Environmental Appraisal of a proposed wind turbine at Whitehouse Burn, Argyll and Bute

Prepared for Genesis Energy
by
Land Use Consultants

with

MacArthur Green Ecology
Hayes McKenzie Noise Consultants
Green Cat Renewables
PMSS

June 2011

www.landuse.co.uk

LUC SERVICES

Environmental Planning

Landscape Design

Landscape Management

Masterplanning

Landscape Planning

Ecology

Environmental Assessment

Rural Futures

Digital Design

Urban Regeneration

Urban Design

43 Chalton Street
London NW1 1JD
Tel: 020 7383 5784
Fax: 020 7383 4798
london@landuse.co.uk

14 Great George Street
Bristol BS1 5RH
Tel: 0117 929 1997
Fax: 0117 929 1998
bristol@landuse.co.uk

37 Otago Street
Glasgow G12 8JJ
Tel: 0141 334 9595
Fax: 0141 334 7789
glasgow@landuse.co.uk

28 Stafford Street
Edinburgh EH3 7BD
Tel: 0131 202 1616
edinburgh@landuse.co.uk

DOCUMENT CONTROL SHEET

Version Status:		**Version Details:**	**Prepared by:**	**Checked by:**	**Approved by:**
Ver:	**Date:**				**Principal**
2	*06/06/11*	*Final Report*	*Steven Orr*	*Sam Oxley*	*Joanna Wright*

CONTENTS

TABLES

FIGURES

APPENDICES

1 Introduction

1.1 Land Use Consultants (LUC) was commissioned to undertake an environmental appraisal to accompany the planning application for a proposed Feed-in-Tariff wind energy development.

1.2 The aim of the work was to respond to the requirements of the screening opinion from the local authority, dated 8th March 2011, and appended to this report. The screening opinion was provided in response to a screening request made to Argyll and Bute Council by LUC on behalf of Genesis Energy Ltd on 8th February 2011.

1.3 It was confirmed that formal Environmental Impact Assessment (EIA) was not needed. However, in summary the following was required:

- an account of the design principles for the project;
- the undertaking of a landscape and visual impact assessment including assessment of short and longer term effects upon landscape fabric; effects upon landscape character (including upon recreational assets); impacts upon designated landscapes; visual impacts (including upon recreational receptors); and cumulative landscape and visual impacts. A 30km radius Zone of Theoretical Visibility (ZTV) was requested;
- an ecological and ornithological assessment;
- an assessment of potential impacts of noise; and,
- an assessment of relevant technical issues, including impact on radar and telecommunications.

SITE LOCATION

1.4 The proposed site is adjacent to Whitehouse Burn in Kintyre, centred on National Grid Reference (NGR): NR 8463 6140. The nearest settlement is Whitehouse, south of Tarbert, to the east of West Loch Tarbert, and the A83.

1.5 The site is currently under mature non-native conifer forest, extending from the B8001 near Spion Kop up to the lower south west facing flanks of Cnoc a' Bhaile-shios (422m AOD), and broadly following the Whitehouse Burn and its tributaries. The nearby hill named Coire nan Capull (335m AOD) has a mast on the summit, and lies to the east of the site.

1.6 below indicates the site location.

