risk Assessments shall follow the principles of the Scottish Government / Drinking Water Quality Regulator for Scotland guidance[xxix].
- Private water supplies with confirmed surface water interaction shall have surface water monitoring locations identified for establishing pre-construction conditions and ongoing conditions through the construction phase. Monitoring locations and parameters shall be determined in consultation with SEPA and other stakeholders, including private water supply owners.

- Mobile bowsers for provision of replacement potable water supply will be available for downstream surface water sourced private water supplies, throughout the construction period. These supplies would be considered as being on stand-by, but available for immediate use should site activities lead to downgraded water quality at surface water abstraction locations.

Residual Effects

Pollution Incidents

8.163 The magnitude of pollution effect on surface water is considered to remain **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

8.164 With the implementation of the mitigation measures, the magnitude of pollution effect on private water supplies is considered to be reduced to **moderate** and remain of **low** probability to occur, giving an overall significance of **minor**.

8.165 The magnitude of pollution effect on groundwater is considered to remain **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

8.166 The magnitude of pollution effect on soil is considered to remain **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

Erosion and Sedimentation

8.167 The magnitude of an erosion effect on soil is considered to be remain **minor and of medium** probability to occur, giving an overall significance of **minor**.

8.168 The magnitude of sedimentation effect on surface water is considered to remain **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

8.169 The magnitude of sedimentation effect on the River Tay SAC is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.170 The magnitude of sedimentation effect on private water supplies is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

Modifications of Surface Water Drainage Patterns

8.171 The magnitude of effect on surface water drainage patterns is considered to remain **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

Modification of Groundwater Levels and Flows

8.172 The magnitude of effect on surface water drainage patterns is considered to remain **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

Compaction of Soils

8.173 The magnitude of effect of compaction of soil is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **negligible**.

Peat Stability

8.174 The magnitude of effect of a peat stability failure on soil loss is considered to remain **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

8.175 The magnitude of effect of a peat stability failure on surface water sedimentation is considered to remain **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

8.176 The magnitude of effect of a peat stability failure on sedimentation of the River Tay SAC is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.177 The magnitude of effect of peat stability failure on private water supplies is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.178 With the implementation of the mitigation measures, the magnitude of effect of a peat stability failure on surface water drainage patterns is considered to remain **moderate** and of **low** probability to occur, giving an overall significance of **minor**.

Operational Effects

8.179 Operational activities would be expected to involve routine maintenance and testing. There may however be a very infrequent requirement for larger scale activity in certain circumstances, such as turbine replacement.

Predicted Effects

Pollution Incidents

8.180 The risk of pollution is substantially lower during operation than during construction because of the decreased levels of activity on the site. The majority of the potential pollutants will have been removed when construction is complete. The turbines and other necessary ancillary equipment which will be installed onsite will require routine maintenance plus there will be vehicular traffic operating, therefore the potential for spillage will remain.

8.181 The magnitude of pollution effect on surface water is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.182 The magnitude of pollution effect on private water supplies is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.183 The magnitude of pollution effect on groundwater is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.184 The magnitude of pollution effect on soil is considered **minor** and of **low** probability to occur, giving an overall significance of **negligible**.

Modification of Surface Water Drainage Patterns

8.185 As the man-made impermeable areas are small in comparison with the catchment area no appreciable increase in runoff volumes is expected, even at Backside Burn catchment level.

8.186 The interception of diffuse overland flow by the tracks and their drains may disrupt the natural drainage regime of the site, with extensive flush zones noted on the site, concentrating flows. New track has been limited to the minimum required length but there remains the potential for drainage alteration.

8.187 Surface flows would be most likely to be impeded during operation due to lack of maintenance of stream crossing structures (e.g. blockages caused by aggregation of small particulates or individual large items) although sedimentation may also be possible as a result of alteration to the hydrological regime.

8.188 Following the good practice measures outlined in **Chapter 4: Scheme Description** will reduce the magnitude of the potential effect, via well designed crossing structures, use of existing culverts to support new bridges and sustainable drainage design features, including soakaways and french drains, which will encourage infiltration into soil and increasing the lag time in peak flows following rainfall events. These features will reduce onsite flooding and increases of peak surface water flows from the site which could exacerbate existing flood risk issues on the downstream River Braan.

8.189 The magnitude of effect on surface water drainage patterns is considered **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

Modification of Groundwater Levels, Flows and GWDTE

8.190 Groundwater levels may be influenced by the drainage features installed at the construction phase, they may also be influenced by local alterations in groundwater regime such as where foundations or track construction leads to changes in level or flow. Such issues are more likely to become apparent in the operation phase than during construction, where corridors of altered vegetation may occur adjacent to tracks and other locations where the natural regime has changed.

8.191 The magnitude of effect on groundwater levels, flows and GWDTE is considered **minor** and of **low** probability to occur, giving an overall significance of **minor**.

Proposed Mitigation

8.192 No mitigation measures, beyond the good practice measures outlined in **Chapter 4: Scheme Description**, including site environmental monitoring, are proposed during the operational phase of the project.

Residual Effects

Pollution Incidents

8.193 The magnitude of pollution effect on surface water is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.194 The magnitude of pollution effect on private water supplies is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.195 The magnitude of pollution effect on groundwater is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

8.196 The magnitude of pollution effect on soil is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **negligible**.

Modification of Surface Water Drainage Patterns

8.197 The magnitude of effect on surface water drainage patterns is considered to remain **minor** and of **medium** probability to occur, giving an overall significance of **minor**.

Modification of Groundwater Levels and Flows

8.198 The magnitude of effect on groundwater levels and flows is considered to remain **minor** and of **low** probability to occur, giving an overall significance of **minor**.

Cumulative Effects Assessment

8.199 Cumulative effects have been considered using a catchment-based approach, as discussed in the hydrology description. Geology and soil cumulative effects are considered to be limited to the site area, however surface water and groundwater pathways have the potential to cause wider cumulative effect.

8.200 Specific to wind farm developments, there are a number of developments in this area, those of most interest are those within the same catchment as the site, i.e. the River Braan. With reference to SEPA's catchment mapping and SNH's windfarm map dated August 2013[xxxvi], Griffin Wind Farm is already operational, with Calliachar also operational and North Calliachar at the application stage. The more distant Crossburns proposal, to the west, is at the scoping stage but is considered more likely to be within the Urlar Burn catchment which flows north east to meet the River Tay, not via the River Braan.

Predicted Cumulative Effects

8.201 Due to the specific locations of each of these projects, runoff from the watercourses draining the Creag a' Bhàird site will not pass through the other sites, however all of these contribute to overall water quality and flow within the River Braan catchment. There is the potential for flow levels, sediment or other contaminant levels to be heightened downstream due to site activities at all these sites, particularly if there were coincident construction phases.

8.202 The issues of most concern would be pollution of surface water and groundwater, sedimentation of surface water, plus modifications to surface water drainage during the construction phase. During the operational phase, ongoing modification to surface water flows would be the main concern, such as increased flows or flooding concerns due inadequately designed drainage and/or watercourse crossing structures.

8.203 Given the design philosophy inherent in this development, with application of the good practice and mitigation measures recommended, including all structures close to watercourses designed for 1:200 year flood events, pollution prevention procedures (including sediment management), sustainable drainage principles throughout and environmental monitoring, it is judged that this development will not cause an adverse cumulative influence on existing developments or those that may be planned downstream within the same hydrological catchments.

8.204 With the site location in the headwaters of the Tombane Burn catchment, it is unlikely there will be other developments upstream that may contribute to the site effect.

8.205 The differing construction programming that would be anticipated to occur across other developments mean it is considered unlikely that water quality and flow issues would be coincident across a number of intra-catchment sites in a manner that would lead to an adverse cumulative effect downstream.

8.206 Potential cumulative effects are summarised on **Table 8.15**, these were separately assessed and are all considered to have an overall significance of **minor**.

Proposed Mitigation

8.207 No mitigation measures, beyond the good practice measures outlined in **Chapter 4: Scheme Description**, are proposed for cumulative effects. It would be anticipated that other sites would similarly follow similar good practice methodology.

Residual Cumulative Effects

8.208 These effects will remain as per the above section, as mitigation is not proposed.

Further Survey Requirements and Monitoring

8.209 Surface water quality will be monitored prior to and during construction, primarily reviewing pH and turbidity to establish pre-construction natural seasonal levels.

8.210 Given private water supply abstractions from the River Braan, downstream of the site, water quality on site streams and at downstream abstraction points will be monitored pre-construction and throughout the construction period.

8.211 Slope stability monitoring will occur during pre-construction and construction phases of work. These would focus on locations highlighted as being of concern, as per the Peat Stability Assessment, **Appendix 8.2**. Further peat probing and stability assessments shall be undertaken post-forestry clearance, to confirm indicative peat depths and stability assessment on the felled area, any additional areas of stability concern identified shall be added to the Geotechnical Risk Register.

8.212 All monitoring activities will be discussed with SEPA and other stakeholders to ensure frequency, determinants and monitoring locations are appropriate.

Summary of Effects

8.213 The effects detailed in the tables below (**Tables 8.13, 8.14 and 8.15**) have been determined with reference to the criteria identified in **Tables 8.2**, **8.3** and **8.4** and the mitigation measures. Following the implementation of good practice measures and specific mitigation measures outlined, no significant effects are predicted.

Table 8.13: Summary of Effects (Construction)

Predicted Effect	Pre-Mitigation Significance of Effect	Mitigation	Significance of Residual Effect
Pollution of surface waters	High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not significant**

Predicted Effect	Pre-Mitigation Significance of Effect	Mitigation	Significance of Residual Effect
Pollution of River Tay SAC	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Pollution of private water supplies	High sensitivity Major magnitude Low probability Resulting in moderate effect **Significant**	Surface water monitoring downstream of site and at abstraction locations Availability of mobile potable water bowsers for downstream private water supplies abstracting from surface waters Reducing magnitude to moderate, reflecting alternative supply availability	High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not significant**
Pollution of groundwater	High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not significant**
Pollution of soil	Medium sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**		Medium sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**
Erosion or loss of soil	Medium sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**		Medium sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**

Predicted Effect	Pre-Mitigation Significance of Effect	Mitigation	Significance of Residual Effect
Sedimentation of surface waters	High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**		High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**
Sedimentation of River Tay SAC	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**
Sedimentation of private water supplies	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**	Surface water monitoring downstream of site and at abstraction locations Availability of mobile potable water bowsers for downstream private water supplies abstracting from surface waters	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**
Modifications to surface water drainage patterns	High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**		High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**
Modification to groundwater levels, flows and GWDTE	High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**		High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not Significant**

Predicted Effect	Pre-Mitigation Significance of Effect	Mitigation	Significance of Residual Effect
Compaction of soil	Medium sensitivity Minor magnitude Low probability Resulting in negligible effect **Not Significant**		Medium sensitivity Minor magnitude Low probability Resulting in negligible effect **Not Significant**
Peat stability failure; soil loss	Medium sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**		Medium sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**
Peat stability failure; sedimentation of surface waters	High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**		High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**
Peat stability failure; Sedimentation of River Tay SAC	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**
Peat stability failure; sedimentation of private water supplies	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**	Surface water monitoring downstream of site and at abstraction locations Availability of mobile potable water bowsers for downstream private water supplies abstracting from surface waters	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Peat stability failure; modification to surface water drainage	High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**		High sensitivity Moderate magnitude Low probability Resulting in minor effect **Not Significant**

Table 8.14: Summary of Effects (Operational)

Predicted Effect	Pre-Mitigation Significance of Effect	Mitigation	Significance of Residual Effect
Pollution of surface waters	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Pollution of private water supplies	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Pollution of groundwater	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Pollution of soil	Medium sensitivity Minor magnitude Low probability Resulting in negligible effect **Not significant**		Medium sensitivity Minor magnitude Low probability Resulting in negligible effect **Not significant**

Predicted Effect	Pre-Mitigation Significance of Effect	Mitigation	Significance of Residual Effect
Modifications to surface water drainage patterns	High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Medium probability Resulting in minor effect **Not significant**
Modification to groundwater levels or flows	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**

Table 8.15: Summary of Effects (Cumulative)

Predicted Effect	Pre-Mitigation Significance of Effect	Mitigation	Significance of Residual Effect
Construction Phase Pollution of surface waters	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Construction Phase Pollution of groundwater	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Construction Phase Sedimentation of surface waters	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not Significant**
Construction Phase Modifications to surface water drainage patterns	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**
Operational Phase Modifications to surface water drainage patterns	High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**		High sensitivity Minor magnitude Low probability Resulting in minor effect **Not significant**

[i] Scottish Executive (2006). Peat landslide hazard and risk assessments: Best practice guide for proposed electricity generation developments. Halcrow Group for the Scottish Executive.
[ii] SNH and FCE (2010). Floating Roads on Peat.http://www.roadex.org/index.php/services/partner-knowledge-bank/scotland/floating-roads-on-peat-report (accessed October 2013), Scottish Natural Heritage and Forestry Civil Engineering.
[iii] Scottish Natural Heritage (2009). A handbook on environmental impact assessment. Scottish Natural Heritage, Battleby, Perthshire.
[iv] Met Office (2013). Eastern Scotland Climatic Region. Retrieved 18 June 2013 from: http://www.metoffice.gov.uk/climate/uk/es/
[v] CEH (2009). Flood estimation handbook, CD-ROM version 3. Centre for Ecology & Hydrology, Wallingford.
[vi] Met Office (2013). Met Office Historic Rainfall Data – Braemar. Retrieved 18 June 2013 from: http://www.metoffice.gov.uk/climate/uk/stationdata/braemardata.txt
[vii] Weather Underground (2013). Wunderground Rainfall Data – Loch Tay. Retrieved 18 June 2013 from:http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=IPERTHSH9
[viii] Weather Underground (2013). Rainfall Data – Glen Turret. Retrieved 18 June 2013 from:http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=ICRIEFF1
[ix] Scottish climate change impacts partnership (2013). Scottish climate change information: UKCP09 Compendium. Retrieved 7 October 2013 from: http://www.adaptationscotland.org.uk/4/70/0/Scottish-Compendium-of-UKCP09-Climate-Change-Information.aspx
[x] BGS (2012). BGS Geoindex Interactive Map. Retrieved March 15 2013 from: http://mapapps2.bgs.ac.uk/geoindex/home.html
[xi] Bluck,B.J.(2002). The Midland Valley Terrain pp. 149-155.In N.H. Trewin, (2002).The geology of Scotland. The Geological Society: London.
[xii] MLURI (1981). Soils Mapping Sheet 5: Eastern Scotland. Soil Survey of Scotland. Macaulay Land Use Research Institute, Aberdeen.
[xiii] MLURI (1982). Handbook to Soils Mapping Sheet 5: Eastern Scotland. Soil Survey of Scotland. Macaulay Land Use Research Institute, Aberdeen.
[xiv] MLURI (2013). Exploring Scotland's Soils. Macaulay Land Use Research Institute, Aberdeen. Website accessed 01 November 2013: http://www.macaulay.ac.uk/explorescotland/soils1.html
[xv] Scottish Executive (2006). Peat landslide hazard and risk assessments: Best practice guide for proposed electricity generation developments.Halcrow Group for the Scottish Executive.
[xvi] BGS(2013). UK online hydrogeology viewer. Available at: http://mapapps.bgs.ac.uk/hydrogeologymap/hydromap.html
[xvii] SNIFFER (2004). *Vulnerability of Groundwater in the Uppermost Aquifer*. Scotland and Northern Ireland Forum For Environmental Research, Edinburgh.
[xviii] SEPA (2012). RBMP interactive Map. Available from: http://gis.sepa.org.uk/rbmp/
[xix] SEPA (2010). Planning Guidance on Windfarm developments, Land use planning system, SEPA Guidance Note 4, Scottish Environment Protection Agency.
[xx] Centre for Ecology and Hydrology (2009). Flood estimation handbook, CD-ROM version 3. Centre for Ecology & Hydrology, Wallingford.
[xxi] Halcrow/HR Wallingford (2004). ISIS hydrological software package.
[xxii] Wallingford HydroSolutions (2007). LowFlows 2000 software package.
[xxiii] Institute of Hydrology (1995). Hydrology of soil types: a hydrologically based classification of the soils of the United Kingdom. Institute of Hydrology Report No. 126.
[xxiv] University of Newcastle (2008). Hydrosystems & Hydroinformatics.School of Civil Engineering & Geosciences, University of Newcastle.
[xxv] NSRI (2008). Soils site report: Full soil report (sample). National Soil Resources Institute, Cranfield University; http://www.landis.org.uk/services/downloads/Full_5km.pdf.
[xxvi] Centre for Ecology and Hydrology (2009). Flood estimation handbook, CD-ROM version 3. Centre for Ecology & Hydrology, Wallingford.
[xxvii] SEPA (2013). Indicative River & Coastal Flood Map. Retrieved 18 June 2013 from: http://go.mappoint.net/sepa/
[xxviii] SEPA (2012). RBMP interactive Map. Available from: http://gis.sepa.org.uk/rbmp/

[xxix] DWQR (2013). Drinking Water Quality Regulator for Scotland. Private Supply. Retrieved 01 November 2013 http://www.dwqr.org.uk/private-supply/what-does-private-supply-mean-for-me

[xxx] SEPA (2013). Freshwater Fisheries. Scottish Environment Protection Agency, Retrieved 18 June 2013. http://www.sepa.org.uk/science_and_research/data_and_reports/water/salmonid_waters.aspx

[xxxi] SEPA (2010). Planning Guidance on Windfarm developments, Land use planning system, SEPA Guidance Note 4, Scottish Environment Protection Agency.

[xxxii] UKTAG (2004). Guidance on the identification of groundwater dependent terrestrial ecosystems.UK Technical Advisory Group on the Water Framework Directive, Task 5a+b.

[xxxiii] JNCC. (2001). National Vegetation Classification: field guide to mires and heaths. Joint Nature Conservtion Committee. Retrieved 29 October 2013 from: http://jncc.defra.gov.uk/page-4267

[xxxiv] JNCC. (2001). National Vegetation Classification: field guide to mires and heaths. Joint Nature Conservtion Committee. Retrieved 29 October 2013 from: http://jncc.defra.gov.uk/page-4267

[xxxv] JNCC. (2001). National Vegetation Classification: field guide to mires and heaths. Joint Nature Conservtion Committee. Retrieved 29 October 2013 from: http://jncc.defra.gov.uk/page-4267

[xxxvi] SNH (2013). Windfarm Footprint Map (August 2013 Map). Scottish Natural Heritage. Retrieved 23 October 2013. http://www.snh.gov.uk/planning-and-development/renewable-energy/research-data-and-trends/trendsandstats/windfarm-footprint-maps/

9 Ecology

Introduction

9.1 This chapter considers the potential effects of the proposed Creag a' Bhàird Wind Farm on those ecological receptors present on and around the site. It details the methods used to establish the ecological receptors within the site and its surroundings, together with the process used to determine the value of the ecological receptors present. The ways in which ecological receptors might be affected (directly or indirectly) by the construction and operation of Creag a' Bhàird Wind Farm are explained. In addition, any cumulative effects of Creag a' Bhàird Wind Farm are considered, taking together effects of other wind farms in the area whether operational, consented or at application, along with the significance of any predicted effects of Creag a' Bhàird Wind Farm. This ecology assessment was undertaken by MacArthur Green.

9.2 Effects on birds are addressed separately in **Chapter 10: Ornithology** of this ES.

9.3 The effects on hydrology are addressed separately within **Chapter 8: Geology, Hydrology and Hydrogeology.** Chapter 8 also considers the hydrological impacts on Ground Water Dependent Terrestrial Ecosystems (GWDTEs) identified in the ecology assessment 'Good Practice Measures' to avoid pollution of water courses on and adjacent to the site are detailed in **Chapter 4: Scheme Description**. The Good Practice Measures will help to ensure that any impact on the River Tay SAC is avoided**.**

9.4 Creag a' Bhàird Wind Farm is described in full within **Chapter 4: Scheme Description** and illustrated within **Figures 4.1 to 4.7**.

9.5 This chapter is supported by the following Appendices provided in Volume 2 of this ES:

- 9.1 Phase 1 habitat survey report;
- 9.2 NVC survey report;
- 9.3 Protected Species survey report;
- 9.4 Bat survey report;
- 9.5 Fisheries survey report;
- 9.6 Species Protection Plan; and
- 9.7 Habitats Regulations Appraisal.

Study Area Description

9.6 For the purposes of this summary and the subsequent baseline descriptions, the site is defined as the area within which all wind farm infrastructure shall be contained and includes the proposed access track route (see **Chapter 4**, **Figure 4.1**).

9.7 The field surveys extended across a larger area than defined by the site; for the purposes of this report, the area covered by these surveys is referred to as 'the study area' and is detailed separately within the field survey methodologies section (and within the individual **Appendices**).

9.8 Creag a' Bhàird Wind Farm falls within the Loch Lomond, the Trossachs and Breadalbane NHZ (NHZ 15). The site is covered by an extensive area of coniferous sitka spruce dominated forestry that also covers the majority of the study area. The remaining habitat within the forestry is dominated by a mixture of dry heath and marshy grassland with occasional patches of acid fen and mire habitat. Areas of acid and neutral flushes, along with small areas of acid grassland and isolated patches of continuous bracken comprise the remaining habitat types recorded. The River Tay SAC is located approximately 5km from the edge of the study area.

Effects Assessed in Full

9.9 The assessment concentrates on the effects of construction, operation and decommissioning of Creag a' Bhàird Wind Farm upon those ecological receptors identified during survey work and as advised by SNH and Perth and Kinross Council in their scoping response. In general, effects upon the following are assessed:

- Designated areas – effects here include direct (i.e. derived from land-take) and indirect (i.e. changes caused by effects to supporting systems such as groundwater);
- Terrestrial habitats – effects here include direct (i.e. derived from land-take) and indirect (i.e. changes caused by effects to supporting systems such as groundwater or overland flow);
- Aquatic habitats – effects here are limited to the ecological impacts of changes in water conditions through potential pollution effects. Hydrological effects are considered in **Chapter 8: Geology, Hydrology and Hydrogeology**; and
- Protected species – effects considered include direct (i.e. loss of life as a result of Creag a' Bhàird Wind Farm; loss of key habitat; displacement from key habitat; barrier effects preventing movement to/from key habitats; and general disturbance) and indirect (i.e. loss/changes of/to food resources; population fragmentation; degradation of key habitat e.g. as a result of pollution).

Effects Scoped Out

9.10 All effects on otter, wildcat, water vole and badger are scoped out of the assessment. Only otter was confirmed as present in the study area but some areas of habitat were considered suitable for wildcat, water vole and badgers. A Species Protection Plan is proposed in **Appendix 9.6** which will ensure that all reasonably practicable measures are taken to ensure that provisions of the relevant wildlife legislation are complied with in relation to these protected species.

9.11 Effects associated with disturbance to pine marten dens or red squirrel dreys during construction are scoped out of the assessment. Pine marten were recorded as present in the study area but no signs of red squirrel were found although they may be present at low densities. A Species Protection Plan is proposed in **Appendix 9.6** which will ensure that all reasonably practicable measures are taken to ensure that provisions of the relevant wildlife legislation are complied with in relation to these protected species.

9.12 Effects on wider-countryside fisheries interests, standing water and running water (not related to the River Tay SAC) are scoped out of this assessment. Pollution prevention measures will be implemented during construction, operation and decommissioning of Creag a' Bhàird Wind Farm to ensure no adverse impacts occur (see **paragraph 9.40**). The Good Practice Measures are detailed in **Chapter 4: Scheme Description.**

9.13 Effects on roosting bats are scoped out of the assessment. No bat roosts were recorded. (**Appendix 9.4**).

9.14 The following habitats are identified as Valued Ecological Receptors of local or regional importance in the study area, however they occupy such small areas within the site and the loss of habitat is so minor that effects on them are scoped out of the assessment: marshy grassland; blanket bog; wet modified bog; fen and wet dwarf shrub heath. The extent of these habitats in the study area and affected by construction are detailed in Tables 9.6 and 9.9.

Assessment Methodology

Assessment Structure

9.15 The assessment method follows the process set out in the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ("the EIA Regulations") and guidance on the implementation of the EU Birds and Habitats Directives[i].

9.16 The method for assessing the likely significance of effects upon on the integrity of a Special Area of Conservation (SAC) is different from that employed for wider countryside interests. This method is detailed separately within the Habitats Regulations Appraisal detailed in **Appendix 9.7**.

9.17 The information provided by these assessment methods will provide sufficient information to allow the competent authority to undertake an appropriate assessment should this be required. This would involve establishing whether the proposal (either alone or in combination with other plans or projects) would have a significant effect on the integrity of the River Tay SAC.

9.18 The evaluation for wider countryside interests involves the following process:

- identification of the potential effects of Creag a' Bhàird Wind Farm, including both beneficial and adverse;
- consideration of the likelihood of occurrence of potential effects where appropriate;
- defining the nature conservation value of the ecological receptors present;
- establishing the receptor's conservation status where appropriate;
- establishing the magnitude of the likely effect (both spatial and temporal);
- based on the above information, a professional judgement as to whether or not the identified effect is significant in the context of the EIA Regulations;
- if a potential effect is determined to be significant, measures to avoid, reduce, mitigate or compensate for the effect are suggested where required;
- opportunities for enhancement are considered; and
- residual effects after mitigation, compensation or enhancement are considered.

Legislation and Guidance

9.19 The following legislation and guidance are considered as part of the assessment:

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna ("Habitats Directive");
- Council Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy ("Water Framework Directive");
- Environmental Impact Assessment Directive 85/337/EEC (as amended);
- European Commission (27 October 2010) Natura 2000 Guidance Document 'Wind Energy Developments and Natura 2000'. European Commission, Brussels;
- Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations (2011);
- The Water Environment and Water Services (Scotland) Act 2003 (WEWS);
- The Wildlife and Countryside Act 1981 (as amended);
- Nature Conservation (Scotland) Act 2004 (as amended);
- The Wildlife and Natural Environment (Scotland) Act 2011;
- The Protection of Badgers Act 1992;
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (the Habitats Regulations);
- SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ('The Habitats and Birds Directives'). Revised Guidance Updating Scottish Office Circular No 6/1995;
- Policy Advice Note PAN 1/2013 - Environmental Impact Assessment (Scottish Government 2013);
- Planning Circular 3 2011;
- Nature Conservancy Council (1989). Guidelines for selection of biological SSSIs;
- Tayside Biodiversity Action Plan (2009);
- IEEM (2006) Guidelines for ecological impact assessment in the UK;
- Hundt L (2012) Bat Surveys: Good Practice Guidelines, 2nd edition, Bat Conservation Trust;
- Natural England (2009) Natural England Technical Information Note TIN 051. Bats and Onshore Wind turbines – Interim Guidance;
- SEPA (2011): Guidance Note 4 - Planning Advice on Windfarm Developments;
- Scottish Natural Heritage (2013) Planning for Development: What to consider and include in Habitat Management Plans;
- Scottish Renewables, SNH, SEPA, FC (Scotland) (2010, Version 1) Good Practice During Windfarm Construction; and
- Scottish Government (September 2001) Calculating Potential Carbon Losses & Savings from Wind Farms on Scottish Peatlands. Windfarms and Carbon savings on peatlands. Technical Note – Version 2.0.1.

Field Survey

9.20 The following field surveys were undertaken in order to inform this assessment (extents noted; further information regarding methods and conditions on site are provided within the section below called 'Existing Conditions'):

- Extended Phase 1 habitat survey (across the full study area);
- National Vegetation Classification (NVC) survey (across the full study area);
- Badger survey (across the full study area and out-with the boundary dependent on prevailing habitat type);
- Bat activity and roost survey (across the full study area);
- Fisheries survey covering the Tombane burn and tributaries, Ballinloan Burn and the river Braan;
- Fresh water pearl mussel survey for a distance of 500m up and downstream of crossing points on site;
- Pine marten survey (across the full study area);
- Red squirrel survey (across the site relevant to the survey method);
- Wildcat survey (across the full study area);
- Otter survey (across the full study area); and
- Water vole survey (across the full study area).

9.21 For a more detailed description of survey methods, see Appendix 9.3.

Consultation

9.22 A desk study was undertaken and covered up to a distance of 5km from the site during summer 2012 and is referenced within the results section and Appendices as appropriate.

9.23 A consultation exercise was undertaken as part of the EIA process. **Table 9.1** details the responses that were obtained.

Table 9.1: Consultation Responses

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
SNH	Scoping opinion	SNH advise that there is connectivity between the proposal and the qualifying interests of the River Tay SAC. Before determining the application SNH advise that an appropriate assessment should be undertaken.	A Habitats Regulations Appraisal is provided within this chapter. The information provided here is sufficient to inform an appropriate assessment should SNH advise that this is required.

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
		The appropriate assessment should be informed by pollution prevention measures contained within a construction method statement clearly outlined in the ES.	Good Practice Pollution Prevention Measures are detailed **Chapter 4: Scheme Description.**
		Requested surveys for bats and otter (European Protected Species). If found, species protection plan to be presented in ES. The same applies for any other legally protected species found on site	Species Protection Plan for the site included within **Appendix 9.6.**
		Any secondary effects on vegetation should be considered, assessed and any mitigation proposals presented in the ES. Should include any changes to land management practise resulting from the presence of the wind farm	Secondary effects are considered within this ES including changes in management practices under forestry planting scheme.
		Where salmonids are present, and there is suitable habitat for freshwater pearl mussel, a freshwater pearl mussel survey is expected to be carried out following our guidance. It should be noted that the absence of records for a particular watercourse or impassable obstacles does not necessarily mean that species are not present, so species surveys should not be ruled out for this season	A fisheries survey has been completed (**Appendix 9.5**) and found no salmon on site (mostly brown trout). A habitat suitability survey was completed for FWPM and the habitat was largely considered unsuitable. Searches were made of the limited suitable habitat and none were found. No FWPM were recorded at Griffin Wind Farm either.
SEPA	Scoping opinion	Phase 1 survey should be carried out for the whole site and 'A Functional Wetland Typology for Scotland' guidance should be used to help identify all wetland areas. NVC should be completed for any wetlands identified. Results of the NVC survey and Appendix 2 of our Planning guidance on wind farm developments should be used to identify if wetlands are groundwater dependent terrestrial ecosystems	This has been completed and GWDTE identified. Full results are provided in **Appendix 9.2** and presented in **Figures 9.2d to 9.2f**.
Perth and Kinross Council – Biodiversity Officer	Scoping opinion	Provided records of species within 2km of the proposed site that are held in electronic form by the Council. List is not exhaustive and full surveys will still require to be submitted as part of the Planning Application Close proximity of the Griffin Wind Farm may mean there is a cumulative effect on species, as this is in effect a continuation of the Griffin Wind Farm in a southerly direction, so this should be considered in reports.	Cumulative effects are considered in section 9.138.

Determining Nature Conservation Value

9.24 Value is defined on the basis of the geographic scale given in **Table 9.2** (which follows standard guidance[ii]). Attributing a value to a receptor is generally straightforward in the case of designated sites, as the designations themselves are normally indicative of a value level. For example, an SAC is undoubtedly of European (International) importance. In the case of species, assigning value is less straightforward as detailed in IEEM (2006) '*it is necessary to consider its distribution and status, including a consideration of trends based on available historical records*'. This means that even though a species may be protected through legislation at a national or international level, the relative value of the population on site may be quite different (e.g. the site population may consist of a single transitory animal, which within the context of a thriving local/regional/national population of a species, is clearly of local or regional value.

9.25 Where possible, the valuation of habitat/populations within this assessment will make use of any relevant published evaluation criteria (e.g. Nature Conservancy Council guidance on selection of biological Site of Special Scientific Interest (SSSIs)). Furthermore, JNCC/NBN guidance (2008[iii]) has been consulted where relevant in order that cross-referencing of classifications within different systems can be standardised (e.g. correctly matching NVC types with Annex I habitats where relevant etc.).

9.26 The term used for the ecological receptors affected at the site is 'Valued Ecological Receptors' (VERs).

9.27 Where relevant, information regarding the particular receptor's conservation status shall also be considered in order to fully define its value. This will enable an appreciation of current population or habitat trends to be incorporated into the assessment.

Table 9.2 Approach to valuing ecological receptors (adapted from Hill *et al* 2005[iv])

Value	Description
International	An internationally designated site (e.g., SAC), or site meeting criteria for international designations.
	Species present in internationally important numbers (>1% of biogeographic populations).
National	A nationally designated site (SSSI, or a National Nature Reserve, NNR), or sites meeting the criteria for national designation.
	Species present in nationally important numbers (>1% UK population).
	Viable areas of priority habitat listed on Annex I of the Habitats Directive and smaller areas of such habitat that are essential to maintain the viability of that ecological resource.

Value	Description
Regional (Natural Heritage Zone or Local Authority Area)	Species present in regionally important numbers (>1% of Regional or Natural Heritage Zone (NHZ) population); and regionally important populations of a species.
	Regionally significant and viable areas of key habitat identified as being of regional value in the appropriate NHZ.
Local	Local Nature Reserves.
	Areas of semi-natural ancient woodland smaller than 0.25 ha.
	Areas of habitat or species considered to appreciably enrich the ecological resource within the local context, e.g., species-rich flushes or hedgerows.
Negligible	Usually widespread and common habitats and species. Receptors falling below local value are not normally considered in detail in the assessment process.

9.28 The following sections further define the methods used to evaluate the magnitude of likely effects and Nature Conservation Value.

Method Used to Evaluate the Magnitude of Likely Effects

9.29 Effect Magnitude refers to changes in the extent and integrity of an ecological receptor. The only definition of ecological 'integrity' within Scottish planning policy is found within circular 6/1995 updated by SERAD 2000[i] which states that, '*The integrity of a site is the coherence of its ecological structure and function, across its whole area, which enables it to sustain the habitat, complex of habitats and/or the levels of populations of the species for which it was classified'.* Although this definition is used specifically regarding SACs and SPAs, it is applied here to wider countryside habitats and species.

9.30 Determining the magnitude of any likely effects requires an understanding of how the ecological receptors are likely to respond as a result of Creag a' Bhàird Wind Farm. This change can occur during construction and/or, operation of the wind farm.

9.31 Effects can be adverse, neutral or beneficial.

9.32 Effects are judged in terms of Magnitude in space and time. There are five levels of spatial effects and temporal effects as detailed in **Tables 9.3** and **9.4**.

Table 9.3 Definition of Spatial Effect Magnitude upon the VERs

Spatial Magnitude	Definition
Very High	Would cause the loss of the majority of a receptor (>80%), or would be sufficient to damage a receptor sufficient to immediately affect its viability.
High	Would have a major effect on the receptor, sufficient to result in short-term losses and impacts upon its long-term viability. For example, more than 20% habitat loss or damage.
Moderate	Would affect the receptor in the short and medium-term, but should not alter its long-term viability. For example, between 10 - 20% habitat loss or damage.
Low	Would have a minor effect upon the receptor, either of sufficiently small-scale or of short duration to cause no long-term harm. For example, less than 10% habitat loss or damage.
Negligible	Minimal change on a very small scale; effects not dissimilar to those expected within a 'do nothing' scenario.

Table 9.4 Temporal Effect Magnitude

Temporal Magnitude	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as 26+ years), except where there is likely to be substantial improvement after this period in which case the category Long Term may be more appropriate.
Long term	Between 15 years up to (and including) 25 years.
Medium term	Between 5 years up to (but not including) 15 years.
Short term	Up to (but not including) 5 years.
Negligible	No effect.

Significance Criteria

9.33 The significance of potential effects is determined by integrating the assessments of Nature Conservation Value, Conservation Status and Magnitude in a reasoned way and through the application of professional judgement.

9.34 **Table 9.5** details the significance criteria that have been used in assessing the effects of Creag a' Bhàird Wind Farm:

Table 9.5 Significance Criteria

Significance Level	Definition
Major	This is a significant effect, as the effect is likely to result in a long term significant adverse effect on the integrity of the receptor.
Moderate	This is a significant effect, as the effect is likely to result in a medium term or partially significant adverse effect on the integrity of the receptor.
Minor	The effect is likely to adversely affect the receptor at an inconsequential level by virtue of its limited duration and/or extent, but there will probably be no effect on its integrity. This is not a significant effect.
Negligible	No material effect. This is not a significant effect.

9.35 Using these definitions, it must be decided whether there will be any effects which will be sufficient to adversely affect the VER to the extent that its Conservation Status deteriorates above and beyond that which would be expected should baseline conditions remain (i.e. the 'do nothing' scenario). Furthermore, these predictions will be given with a level of confidence relative to the effect being assessed (in line with IEEM 2006[ii]).

Cumulative Assessment

9.36 SNH (2012)[v] cumulative assessment guidance is used to inform the cumulative assessment in this chapter. Cumulative effects are not possible to evaluate through the study of one development in isolation, but require the assessment of effects when considered in combination with other developments. The spatial extent of the cumulative assessment is heavily dependent on the ecology of the receptor but in all cases will involve consideration of the cumulative effects upon the receptor extents or populations relevant to that receptor. For example, for water voles it may be appropriate to consider effects specific to individual catchments, should the distance between neighbouring catchments be

sufficient to assume no movement of animals between them whereas for blanket bog the region or the Natural Heritage Zone may be the relevant spatial scale.

Limitations

9.37 Limitations exist with regard to the knowledge base on how some species, and the populations to which they belong, react to effects. A precautionary approach is taken in these circumstances, and as such it is considered that these limitations do not affect the robustness of this assessment.

Project Assumptions

9.38 The connection of Creag a' Bhàird Wind Farm to the electricity network will be assessed as part of the work on a separate application which would be submitted by the local electricity distribution company.

9.39 All electrical cabling between the proposed turbines and the substation will be underground and follow the proposed access tracks. Connection between the substation and the electrical grid will form part of a separate planning application, as required.

9.40 Implementation of appropriate pollution prevention measures will occur across the site as standard (see **Chapter 4 - Scheme Description**).

9.41 A Species Protection Plan (**Appendix 9.6**) to this ES will be implemented during construction and decommissioning of the development.

Existing Conditions

9.42 This section details the baseline conditions as recorded on the site.

Desk Study

9.43 Information on designated sites and species of interest was obtained via consultation with online datasets (specifically the SNHi[1] resource).

9.44 The Griffin ES was reviewed and the only protected species identified during the related field survey work was otter. No signs of water vole, pine marten, red squirrel or wildcat was recorded.

9.45 No designated sites are present within the site, with the following sites present within 5km (sites designated for their ecological importance only):

- The River Tay Special Area of Conservation (SAC)/Site of Special Scientific Interest (SSSI) is located approximately 5km to the east of the site – designated for its importance to Atlantic Salmon *Salmo salar*, river lamprey *Lampetra fluviatilis*, brook lamprey *Lampetra planeri, Sea lamprey Petromyzon marinus,* otter and clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels . All features are considered by SNH to be in 'favourable maintained' condition.

9.46 In addition, the following species of interest were also recorded as being present within 5km of Creag a' Bhàird Wind Farm (NBN Gateway – see **Appendix 9.1**):

- Red squirrel *Sciurus vulgaris*;
- Pipistrelle bat species *Pipistrellus* spp.;
- River lamprey *Lampetra fluviatilis*, brook lamprey *L. planeri* and sea lamprey *Petromyzon marinus;* and
- Atlantic salmon *Salmo salar.*

[1] Found at www.snh.gov.uk

Field Study

9.47 Details regarding field survey methodologies and results are included within **Appendices 9.1 – 9.5**. The following section summarises the baseline conditions as identified during these surveys.

Habitat Description – Phase 1 and NVC Habitat Survey

9.48 A Phase 1 habitat survey was completed in August 2012 with specific survey methods detailed in **Appendix 9.1**. **Table 9.6** summaries the habitat extents recorded and these are illustrated in **Figure 9.1a.**

Table 9.6 Habitat Types by Area (within the site)

Phase 1 Habitat Type	% of the site	Area (ha)
Coniferous plantation woodland	79.39	246.90
Acid dry dwarf shrub heath	12.28	38.19
Marsh/marshy grassland	3.49	10.85
Existing Tracks	2.21	6.86
Continuous bracken	0.82	2.54
Blanket bog	0.30	0.92
Fen	0.28	0.88
Unimproved acid grassland	0.40	1.23
Bare ground	0.18	0.55
Semi-improved acid grassland	0.57	1.77
Wet modified bog	0.06	0.20
Wet dwarf shrub heath	0.03	0.09
TOTAL		**311**

9.49 NVC surveys were also completed in August 2012. Surveys followed standard Joint Nature Conservation Committee (JNCC) methods (as detailed within **Appendix 9.2** and illustrated in **Figures 9.2a to 9.2c**) and resulted in 18 vegetation communities being recorded at the site (**Table 9.7**). It should be noted that NVC community representation across the site is often within the context of a mosaic habitat and that although these habitats were recorded, this does not necessarily translate to dominance within a particular stand.

9.50 These results were then referenced against SEPA guidance in order to identify those habitats classified as likely to be groundwater dependent (Ground Water Dependent Terrestrial Ecosystems – GWDTE), as detailed in **Table 9.7**. Further to the above, only those communities where a GWDTE was considered to be a dominant/important factor in that community's hydrological structure and function is an assessment of effects upon it within a GWDTE context considered (see **Chapter 8: Geology, Hydrology and Hydrogeology** for further reference to GWDTE). Subsequently, those incidental GWDTEs within a wider non-GWDTE community/mosaic are not considered any further in this regard.

9.51 Habitats that fall within an Annex 1 habitat categorisation under the Habitats Directive are also detailed in **Table 9.7**. These habitats are not related to the River Tay SAC.

Table 9.7 NVC types and their Annex 1 and GWDTE Status

NVC Type	Annex 1	GWDTE
H12 *Calluna vulgaris – Vaccinium myrtillus* heath	European Dry Heath	-
H10 *Calluna vulgaris – Erica cinerea* heath	European Dry Heath	-
H21 *Calluna vulgaris – Vaccinium myrtillus – Sphagnum capillifolium*	European Dry Heath	-
M19 *Calluna vulgaris – Eriophorum vaginatum* blanket mire (sub-community a)	Blanket Bog	-
M15 *Trichophorum cespitosum – Erica tetralix* wet heath (sub-communities b and c)	North Atlantic Wet Heath	Moderate*
M6 *Carex echinata – Sphagnum fallax/denticulatum* mire (sub-communities a, c and d)	-	High
M17 *Trichophorum cespitosum – Eriophorum vaginatum* blanket mire	Blanket Bog	-
M20 *Eriophorum vaginatum* blanket and raised mire	Blanket Bog	-
M10 *Carex dioica – Pinguicula vulgaris* mire (sub-community a)	-	High
M4 *Carex rostrata – Sphagnum recurvum mire*	Transition Mires & Quaking Bogs	-
M23 *Juncus effusus/acutifloris – Galium palustre rush* mire (sub-community a and b)	-	High
M2 *Sphagnum cuspidatum/recurvum* bog pool community	Depressions on Peat Substrates	-
U5 *Nardus stricta – Galium saxatile* grassland	-	-
U4 *Festuca ovina – Agrostis capillaris – Galium saxatile* grassland (sub-community a)	-	-
MG10 *Holcus lanatus-Juncus effusus* rush-pasture	-	Moderate*
MG9 *Holcus lanatus-Deschampsia cespitosa* grassland	-	Moderate*
U20 *Pteridium aquilinum - Galium saxatile* community	-	-
W1 *Salix cinerea – Galium palustre* woodland	-	Moderate*

*Ground water dependency may or may not exist – it is dependent on the local hydrological setting as discussed further in **Chapter 8: Geology, Hydrology and Hydrogeology**.

9.52 A brief description of the Phase 1 habitats and associated NVC types recorded on site is detailed below; more detailed descriptions are provided in **Appendix 9.1**. These habitat descriptions are illustrated on **Figure 9.1a**. Because the final site area (the red line planning boundary) is smaller than the original area that was surveyed, some habitats were also recorded out-with the site.

9.53 **Sitka spruce dominated coniferous plantation forestry** is the dominant habitat type within the site and covers an estimated 79.39% of the site. Small areas of scots pine *Pinus sylvestris* and larch species *larix spp* are also found scattered along watercourses

9.54 **Dry dwarf shrub heath** is present across much of the unplanted parts of the site and tends to be the dominant habitat in these areas; it occupies 12.28% of the site. The NVC community types which fall within this Phase 1 category include H10, H12 and H21. This habitat is listed in Annex 1 of the Habitats Directive as European Dry Heath. Some areas of this habitat were recorded as degraded as a consequence of deer browsing and trampling impacts.

9.55 **Marshy grassland** occupies 3.49% of the site and is generally scattered in its distribution and tends to be predominantly found adjacent to watercourses. It occasionally forms small mosaics with acid fen. The NVC community types which fall within this Phase 1 category include M23, MG9 and MG10 – all are GWDTEs as detailed in **Table 9.7** above.

9.56 **Continuous bracken** *Pteridium aquilinum* habitat occupies 0.82% of the site. It is present in large patches across several of the gaps within the otherwise enclosed coniferous forestry. The habitat is characteristically devoid of any associate species and is classified as U20 NVC type.

9.57 **Blanket bog** habitat occupies 0.30% of the site. It is only found across the summit of Meall Mor Hill in the south of the site. This Phase 1 habitat falls within the NVC community type M17, M19 and M20. This habitat is listed in Annex 1 of the Habitats Directive as Blanket Bog.

9.58 **Acid fen** habitat occupies 0.28% of the site. It occurs in very limited patches throughout the site among the forestry with the largest area being recorded out with the site to the south east. This Phase 1 type would fall within the M6 NVC community type.

9.59 **Acid grassland (unimproved)** occupies 0.40% of the site. It is restricted to two large patches along a section of the access route by Creag Ard Hill. Elsewhere the habitat exists in small patches along sections of forestry ride where it sits amongst areas of wet and dry heath. This Phase 1 habitat falls within the NVC community type U5 and U4.

9.60 **Wet modified bog habitat** occupies 0.06% of the site. It is restricted to around three small patches within the site (south and north west). This Phase 1 habitat falls within the NVC community type M19 and M20. This habitat is listed in Annex 1 of the Habitats Directive as Blanket Bog.

9.61 **Wet dwarf shrub heath** habitat occupies 0.03% of the site. It is restricted to small patches within the site with the largest area being recorded out-with and to the south east the site boundary. The NVC community type M15 recorded on site fall within this category. This habitat is listed in Annex 1 of the Habitats Directive as North Atlantic Wet Heath and is also a potentially moderate GWDTE as detailed in Table 9.7 above.

9.62 **Running water occupies** 4.1km of the site. The site is bisected by a major watercourse, the Tombane Burn, and a series of minor watercourses. The Cochill Burn runs adjacent to the western edge of the access track. These watercourses form part of the River Tay catchment and are therefore connected to the River Tay SAC.

Non-avian fauna

Badger

9.63 Full details pertaining to the legal status of badgers are included within **Appendix 9.3**.

9.64 Field survey methods followed standard guidance and are detailed within **Appendix 9.3**.

9.65 No signs of badger presence were recorded during field surveys, with the site considered generally unsuitable for the species due to the general peat-dominated substrate. The acid grassland located along a section of the access route and the large areas of open dry heath located in the south-eastern section of the survey area provide more suitable habitat for badgers. These areas were generally less peaty in places and may afford greater foraging opportunities for local badgers.

Bats

9.66 Full details pertaining to the legal status of bats are included within **Appendix 9.4**.

9.67 The following field surveys were undertaken, with full methods detailed within **Appendix 9.4**:

- Daytime assessment and roost searches;

- Night transects; and
- Static activity surveys – Anabat survey.

9.68 Field survey methods were based on best practice guidelines (adapted as appropriate for the site) and are detailed within **Appendix 9.4**.

9.69 A total of at least four bat species were recorded during surveying as follows (in order of most common):

- Common pipistrelle *Pipistrellus pipistrellus* (68.3% of passes);
- Soprano pipistrelle *Pipistrellus pygmaeus* (23.7% of passes);
- Myotis spp (5.5% of passes);
- Pipistrelle (unidentified) (1.6% of passes); and
- Brown long-eared bat *Plecotus auritus* (0.9% of passes).

9.70 No bat roosts were identified during surveying and no significant potential for roosting was noted.

9.71 The most exhaustive data was obtained from the Anabat survey (see **Appendix 9.4**), and revealed that bat activity across the site is low, with an average of 1.56 bat passes per hour (BPpH) recorded. In total, 1,545 bat passes were recorded from 59,400 minutes (116 nights) of static surveying.

9.72 The total estimate of BPpH obtained (from static surveys) from a location close to an edge feature was 2.81BPpH, whilst closed (forested) habitat generated a far smaller figure as expected (0.31BPpH).

9.73 The vast majority of all the bat passes recorded (from all surveys) were common pipistrelle (1144 passes), with saprono pipistrelle (396 passes) the second most abundant.

9.74 Myotis spp. were recorded at low levels, with only 92 passes recorded.

9.75 The walked transects revealed a similar picture to the static surveys, but to a much lesser extent with low activity recorded throughout. No records of Myotis spp. were made during the walked transects.

Otter

9.76 Full details pertaining to the legal status of otters *lutra lutra* are included within **Appendix 9.3 & Figure 9.3**.

9.77 Standard survey methods were employed and are detailed within **Appendix 9.3 & Figure 9.3**.

9.78 The survey revealed numerous otter spraint locations along the length of the Tombane Burn in the central eastern and northern sections of the survey area. Spraints were also observed along sections of several tributary burns near Core nan Gabhar Hill. Two further spraints were recorded along the Cochill Burn where the access route connects with the A826. All recorded spraints were in a moderately fresh state. No otter holts or couches were recorded within the site.

Water vole

9.79 Full details pertaining to the legal status of water voles *Arvicola amphibius* are included within **Appendix 9.3**.

9.80 Standard survey methods were employed and are detailed within **Appendix 9.3**.

9.81 No records of water vole presence within the vicinity of the site were obtained during a search of online data sets.

9.82 No signs of water vole presence were recorded during surveying. The majority of water courses on site were considered sub-optimal for water vole however some areas of suitable habitat for the species exist, with numerous vegetated minor watercourses/drainage channels which would provide suitable food resource and cover.

Pine marten

9.83 Full details pertaining to the legal status of pine marten *Martes martes* are included within **Appendix 9.3**.

9.84 Standard survey methods were employed and are detailed within **Appendix 9.3**. The survey recorded pine marten scats at two separate locations across the site; one on an area of natural rock outcropping, and the other along a section of old stone dyke that borders the survey area. The site generally appears to contain moderately suitable habitat for foraging and breeding pine marten although no dens were found.

Red squirrel

9.85 Full details pertaining to the legal status of red squirrel *Sciurus vulgaris* are included within **Appendix 9.3**.

9.86 Standard survey methods were employed and are detailed within **Appendix 9.3**.

9.87 Red squirrels have been recorded on several occasions within 5km of the survey area over the last 10 years. The latest record was taken from 2012 at Tomnagairn, approximately 1km east of the site.

9.88 No signs of red squirrel presence were recorded during surveying. The woodland within the site consists predominantly of sitka spruce monoculture which is sub optimal for red squirrel due to its unpredictable coning cycle and low seed energy value compared to other tree species (Gurnell et al., 2009[vi]; Poulsom et al., 2005[vii]).

Wildcat

9.89 Full details pertaining to the legal status of *Felis silvestris grampia* are included within **Appendix 9.3**.

9.90 Standard survey methods were employed and are detailed within **Appendix 9.3**.

9.91 No records of wildcat were found during the desk study.

9.92 No evidence of wildcat presence was recorded during the surveys. However, the areas of rocky outcropping recorded across the survey area could be utilised by wildcat for shelter and potential den sites. Furthermore, much of the open dry heath could offer suitable foraging opportunities for resident individuals or for individuals passing through the area.

Freshwater pearl mussel

9.93 Full details pertaining to the legal status of freshwater pearl mussel *Margaritifera margaritifera* are included within **Appendix 9.3.**

9.94 Standard survey methods were employed and are detailed in **Appendix 9.3**.

9.95 No records of freshwater pearl mussel were found during the desk study.

9.96 No evidence of freshwater pearl mussel presence was recorded during the surveys. However, some areas of suitable habitat were recorded as detailed within **Appendix 9.3**.

Fish

9.97 Electrofishing surveys were undertaken by the Tay District Salmon Fisheries Board Trust and are detailed within **Appendix 9.5**.

9.98 Four sites were electro-fished in order to establish fish populations across the site. Seven locations were sampled adjacent to the site. No wild salmon were recorded during the surveys; only artificially introduced salmon were recorded. Salmon are not naturally found in the River Braan or in any of the tributaries fished during the course of the surveys. Brown trout was the main species found during the surveys. This was expected given that large waterfalls in the lower River Braan, downstream of the lowest electrofishing site, preclude access for salmon and other migratory species of fish. Overall densities of brown trout were relatively modest and not unusual for upland streams of the types surveyed.

The 'Do Nothing' Scenario

9.99 In the absence of Creag a' Bhàird Wind Farm, it is likely that the ecological receptors will generally remain as they are at present but with some improved habitat quality for red squirrel. The forestry will continue to mature but would be subject to a felling plan being agreed with Forestry Commission Scotland (no felling plan exists at present) which would follow relevant guidance and policy.

Effects Assessment

9.100 This section provides an assessment of the likely effects of Creag a' Bhàird Wind Farm on the VERs. For each VER, the potential effect is assessed for each of the construction, operation and decommissioning phases of Creag a' Bhàird Wind Farm. Only those receptors confirmed across the site and considered to be 'Valued' (i.e. VERs) are detailed below.

9.101 A summary of the habitats and species identified as VERs within the site is given in **Table 9.8**, together with the justification for this qualification. Habitats or species that have been scoped out of this assessment are listed with justification in the Effects Scoped Out section.

Table 9.8 Nature Conservation Value of Confirmed Valued Ecological Receptors within and adjacent to the Site

Valued Ecological	Nature Conservation Value	Relevant Legislation/Guidance & Justification
River Tay SAC **Qualifying features:** **Atlantic Salmon** **Brook Lamprey** **River Lamprey** **Sea Lamprey** **Otter** **Clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels**	International	The River Tay is designated as an SAC and International Nature Conservation Value. Conservation status – 'favourable maintained' (SNH Site Link V3).
Wet Modified Bog*	Local	The wet modified bog across the study area is a heavily degraded example of blanket bog habitat. Despite this association with Annex 1 blanket bog (both M19 and M20 NVC types correspond with this category), the habitat is degraded to an extent that assigning value higher than Local is not deemed appropriate. Furthermore similar habitat of equivalent and far greater quality is relatively common across the region. The dominant NVC (M19 and M20) reflects the level of degradation present here. Much of this habitat occurs in the land out with the site to the south.
Blanket Bog*	Regional	Blanket Bog is listed as an Annex 1 priority habitat in the Habitats Directive. The area recorded during surveys consists of a fairly high quality intact unit and is therefore considered regionally important. However, it is out-with the site boundary and has no hydrological connectivity to the site and will therefore not be affected by Creag a' Bhàird Wind Farm.
Dry Dwarf Shrub Heath	Local	Dry heath is listed as an Annex 1 habitat in the Habitats Directive and is considered within the Upland Heathland Tayside LBAP. Due to the habitat's fragmented (due to commercial forestry) and degraded condition in some areas it is considered to be no greater than Local Nature Conservation Value.
Wet Dwarf Shrub Heath*	Negligible	Wet Heath is listed as an Annex 1 habitat in the Habitats Directive and is considered within the Upland Heathland Tayside LBAP. Due to the habitat's fragmented (due to commercial forestry) and sparse presence throughout the site it is considered to be no greater than negligible Nature Conservation Value.
Marshy Grassland*	Local	Marshy grassland within the site has a loose association with the UKBAP habitat purple moor-grass and rush pasture (M23 NVC type is specifically listed on the UKBAP). This habitat falls within wet grassland action plan of the Tayside LBAP. This habitat is scattered throughout the site and usually beside watercourses, it does not represent a high quality example of the habitat, with low species diversity throughout. It is also a generally common habitat within the wider area and is therefore assessed to be of Local Nature Conservation Value.
Acid Fen*	Negligible	'Upland Flushes, Fens and Swamps' and 'Lowland Fens' are listed as UK BAP priority habitats. The fen habitat on the site is restricted to limited small patches closely aligned with the M6 NVC type. The habitat is relatively typical and widespread within the region and is not greater than negligible Nature Conservation Value due to its limited distribution in the site.
Standing Water*	Local	Standing water ('Ponds') is listed on both the UKBAP as a priority habitat and the Tayside LBAP. Only two small ponds were found and they are classified as being of Local Nature Conservation Value due to their small size and limited species diversity.
Running Water	Regional	Watercourses are listed on both the UKBAP and on the Tayside LBAP (as Rivers and Burns). The watercourses here are situated entirely within the river Tay catchment and thus are connected with the River Tay SAC (located approximately 5km downstream of the site). When considering this association, and in light of the watercourses being fairly typical of middle/upper reaches of upland watercourses in terms of the channel characteristics, associated vegetation and fauna, they are considered to be of Regional Nature Conservation Value at a site level.
Otter*	Local	Otters are listed on Annex II of the Habitats Directive, and fully protected through the Habitats Regulations. Otters are also listed as a priority species on the Tayside LBAP. Otter activity was confirmed on the site, although no holts/couches were identified. The current increasingly favourable conservation status of the species within Scotland is

Valued Ecological	Nature Conservation Value	Relevant Legislation/Guidance & Justification
		also noted. In light of this, their Nature Conservation Value across the site is assessed to be Local.
Pine Marten	Local	Pine Marten are listed on schedule 5 of the Wildlife and Countryside Act (as amended) 1981 and is listed on Schedule 3 of the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended). It is a UKBAP priority species. Pine marten presence was confirmed on the site although no breeding sites were confirmed. Their Nature Conservation Value across the site is assessed to be Local.
Red Squirrel	Local	Red Squirrel are listed on schedule 5 of the Wildlife and Countryside Act (as amended) 1981. It is a UKBAP priority species. Red squirrel presence was not confirmed on the site however it is considered precautionary to assume they are present but at low densities (due to the low habitat quality). Their Nature Conservation Value across the site is assessed to be Local.
Bats	Local	Bats are listed on Annex II of the Habitats Directive, and fully protected through the Habitats Regulations. Bats are also listed as a priority species on the Tayside LBAP. Activity of four bat species was confirmed on the site, although no roosts were identified. Their Nature Conservation Value across the site is assessed to be Local

9.102 Effects on VERs with the superscript '*' have been scoped out of this assessment as explained in paragraph 9.10 to 9.14.

Construction Effects

Predicted Effects

9.103 The most tangible effect during the construction stage of Creag a' Bhàird Wind Farm will be direct habitat loss. **Table 9.9** below details the estimated relative losses expected to occur by habitat type.

Table 9.9 Estimated loss of habitat (by area and percentage of habitat type) within the site

Habitat	Actual Loss (ha)	Relative Loss by Habitat (%)
Coniferous plantation woodland *	3.518	50.15
Existing Access Tracks (1_25000 OS Raster)*	2.557	36.45
Acid dry dwarf shrub heath	0.694	9.89
Bare ground*	0.116	1.65
Marsh/marshy grassland *	0.078	1.11
Semi-improved acid grassland *	0.049	0.70
Unimproved acid grassland*	0.004	0.06
TOTAL	7.015	100

9.104 Effects on the habitats with the superscript '*' have been scoped out of this assessment due to the minor nature of habitat loss involved or their low nature conservation value (see Effects Scoped Out section).

9.105 The following sections assess the effect of these losses for each VER. Only those of local Nature Conservation Value or greater are considered (see **Table 9.9**).

Dry Dwarf Shrub Heath

9.106 Dry dwarf shrub heath is the most abundant habitat type on the site. Evidence of deer browsing and trampling impacts has caused some degradation to this habitat.

9.107 Effects upon dry dwarf shrub heath habitat during construction will be direct (through habitat loss). The total amount of direct habitat loss will be 0.7 ha, which represents 9.9% of the overall habitat extent within the site. When considering the above, and accounting for the relative abundance of the habitat within the wider area, an effect magnitude of **Low** spatial and **Long Term** temporal is assigned.

9.108 The dry dwarf shrub heath within the site has a Nature Conservation Value of **Local**; the overall effect significance is therefore considered to be **Minor** and **Not Significant** in the context of the EIA Regulations.

Red Squirrel

9.109 Red squirrel presence was not recorded within the study area however this is considered to be due to the low habitat quality and therefore low densities of red squirrels are assumed rather than their absence from the site.

9.110 Construction related effects have been scoped out of the assessment as explained in the Effects Scoped Out section. The Operational Effect section considers operational phase effects of habitat alteration and displacement. These effects would commence during the construction phase as forest is felled, however, to avoid double counting of effects they are covered within the operational section below.

Pine Marten

9.111 Pine marten presence was recorded within the study area.

9.112 Construction related effects have been scoped out of the assessment as explained in the Effects Scoped Out section. The Operational Effects section considers operational phase effects of habitat alteration. These effects would commence during the construction phase as forest is felled, however, to avoid double counting they are covered within the operational section below.

Proposed Mitigation

Measures Prior to Construction

9.113 Although no significant effects have been identified as a result of Creag a' Bhàird Wind Farm, it is considered necessary that mitigation measures are implemented in order that these effects identified can be avoided or reduced further, where appropriate.

9.114 To ensure all reasonable precautions are taken to avoid effects on protected species during the construction phase, it is recommended that a Species Protection Plan (SPP) is agreed in consultation with Perth and Kinross Council and SNH. A draft SPP is provided in **Appendix 9.6** and it detail measures to protect otter, wildcat, pine marten, water vole, red squirrel and badgers. The SPP includes pre-construction surveys and good practice measures during constructions.

9.115 Pollution Prevention Measures are detailed in **Chapter 4: Scheme Description (see section entitled 'Good Practice Measures')**. This will be approved by Perth and Kinross Council in consultation with SNH and SEPA in advance of construction. These measures will ensure no likely significant effect will occur on the River Tay SAC.

Construction Measures

9.116 Good practice measures will be implemented throughout construction in order to minimise the risks associated with a construction site on otters, in line with SNH guidance[viii]. This would involve covering/securing all excavations and piping, and storing all chemicals safely within bunded containers a minimum distance (<100m) from all water-bodies.

9.117 The SPP should also take into account good practice in forestry operations for red squirrels (FCS guidance note 33[ix]), wildcats (FCS guidance note 35d[x]) and pine marten.

9.118 The agreed pollution prevention measures will be implemented by the developer and infrastructure contractor monitored by the ECoW.

9.119 In order to ensure compliance with the measures as described above, the ECoW will be required to be present on the site during construction. This role would be undertaken by a suitably qualified and experienced consultant, to be agreed with Perth and Kinross Council, SNH and SEPA and would involve the monitoring of the mitigation measures, together with a briefing with regards the ecological sensitivities on the site, to all site personnel prior to their commencing work on the site.

Residual Effects

9.120 With the implementation of the mitigation measures as described above, it is considered that all construction effects will be reduced to **Negligible** and will be therefore be **Not Significant** in the context of the EIA Regulations. **Table 9.11** below summarises this process.

Operational Effects

Dry Dwarf Shrub Heath

9.121 Habitat loss during the construction phase and has been considered in the Construction Effects section above. No further effects are predicted during the operational phase.

Red Squirrel

9.122 Red squirrel presence was not recorded within the study area however this is considered to be due to the low habitat quality (semi-mature sitka spruce dominated plantation) and therefore low densities of red squirrels rather than their absence.

9.123 The carrying capacity for the forest within the site is considered to be low and is likely to fall within the range of 0.00 to 0.11 squirrels per hectare. Based on a 228ha forest this equates to population anywhere between 0 and 26 red squirrels using the site[v]. Given that no squirrel signs were recorded on site and that the yield class is low (27.5% of the forest is YC 8, 36% is YC 12 and 36% is YC 16) and the forestry still relatively young (33 years since planting as of 2013), it is likely that the site is unlikely to support 26 squirrels and that the maximum is more likely to be around 10-15 squirrels. The existing 228ha of mature forestry plantation on the site will be felled and then replanted with a mix of conifers, pine and areas of mixed broadleaved woodland[2]. This forest restructuring will lead to the potential displacement of between 0 and 26 red squirrels from the study area to adjacent forestry. Although initial felling of the forest is likely to have an adverse effect on red squirrel within the site over the next 20 years or so as the new woodland establishes it will have an overall beneficial effect to red squirrel within the area in the longer term due to higher diversity of tree species and edge habitat.

9.124 Although listed on Schedule 5 of the Wildlife and Countryside Act, the potential red squirrel population which may use the study area is considered to be of **Local** Nature Conservation Value by virtue of its likely low level presence. Although Scotland is a stronghold for red squirrels within the UK their Conservation Status across Scotland is considered to be unfavourable and declining[xi]. Loss of a maximum of 26 squirrels is equivalent to around 0.02% of the Scottish population (121,000[xii]) although given the extent of forestry in the surrounding area it is considered more likely that they will be displaced to this wider area, however, the worst case scenario is assessed here. The potential magnitude of effect upon the species of forestry re-structuring is considered to be **Low** and **Long Term**, resulting in a **Minor** and **Not Significant** effect in the context of the EIA Regulations.

[2] Proposed planting: Sitka spruce – 70%, Norway spruce – 2.5%, Scot pine – 6.8%, Native broadleaves – 11%, Open ground – 8.7%.

Pine Marten

9.125 Pine marten presence was recorded within the study area.

9.126 Pine marten have a preference for forest habitats, including coniferous, deciduous and mixed forest. They prefer areas of extensive mature conifer plantations over areas of open young plantation (SNH, 2013[xiii]). This evidence can be supported as studies have shown that a 'closed treetop' is an important factor in habitat selection for pine marten (Overskaug et al, 1994[xiv]). However, pine marten do not restrict their range to forest areas, and will often venture out into open areas, which form an important part of their habitat requirements. Nonetheless, studies show that they will remain close to forest boundaries whilst roaming in open areas, which further demonstrates the dependence and preference of this habitat for the species (Pereboom et al, 2008[xv]). It is likely that the species will avoid spending large amounts of time in areas of open ground due to the increased risk of predation (for example, foxes are known to catch and kill martens). It has also been noted that the growth and expansion of commercial forestry across Scotland in the 20th century may have benefited the species, in terms of increased availability of habitat (SNH, 2013).

9.127 The pine marten is noted to have a territory of 5 to 15km^2 for females, with the possibility of males having a territory of up to double this in habitat such as sitka spruce forest (British Wildlife Centre, 2012[xvi]). In 2013, SNH stated that *'although not confined to woodland, each animal requires between 86 and 166ha of woodland within its territory'*. Males are also territorial and exclude other males from their territories.

9.128 Therefore mature forestry forms an important part of pine marten habitat requirements. The existing 228ha of mature forestry plantation on the site will be felled and then replanted with a mixture of sitka spruce, pine and areas of mixed broadleaved woodland. This forest restructuring will lead to the potential displacement of 1 active pine marten territory from the area to adjacent forestry. A worst case assumption would be that the male in this territory would be lost rather than displaced; this would be equivalent to around 0.03% of the Scottish population. Although initial felling of the forest is likely to have an adverse effect on pine marten within the site over the next 15-20 years as the new woodland establishes it will have an overall beneficial effect to pine marten within the area in the longer term.

9.129 Pine marten is listed on Schedule 5 of the Wildlife and Countryside Act, however, the pine marten population which uses the study area is considered to be of **Local** Nature Conservation Value by virtue its potential low density. In addition, the species is in increasingly favourable Conservation Status across Scotland (i.e. increasing in numbers and range)[xvii,xviii]. The potential magnitude of effect upon the species of forestry re-structuring is considered to be **Low** and **Medium Term**, resulting in a **Minor** and **Not Significant** effect in the context of the EIA Regulations.

Bats

9.130 Common and soprano pipistrelle bats are assessed by Natural England (2012[3]) guidance to be of medium risk in terms of collision although they are of low risk in terms of any threat to national populations. These pipistrelle species regularly fly at low heights, typically less than 25 m and, assuming that their behaviour is not modified by the presence of turbines, then the collision risk of common and soprano pipistrelle bats is considered to be low, particularly as the turbines will be located 100m from the edge of any replanted forestry. The spatial and temporal magnitudes of effects on the populations of these two species across the site are therefore considered to be **Low spatial and Long Term temporal** when the low levels of activity are considered. This would result in an overall **Minor** and **Not Significant** effect in the context of the EIA Regulations.

9.131 Myotis and brown long eared bats are assessed by Natural England guidance to be of low risk in terms of collision but potentially threatened due to the impacts of wind turbines. When considering the very low levels of total activity across the site, the effect magnitude on this species is considered to be **Low spatial and Long Term temporal**, which results in an overall **Minor** and **not Significant** effect in the context of the EIA Regulations.

9.132 A further consideration to the above assessment is the maintenance of a stand-off distance between the turbines and all woodland edges on site, in line with Natural England guidance (2012). Tree felling and then replanting will take place on the site with turbine keyholes being 100m radius (**see Chapter 4 –**

[3] Natural England (2012). Bats and onshore wind turbines: interim guidance. TIN051.Second Edition.

Scheme Description). The recommended stand-off distance between the feature and the centre of the turbine has been calculated using the following equation:

b =√((50+bl)"2" -(hh-fh)"2")

9.133 Where bl = blade length; hh = hub height; and fh = feature height

9.134 Feature height is 10 m as the trees will be felled when they reach this critical height (**refer to Chapter 4 – Scheme Description**). This results in a stand-off distance of 76.7m as follows:

b =√((50+46.5)"2" -(68.5-10)"2") = 76.7m.

9.135 The turbine key hole radius of 100m is therefore greater than the minimum stand-off distance and will reduce the already minimal potential adverse effects further.

Proposed Mitigation

9.136 Given that the effects are considered to be not significant no mitigation is required. It is however recommended that enhancement measures are incorporated into the forest design. These measures will benefit both red squirrel and pine marten:

- 20% of the forest edges should be planted with scots pine, larch, Norway spruce, logepole, firs, hawthorn and rowan;
- Smaller coupes should be designed into the forest to increase available edge habitat which in turn will increase coning and therefore the available food resource the in the longer term;
- Longer term retention of suitable areas of sitka and any larch, spruce should be considered; and
- A minimum stand-off distance to forestry edge feature of 77m should be adhered to.

Residual Effects

9.137 With the implementation of the enhancement measures as described above, it is considered that all effects will be reduced to either **Minor** or **Negligible** and will be therefore be **Not Significant** in the context of the EIA Regulations. **Table 9.11** summarises this process.

Cumulative Effects Assessment

9.138 This section presents information about the potential cumulative effects of Creag a' Bhàird Wind Farm combined with other nearby existing or proposed projects or activities that are subject to an EIA process. The primary concern with regard to the assessment of cumulative impacts is to identify situations where impacts on habitats or species populations that may be acceptable from individual developments, are judged to be unacceptable combined with impacts from other developments.

9.139 A desk study has found no significant non-wind farm projects or activities within 60km that would potentially affect any of the VERs, and are not already incorporated into the baseline (e.g. forestry activities are well established in the area and so any effects on protected species are likely to have been already incorporated into baseline survey results). There are however seven other wind farms inside NHZ 15 (Loch Lomond, The Trossachs and Breadalbane) and within 60km of the site, shown in **Table 9.10**.

9.140 Of the VERs considered for Creag a' Bhàird Wind Farm alone, bats have been scoped out of the cumulative assessment due to the absence of roosts from the site and the implementation of good practice mitigation regarding buffer distances of turbines from forestry edge to minimise impacts on foraging bats. No cumulative effects due to Creag a' Bhàird Wind Farm combined with other projects are therefore predicted.

9.141 All in-combination effects on the River Tay SAC have been scoped out due to the negligible effect predicted to arise from the construction and operation of Creag a' Bhàird Wind Farm. No in-combination effects due to Creag a' Bhàird Wind Farm combined with other projects are therefore predicted to occur, and the integrity of the River Tay SAC will be unaffected.

9.142 **Table 9.10** details the other wind farms and the impacts they are predicted to have on the remaining VERs: red squirrel and pine marten.

Table 9.10: Details of Impacts Arising from other Wind Farms

Wind Farm	Status	Red Squirrel	Pine Marten
Creag a' Bhàird	Application	Minor and not significant: 0-26 squirrels displaced	Minor and not significant: 1 active pine marten territory predicted to be displaced
Griffin	Operational since March-July 2012	Residual Impact Low – no squirrels recorded but assumed to use the site for foraging	Residual Impact Low – no pine marten recorded on the site although assumed to be present at low levels.
North Calliachar	Application submitted March 2013	No evidence of red squirrel recorded. No impact predicted	Pine marten presence confirmed. Artificial den sites proposed as compensation. negligible impact
Calliachar	Operational since September 2013	None present – no forest	None present – no forest
Crossburns	Application submission date 'late 2013'	None present – no forest	None present – no forest
Mains of Pittendriech	Consented	None present – no forest	None present – no forest
Innernyte	Application refused	None present – no forest	None present – no forest
Braes of Doune	Operational since 2007	None present – no forest	None present – no forest

9.143 In addition to Creag a' Bhàird Wind Farm only Griffin Wind Farm and North Calliachar Wind Farm have been found to have potential impacts on red squirrel and pine marten. Given the very low levels of predicated residual impacts, the cumulative effects on red squirrel and pine marten can both be considered as Low and Long Term magnitude and not significant according to the EIA Regulations, within the context of regional/NHZ populations.

Summary of Effects

9.144 **Table 9.11** below summarises the predicted effects of Creag a' Bhàird Wind Farm on the VERs present.

Table 9.11: Summary of Effects

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Construction			
Dry Dwarf Shrub Heath	Minor	None	Minor
Red Squirrel	None	Species Protection Plan	None
Pine Marten	None	Species Protection Plan	None
Operation			
Dry Dwarf Shrub Heath	None	None	None
Red Squirrel	Minor	Additional measures to enhance the forest design for the benefit of red squirrel.	Negligible
Pine Marten	Minor	Additional measures to enhance the forest design for the benefit of pine marten.	Negligible
Bats	Minor	A minimum of 77m turbine stand-off to forest edge feature.	Negligible

[i] SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ('The Habitats and Birds Directives'). Revised Guidance Updating Scottish Office Circular No 6/1995

ii IEEM (2006) Guidelines for ecological impact assessment in the UK

iii JNCC/NBN. 2008. NVC & Other Classification (webpage and link to corresponding xls) http://jncc.defra.gov.uk/page-4266

iv Hill, D., Fasham, M., Tucker, G., Shewry, M & Shaw, P. Handbook of Biodiversity Methods – Survey, Evaluation and Monitoring. Cambridge University Press.

[v] SNH (2012) Assessing the Cumulative Impacts of Onshore Wind Energy Developments.

[vi] Gurnell, J., Lurz, P. McDonald, R. & Pepper, H. (2009) *Practical Techniques for Surveying and Monitoring Squirrels.* Forestry Commission Practice Note, October 2009

[vii] Poulsom, L., Griffiths, M., Broome, A., and Mayle, B. (2005). *Identification of priority woodlands for red squirrel conservation in North and Central Scotland: a preliminary analysis.* Scottish Natural Heritage Commissioned Report No. 089 (ROAME No. F02AC334).

viii SNH (2008) Otters and Development online publication, http://www.snh.org.uk/publications/online/wildlife/otters/default.asp

[ix] FCS Guidance Note 33: Forest operations and red squirrels in Scottish forests – the law and good practice: November 2006.

[x] FCS Guidance Note 35d: Forest operations and wildcats in Scotland.

xi JNCC (15/12/2010) UK Priority Species Pages – Version 2. Red squirrel *Sciurus vulgaris.* http://jncc.defra.gov.uk/_speciespages/565.pdf

[xii] Harris, S., Morris, P., Wray, S. & Yalden, D. (1995). A review of British mammals: population estimates and conservation status of British mammals other than cetaceans.
JNCC, Peterborough

[xiii] Scottish Natural Heritage (2013). *Pine martens.* Available at: http://www.snh.gov.uk/about-scotlands-nature/species/mammals/land-mammals/pine-martens/.

[xiv] Overskaug, K., Broseth, H., Knutsen, B. (1994). Area and habitat use of pine martens*, Martes martes*, in mid-Norway. *Lutra*, 37: 81-88

[xv] Pereboom, V., Mergey, M., Villerette, N., Helder, R., Gerard, J-F and Lodé, T. (2008). Movement patterns, habitat selection, and corridor use of a typical woodland-dweller species, the European pine marten (*Martes martes*), in fragmented landscape. *Canadian Journal of Zoology.* 86: 983-991

[xvi] British Wildlife Centre (2012). British Wildlife Species Collection – Pine marten – *Martes martes*. Available at: http://www.britishwildlifecentre.co.uk/planyourvisit/animals/pinemarten.html. Accessed on: 19th November 2013

xvii Second Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2001 to December 2006. Conservation Status Assessment for Species: S1357 – *Martes martes* – Pine Marten. http://jncc.defra.gov.uk/pdf/Article17/FCS2007-S1357-Final.pdf

[xviii] SNH (2013) Expansion zone survey of pine marten distribution in Scotland. Commissioned report number 250.

10 Ornithology

Introduction

10.1 This chapter considers the potential effects of the proposed Creag a' Bhàird Wind Farm on birds. It summarises the methods used to establish the bird populations within the site and its surroundings, the results of the baseline surveys, and the process used to determine the Nature Conservation Importance of the bird populations present. he ways in which birds might be affected (directly or indirectly) by the construction and operation of Creag a' Bhàird Wind Farm are assessed. In addition, any cumulative effects of Creag a' Bhàird Wind Farm are considered, taking together effects of other regulated projects or activities in the area whether operational, consented or at application, along with the significance of any predicted effects of Creag a' Bhàird Wind Farm. The ornithology assessment was undertaken by MacArthur Green.

10.2 This chapter complements the assessment of potential ecological effects presented in **Chapter 9: Ecology**.

10.3 This chapter is supported by **Appendix 10.1** which contains the following Annexes:

- Annex A – Legal Protection.
- Annex B – Bird Survey Methodologies.
- Annex C – Survey Effort and Related Information.
- Annex D – Survey Results.
- Annex E – Collision Risk Assessments.
- Annex F – Confidential Scarce Breeding Bird Survey Results.

10.4 In addition **Appendix 10.2** contains the Habitats Regulations Appraisal (HRA).

Study Area Description

10.5 The assessment focuses on the site and appropriate study areas which have been applied, as recommended by Scottish Natural Heritage (SNH) Guidance (2010[i]) (see **Appendix 10.1** and **Figure 10.1**). Whilst SNH has advised that where baseline surveys have commenced prior to the publishing of an updated version of the guidance in 2013[ii] the 2010 version should remain as the primary reference, in general the requirements of the newer version were also met by the baseline surveys.

10.6 A further definition exists for the area in which birds are at risk of collision with turbines. This area comprises a 500m buffer around each turbine and collectively is defined as the 'Collision Risk Analysis Area' (CRAA) for the purposes of this assessment (see **Figure 10.3**). This is required to inform accurate collision risk modelling.

10.7 There are no statutory designations within the site. Designated sites (with regards to ornithological interests) that fall within 20km of Creag a' Bhàird Wind Farm are detailed in **Table 10.6** and shown in **Figure 10.2**.

Effects Assessed in Full

10.8 The following effects have been assessed in full in relation to construction and operation of Creag a' Bhàird Wind Farm:

- Direct habitat loss for birds through construction of the wind farm infrastructure.
- Displacement of birds through indirect loss of habitat where birds avoid the Creag a' Bhàird Wind Farm, and its surrounding area due to construction, turbine operation and maintenance, and visitor disturbance. Displacement can also include barrier effects in which birds are deterred from using normal routes to feeding or roosting grounds.
- Habitat modification due to change in land cover (e.g. felling or effects on hydrology), and consequent effects on bird populations.
- Death or injury through collision with turbine blades, overhead wires (if any), met masts, or fences (if any) associated with Creag a' Bhàird Wind Farm.
- Cumulative effects of Creag a' Bhàird Wind Farm in the context of other nearby regulated projects or activities.

Effects Scoped Out

10.9 No construction or operational effects were scoped out prior to commencement of surveys and determination of the presence and distribution of birds in relation to the planned infrastructure and activities associated with Creag a' Bhàird Wind Farm.

10.10 A total of 52 bird species were recorded at, or within, respective study areas, to Creag a' Bhàird Wind Farm during the baseline ornithological surveys which were undertaken between March 2011 and August 2012 (see **Appendix 10.1 Annex D**). Effects on all species of Low Nature Conservation Importance (as defined by **Table 10.4**) have been 'scoped out', following the rationale presented in SNH guidance [ix] on species priorities.

10.11 On the basis of the results of survey work undertaken, the professional judgement of MacArthur Green, experience from other relevant projects and policy guidance or standards (e.g. SNH guidance on SPA connectivity[iii]), effects on a number of Target Species[1] have been 'scoped out'. The activity recorded by these species and the reasons for scoping them out are detailed below:

- Effects upon the **Cairngorms Massif SPA** qualifying interest (golden eagle) have been scoped out due to the distance at which the site lies from the SPA (15-20km) and because golden eagle was not recorded during baseline surveys or historic information.
- Effects upon **all passerine species** have been scoped out as it has been assumed, following SNH guidance[i], that collision risk for small passerine birds (e.g. pipits, finches, buntings, thrushes) is negligible and would have no effect on their populations because survival rates of small passerines in Britain are naturally low. Bird species that have high natural adult mortality rates tend to produce large, but often variable, numbers of young each year. For such species, low levels of additional mortality will have little influence on their population dynamics which tend to fluctuate from year to year.
- Effects upon **greylag goose** have been scoped out because records were restricted to a small number of birds overflying the site (two flocks, comprising a total of 24 individuals. No disturbance-displacement effects would therefore occur, and collision risk modelling predicted a mortality rate of only one collision per 191 non-breeding seasons (**Appendix 10.1, Annex E**).
- Effects upon **goshawk** have been scoped out due to the very low levels of activity recorded for this species during surveys. Only two goshawk flights were recorded during vantage point surveys, both on 28/03/2011, indicating the same individual. This bird passed through the CRAA for 43 seconds of which 37% was at Potential Collision Height (PCH). Resultant collision risk modelling predicted negligible levels of mortality (one bird every 622 breeding seasons, **Appendix 10.1, Annex E**). No goshawk nest sites were recorded within the site or within a 2km study area during 2011 and 2012 surveys.
- Effects upon **merlin** have been scoped out due to the very low levels of activity recorded for this species during surveys. Only a single merlin flight was recorded during vantage point surveys, outside of the breeding season on 11/01/2012. This bird passed through the CRAA for 29 seconds of which 51% was at PCH. Resultant collision risk modelling predicted negligible levels of mortality (one bird every 933 non-breeding seasons **Appendix 10.1, Annex E**). The only other record of merlin came during a raptor survey in April 2011 when a single female was observed. No merlin nest sites were recorded within the site or within a 2km buffer distance during 2011 and 2012 surveys. Foraging distance during the breeding season is up to 5km from nest site[iii] and so no connectivity with any designated site is predicted (no designated sites with ornithological interests are located within this distance – see **Table 10.6**).
- Effects upon **peregrine** have been scoped out due to the very low levels of activity recorded for this species during surveys. Only three 'at-risk' peregrine flights were recorded during vantage point

[1] Target species are those species considered of High or Moderate Nature Conservation Importance or deemed at risk from wind farm developments. Table 2 of **Appendix 10.1** details a full list of target species recorded within the site and associated survey buffers, their Nature Conservation Importance and Conservation Status.

surveys (one during each season surveyed), and it was evident that the species did not utilise the site (no breeding activity recorded). Resultant collision risk modelling predicted negligible levels of mortality with 0.004 birds per non-breeding season, and 0.001 per breeding season (at 98% avoidance rate) to give an annual mortality rate of 0.006 birds, or one collision every 178 years (**Appendix 10.1, Annex E)**. Core foraging distance during the breeding season is up to 2km from nest site[iii] and so no connectivity with any designated site is predicted (no designated sites with ornithological interests are located within this distance – see **Table 10.6**).