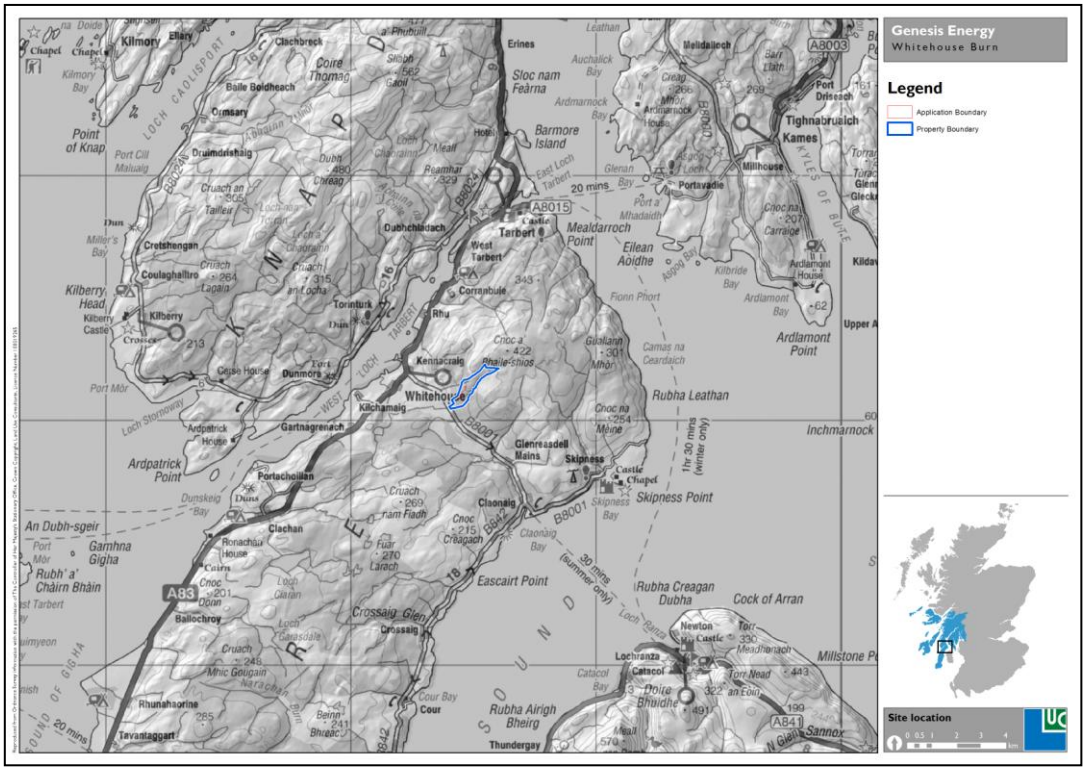

Figure 1.1: Location map

METHODOLOGY

1.7 The work to inform this report included examination of maps and air photographs; analysis of published material; field surveys of the proposed wind turbine location and surrounding area; and digital modelling work to prepare wirelines, photomontages and zone of theoretical visibility (ZTV) maps. Extensive computer modelling was also required to assess potential access issues and the effects of noise on local residents.

1.8 Further detail on the methods used for each aspect of the work, and the guidance followed is provided within each relevant chapter of the report.

1.9 In addition, relevant planning documentation was reviewed, including Supplementary Planning Guidance. Environmental designations and sensitivities were reviewed.

1.10 Consultation was undertaken with the local authority and statutory bodies to agree the scope of the work, and details such as assessment viewpoints.

2 Scheme details

INTRODUCTION

2.1 The project consists of the erection of a single wind turbine, 60m tall to hub and 84m tall to blade tip, an associated small electrical substation building and necessary upgrading works to a pre-existing forestry track. Connection to the National Grid will be achieved via existing 33kV overhead lines running through the forest around 950m to the south west of the development site. A formal grid connection offer (DRN459) has been secured and shall take effect as a special connection agreement under Section 22 of the Electricity Act 1989, as amended.

2.2 Underground cables will be routed alongside the upgraded and existing track. Works to connect the development to the grid will be undertaken by Scottish Hydro Electric Power Distribution (SHEPD) under the Permitted Development rights granted to Statutory Undertakers by Class 40, Part 13 of The Town and Country Planning (General Permitted Development) (Scotland) Order 1992, as amended.

2.3 No new overhead infrastructure will be required, therefore consent from Ministers under Section 37 of The Electricity Act 1989 is not required.

TURBINE SPECIFICATIONS

2.4 The preferred turbine model is the Enercon E48, standing 60m tall to the hub, and 84m to blade tip.

2.5 It comprises;

- a circular reinforced concrete foundation pad (16m diameter, 1.6m maximum section);
- a three section tubular steel tower;
- the hub nacelle containing the drive system (generator[1], control systems, braking and safety systems), yaw motors; and,
- three variable pitch glass-fibre blades.

2.6 A design drawing and detailed foundation drawings are included as **Appendix 1**.

2.7 Detailed geotechnical investigations of the site, involving trial pits, boreholes and bearing plate tests will be conducted in advance of construction by the turbine suppliers and installers.

ADDITIONAL WORKS

Substation

2.8 A small electrical substation building will be required to house switchgear and transformers to facilitate connection to the grid.

[1] Enercon turbines use direct-drive annular generators, and require no gearbox – and so are significantly quieter than equivalent machines.