- Effects upon **white-tailed eagle** have been scoped out due to the very low levels of activity recorded for this species during surveys. Only a single white-tailed eagle flight was recorded during vantage point surveys, on 10/05/2011. This bird passed through the CRAA for 114 seconds at PCH. Resultant collision risk modelling predicted negligible levels of mortality (one bird every 24 breeding seasons, **Appendix 10.1, Annex E**), although since this is only based on one flight, the confidence level in such predictions is low. No observations were recorded during any other baseline surveys and no white-tailed eagle nest sites were recorded within the site or within a 6km study area during 2011 and 2012, suggesting this individual was most likely a wandering non-breeder, and the site is of negligible importance for the species.
- Effects upon **red kite** have been scoped out due to the very low levels of activity recorded for this species during surveys. Only a single red kite flight was recorded during vantage point surveys on 21/04/2012. This bird passed through the CRAA for 90 seconds of which 36% was at PCH. Resultant collision risk modelling predicted negligible levels of mortality (one bird every 176 breeding seasons **Appendix 10.1, Annex E**). Two records of red kite came during raptor surveys in 2012 when single individuals were present, but no breeding activity was observed. No red kite nest sites were recorded within the site or within a 2km buffer distance during 2011 and 2012 surveys.
- Based on the scoping out of particular target species above, effects upon **Lochs of Butterstone, Craiglush and Lowes SSSI** (greylag goose and breeding bird assemblage), **Shingle Islands SSSI** (breeding bird assemblage), **Ben Chonzie SSSI** (breeding bird assemblage), **Ben Vrackie SSSI** (breeding bird assemblage), **Lochs Clunie and Marlee SSSI** (greylag goose) **Meiklour Area SSSI** (greylag goose) have been scoped out because of the species for which these site have been designated (see **Appendix 10.1** details), the distance at which the wind farm lies from these designated sites (5-20km) and therefore lack of connectivity for any species (based on SNH guidance[iii]), and/or the very low level of activity of the species recorded within the study area (most assemblage species, including osprey were not recorded during any baseline surveys).

Assessment Methodology

Assessment Structure

10.12 The assessment is structured around the consideration of potential effects, including construction, operational and cumulative effects, of Creag a' Bhàird Wind Farm, within which 'scoped in' target species and designated sites are considered at the appropriate level (NHZ/regional, national or designated site reference populations).

10.13 The assessment makes the following assumptions:

- The construction period for the development will last for approximately 20 months and includes forest clearance, construction of access tracks, hard standing, turbines and other infrastructure, and site restoration (see **Chapter 4: Scheme Description** for more details). The number of bird breeding seasons potentially disrupted would depend on the month in which construction commences and the breeding season of the potentially affected species. The breeding season of most birds at Creag a' Bhàird Wind Farm extends from April to July although some birds may commence breeding earlier[iv]. For the purposes of this assessment it is assumed that, for any given species of bird, construction activities would commence during the breeding season and would therefore potentially affect breeding for a maximum of two years, assuming that construction will take approximately 20 months.
- It is assumed that a Breeding Bird Protection Plan will be agreed in consultation with SNH in advance of construction. This plan will ensure that all reasonable measures are taken to avoid disturbance to breeding birds and to avoid damage to, or destruction of, nest sites.
- All electrical cabling proposed between the turbines and the site substation will be underground and follow tracks.
- The permanent meteorological mast will be of lattice tower design.

Data Sources and Guidance

10.14 The assessment has been undertaken in line with the following European legislation, policy, and guidance:

- Directive 2009/147/EC on the Conservation of Wild Birds (Birds Directive);
- Directive 92/43/EEC on Conservation of Natural Habitats and of Wild Fauna and Flora (as amended) (Habitats Directive);
- The Environmental Impact Assessment Directive 85/337/EEC (as amended).

10.15 The following national legislation, policy and guidance are considered as part of the assessment:

- The Wildlife and Countryside Act 1981 (as amended);
- The Nature Conservation (Scotland) Act 2004 (as amended);
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011;
- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended) (The Habitats Regulations);
- SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation; Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ('the Habitats and Birds Directives'). Revised Guidance Updating Scottish Office Circular No 6/1995[v];
- European Commission (27 October 2010) Natura 2000 Guidance Document 'Wind Energy Developments and Natura 2000'. European Commission, Brussels.
- The UK Biodiversity Action Plan (BAP)[vi];
- Birds of Conservation Concern (BoCC) 3 'Red List' (2009)[vii];
- Scottish Natural Heritage (2000) Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action. SNH Guidance Note. SNH[viii];
- Scottish Natural Heritage (2006) Assessing significance of impacts from onshore windfarms on birds outwith designated areas[ix];
- Scottish Natural Heritage (September, 2009) Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees[x];
- Scottish Natural Heritage (2005, revised 2010) Survey methods for use in assessing the impacts of onshore windfarms on bird communities). SNH[i];
- Scottish Natural Heritage (August 2013) Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH[iii]
- Scottish Natural Heritage (March 2012). Assessing the Cumulative Impact of Onshore Wind Energy Developments. SNH[xi];
- Scottish Natural Heritage (July 2013) Assessing connectivity with Special Protection Areas. SNH[xii].

10.16 The following data sources were considered as part of the assessment:

- SNH Site Link (www.snh.gov.uk/sitelink);
- NBN Gateway (www.searchnbn.net); and
- BTO BirdTrack (http://blx1.bto.org/birdtrack/grid-refs/grid-species-by-location.jsp).

Field Surveys

10.17 All surveys followed recommended methods and used associated survey buffers of the site (see **Appendix 10.1 Annex B**) and were considered appropriate by SNH in their Scoping Opinion (May 2013).

10.18 Ornithological fieldwork commenced in March 2011 and was completed in August 2012 and comprised of the following surveys (see **Appendix 10.1**, **Annexes C** and **D** and **Figures 10.1 and 10.3 to 10.15** for further details):

- flight activity Vantage Point (VP) surveys (within the site and a 500m buffer of the site). Fieldwork carried out from March 2011 to August 2012 inclusive;
- Upland Breeding Birds Surveys (BBS) (within the site and a 500m buffer around the site). Fieldwork carried out in spring-summer 2011 and 2012;
- breeding diurnal raptor (including short-eared owl) surveys (within the site and a 2km buffer around the site). Fieldwork carried out in spring-summer 2011 and 2012;
- Black grouse lek surveys (within the site and a 1.5km buffer around the site). Fieldwork carried out in spring-summer 2011 and 2012;
- non-breeding bird/winter walkover surveys (winter period) (within the site and a 500m buffer around the site). Fieldwork carried out in winter 2011/2012.

Consultation

10.19 The following organisations responded to requests for information and advice to inform the EIA: SNH, RSPB, Perth and Kinross Council. Issues identified through these consultations are detailed within **Table 10.1**.

Table 10.1: Consultation Responses

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
SNH	Scoping opinion 7th May 2013	Total number of VP hours from each VP is not specified	**Appendix 10.1, Annex C** details all survey effort
		Vantage point locations and viewsheds are not included within the scoping report so unable to provide comment on overall suitability of the VP work; request this information to be included in the ES	Viewsheds are shown in **Figure 10.3** and comply with survey requirements.
		Site located immediately adjacent to relatively newly constructed wind farm – Griffin wind farm. Any suspected disturbance or displacement during surveys due to recent construction works, potential servicing and other activities at Griffin wind farm should be presented within the ES	**Appendix 10.1, Annexes C and D** detail all survey and survey limitations. There were no recorded incidences of suspected disturbance.
		ES needs to provide detailed information on any mitigation measures proposed with respect to nesting birds which may be impacted by wind farm construction; the implications of any change in land management practice should also be considered and presented in relation to the bird species that breed within or use the proposed wind farm site	See Effects Assessment section – changes in habitat type from baseline have been fully considered. Mitigation measures for breeding birds included where appropriate.
RSPB	-	No comments to make at this stage	No action required
Perth and Kinross Council – Biodiversity Officer	Scoping opinion 13th May 2013	At least one breeding pair of Barn Owls within 2km of the site (actually about 500m from the site) which was not mentioned in the section on Ornithology	Species covered by scarce breeding bird surveys (**Appendix 10.1**) – all suitable locations within 1km of site checked. No evidence recorded.
		Cumulative effect on species to be considered in reports due to close proximity of Griffin Wind Farm	Griffin Wind Farm effects have been considered fully in Cumulative Effects Assessment section.

Assessing Significance

10.20 The assessment method follows the process set out in the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ('the EIA Regulations') and guidance on the implementation of the Birds and Habitats Directive[v].

10.21 In assessing the effects, emphasis is given to the national and NHZ/regional populations of the species as appropriate (or the designated site, where relevant).

Methodology for Assessing Wider-Countryside Ornithological Interests

10.22 The evaluation for wider-countryside interests (interests unrelated to a SPA, but including a SSSI) involves the following process:

- identification of the potential effects of Creag a' Bhàird Wind Farm;
- consideration of the likelihood of occurrence of potential effects where appropriate;
- defining the Nature Conservation Importance of the bird populations present;
- establishing the population's Conservation Status;
- establishing the Magnitude of the Likely Effect (both spatial and temporal);
- based on the above information, a judgement is made as to whether or not the identified effect is significant with respect to the EIA Regulations;
- if a potential effect is determined to be significant, measures to mitigate or compensate the effect are suggested where required;
- opportunities for enhancement are considered where appropriate;
- residual effects after mitigation, compensation or enhancement are considered.

Methodology for Assessing Methodology for Assessing Adverse Effect on the Integrity of an SPA

10.23 The method for assessing the significance of a likely effect on the integrity of an SPA is different from that employed for wider-countryside ornithological interests. The Habitats Directive is transposed into domestic legislation by the Habitats Regulations. Regulation 48 indicates a number of steps to be taken by the competent authority before granting consent (these are referred to here as a 'Habitats Regulation Appraisal'). In order of application, the first four are:

- Step 1. Consider whether the proposal is directly connected to or necessary for the management of the site (Regulation 48 (1b)).
- If not, Step 2. Consider whether the proposal, alone or in combination, is likely to have a significant effect ('LSE') on the site (Regulation 48 (1a)).
- If so, Step 3. Make an Appropriate Assessment of the implications for the site in view of that site's conservation objectives (Regulation 48 (1)).
- Step 4. Consider whether it can be ascertained that the proposal will not adversely affect the integrity of the site ('Integrity Test') having regard to the manner in which it is proposed to be carried out or to any conditions or restrictions subject to which they propose that the consent, permission or other authorisation should be given (Regulation 48 (5 & 6). Relevant information can be considered at Step 2.

10.24 The assessment on the integrity of SPAs in relation to the Creag a' Bhàird Wind Farm is presented in the Habitats Regulations Appraisal in **Appendix 10.2**. The result of baseline surveys and scientific conclusions presented here in the EIA assessment are also used to inform the appraisal process.

10.25 For clarity, the following sections further define the methods used to evaluate Conservation Status, Magnitude of Likely Effects and Nature Conservation Importance.

Methods Used to Evaluate Conservation Status of Bird Populations

10.26 As defined by SNH, the Conservation Status of a species is *"the sum of the influences acting on it which may affect its long-term distribution and abundance, within the geographical area of interest (which for the purposes of the Birds Directive is the EU)"*[ix] (Para. 14).

10.27 Conservation Status is considered favourable under the following circumstances[ix] (Para.15):

- "*Population dynamics indicate that the species is maintaining itself on a long-term basis as a viable component of its habitats; and*
- *the natural range of the species is not being reduced, nor is likely to be reduced for the foreseeable future; and*
- *there is (and probably will continue to be) a sufficiently large habitat to maintain its population on a long-term basis*".

10.28 SNH states that, *"An impact should be judged as of concern where it would adversely affect the favourable conservation status of a species, or stop a recovering species from reaching favourable conservation status, at international or national level or regionally"* [ix] (Para. 17).

10.29 The relevant scale for breeding species is considered to be the appropriate Natural Heritage Zone(s) (NHZ) which the site falls within. Creag a' Bhàird Wind Farm falls within the Loch Lomond, The Trossachs and Breadalbane NHZ (NHZ 15) (**Figure 10.2**). For wintering or migratory species, the national population is often considered to be the relevant scale for determining effects on the Conservation Status[ix] (Para. 20 & 21) and this approach is applied here.

Methods Used to Evaluate the Magnitude of Likely Effects

10.30 An effect is defined as a change to the abundance and/or distribution of a population as a result of the Creag a' Bhàird Wind Farm. Effects can be adverse, neutral or favourable.

10.31 There can often be varying degrees of uncertainty over effects as a result of limited information. A precautionary approach is adopted where the response of a population to an effect is uncertain.

10.32 In determining the magnitude of effects, the resilience of a population to recover from temporary adverse conditions is considered in respect of each potentially affected population.

10.33 The sensitivity of individual species to disturbance during relevant behaviours is considered when determining spatial and temporal magnitude of effect and is assessed using guidance described by Bright et al[xiii], Hill et al[xiv] and Ruddock and Whitfield[xv].

10.34 In the case of non-designated sites, magnitude is assessed in respect of an appropriate ecological unit. In the present case, the appropriate unit for breeding species is taken to be the Loch Lomond, The Trossachs and Breadalbane NHZ (NHZ 15) as defined by SNH[ix].

10.35 Effects are judged in terms of magnitude in space and time. There are five levels of spatial effects and temporal effects as detailed in **Tables 10.2** and **10.3** below respectively.

Table 10.2: Spatial Effect Magnitude

Spatial Magnitude	Definition
Very High	Total/near total loss of a bird population due to mortality or displacement. Total/near total loss of productivity in a bird population due to disturbance. Guide: >80% of population lost through additive mortality.
High	Major reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 21-80% of population lost through additive mortality.
Moderate	Partial reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 6-20% of population lost through additive mortality.
Low	Small but discernible reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Guide: 1-5% of population lost through additive mortality.
Negligible	Very slight reduction in the status or productivity of a bird population due to mortality or displacement or disturbance. Reduction barely discernible, approximating to the "no change" situation. Guide: < 1% population lost through additive mortality.

Table 10.3: Temporal Effect Magnitude

Temporal Magnitude	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period. Where this is the case, Long-Term may be more appropriate.
Long-term	Approximately 15 - 25 years or longer (see above).
Medium-term	Approximately 5 – 15 years.
Short-term	Up to approximately 5 years.
Negligible	<12 months.

Methods Used to Evaluate the Nature Conservation Importance of Bird Populations

10.36 There are three levels of Nature Conservation Importance (NCI) as detailed below in **Table 10.4**.

Table 10.4: Determining Factors of a Population's Nature Conservation Importance

Importance	Definition
High	Populations receiving protection by a SPA, proposed SPA, Ramsar Site, SSSI or which would otherwise qualify under selection guidelines.
Moderate	The presence of species listed in Annex 1 of the Birds Directive (but population does not meet the designation criteria under selection guidelines). The presence of breeding species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended). The presence of species noted on the latest Birds of Conservation Concern (BoCC) 'Red' list[vii]. Regularly occurring migratory species, which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to Creag a' Bhàird Wind Farm. Species present in regionally important numbers (>1% regional breeding population).
Low	All other species populations not covered by the above categories.

10.37 'Target species' were taken to be those species of High and Moderate Nature Conservation Importance (**Table 10.4**).

Significance Criteria

10.38 The predicted significance of the effect has been determined through a standard method of assessment based on professional judgement, considering both sensitivity (i.e. each bird species' relative sensitivity to disturbance) and magnitude of change. The significance criteria used in this assessment are listed below in **Table 10.5**.

Table 10.5: Significance Criteria

Significance of Effect	Description
Major	The effect is likely to result in a long-term significant adverse effect on the integrity of a receptor.
Moderate	The effect is likely to result in a medium-term or partially significant adverse effect on the integrity of a receptor.
Minor	The effect is likely to adversely affect a receptor at an insignificant level by virtue of its limitations in terms of duration or extent, but there will probably be no effect on its integrity.
Negligible	No effect.

10.39 Major and moderate effects are considered significant in the context of the EIA Regulations.

10.40 Minor and negligible effects are considered not significant in the context of the EIA Regulations.

Cumulative Assessment

10.41 The same assessment method as described within the 'Assessment Methodology' section will be used to undertake the cumulative assessment. Current SNH guidance on undertaking cumulative assessments is used[xi].

10.42 By definition, cumulative effects are not possible to evaluate through the study of one development in isolation, but will require the assessment of effects when considered in combination with other regulated projects or activities. The context in which these effects are considered will be heavily dependent on the ecology of the species in question. For example, it may be appropriate to consider cumulative collision risk to wildfowl associated with an SPA within the context of their wider foraging range and as such may involve the consideration of developments within up to 20km of the SPA. It is also important to consider the habitat of where a project or activity is located, which will in turn influence the bird assemblage present. As such, as well as distance from site, the inclusion of a project or activity within the same NHZ (in this case NHZ 15, Loch Lomond, The Trossachs and Breadalbane) is also a prerequisite for the cumulative assessment.

10.43 For breeding species, it will be necessary to consider the cumulative effects of other regulated projects and activities whereby the overall displacement area is increased. In isolation, it may be considered that local displacement will result in breeding birds moving to adjacent habitats, whereas in reality, these 'receptor sites' are subject to development themselves and will thus be unavailable.

Planning Policy

10.44 Planning policies of relevance to this assessment are provided in **Chapter 5: Planning Policy Context**.

Existing Conditions

10.45 This section details:

- Statutory Nature Conservation Designations for birds within 20km of Creag a' Bhàird Wind Farm;
- birds recorded during bird surveys (for details see **Appendix 10.1**); and
- the Conservation Status of the birds recorded during bird surveys.

Statutory Nature Conservation Designations

10.46 There are no statutory nature conservation designations within the site. Information pertaining to sites within 20km of Creag a' Bhàird Wind Farm, with ornithological qualifying features, is listed in **Table 10.6**. Further details of SSSI notified ornithological interests are presented in **Appendix 10.1**.

Table 10.6: Statutory Nature Conservation Designations within 20km of Creag a' Bhàird Wind Farm

Distance from the site	Designated Site	Ornithological Qualifying Features
Within 5km	None	-
Within 10km	Forest of Clunie SPA and SSSI	Hen harrier *Circus cyaneus* (average of 20 breeding females between 1994 and 1998, 4% of GB); Osprey *Pandion haliaetus* (average of 6 pairs between 1994 and 1998, 6% of GB); Short-eared owl *Asio flammeus* (15 pairs in 1998, 2% of GB); Merlin *Falco columbarius* (12 pairs in 1998, 0.9% of GB); Black grouse *Tetrao tetrix* (SSSI only,

Distance from the site	Designated Site	Ornithological Qualifying Features
		breeding); Breeding bird assemblage (SSSI only)
	Lochs of Butterstone, Craiglush and Lowes SSSI	Greylag goose *Anser anser*, non-breeding; Breeding bird assemblage
	Shingle Islands SSSI	Breeding bird assemblage
Within 15km	Ben Chonzie SSSI	Breeding bird assemblage
Within 20km	Cairngorms Massif SPA	Golden eagle *Aquila chrysaetos* (26 active territories in 2003, representing approximately 5.8 % of the GB population)
	Ben Vrackie SSSI	Breeding bird assemblage
	Lochs Clunie and Marlee SSSI	Greylag goose *Anser anser*, non-breeding
	Meiklour Area SSSI	Greylag goose *Anser anser*, non-breeding

Birds Recorded During Surveys

10.47 The following paragraphs summarise the nature of the ornithological survey findings. To avoid repetition, 'Target Species' observed but scoped out of the assessment are only detailed in paragraph 10.11 above. Full results can be found within **Technical Appendix 10.1 Annex D** and **Figures 10.4** to **10.15**.

Raptors and owls

10.48 There were no confirmed breeding attempts of any raptor or owl species recorded during baseline surveys within the site plus 2km buffer in 2011 or 2012. However a possible but unconfirmed short-eared owl breeding attempt was recorded in 2011.

10.49 Hen harrier was the most frequently occurring Target Species during vantage point surveys with 11 flights recorded between March 2011 and August 2012. Ten of these flights passed through the CRAA of with the majority during the 2011 and 2012 breeding seasons. The total flight time for hen harrier at PCH in the CRAA during the 2011 breeding season was 524 seconds. The total flight time for hen harrier at PCH in the CRAA during the 2011-12 non-breeding season was 229 seconds, and in the 2012 breeding season was five seconds. Hen harrier activity was also recorded during raptor surveys and woodland point counts, and although this was confined to the breeding season, no breeding behaviour was observed, with only single individuals recorded on each occasion (all but one of these being adult males).

10.50 Although the species was not recorded during flight activity surveys, a possible but unconfirmed short-eared owl breeding attempt was recorded adjacent to the access track and around 580m from the site boundary in 2011, when a prey item was possibly delivered to a nest. During breeding raptor and owl surveys, and woodland point counts, individual short-eared owls were recorded hunting relatively frequently in both 2011 and 2012, particularly within the vicinity of the possible breeding location outside of the site boundary (**Figure 10.17 – Confidential**).

10.51 A total of four peregrine flights were recorded, of which three were 'at-risk', being within the CRAA at PCH. This comprised one flight of 16 seconds duration at-risk in the 2011 breeding season, one flight of 45 seconds at-risk in the non-breeding season, and one flight of ten seconds at risk in the 2012 breeding season. The species was not recorded during any breeding surveys and no breeding behaviour was observed.

10.52 Observations of other raptors on site and within the survey area included red kite, goshawk, white-tailed eagle, merlin (scoped out in paragraph 10.10 due to low activity levels) plus the secondary species buzzard, kestrel and sparrowhawk. No breeding attempts were recorded within the 2km survey buffer.

Black Grouse

10.53 Black grouse are present throughout the year within the site and wider area. Black grouse surveys and other incidental records in 2011 and 2012 suggested that four lek locations are present within 1.5km of the site, with lekking activity recorded at two of these locations in 2011 and at three locations in 2012 (see **Appendix 10.1, Annex D** for further information). A peak of ten males was recorded at the closest lek site, approximately 480m from the site boundary and 520m from the nearest turbine, with peaks of six males at two leks (one 530m from the access track), and four males at the other.

10.54 During flight activity surveys ten individuals were recorded, although all flew below PCH. This comprised groups of three, five and two individuals in May 2011, October 2011 and January 2012 respectively.

Geese

10.55 Greylag goose was the only goose species recorded during baseline surveys. No breeding evidence was observed, and activity was confined to two flocks of 4 and 20 individuals that traversed the CRAA at PCH in winter 2011-12.

Other Birds

10.56 Breeding bird, woodland point count and winter walkover surveys revealed the presence of a number of other species, mostly passerines of low Nature Conservation Importance when considered individually (**Appendix 10.1, Annex D** and **Table 10.4**). Some red-listed passerine species (e.g. skylark, linnet, lesser redpoll) plus Schedule 1 listed crossbill were present but have been scoped out as per paragraph 10.11.

10.57 Upland breeding bird surveys in 2011 noted three curlew territories, one snipe territory and one red grouse territory within the study area (**Figure 10.11**). These are of low conservation importance and although are listed interests of breeding assemblages of SSSIs within 20km, connectivity is unlikely. These species have therefore been scoped out from assessment.

Wind Farm Layout Design Considerations

10.58 No revisions to the layout were required for ornithological reasons.

Effects Assessment

10.59 The assessment of effects is based upon the project description outlined in **Chapter 4: Scheme Description** and is structured as follows:

- construction effects;
- operational effects; and
- cumulative effects.

10.60 The assessment is applied to those 'scoped-in' bird populations of Moderate or High Nature Conservation Importance (see **Table 10.4**) that are known to be present within the site or surrounding area (as confirmed through survey results and consultations outlined above). These comprise: **black grouse, hen harrier (wider countryside and Forest of Clunie SSSI populations)** and **short-eared owl** (**Table 10.7**).

10.61 It was not considered that the overall breeding bird assemblage, if considered as a single receptor, would reach Moderate Nature Conservation Importance within a regional context, as it comprises common woodland and open upland species (e.g. song thrush, skylark).

10.62 Based on the *Methodology for Assessing Adverse Effect on the Integrity of an SPA* procedure outlined above, the proposal is not directly connected to or necessary for the management of the site (Step 1). It is concluded that a Likely Significant Effect (Step 2) cannot be discounted at this stage for the hen harrier population of the Forest of Clunie SPA due to potential connectivity with the site.

10.63 SNH guidance[iii] states that core foraging range of breeding hen harriers is generally restricted to 2km from the nest, and so although connectivity of the site with SPA breeding pairs is unlikely, the presence of individuals across the site and in the wider area (e.g. within the Griffin Wind Farm study area[xvi])

during the post-breeding dispersal and non-breeding season suggests that some form of connectivity cannot be ruled out without further evidence provided. Effects on the integrity of the Forest of Clunie SPA will therefore be considered separately in the Habitats Regulations Appraisal in **Appendix 10.2**.

Table 10.7: Nature Conservation Importance of Recorded Bird Populations

Species	Nature Conservation Importance	Reason
Black grouse	Moderate	BoCC Red-listed
Hen harrier	High	Qualifying feature of Forest of Clunie SPA and SSSI; Annex I, Schedule 1 and BoCC Red-listed
Short-eared owl	Moderate	Annex I listed

10.64 In addition, it is necessary to consider the species' Conservation Status when assessing the likely impacts, relevant Conservation Status information for the 'scoped in' Target Species is detailed within **Table 10.8.**

Table 10.8: Conservation Status of Scoped In Target Species

Species	Conservation Status Information	Conservation Status
Black grouse	Red List (HD, BDp[1])	Black grouse is Red-listed due to a historical decline in the UK between 1800 and 1995, without substantial recent recovery. It also qualifies due to a severe decline in the UK breeding population size of >50% over 25 years. Breeding numbers in the UK declined by 80% between 1991 and 2004. Sim et al.[xvii] estimated there to be 5,078 male black grouse in the UK in 2005, with approximately two-thirds of these occurring in Scotland. However, Forrester et al.[iv] estimate that in Scotland there are around 3,550 to 5,750 lekking males, representing about 71% of the British population. In Scotland the breeding range is contracting and numbers are declining, though the rate of decline varies regionally, being highest in southern Scotland. Numbers declined by 16% in North Scotland and by 9% in Northeast Scotland between 1995 and 2005, suggesting that the national and regional populations are in **unfavourable conservation status**.
Hen harrier	Red List (HD, SPEC)	Hen harrier is Red-listed due to a historical decline in the UK between 1800 and 1995, without substantial recent recovery. It is also a Species of European Conservation Concern (SPEC 3 – depleted, large historical decline). The UK and Isle of Man Hen Harrier population was estimated at 662 territorial pairs in 2010, which is a decline of 18% since 2004. Scotland holds the bulk (76%) of the population (505 territorial pairs, where a decline of 20% since the previous survey was observed[xviii]. The regional NHZ15 (Loch Lomond, the Trossachs and Breadalbane) population was considered by Fielding *et al.* (2011)[xix] to be **marginally in favourable conservation**
		status, although productivity levels were close to the threshold, attributed at least partly due to persecution. Thus the national population is considered to be in **unfavourable conservation status**. The Forest of Clunie SPA/SSSI population is considered to be **unfabourable, declining**.
Short-eared owl	Amber List (SPEC)	Short-eared owl is Amber listed as it is a Species of European Conservation Concern (SPEC 3 – depleted, large historical decline), but there is little clear evidence of a long-term decline in breeding numbers at the UK level because numbers fluctuate and have not been censused accurately at a national scale. Forrester et al. (2007) estimates the Scottish population at between 780 and 2,700 in 2000 pairs, or by extrapolating from data collected in Lothian and Borders between 1988-94 (which the authors regarded – probably correctly – as being more accurate), at somewhere between 250 and 1,250 pairs. A recent population estimate for Britain is 610 - 2140 pairs [xx]. Forrester et al. (2007) suggest that there have been declines in Scotland, with reduced breeding numbers in the Borders in the mid-1990s and in Aberdeenshire since 1968-72. The two BTO breeding bird atlases suggest a 15% decline in breeding numbers in Scotland between 1968-72 and 1988-91. Regional estimates and trends are unavailable, although the Forest of Clunie SPA/SSSI population is considered to be unfavourable, declining from the last monitoring in 2009. However, these trends need to be considered in the context of changes in breeding numbers by up to a factor of ten between years with high and low vole population densities (Forrester et al. 2007). It is difficult to assess whether or not this species is currently in favourable conservation status. It is likely to be affected in some areas by persecution and by habitat change, and may benefit from reduced densities of sheep on Scottish hill land. As a precaution however, the species is considered to be in **unfavourable conservation status** at a regional and national level.

BoCC criteria (Eaton et al. 2009):
HD Historical Decline. A severe decline in the UK between 1800 and 1995, without substantial recent recovery.
BDp[1] Breeding Population Decline. Severe decline in the UK breeding population size, of >50%, over 25 years.
SPEC European Conservation status. Categorised as a Species of European Conservation Concern (SPEC 1, 2 or 3).
WL Localisation. At least 50% of the UK non-breeding population found in 10 or fewer sites.
WI International Importance. At least 20% of the European non-breeding population found in the UK.

Construction Effects

Predicted Effects

10.65 The main potential effects of construction activities are the displacement and disruption of breeding and foraging birds as a result of noise and visible disturbance. Effects on breeding birds would be confined to activities in the locality of temporary construction compounds, turbines, tracks and other site infrastructure. Few attempts have been made to quantify the disturbance of birds due to activities of

this type, and much of the available information is inconsistent. However, as a broad generalisation, larger bird species, those higher up the food chain, or those that feed in flocks in the open, tend to be more susceptible to disturbance than are small birds living in structurally complex habitats (such as woodland, scrub and hedgerow)[xiv].

10.66 The following assessments only relate to those effects considered relevant to the species.

Black grouse

10.67 **Effect:** Lekking and foraging black grouse may be displaced from the wind farm area during construction. Four lek sites were recorded within 1.5km of the site in 2011 and 2012, with the closest located 480m from the northern site boundary and 520m from the closest turbine. A second lek was recorded 530m north of the access track, and two further leks were within around 1km from the site boundary (**Figure 10.13**).

10.68 **Nature Conservation Importance**: Due to its Red-list status the species is classified as **Moderate** Nature Conservation Importance (**Table 10.7**).

10.69 **Conservation Status:** The regional/NHZ and national populations are likely to be of **Unfavourable conservation status**.

10.70 **Magnitude of Effect:** There are two main areas of research relevant to determining the magnitude of effect; impacts of human disturbance and impacts of wind farms. These are discussed in turn below.

10.71 Susceptibility to Human Disturbance: Disturbance of forest associated wildlife by human recreational activity is widespread and can strongly influence bird populations and distribution (Steven et al.[xxi] and Marzano and Dandy[xxii]). Following changes to English law allowing greater access onto upland areas, Warren et al.[xxiii] found evidence that black grouse in northern England were disturbed by recreational activity on rights of way across moorland and changed distribution across habitat as a consequence, and as a precautionary approach Natural England excluded human access from these rights of way during particular periods to avoid possible impacts on black grouse breeding success. However, Miquet[xxiv] reported no impact on breeding numbers and breeding success of high levels of human disturbance of black grouse in winter. Herzog and Krueger[xxv] looked for impacts of human disturbance on black grouse population trend in the Ore Mountains, but found little evidence for this but clear evidence for an impact of habitat change and some evidence for an impact of climate change. Baines and Richardson[xxvi] carried out an experiment to test the impact of human disturbance on black grouse; birds that were disturbed more regularly flushed at greater distances, especially in spring. However, there were no differences in survival rates, clutch sizes or breeding success between birds experimentally subjected to low, moderate and high levels of deliberate human disturbance. The authors concluded that the disturbance regimes imposed had no discernible impact on black grouse population dynamics.

10.72 Susceptibility to impacts from wind farms: Bright et al.[xxvii] assessed the likely sensitivity of black grouse to population level impacts of wind farms as 'moderate', based on black grouse research reported in Johnstone[xxviii], Cayford[xxix], Anon[xxx] and Warren and Baines[xxxi], although none of those studies involved studies of the species at wind farms. Direct study of black grouse at wind farms indicated that black grouse behaviours show no obvious signs of being affected by wind farm construction disturbance, but that the amount of time birds spend attending leks may decline[xxxii]. In addition, Zeiler and Grünschachner-Berger[xxxiii] reported cases of collision mortality, and strong declines in black grouse numbers in local populations in areas where three wind farms were constructed in the Alpine zone in Austria. In a follow-up study at one of the same locations, Grünschachner-Berger and Kainer[xxxiv] reported that black grouse strongly avoided using the area within a wind farm, but in winter did feed on ground nearby that was heavily disturbed by activities on a ski run.

10.73 Similar concerns exist in North America. The sage grouse is a game bird of conservation concern, with some similarities to black grouse, and has shown a decline in numbers of up to 93% due to habitat loss, possibly exacerbated recently by West Nile virus and climate change. Concerns over possible additional impacts from wind farms in sage grouse habitat have so far turned out to be largely unsubstantiated, with evidence from radio tracking studies that sage grouse continue to feed around wind turbines and are subject to only a low collision mortality rate[xxxv].

10.74 Construction activities may temporarily displace black grouse from existing lekking or foraging areas and this could lead to effects on productivity and survival. If the current population of black grouse is limited by habitat then any displacement of foraging grouse from the areas presently used is likely to have a material effect on its viability. Any reduction in lekking at the traditional lek sites may also have adverse effects on the productivity of the local population and its social coherence. On the other hand, if population trend is ultimately dependent on the performance of the wider population then it is probable that any local and temporary displacement effects would be immaterial. Given the uncertainty over this, a precautionary approach is adopted here and the former scenario is assumed.

10.75 According to an expert survey by Ruddock and Whitfield (2007)[xv] leks may be actively disturbed at 300–500m from disturbance source, and so the lek to the north of the site may be affected by unmitigated construction activity at Creag a' Bhàird (if, in a worst-case scenario, construction activity takes place right up to the site boundary which is 480m distant). This lek was most recently reported in monitoring surveys of the Griffin Wind Farm[lxxi] in 2012 in which the author concluded post construction activities did not have an adverse impact upon lekking behaviour (despite being within approximately 750m of the site boundary). Results from 2008-12 showed that the lek is relatively stable despite the construction of Griffin Wind Farm, although there was a peak of 15 males in 2008, which had reduced to ten males in 2012 during Creag a' Bhàird baseline surveys and Griffin monitoring surveys.

10.76 The lek recorded 530m north of the access track was also recorded during monitoring surveys at Griffin and has increased in size from one to three males in 2008-11 to six males in 2012. As this lek has been adjacent to the public road for a number of years, birds evidently tolerate traffic and associated noise. However, during Griffin surveys birds were noted to be disturbed from the lek during a site visit when people opened and closed the access gate to the site on each arrivalxxi. It is therefore possible that this lek may also be disturbed by unmitigated construction activity for Creag a' Bhàird.

10.77 Although an NHZ population is unknown, Forrester *et al.* [iv] estimated from the 2005 national census that the northeast Scotland population (encompassing Perth and Kinross, Angus and Dundee, Fife, northeast Scotland, Moray and Nairn) to be 1,500 lekking males. The area within NHZ 15 is considered to be one of the strongholds of the species in Scotland, so it is considered that the NHZ population is approximately 1,000 lekking males. The loss of 16-21 lekking males from the two leks would therefore represent around 2% of the NHZ population, although may also contribute to increased fragmentation of habitat for movements of birds between lek sites, which may be an issue in the local area due to the low numbers of females recorded during baseline surveys of Creag a' Bhàird and nearby Griffin Wind Farm[lxxi].

10.78 Evidence from radiotracking studies reveal home ranges of black grouse adults to be up to 1.5km around leks[xxxvi] Within the UK, black grouse are essentially sedentary and dispersal is primarily confined to first-year hens. Studies have shown that dispersal can be as much as 19km from natal area, although mean distances of 4-9km are likely to be more commonplace. Small numbers of males have been recorded dispersing up to 10km from their natal area, but this is unusual. Although there may be some connectivity of populations throughout the NHZ, direct connectivity with the Forest of Clunie SSSI is unlikely and so no direct effects are predicted on this population.

10.79 The magnitude of effect of construction activity on the NHZ black grouse population is therefore considered to be **Low-medium Spatial** and **Short-Term** temporal.

10.80 **Significance of Effect**: The effect is classified as **Minor-moderate** and is therefore potentially **Significant** in the context of the EIA Regulations.

Proposed Mitigation

10.81 Surveys for lekking black grouse following the methodology detailed within SNH, 2010[i] will be completed during the construction phase during April and May. Should any leks be identified on the site, a 500m disturbance buffer will be established and no activity should occur in these areas during the period of 1hr before and after dawn. The Ecological Clerk of Works (ECoW) should oversee the implementation of the above measures.

10.82 To minimise the possibility of disturbance to the lek closest to the access track, a minimum level of pedestrian activity at the gate beside the A826 will occur during lekking times. In particular, the gate will remain open after first arrival, therefore avoiding every subsequent entry to open and close the gate and the associated potential disturbance to the lek due to pedestrian activity. At Griffin this action was enforced by the developer under agreement with the site ECoW and no further disturbance was noted during the main breeding period in April and early Maylxxi.

Residual Effects

10.83 The proposed mitigation reduces the effect from Minor-moderate to **Minor** and therefore **not significant** in the context of the EIA Regulations.

Hen harrier

10.84 **Effect:** foraging hen harrier may be displaced from the site during construction. Although no breeding evidence was observed, individual hen harriers were recorded traversing the site, likely to and from more suitable foraging areas.

10.85 **Nature Conservation Importance**: Although it is more likely that foraging birds present on site are from pairs closer to the site than the SSSI/SPA, due to possible (albeit weak) connectivity with the Forest of Clunie SSSI/SPA the species is classified as **High** Nature Conservation Importance (**Table 10.7**).

10.86 **Conservation Status:** Although the NHZ population may be in marginally **Favourable conservation status**, the national population and the Forest of Clunie SSSI/SPA population are considered to be in **Unfavourable** and '**Unfavourable, declining**' **conservation status** respectively.

10.87 **Magnitude of Effect:** No hen harrier breeding was recorded within 2km of the site during baseline surveys, and so activity was confined to flights traversing the site. A total of 11 flights were recorded during flight activity surveys, mainly of individual adult males during the two breeding seasons, suggesting the site may form part of a loose territory, albeit no evidence of a pair was observed. Evidence of hen harrier activity at Griffin Wind Farm in 2012[xxxvii] comprised male adults only, and it was likewise concluded that individuals were nesting some way outside the wind farm boundary and were coming to the site to hunt. Based on the very low levels of activity at Creag a' Bhàird the nearest nest location is likely to be even further from the site than Griffin.

10.88 There is little evidence to indicate what extent foraging hen harriers may be displaced around wind farm construction activities, although Ruddock and Whitfield[xv] stated that during wind farm construction, displacement from nest sites has been suggested potentially to occur up to 500m around construction sites with some disruption up to 1km, depending on line of visibility. Foraging activity of northern harrier (the North American subspecies of hen harrier) was however reported to continue at a study site where target practice reached up to 60m from the hunting bird. Actual disturbance distances for foraging birds are therefore likely to be lower than nesting birds, but dependent on the habitat quality of the site and the relative quality of alternative habitat.

10.89 Currently the site comprises mature conifer plantation and will be sub-optimal habitat for foraging and nesting, and so temporary restrictions on movements due to construction and tree-removal activities are unlikely to significantly compromise the integrity of any territory or impact on foraging abilities of any birds. With no individuals significantly affected, the spatial effect is assessed as **Negligible** magnitude and the temporal effect is assessed as Short Term.

10.90 **Significance of Effect:** The effect on hen harrier populations (NHZ and Forest of Clunie SSSI) during construction is therefore considered to be **Minor** and **Not Significant** in the context of the EIA Regulations.

Proposed Mitigation

10.91 To add further confidence to the conclusion of no significance, surveys for nesting hen harrier will be undertaken during the construction phase from March to April. Should any breeding activity be identified on the site, a 500m disturbance buffer will be established and no activity should occur in these areas until breeding is complete.

10.92 The Ecological Clerk of Works should oversee the implementation of the above mitigation measures.

Residual Effects

10.93 The proposed mitigation ensures that no net displacement above baseline level will occur and therefore the effect remains **Minor** and therefore **not significant** in the context of the EIA Regulations.

10.94 Residual effects on the hen harrier population of the Forest of Clunie SPA are assessed in the Habitat Regulations Appraisal in **Appendix 10.2**.

Short-eared owl

10.95 **Effect:** nesting and foraging short-eared owl may be displaced from the site and surrounding area during construction.

10.96 **Nature Conservation Importance**: Due to its presence on Annex I of the Birds Directive, the species is classified as being of **Moderate** Nature Conservation Importance (**Table 10.7**).

10.97 **Conservation Status:** although inconclusive, the conservation status of the NHZ and national populations are considered here to be in **Unfavourable conservation status** (**Table 10.8**).

10.98 **Magnitude of Effect:** A possible breeding attempt was recorded adjacent to the access track and within approximately 580m of the site (990m from the closest turbine) in 2011 (see **Appendix 10.1**, **confidential Annex F** for location), and foraging activity was recorded in both 2011 and 2012 breeding seasons.

10.99 No studies of human disturbance on short-eared owl were found in the literature review by Ruddock and Whitfield[xv], and their expert opinion survey resulted in a wide range of typical distances at which short-eared owls may be disturbed by an approaching observer, from <10m to 300–500m. This suggests that a breeding pair, if located in the same area in future years, would potentially be disturbed by construction activity along the access track. Within the site itself however, the habitat comprises mature conifer plantation that will currently be sub-optimal habitat for foraging and nesting, and so temporary restrictions on movements due to construction and tree-removal activities are unlikely to compromise any individual's foraging ability.

10.100 Although some short-eared owl populations are relatively sedentary, the species is generally nomadic, with its movements and productivity closely related to the cyclic population of field voles[iv]. This makes assessing the national and NHZ populations very difficult, as exemplified in the wide-range Scottish estimate of 125-1,250 pairs in 2007[iv]. From the breeding distribution map presented in Forrester *et al.*[iv] the species appears to be present through much of the uplands of NHZ 15 and Scottish distribution fits reasonably well with that predicted for hen harrier by Fielding *et al.*[xix], which is likely to be due to similar habitat requirements. If the Scottish hen harrier population from this is taken to be 1,467-1,790 pairs, and the population of NHZ 15 represents around 6% of this, assuming a similar distribution for short-eared owl would produce an NHZ 15 estimate of 7-75 pairs. The loss of one pair would therefore represent a loss of 1.3-14% of the NHZ population.

10.101 Although it is possible that short-eared owls may return to a similar nest site in future years, inter-annual variation in nest sites and foraging range is more likely, in response to vole numbers and distribution each year. Therefore the likelihood of a breeding attempt in a similar location (within disturbance distance) in future years is low. However, based on the greater likelihood of a local breeding attempt occurring when there is a good vole year (and therefore a population within the NHZ nearer the upper estimated range), the spatial effect on one NHZ pair is therefore assessed as **Low-medium** magnitude and the temporal effect is assessed as Short Term.

10.102 **Significance of Effect:** The effect on short-eared owl populations during construction is therefore considered to be **Minor-moderate** and is therefore potentially **Significant** in the context of the EIA Regulations, within the context of the NHZ population.

Proposed Mitigation

10.103 Under the Wildlife and Countryside Act 1981 as amended by the Nature Conservation (Scotland) Act 2004, it is an offence with only limited exceptions, to:

- intentionally or recklessly take, interfere with, damage or destroy the nest of any wild bird whilst it is in use or being built;
- intentionally or recklessly take, interfere with or destroy the egg of any wild bird; or
- intentionally or recklessly disturb any wild bird listed on Schedule 1 while it is nest building, or at (or near) a nest containing eggs or young, or disturb the dependent young of such a bird.

10.104 Measures will therefore be implemented to ensure that no construction activity contravenes with these legal requirements. Although not a Schedule 1 species, short-eared owl is Annex I listed and so every effort will be undertaken to avoid disturbance as well as destruction of nest sites or individuals.

10.105 SNH[xxxviii] recognises that it is normally not possible to schedule work outside of the breeding season as this coincides with the best weather for construction. It is therefore not considered realistic to exclude all construction activity along the access track during the breeding season.

10.106 Following SNH's guidance[xxxix], construction activities will therefore aim to commence before mid-March. By timing construction activities to start before the breeding season, birds will have an opportunity to take potential disturbance into account in the process of selecting a nest site, and those birds with a choice of nest sites may select an alternative nest site for that season.

10.107 Visual deterrent devices may also be placed within a restricted area of access track well in advance so that birds will not choose to nest within that locality. Examples of deterrence include using bird scarers, reflective tape or ribbons on posts. These would be designed and located in a suitable way that would avoid the possibility of visual disturbance to the nearest black grouse lek (see above). If nest building activity is seen within a cordoned area, continued deterrence would be considered to constitute disturbance and is an offence under the Wildlife and Countryside Act, so would be stopped immediately.

10.108 As outlined above for black grouse, efforts will be made to minimise potential sources of disturbance along the access track, by for example, avoiding unnecessary gate opening and closure.

10.109 Surveys for nesting short-eared owl within the wind farm site itself will be undertaken during the construction phase from March to April. Should any breeding activity be identified, a 500m disturbance buffer will be established and no activity should occur in these areas until breeding is complete.

10.110 The ECoW would oversee the implementation of the above mitigation measures.

Residual Effects

10.111 The proposed mitigation ensures that no losses to the NHZ breeding population are likely to occur and no net losses to foraging habitat will result. The effect is therefore reduced to **Minor** and therefore **not significant** in the context of the EIA Regulations, within the context of the NHZ population.

Operational Effects

Predicted Effects

Bird Collision Mortality Risks

10.112 Birds that utilise the Collision Risk Analysis Area during the lifetime of Creag a' Bhàird Wind Farm will be at risk of collision with the turbines. The risk of collision with moving wind turbine blades is presumed to be related to the amount of flight activity over the site and the ability of birds to detect and manoeuvre around rotating turbine blades. On this basis, it is clear that collision mortality rates are likely to increase with a wind farm's proximity to large concentrations of birds, whether this is breeding and foraging birds, wintering birds, or those utilising specific areas for local or large-scale migration[xl].

10.113 The majority of studies of bird collisions with wind turbines have recorded very low levels of mortality[xli-xlv]. This is perhaps largely a reflection of the fact that many wind farms are located away from large concentrations of birds. It is also important to note that many records are based only on finding corpses, with no correction for corpses that are overlooked or are removed by scavengers[xlv]. It also reflects the fact that birds have been found by direct observation to be very efficient at avoiding wind turbines[xlvi xlvii]

10.114 Band et al.[xlviii] describe a method of quantifying potential bird collisions with onshore turbines, in which the activity rate per unit area per season is extrapolated, the likelihood of a collision is calculated, and then an 'avoidance rate' [xlvi] applied to account for behavioural adaptation of birds to the presence of turbines. This results in a figure for the likely mortality rate at the wind farm which is then assessed within the context of the species' relevant populations to determine the significance of any losses. Collision Rate Modelling (CRM) results are detailed in the accompanying **Appendix 10.1**, **Annex E**.

10.115 It has been accepted by SNH, RSPB and the Joint Nature Conservancy Council (JNCC) that this CRM method is more suitable for some bird species than for others. For some species, species-specific avoidance rates have been measured at a number of wind farms (for example for various species of geese and birds of prey). For other species which have not been studied in detail, a precautionary generic avoidance rate estimate of 98% has to be used where species-specific data is lacking.

10.116 A major criticism of CRM is that the value of the avoidance rate has a strong influence on predicted mortality, yet there is little empirical basis for rate estimation for most species[xlix]. Since this method was developed, the CRM has progressively become better informed by specific avoidance rate studies, which are applied accordingly[xlvi]. In general, the trend in recent years has been for species-specific avoidance rates to be found to be higher (closer to 100%) than had been conservatively estimated in the past[xlvi]. Thus, collision rate estimates based on generic avoidance rate estimates give conservative results (i.e. are likely to overestimate actual bird mortality.

10.117 For the avoidance of repetition, reference should be made to previous paragraphs with regards to the Nature Conservation Importance and Conservation Status of the various target species.

Hen harrier

10.118 **Effect:** A total of 11 hen harrier flights were recorded during flight activity surveys in 2011-12, of which eight were recorded within the CRAA at risk heights. Most activity was recorded during the 2011 breeding season with five 'at-risk' flights totalling 524 seconds. In the 2011/12 non-breeding season two 'at-risk' flights (total of 229 seconds) were recorded, with only one 'at-risk' flight of five seconds recorded during the 2012 breeding season.

10.119 Estimated collision rates from the SNH (Band) CRM model for hen harrier (using an accepted 99% avoidance rate) are up to 0.02 collisions per breeding season, and 0.01 collisions per non-breeding season, resulting in an annual mortality of up to 0.03 collisions per year (equivalent to one bird every 29 years). Details of collision modelling data and calculations are in the **Appendix 10.1**, **Annex E**.

10.120 **Nature Conservation Importance and relevant Conservation Status**: **High** and **Unfavourable** within the context of the national and Forest of Clunie SPA/SSSI populations, and **marginally favourable** within the context of the NHZ population.

10.121 **Magnitude of Effect**: The pattern of flight lines observed (see **Figures 10.5 to 10.10**) suggest that the site is currently of low importance to hen harrier, as individuals only occasionally fly over the site without any foraging or breeding behaviour evident (hence the low predicted collision rates). However, since the site currently comprises mainly mature plantation but large areas will be clear-felled during construction, this significant change in habitat type requires consideration as to whether this is likely to alter future hen harrier activity levels and therefore collision rates, from those observed during baseline surveys[l].

10.122 At Creag a' Bhàird, replanting on site will primarily involve commercial conifers (Sitka spruce) so the habitat will become second rotation plantation forestry. Small areas of open ground and mixed native broadleaf trees will be included (in accordance with forestry design standards) but replanting with commercial conifers will predominate. No planting will occur within a 100m radius of each of the turbines. This forest would then be clear felled upon reaching 10m in height.

10.123 The likelihood of 'at-risk' flights may therefore be lower when the trees are clear-felled, as hen harriers mainly hunt at altitudes below rotor height. This reduction in collision risk may however be offset at least in part by greater suitability of habitat for foraging or breeding harriers once plantation is removed (at least until tree regeneration), which may in turn increase collision risk once the project is operational.

10.124 Collision risks to foraging hen harrier are considered to be low in comparison with other raptor species based on their hunting behaviour and associated low flight heights. An avoidance rate of 99% was recommended by Whitfield and Madders[li] to reflect this, based on mortality and avoidance rates from eight operational wind farms in the USA. Madden & Porter[lii] showed that hen harriers managed to avoid turbines, even when erected in their nesting or foraging areas. This finding was also observed for foraging birds by Scott & McHaffie[liii].

10.125 Hen harriers generally build their nests amongst tall vegetation, and there is a general recognised preference for nesting amongst heather[liv lv]. The most common nesting situations are on gentle slopes, generally sheltered from the prevailing wind, in proximity to incised valleys or burns[liv]. There are few known examples of hen harriers breeding or attempting to breed in second generation forests, e.g. Petty and Anderson[lvi] noted that access to suitable large areas of open ground with vole and small bird populations are rarely available close to areas of clear fell. It is thought that maturing plantations (from about seven years after planting) would not provide suitable habitat for hen harrier foraging because of reduced access to open hunting grounds within the clear fell as the canopy closed, and that for these reasons the species would not often re-colonise areas of clear-felled timber[lvii]. While hen harriers will forage in such habitat until the trees are a few years old (perhaps up to about seven years after planting when canopy closes[lviii xvii], their use of second-rotation is much less than for first-planted forestry[lix].

10.126 The existing habitat within the forestry rides may support suitable foraging habitat for hen harriers and so when the trees are felled the ride network will be opened up and may make the area more attractive. It should be noted however that because the forestry will be approximately 35 years old at the time of felling, much of the understory vegetation will have been shaded out and lost for a considerable period of time, thereby rendering the site to be of poor vole habitat.

10.127 It is also considered unlikely that activity would increase substantially given the current depleted nature of the hen harrier population in the NHZ as detailed in **Table 10.8**. Because the NHZ population is likely below carrying capacity it is reasonable to assume that there is abundant high quality nesting and foraging habitat within the NHZ and that raptors are unlikely to substantially increase their use of sub-

optimal habitat offered by a clear-felled/restocked commercial forestry site. Nonetheless, given the uncertainty over the potential increase in hen harrier activity, and the recorded mortalities of two hen harriers at the recently operational Griffin Wind Farm (see Cumulative Effects Assessment) it is prudent to mitigate this this risk.

10.128 Because of the uncertainty over future collision risk compared to current baseline, if unmitigated, predicted mortality rates here are considered to potentially underestimate the magnitude of collision risk during operation. This magnitude of effect is therefore considered **Low** Spatial and **Long Term** Temporal within the context of the NHZ population.

10.129 **Significance of Effect**: The effect is classified as **Moderate** and is therefore **Significant** in the context of the EIA Regulations.

Proposed Mitigation

10.130 To keep hen harrier (and other raptor species) activity to an acceptable risk level, SNH guidance[lx] on management of clear-felled forestry sites for birds will be followed. A cutting regime will be implemented within the site boundary with the aim of keep grass sward low to prevent increases in vole utilisation and ultimately the attraction of hen harriers. In conjunction with this, post-construction prey and bird surveys will be undertaken to record any changes in activity levels.

10.131 As voles prefer tussock grassland with a good litter layer and structure to build runs and nests, the main areas of concern would be the current forest rides. It is proposed that if required, ride networks within the wind farm envelope will be scarified/flailed during felling and then planted within a year to make the habitat unattractive to foraging hen harriers immediately and over the 25 year operational life of the wind farm.

Residual Effects

10.132 The proposed mitigation will provide a habitat that is low in prey potential for hen harrier and other raptor species, thereby keeping flight activity to a similarly low level, as recorded during baseline surveys. Forest-felling means that any activity within the site, prior to subsequent maturation of second generation plantation, is more likely to be at low altitude, below rotor height. Overall the mitigation reduces the effect from Moderate to **Minor** and therefore **not significant** in the context of the EIA Regulations.

10.133 Residual effects on the hen harrier population of the Forest of Clunie SPA are assessed in the Habitat Regulations Appraisal in **Appendix 10.2**.

Black grouse

10.134 **Effect:** During flight activity surveys groups of three, five and two individuals were recorded flying within the CRAA in May 2011, October 2011 and January 2012 respectively. All of these birds were however recorded below risk height, which is generally typical of the species' flight behaviour. However, black grouse are known to be at risk of colliding with structures close to ground level, such as fences and wires; deer fencing has proved to be a particular hazard for this species. Zeiler and Grünschachner-Berger[xxxiii] reported cases of black grouse mortality resulting from collisions with various structures close to ground level, and they report strong declines in black grouse numbers in local populations in areas where three wind farms were constructed in the Alpine zone in Austria.

10.135 **Nature Conservation Importance and relevant Conservation Status**: **Moderate** and **Unfavourable** at a national and NHZ scale.

10.136 **Magnitude of Effect**: Since no flights were at collision risk height, the magnitude of the effect of collisions with turbine blades is negligible. However there is likely to be some risk to black grouse from any structures such as railings of the steps associated with wind turbines. Based on a NHZ population of around 1,000 lekking males, the magnitude of effect of collision with turbine infrastructure on black grouse is considered to be at worst **Low Spatial** and **Long-Term** temporal on the NHZ population.

10.137 Significance of Effect: The effect is classified as **Minor** and is therefore **Not significant** in the context of the EIA Regulations.

Proposed Mitigation

10.138 To provide more confidence in the conclusion of no significance, chestnut paling fencing (or similar) will be erected around turbines closest to lek sites to reduce the likelihood of collision with towers and of railings of steps leading into turbines.

Residual Effects

10.139 The proposed mitigation reduces the effect from Minor to **Negligible** and therefore **not significant** in the context of the EIA Regulations.

Short-eared owl

10.140 **Effect:** Foraging or nesting short-eared owls may be at risk of collisions with turbines or other infrastructure. No flights were however recorded during baseline flight activity surveys.

10.141 **Nature Conservation Importance and relevant Conservation Status**: **Moderate** and **Unfavourable** at a national and NHZ scale.

10.142 **Magnitude of Effect**: Short-eared owls usually hunt low over the ground, and so will be unlikely to collide with wind turbines. Since this species very rarely flies at turbine height (unless immediately around nest sites) and seems not to use the CRAA area, risk is considered to be Negligible. However, given that substantial areas of timber within the site will be clear-felled for wind farm construction, there is a need to consider whether this is likely to alter future short-eared owl activity levels during operation.

10.143 As the clear-felled areas will immediately be replanted so the habitat will become second rotation plantation forestry, the same consideration applies here as detailed for hen harrier above, where significant increases in activity levels are unlikely, but possible, particularly in the short-term before canopy closure. In the breeding season, short-eared owls require an extensive tract of open land with an adequate small mammal population[lxi], which is unlikely to be provided by the opening up of forest rides. Nevertheless, unmitigated, the magnitude of effect is considered **Low** Spatial and **Medium-term** Temporal within a NHZ context.

10.144 Significance of Effect: The effect is classified as **Minor** and is therefore **Not significant** in the context of the EIA Regulations.

Proposed Mitigation

10.145 To provide more confidence in the conclusion of no significance, the proposed mitigation outlined above for hen harrier (paragraph 10.130) will be equally applicable for short-eared owl.

Residual Effects

10.146 The proposed mitigation reduces the effect from Minor to **Negligible** and therefore not significant in the context of the EIA Regulations.

Displacement Effects

10.147 The displacement of nesting and foraging birds from the site has the potential to extend beyond the construction phase, as described above, and to occur during the operational phase of Creag a' Bhàird Wind Farm, although lower levels of disturbance during operation compared to construction suggest that displacement effects will be less than those reviewed for the construction phase above. Displacement away from operational turbines has been found to occur in a number of individual wind farm studies, generally over distances of up to 100m or 200m from turbines, although the effects vary considerably between sites and species[lxii]. Additional existing information[lxiii] suggests that these effects are minimal, with most species affected only slightly, if at all, whilst Drewitt and Langston[xiv] highlighted the need for further study in order to accurately quantify displacement effects. Devereux et al.[lxiv] showed that wind farms had no, or at most a minimal effect, on the local distribution of wintering farmland birds. Considering a range of breeding bird species but predominantly waders and passerines at upland wind farms, Pearce-Higgins et al.[lxv] showed that there were no displacement impacts on any bird species from wind farms during the operational phase other than those that had already occurred during construction, and for some species the impacts during construction were reversed during operation with numbers returning to pre-construction numbers. So the overall picture from Pearce-Higgins et al.[lxv] is that disturbance is only an issue requiring consideration for the construction phase and not for wind farm operation.

10.148 Those studies mentioned above were focused on direct displacement (i.e. avoidance of areas surrounding wind farm installations); an additional consideration is the displacement of birds from larger areas where the turbines act as a barrier to bird movement. The likelihood of this effect occurring tends to increase with wind farm size, where large turbine arrays can force birds to alter their regular flight-paths, resulting in an increase in distance flown and so energy expended. However, a review of the literature suggests that none of the barrier effects identified so far have significant effects on populations[xlv]. This was also the conclusion from modelling of energy costs to those bird species most likely to be sensitive to barrier effects (large and long-lived breeding birds such as seabirds) by Masden et al.[lxvi]. In the case of Creag a' Bhàird Wind Farm, the site is evidently of low importance for all target species, evidenced by the low activity rates recorded during baseline surveys, and so barrier effects are not predicted to be a significant issue.

10.149 Pearce-Higgins et al.[lxii] observed certain species experiencing localised population increases with proximity to wind farm infrastructure installations, so while some birds may be displaced locally, others may benefit from the introduction of new structures into the habitat, or some other consequence of construction. This finding was further supported by Pearce-Higgins et al.[lxv] who reported significant increases in breeding numbers of skylarks and stonechats at wind farms.

Hen harrier

10.150 **Effect**: No hen harriers were recorded as breeding within the site or 2km study area, and therefore there will be no displacement of hen harrier nest sites in the local area. Low levels of flight activity indicate that the site is of low foraging importance.

10.151 **Nature Conservation Importance and relevant Conservation Status**: **High** and marginally **Favourable** at an NHZ level, but **Unfavourable** in relation to the Forest of Clunie SPA/SSSI population and the national population.

10.152 **Magnitude of Effect**: In keeping with most other studies of raptor displacement, it appears that hen harriers have a low sensitivity to disturbance at operational wind farms. Whitfield and Madders[lxvii] considered that if displacement of foraging hen harrier occurs, it is likely to be within 100m from turbines, if at all. This implies that any avoidance of the area close to turbines would be a negligible effect at the population level. With this in mind, although hen harriers may be displaced from the immediate area around turbines during wind farm operation, the magnitude of such an effect is considered to be **Negligible** spatial, but **Long Term** temporal.

10.153 **Significance of Effect**: The overall effect on hen harrier is therefore assessed as **Negligible** and therefore **Not Significant** in the context of the EIA Regulations.

10.154 Effects on the hen harrier population of the Forest of Clunie SPA are assessed in the Habitat Regulations Appraisal in **Appendix 10.2**.

Black grouse

10.155 **Effect**: Four lek sites were recorded within 1.5km of the site in 2011 and 2012, with the closest located 480m from the site boundary, and three others within around 1km from the site boundary (see **Figure 10.13**).

10.156 **Nature Conservation Importance and relevant Conservation Status**: **Moderate** and **Unfavourable, declining**.

10.157 **Magnitude of Effect**: The literature reviewed in paragraphs 10.7171 to 10.73 suggests that black grouse are more sensitive to disturbance than are most other species, and that wind farm operation may cause some displacement of breeding and foraging black grouse from areas close to turbines.

10.158 The closest lek site recorded is 480m away from the site boundary, and 520m from the nearest turbine location. All of the other lek sites are at least 1km away from the nearest turbine. One lek is located around 530m from the access track, and the possibility of displacement from operational turbines is remote. Although some access may be required for maintenance activities through the lifespan of the wind farm, this is likely to be of negligible frequency and duration compared to construction access.

10.159 Based on predicted disturbance distances in Ruddock and Whitfield[xv] and low frequency of maintenance activities, no lekking grouse are likely to be displaced by the operational turbines or any associated activities.

10.160 Works were completed in February 2012 at Griffin Wind Farm, although the project was not fully operational until July 2012. Nevertheless early indications are that there are no obvious effects of these turbines on the lek closest to both Creag a' Bhàird and Griffin[lxxi] (lek site is approximately 500-600m from the closest turbine at Griffin). However there is still some uncertainty over long-term effects, and given the Nature Conservation Importance and relevant Conservation Status of black grouse the magnitude of effect is considered **Low Spatial** and **Long Term Temporal** within the context of the NHZ population.

10.161 **Significance of Effect:** The effect is classified as **Minor** and is therefore **Not significant** in the context of the EIA Regulations.

Short-eared owl

10.162 **Effect:** Nesting short-eared owls may be at risk of displacement around access tracks, turbines or other infrastructure. No flights were recorded during baseline flight activity surveys within the wind farm site itself, and so foraging activity is likely to be unaffected here.

10.163 **Nature Conservation Importance and relevant Conservation Status**: **Moderate** and **Unfavourable** at a national and NHZ scale.

10.164 **Magnitude of Effect:** The possible short-eared owl nest site recorded in 2011 was an estimated 580m from the site boundary, and around 990m from the closest turbine. Although located close to the access track, due to the low levels of site access during the maintenance period compared to construction period, significant disturbance-displacement is considered unlikely and any breeding attempt will be unaffected.

10.165 Although it is acknowledged that there is a lack of empirical data on displacement of short-eared owls around operational wind farms, distances of any effects are likely to be lower than the 300-500m prescribed by Ruddock and Whitfield[xv] which relate to human movements. With no net loss of foraging habitat within the wind farm, the magnitude of a displacement effect is considered to be **Negligible** spatial, but **Long Term** temporal.

10.166 **Significance of Effect**: The overall effect on hen harrier is therefore assessed as **Minor** and therefore **Not Significant** in the context of the EIA Regulations.

Cumulative Effects Assessment

10.167 This section presents information about the potential cumulative effects of Creag a' Bhàird Wind Farm combined with other nearby existing or proposed projects or activities that are subject to an EIA process. SNH has provided guidance on assessing the cumulative impacts on birds[ix,lxviii]. This assessment follows the principles set out in that guidance. The primary concern with regard to the assessment of cumulative impacts is to identify situations where impacts on populations that may be acceptable from individual developments, are judged to be unacceptable in combination with impacts from other developments[lxix]. This could be the case, for example, where there are two developments predicted to lead to a minor loss of foraging within the territory of a single pair of eagles. While these impacts may be minor in isolation, taken together they could cross a critical threshold that leads to the abandonment of a territory. Other situations where cumulative impacts could be significant are where there are several minor impacts on a population (considered to be acceptable in isolation) that in combination may threaten the integrity of that population. Thus in a hypothetical case, described by SNH[lxviii], wind farm A gives rise to a low level of bird mortality, which lies well within the capacity of that bird population for regeneration and hence has little effect on the overall bird population level. The same would apply to a second wind farm B, taken on its own. However, the level of bird mortality caused by wind farms A and B taken together could exceed the capacity of the population for regeneration, in which case the population would go into decline. Whereas the impact of A and B, each on their own, was not of concern, the impact of A + B is to cause population decrease which is of concern. According to SNH[lxviii] "*Cumulative impact assessment can be expensive and time consuming, as it requires knowledge, at least in outline, of the effects of each existing or proposed development within the vicinity. We therefore only seek cumulative impact assessments where it is considered that a proposal could result in significant cumulative impacts which could affect the eventual planning decision. In some situations, a Habitats Regulations Appraisal may be required and this may involve a wider consideration of in combination and other impacts. The key principle for all cumulative impact assessments is to focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting*

process". Cumulative impacts may include cumulative collision mortality, disturbance, habitat loss or barrier effects, all of which should be considered in turn. Cumulative impacts of collision risk should be summed quantitatively, but according to SNH[lxviii] "*In practice some effects, such as levels of disturbance or the barrier effect, may need considerable additional research work to assess impacts quantitatively. A more qualitative process may need to be applied until this quantitative information is available, e.g. from post-construction monitoring or research"*.

10.168 Some of the birds recorded within the site may forage over a wide area, up to a distance of about 20km (e.g. goose species[lxx]). Those species using such a large area may be affected by other projects or activities within that range. This cumulative effects assessment considers effects up to 20km from Creag a' Bhàird Wind Farm, in order to assess whether bird populations may be significantly affected by multiple small effects at different sites within their home range. In addition to this, a further prerequisite is whether the project or activity is found within a similar habitat type, and therefore is likely to result in similar effects on similar species as Creag a' Bhàird may. It therefore follows that projects or activities within NHZ 15 (Loch Lomond, the Trossachs and Breadalbane) only are included.

10.169 A desk study has found no significant non-wind farm projects or activities within 20km inside NHZ 15 that would potentially affect any of the target species, and are not already incorporated into the baseline (e.g. forestry activities are well established in the area and so any effects on regional bird populations are likely to have been already incorporated into baseline survey results). There are however five other wind farms inside NHZ 15 and within 20km of the site, shown in **Table 10.9** and **Figure 10.16**. Mains of Pittendriech and Innernyte Wind Farms have been scoped out as they are within an adjacent NHZ (and just under 20km away). No impact assessment or baseline data have been made publically available to date for Crossburns Wind Farm and so this project has been scoped out of the cumulative assessment.

Table 10.9: Other Wind Farm projects considered within the cumulative impact assessment

Wind Farm	Distance from site	Status	Number of turbines	Notes
Griffin	0km	Operational in two phases in March and July 2012	68	Potential for operational cumulative impacts only
Calliachar	4.3km	Operational since Sep 2013	14	Potential for operational cumulative impacts only
North Calliachar	5.7km	Application submitted March 2013	7	Potential for construction and operational cumulative impacts
Crossburns	7.6km	Application submission late 2013	Up to 40	Scoping report only – no baseline data available for cumulative assessment
Mull Hill	11.9km	Under appeal since August 2013	9	Potential for construction and operational cumulative impacts

Predicted Cumulative Effects

Disturbance-displacement effects

10.170 Cumulative construction disturbance would only occur where projects have overlapping construction phases with Creag a' Bhàird Wind Farm. From the evidence in **Table 10.9**, this would be restricted to North Calliachar and Mull Hill Wind Farms only. During the operational phase of Creag a' Bhàird it is anticipated that all of the five projects will also be operational for at least part of the time (assuming consent for each). A summary of predicted effects for each project, taken from relevant submission documents, is shown in **Table 10.10**.

Table 10.10: Summary of predicted effects at other projects

Species	Wind Farm	Predicted effects in project EIAs
Black grouse	Creag a' Bhàird	A lek of up to 10-15 males may be disturbed. Should any leks be identified on the site prior to construction, a 500m disturbance buffer will be established and no activity would occur in these areas during the period of 1hr before and after dawn. No flights were recorded at risk and so no collision modelling was undertaken.
	North Calliachar	Peak count of 7 males and 3 females within site plus 500m buffer. The wind farm was however designed to avoid all multi-male leks, and as a result only a single lekking male was seen within the potential impact zone for disturbance to this species. Measures will be implemented under the proposed Habitat Management Plan (HMP) to directly benefit this species. This will ensure that any adverse effects are offset and that a net gain is delivered to this species, through enhanced habitat and reduced predation. There were no flights observed through the collision risk zone at rotor height, so the collision risk with the rotor blades would be of negligible magnitude and not significant.
	Mull Hill	Wind farm could potentially displace two black grouse leks (up to 15 males), but the predicted outcomes would be to either move to adjacent habitat or join nearby leks. Nevertheless a HMP would be implemented to offset any adverse effects on this species. No construction planned during breeding season within 500m of main lek site and no construction works will be undertaken during core black grouse lekking period (late March to mid-May) until two hours after sunrise.
	Griffin	Lek of ten birds recorded 600m from nearest construction area. Single male lek observed 160m from nearest proposed working area but buffered by plantation to be retained. Additional male recorded on alternative access route. Little usage of site for foraging or roosting. Predicted that if disturbed during 24 month construction period or operation, birds will move to alternative habitat or other lek sites. No flights recorded during flight activity surveys so no collision modelling undertaken. A land management plan was proposed for the site in the ES, which would enhance habitat for black grouse. A lek protection protocol during construction minimised the level of pedestrian activity at the access gate during lekking times. Since construction the main black grouse leks were located away from the wind farm and have been largely unaffected by the development[lxxi in lxxiii].
	Calliachar	There were no records of black grouse within the main study area or the 1km buffer during any surveys, therefore no adverse effects on that species were predicted. Mitigation measure to ensure that site access tracks do not interfere with any black grouse leks. For the revised scheme an Ecological (Habitat and Species) Protection Plan (EPP) was produced as part of the SEMP prior to

Species	Wind Farm	Predicted effects in project EIAs
		construction commencing on site. A main aim is to increase the potential on the Moness Estate (1,320 ha) to support black grouse and monitor the progress.
Hen harrier	Creag a' Bhàird	No breeding activity recorded and infrequent site usage suggesting the site is of low importance for the species. Collision modelling predicted a mortality rate of 0.03 collisions per year.
	North Calliachar	No evidence of breeding within 2km of the wind farm site during baseline surveys and there is a minimum 500m buffer between all turbine locations and historic nest sites. Flight activity over the proposed wind farm site was very low and overall collision risk would be negligible in the context of the NHZ population (only 0.01 collisions per year). There could be a loss of a small amount of foraging area through disturbance from a zone around the wind turbines, though this would only affect a small part of the range of this species and a part that the VP surveys have shown not to be particularly important.
	Mull Hill	Recorded infrequently and no breeding evidence – not assessed
	Griffin	Not assessed in ES chapter, but two hen harrier collisions in 2012 have been documented[lxxii]. Since the felling associated with the development has been undertaken, use of the area by hen harriers has increased, due to an increase in habitat availability[lxxiii].
	Calliachar	Two pairs were nesting within the original study area in 2004, and RSPB reported up to 4 pairs breeding within the site and its surrounds in recent years. A predicted annual mortality rate of 0.05 collisions (at 99% avoidance rate) was predicted using the revised layout, which was the same as the original calculations. Design mitigation of the revised site included avoiding locating wind turbines within 500m of all recent hen harrier nest sites and important foraging areas. For the revised scheme an Ecological (Habitat and Species) Protection Plan (EPP) was produced as part of the SEMP prior to construction commencing on site. A main aim is to increase the potential on the Moness Estate (1,320 ha) to support hen harrier and monitor the progress.
Short-eared owl	Creag a' Bhàird	No short-eared owl breeding evidence within 500m of site boundary. Site is not currently used for foraging so negligible net habitat loss and no collision modelling was undertaken.
	North Calliachar	Not assessed as no impacts identified
	Mull Hill	No short-eared owls recorded nesting within 500m of the turbines. Species may be displaced from foraging close to turbine areas but activity levels are variable, and there is abundant alternative habitat nearby (low magnitude). Mitigation included the exclusion of construction activity around any nest site recorded during pre-construction surveys. Collision modelling predicted a precautionary 0.25 collisions per

Species	Wind Farm	Predicted effects in project EIAs
		breeding season using 2010 data, but during 2011 no flights were recorded at risk, so predicted mortality was zero.
	Griffin	Not assessed as no impacts identified
	Calliachar	Up to four pairs were recorded within the original study area but only one breeding pair was located within 500m of turbines. Design mitigation of the revised layout included avoiding locating wind turbines within areas that have been regularly used by nesting short-eared owls in recent years as much as possible. The overall level of short-eared owl flight activity within the study area was relatively high, and associated mainly with the birds' nesting areas. An annual mortality rate of 0.43 collisions (at 98% avoidance rate) was predicted using the revised layout specifications. For the revised scheme an Ecological (Habitat and Species) Protection Plan (EPP) was produced as part of the SEMP prior to construction commencing on site. A main aim is to increase the potential on the Moness Estate (1,320 ha) to support short-eared owl and monitor the progress.

Sources:
North Calliachar:
Golder Associates (2013) North Calliachar Environmental Statement Volume 2, Annex B: Ornithology. I&H Brown NC Ltd.
Mull Hill:
Force 9 Energy LLP (Dec 2011). Mull Hill Wind Farm Environmental Statement Volume 1: Written statement and Technical Appendices.
Griffin:
Green Power (April 2004). Griffin Wind Farm Environmental Statement, Chapter 8: Ornithology Impact Assessment.
Hen harrier collisions documented in http://www.rspb.org.uk/news/336895-harrier-deaths-renew-calls-for-continued-windfarm-monitoring
Calliachar:
Environ (2011). Calliachar Wind Farm Environmental Statement. SSE Renewables (modified scheme).
Golder Associates (2007). Calliachar Wind Farm Environmental Statement. I & H Brown (original scheme).

Black grouse

10.171 From the summary of results in **Table 10.10** up to 32-37 lekking male black grouse were predicted to occur within potential zones of disturbance at Creag a' Bhàird (10-15 males), North Calliachar (seven males) and Mull Hill (15 males) combined (3-4% of the NHZ population). The impact assessment for Creag a' Bhàird alone has shown that no leks are likely to be displaced due to the distance from the site and access track. Due to a combination of design mitigation, construction mitigation measures, as well as habitat management/enhancement plans at other sites (**Table 10.10**), cumulative disturbance effects will be largely avoided. For operational displacement, evidence from post-construction monitoring at Griffin has suggested that nearby leks to both Griffin and Creag a' Bhàird have largely been unaffected by the development, which may be at least in part due to the land management plan designed to enhance black grouse habitat within the site, as well as a lek protocol to minimise construction disturbance. At Calliachar no black grouse leks were recorded within 1km of the site, and habitat enhancement has potentially provided increased habitat availability since construction. Overall therefore the cumulative disturbance-displacement effect, when considering various mitigation and enhancement measures would be no more than **Minor** and therefore **Not Significant** within the context of the NHZ and SSSI populations.

Hen harrier

10.172 No evidence of hen harrier breeding within a potential disturbance zone was recorded at either North Calliachar or Mull Hill wind farms (where construction activity may overlap), and generally flight activity levels were very low, with only a small amount of foraging habitat potentially affected around the turbines at North Calliachar. When considering operational effects, although the species was not assessed for Griffin Wind Farm, it is evident that displacement is not a significant issue, with the recovery of two hen harriers injured by the effects of wind turbines (see Bird Collision Mortality Risks section below for more details). No breeding evidence has been reported within possible displacement zones from this site. At Calliachar no significant disturbance-displacement effects were predicted as the site does not form an important part of a foraging range. Cumulative disturbance-displacement impacts can therefore be assessed as **Minor** and **Not Significant** in the context of the EIA Regulations, within the context of respective NHZ and SSSI populations.

10.173 In-combination effects on the hen harrier population of the Forest of Clunie SPA are assessed in the Habitat Regulations Appraisal in **Appendix 10.2**.

Short-eared owl

10.174 For **short-eared owl**, a small amount of foraging habitat at Mull Hill may be temporarily unavailable during construction, but would still remain insignificant even cumulatively with other sites. With the successful implementation of mitigation measures at Mull Hill and at Creag a' Bhàird Wind Farm (paragraph10.130) no breeding pairs would be affected during the construction period.

10.175 The species was not considered in either the North Calliachar or Griffin assessments and so significant disturbance-displacement effects are unlikely. For Calliachar it was concluded if unmitigated, one breeding pair may be affected by disturbance-displacement effects, and flight activity rates were relatively high within the site, suggesting some foraging habitat may be lost. Measures to minimise effects are outlined as part of design mitigation and habitat enhancement, and it is therefore likely that breeding pairs would be able to find alternative nesting and foraging habitat nearby, particularly since there is often notable natural inter-annual variation in nest site location for this species. With the possible breeding location at Creag a' Bhàird beyond disturbance-displacement distance from turbines (580m from the site boundary), and operational maintenance activities likely to be infrequent and of lower intensity than during construction, cumulative disturbance-displacement effects can therefore be assessed as no more than **Minor** and **Not Significant** in the context of the EIA Regulations, within the context of respective NHZ population.

Bird Collision Mortality Risks

10.176 Collision rates estimated by the Collision Risk Model for Creag a' Bhàird Wind Farm should be considered alongside collision mortality caused by other wind farms in **Table 10.9** to provide an estimated cumulative mortality rate. In a number of cases, other projects have not carried out modelling for a species, and this is usually a reflection of very low activity rates recorded during baseline surveys. Consequently the mortality rates in these particular cases are assumed to be negligible.

Black grouse

10.177 Generally the large majority of black grouse flights are below rotor heights, and as a consequence of this (and in some cases very low levels of activity), no collision modelling was undertaken for any project, and the likelihood of collisions with rotor blades is very low. Despite this, as outlined above, the possibility of collisions with turbine towers and other infrastructure remain. Mitigation measures have been recommended for the turbines closest to lek sites at Creag a' Bhàird which would reduce collision risk to an acceptable level. At other project sites such specific mitigation measures may not be implemented, but since habitat management and enhancement measures have been considered, which, with the exception of Griffin, would be away from turbines, then black grouse flight activity close to infrastructure would be unlikely. In the case of Griffin, although habitat may now be improved for the species, the main lek site was recorded 600m away, which suggests that flight activity will remain low within the wind farm site. It is therefore considered that cumulative collision rates would be **Minor** and **Not Significant** in the context of the EIA Regulations, within the context of NHZ population.

Hen harrier

10.178 A mortality rate of 0.03 hen harrier collisions per year was predicted at Creag a' Bhàird Wind Farm, and when combined with the predicted rates at North Calliachar (0.01 collisions per year) and Calliachar (0.05 collisions per year), an overall annual mortality rate of 0.09 collisions per year is predicted, which equates to one collision every 11 years from these three wind farms. Evidence from Mull Hill suggests that, although not quantified, collision risk for hen harriers would be negligible and would not significantly contribute to these rates. Although hen harrier collision mortality was not considered in the Griffin ES, two hen harrier collisions have been recorded within the first year of operation within the same area of the wind farm in spring 2012. Post mortem examinations concluded that the injuries, although not consistent with collision with turbine blades, were likely as a consequence of turbulence around a turbine[lxxiv]. Griffin Wind Farm (68 turbines) is much larger in size than Creag a' Bhàird (13 turbines), Calliachar (14 turbines), North Calliachar (7 turbines) and Mull Hill (9 turbines) combined, and so it is possible that mortality would be more likely there, rather than at other sites.

10.179 The area of the Griffin Wind Farm where recoveries took place was previously forestry that was clear-felled to aid the wind farm's construction and operation, and so would likely have become more attractive to foraging harriers compared to when baseline surveys were carried out. Unlike the proposal for Creag a' Bhàird (see Operational Effects), one of the objectives in the Griffin Land Management Plan (LMP) was the restoration of open moorland habitat (originally dry heath but now amended to mosaic habitats) in the clear-felled turbine envelope to increase foraging habitat for raptors[lxxv]. This was to be achieved by protecting existing open habitats, encouraging vegetation regeneration after tree removal and managing open ground habitat against regeneration of trees or bracken. Although no specific information is available, RSPB has noted that they are continuing to work with the developer to monitor the site, and use the information to change the management of the open ground areas, thereby reducing future risks and reduce the threat of future collisions.

10.180 In contrast to Griffin, the planned regeneration of forestry and proposals to make the Creag a' Bhàird site unattractive for foraging immediately post-felling mean that collisions would be much less likely. With an NHZ population of at least 71 pairs and an average baseline mortality rate of 0.222[xix], a cumulative mortality rate of 0.09 collision per year when considering the other projects would be an increase in baseline mortality by 0.28% (assuming all mortality is on adult breeders). Despite the NHZ population being near unfavourable conservation status, this is likely to be within the natural range of variation in mortality within the NHZ population, and therefore sustainable at an NHZ level. With a reduced level of mortality likely at Griffin in future years due to planned changes in on-site management to reduce collision risks, the cumulative collision mortality is considered to be **Minor** and **Not Significant** in the context of the EIA Regulations, within the context of the NHZ and SSSI populations.

10.181 In-combination effects on the hen harrier population of the Forest of Clunie SPA are assessed in the Habitat Regulations Appraisal in **Appendix 10.2**.

Short-eared owl

10.182 The collision rate predicted for short-eared owl at Mull Hill was up to 0.25 collisions per breeding season, and at Calliachar was 0.43 collisions per year, giving a cumulative mortality rate of 0.68 collisions per year, or one collision every 1-2 years. The species was not assessed at Calliachar, nor Griffin, although in the latter's case the site may have become more suitable for the species since operation (but may in future be less so – see hen harrier above). The mitigation measures at Creag a' Bhàird described above for hen harrier (vegetation management to keep prey densities low within turbine area) are equally applicable to short-eared owl, and so a significant collision mortality is considered unlikely. Therefore although the species is probably in unfavourable conservation status at a NHZ level, and additional mortality is predicted, Creag a' Bhàird will not significantly contribute to this. As such the cumulative collision risk is considered to be **Minor** and **Not Significant** in the context of the EIA Regulations, within the context of the NHZ population.

Proposed Mitigation

10.183 Given the non-significant levels of cumulative effects on target bird populations in this area, no mitigation is considered necessary additional to pre-construction surveys, spatial and temporal restrictions for construction activity around nests of lek sites, the deployment of chestnut paling for black grouse, and vegetation management for hen harrier and short-eared owl which will keep prey densities low.