2.9 The structure will be of prefabricated concrete and steel, on a concrete base. It will measure 2.6m tall, and 4.2m by 7m in plan with a 1.7m 'cellar' for plant and cable access.

2.10 Detailed design drawings are provided in **Appendix 1**.

Crane pad and hardstanding

2.11 A levelled, crushed stone surfaced plinth, measuring 20m by 30m will be constructed adjacent to the turbine base to facilitate crane operation and erection. Two cranes are required. A c.20 tonne crane is necessary to assist in the erection of the c.100 tonne crane used to move the turbine sections into position.

2.12 A further temporary laydown and assembly space – comprising levelled soft ground – is required to enable contractors to pre-assemble modular turbine components prior to their positioning by crane. This space will measure 30m by 15m.

Track upgrade

2.13 Around half the length of the existing forest track leading to the site has insufficient load-bearing capacity to accommodate the heavy plant required for erection of the wind turbine. It will therefore require resurfacing and reinforcement to meet the turbine supplier's specification.

2.14 The first 600m of track from the junction with the B8001 has recently been brought up to a suitable standard as a result of ongoing forestry operations (4m wide with 150kN bearing capacity). The remaining 550m section from NR 8439 6089 onwards is currently in relatively poor condition and of inconsistent width.

2.15 No on-site excavation of borrow pits will be required.

2.16 A location map, site layout and construction details are included within **Appendix 1**.

SITE RESTORATION

2.17 This section relates to two separate phases of restoration: one immediately post-construction, and another at the end of the life of the development.

Post-construction restoration

2.18 Topsoil (including peat) and subsoil excavated during construction of the turbine foundations, levelled areas and substation building will be stored separately and reinstated in stratigraphic order where possible (i.e. where structures are not present).

2.19 Surplus material will be used in creating the soft-surfaced assembly area. Re-colonisation from the existing seedbank is preferred to artificial seeding to promote vegetation regrowth. The area of forest felled around the construction site will be maintained as relatively open ground to facilitate efficient operation and easy access if required.

2.20 The forest compartment in which the turbine will be located is scheduled for felling in around nine year's time, creating an opportunity to develop the open ground habitat resource. However, it is scheduled to be replanted with Sitka spruce[2].

2.21 The areas of hardstanding, while not in regular use, will be prevented from inundation by self-seeded vegetation – particularly tree saplings – through periodic maintenance. Chemical use will be avoided.

End-of-life restoration

2.22 The hardstanding and laydown space will require assessment for stability, but will be re-used for the reverse process of dismantling the turbine. The track will be in semi-regular use during the course of forest management operations and is therefore likely to have been relatively well maintained.

2.23 It is anticipated that the tower will be decoupled from its foundation and will be entirely recycled. Removing the foundation pad completely has the potential to cause considerably more environmental disturbance than allowing it to remain in situ. However, current practice suggests that it may be advisable to break the concrete work down to a depth of around 1m and restore the ground surface to grade with the neighbouring areas.

2.24 There is currently insufficient data to make a suitably informed judgement of the most environmentally responsible and sustainable choice. While there may be benefits to removing and recycling the concrete (for secondary aggregates) and the steelwork – in parallel with reducing the potential for changes in soil chemistry as a result of acid attack, stress and water erosion – the disturbance and potential for increased/polluted runoff during excavation and breaking up of the foundations may outweigh such gains.

2.25 It is anticipated that best practice in this area will evolve and be refined considerably over the coming decade as the first generation of UK windfarms are either decommissioned and restored – or alternatively are 'repowered'. The applicant is therefore content to be guided by the judgement of the planning authority and will adopt the best practice approach recommended at the end of the development's operational life.

Restoration bond

2.26 The applicant undertakes to institute a bond, held in trust by the local authority, sufficient to facilitate full restoration of the site. It is anticipated that such an arrangement will be included within any obligation under Section 75 of The Town and Country Planning (Scotland) Act 1997, as amended, to ensure that its terms are enforceable against any successors in title.

[2] R Dixon & Son Ltd. (2010) *Long term forest plan 2010-2029, Spion Kop Forest, Argyll* (SRDP Proposal 4164672)

COMMUNITY BENEFIT FUND

2.27 The developer undertakes to pay 3% of gross revenues arising from the development into a suitably constituted fund to benefit the local community.