Residual Cumulative Effects

10.184 Residual cumulative effects on bird populations are considered to be no more than **Minor** and **Not Significant** in the context of the EIA Regulations.

Further Survey Requirements and Monitoring

10.185 Pre-construction breeding bird surveys will be undertaken as part of the Breeding Bird Protection Plan.

10.186 Breeding raptor and black grouse lek surveys should be completed during construction and years 1, 2, 3, 5, 10 and 15 during the operational period.

Summary of Effects

10.187 **Table 10.11** below summarises the predicted effects of Creag a' Bhàird Wind Farm on birds.

Table 10.11: Summary of Effects

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Construction			
Black grouse: Displacement	Minor-moderate	Restriction on activity within 500m one hour before and after dawn during breeding season. Control of site access from A826 and minimise pedestrian activity along access track.	Minor
Hen harrier: Displacement	Minor	Pre-construction surveys to determine breeding and exclusion of construction around any nest	Minor
Short-eared owl: Displacement	Minor-moderate	Construction activities to commence prior to breeding season. Visual deterrents put in place on restricted sections of access track to exclude breeding attempts. Minimise pedestrian activity along access track. Pre-construction surveys within wind farm to determine breeding and exclusion of construction around any nest	Minor
Operation			
Black grouse: Collision	Minor	Chestnut Paling Fencing to reduce collision risk around turbines close to lek sites.	Negligible
Hen harrier: Collision	Moderate	Replanting conifer plantation Prey surveys and strimming of rides	Minor
Short-eared owl: Collision	Minor	Replanting conifer plantation Monitoring and strimming of rides to reduce prey density	Negligible
Black Grouse: Displacement	Minor	None	Minor
Hen harrier: Displacement (of flight lines)	Negligible	None	Negligible
Short-eared owl: Displacement (of flight lines)	Negligible	None	Negligible
Cumulative			
Collision	Minor	None	Minor
Disturbance/Displacement (Construction)	Minor	None	Minor
Disturbance/Displacement (Operation)	Minor	None	Minor

[i] Scottish Natural Heritage. (2010). Survey methods for use in assessing the impacts of onshore windfarms on bird communities. SNH.
[ii] Scottish Natural Heritage. (2013). Recommended bird survey methods to inform impact assessment of onshore wind farms. SNH.
[iii] Scottish Natural Heritage (2013). Assessing Connectivity with Special Protection Areas (SPAs). Guidance Note, July 2013.
[iv] Forrester, R.W., Andrews, I.J., McInerny, C.J., Murray, R.D., McGowan, R.Y., Zonfrillo, B., Betts, M.W., Jardine, D.C. and Grundy, D.S. (2007). The Birds of Scotland. Scottish Ornithologists Club, Aberlady.
[v] SERAD (Scottish Executive Rural Affairs Department) 2000. Habitats and Birds Directives, Nature Conservation: Implementation in Scotland of EC Directives on the Conservation of Natural Habitats and of Wild Flora and Fauna and the Conservation of Wild Birds ('The Habitats and Birds Directives'), Revised Guidance Updating Scottish Office Circular No 6/1995.
[vi] UK Biodiversity Action Plan.
[vii] Eaton, M.A., Brown, A.F., Noble, D.G., Musgrove, A.J., Hearn, R.D., Aebischer, N.J., Gibbons, D.W., Evans, A. and Gregory, R.D. (2009). Birds of conservation concern 3. The population status of birds in the United Kingdom, Channel Islands and Isle of Man, British Birds 102: 296-341.
[viii] Scottish Natural Heritage. (2000). Windfarms and birds: calculating a theoretical collision risk assuming no avoidance action. SNH Guidance Note, SNH.
[ix] Scottish Natural Heritage. (2006). Assessing significance of impacts from onshore windfarms on birds out with designated areas. SNH.
[x] Scottish Natural Heritage. (September, 2009). Environmental Statements and Annexes of Environmentally Sensitive Bird Information; Guidance for Developers, Consultants and Consultees. SNH.
[xi] Scottish Natural Heritage. (March 2012). Assessing the Cumulative Impacts of Onshore Wind Energy Developments, SNH.
[xii] Scottish Natural Heritage (July 2013) Assessing connectivity with Special Protection Areas. SNH.
[xiii] Bright, J. A., Langston, R. H. W., Bullman, R., Evans, R. J., Gardner, S., Pearce-Higgins, J. & Wilson, E. (2006). Bird Sensitivity Map to provide locational guidance for onshore wind farms in Scotland. Royal Society for the Protection of Birds.
[xiv] Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. (1997). Bird disturbance: improving the quality of disturbance research. Journal of Applied Ecology 34:275-288.
[xv] Ruddock, M. & Whitfield, D. P. (2007). A Review of Disturbance Distances in Selected Bird Species, A report from Natural Research (Projects) Ltd to Scottish Natural Heritage 2007.
[xvi] Patterson, I.J. and Lambie, D. (2013). Ornithological survey at Griffin wind farm: Flight activity Winter 2012/13. Northern Ecological Services.
[xvii] Sim, I.M.W., Eaton, M.A., Setchfield, R.P., Warren, P.K. and Lindley, P. (2008). Abundance of male black grouse *Tetrao tetrix* in Britain in 2005, and change since 1995-96. Bird Study 55: 304-313.
[xviii] Hayhow, D.B., Eaton, M.A., Bladwell, S., Etheridge, B., Ewing, S.R., Ruddock, M., Saunders, R., Sharpe, C., Sim, I.M.W., and Stevenson, A. (2013). The status of the Hen Harrier, Circus cyaneus, in the UK and Isle of Man in 2010. Bird Study 60:4, 446-458.
[xix] Fielding, A., Haworth, P., Whitfield, P., McLeod, D. & Riley, H. (2011). A Conservation Framework for Hen Harriers in the United Kingdom. JNCC Report 441. Joint Nature Conservation Committee, Peterborough.
[xx] Musgrove, A., Aebischer, N., Eaton, M., Hearn, R., Newson, S., Noble, D. Parsons, M., Risely, K. and Stroud, D. (2013). Population estimates of birds in Great Britain and the United Kingdom. British Birds 106: 64-100.
[xxi] Steven, R., Pickering, C. and Castley, J.G. (2011). A review of the impacts of nature based recreation on birds. Journal of Environmental Management 92: 2287-2294.
[xxii] Marzano, M. and Dandy, N. (2012). Recreationist behaviour in forests and the disturbance of wildlife. Biodiversity and Conservation 21: 2967-2986.

[xxiii] Warren, P., Baines, D. and Richardson, M. (2009). Mitigating against the impacts of human disturbance on black grouse *Tetrao tetrix* in northern England. Folia Zoologica 58: 183-189.
[xxiv] Miquet, A. (1988). Effects of winter disturbance on the black grouse *Tetrao tetrix*. Gibier Faune Sauvage 5: 321-330.
[xxv] Herzog, S. and Krueger, T. (2003). Influences of habitat structure, climate, disturbances and predation on population dynamics of black grouse in the northern Ore Mountains. Sylvia 39 (Supplement): 9-15.
[xxvi] Baines, D. and Richardson, M. (2007). An experimental assessment of the potential effects of human disturbance on black grouse *Tetrao tetrix* in the North Pennines, England. Ibis 149: 56-64.
[xxvii] Bright, J., Langston, R., Bullman, R., Evans, R., Gardner, S. and Pearce-Higgins, J. (2008). Map of bird sensitivities to Windfarms in Scotland: A tool to aid planning and conservation. Biological Conservation 141: 2342-2356.
[xxviii] Johnstone, G.W. (1969). Ecology, dispersion and arena behaviour of Black Grouse (*Lyrurys tetrix* L.) in Glen Dye, N.E. Scotland. Ph.D. thesis, University of Aberdeen.
[xxix] Cayford, J.T. (1993). Black grouse and forestry: Habitat requirements and management. Forestry Commission Technical Paper 1, Edinburgh.
[xxx] Anon. (2003). Black Grouse Species Action Plan. UK Biodiversity Group Tranche 2 Action Plans – Volume VI: Terrestrial and Freshwater Species and Habitats, October 1999, Tranche 2, vol. VI, p. 17.
[xxxi] Warren, P., Baines, D. (2004). Black Grouse in northern England: stemming the decline. British Birds 97, 183–189.
[xxxii] Zeiler, H and Berger, V. (2004). Windfarm extensions, a risk for wild animals. Unpublished report.
[xxxiii] Zeiler, H.P. and Grünschachner-Berger, V. (2009). Impact of wind power plants on black grouse, *Lyrurus tetrix* in Alpine regions. Folia Zoologica 58: 173-182.
[xxxiv] Grünschachner-Berger, V. and Kainer, M. (2011). Black grouse *Tetrao tetrix* (Linnaeus 1758): How to live between skiing areas and windparks. Egretta 52: 46-54.
[xxxv] Johnson, G. and Holloran, M. (2010). Greater sage-grouse and wind energy development: a review of the issues. Western EcoSystems Technology Inc. 78pp.
[xxxvi] Pendlebury, C., Zisman, S., Walls, R., Sweeney, J., McLoughlin, E., Robinson,C., Turner, L. & Loughrey, J. (2011). Literature review to assess bird species connectivity to Special Protection Areas. Scottish Natural Heritage Commissioned Report No. 390.
[xxxvii] Patterson, I.J. and Lambie, D. (2012). Ornithological survey at Griffin wind farm: Flight activity Spring and summer 2012. Northern Ecological Services.
[xxxviii] Scottish Natural Heritage (2011). Guidance note on construction and breeding birds. http://www.snh.gov.uk/docs/A514967.pdf
[xxxix] Scottish Natural Heritage (2011). Guidance note on construction and breeding birds. http://www.snh.gov.uk/docs/A514967.pdf
[xl] Gill, J.P., Townsley, M. and Mudge, G.P. (1996). Review of the impacts of Windfarms and other aerial structures upon birds. SNH Review 21: 68pp.
[xli] Winkelman, J.E. (1992a). The impact of the Sep wind park near Oosterbierum, The Netherlands, on birds 1: Collision victims. RIN rapport 92/2 Arnhem: Rijksintiuut voor Natuurbeheer.
[xlii] Winkelman, J.E. (1992b). The impact of the Sep wind park near Oosterbierum, The Netherlands, on birds 2: Nocturnal collision risks. RIN rapport 92/3 Arnhem: Rijksintituut voor Natuurbeheer.
[xliii] Painter, A., Little, B. and Lawrence, S. (1999). Continuation of bird studies at Blyth Harbour Windfarm and the implications for offshore Windfarms. Report by Border Wind Ltd. DTI, ETSU W/13/00485/00/00.
[xliv] Erickson, W.P., Johnson, G.D., Strickland, M.D., Young, D.P., Semja, K.J. and Good, R.E. (2001). Avian collisions with wind turbines: A summary of existing studies and comparisons to other sources of avian collision mortality in the United States. Western Ecosystems Technology Inc.
[xlv] Drewitt, A.L. and Langston, R.L.H. (2006). Assessing the impacts of Windfarms on birds. Ibis 148: 29-42.
[xlvi] Scottish Natural Heritage. (2010). Use of avoidance rates in the SNH Windfarm collision risk model. SNH.
[xlvii] Scottish Natural Heritage (2013) Avoidance rates for wintering species of geese in Scotland at onshore wind farms. SNH
[xlviii] Band, W., Madders, M. and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at Windfarms. In: de Lucas, M., Janss, G.F.E. and Ferrer, M. (eds.) Birds and Windfarms: Risk Assessment and Mitigation. Pp. 259-275. Quercus, Madrid.
[xlix] Whitfield, D.P. and Madders, M. (2006). A review of the impacts of wind farms on hen harriers *Circus cyaneus* and an estimation of collision avoidance rates. Natural Research Information Note 1 (revised). Natural Research Ltd, Banchory.
[l] Scottish Natural Heritage (2010). Post-construction management of Windfarms on clear-felled forestry sites; reducing the collision risk for hen harrier, merlin and short-eared owl from Special Protection Areas.
[li] Whitfield, D.P. & Madders, M. 2006. A review of the impacts of windfarms on hen harriers Circus cyaneus and an estimation of collision avoidance rates. Natural Research Information Note 1 (revised). Natural Research Ltd, Banchory, UK.
[lii] Madden, B. and Porter, B. (2007). Do wind turbines displace hen harriers Circus cyaneus from foraging habitat? Preliminary results of a case study at the Derrybrien Wind Farm, County Galway. Irish Birds 8: 231-236.
[liii] Scott, D. and McHaffie, P. (2008). Hen harrier circus cyaneus killed at windfarm site in County Antrim. Irish Birds 8: 436-437.
[liv] Watson, D. 1977. The Hen Harrier. Poyser, Berkhamsted.
[lv] Redpath, S., Madders, M., Donnelly, E., Anderson, B. Thirgood, S., Martin, A. and McLeod, D. 1998. Nest site selection by hen Harriers in Scotland. Bird Study 45: 51-61.
[lvi] Petty, S.J. and Anderson, D. 1986. Breeding by hen harriers Circus cyaneus on restocked sites in upland forests. Bird Study 33: 177-178.
[lvii] Sim, I.M.W., Gibbons, D.W., Bainbridge, I.P. & Mattingley, W.A. 2001. Status of the hen harrier Circus cyaneus in the UK and the Isle of Man in 1998. Bird Study 48: 341-353.
[lviii] Proe, M.F., Craig, J., Dutch, J., Griffiths, J. 1997. Use of vector analysis to determine the effects of harvest residues on early growth of second-rotation Sitka spruce. Forest Ecology and Management 122: 87-105.
[lix] Petty, S.J. 1996. Adaptations of raptors to man-made forests in the British uplands. In: Raptors in Human Landscapes (Ed. Bird DM, Varland DE and Negro JJ). Pp. 201-214. Academic Press, London.
[lx] Scottish Natural Heritage (2010). Post-construction management of wind farms on clear-felled forestry sites: reducing the collision risk for hen harrier, merlin and short-eared owl from Special Protection Areas. Information Note, November 2010.
[lxi] Hardey, J., Crick, H., Wernham, C., Riely, H., Etheridge, B. & Thompson, D. (2006). Raptors: a field guide to survey and monitoring. The Stationery Office, Edinburgh.
[lxii] Pearce-Higgins, J.W., Stephen, L., Langston, R.H.W., Bainbridge, I.P. and Bullman, R. (2009). Distribution of breeding birds around upland Windfarms. Journal of Applied Ecology 46: 1323-1331.
[lxiii] Whitfield, D.P., Green, M. and Fielding, M.H. (2010). Are breeding curlew *Numenius arquata* displaced by wind energy developments? Natural Research Projects Ltd., Banchory.
[lxiv] Devereux, C.L., Denny, M.J.H. and Whittingham, M.J. (2008). Minimal effects of wind turbines on the distribution of wintering farmland birds. Journal of Applied Ecology 45: 1689-1694.
[lxv] Pearce-Higgins, J.W., Stephen, L., Douse, A. and Langston, R.H.W. (2012). Greater impacts of Windfarms on bird populations during construction than subsequent operation: results of a multi-site and multi-species analysis. Journal of Applied Ecology 49: 386-394.
[lxvi] Masden, E.A., Haydon, D.T., Fox, A.D. and Furness, R.W. (2010). Barriers to movement: Modelling energetic costs of avoiding marine Windfarms amongst breeding seabirds. Marine Pollution Bulletin 60: 1085-1091.
[lxvii] Whitfield, D.P. & Madders, M. 2006. A review of the impacts of windfarms on hen harriers Circus cyaneus and an estimation of collision avoidance rates. Natural Research Information Note 1 (revised). Natural Research Ltd, Banchory, UK.
[lxviii] Scottish Natural Heritage (2012). Assessing the cumulative impact of onshore wind energy developments. Information and Guidance paper, SNH. 41pp.
[lxix] Masden, E.A., Fox, A.D., Furness, R.W., Bullman, R. and Haydon, D.T. (2010). Cumulative impact assessments and bird/wind farm interactions: Developing a conceptual framework. Environmental Impact Assessment Review 30, 1-7.
[lxx] Scottish Natural Heritage (March 2012) Assessing Connectivity with Special Protection Areas (SPAs).
[lxxi] Ross, A. (2012). Griffin Wind Farm LMP: Black grouse lek survey report 2012. Northern Ecological Services report to SSE Renewables.
[lxxii] http://www.rspb.org.uk/news/336895-harrier-deaths-renew-calls-for-continued-windfarm-monitoring
[lxxiii] Golder Associates (2013). North Calliachar Environmental Statement Volume 2, Annex B: Ornithology. I&H Brown NC Ltd.
[lxxiv] Stanek, S. (2013). Dicing with Death? An evaluation of Hen Harrier (Circus cyaneus) flights and associated collision risk with wind turbines, using a new methodology. MSc. thesis submitted to Imperial College London.
[lxxv] Griffin LMP Amendment. Report C6.47 of planning application 04/00004/WIND on Perth & Kinross Council planning website.

11 Archaeology and Cultural Heritage

Introduction

11.1 This chapter considers the potential effects of the proposed Creag a' Bhàird Wind Farm on cultural heritage. It details the baseline situation based on the results of a desk-based study and walkover survey and the potential physical and setting effects of the proposed development. The assessment was undertaken by CgMs Consulting Limited.

11.2 Some figures relevant to both the Landscape and Visual Impact Assessment and the cultural heritage study are presented in **Chapter 6: Landscape and Visual Amenity**.

Study Area Description

11.3 The following areas are referred to in the text:

- The Site (**Figure 11.1**). This is based on the site boundary, including the access track from the main road; data has been gathered for this area to identify potential physical effects.
- Wider Study Area (**Figure 11.2**). This extends as a 5km buffer from the proposed turbine locations. Data has been gathered for this area to identify potential setting effects relating to all designated assets. This includes scheduled monuments and listed buildings (there are no inventory battlefields, world heritage sites, inventory gardens and designed landscapes (GDL), or conservation areas). Data relating to undesignated assets was also recovered from this area to inform assessment of the potential for previously unrecorded assets in the site.

11.4 The Historic Scotland guidance note concerning the assessment of impacts on setting advises that assessment should not be constrained by pre-defined zones. More distant assets and places should be considered at an initial stage and discounted after assessment.[i] The study area above was defined after an initial stage of assessment and is an amendment to the scope of work described in the scoping report. The application of the wider study area was agreed during consultation with Perth and Kinross Heritage Trust (PKHT) and the Perth and Kinross Conservation Officer (see **Table 11.1**). Consultation with Historic Scotland led to an agreed list of assets that should be fully assessed and the potential effects on a number of scheduled monuments within the wider study area were 'scoped out' (see **Table 11.1**).

Effects Assessed in Full

11.5 The following effects have been assessed in full:

- Direct effects resulting from the construction of the wind farm, including forestry operations, infrastructure and accidental damage.
- Indirect effects on the settings of designated heritage assets resulting from the operation of the wind farm. In the current context, such effects will be restricted to those resulting from visual impact leading to a loss of cultural significance or rendering it more difficult to appreciate an asset's cultural significance.

Effects Scoped Out

11.6 On the basis of the desk-based and survey work undertaken, the professional judgement of the EIA team, experience from other relevant projects, consultation responses and policy guidance or standards, the following have been 'scoped out':

- Effects on the settings of scheduled monuments within the wider study area that were considered unlikely to be susceptible to impacts on their setting as a result of their location in relation to the proposed development and/or their cultural significance. The relevant assets were confirmed during consultation with Historic Scotland and Perth and Kinross Heritage Trust (see **Table 11.1**) and the excluded assets are listed in **Appendix 11.1**.
- Effects on the settings of designated heritage assets outside the wider study area; in particular, effects on four GDLs (The Hermitage, Murthly Castle, Grandtully Castle and Dunkeld House) within 10km but outside the ZTV of the proposed development. This was confirmed during consultation with Historic Scotland and Perth and Kinross Heritage Trust (see **Table 11.1**) and brief descriptions of these assets are contained in **Appendix 11.1**.

Assessment Methodology

Assessment Structure

11.7 The assessment is structured around the consideration of potential effects on the following:

- physical fabric of on-site archaeology;
- settings of designated cultural heritage assets in the surrounding area.

Legislative Background

11.8 The Ancient Monuments and Archaeological Areas Act 1979 and the Planning (Listed Buildings and Conservation Areas)(Scotland) Act 1997 provide the legislative basis for the protection of the historic environment. These were amended by the Historic Environment (Amendment) (Scotland) Act 2011.

Data Sources and Guidance

11.9 The following data sources have been used.

- Historic Scotland Geographic Information System (GIS) datasets for designated assets;
- National Monuments Record of Scotland (NMRS), including aerial photography (relevant images are listed in **Appendix 11.2**);
- Perth and Kinross Historic Environment Record (PKHER);
- Historic Land Use Assessment data (Royal Commission on the Ancient and Historical Monuments of Scotland; RCHAMS);
- National Library of Scotland;
- Other readily available documentary sources, including *Statistical Accounts*.[1]

11.10 The study has been undertaken with reference to relevant Institute for Archaeologists' guidance[ii] and the requirements of Perth and Kinross Heritage Trust, as outlined in their scoping response (see **Table 11.1**). In response to the scoping report, Historic Scotland indicated that they were broadly content with the approach as set out therein, but noted that they generally advised that the assessment of setting effects on assets should be based on a ZTV rather than study areas of a prescribed distance. A revision to the scope of assessment was agreed with Historic Scotland and Perth and Kinross Heritage Trust in subsequent consultation (see **Table 11.1** and **Section 11.4**).

11.11 The assessment draws on the following guidance:

- *Scottish Historic Environment Policy.*[iii]
- *Managing Change in the Historic Environment: Setting.*[iv]

11.12 Scottish Historic Environment Policy (SHEP) sets out Scottish Ministers' policies for the historic environment, provides policy direction and a framework that informs management of the historic environment. Of particular relevance to this assessment is a key principle with regard to setting, which states that conservation of the historic environment should 'have regard to retaining, or where appropriate enhancing, the setting of the site, monument, building or landscape'.[v] It goes on to note that where change may have an impact on the historic environment appropriate assessment methodologies should be used to determine the full impact of proposed development. SHEP notes that there are a range of mechanisms in place to protect and manage the historic environment, including consents and consideration in the planning system, and that both Historic Scotland and planning authorities have relevant powers and responsibilities.

11.13 Further advice on the assessment process is given in a Historic Scotland guidance note.[vi] This sets out principles that apply to developments, which may affect the settings of designated assets. The guidance

[1] The Statistical Accounts of Scotland consist of three series of documentary publications covering life in Scotland in the 18th, 19th and 20th centuries. They comprise accounts of each parish produced by the relevant minister. The first two, published from 1791-99 and 1834-45, are valuable sources of local historical information.

note is used to assist in determining applications and notes that it is up to planning authorities to determine whether a development will impact on the setting of a historic asset, but that this may also be identified through Environmental Impact Assessment.

11.14 The guidance note defines setting thus: '*Setting should be thought of as the way in which the surroundings of a historic asset or place contribute to how it is experienced, understood and appreciated'.*[vii] It notes that setting often extends into the broader landscape and can include views to, or from, aesthetic qualities and the character of the surroundings, as well as other factors. These factors can combine in an overall effect that the note terms a 'Sense of Place'.

11.15 The note sets out a framework for assessing the impact of any development on the setting of historic assets, which consists of three stages:

- Identify the historic assets that may be affected by a proposed change.
- Define the setting by establishing how the surroundings contribute to the ways in which the historic asset or place is understood, appreciated and experienced.
- Assess how any change would impact upon that setting.

11.16 The methodology of this assessment is consistent with the framework. It has also taken into account the guidance given in Section 4.13 of the note, which explains that an assessment of effects on setting should not be restricted to the interruption of key views but should include: 'whether the proposed change would dominate or detract in a way that affects our ability to understand and appreciate the historic asset'.[viii] The assessment also considers the potential for cumulative effects.

11.17 The guidance note also advises that where assessment has demonstrated an adverse effect it may be possible to design development to reduce this effect to a minimal level.

Field Survey

11.18 Field survey of the site was undertaken on the 19th April 2013 in sunny conditions with excellent visibility. The effectiveness of field survey in areas of thick conifer forestry is compromised and ineffective due to the dense concentration of mature trees. Therefore, it was agreed with PKHT that the scope of the field survey would be restricted to open areas in the vicinity of proposed turbines (corridors around watercourses, fire breaks and existing access tracks). The location and extents of assets were recorded using consumer grade Global Positioning System (GPS) handset with European Geostationary Navigation Overlay Service (EGNOS) correction, accurate to 3m.

11.19 Relevant assets in the wider study area were visited to assess potential effects on their setting on the 24th September 2013 in moderate visibility.

Consultation

11.20 A table of consultation responses is set out below:

Table 11.1: Consultation Responses

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Perth and Kinross Heritage Trust (PKHT)	Formal scoping consultation	Indicated agreement with the scope of assessment outlined in the Scoping Report. Noted that the chapter should contain recommendations regarding mitigation.	In response to comments from Historic Scotland a revised scope of assessment was agreed with PKHT regarding effects on scheduled monuments (email of 29th May 2013). A reduction in the scope of assessment regarding Category B & C listed structures (from a 10km to 5km study area) was agreed at the same time. PKHT also advised that the Perth and Kinross Council Conservation Officer should be consulted (see below).
	Follow-up consultation with regard to mitigation of direct effects on heritage assets.	Proposed outline mitigation measures for direct effects submitted and comments received from PKHT (email of 11th October 2013).	Recommendations regarding mitigation are included in this chapter and take into account comments from PKHT.
Perth and Kinross Conservation Officer	Consultation as requested by PKHT in relation to the reduction of study area for potential effects on the settings of listed buildings.	Conservation Officer agreed with the reduction in size of study area from 10km to 5km (email of 10th July 2013).	Scope of assessment revised as agreed.
Historic Scotland	Formal Scoping Consultation	Indicated that there were unlikely to be any direct effects on assets within their remit. Noted that there may be indirect setting effects on assets within their remit and noted that they generally advised that the assessment of setting effects (including potential cumulative effects) on assets should be based on a ZTV rather than study areas of a prescribed distance. The response also listed in an Annex all those assets that required inclusion in the assessment. Supporting visualisations were requested in relation to four of these assets.	Contacted for explicit agreement to a revision in the scope of assessment of indirect setting effects based on their scoping response (email of 22th May 2013). It was agreed that the effects on all assets not named in the Historic Scotland Annex would be scoped out of the assessment (subject to no significant changes to the ZTV and consultation with PKHT). Effects on the named assets are assessed in this chapter and supporting visualisations provided.

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
	Follow-up consultation with regard to nature of visualisations to be included in the assessment.	It was proposed that cumulative wireframes combined with photographs where appropriate were sufficient (for all four assets where supporting visualisations had been requested and one additional). Historic Scotland agreed that the scope and nature of the proposed visualisations were appropriate (email of 10th October 2013).	Visualisations included as agreed.

Assessing Significance

11.21 The following methodology has been used to assess the significance of direct effects upon cultural heritage assets as well as to consider indirect effects upon their setting.

11.22 The assessment of an effect's significance depends on the sensitivity of the asset affected and the magnitude of predicted change. The sensitivity of an asset to effects has been determined on the basis of designation and in the case of undesignated assets, with reference to the criteria provided in Annex 1 of *Scottish Historic Environment Policy* for the determination of national importance for scheduling. Sensitivity to effects reflects the level of importance of the asset as presented below (**Table 11.2**).

Table 11.2: Sensitivity Criteria

Sensitivity	Importance	Description
High	National	Nationally important designated assets (scheduled monuments, Category A listed buildings, inventory gardens and designed landscapes and inventory battlefields) or assets meeting the criteria for national importance. Some conservation areas are of national importance.
Medium	Regional	Category B listed buildings, conservation areas and undesignated cultural heritage assets and historic buildings of regional importance. Assets of regional importance.
Low	Local	Category C listed buildings and undesignated cultural heritage assets and historic buildings of local importance.

11.23 The magnitude of change has been assessed with reference to the degree of change in the asset's cultural significance (**Table 11.3**). The term 'cultural significance' is as used in *Scottish Historic Environment Policy* Annex 1; and is distinct from sensitivity and significance of effects (as used in standard Environmental Impact Assessment terminology). The cultural significance of an asset can be characterised by reference to one or more characteristics, namely:

- ***Intrinsic*** *– those inherent in the monument;*
- ***Contextual*** *– those relating to the monument's place in the landscape or in the body of existing knowledge; and*
- ***Associative*** *– more subjective* [considerations] *of the associations of the asset, including with current or past aesthetic preferences.*

11.24 The cultural significance of each asset potentially affected has been described and the degree to which the overall cultural significance of the asset is affected is used to arrive at a magnitude of predicted change as set out below.

Table 11.3: Magnitude Criteria

Magnitude of Change	Description
Major	Total loss or substantial alteration to key elements of the asset or its setting, such that post-development cultural significance of the asset will be fundamentally changed.
Moderate	Loss or alteration to one or more key elements of the asset or its setting, such that post-development cultural significance of the asset will be materially changed.
Minor	Marginal shift away from the baseline conditions. Change arising from the loss/alteration will be readily detectable but not material: the asset's cultural significance post development will be slightly diminished.
Negligible	Change in cultural significance barely detectable.

11.25 It should be noted that it is possible for appreciable change to occur in the setting of a heritage asset without there being any adverse effect upon its cultural significance. Where change occurs but this does not affect cultural significance it has been concluded that there will be no effect.

11.26 The sensitivity of the asset, together with the magnitude of change, defines the significance of the effect (**Table 11.4**). Where there is scope for two levels of effect (e.g. major or moderate), professional judgement has been used.

Table 11.4: Significance of Effects Criteria

Sensitivity	Magnitude of Change			
	Major	**Moderate**	**Minor**	**Negligible**
High	Major	Major or Moderate	Moderate or Minor	Negligible
Medium	Major or Moderate	Moderate	Minor	Negligible
Low	Moderate or Minor	Minor	Minor or Negligible	Negligible

11.27 Major and moderate effects are considered significant in the context of the Environmental Impact Assessment (Scotland) Regulations 2011 ("EIA Regulations").

Planning Policy

11.28 Planning policies of relevance to this assessment are provided in **Chapter 5: Planning Policy Context**.

Existing Conditions

11.29 This section details:

- Topography as relevant to an assessment of effects on cultural heritage (i.e. where it informs consideration of potential for previously unrecorded assets). A detailed description of the site and proposed wind farm is found in **Chapter 4: Development Description.**
- Heritage assets recorded within the site.
- The potential for previously unrecorded assets to be present within the site.
- Designated assets within the wider study area not scoped out during consultation.

11.30 The condition of heritage assets within the site may be degraded as a result of on-going commercial forestry operations. These operations will involve periodic felling and replanting, which could result in the exposure of previously unrecorded heritage assets during clearance and their possible disturbance during replanting. Therefore, the baseline condition of assets within the site may degrade if the 'do nothing' scenario were to be played out.

11.31 The settings of designated assets in the wider study area in proximity to commercial forestry plantations may change substantially in the foreseeable future. In particular, this is relevant to the setting of a prehistoric settlement at Scotston (AM4860; **Figure 11.2**); felling around this asset will considerably alter its immediate setting and the views that can be obtained from it, including views toward the proposed development.

11.32 The locations of selected undesignated heritage assets in the vicinity are shown in **Figure 11.1**. Designated assets relevant to the assessment are shown on **Figure 11.2**. Non-designated assets are referred to by numbers used by PKHER (and prefixed 'MPK'); assets identified during the current study are prefixed 'CH'. Listed Buildings and Scheduled Monuments are referred to by the reference numbers used by Historic Scotland (and prefixed 'HB' and 'AM' respectively).

Topography

11.33 The site takes in part of the upper northern slopes of Strathbraan and the upper eastern slopes of Glen Cochill. The sides of these major glens are incised by smaller tributaries and the site also straddles the north-west/south-east orientated valley of the Tombane, which flows down to meet the River Braan. Levels within the site vary from 260m above ordnance datum ('mOD') by the Tombane up to 466mOD on Meall Mòr. There are rocky outcrops at Creag a' Bhàird and Craig Tombane. The latter and Druim Mòr separate the valley of the Tombane from that of the Ballinloan to the north-east. The north-east extremity of the site (the location of turbines 8 and 13; **Figure 11.1**) occupies the upper slopes of the Ballinloan's valley. Land-use within the site is almost entirely commercial forestry.

Assets within the Site

11.34 There are no designated assets within the site.

11.35 There are no previously recorded undesignated assets within the site.

11.36 Historic Land Use Assessment Data does not extend to cover the site.

Potential for Previously Unrecorded Assets

11.37 Parts of Strathbraan not covered by forestry were subject to survey by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS) in 1993. The results have been summarised in a published article.[ix] The upper valley of the Ballinloan is one of a 'number of important relict, archaeological landscapes' preserved in marginal land that was not subject to post-medieval improvement and agriculture. This relict landscape includes a variety of archaeological remains from a number of periods and within several discrete areas (shown on **Figure 11.1** as 'Ballinloan Burn surveyed remains').[x] The earliest remains are clearance cairns and field boundaries thought to be of later prehistoric date. Later settlement includes a distinctive type of building, known as the 'Pitcarmick-type' and thought to date to the 1st millennium AD, within a network of field boundaries. The latter are post-dated by a number of buildings assumed to be of medieval date, with attendant field systems, rig cultivation and shielings. There are also a number of post-improvement (post-medieval) sites such as the Scheduled Monument comprising an abandoned settlement at Salachill (MPK7257; **Figure.11.1**). The field systems and settlement are noted to have been located on better-drained land.

11.38 The closest concentration of recorded remains is around 200m north-east of the site (MPK7339; **Figure 11.1**) and some 400m north-east of the nearest turbine. It comprises a mound of unknown date, a group of turf-built huts, two buildings, a field system, some cultivation remains and clearance cairns.[xi] The settlement and cultivation remains are assumed to be of medieval or post-medieval date. Adjacent to the site is an isolated trackway (MPK7287; **Figure.11.1**) assumed to be of post-medieval or modern date. It can be assumed to have formerly run into the site.

11.39 Other such relict landscapes survive to the west in Glen Cochill (MPK1592 & 6303; **Figure 11.1**) and to the east near the Pitleoch Burn (MPK7289; **Figure 11.1**). These include hut-circles (structures) of presumed later prehistoric date. It appears that the south-facing (i.e. northern) slopes of Strathbraan were settled from the later prehistoric period onward. Settlement extended further upslope than later agriculture and consequently associated remains have not been degraded by cultivation. Associated assets comprise well-preserved and upstanding features. The majority of assets appear to be at altitudes of 350mOD and under, although some features associated with cultivation have been found as high as 390mOD during archaeological work in advance of construction on the neighbouring Griffin Wind Farm (see **Section 11.45**).

11.40 Isolated assets have been found at higher elevations. For example, a hut or pen is recorded around 300m south of the site around 400mOD (MPK5785; **Figure 11.1**) and shielings at Creag Mhor and Creag A Bhealaidh (MPK6304 & 6302; **Figure 11.1**), around 1km north of the site, are just above 400mOD. These assets are associated with transhumance agriculture and are presumed to be medieval or post-medieval in date.[xii]

11.41 It seems likely that the valley of the Tombane, which the site straddles, would have contained a comparable variety of archaeological remains that had been obscured by commercial forestry by the time of the RCHAMS survey. Some recorded assets outside of the plantation and within the Tombane's valley do suggest their presence. A possible cup-marked stone of unknown date (but possibly as early as the Neolithic) is adjacent to the site (MPK16830; **Figure 11.1**) and a hut-circle (presumed to indicate later prehistoric settlement; MPK7336) is recorded 200m south-east of the site at 320mOD. Cup-marked stones are regularly recorded in the vicinity and another has been recorded on the north side of Ballinloan Burn (MPK18178; **Figure 11.1**).

11.42 Two farmsteads (post-medieval but possibly medieval in origin) are recorded at Upper Tombane (MPK7117 & 7342; **Figure 11.1**) and can be seen on the OS first edition map, which was surveyed around the middle of the 19th century.[xiii] The farmsteads are shown within a network of small linear fields with tracks leading upslope to larger enclosures; marked as unimproved land. The site occupies this unimproved land. The example of the adjacent Ballinloan valley suggests that there is high potential for earlier settlement to have existed within this unimproved land, beyond the limits of post-medieval cultivation.

11.43 The clearest aerial photographs of the site taken in 1988[xiv], prior to planting, are not of sufficiently large scale to identify archaeological features beyond post-medieval land divisions and tracks mapped by the Ordnance Survey. However, they do show a clear variation in vegetation between higher parts of the area (presumably open moor) and grass-dominated areas at lower elevations, but still outside improved farmland. The area around the Tombane is grass-dominated and comparable to that around the Ballinloan. Turbines 1-3 (**Figure 11.1**) are close to the edge of moorland; the remaining turbines appear to be in grass-dominated areas. All the turbines are located around the 350mOD contour or lower and therefore at altitudes where recorded remains become more common.

11.44 It is clear from an aerial photograph taken in 1993[xv] that ploughing preceded commercial forestry planting. This may have degraded and disturbed any archaeological assets that were present. However, recent work associated with the neighbouring Griffin Wind Farm has demonstrated that archaeological features can survive being incorporated in a commercial forestry plantation. At Griffin, an archaeological walkover was undertaken after felling and identified a total of 35 possible assets; of these 11 were proposed for further work as they might be disturbed by the development.[xvi] It was noted that the presence of brash limited the effectiveness of the walkover survey. The identified assets comprised five cairns, possible structures, shielings and former quarries. Further work included evaluation trenching, detailed survey, targeted monitoring of brash removal and construction works, followed by areas of excavation where required.

11.45 One area of excavation at around 380mOD included a group of clearance cairns and banks interpreted as field divisions of prehistoric date around 1km north-west of the site (CH1; **Figure 11.1**).[xvii] Another group of cairns and banks at a height of up to 390mOD was excavated on the eastern side of the Ballinloan Burn (CH2; **Figure 11.1**).[xviii] Both groups were interpreted as comprising agricultural remains on the upper margins of cultivated land and related to settlements further downslope. In the former group (CH1) one further feature (a small clearance cairn) that had not been identified during walkover survey was identified during excavation. In the latter group (CH2) two cairns had been noted during an initial walkover when brash was still present; a further five cairns and four banks were noted during monitoring of brash removal. No additional features were identified during excavation. It can be concluded that walkover survey was an efficient method of identifying the majority of archaeological features when undertaken following or during removal of brash.

11.46 During construction of Griffin Wind Farm the stripping of topsoil for a length of access track and four turbine bases was archaeologically monitored to the north-west of Turbine 8 in the proposed development (**Figure 11.1**). This did not encounter any remains and it is notable that the monitored

area was located between the nearest group of recorded remains (MPK7339; **Figure 11.1**) and the proposed development.

11.47 The field survey undertaken as part of this assessment identified two features that are not apparent on modern mapping: a former track and ford (CH3; **Figure 11.1**) and a stretch of drystone wall that was shown on the first edition OS map (CH4; **Figure 11.1**). Other features shown on the first edition map (boundaries and tracks) survive within the site and are apparent on modern mapping. All of these assets are assessed of local importance and low sensitivity. A disused quarry at Creag a' Bhàird is not shown on the first edition OS map, and must be more recent in date; it is shown on modern mapping and is not assessed as archaeologically sensitive.

11.48 There are pockets of deep peat in some parts of the site (described in detail in **Chapter 8: Geology, Hydrology and Hydrogeology**). These can reach depths of 2.5m and are very localised; the vast majority of the site has depths of less than 1m. The design of the proposed wind farm has sought to avoid and reduce effects upon deep peat as far as reasonably practicable and the infrastructure and turbines are generally located in areas with less than 0.5m of peat. Two deeper pockets may be affected (adjacent to turbines 2 and 7; **Figure 11.1**) but given their location they are not likely to be in proximity to archaeological assets (see below) and their archaeological interest is limited. Consequently, the proposed wind farm is not considered likely to have any adverse effect on any palaeo-environmental information contained within peat and this is not considered further.

11.49 The assets recorded by the RCHAMS survey in 1993 and more recently in advance of construction of the Griffin Wind Farm suggest that the site has potential to contain previously unrecorded assets. The potential to contain assets related to settlement and agriculture is greatest on better-drained land within the valley of the Tombane at elevations lower than 350mOD. If present these assets are likely to be of regional or local importance. The proposed turbines in locations with the greatest potential to contain such assets are Turbines 5, 6 and 11 because they are at lower elevations closer to the Tombane. No proposed turbines are at altitudes above where remains have been previously identified in the wider study area but turbines 1-4, 7, 9 and 12 are located in areas that would have been relatively exposed and with frequent rocky outcrops, which suggests a lower potential to contain assets relating to settlement and agriculture.

11.50 The results of work at Griffin Wind Farm suggests that it will be possible to refine this assessment of potential, and identify nearly all of any archaeological assets that survive within the site, by undertaking a walkover survey following felling and brash removal.

Scheduled Monuments

11.51 There are eleven scheduled monuments in the wider study area (**Figure 11.2**). Of these four have been scoped out of the assessment. They are listed in Appendix 11.1 but are not considered further. All scheduled monuments are of high sensitivity and have intrinsic value as potential sources of data and examples of their type. The descriptions of each asset below is consistent with the second stage of Historic Scotland's framework for assessing effects on setting (see **Section 11.15**): they seek to define the setting by establishing how the surroundings contribute to the ways in which the historic assets are understood, appreciated and experienced.

Table 11.5: Scheduled Monuments included in the Assessment

AM no	Name
1566	Meikle Findowie, stone circle 460m S of Strathbraan
4860	Scotston, settlement & field system 700m NNW of
5322	St Louis, settlement, field system and cairn 600m NW of
5612	Trochry (variably spelled Trochrie) Castle
8399	Airlich Hill, cup-marked rock 800m SSE of Meikle Findowie
9617	Meikle Tombane, mill 90m WNW of
9631	Salachill, abandoned township 250m SSE of

11.52 The stone circle at Meikle Findowie (AM1566; **Figure 11.2**) comprises a double ring of upstanding and prostrate stones. The circle lies within rough grazing, part-way up the northern side of Airlich Hill on the south side of Strathbraan and within a field defined by stone dykes. It is small (being around 8m in diameter) but can be picked out on the horizon when looking south from the base and northern side of Strathbraan. From the asset there are open views along Strathbraan to the west and east, which include farms and pasture, the A822, natural woodland along the Braan, and some blocks of conifer plantation. There are also open views to the north-west and north, across Strathbraan, which include more extensive conifer plantations on the uplands and turbines associated with Griffin Wind Farm on the horizon (**Figure 11.8**). Views to the south are blocked by Airlich Hill itself, but it is possible to see its summit some 430m south-east where there is a cup-marked rock, which is also scheduled (AM8399; **Figure 11.2**).

11.53 The cup-marked rock comprises a flat area within a rock outcrop to the immediate south of the summit bearing at least nine cup-marks. These are not visible until in close proximity to the outcrop. Views when adjacent to the cup-marks are constrained by the summit of Airlich Hill and the outcrop itself. There is a partial view to Strathbraan to the north-west and more open views to uplands in the south and west; where there are noted to be prehistoric settlement and cultivation remains. A stone dyke runs past the summit to the immediate south-west.

11.54 The stone circle is thought to date to the Neolithic and cup-marked rocks are most commonly thought to be Bronze Age in date. Related information produced by Historic Scotland notes that both monuments are of national importance because of their potential to contribute to an understanding of prehistoric ritual practices and that this importance is increased by proximity to other monuments of potentially contemporary date.[xix]

11.55 Some aspects of the outward views from the stone circle were probably important to its function and form; hence the asset's wider surroundings add to its contextual value. In particular, views along Strathbraan to its junction with Strathtay to the east and Glen Cochill to the west are striking and are considered to add to the asset's cultural significance. The asset is visible from a reasonable distance, and from many points while travelling along Strathbraan. These views are also likely to have been relevant to the asset's function and contribute to its contextual value. The asset does not make a strong aesthetic contribution to associated views and consequently only the functional relationships between the asset and its surroundings are considered relevant.

11.56 The cup-marked rock is of obscure function and may have been associated with rituals and/or more utilitarian functions such as marking a boundary. The asset has not been located to take advantage of open views and has minimal visibility in the landscape. Views to the south and west include potentially contemporary remains that may have been important to the asset's original function and consequently contribute to its contextual value.

11.57 The settlement and field system at Scotston (AM4860; **Figure 11.2**) is thought to be of Late Bronze Age date. It comprises the remains of at least eight circular houses surviving as low turf covered banks set within a network of boundary banks and clearance cairns. Historic Scotland's related information notes that the monument is of national importance as a well preserved and extensive prehistoric asset which has the potential to enhance our understanding of Bronze Age settlement and farming. It is noted as being of particular importance because it has excellent field characteristics and because few of its kind survive undamaged in this region. A comparable asset survives close by (AM5322; **Figure 11.2**) and this proximity adds to both assets' cultural significance.

11.58 Scotston lies within uncultivated terraces covered by heather on the lower slopes of Glen Cochill to the east of the A826. There are open views west and south-west, across and down Glen Cochill and including the Scheduled Monument at St Louis (AM5322; see **Section 11.52**). On all other sides the asset is surrounded by commercial forestry that currently blocks views. The asset is crossed by pylons running from north-west to south-east near its eastern boundary. The blades and hubs of turbines associated with Griffin Wind Farm are visible above conifers to the north and east. The asset's setting within Glen Cochill is important to an understanding of its function as the remains are associated with exploitation of the valley and the now uncultivated nature of the valley illustrates both the marginal nature of that exploitation and that it occurred during better climactic conditions. Inter-visibility with the possibly contemporary settlement at St Louis adds an appreciation of the asset's relationship to the wider pattern of later prehistoric settlement in the region. Hence the asset's setting within Glen Cochill adds to its contextual value. This can be appreciated in views from the asset to the west and south-west. Features within the asset itself are not visible until in close proximity and do not contribute to the

aesthetics of any views. Hence only the functional relationship between the settlement and its surroundings is considered relevant to its cultural significance.

11.59 The settlement, field system and cairn of St Louis (AM5322; **Figure 11.2**) lie in uncultivated land on the undulating floor of Glen Cochill adjacent to the A826. The asset comprises the upstanding remains of a settlement and field system presumed to be Late Bronze Age in date, and the surviving parts of the White Cairn, a burial mound of the Early Bronze Age, as well as other possible burial cairns. The White Cairn has been excavated but survives as a low mound with an empty cist in its centre. There are open views up and down Glen Cochill to the north and south from many parts of the asset; in particular, the view from the White Cairn is open to the south down toward the junction with Strathbraan, but is obstructed by rising ground to the north. To the east and west views are to the sides of the glen. To the east, beyond the A826, are commercial forestry plantations and a line of telegraph poles and pylons; the upper parts of turbines associated with the Griffin Wind Farm are visible on the horizon above the conifers (**Figure 11.8**). The western slopes of the glen are bare.

11.60 Similarly to Scotston, the asset has a clear functional relationship with its surroundings in Glen Cochill; allowing an appreciation of later prehistoric agricultural exploitation of this marginal land. Some features within the asset, notably the White Cairn, were presumably built to be visible from the surroundings but, due to the undulating nature of the valley floor, are not widely prominent. The White Cairn may have been located to take advantage of open views down the glen to the south, toward the junction with Strathbraan. This view may have had some relationship to the cairn's function; and the cairn may have been built to be seen by people travelling along the glen. Consequently the asset's surroundings in Glen Cochill, including the monument at Scotston, and wider views from certain features in the asset down Glen Cochill to the south add to its contextual value. The features within the asset do not contribute to the aesthetics of any views and only the functional relationship between the asset and its surroundings is considered relevant to its cultural significance.

11.61 The castle at Trochry (AM5612; **Figure 11.2**) comprises the remains of a 15th to 16th century defensive residence owned by the Gowrie family. The only visible remnant is part of a circular tower which stands about 5m high in a private garden. The surrounding area contains many mature trees and private dwellings. Consequently, it is not possible to gain clear views of the asset from publicly accessible areas. The asset has a clear functional relationship with its surroundings, specifically the village of Trochry, the River Braan and communication routes along Strathbraan, which it controlled. Consequently, any views to or from the asset that include these elements of its setting contribute to its contextual value. The asset does not contribute to the aesthetics of any views and only the functional relationship between the tower and its surroundings is considered relevant to its cultural significance.

11.62 The mill at Meikle Tombane (AM9617; **Figure 11.2**) is of post-medieval date and survives as a ruin. The mill is on the eastern side of the Tombane and is levelled into the base of the steeply-sloping valley side adjacent to private dwellings, including Meikle Tombane, and gardens. Views from the asset are to the surrounding valley of the Tombane, which comprises pasture fields separated by stone dykes and conifer plantation beyond to the north-west; the buildings and trees associated with Meikle Tombane prevent south-eastern views to Strathbraan (**Figure 11.8**). Historic Scotland's related information notes that the asset is considered of national importance because of its potential to contribute to an understanding of post-medieval settlement and economy. This importance is increased by its proximity to other potentially contemporary remains including field boundaries and settlements. Such contemporary remains in the surroundings have a clear functional relationship with the asset and contribute to its contextual value. The asset also has a clear functional relationship to the Tombane, which powered it, and the valley through which it runs. These aspects of the mill's setting contribute to its contextual value. The asset is not widely visible because of its location in the base of the Tombane valley and behind Meikle Tombane. Hence it is not considered to add to the aesthetics of any views and only the functional relationships between the asset and its surroundings are considered relevant to its cultural significance.

11.63 The monument at Salachill (AM9631; **Figure 11.2**) is an abandoned post-medieval township, situated on a south-west facing valley side above the Ballinloan. It includes the ruins of over 20 stone buildings linked by tracks and set within a field system that extends throughout the valley and down to Strathbraan; some tracks remain in use as walking routes. There are open views from the asset across the valley of the Ballinloan to its western slopes, with conifer plantations beyond. Looking north, up the valley, are uncultivated uplands, further plantations and many turbines associated with the Griffin Wind Farm (**Figure 11.8**). The turbines extend round to the north-east, at higher elevations than the asset, and the upper parts of some appear on the horizon beyond unimproved pasture in this direction. Views down the valley, to the south-east and toward Strathbraan, are constrained by a block of conifers. The base of the valley contains native woodland. Associated information provided by Historic Scotland notes that the monument is considered of national importance because it is a very well-preserved abandoned township, with the potential to contribute to an understanding of post-medieval settlement, economy and land-use.

11.64 The Ballinloan valley has a clear functional relationship with the township because it contains land that would have been exploited by the inhabitants, and many remnants of that exploitation can be identified (principally drystone dykes defining former field boundaries and tracks). Views from the asset to the surrounding valley add to an understanding of its function and development, and contribute to its contextual value. The ruins, dykes and tracks within and around the asset are easily identifiable from elsewhere in the valley and the uplands beyond. They add aesthetically to relevant views and this contributes associative value to the asset. The township is directly related to many historical documents that provide a clear relationship with particular families and individuals. This, and the township's strong aesthetic relationship with the surrounding valley, is considered to provide the asset with a 'sense of place' that also contributes to its cultural significance.

Listed Buildings

11.65 There are eight listed buildings in the Wider Study Area. All are located on or near the base of Strathbraan and the A822; five are Category B and three are Category C. All listed buildings are considered to have intrinsic value (as examples of their type and potential sources of data). Category B and C listed buildings are considered of medium and low sensitivity respectively. The proposed development is not assessed as having a potential effect on any of these assets. In this section the assets' baseline condition are briefly described and the reasons for concluding that the proposed development will have no effect given; they are not considered further. This approach is consistent with the second and third stages of Historic Scotland's framework for assessing effects on setting (see Section 11.15).

Table 11.6: Listed buildings within the Wider Study Area

LB no	Category	Name
6362	B	Amulree and Strathbraan Parish Church with graveyard, gates and gatepiers.
11107	C	Lagganallachy graveyard.
11108	B	Newton Bridge over the River Braan.
11109	B	Ballinloan Bridge over Ballinloan Burn.
11110	C	Trochry Mill.
11111	B	Aldmad Bridge over River Braan.
11112	C	Bridge at Glenfender Cottage over Glenfender Burn.
11123	B	Amulree Bridge

11.66 The Category B Amulree and Strathbraan Parish Church (HB6362; **Figure 11.2**) is a simple single-storey 18th century building with a small belfry above the main entrance. A short distance away the Category B Amulree Bridge (HB11123) crosses the River Braan; the bridge was built in the 18th century as part of a military road. The structures are not prominent in the landscape and both are assessed as having functional relationships with their immediate surroundings, including the River Braan, adjacent roads and the settlement of Amulree. They are some 4.5km from the nearest turbine and outside the ZTV of the development. No views that would include visibility of the assets and the proposed development are considered relevant. It is concluded that there is no potential for effects on either asset's cultural significance.

11.67 The Category C Lagganallachy Graveyard (HB11107; **Figure 11.2**) contains a late 18th century tombstone bearing a depiction of Adam and Eve which is a Scheduled Monument and has been scoped out of the assessment (AM1618; **Figure 11.2**), and the ruins of a 19th century church. The asset is

located directly adjacent to, and on the south side, of a minor road on the sloping north side of Strathbraan. It is adjacent to a settlement and with frequent mature trees in the vicinity. The graveyard and church are not prominent in the landscape and are assessed as having a functional relationship with their immediate surroundings; specifically, the adjacent road and settlement. The assets are some 4.7km from the nearest turbine and outside the ZTV of the proposed development. No views that would contain visibility of the asset and the proposed development are considered relevant to its cultural significance. It is concluded that there are no potential effects on the cultural significance of this asset.

11.68 Trochry Mill (HB1110; **Figure 11.2**) is a 19th century two-storey mill converted into a dwelling within the settlement of Trochry. It is surrounded by other buildings and mature trees and is not visible from outside of Trochry. It is assessed as having a functional relationship with its immediate surroundings, specifically the River Braan and the settlement of Trochry. The asset is outside the ZTV of the proposed development and 3.7km distant from the nearest turbine. No views that would contain visibility of the asset and the proposed development are considered relevant to its cultural significance. It is concluded that there are no potential effects on the cultural significance of this asset.

11.69 The 19th century Ballinloan Bridge is Category B listed and carries a track (on the line of a former military road) over the Ballinloan Burn (HB11109; **Figure 11.2**). A short distance to the east, and also Category B listed, is the 19th century Newton Bridge (HB11108; **Figure 11.2**), which carries a minor road across the River Braan. They are 3km and 3.6km from the nearest turbine respectively. The Ballinloan Bridge is outside the ZTV and the Newton Bridge is within the ZTV to tip of up to 2 turbines; views in the direction of the proposed turbines from the Newton Bridge are screened by mature trees. The bridge at Almad (HB11111; **Figure 11.2**) carries a minor road over the River Braan, was built in the late 18th century and is within the ZTV to tip of one turbine and the nearest turbine is 2.3km distant; the bridge is surrounded by mature trees. The Bridge at Glenfender (HB11112; **Figure 11.2**) is of probable 18th century date and was constructed to carry a former military road over the Glenfender Burn. It is within the ZTV to tip of up to three turbines at a distance of 2.8km and is surrounded by mature trees. None of these bridges is prominent in the landscape and there are no views toward them that are considered relevant to their cultural significance. They are all assessed as having functional relationships with their immediate surroundings, specifically the roads they carry and watercourses they cross. It is concluded that there is no potential for effects on any of these assets' cultural significance, whether or not they are within the proposed development's ZTV.

Wind Farm Layout Design Considerations

11.70 No modifications to the proposed development layout were made on account of potential effects on cultural heritage assets.

Effects Assessment

11.71 The assessment of effects is based upon the project description outlined in **Chapter 4: Scheme Description** and is structured as follows:

- construction effects;
- operational effects;
- cumulative effects.

Construction Effects

Predicted Effects

11.72 There are no previously recorded designated or undesignated assets within the site. Desk-based and walkover survey undertaken as part of this assessment has established that remains relating to post-medieval and modern land-use (dykes, tracks and a quarry) survive within the site. Assets related to post-medieval land-use, such as dykes and other field boundaries are viewed as being of local importance and so low sensitivity. Construction works in order to create required infrastructure have the potential to alter or remove parts of these assets. In a worst-case scenario this has the potential to materially change the cultural significance of such assets and therefore be an adverse change of moderate magnitude. The significance of effect of a moderate change on an asset of low sensitivity is **Minor**.

11.73 The assessment has concluded that there is potential for previously unrecorded assets to survive within the site. Work undertaken in association with construction of the Griffin Wind Farm has shown that such assets may currently be obscured by forestry but can survive as upstanding remains which can be identified through walkover survey when forestry is removed. Identification of such assets at Griffin was most effective following felling and brash removal. The results derived from archaeological monitoring of topsoil stripping in advance of construction works at Griffin suggested that the potential for identifying further sub-surface assets, identifiable only following topsoil removal, was low. The types of asset that can be reasonably predicted to be present within the site on the basis of those recorded in the wider study area are remains related to rural settlement and agriculture from the prehistoric period and later. While it is not possible to precisely predict the nature and so sensitivity of any such assets, they are likely to be of regional or local importance and so medium or low sensitivity. It should be noted that commercial forestry plantation may have degraded the preservation of any such assets and reduced their importance.

11.74 Construction work will be preceded by clear felling of the entire site; previously unrecorded upstanding archaeological assets currently obscured by forestry may be exposed. Replanting will primarily involve commercial conifers with no planting within a 100m radius of each of the turbines; small areas of open ground and mixed native broadleaf trees will be included. No off-site compensatory planting is planned. Replanting has the potential to have direct adverse effects on any exposed assets through ground disturbance caused by the planting itself and subsequent root growth. Removal of tree stumps has the potential to damage assets adjacent to or beneath the stumps.

11.75 Construction works have the potential to disturb previously unrecorded assets through accidental damage (for example machine movement) and by excavations for the turbines, any related infrastructure and borrow-pits. The access track from the main road to the site will be renewed and widened where it extends beyond the pylon line shown on **Figure 11.1**; no felling is expected to be necessary to accommodate these works.

11.76 Such activities have the potential to destroy all, or much, of the cultural significance of any previously unrecorded heritage assets and so be considered changes of major magnitude. Therefore, in a 'worst case scenario' where the affected asset is of medium sensitivity, the significance of the effect has the potential to be **Major**.

Proposed Mitigation

11.77 Felling will be undertaken in cognisance that upstanding archaeological assets survive within the site and so as to avoid disturbance to any such assets as far as possible. In particular, dykes should not be removed and below-ground disturbance avoided.

11.78 Areas where it is possible that previously unrecorded assets may be disturbed, through land management (including removal of tree stumps and replanting) or construction works, will be defined and subject to an archaeological walkover survey. Areas where no ground disturbance works are planned will be excluded. The walkover survey will be undertaken following felling and brash removal but in advance of any potential disturbance. The walkover survey will be undertaken in accordance with a suitable methodology to allow identification, characterisation and basic mapping of all previously unrecorded archaeological assets.

11.79 The above information will be used to formulate a mitigation strategy that allows for preservation of any identified assets **OR** further archaeological survey and excavation to record the affected assets to an appropriate level prior to any disturbance. The mitigation strategy will be cognisant of the importance and nature of the affected assets. For example, mitigation for post-medieval landscape features may include: breaching assets at right angles and making good any temporary breaches with no archaeological recording required to supplement the information gathered during the walkover survey. Assets of higher sensitivity may require preservation by avoidance during re-planting or micro-siting **OR** archaeological excavation, recording and reporting.

11.80 The preferred option in the mitigation strategy will be to preserve archaeological assets *in situ* as far as practicable.

11.81 The mitigation would be secured by application of a condition on development and a full specification for the works (Written Scheme of Investigation; WSI) agreed with the Perth and Kinross Heritage Trust (on behalf of the planning authority) prior to work commencing. Further stages of work dependent on the results of the survey and development activity would be subject to agreement by submission of written addenda to the WSI.

Residual Effects

11.82 Following implementation of the mitigation there will be a residual beneficial effect on previously unrecorded assets that are preserved *in situ* as their baseline condition may degrade if the 'do nothing scenario' was played out; see **Section 11.30**. It is envisaged that this form of mitigation would be of particular benefit to those assets that are considered of regional importance and medium sensitivity.

11.83 For any assets subject to a programme of archaeological recording prior to their whole or partial physical loss; that loss will be offset through their preservation by record. Preservation by record is viewed as a less desirable outcome than preservation *in situ*. The change can be characterised as a slight loss of the affected assets' cultural significance so a change of Minor magnitude. A change of Minor magnitude on assets that are, at worst, of medium sensitivity is assessed of **Minor** significance. It should also be taken into consideration that the 'do nothing scenario' could result in the loss of any such assets without any mitigation.

Operational Effects

11.84 The assessment below is consistent with the third stage of Historic Scotland's framework for assessing effects on setting (see **Section 11.15**): it considers how predicted changes would impact upon the setting of each asset as defined in **Sections 11.51-69**.

11.85 The operational effects considered below are restricted to those associated with the proposed turbines. The closest relevant asset is around 1km from areas of forestry that will be felled; consequently, felling and replanting of the site will not clear, or subsequently block, any views from these assets. There will be a perceptible change in the wider landscape that these assets occupy as a result of felling and replanting; this change is considered to be neutral as it approximates existing conditions and the 'do nothing' scenario (see **Section 11.30**). It is also considered that associated infrastructure, such as access tracks, borrow pits etc., has no potential to affect the settings of any heritage assets because of the former's limited visibility and distance from assets.

Predicted Effects

11.86 The stone circle at Meikle Findowie (AM1566; **Figure 11.2**) lies 3.3km from the nearest proposed turbine and within the ZTV to tip of 13 proposed turbines; some 430m south-east is a cup-marked rock, which is also scheduled (AM8399). The latter lies 3.7km from the nearest proposed turbine and also within the ZTV to tip of up to 13 proposed turbines. A visualisation and photograph from the stone circle are included (**Figure 11.3** and **11.8**). This demonstrates that all the proposed turbines are visible on the horizon above the upper slopes of the opposite (northern) side of Strathbraan. Four turbines are visible in their entirety; the upper parts of the towers of five will be visible while four are largely obscured by Meall Mòr, with only their hubs and/or blades visible. The proposed turbines will introduce an additional modern element into views from both assets to the north and across Strathbraan; this view already contains many turbines associated with Griffin Wind Farm directly behind the eastern six proposed turbines.

11.87 Views to the south and west from the cup-marked rock are considered to contribute to its cultural significance and will not be affected by the proposed turbines. Views to the north, toward the proposed development, are not considered to contribute to its cultural significance. For this reason, and because they were not useful illustrative aids, a wireframe and photograph from the cup-marked rock have not been included in this assessment. The proposed turbines are concluded to be a change of negligible magnitude and the significance of effect on the setting of the cup-marked rock is concluded to be **Negligible**.

11.88 Views from the stone circle along and across Strathbraan are assessed as adding to this asset's cultural significance as are views to the asset from the valley floor. The introduction of the proposed turbines will not affect the latter; it will add additional modern elements into the view north and across Strathbraan. The eastern turbines will be seen as part of the group formed by Griffin Wind Farm; seven proposed turbines will form a new, discrete, western group, partially visible behind Meall Mòr. The addition of these turbines increases the angle of view occupied by modern development and blade movement. It will remain easy to understand the asset's functional relationship with its surroundings through an appreciation of the open views along and across Strathbraan. The introduction of the turbines may detract slightly from this appreciation and this is assessed as a marginal shift in baseline conditions which will slightly diminish the cultural significance of the asset. This is a change of minor magnitude on an asset of high sensitivity. This is assessed as an effect of **Minor** (rather than moderate) significance because the asset is a considerable distance from the turbines, and because they do not alter the most striking parts of the view which are aligned east and west along the axis of Strathbraan.

11.89 The settlement and field system at Scotston (AM4860; **Figure 11.2**) is 2km north-west of the nearest proposed turbine and within the ZTV of up to 13 proposed turbines. A visualisation from the asset is included (**Figure 11.4**); a photograph is not included as this view is currently screened by conifers. If the conifers were to be felled, the upper parts and blades of the proposed turbines will be visible on the horizon to the south-east and beyond the upper slopes of Glen Cochill. Views from the asset along and across Glen Cochill to the west and south-west contribute to its cultural significance and will not be affected. The proposed turbines are consequently assessed as having the potential to cause a negligible change to the asset's cultural significance. A change of negligible magnitude on an asset of high sensitivity is an effect of **Negligible** significance.

11.90 The monument of St Louis in Glen Cochill (AM5322; **Figure 11.2**) lies 1.2km from the nearest proposed turbine and within the ZTV of up to 13 proposed turbines. A visualisation and photograph from the asset is included (**Figure 11.5** and **11.8**). In the visualisation the upper parts of 12 proposed turbines are visible on the horizon above the upper eastern slopes of Glen Cochill. Views from the asset to the monument at Scotston and wider views from certain features in the asset down Glen Cochill to the south are assessed as contributing to its cultural significance. The introduction of the turbines beyond the eastern side of Glen Cochill will not affect these views. Views from the asset to its surroundings in Glen Cochil add to an understanding of its functional relationship with the surrounding valley. The turbines will introduce an additional modern element into views east from the asset, across Glen Cochill, which already contain much modern alteration, namely the A822, modern pylons, telegraph poles, conifer plantation and turbines within the Griffin Wind Farm beyond. The proposed turbines will be closer to the asset and to the south of those within the Griffin Wind Farm. They will extend the angle of view occupied by turbines and containing blade movement. It will remain easy to understand the asset's functional relationship with the surrounding glen but the turbines may detract slightly from an appreciation of some views from the asset across Glen Cochil. This is assessed as a marginal shift in baseline conditions which will slightly diminish the cultural significance of the asset and consequently a change of minor magnitude. A change of minor magnitude on an asset of high sensitivity can be either minor or moderate in significance. In this instance it is concluded to be of **Minor** significance because the proposed turbines are on the margins of views that contribute to the asset's cultural significance and because these margins already contain many other modern elements.

11.91 The castle at Trochrie (AM5612; **Figure 11.2**) lies 3.7km from the nearest proposed turbine and is outside the ZTV of all proposed turbines; hence no visualisations are included. It will have no visibility of the proposed development and there are no relevant views which will combine the proposed development and the asset. It is concluded the proposed development will have no effect on its setting.

11.92 The mill at Meikle Tombane (AM9617; **Figure 11.2**) is around 1.2km from the nearest proposed turbine and within the ZTV to tip of up to 13 proposed turbines. A visualisation from the asset is included (**Figure 11.6**) as is a photograph from the south of the dwelling at Meikle Tombane (**Figure 11.8**); it was not possible to gain access to the asset itself during this assessment because of the proximity of this private dwelling. Most of two proposed turbines are visible in the upper parts of the valley of the Tombane and on the horizon to the north. The upper parts of 11 proposed turbines are visible on the horizon to the north-east and north-west, beyond the valley of the Tombane. Views from the asset to contemporary remains in the valley of the Tombane and to the Tombane valley itself contribute to its cultural significance. These views are largely rural in nature, although there is some visibility of the upper parts of turbines associated with the Griffin Wind Farm to the north and a conifer plantation. The proposed turbines will introduce modern elements into views north along the Tombane; in particular, the two turbines within the valley of the Tombane will appear in front of, and closer, than turbines associated with Griffin Wind Farm. The proposed turbines are located in the upper part of the Tombane's valley outside the network of contemporary boundaries, pasture and settlement that surrounds the mill and forms its immediate setting. They will not affect an ability to understand the mill's functional relationship with the Tombane and its valley, or its place within the surrounding landscape of contemporary remains.

The proposed turbines may slightly detract from an appreciation of some views that contribute to an understanding of the asset's functional relationship with its setting. This is assessed as a marginal shift in baseline conditions which will slightly diminish the cultural significance of the asset and so is predicted to be a change of minor magnitude on an asset of high sensitivity. It is assessed as an effect of **Minor** (rather than moderate) significance because the proposed turbines are outside the network of contemporary boundaries that surround the asset and because only two turbines are within the valley of the Tombane.

11.93 The monument at Salachill (AM9631; **Figure 11.3**) is an abandoned township and lies 1.15km from the nearest proposed turbine and within the ZTV to tip of up to 13 proposed turbines. A visualisation and photograph from the asset is included (**Figure 11.7** and **11.8**). The towers and upper parts of four proposed turbines are visible on the horizon and behind Druim Mòr; the upper parts (blades and hubs) of the remaining nine are visible at a greater distance on the horizon. Views to and from the asset contribute to its cultural significance and the asset is considered to contribute to a 'sense of place'. The proposed turbines will add additional modern elements into views from the asset to the south-west; out across the Ballinloan valley to the uplands beyond. Views from the asset in this (and other) directions contain many turbines associated with the Griffin Wind Farm. The proposed turbines will be seen as a southward extension of that group visible on the horizon and not within the Ballinloan valley itself. They will not affect an ability to understand the asset's functional relationship with its setting. The proposed turbines are not located in a position that will have a substantive effect on views toward the asset and it will remain easy to appreciate the aesthetic value of the asset and its contribution to a sense of place. However, the proposed turbines will be modern additions within views from the asset that contribute to its cultural significance. They will extend the angle of view occupied by turbines and blade movement; although in comparison to the angle of view occupied by the Griffin Wind Farm this increase will be relatively small (see **Section 11.103**). The introduction of the proposed turbines is considered likely to slightly detract from an appreciation of views out from the asset across the Ballinloan valley, which contribute to the cultural significance of the asset. This is assessed as a marginal shift in baseline conditions which will slightly diminish the cultural significance of the asset and consequently a change of minor magnitude. A change of minor magnitude on an asset of high sensitivity can be of either minor or moderate significance. In this case it is concluded to be of **Minor** significance because the proposed turbines are outside the Ballinloan valley itself, which forms the most important part of the asset's setting, and because visibility of nine of the turbines is extremely limited by topography.

Proposed Mitigation

11.94 No mitigation is proposed.

Residual Effects

11.95 There will be **Minor** residual effects on: the stone circle at Meikle Findowie (AM 1566); the settlement, field system and cairn at St Louis (AM 5322), the mill at Meikle Tombane (AM 9617) and the settlement at Salachill (AM9631).

Cumulative Effect Assessment

11.96 This section considers cumulative operational effects resulting from the addition of the proposed development to wind farms within 10km that are operational, under construction, consented or in planning. The wind farms in question are shown in **Chapter 6 Figure 6.12**.

11.97 In keeping with the approach adopted in the Landscape and Visual Impact Assessment (**Chapter 6**), cumulative impacts have been considered as three scenarios:

- Scenario 1: The proposed development with operational wind farms and those under construction. The wind farms considered comprise Griffin (operational and hence part of the baseline conditions described above) and Calliachar (under construction). The latter will be theoretically visible from one asset, the settlement and field system at Scotston (AM4860; **Figure 11.4**).
- Scenario 2: Scenario 1 plus consented wind farms. No consented wind farms are present within 10km. Consequently, this scenario is not considered further.
- Scenario 3: Scenario 2 plus wind farms in planning. Two wind farms in planning are located within 10km: North Calliachar (application submitted) and Crossburns (scoping). Neither is visible from any of the assets considered below. Consequently, this scenario is not considered further.

11.98 Cumulative visualisations have been produced where appropriate, and these locations have been agreed in consultation with Historic Scotland. The visualisations consist of 360° wireframes showing all cumulative developments (**Figures 11.3-11.7**).

11.99 In the methodology used in this assessment negligible effects are those where the magnitude of change in cultural significance is considered to be barely detectable; assets with this level of effect are Scotston settlement and field system (AM4860) and a cup-marked rock on Airlich Hill (AM8399). In neither case is a cumulative effect from the proposed development in combination with those set out above considered likely to raise the magnitude of change above barely detectable; consequently they are not considered further.

11.100 Cumulative effects are considered individually for those assets where effects have been assessed as being of Minor significance (none were considered greater than minor), i.e. Meikle Findowie stone circle (AM1566); the settlement, field system and cairn at St Louis (AM5322), the mill at Meikle Tombane (AM9617) and the settlement at Salachill (AM9631). The assessment of cumulative effects has been undertaken in two stages. In the first stage, the overall cumulative effect is assessed. Where this is significant, that is of moderate or major significance, the contribution of the proposed Creag a' Bhàird Wind Farm to the total cumulative effect is considered.

Predicted Cumulative Effects

11.101 Views to the north and north-west from Meikle Findowie stone circle (AM1566) will contain the proposed development and the operational Griffin Wind Farm (**Figure 11.3** and **11.8**). The proposed turbines will form two groups when seen from this asset: the eastern six will be seen directly in front of Griffin Wind Farm, and will appear part of the same group. The western seven will be seen as a new, discrete group and will extend the angle of view occupied by turbines by some 15°; it is currently around 60°. Cumulatively, the turbines will add multiple modern elements on the horizon above the northern slopes of Strathbraan, which are otherwise rural in character. They will not affect an ability to understand the asset's functional relationship with its surroundings; in particular, through views along and across Strathbraan. The turbines, and associated blade movement, may slightly detract from an appreciation of these aspects of the asset's setting, which are considered important to its cultural significance. It is concluded that, cumulatively, the turbines will be readily detectable but not material and the asset's cultural significance will be slightly diminished as a result. This is assessed as a marginal change to baseline conditions and therefore a change of Minor magnitude. Consequently, the cumulative effect is assessed as **Minor**.

11.102 Views to the north and north-east from the settlement, field system and cairn at St Louis (AM5322) will contain the proposed development and the operational Griffin Wind Farm (**Figure 11.5** and **11.8**). The proposed turbines will be seen as a single group forming a southward extension of the operational turbines. The proposed turbines will increase the angle of view occupied by turbines by some 30°; it is currently around 60°. Cumulatively, the turbines will add multiple modern elements on the horizon above the east side of Glen Cochill, which contains other modern elements such as conifer plantations and pylons. They will not affect an ability to understand the asset's functional relationship with its surroundings; in particular, through views within Glen Cochill and more open views to the south toward Strathbraan. The turbines, and associated blade movement, may detract from an appreciation of these aspects of the asset's setting, which are considered important to its cultural significance. It is concluded that, cumulatively, the turbines will be readily detectable but not material and the asset's cultural significance will be slightly diminished as a result. This is viewed as a marginal change to baseline conditions and therefore a change of Minor magnitude. Consequently, the cumulative effect is assessed as **Minor**.

11.103 Views to the north-west from the mill at Meikle Tombane (AM9617) will contain the proposed development and nine turbines within the operational Griffin Wind Farm (**Figure 11.6** and **11.8**). The proposed turbines will be in front of the operational turbines and cumulatively they will form a single group. The proposed turbines are closer to the asset than the operational turbines. Cumulatively, the turbines will introduce multiple modern elements on the horizon above the upper parts of the valley of the Tombane. This view is largely rural in character but does contain a conifer plantation. The turbines will not affect an ability to understand the asset's functional relationship with the surrounding settlements, field system and the valley of the Tombane itself. The turbines, and associated blade movement, may detract from an appreciation of these aspects of the asset's setting, which are

considered important to its cultural significance. It is concluded that, cumulatively, the turbines will be readily detectable but not material and the asset's cultural significance will be slightly diminished as a result. This is viewed as a marginal change to baseline conditions and therefore a change of Minor magnitude. Consequently the cumulative effect is assessed as **Minor**.

11.104 Views to the south-west, and extending round to the north-east, from the abandoned settlement at Salachill (AM9631) will contain the proposed development and many turbines associated with the operational Griffin Wind Farm (**Figure 11.7** and **11.8**). Cumulatively the proposed turbines will be seen as part of the same group as the operational turbines and will extend the angle of view occupied to the southeast by around 25° (from an existing 100°). The turbines add multiple modern elements to views from the asset to the upper slopes of the Ballinloan valley and the horizon beyond. Otherwise these views are rural in character with very few modern elements. Cumulatively, the turbines do not affect an ability to understand the asset's functional relationship with its surroundings; in particular views to the surrounding Ballinloan valley and associated contemporary remains (dykes and tracks). Views from and to the asset can also be appreciated aesthetically and may be considered to provide the asset with a 'sense of place' that contributes to its cultural significance. Cumulatively, the turbines fundamentally alter the aesthetics of views from and to the asset and therefore are assessed as materially changing the cultural significance of the asset. This is a change of moderate magnitude. Changes of moderate magnitude can be of either Major or Moderate significance. In this case, the cumulative effect is assessed of **Moderate** significance rather than Major because all the turbines are located outside of the most important part of the setting of the asset (the Ballinloan valley itself) and consequently have an appreciable separation from the asset and do not dominate it.

11.105 The proposed turbines will be seen as a relatively small extension of the existing group; with only four visible beyond their upper parts. They will be located on the horizon above the opposite side of the Ballinloan valley and so will not introduce turbines into any parts of the asset's settings that are particularly sensitive and they will not be closer than operational turbines. For these reasons, the contribution of the proposed development to this total cumulative effect is considered to be minor.

Proposed Mitigation

11.106 No mitigation is proposed.

Residual Cumulative Effects

11.107 There will be **Minor** residual cumulative effects on: the stone circle at Meikle Findowie (AM 1566); the settlement, field system and cairn at St Louis (AM 5322) and the mill at Meikle Tombane (AM 9617).

11.108 There will be a **Moderate** residual cumulative effect on the settlement at Salachill (AM9631).

Further Survey Requirements and Monitoring

11.109 No further survey or monitoring is proposed.

Summary of Effects

11.110 **Table 11.7** below summarises the predicted effects of the wind farm on cultural heritage.

Table 11.7: Summary of Effects

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Construction effects on heritage assets relating to post-medieval and modern land-use recorded during this assessment.	Negligible	None	Negligible
Potential for construction effects upon previously unrecorded heritage assets currently obscured by forestry	Potentially Major	Archaeological survey post-felling and brash removal. Recording and mapping of identified assets. Physical preservation of identified assets by micro-siting/avoidance or preservation by record (archaeological excavation and/or recording).	Minor adverse effect at worst. Beneficial effect for those assets physically preserved.
Operational setting effect on the stone circle at Meikle Findowie (AM 1566)	Minor	None	Minor
Operational setting effect on the settlement, field system and cairn at St Louis (AM 5322)	Minor	None	Minor
Operational setting effect on the mill at Meikle Tombane (AM 9617)	Minor	None	Minor
Operational setting effect on the settlement at Salachill (AM9631)	Minor	None	Minor
Cumulative effect on the stone circle at Meikle Findowie (AM 1566)	Minor	None	Minor
Cumulative effect on the settlement, field system and cairn at St Louis (AM 5322)	Minor	None	Minor
Cumulative effect on the mill at Meikle Tombane (AM 9617)	Minor	None	Minor
Cumulative effect on the settlement at Salachill (AM9631)	Moderate	None	Moderate

[i] Historic Scotland 2010 *Managing Change in the Historic Environment: Setting*. HMSO.
[ii] Institute for Archaeologists 2012 *Standards and Guidance for Historic Environment Desk Based Assessment*
[iii] Historic Scotland 2011 *Scottish Historic Environment Policy*. HMSO.
[iv] Historic Scotland 2010.
[v] Historic Scotland 2011, 9.
[vi] Historic Scotland 2010.
[vii] Historic Scotland 2010.
[viii] Historic Scotland 2010, 6.
[ix] D.Cowley 1997 'Archaeological Landscapes in Strathbraan' *Tayside and Fife Archaeological Journal* Vol.3, 161-175.
[x] MPK 7352, 6065, 7351, 7349, 7348, 7161, 7341, 5763, 7337, 7364, 7343, 7350.
[xi] RCHAMS NN94 SW 25
[xii] Cowley, 169.
[xiii] Ordnance Survey 1867 (surveyed 1863-4) *Perthshire* Sheet LXI (1:10560).
[xiv] National Centre for Aerial Photography (NCAP): Lib Ref C0271, Sortie ASS/511/88, 1988, Frame 222 & 223.
[xv] RCHAMS Record NN94 SW 25.26, Oblique Aerial Photograph C12327,1993.
[xvi] Scott L 2011 *Griffin Wind Farm, Perth & Kinross: Report on the Post-Felling Walkover Survey*. Headland Archaeology Archive Report.
[xvii] Headland Archaeology 2011 *Griffin Wind Farm, Perth & Kinross: Report on archaeological fieldwork in the areas of Turbines 26 to 30*. Headland Archaeology Archive Report.
[xviii] Headland Archaeology 2011 *Excavation at Turbine 38: Griffin Windfarm, Perth & Kinross*. Headland Archaeology Archive Report.
[xix] http://www.historic-scotland.gov.uk/index/heritage/searchmonuments/scheduled-monument-search.htm

12 Access, Traffic and Transport

Introduction

12.1 This chapter assesses the likely traffic and transport effects associated with the construction of the Creag a' Bhàird Wind Farm, which is located off the A826 to the southeast of Aberfeldy. This chapter includes the identification of the development access and route of traffic from port to site. It also assesses traffic volumes generated by site activities during construction, and considers the impact of changes to traffic volumes on the surrounding road network. Furthermore, it identifies the routing to the site for Heavy Goods Vehicles (HGVs) and abnormal loads. The site is accessed via one existing access directly off the A826.

12.2 The traffic and transport assessment has been undertaken by Grontmij.

Study Area Description

12.3 The development is located within the Perth & Kinross Council area in central Scotland. The site is accessed from the A826, approximately 5km north of the A826/A822 junction, which in turn lies approximately 10km west of Dunkeld and the trunk road network (A9). Perth is a further 20km south along the A9 from Dunkeld.

12.4 **Figure 12.1** shows the area surrounding the development considered within this assessment. The red line highlights the proposed routing of construction traffic to the site along the M90, A9, A822 and A826.

Effects Assessed in Full

12.5 The project description, on which this assessment is based, is contained in **Chapter 4: Scheme Description**, with further specific details provided in the sections below.

12.6 The potential impacts considered in this assessment are:

- construction traffic (including forestry traffic);
- construction programme;
- routing to the site;
- abnormal loads;
- operational traffic; and
- cumulative effects.

12.7 Typically for a wind farm development, the number of vehicles generated during the operational phase will be considerably fewer than during the construction phase, with no more than two weekly maintenance visits. Therefore, this assessment will mainly focus on the traffic effects during construction, however, at the request of Perth & Kinross Council, consideration will also be given to operational and cumulative traffic effects.

Effects Scoped Out

12.8 The effects on the M90 Motorway and A9 trunk road have not been assessed, as the additional number of vehicles generated by the development will be insignificant against the existing very large base flow on the M90 and A9.

12.9 The rural nature of the site means that access by bus, rail, bicycle or on foot is not considered a feasible option for staff accessing the site or the transportation of materials. Therefore, these modes are not considered further in this assessment.

12.10 The potential effects of noise associated with construction traffic are assessed in **Chapter 7: Noise**.

Assessment Methodology

Assessment Structure

12.11 The assessment has been undertaken with reference to The Institute of Environmental Management and Assessment (IEMA) publication '*Guidance Notes 1: Guidelines for the Environmental Assessment of Road Traffic 1993*'.

12.12 Baseline road traffic data for 2006 for the A826 and A822 was obtained from an adjacent application – Griffin Wind Farm (supplied by Perth & Kinross Council (PKC) Development Services) for the 12 hour period of 0700 to 1900.

12.13 This assessment has been informed by the following:

- site visits to review the area and road network;
- a desk-based study of the surrounding road network reviewing maps and adjacent applications;
- discussions with PKC; and
- estimates of construction traffic based on Grontmij's experience of previous projects of this scale.

12.14 Consultation responses are detailed in **Table 12.1**. Consultations were carried out during the EIA scoping process and thereafter to gain further information on the scoping opinion response.

Table 12.1 – Consultation Responses

Consultee	Summary of Response
Perth & Kinross Council	Some of the improvements / works done on the A822/A826 (including the passing places) to support delivery of the Griffin Wind Farm and Calliachar Wind Farm turbines do not form part of the adopted road network. Further advice is required to be sought as these are required to accommodate the delivery vehicles. In addition, a Section 96 agreement will have to be entered into for the route. PKC has recognised the wind farm routing displayed in **Figure 12.1** and find it acceptable on the condition it has been subjected to a thorough route assessment. PKC has also accepted the traffic volumes set out in **Table 12.5**. PKC has indicated that a Traffic Management Plan (see **Appendix 12.1**) is expected to be in place for the development.

Access

12.15 It is proposed that all vehicles approaching the site (including abnormal loads) will use the A826 and A822, as the A822 provides a strategic link to the trunk road network.

12.16 Upon entering the site via the A826, site traffic will use an existing access track that was originally developed to access the forestry area. This access will require minor improvement works.

12.17 Turbine components will arrive into the Port of Rosyth. The port and the surrounding roads are capable of accommodating large loads. Vehicle routing within the port will be in agreement with the appropriate authorities.

12.18 The delivery route proposed for abnormal loads starts on Ferrytoll Road at the Port of Rosyth. Construction traffic will then join the A90 northbound via the merge off the B980 at Ferrytoll, continuing along the A90 / M90 until it connects to the A9 to the west of Perth. The route continues along the A9, turning left onto the A822 at Dunkeld. After approximately 10km, the route then takes a right turn onto the A826, travelling north for approximately 5km until the access is reached. General (i.e. normal load) construction traffic will also use the A9, A822 and A826 to access the site. It is proposed that forestry traffic will use the same route, from the A9 to the site access, however market forces will dictate the destination for timber export, and therefore a different route may be used – the shortest route to the trunk road will be used.

12.19 No major modifications are anticipated to be needed on the route, however minor works, such as the temporary removal of signs may be necessary to accommodate the swept path of abnormal loads. All minor works will be agreed with the appropriate Roads Authority (Perth & Kinross Council) and any items removed will be reinstated as soon as possible after abnormal load deliveries have been completed.

Assessing Significance

12.20 The IEMA guidance advises that assessments are undertaken when there is an estimated increase of over 30% on baseline traffic flows or the percentage of HGVs is projected to increase by over 30%. Increases of this order can represent a significant change in environmental conditions. In areas with sensitive receptors, increases of greater than 10% of baseline total and HGV flows may be considered significant. There are no sensitive receptors, such as schools, in the area adjacent to the site or on the proposed route.

12.21 Where the predicted increase is less than the thresholds described above, the guidelines suggest that the significance of the change to the traffic flow is low or insignificant and does not require further assessment.

Planning Policy

12.22 Planning policies of relevance to this assessment are provided in **Chapter 5: Planning Policy Context**.

12.23 Relevant local and national planning policy is discussed in Transport Scotland's *Planning Advice Note: PAN 75 – Planning for Transport*. It states:

> "*All planning applications that involve the generation of person trips should provide information which covers the transport implications of the development. The level of detail will be proportionate to the complexity and scale of impact of the proposal*."

12.24 PAN 75 also includes discussion of travel plans, to encourage sustainable travel once a development becomes operational. It is not anticipated that a travel plan would be required for the Creag a' Bhàird Wind Farm, as the number of operational vehicles is expected to be insignificant.

Existing Conditions

Study Area

12.25 The development is located adjacent to the A826, with Aberfeldy approximately 10km to the northwest, Dunkeld approximately 15km to the east and Perth approximately 40km to the southeast. The A826 is a typical rural road which accommodates a two-way flow, although HGVs may have to slow to pass each other. The road is generally well maintained – the geometry is of a mixed standard with a number of relatively sharp bends. The A826 connects to the A822 approximately 5km south of the site, which is relatively lightly trafficked as shown by the traffic flows in **Table 12.2**.

12.26 The A822 connects the A826 with the A9 at Dunkeld, running east-west to the south of the site, and is, generally, a standard single carriageway suitable for HGVs. Traffic flows on the A822 are approximately 80% of those on the A826. The A822 forms a priority junction with the A9, a highly strategic route forming part of the Scottish Trunk Road Network.

Road Traffic Data

12.27 Baseline traffic data for the A822 and A826 has been obtained from a previous Automatic Traffic Count (ATC) survey undertaken for the Griffin Wind Farm application. This data was collected and between 7th and 13th July 2006, for a 12 hour period between 0700 and 1900. The 2006 flows have been factored to the year of construction start of 2015 using a central National Road Traffic Forecast (NRTF) growth factor of 1.1465. The 2015 weekday average flows are presented in **Table 12.2** and **Table 12.3,** and have been used as the baseline for this assessment.

Table 12.2 – Factored Baseline 2015 Traffic Flows on A822 (0700-1900)

Vehicle Class	Eastbound	Westbound	Two-way
Total	405	446	851
Lights	357	392	749
HGVs	48	54	102

Table 12.3 – Factored Baseline 2015 Traffic Flows on A826 (0700-1900)

Vehicle Class	Northbound	Southbound	Two-way
Total	544	504	1,048
Lights	490	462	952
HGVs	54	42	96

Effects Assessment

12.28 The assessment of effects is based upon the project description outlined in **Chapter 4: Scheme Description** and is structured as follows:

- Construction effects;
- Operational effects; and
- Cumulative effects.

Construction Effects

Predicted Effects

12.29 Traffic flows have been calculated for each of the stages in the assumed construction programme. The levels of traffic generated are based on Grontmij's experience of similar projects in Scotland.

12.30 The precise numbers of staff on site each day will depend on the activities being undertaken. However, a maximum of 40 staff on site per day has been assumed to provide a robust assessment. It has been assumed that 10 staff travel on their own to site and the remaining 30 staff travel in groups of three in vehicles provided for them, equating to a total of 20 staff vehicles arriving on site per day.

12.31 The traffic movements reflect the construction tasks/processes outlined in **Chapter 4: Scheme Description,** and shows this traffic as both daily and monthly two-way traffic movements.

12.32 These figures are typical daily traffic flows – the precise traffic on a particular day would be affected by site activities and other factors such as weather. The daily flows are based on the site being operational 25 days per month over a 20 month period of construction.

12.33 For the purpose of estimating the number of HGVs associated with various phases of the construction programme, the following assumptions have been made:

- 7,000 cubic metres of stone material will be delivered in 20 tonne HGVs over a four month period;
- 52 tonnes per turbine of steel will be delivered using 24 tonne HGVs over a four month period;
- 430 cubic metres per turbine of concrete will be delivered in six cubic metre capacity HGVs over an eight month period;
- 43,800 tonnes of forestry will be removed from the site using 25 tonne HGVs over a 12 month period;
- 13 turbines will be delivered to site during the construction programme over a six month period;
- Six abnormal loads will be required per turbine, along with two escort vehicles per abnormal load;
- Deliveries of turbine parts to the site will arrive as abnormal loads and depart as regular HGVs with retractable trailers reducing from 40m to approximately 16m;
- Two light vehicles per day will arrive on site for the commissioning of the site over a four month period; and
- The overlap of each stage is as shown at the top of **Table 12.4**.

Table 12.4 – Construction Programme and Two-way Vehicle Movements Summary

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
		FORESTRY																			
				STONE DELIVERY																	
							STEEL DELIVERY														
								CONCRETE DELIVERY													
														TURBINE DELIVERY							
																		COMMISIONING			
		MONTHLY TWO-WAY MOVEMENTS																			
	TOTAL	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Forestry																					
Arrivals + Departures	3504	292	292	292	292	292	292	292	292	292	292	292	292								
Stone																					
Material Delivery (arr + dep)	1470			368	367	368	367														
Steel																					
Material Delivery (arr + dep)	58						15	14	15	14											
Concrete																					
Material Delivery (arr + dep)	1864							233	233	233	233	233	233	233	233						
Abnormal Loads																					
Turbine Components (arr)	78													12	18	12	12	12	12		
Police Escort (arr + dep)	312													48	72	48	48	48	48		
Depart as regular HGV (dep)	78													12	18	12	12	12	12		
Commisioning																					
Arrivals + Departures	400																	100	100	100	100
Site Staff																					
Arrivals + Departures	20000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000
Grand Monthly Total																					
Arrivals	13882	646	646	830	830	830	837	770	770	770	763	763	763	653	671	536	536	586	586	550	550
Departures	13882	646	646	830	830	830	837	770	770	770	763	763	763	653	671	536	536	586	586	550	550
Grand Daily Total																					
Arrivals	561	26	26	33	33	33	34	31	31	31	31	31	31	27	27	22	22	24	24	22	22
Departures	561	26	26	33	33	33	34	31	31	31	31	31	31	27	27	22	22	24	24	22	22
HGV Daily Total																					
Arrivals	141	6	6	13	13	13	14	11	11	11	11	11	11	5	5	0	0	0	0	0	0
Departures	147	6	6	13	13	13	14	11	11	11	11	11	11	6	6	1	1	1	1	0	0
Lights Daily Total																					
Arrivals	414	20	20	20	20	20	20	20	20	20	20	20	20	21	21	21	21	23	23	22	22
Departures	414	20	20	20	20	20	20	20	20	20	20	20	20	21	21	21	21	23	23	22	22
Abnormal Daily Total																					
Arrivals	78	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	0
Departures	312	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0	0

12.34 Construction vehicle movements are displayed in **Table 12.4** for the A822 and A826. As discussed in previous sections of this chapter, all materials (including abnormal loads) will use the A822 and the A826 to access the site. To ensure the most rigorous conditions are assessed, the month with the highest traffic generation will be considered – month six. The percentage impact on the A822 and A826 is shown in **Table 12.5**.

Table 12.5 – Traffic Increase on A822 and A826 (0700-1900)

	A822				A826			
	2015 Baseline	Staff and Construction Traffic	2015 Baseline plus Construction	**% increase**	2015 Baseline	Staff and Construction Traffic	2015 Baseline plus Construction	**% increase**
Total	851	68	919	**8.0**	1,048	68	1,116	**6.5**
Lights	749	40	789	**5.3**	952	40	992	**4.2**
HGVs	102	28	130	**27.5**	96	28	124	**29.2**

12.35 The predicted increases in total flow due to construction traffic on the A822 and A826 are 8.0% and 6.5% respectively. The predicted HGV increases on the A822 and A826 are 27.5% and 29.2% respectively. These percentage increases are below the 30% significance threshold set out in the IEMA guidance and, therefore, they do not require further assessment in this chapter (no sensitive receptors have been identified on the route). It should be noted that there is an existing forestry extraction operation in the area. Therefore, some of the vehicle movements displayed in **Table 12.4** relating to forestry may already be included in the baseline flows.

Proposed Mitigation

12.36 A Traffic Management Plan (TMP) will be prepared as requested by PKC and implemented for the construction works. The TMP will include a more detailed timetable of works including how traffic associated with the site will be managed including: permitted delivery times, traffic control measures and any mitigation measures required to accommodate the passage of abnormal loads. The content of the TMP will be agreed with the Road Authorities and the Police prior to construction starting. It is likely that the TMP will be subject to a planning condition, prior to the commencement of the site works. In addition, an agreement under Section 56 of the Roads (Scotland) Act 1984 may be necessary. The TMP can be found in **Appendix 12.1**.

12.37 The TMP will include the provision of temporary speed restrictions and appropriate traffic management measures as specified by Perth & Kinross Council. These are as follows:

- Trial run – an empty trailer bed under police escort shall traverse the route in order to ensure it is suitable to accommodate abnormal load deliveries;
- Speed limits – narrow or winding sections and corners shall have a proposed 40mph advisory speed limit;
- Notices of Abnormal Loads – information will be provided to the public at key locations on the route, with the content and locations of the notices to be agreed with Police Scotland. Additionally, letter drops shall be made to properties along the A822 and A826;
- Wheel wash – wheel-washing facilities will be included at the site entrance to clean vehicles leaving the site, minimising debris on the public highway;
- Road cleaning – the Contractor will install a street cleaning machine at the site entrance to clean the public highway at this location;
- Street furniture – some street furniture will be required to be removed to facilitate abnormal load deliveries, in agreement with the PKC Roads Department;
- Road signage – the Contractor shall provide and maintain appropriate signage warning about the presence of construction traffic on the access route;
- Passing places – passing places exist along the route, displayed in **Figure 12.2**. These passing places will be used to avoid the generation of convoys of general traffic forming behind slow moving large site traffic;
- Vehicle identification – drivers will be assigned a unique letter which must be displayed at the front of the vehicle at all times when at or en route to the development;
- Drivers' Code of Conduct – all drivers (including those associated with forestry operations) will be advised of the restrictions set out in this plan as part of the site induction process. If any drivers are found to be using any other routes, delivering outwith designated times, or generally behaving in an unprofessional manner, appropriate action will be taken by the Contractor, which may include excluding a driver or haulier from the site completely;
- Traffic counters – traffic counters will be installed at the entrance to the site to record the arrival and departure of all vehicles entering and exiting the site. These will be used to determine if any deliveries are being made outwith designated delivery times;
- Breakdown / emergency arrangements – arrangements will be put in place so that drivers are aware of the procedure to be followed in the event of a breakdown / emergency; and
- Delivery times – no deliveries are to be made to site during the following times:
    - Before 7am or after 7pm Monday to Friday;
    - Between 8am and 9am Monday to Friday (AM school run);

- Between 3pm and 5pm Monday to Friday (PM school run) NB: this is not a blanket ban due to the period duration, although it is proposed that the reduction of traffic during this period will be required to be demonstrated via the site entrance traffic counters;
- Before 7am or after 1pm on Saturday;
- All day Sunday; and
- When advised by Police Scotland or a roads authority (the Police may insist on deliveries at times of the day outwith the agreed construction timetable for road safety reasons).

- Site entrance – to ensure compliance, the site gate will be closed at times when deliveries are not permitted.

12.38 Prior to commencement of construction works, the developer will undertake a local road condition survey in the presence of the Road Authority. The survey will include an assessment of any structures along the route, accompanied by video evidence of the roads' condition. Deterioration of the local road network will be monitored by PKC, and the developer will be responsible for all costs of repair work required as a result of development traffic. A legal agreement will be in place between the developer and PKC to recover any extraordinary expense incurred in repairing roads damaged by construction vehicles associated with the site, through the Roads (Scotland) Act 1984 Section 96(3) or 96(1).

12.39 Any road improvements required to be undertaken within the PKC area highlighted in the TMP shall be made via an application(s) Under Section 56 of the Roads (Scotland) Act 1984 for a Minor Roadworks Consent for the formation of any improvement works. This would allow for the safe passage of HGVs and abnormal loads prior to the works commencing on site, including the site access arrangements.

12.40 All abnormal loads will be escorted to the site by police vehicles and will be timed to avoid peak traffic periods on the local road network. Any temporary traffic management measures required for local roads will be implemented under the appropriate Acts and Agreements to ensure safe access. No traffic management will be required on the trunk road network.

Residual Effects

12.41 No significant residual effects are predicted as the number of vehicles associated with the construction of the development is not significant.

Operational Effects

Predicted Effects

12.42 Traffic movements will comprise occasional maintenance vehicles (typically small vans) accessing the wind farm for turbine servicing or repair. These movements are unlikely to exceed two per week. If more extensive maintenance were to be needed, a crane may be required. On the basis of the limited traffic movements, including the potential infrequent use of a crane, no significant effects are predicted during operation.

Proposed Mitigation

12.43 As no significant effects are likely to occur, no mitigation measures are proposed.

Residual Effects

12.44 No significant residual effects are predicted, as the numbers of vehicles associated with the operation of the development are likely to be minimal.

Cumulative Effects Assessment

12.45 No cumulative effects are anticipated as a result of this development, as it is anticipated that no other projects will be under construction. Should such circumstances arise, liaison will take place between the contractors appointed for the affected project(s), the police and the Roads Authority in the development of the construction Traffic Management Plan.

Summary

12.46 This assessment has identified the traffic likely to be generated by the construction and operation of the Creag a' Bhàird Wind Farm. The increase in traffic during all assessed phases of the project's life cycle has been estimated to be less than 30% and therefore not significant in the context of the EIA Regulations.

Table 12.6 – Summary of Effects

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Construction traffic to the site	Not Significant	Traffic Management Plan, Video Survey of route	Not Significant
Operational traffic to the site	Not Significant	None required	Not Significant
Cumulative effect with adjacent developments	Not Significant	None required	Not Significant

13 Socio-Economics

Introduction

13.1 This chapter considers the potential social and economic effects of the proposed Creag a' Bhàird Wind Farm. It details the likely direct employment generation and any likely indirect economic benefits as a result of Creag a' Bhàird Wind Farm. It also considers potential effects in relation to public access and recreation and tourism. The socio-economic assessment has been undertaken by LUC.

Study Area Description

13.2 The assessment focuses on the wind farm site in terms of direct effects on public access and the site and surrounding area with regard to effects on recreation.

13.3 With respect to direct employment and the wider economic and tourism effects of Creag a' Bhàird Wind Farm, the assessment considers potential effects at the Perth and Kinross administrative area level.

13.4 The cumulative assessment of effects considers the effect of the construction and operation of schemes within 35km of the site, as identified in **Chapter 6: Landscape and Visual Amenity**.

Effects Assessed

13.5 The following effects have been considered:

- direct employment generation during construction and operation of Creag a' Bhàird Wind Farm and associated indirect economic benefits, such as effects on local commerce;
- direct effects of Creag a' Bhàird Wind Farm on public access (including Rights of Way (ROW) and core paths) and recreation during construction and operation;
- direct and indirect effects on tourism during construction and operation of Creag a' Bhàird Wind Farm.

13.6 Effects on recreational amenity during construction and operation relating to the visibility of Creag a' Bhàird Wind Farm are considered in **Chapter 6**.

Effects Scoped Out

13.7 On the basis of desk based work, the professional judgement of the EIA team and experience from other similar projects, the following effects have been scoped out:

- disruption of services such as electricity , gas and public water supply during construction and operation of Creag a' Bhàird Wind Farm as none of these services will be affected by the proposed wind farm;
- direct effects on 'formal' recreation (i.e. activities which require purpose built facilities such as pitches, tracks etc.) during construction and operation of Creag a' Bhàird Wind Farm, as no such facilities will be affected by the wind farm.

Assessment Methodology

Assessment Structure

13.8 The assessment is structured around the consideration of potential effects on the following:

- effects on employment and associated benefits during construction and operation of Creag a' Bhàird Wind Farm;
- direct effects on public access and recreation during construction and operation of Creag a' Bhàird Wind Farm;
- effects on tourism resulting from construction and operation of Creag a' Bhàird Wind Farm.

Data Sources and Guidance

13.9 The following data sources were used to inform the assessment:

- TAYplan Strategic Development Plan 2012-2032[i];
- Perth and Kinross Council Highland Area Local Plan 2000[ii];
- Perth and Kinross Council Proposed Local Development Plan[iii];
- Perth and Kinross Council Core Paths Plan 2012[iv];
- Scottish Neighbourhood Statistics[v];
- Census and population information from 'scrol' Scotland's Census Results Online and any relevant local authority publications)[vi];
- The Scottish Index for Multiple Deprivation (2012)[vii];
- General Register Office for Scotland (GRO Scotland) data[viii];
- Nomis (Office for National Statistics) official labour market statistics website[ix];
- Scottish Government Labour Market Statistics (2011)[x];
- Tourism statistics (from VisitScotland and specific tourist attractions in the area)[xi];
- Local websites (referenced as appropriate throughout text).

Field Survey

13.10 No specific field survey was considered necessary to inform the assessment.

Consultation

13.11 As detailed in **Chapter 2: Approach to the EIA**, a request for a Scoping Opinion was submitted to Perth and Kinross Council in March 2013. The issues raised in the Scoping Opinion which relate to socio-economics are detailed in **Chapter 2**.

Assessing Significance

13.12 Criteria for determining the significance of socio-economic, recreation and tourism effects are provided in **Table 13.1**. The significance criteria have been devised by LUC based on professional judgement and previous experience of undertaking socio-economic assessments. The criteria primarily consider the magnitude of effects (e.g. the number of people, recreational activities or economic activities affected). However, when applying the criteria, professional judgement has been employed and consideration taken of the receptor sensitivity, where appropriate.

13.13 Effects associated with the construction phase of the Creag a' Bhàird Wind Farm are considered to be temporary and short-term and effects during operation are considered to be long-term effects.

Table 13.1: Effect Significance Criteria

Significance of Effect	Description
Major	Where the extent of the effects on economic activities, local businesses, recreation, tourism or the local population is large in scale or magnitude, and a large number of people or activities will be affected (either positively or negatively).
Moderate	Where the extent of effects on economic activities, local businesses, recreation, tourism or the local population is small in scale or magnitude, but a large number of people or activities will be affected (either positively or negatively). or Where the extent of effects on economic activities, local businesses, recreation, tourism, or the local population is large in scale or magnitude, but only a small number of people or activities will be affected (either positively or negatively).

Significance of Effect	Description
Minor	Where the extent of effects on economic activities, local businesses, recreation, tourism or the local population is small in scale or magnitude and will only affect a small number of people (either positively or negatively).
Negligible	Where the extent of effects on economic activities, local businesses, recreation, tourism, or the local population is barely noticeable in scale or magnitude, and will only affect a small number of people or activities (either positively or negatively).

13.14 'Major' and 'moderate' effects are considered to be significant in the context of the EIA Regulations.

Planning Policy

13.15 Planning policies of relevance to this assessment are identified in **Chapter 5: Planning Policy Context**.

Existing Conditions

13.16 This section details:

- the current socio-economic conditions in the Perth and Kinross Council administrative area and the locality within which the site is located, including population, demographics and employment;
- tourism and recreation information and statistics for the same area;
- public attitudes to wind farms, specifically in terms of amenity of local residents and effects on tourism.

Population Profile

13.17 The Perth and Kinross area had an estimated population of 147,740, which accounted for 2.8% of Scotland's population as a whole. By 2035 the population of Perth and Kinross is expected to be approximately 195,187, a 32.1% increase compared to 2010 levels[viii]. **Table 13.2** below provides an age demographic breakdown for the Perth and Kinross area and for Scotland as a whole based on population estimates for 2012[viii].

Table 13.2: Age Demographics of Perth and Kinross and Scotland based on 2012 estimates

Age Group	Perth and Kinross (no.)	Perth and Kinross (%)	Scotland(no.)	Scotland (%)
0-15	24, 972	16.9%	914,671	17.2
16-29	22,772	15.4%	975,810	18.4
30-44	26,200	17.7%	1,040,430	19.6
45-59	32,767	22.2%	1,134,300	21.3
60-74	26,623	18.0%	829,903	15.6
75+	14,406	9.8%	418,486	7.9
Total	147,740	100.0	5,313,600	100

13.18 Scotland's population as a whole is expected to rise by 10.2% from 2010 to 2035. Over the 25 year period the age group which is projected to increase the most in size in Perth and Kinross is the 75+ group, and this trend will be common across Scotland as a whole[viii].

13.19 An increase in the number of older people is likely to result in greater demands on the social and healthcare systems in Perth and Kinross and across Scotland as a whole.

Deprivation

13.20 Published by the Scottish Government, the Scottish Index of Multiple Deprivation (SIMD) 2012[vii] measures area deprivation based on categories such as income, education, unemployment, health, access to services and housing and crime to calculate the average deprivation for small 'data zones'. The results from the SIMD 2012 highlights that 6 (0.6%) of the 976 data zones in the 15% most deprived areas in Scotland were found in Perth and Kinross. The number of people living in these most deprived areas in Perth & Kinross at the time of the 2012 SIMD study was 2,863, which is around 2% of the population. The figure for Scotland is 14.5%, therefore, proportionally, there are significantly fewer people living in the deprived areas of Perth & Kinross than there are nationally.

Employment and Unemployment

13.21 The Office for National Statistics[ix] provides the unemployment rates across local council regions. From April 2012 to March 2013 4,600 people within the Perth and Kinross area were unemployed, equating to 5.9% of the population. This was lower than Scotland's overall rate of 7.8%. Across the same period the employment rate for Perth and Kinross was 80.4% compared to 76.9% for Scotland as a whole.

13.22 The ONS also provides the employment by occupation figures within Perth and Kinross for the period April 2012 to March 2013. **Table 13.3** shows employment by occupation for the working population (age 16+) for Perth and Kinross and Scotland as a whole. The table indicates that the highest proportion of people is employed within 'professional occupations' such as health and education within both Perth and Kinross and Scotland as a whole. Overall, there is a similar trend in the employment by occupation levels across both Perth and Kinross and Scotland.

Table 13.3: Employment by Occupation in Perth and Kinross and Scotland 2012-2013

Occupation type	Perth and Kinross (%)	Scotland (%)
Managers, directors and senior officials	11.4	8.6
Professional occupations	20.2	19.8
Associate professional & technical	14.5	12.7
Administrative & secretarial	11.3	10.9
Skilled trades occupations	11.9	11.4
Caring, leisure and Other Service occupations	12.1	11.2
Sales and customer service	7.1	9.2
Process plant & machine operatives	4.3	6.4
Elementary occupations	11.0	11.3

13.23 **Table 13.4** shows the destination of school leavers in Perth and Kinross after secondary school, in comparison to national figures[xii]. It highlights that a larger proportion of secondary school leavers in Perth and Kinross entered into employment in 2011/2012 than across Scotland as a whole. There were approximately the same number of high school leavers entering into higher and further education in Perth and Kinross and Scotland as a whole.

Table 13.4: Destination of High School Leavers in Perth and Kinross in 2011/2012

	Higher Education (%)	Further Education (%)	Training (%)	Employment (%)	Voluntary work (%)	Unemployed (Seeking) (%)	Unemployed (Not seeking)	Unknown (%)
Perth and Kinross	37.6	25.1	3.4	24.6	*	6.0	1.9	*
Scotland	35.7	25	3.8	23.9	0.5	8.2	1.8	0.6

Public Access and Recreation

13.24 There are no Rights of Way (RoW), core paths or formal recreational activities within the site. The closest RoW (RoW 35/1) is approximately 1.2km to the south of the site. As shown on **Figure 13.1**, RoW 35/1 is also designated as a core path (DUNK/77). RoW 35/1 runs for 3.9km from Strathbraan off the A822 to Little Glenshee via Aldmad Bridge, and corresponds with core path AGVN/121 within the wider area. Approximately 1.3km north-east of the site is core path DUNK/120. This core path runs for 9.4km from Trochry at Ballinlick to Griffin Forest southern loop track, and corresponds with core path DUNK 118 (Griffin Forest southern loop track at Loch Kennard) and a network of other paths within the wider area.

13.25 Scottish Quads activity centre, based at Tomnagrew Farm, offers activities such as off road 4x4 adventures, quad biking, clay pigeon shooting, bungee jumping and paintballing. This is located approximately 1km south-east of the site and is accessed from the A822. Moreover, Quadnation is another quad biking centre and is located approximately 1km east of the site.

13.26 The Rob Roy Way is a 128km walk linking Drymen (on the West Highland Way) with Pitlochry in Perthshire and is designated as one of Scotland's Great National Trails. The Amulree to Aberfeldy section (24.75km) of the Rob Roy Way lies within the wider area and comes within approximately 4km of the site at its closest point. As shown on **Figure 13.1**, a part of this section of the Rob Roy Way is also designated as RoW 15/6 and core path DUNK 76. RoW 15/6 travels north-west for 6.2km from Glen Quaich path, Amulree to Kenmore hill road, via Turrerich.

13.27 National Cycling Network route (NCN77) also lies within the wider area; approximately 6km north-east of the site at its closest point.

13.28 Aberfeldy, which is located approximately 8.5km north of the site, is a popular base location for outdoor activities such as white water rafting, kayaking, walking and cycling. Tay Forest Park, located approximately 5km north-east of the Creag a' Bhàird Wind Farm at its closest point, also offers woodland walks.

Tourism

13.29 Tourism is an important source of income for eastern Scotland. Statistics produced by VisitScotland[xi] provide an overview of the numbers of trips made and estimated spend by UK and overseas tourists. These are listed in **Table 13.5**.

Table 13.5: Visitor Numbers and Estimated Spend in Eastern Scotland in 2011

UK Tourists	
No. of trips	4.6 million
Spend	£952 million
Overseas Tourists	
No. of trips	1.68 million
UK Tourists	
Spend	£751 million

13.30 There are no specific visitor attractions in the immediate vicinity of Creag a' Bhàird Wind Farm. Tourist destinations within the wider area include Beatrix Potter Exhibition Centre in Birnam, which is approximately 10km north-east of the site, Highland Safaris; located approximately 12km north-west of the site and Castle Menzies which is approximately 12.5km north-west of the site.

13.31 The village of Aberfeldy provides a base to explore the surrounding area and engage in many outdoor recreational activities including walking, cycling, fishing, horse-riding and water sports. There are also a number of features of archaeological and historic interest.

Public Attitudes to Windfarms

Amenity of Local Residents

13.32 Potential effects on the amenity of local residents are considered to include changes to views, potential noise disturbance and potential effects as a result of increased traffic and heavy goods vehicles on routes. People often have preconceptions about wind farms and how they will affect amenity, and these have been the subject of numerous public opinion surveys. A number of surveys and studies have been undertaken to investigate the attitudes of the public to wind farms, including those focused on people who live in close proximity to wind farms and those seeking the views of tourists and visitors to areas where wind farms are present.

13.33 One of the most comprehensive surveys of the attitudes of the Scottish public towards wind energy is the 2003 MORI survey 'Public Attitudes to Windfarms: A Survey of Local Residents in Scotland' undertaken on behalf of the (then) Scottish Executive[xiii]. In total, 1,810 adults aged over 18 and living within a 20km zone of an operational wind farm were interviewed by telephone between 27th February and 18th March 2003. The survey obtained results that are representative of people living within three proximity zones: residents within a 5km radius; residents between 5km and 10km of the wind farm; and residents between 10 and 20km of the wind farm. This survey found that people were three times more likely to say they felt their local wind farm had a positive effect on the area (20%) as they were to say it had a negative effect (7%). Most people felt the wind farm had neither a positive nor a negative effect. People living within 5km of the local wind farm held the most positive views with 45% saying they thought the overall effect had been positive and only 6% saying they thought it had been negative.

13.34 The survey also noted differences in attitudes before construction and once the wind farm was operational. The proportion of respondents who had anticipated problems prior to the wind farm (46%) was far higher than the proportion that actually experienced problems after the wind farm (8%). For example, although 15% of respondents had expected to experience a problem with noise or disturbance during construction, only 4% say that construction caused noise or disturbance.

13.35 In 2012, a YouGov study commissioned by Scottish Renewables found that out of 1,000 Scottish people surveyed, 71% were in support of wind power and only 7% were against[xiv].

13.36 An online poll undertaken in February 2013 by YouGov on behalf of Scottish Renewables identified that 64% of people in Scotland support wind power as part of the country's energy mix. Of the 1,003 people surveyed, 30% 'strongly agree' with the statement "*I support the continuing development of wind power as part of a mix of renewables and conventional forms of electricity generation*". A further 34% said they 'tend to agree'. This compares with only 11% who 'strongly disagree'[xv].

13.37 **Chapter 6: Landscape and Visual Amenity** presents the assessment of the predicted visual effects of Creag a' Bhàird Wind Farm on key settlements. **Chapter 7: Noise** considers the potential effects on local dwellings of disturbance caused by noise. **Chapter 12: Access, Traffic and Transport** considers the effects of traffic movements generated during both construction and operation of Creag a' Bhàird Wind Farm. Given this, the effect on local amenity in respect of the above is not considered further in this chapter.

Effects on Tourism

13.38 A MORI poll was commissioned by the Scottish Renewables Forum and the British Wind Energy Association in 2002 to determine public attitudes towards wind farms in Argyll, which had the highest concentration of wind farm developments in Scotland. The survey, which was based on detailed interviews with approximately 300 visitors spanned over two September weekends, found that over 90%

of visitors would return to Scotland for a holiday regardless of a wind farm in the area. Only 8% of the tourists who had seen a wind farm during their visit returned with a negative impression. Eight out of ten said that they would go to a wind farm visitor or information centre during their stay[xvi].

13.39 In June 2007, Glasgow Caledonian University was commissioned by the Scottish Government to assess whether Government priorities for wind farms in Scotland are likely to have an economic effect (positive or negative) on Scottish tourism. The overall conclusion of the research was that the Scottish Government should be able to meet commitments to generate at least 50% of Scotland's electricity from renewable sources by 2020 with minimal effect on the tourism industry's ambition to grow revenues by over £2 billion in real terms in the 10 years to 2015. It also found that three quarters of tourists felt wind farms had a positive (39%) or neutral (36%) effect on the landscape[xvii].

13.40 A recent survey commissioned by VisitScotland (2011)[xviii] involved interviewing 3,000 people in order to learn more about consumer attitudes to wind farms and their effect on tourism. The selected sample comprised 2,000 people from a nationally representative UK sample and a Scottish representative sample of 1,000 people. The majority of those interviewed thought that natural scenery and landscape were important to them when taking a short break or holiday. The majority of people had seen a wind farm whilst on a holiday in the UK (Scotland) and indicated, on the most part (80% of UK respondents and 83% of Scottish respondents), that the presence of a wind farm would not affect their decision about where to visit or stay in the UK. According to the survey results, although the majority of people feel that wind farms do not spoil the look of the UK (Scottish) countryside, it was also found that seeing a wind farm would not add to the enjoyment of it. When asked whether they would be interested in visiting a wind farm if there was a visitor centre, there were more respondents from Scotland (46%) that expressed an interest compared to those from the UK (40%). However, in general, respondents would prefer wind farms not to be in areas popular with tourists. Finally, the survey revealed that the responses from those surveyed indicated that wind farms are not regarded as detrimental to the landscape and neither do they ruin the tourism experience of an area.

13.41 The YouGov poll, commissioned by Scottish Renewables in 2013, indicated that 69% of respondents would not base their decision to visit an area of Scotland on the presence of a wind farm[xix]. It has also been found that wind farms may act as tourist attractions in their own right, with 120,000 people visiting the visitor centre at Whitelee Wind Farm in the 12 months after its opening in 2009[xx].

13.42 These studies highlight the varying opinions with regards to wind energy; however, they suggest in all cases that the majority of those surveyed do not have a negative attitude towards wind farms.

Wind Farm Layout Design Considerations

13.43 As detailed in **Chapter 3**: **Site Selection and Design Strategy,** one of the main objectives of the design process was to design the wind farm in such a way that it relates to the surrounding landscape and minimises effects on landscape and visual amenity. As a result, the visibility of the scheme from the wider landscape has been limited, especially in terms of the main tourist areas.

Effects Assessment

13.44 The assessment of effects is based upon the Creag a' Bhàird Wind Farm description provided in **Chapter 4: Scheme Description** and is structured as follows:

- construction effects;
- operational effects;
- cumulative effects of Creag a' Bhàird Wind Farm and other wind farm proposals in the area.

Construction Effects

Predicted Effects

Direct Employment

13.45 It is anticipated that a temporary workforce, varying between 20 and 40 people will be employed during the construction phase. It is standard practice in economic appraisals to convert temporary employment levels into full-time equivalents (FTEs). Therefore, using a conversion factor of ten years of full time employment to one permanent FTE[1] , the total employment generated through construction will be between 2 and 4 FTEs. It is considered that this represents a temporary effect of minor positive significance to the local economy.

Indirect Economic Benefits

13.46 It is likely that there will be some local employment generated as an indirect result of the construction of the Creag a' Bhàird Wind Farm. This could include supply chain spin-offs for local businesses and sub-contracted work relating to the transportation of construction workers and materials. Any construction workers not living locally may choose to reside in local accommodation which will further benefit the local economy through spending in local hotels, shops, restaurants and other accommodation. It is considered that indirect employment as a result of Creag a' Bhàird Wind Farm will have a temporary effect of minor positive significance to the local economy.

Public Access and Recreation

13.47 The site is not currently used for any formal recreational activities and there will be no access to the site for informal recreational purposes during the construction period (approximately 20 months). As stated above, there are no RoWs or core paths crossing the site. Users of the nearest RoW and core paths (RoW 35/1, DUNK/77 and DUNK/120), as shown on **Figure 13.1,** and visitors to Scottish Quads and Quadnation may be adversely affected in terms of visual amenity, noise and dust nuisance during construction, however this effect will be temporary and intermittent.

13.48 The visual amenity of users of the Rob Roy Way Amulree to Aberfeldy section, RoW 15/6 and core path DUNK/76 may be adversely affected during construction, however this effect will be temporary and intermittent during this period. The magnitude of effect on users of these routes will depend on the time of year (effects would be most pronounced when the route are heavily used e.g. in spring/summer).

13.49 Given the extensive scope for informal recreation in the surrounding area, and informal nature of recreational activity, it is not anticipated that Creag a' Bhàird Wind Farm will directly affect public access or recreational activity in the wider area, including the routes identified above.

13.50 It is anticipated that Creag a' Bhàird Wind Farm will result in a temporary effect of minor significance in relation to public access and recreation within the site and immediate surrounds during construction.

Tourism

13.51 It is not considered that construction of the wind farm will have a significant effect on tourism in the vicinity of the site, or the wider area and as such the effect on tourism during construction is predicted as negligible.

Proposed Mitigation

13.52 During construction of the wind farm, the following mitigation measures are proposed to reduce potential effects:

- measures to control dust and noise emissions from construction activities will be implemented using best practice measures to reduce the effects on users of the nearby routes and visitors to Scottish Quads and Quadnation. These measures will be set out in an Environmental Management Plan (EMP) for the site.

Residual Effects

13.53 The Creag a' Bhàird Wind Farm will have a temporary effect of minor positive significance both in terms of direct employment opportunities and indirect economic benefits.

[1] Full time equivalent (FTE) is a way to measure a workers involvement in a project. An FTE of 1.0 means that the person is equivalent to a fulltime worker. In this example, 10 to 30 people employed for 12 months is equivalent to 120-360 months of potential employment. For one year, this is equivalent to 10-30 full time jobs and for 10 years, 1-3 full time jobs.

13.54 Taking into account the implementation of proposed mitigation, the residual effect of the Creag a' Bhàird Wind Farm in relation to public access and recreation, within the site and immediate surrounds, will be negligible.

13.55 The predicted effect of the Creag a' Bhàird Wind Farm on tourism will be negligible.

Operational Effects

Predicted Effects

Direct Employment

13.56 Once operational, Creag a' Bhàird Wind Farm will require a small team of personnel to service, maintain and operate it. It is predicted that 1 FTE job will be created during the lifetime of the wind farm (25 years). It is likely that this job should be to undertake routine turbine servicing and wider site maintenance. Adopting a precautionary approach, this will result in an effect of negligible positive significance.

Indirect Economic Benefits

13.57 It is likely that there will be some local employment generated as an indirect result of the operation of Creag a' Bhàird Wind Farm, and this will be associated with induced employment effects resulting from increased household expenditure among those individuals who have gained employment both directly and indirectly as a result of operation of Creag a' Bhàird Wind Farm. Adopting a precautionary approach, this will result in an effect of negligible positive significance to the local economy.

Public Access and Recreation

13.58 There will be no restrictions on access to the site during operation of the Creag a' Bhàird Wind Farm other than where maintenance is required.

13.59 Operation of Creag a' Bhàird Wind Farm will not prevent people from visiting the area or from undertaking recreational activities in the area. The change in views from certain areas and routes may, however, influence some individuals in their choice of location to visit or recreational activities to undertake. It should be noted that the effect that changes in views will have on recreational activity will depend on the personal opinion of the viewer which is subjective; some people may be predisposed to dislike wind turbines whilst others may view them as complementary to the landscape. The overall effect of Creag a' Bhàird Wind Farm on public access and recreation once operational is considered to be of negligible significance.

Tourism

13.60 Creag a' Bhàird Wind Farm will not prevent visitors accessing the identified attractions and popular points of interest during operation. Most surveys undertaken suggest that wind farms do not discourage people from visiting an area and it is considered that effects on tourism, whilst Creag a' Bhàird Wind Farm is operational, are unlikely and represent an effect of negligible significance.

Proposed Mitigation

13.61 No mitigation measures are proposed during operation as effects are deemed to be negligible.

Residual Effects

13.62 Operation and maintenance of Creag a' Bhàird Wind Farm will have an effect of negligible positive significance both in terms of direct employment opportunities and indirect economic benefits.

13.63 The significance of the residual effects of the operation of Creag a' Bhàird Wind Farm remains as negligible for public access and recreation and also for tourism.

Cumulative Effects Assessment

13.64 This section considers the cumulative effects on direct employment and indirect economic benefits, public access and recreation and tourism which would arise from the construction and operation of Creag a' Bhàird Wind Farm in conjunction with schemes within 35km of the site.

Predicted Cumulative Effects

Direct Employment and Indirect Economic Benefits

13.65 Should all of the schemes identified within 35km (as shown on **Figure 6.6** and which are not yet operational) be constructed and operated, the cumulative effect on direct employment and in terms of indirect economic benefits, particularly during construction, will be positive. Adopting a precautionary approach the contribution of Creag a' Bhàird Wind Farm to this positive effect is likely to be of negligible significance.

Public Access and Recreation

13.66 It is considered possible that there may be some positive cumulative effects on public access and recreation in the wider area through the provision of new paths and access routes available to walkers, cyclists and horse riders etc. The contribution of Creag a' Bhàird Wind Farm to this positive effect is considered to be of negligible significance.

Tourism

13.67 As discussed above, recent research suggests that wind farms do not have a negative effect on tourism. Cumulative effects on tourism, as a result of construction of all the potential wind farm projects within 35km, are therefore considered to be of negligible significance.

Further Survey Requirements and Monitoring

13.68 No further surveys or monitoring is proposed.

Summary of Effects

13.69 **Table 13.6** below summarises the predicted effects of Creag a' Bhàird Wind Farm on the socio-economic aspects considered:

Table 13.6: Summary of Predicted Significant Effects

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Construction			
Direct Employment	Temporary minor (positive)	None	Temporary minor (positive)
Indirect Economic Benefits	Temporary minor (positive)	None	Temporary minor (positive)
Effects on public access and recreation within the site and immediate surrounds	Temporary minor	Measures to control dust and noise emissions from construction activities	Negligible
Effects on tourism	Negligible	None	Negligible
Operation			
Direct Employment	Negligible (positive)	None	Negligible (positive)
Indirect Economic Benefits	Negligible (positive)	None	Negligible (positive)

Predicted Effect	Significance	Mitigation	Significance of Residual Effect
Effects on public access and recreation within the site and immediate surrounds	Negligible	None	Negligible
Effects on tourism	Negligible	None	Negligible
Cumulative			
Direct Employment	Negligible (positive)	None	Negligible (positive)
Indirect Economic Benefits	Negligible (positive)	None	Negligible (positive)
Effects on public access and recreation	Negligible (positive)	None	Negligible (positive)
Effects on tourism	Negligible	None	Negligible

[i] TAYplan, (2012), '*TAYplan: Scotland's SusTAYnable Region – Strategic Development Plan 2012-2032'*, Available [online] at: http://www.tayplan-sdpa.gov.uk/FINAL%20Approved%20Plan%20June%202012%20low%20res.pdf, Last accessed on: 22/01/2013

[ii] Perth and Kinross Council, (2000), '*Highland Area Local Plan*', Available [online] at: http://www.pkc.gov.uk/article/2251/Highland-Area-Local-Plan, Last accessed on: 22/01/2013

[iii] Perth and Kinross Council, (2012), '*Local Development Plan'*, Available [online] at: http://www.pkc.gov.uk/proposed ldp, Last accessed on: 22/01/2013

[iv] Perth and Kinross Council, (2012), 'Core Paths Planning', Available [online] at: http://www.pkc.gov.uk/article/2154/Core-paths-planning, Last accessed on: 22/01/2013

[v] Scottish Neighbourhood Statistics, (2011), '*Area Profile Report for Local Authority Perth and Kinross'*, Available [online] at: http://www.sns.gov.uk/Reports/Report.aspx?ReportId=2&AreaTypeId=LA&AreaId=340&MetaIndicatorCode=GR-sapepeop, Last access on: 22/01/2013

[vi] SCROl, (2013), Available [online] at: http://www.scrol.gov.uk/scrol/common/home.jsp, Last accessed on: 22/01/2013

[vii] The Scottish Government, (2012), '*Scottish Index of Multiple Deprivation 2012*', Available [online] at: http://simd.scotland.gov.uk/publication-2012/local-authority-summaries-simd-2012/, Last accessed on: 22/01/2013

[viii] General Register Office (GRO) for Scotland, (2013), '*Perth and Kinross Council Area – Demographic Factsheet'*, Available [online] at: http://www.gro-scotland.gov.uk/files2/stats/council-area-data-sheets/perth-and-kinross-factsheet.pdf, Last accessed on: 02/10/2013

[ix] NOMIS Official Labour Market Statistics, (2012),' *Labour Market Profile: Perth and Kinross'*, Available [online] at: http://www.nomisweb.co.uk/reports/lmp/la/1946157428/report.aspx#tabempunemp, Last accessed on: 02/10/2013

[x] The Scottish Government, (2011), Available [online] at: http://www.scotland.gov.uk/Publications/2012/07/9077/0, Last accessed on: 22/01/2013

[xi] Visit Scotland, (2011), '*Tourism in Eastern Scotland 2011'*,Available [online] at: http://www.visitscotland.org/pdf/Tourism%20in%20Eastern%20Scotland%202011.pdf, Last accessed on: 22/01/2013

[xii] Scottish Government, (2010), 'Follow Up Leaver Destinations and Attainment Supplementary Data, Available [online] at: http://www.scotland.gov.uk/Topics/Statistics/Browse/School-Education/Datasets/attainmentandleavers, Last accessed on: 02/10/2013.

[xiii] Scottish Executive, (2003), '*Public Attitudes to Windfarms: A Survey of Local Residents in Scotland'*. Available [online] at: http://www.scotland.gov.uk/Resource/Doc/47133/0014639.pdf, Last accessed on: 23/01/2013

[xiv] YouGov, (2012), 'Trump on Wind Power: No Effect', Available [online] at: http://yougov.co.uk/news/2012/04/25/trump-wind-power-no-effect/, Last accessed on: 23/01/2013

[xv] YouGov, 2013, 'Scots Support Renewable Energy', [online], Available at: http://yougov.co.uk/news/2013/03/20/scots-support-renewable-energy/ Last accessed on: 26/07/2013

[xvi] Scottish Renewables and the British Wind energy Association, (2002), 'Tourist Attitudes towards Wind Farms', Available [online] at: http://www.cne-siar.gov.uk/energy/2%20pg%20briefing.PDF, Last accessed on: 23/01/2013

[xvii] Glasgow Caledonian University, (2007), 'The Economic Impacts of Wind Farms on Scottish Tourism', Available [online] at: http://www.scotland.gov.uk/Publications/2008/03/07113554/0, Last accessed on: 23/01/2013.

[xviii] Visit Scotland, (2011), '*Wind Farm Consumer Research'*, Available [online] at: http://www.visitscotland.org/research_and_statistics/tourism_topics/wind_farms.aspx, Last accessed on: 24/01/2013.

[xix] Scottish Renewables, 2013, '*New Poll Suggests Scots Twice as Favourable to Wind Power than Nuclear or Shale Gas*', [online], Available at: http://www.scottishrenewables.com/news/new-poll-scots-twice-favourable-wind-than-nuclear/, Last accessed on: 26/07/2013

[xx] ScottishPower Renewables, 2009, ' More Than 120,000 Visitors Blow-in to Whitelee Wind Farm', [online], Available at: http://www.whiteleewindfarm.co.uk/news/more_12000_visitors_blow_in_whitelee_windfarm, Last accessed on: 26/07/3013

14 Other Issues

Introduction

14.1 This chapter assesses the potential effects of the proposed Creag a' Bhàird Wind Farm relating to:

- aviation and defence;
- telecommunications;
- television;
- dust effects;
- carbon balance (see also **Appendix 14.1** Carbon Balance Assessment Report).

14.2 The initial aviation and defence work was completed by The Wind Consultancy Service (TWCS) and Force 9 Energy LLP (Force 9 Energy). TWCS also undertook the telecommunications and television assessments. LUC completed the assessment of dust effects.

14.3 A number of additional potential effects including those relating to shadow flicker and turbine icing have been scoped out of the assessment (see **Section 14.10** below).

Study Area Description

Aviation and Defence

14.4 An initial aviation assessment was undertaken to identify potential aviation issues. The study assessed the following aviation installation types (and included use of the NATS En Route on-line self-assessment maps):

- Ministry of Defence Air Surveillance and Control System (ASACS) radar sites within 100km of the centre of the site;
- Ministry of Defence Danger Areas (used for bombing and training exercises);
- Military Aerodromes and Military Air Traffic Control (ATC) radar sites within 60km of the centre of the site;
- Military Precision Approach Radar (PAR) sites within 50km of the site;
- Ministry of Defence Tactical Training Areas within 10km of the site;
- Meteorological Radars within 20km of the site;
- NATS En Route radar sites within 100km of the site;
- NATS En Route radio navigation beacons within 10km of the site.

Telecommunications

14.5 Telecommunications operators were consulted and information requested for telecommunications links within 4km of the centre of the site.

Television

14.6 The site is located in the STV North region and television transmissions for homes near the site are likely to be provided by the Angus transmitter group.

Dust

14.7 The assessment of dust effects during construction has been undertaken for receptors within 200m of the site in accordance with accepted good practice using a risk based approach (this is detailed further below).

Carbon Balance

14.8 The assessment of carbon balance focuses on the site. It quantifies the sources of emissions resulting from construction of the development and balances this against the predicted emissions avoided once the development is operational.

Effects Assessed in Full

14.9 The following effects associated with the development have been assessed:

- Potential technical effects on aviation and defence once the development is operational: wind turbines can affect navigation and surveillance systems (including radar) and can affect the use of aerodromes.
- Operational effects on telecommunications: wind turbines can potentially cause interference through reflection and shadowing to electro-magnetically propagated telecommunications signals including terrestrial fixed microwave links managed by telecommunications operators.
- Operational effects on television reception: wind turbines have the potential to interfere with television broadcasting systems causing receiving viewers to experience degradation in picture quality or loss of reception. Ofcom guidance regarding wind farms and other tall structures[i] states *"Digital terrestrial TV (freeview, or Digital Terrestrial Television) offers a high degree of resistance to some of the signal impairments (particularly delayed image interference) which can spoil analogue TV reception, and may offer an alternative in areas where digital coverage is available."* The digital switchover has already taken place in all UK television regions.
- The effect of dust on sensitive receptors during construction: construction activities can result in temporary effects from dust if unmanaged. This can result in nuisance effects such as soiling of buildings and, if present over a long period of time, can affect human health.
- The main aims of the carbon balance assessment are: to quantify sources of carbon emissions associated with the development (i.e. from construction, operation and transportation of materials, as well as loss of peat/forestry if relevant); to quantify the carbon emissions which will be saved by constructing the development; and to calculate the length of time for the development to become a 'net avoider', rather than a 'net emitter' of carbon dioxide emissions. The length of time, usually expressed in months, is termed the 'payback time'.

Effects Scoped Out

14.10 The following effects associated the development have been scoped out of the assessment:

- Construction effects on telecommunications, shadow flicker, television and aviation and defence as these effects solely relate to operational turbines.
- Shadow flicker effects during operation: shadow flicker is an effect that can occur when the shadow of a moving wind turbine blade passes over a small opening (e.g. a window), briefly reducing the intensity of light within the room, and causing a flickering to be perceived. Shadow flicker effects occur only within 130 degrees of north and within ten rotor diameters of a turbine (i.e. 900m in the case of the development). As there are no properties within 130 degrees of north and within 900m of the development, shadow flicker effects have been scoped out of this assessment.
- NATS En Route Radar and navigation beacons: Review of the NATS self-assessment maps have identified that no issues associated with construction or operation of the development are likely. There are no navigation beacons located within 10km of the centre of the site and potential effects on these are therefore not considered further in this assessment.
- Effects on Civil Aerodromes and Heliports and Civil Airport Air Traffic Control (ATC) radar during construction and operation: there are no civil aerodromes, heliports, airports or ATC radars located within 30km of the centre of the site. Potential effects on these installations are therefore not considered further.
- Effects on military Air Surveillance and Control Systems (ASACS) Radar, Military Precision Approach Radar (PAR) and Military Aerodromes during construction and operation: There are no ASACS Radar or PAR radars within 50km of the site.
- Effects on Military Low Flying during construction and operation: the site is located within a "*Low priority military low flying area less likely to raise concerns"* [ii] and no effects are predicted.

- Radio broadcasting: it is not considered likely that radio broadcasting signals will be affected by the development once operational. This is because i) the length of radio broadcast signal wavelengths are such that interference from wind turbines is unlikely and ii) any interference to the radio signal is unlikely to noticeably affect the audio signal.
- Turbine icing: in certain weather conditions, such as still, cold weather, ice may form on turbine blades. This may result in ice fragments being thrown from the blades when operating and in ice falling from the blades when shut down. The Scottish Government web based renewables advice for onshore wind turbines[iii] states *"The build-up of ice on turbine blades is unlikely to present problems on the majority of sites. When icing occurs, the turbines' own vibration sensors are likely to detect the imbalance and inhibit the operation of the machines"*. In addition, the operators would implement measures to ensure the safety of workers and the general public in relation to ice throw and ice fall. These would comprise notices placed at access points alerting members of the public of the possible risk of ice throw and ice fall under certain conditions.
- Dust effects during operation of the development: during operation there will be limited dust raising maintenance activities being undertaken and transport will be limited.
- Cumulative effects: there are a number of operational and proposed wind farms located in the vicinity of the development including Griffin Wind Farm and Calliachar Wind Farm (both operational), and North Calliachar Wind Farm (application stage). No communication links effects are predicted as a result of operation of the development; therefore, no cumulative effects are considered likely. In relation to television reception, any effects resulting from other schemes are likely to be already mitigated therefore it is considered unlikely that there will be any cumulative effects. Cumulative dust effects during construction and operation of the development have been scoped out as dust generally settles locally and there would be no cumulative effect with other developments.

Assessment Methodology

Assessment Structure

14.11 The assessment is structured around the consideration of the following:

- effects on aviation and defence during operation;
- effects on telecommunications during operation;
- effects on television reception during operation;
- dust effects during construction;
- carbon balance assessment.

Data Sources and Guidance

14.12 The following guidance documents were referred to in undertaking this assessment:

- Scottish Planning Policy (February 2010)[iv];
- CAA Policy and Guidelines on Wind Turbines (2012)[v];
- PAN 50: Controlling the Environmental Effects of Surface Mineral Working (1996)[vi];
- PAN 51: Planning, Environmental Protection and Regulation (revised 2006)[vii];
- Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment, Section 3 Environmental Assessment Techniques, Part 1, HA207/07 Air Quality[viii];
- Scottish Government (2011c). *Calculating Potential Carbon Losses & Savings from Wind Farms on Scottish Peatlands, Technical Note – Version 2.0.1.*[ix];
- Scottish Government (2011d). *Carbon Payback Calculator: Guidance on how to use the spreadsheet*[x];
- Scottish Government (2012): Calculating carbon savings from wind farms on Scottish peat lands - A New Approach. Spreadsheet version 2.7.0:[xi];
- Scottish Natural Heritage (2003). Wind Farms and Carbon Savings, SNH Technical Guidance Note[xii].

14.13 The following data sources were used to inform the assessment:

- Department of Energy and Climate Change (DECC) (2013a). *Digest of UK Energy Statistics, DUKES Chapter 6: Renewable Sources of Energy, Table 6.5: Load factors for renewable electricity generation*[xiii];
- Department of Energy and Climate Change (DECC) (2013b). *Digest of UK Energy Statistics, DUKES Chapter 6: Renewable sources of energy*[xiv];
- Department of Energy and Climate Change (DECC) (2013c): *Digest of UK Energy Statistics, (DUKES) Chapter 5: Electricity, Table 5.7 Plant capacity – United Kingdom*[xv];
- Department of Energy and Climate Change (DECC) (2013d): *Digest of UK Energy Statistics, (DUKES) Chapter 5: Electricity, Table 5.1*[xvi];
- Department of Energy and Climate Change (DECC) (2013e): Digest of UK Energy Statistics, DUKES Chapter 5 - Electricity: Table 5C: Estimated carbon dioxide emissions from electricity generation 2010 to 2012[xvii];
- Met Office (2013). Strathallan 1981-2010 averages[xviii].

Field Survey

14.14 No field surveys were required to inform the assessment, however peat probing was undertaken within the site to inform the assessments within **Chapter 8: Geology, Hydrology and Hydrogeology** and **Chapter 9: Ecology**, and this information was used to inform the Carbon Balance Assessment.

Consultation

14.15 Consultation has been undertaken to inform the assessment, a summary of which is provided in **Table 14.1** below.

Table 14.1: Consultation Responses

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Civil Aviation Authority (CAA)	Scoping	No concerns raised.	No specific action required.
Ministry of Defence (MOD)	Scoping	The MOD raised no concerns over the Development in February 2011 in terms of radar or low flying. The MOD requested that turbines be fitted with red or infrared lighting. They further requested to be consulted and notified about progress of planning applications and submissions.	No specific action required.
NATS En Route	Scoping	No conflicts with NATS En Route safeguarding criteria.	No action required.

Consultee	Scoping/Other Consultation	Issue Raised	Response/Action Taken
Office of Communications (Ofcom) (operate domestic reception for terrestrial television and radio transmissions)	Scoping	Advised that four communications links are located in the vicinity of the Development. Advised consultation be carried out with Atkins Ltd and Joint Radio Company (JRC).	Link operators provided link end information which allowed plotting of links to avoid link/turbine interaction. Consultation with Atkins and JRC undertaken (see below).
Joint Radio Committee (JRC)	Scoping	Advised that the Development will not affect any communications links.	No action required.
Atkins	Other Consultation	No issues identified.	No action required.
British Broadcasting Corporation (BBC) Windfarm Tool (online)	Other consultation	No properties will be affected by the Development.	No action required.
Linesearch (online)	Other consultation	No underground services will be affected by the Development.	No action required.

Assessing Significance

Aviation and Defence, Telecommunications and Television

14.16 For effects on aviation and defence, telecommunications and television, predicted effects are judged as being either significant (where there is an effect which cannot be mitigated) or non-significant (where there is no effect, or where an effect can be mitigated) and have been determined through a standard method of assessment based on professional judgement obtained during work relating to a large number of previous wind farm projects. Due to the nature of these effects, levels of significance (e.g. major, moderate, minor or negligible) have not been identified. Where a 'significant effect' is identified, this is considered to be significant in the context of the EIA Regulations.

Dust

14.17 The risk based approach to assessing dust nuisance has been based on the likelihood of dust emissions causing nuisance (such as soiling of buildings) and the potential for effects on human health, with the aim of determining the level of mitigation, if required, to ensure that any potential effects are minimised. The DMRB states that dust generated during construction should be mitigated and that the locations of 'sensitive receptors' within 200m should be identified and mitigation measures to reduce dust effects be applied. As such, all receptors within 200m of potential dust sources have been considered as potential receptors.

14.18 Sensitivity of receptors is determined through professional judgement based on sensitive receptors defined in the DMRB. Effect magnitude has been determined through consideration of the potential dust raising activities during construction. Activities with high dust raising potential include earthworks (e.g. earth moving and excavation,), material handling (e.g. stockpiling and loading/unloading vehicles). Natural causes, e.g. wind blowing on stockpiles and uncovered vehicles can also potentially have a high dust raising potential. Material transport and traffic on un-surfaced roads are considered to have medium dust raising potential and the movement of dirty vehicles have a low dust raising potential.

14.19 Professional judgement is used to consider how receptor sensitivity and effect magnitude combine to affect potential receptors. Effects which are predicted to have an adverse effect on the amenity of the receptor or on human health are considered significant in the context of the EIA Regulations.

Carbon Balance

14.20 The carbon balance assessment was undertaken using the latest Scottish Government guidance. There is no formally established methodology or criteria for determining the significance of carbon sources or sinks in relation to carbon balance. However, the shorter the 'payback time' of CO_2 emissions, the sooner the project becomes a 'net avoider' of CO_2 emissions.

Planning Policy

14.21 Planning policies of relevance to this assessment are identified in **Chapter 5: Planning Policy Context**.

Existing Conditions

Aviation and Defence

14.22 Under the Civil Aviation Act, the CAA is responsible for providing advice about aviation safety. The Authority's Directorate of Airspace Policy (DAP) has the lead responsibility within the CAA for all wind turbine related issues. The Authority's policy on wind turbine development and related guidance to the UK civil aviation community is set out in CAP 764. The CAA changed its policy regarding pre-planning consultations in December 2010, stating that "*it will no longer process pre-planning enquiries unless submitted as a Scoping Opinion through a Local or National Planning Authority. As completion of the pre-planning process is not a statutory requirement, the CAA's decision will not affect the formal planning process.* "

14.23 The initial consultation with the CAA was made immediately before the policy change noted above. The CAA noted the development and made no further comment.

14.24 Data published by the Department of the Environment and Climate Change[xix] has been used to assess the likely effect of the Development on aviation interests. The Development:

- lies outside any consultation zone for safeguarded aerodromes; and
- lies outside the area where there may be effects on any Secondary Surveillance Radar (SSR).

14.25 Planning authorities will consult local aerodromes as follows:

- officially safeguarded aerodromes: Planning authorities must consult aerodromes on all matters relating to safeguarding (DfT / ODPM / NAFW Circular 1/2003 and Scottish Circular 2/2003 refers); and
- non-officially safeguarded aerodromes: Aerodrome Operators are advised to establish a consultation process with local planning authorities.

14.26 The MOD was consulted on the scoping wind farm design (refer to ES **Chapter 3: Site Selection and Design Strategy**) by Force 9 Energy in January 2011. The MOD responded confirming no objections to the project in February 2011. Force 9 Energy consulted again in August 2012, again, no objection was raised.

Telecommunications and other infrastructure

14.27 An enquiry was entered into the Linesearch facility which *"provides a single point of contact for all initial enquiries relating to the apparatus owned and/or operated by our Members, which now totals some 7,900 kms of pipeline and fibre optic cable ducts".* The results of this enquiry showed that the Development was not in the zone of interest for any of the listed organisations.

14.28 Following consultation with Ofcom, Atkins and the JRC, four telecommunication links (two from MLL Telecom, one each from BT and Orange) which may have had the potential to be affected by the development were identified. These links were mapped and appropriate setback distances were used to site turbines away from them.

Television

14.29 The online BBC Windfarm Tool (which provides an estimate of the population numbers potentially affected by the installation of wind turbines) indicated in December 2010 there is unlikely to be interference with local transmitters, with the result that no homes may be affected for which an alternative off-air service may be available.

Dust

14.30 The nearest residential property, Scotston (Grid Ref. 290546,742608) is located more than 600m from the site access track entrance. All other residential properties are located over 800m from the site.

Carbon Balance

14.31 The results of onsite survey work have confirmed that peat is present across the site. Whilst the final turbine and infrastructure layout of the development has sought to avoid deeper areas of peat, some peat will be required to be removed during construction and this has been taken into account in the carbon balance assessment.

Wind Farm Layout Design Considerations

14.32 The layout was designed to seek to minimise the loss of peat which is relevant to the carbon balance assessment. No further modifications to the layout were required in relation to the issues considered in this chapter.

Effects Assessment

14.33 The assessment of effects is based upon the scheme description outlined in **Chapter 4: Scheme Description** and considers the construction and operational effects of the development.

Construction Effects

Predicted Effects

Dust

14.34 The types of activities that may cause 'fugitive dust emissions'[1] are detailed above in **Section 14.18** Given the location of the nearest receptor identified and proximity to the access track, the movement of vehicles as they transport equipment and goods to site is the most likely source of dust during the construction period. The level and distribution of emissions will vary according to factors such as the duration of dust-generating activity and weather conditions.

14.35 Dust emitting activities generally respond well to appropriate dust control measures such as those outlined in PAN 50: Controlling the Environmental Effects of Surface Mineral Workings, and negative effects can greatly be reduced or eliminated. The developer will commit to adopting good practices for dust management during construction thereby controlling and reducing any potential effects on the potential receptors identified. These measures include:

- ensuring all loads entering and leaving the site are covered where practicable;
- the use of wheel wash facilities prior to exiting the main construction site to ensure mud and/or other wastes are not tracked down the access track and on to the public road;
- enforcing an appropriate speed limit.

14.36 With adherence to these good practice measures, the predicted dust effects will be temporary and will not be significant.

[1]Fugitive dust emissions are defined as any solid particulate matter that becomes airborne due to man-made or natural activities such as the movement of soil, vehicles, equipment, blasting and wind.

Proposed Mitigation

Dust

14.37 No mitigation beyond the adoption of good practice measures for dust management is required.

Residual Effects

14.38 The predicted residual effect of the development on dust receptors will not be significant with the implementation of the good practice measures proposed.

Operational Effects

Predicted Effects

Aviation and Defence

14.39 The MOD has raised no concerns about the development.

14.40 The CAA has raised no concerns about the development.

14.41 The predicted effect of the operation of the development on radar is therefore considered not significant.

Telecommunications

14.42 As noted above, consultation with Ofcom identified that there are four communications links within the vicinity of the site.

14.43 The predicted effect of operation of the development on telecommunications is considered not significant as the paths of the links were used to design out any link/turbine interactions.

Television Reception

14.44 The BBC online tool reported that no properties are likely to be affected by wind turbines in this location. This was reported on the basis of a central grid reference for the site.

Proposed Mitigation

Aviation and Defence

14.45 Given that the MOD and CAA have not raised any concerns about the development, no mitigation is considered necessary.

Telecommunications

14.46 Effects on telecommunications are predicted as being not significant therefore no mitigation measures are considered necessary.

Television Reception

14.47 The BBC online tool suggests there are no properties which may experience interference to their television reception once the development is operational. Effects on television reception would be confirmed following an onsite survey should issues arise. Installation of satellite television or upgrades of the current antenna systems would be the most appropriate and effective form of mitigation at these properties.

Residual Effects

14.48 The predicted residual effect of the development on civil and military aviation is considered to be not significant.

14.49 The predicted residual effect of the development on telecommunications is not significant.

14.50 The predicted residual effect of the development on television reception is not significant.

Carbon Balance

14.51 The carbon balance assessment has calculated the 'payback time' of CO_2 emissions for the development. A copy of the carbon balance assessment report is provided at **Appendix 14.1** and a summary of the

findings is provided below. In compiling carbon data, a conservative approach has been taken; therefore, little allowance has been made for CO_2 gains due to onsite improvements. Specifically, the exclusion of forestry replanting data in the calculator which is likely to have a huge positive impact on carbon savings for the site.

14.52 The payback time is defined as the length of time (in months) required for the development to be considered a net avoider of emissions rather than a net emitter. The calculation of payback time includes consideration of emissions resulting from the construction and operational phases of the development and includes the quantification of the carbon storage loss as a result of loss of peat and forestry within the site (expressed as CO_2 emissions).

14.53 The detailed methodology and assumptions used within the assessment are presented in **Appendix 14.1**. The main aims of the calculation are:

- to quantify sources of carbon emissions associated with the development;
- to quantify the carbon emissions which will be 'avoided' by operating the development;
- to calculate the length of time for the development to become a 'net avoider', rather than a 'net emitter' of carbon dioxide emissions.

14.54 Total carbon losses associated with the development are shown in **Table 4.2** below.

Table 14.2:Total Carbon Losses Due to Wind Farm

Source of Losses	Carbon losses (tCO_2yr^{-1})		
	Expected Value*	Minimum Value	Maximum Value
Turbine life cycle	21859	21859	21859
Backup generation	20823 (0)	0	22918
Reduction in carbon fixing potential	156	50	329
Soil organic matter	1412	248	2574
Dissolved Organic Carbon (DOC) & Particulate Organic Carbon (POC) leaching	0	0	0
Felling of forestry	75280	50187	75280
Total	**119530 (98707)**	**72344**	**122960**

* Numbers in brackets reflect carbon losses for the scenario where no backup generation capacity is required.

14.55 With the exception of the backup generation (assumed to be from fossil fuel sources), the carbon losses are independent of the generation mix used to calculate the overall carbon balance. Assuming a requirement for backup generation capacity, the calculator model indicates that based on expected values, over 18% of the carbon losses are from turbine life cycle, with approximately 1% due to losses of soil organic matter and 63% due to felling of forestry. Over 17% of the potential carbon losses are due to the requirement for backup power generation. It is likely that the need for backup power generation will be much smaller, perhaps for 10% or less of the wind farm's proposed operational period of 25 years. Should no backup generation capacity be required, emissions from turbine life cycle, soil organic matter losses and felling of forestry account for over 98% of carbon emissions.

14.56 Given that the "Grid-mix" will involve renewable energy developments that are operational, the "Fossil fuel-mix" represents the most likely scenario in terms of the existing capacity to be replaced by electricity generated from the site.

14.57 As shown in **Table 14.3** and assuming a requirement for backup generation capacity of 5%, the expected payback time is calculated to be approximately 29 months. With a 25 year operational life, this would mean that this development would save over 10 times the carbon emissions generated. Based on the worst case scenario, represented by the maximum values entered in the calculator, payback time is calculated to be 35 months.

14.58 The more likely scenario is that there will be little or no requirement for backup generation capacity, based on predictions for the growth in the contribution of wind energy to the national grid. With no requirement for backup capacity, the carbon payback period is reduced to 24 months based on the "Fossil Fuel-mix".

Table 14.3 Payback Timetable

Generation Source	Counterfactual emission factors (tCO_2MWh^{-1})[xx]	Carbon Payback time (years)			
		Expected Value		Minimum Value	Maximum Value
		0% Backup	5% Backup		
Coal fired	0.902	1.4	1.7	0.9	1.9
Grid Mix	0.460	2.7	3.3	1.7	4.0
Fossil Fuel Mix	0.636	2.0	2.4	1.2	2.9

Cumulative Effects Assessment

14.59 No cumulative effects have been identified.

Further Survey Requirements and Monitoring

14.60 No further survey requirements or monitoring are proposed.

Summary of Effects

14.61 **Table 14.4** summarises the predicted effects of the development.

Table 14.3: Summary of Effects

Predicted Effects	Significance	Proposed Mitigation	Residual Effects
Aviation and Defence	Not significant.	No mitigation required	Not significant
Telecommunications	Not significant	No mitigation required	Not significant
Television Reception	Not significant	No mitigation required	Not significant
Dust	Not significant	None	Not significant
Carbon Balance	The payback period during which any CO_2 emitted during construction and operation will be offset is 29 months (assuming a requirement for backup generation capacity of 5%). Beyond this period the development will make a positive net contribution to CO_2 reductions.		

[i] Ofcom (2009), Tall Structures and their impact on broadcast and other wireless services
[ii] Ministry of Defence (2011), Low Flying Consultation Zones
[iii] The Scottish Government (2011) 'Onshore Wind Turbines' Web Based Renewables Advice (updated October 2012)
[iv] The Scottish Government (2010), Scottish Planning Policy (SPP)
[v] Directorate of Airspace Policy (2012), CAP 764 CAA Policy and Guidelines on Wind Turbines 4th edition
[vi] The Scottish Executive (1996), PAN 50: Controlling the Environmental Effects of Surface Mineral Working
[vii] The Scottish Government (2006) PAN 51: Planning, Environmental Protection and Regulation
[viii] Design Manual for Roads and Bridges (DMRB), Volume 11 Environmental Assessment Techniques, Part 1, HA207/07 Air Quality
[ix] Scottish Government (2011c). *Calculating Potential Carbon Losses & Savings from Wind Farms on Scottish Peatlands, Technical Note – Version 2.0.1.*: http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/17852-1/CSavings/CTN201
[x] Scottish Government (2011d). *Carbon Payback Calculator: Guidance on how to use the spreadsheet*: http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Energy-sources/19185/17852-1/CSavings/CCalcGuidance (accessed 24 June 2013)
[xi] Scottish Government (2012): Calculating carbon savings from wind farms on Scottish peat lands - A New Approach. Spreadsheet version 2.7.0: Version dated 27 October 2012
[xii] Scottish Natural Heritage (2003). Wind Farms and Carbon Savings, SNH Technical Guidance Note
[xiii] Department of Energy and Climate Change (DECC) (2013a). *Digest of UK Energy Statistics, DUKES 6.5: Load factors for electricity generated from renewable sources*: https://www.gov.uk/government/publications/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes (Accessed 25th November 2013)
[xiv] Department of Energy and Climate Change (DECC) (2013b). *Digest of UK Energy Statistics, DUKES Chapter 6: Renewable sources of energy:* https://www.gov.uk/government/publications/renewable-sources-of-energy-chapter-6-digest-of-united-kingdom-energy-statistics-dukes (Accessed 25th November 2013)
[xv] Department of Energy and Climate Change (DECC) (2013c): *Digest of UK Energy Statistics, (DUKES) Chapter 5: Electricity, Table 5.7 Plant capacity – United Kingdom*: https://www.gov.uk/government/publications/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes (accessed 25th November 2013)
[xvi] Department of Energy and Climate Change (DECC) (2013d): *Digest of UK Energy Statistics, (DUKES) Chapter 5: Electricity, Table 5.1*: https://www.gov.uk/government/publications/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes (accessed 25th November 2013)
[xvii] Department of Energy and Climate Change (DECC) (2013e): Digest of UK Energy Statistics, DUKES Chapter 5 - Electricity: Table 5C: Estimated carbon dioxide emissions from electricity generation 2010 to 2012: https://www.gov.uk/government/publications/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes (accessed 25th November 2013)
[xviii] Met Office (2013). *Strathallan 1981 – 2010 averages*: http://www.metoffice.gov.uk/public/weather/climate/strathallan#?tab=climateTables (accessed 30th September 2013)
[xix] https://restats.decc.gov.uk/cms/aviation-safeguarding-maps
[xx] Department of Energy and Climate Change (DECC) (2013e): Digest of UK Energy Statistics, DUKES Chapter 5 - Electricity: Table 5C: Estimated carbon dioxide emissions from electricity generation 2010 to 2012: https://www.gov.uk/government/publications/electricity-chapter-5-digest-of-united-kingdom-energy-statistics-dukes (accessed 25th November 2013)

15 Summary

Introduction

15.1 Chapters **6 to 14** of the Environmental Statement (ES) report the findings of the assessments of the predicted effects of Creag a' Bhàird Wind Farm on a topic-by-topic basis. The significance of these effects has been assessed using criteria defined in the topic chapters. Where appropriate, the significance of effects has been categorised as major, moderate, minor or negligible. In the context of the Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011 ('the EIA Regulations')[i], effects assessed as being of '**major**' or '**moderate**' significance are considered to be significant effects. For some of the assessments, effects are either considered to be **significant** or **not significant** in the context of the EIA Regulations. In line with Planning Circular 3 2011[ii], the EIA Regulations, and other relevant EIA guidance, the ES has focused particularly on significant effects (both positive and negative).

15.2 **Table 15.1** summarises the predicted significant effects of the wind farm prior to, and following, the implementation of committed mitigation measures. Summaries of all significant and non-significant effects can be found at the end of each assessment chapter.

Summary of Significant Effects

15.3 Prior to committed mitigation, significant effects are predicted in relation to:

- Landscape and Visual Amenity;
- Geology, Hydrology and Hydrogeology;
- Ornithology;
- Archaeology and Cultural Heritage.

15.4 No significant effects are predicted in relation to:

- Noise;
- Ecology;
- Access, Traffic and Transport;
- Socio-Economics;
- Other Issues.

15.5 Only effects which are considered to be significant prior to mitigation are presented in **Table 15.1**. All other effects are considered to be non-significant prior to mitigation and are therefore not presented.

15.6 From the outset, the purpose of the design strategy for the wind farm was to avoid significant environmental effects through design of the turbines and associated infrastructure. The overall aim of the design strategy was to create a wind farm with a cohesive design that relates to the surrounding landscape, and to the adjacent Griffin Wind Farm, in line with appropriate published guidance.

15.7 The main components of the wind farm considered in the early design stage were the turbines. Given their form as tall, man-made structures, potentially visible within a wide area, the location and scale of these influenced the design to minimise landscape and visual effects. The design layout was also informed by wind yield and ground condition considerations as information emerged through the EIA process. Informed by the emerging design of the turbine layout, other infrastructure features such as the access tracks were subsequently designed, taking into account environmental constraints data.

15.8 As shown in **Table 15.1**, there is scope to mitigate most of the predicted significant effects and many are therefore not significant following mitigation.

15.9 The landscape and visual assessment has predicted that there will be a major landscape effect on the site relating to excavations and track construction, the presence of tall cranes and partially built towers whilst turbines are being erected. This effect, however, will be temporary. In addition, it is anticipated that there will be a major effect on the local area of LCT 3: Highland Summits and Plateaux during construction. Following the implementation of mitigation and site restoration proposals, it is predicted that the significant effect on the landscape will be restricted to within 2km of the site, and will not be significant in terms of the LCT as a whole. It is also anticipated that there will be major effects on the site during operation of the wind farm, as well as major effects on the local area of LCT 3: Highland Summits and Plateaux. The significant effect on LCT 3 will be restricted to within 3km of the site during operation. Further mitigation, in addition to that undertaken as part of the design strategy is not possible due to the inherent nature of wind farm developments.

15.10 In terms of visual amenity, during construction, the level of effect on views from Strathbraan and Scotston in Glen Cochill will be moderate (temporary). Local hill walkers will have views into the site, and will therefore see forestry removal, turbine construction and possibly the construction of low level elements within the site (e.g. access tracks and substations), dependant on location. It is considered that this will result in a moderate (temporary) effect on local hill walkers. Significant visual effects are predicted for six of the 19 representative viewpoints (four major effects and two moderate effects) during operation of the wind farm. The visual assessment concludes that significant effects on views will be experienced by viewers who are susceptible to change, at locations up to 6km from the proposed turbines, where there are open views towards the wind farm.

15.11 The geology, hydrology and hydrogeology assessment has identified that, prior to mitigation, there is potential for a moderate pollution effect on private water supplies during construction. This effect will be reduced to minor following mitigation, which will include surface water monitoring downstream of the site and at abstraction locations. No further significant effects are anticipated in relation to geology, hydrology and hydrogeology.

15.12 The ornithology assessment has identified that construction activities will displace black grouse from foraging areas, and this is considered to represent an effect of minor-moderate significance. Following the implementation of proposed mitigation as set out in **Table 15.1**, a residual minor effect will remain. The assessment has also identified a minor-moderate displacement effect on short-eared owl during construction. It is anticipated that a minor residual effect will remain following committed mitigation.

15.13 During operation of the wind farm, it is predicted that there will be a moderate collision effect on hen harrier. This effect will be reduced to minor following mitigation.

15.14 The archaeology and cultural heritage assessment has identified that, during construction, there is potential for major effects to occur upon previously unrecorded heritage assets currently obscured by forestry. A minor effect will remain following the proposed implementation set out in **Table 15.1**. In addition, a moderate residual cumulative effect on the setting of the Salachill settlement is predicted.

Interrelated Effects

15.15 The EIA Regulations (Schedule 4, Part 1, paragraph 3) require that Environmental Statements consider the interrelationships between aspects of the environment likely to be significantly affected by a development. It is considered that the following effects are interrelated:

- There is a correlation between recreation and tourism effects and views of the wind farm from viewpoints within the wider 35km landscape and visual study area. Whilst the assessment of such interrelated effects is presented within **Chapter 13: Socio-Economics**, the assessment necessarily relates to the assessment in **Chapter 6: Landscape and Visual Amenity**. No significant effects are predicted on recreation and tourism as a result of Creag a' Bhàird Wind Farm.

- There is some correlation between landscape and cultural heritage effects in relation to the change in views resulting from the wind farm where these are evident from cultural heritage receptors. An assessment of effects on the setting of cultural heritage features is undertaken in **Chapter 11: Archaeology and Cultural Heritage,** which is interrelated to the findings of the assessment in **Chapter 6: Landscape and Visual Amenity** whereby changes to views within the wider area are discussed.

- There is some correlation between likely effects on hydrology and ecology given that changes to hydrology resulting from the wind farm could result in effects on ecological receptors for example, disruption of the hydrological patterns within groundwater dependent habitats. These interrelated effects are assessed in **Chapter 8: Geology, Hydrology and Hydrogeology** and **Chapter 9: Ecology**.

- There is some correlation between potential effects on local residential amenity resulting from visual effects on settlements; temporary effects from construction noise and traffic, as well as operational noise. Effects on settlements are considered in **Chapter 6: Landscape and Visual Amenity**, **Chapter 7: Noise** and **Chapter 12: Access, Traffic and Transport**.

Table 15.1: Summary of Predicted Significant Effects

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
Landscape and Visual Amenity			
Construction			
Landscape			
Construction effects on the landscape of the site.	Major	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Major
Construction effects on LCT 3: Highland Summits and Plateaux.	Major (local). No effect on the overall LCT.	As above.	Major effect across a small area, no more than 2km from the site. Not significant on the overall LCT.
Operation			
Landscape			
Operational effects on the landscape of the site.	Major	In built design mitigation.	Major
Operational effects on LCT 3: Highland Summits and Plateaux	Major (local)	In built design mitigation.	Significant across a small area, no more than 3km from the site. Not significant on the overall LCT.
Construction			
Visual Amenity			
Construction Effects on residential receptors within Strathbraan and Scotston, Glen Cochill	Moderate and Significant (temporary)	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Moderate and Significant (temporary)
Construction effects on local hillwalkers using the hills around Strathbraan	Moderate and Significant (temporary)	Follow agreed CMS during construction. Restoration of disturbed areas planting of commercial crop post construction.	Moderate and Significant (temporary)
Operation			
Visual Amenity			
Effects on views from VP01 Druim Mòr.	Major	In built design mitigation	Major
Effects on views from VP02 Ben Salachill.	Major	In built design mitigation	Major
Effects on views from VP03 A826 within Glen Cochill.	Moderate	In built design mitigation	Moderate
Effects on views from VP04 General Wade's Military Road, Glen Cochill.	Major	In built design mitigation	Major
Effects on views from VP05 A822 near Borelick.	Major	In built design mitigation	Major
Effects on views from VP07 Creag Liath (426m AOD)	Moderate	In built design mitigation	Moderate
Geology, Hydrology and Hydrogeology			
Construction			
Pollution of private water supplies	Moderate	Surface water monitoring downstream of site and at abstraction locations Availability of mobile potable water bowsers for downstream private water supplies abstracting from surface waters Reducing magnitude to moderate, reflecting alternative supply availability	Minor

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
Ornithology			
Construction			
Black-grouse displacement	Minor-moderate	Restriction on activity within 500m one hour before and after dawn during breeding season. Control of site access from A826 and minimise pedestrian activity along access track.	Minor
Short-eared owl displacement	Minor-moderate	Construction activities to commence prior to breeding season. Visual deterrents put in place on restricted sections of access track to exclude breeding attempts. Minimise pedestrian activity along access track. Pre-construction surveys within wind farm to determine breeding and exclusion of construction around any nest	Minor
Operation			
Hen Harrier Collision	Moderate	Replanting conifer plantation Prey surveys and strimming of rides	Minor
Archaeology and Cultural Heritage			
Construction			
Potential for construction effects upon previously unrecorded heritage assets currently obscured by forestry.	Potentially major	Archaeological survey post-felling and brash removal. Recording and mapping of identified assets. Physical preservation of identified assets by micro-siting/avoidance or preservation by record (archaeological excavation and/or recording).	Minor adverse effect at worst. Beneficial effect for those assets physically preserved.

Predicted Effect	Significance of Effect	Mitigation	Significance of Residual Effect
Cumulative Effects			
Cumulative effect on the settlement at Salachill (AM9631)	Moderate	None	Moderate

[i] The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011
[ii] Planning Circular 3 2011: The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011