2.28 Advice contained within PAN 1/2010 states that Obligations drawn up under Section 75 of the 1997 Act, as amended, are not considered appropriate vehicles for administration of such funds. It is therefore anticipated that such an agreement should be reached under other legal powers granted to local authorities (e.g. under Section 69 of the Local Government (Scotland) Act 1973.)

2.29 It should be noted that the offer of a community benefit fund is not a material consideration for the purposes of planning. It is offered solely to fulfil the developer's commitment to corporate social responsibility and sustainability.

3 Planning policy context

INTRODUCTION

3.1 This section represents a review of national and local planning policies that may reasonably be applied to the proposed development.

NATIONAL POLICY

3.2 **Table 3.1** below sets out key national policy relating to renewable energy and landscape and visual impact of wind energy development. Broader policy considerations are not discussed.

Table 3.1: Summary of National Planning Policy

Policy Document	Summary of provisions

Scottish Planning Policy	The Scottish Planning Policy (SPP) sets out the Scottish Government's policy on wind energy development. It supersedes SPP6 and aims to ensure the delivery of renewables targets, setting out the role of the planning system in implementing the SG vision for a lower carbon Scotland.
	
	The SPP requires that:
	
	• Planning authorities support the development of windfarms in locations where the technology can operate efficiently and environmental and cumulative impacts can be satisfactorily addressed.
	
	• Development plans provide a clear indication of the potential for development of windfarms of all scales and should set out the criteria that will be considered in deciding applications for all windfarms, including extensions.
	
	• Landscape and visual impact is a key consideration – the SPP states that:
	
	  • The design and location of any windfarm 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.
	
	  • When considering cumulative impact, planning authorities should take account of existing windfarms, those which have permission and valid applications for windfarms which have not been determined. Decisions should not be unreasonably delayed because other schemes in the area are at a less advanced stage in the application process. The weight that planning authorities attach to undetermined applications should reflect their position in the application process. Cumulative impact will largely relate to the scale and proximity of further development. The factors that will be taken into account when considering cumulative impact should be set out in the development plan or supplementary guidance.
	
	• Paragraph 190 of the SPP recommends a separation distance of 2km between areas of search and settlements

LOCAL PLANNING POLICY

3.3 An application for development of the Whitehouse Burn site is being submitted to Argyll and Bute Council who will make their determination based on the **Argyll and Bute Structure Plan 2002** and the **Argyll and Bute Local Plan 2009**, guided by national and regional planning policy.

3.4 Structure Plan Policies relevant to the development are detailed in Table 3.2 below. Although the Structure Plan is technically out of date (being more than five years old) it will continue to be an integral part of the development plan until superseded by the emerging Local Development Plan. The Local Plan will therefore be the primary material consideration in the determination of any eventual application.

3.5 An assessment of compliance is provided in ***bold, italic text*** within the table.

Table 3.2: Structure plan policies

Structure Plan	
Policy STRAT SI 1 – Sustainable Development.	Argyll and Bute Council shall adhere to the following principles in considering development proposals, and in its policies, proposals and land allocations in Local Plans. It will seek to:- • maximise the opportunity for local community benefit; • make efficient use of vacant and/or brownfield land; • support existing communities and maximise the use of existing service infrastructure; • maximise the opportunities for sustainable forms of design, including energy efficiency; • avoid the use of prime quality or locally important good quality agricultural land; • use public transport routes fully and increase walking and cycling networks; • avoid the loss of recreational and amenity open space; • conserve the natural and built environment and avoid significant adverse impacts on biodiversity, natural and built heritage resources; • respect the landscape character of an area and the setting and character of settlements; • avoid places where there is a significant risk of flooding, tidal inundation, coastal erosion or ground instability; and • avoid having an adverse effect on land, air and water quality. ***With the adoption of good practice construction methods, the proposed development will assist in compliance with this policy. The proposal will have no significant impacts on natural and cultural heritage resources. Although it will result in change within the landscape, significant effects have been avoided wherever possible.***
STRAT DC 7 – Nature Conservation and Development Control	A. Development likely to have a significant effect on a Natura site will be subject to an Appropriate Assessment. The development will only be permitted where the assessment indicates that it will not adversely affect the integrity of the site, or, there are no alternative solutions and there are imperative reasons of overriding public interest

	B. On sites of national importance, SSSIs and NNRs, development will only be permitted where it can be demonstrated that the overall objectives of the designation and the overall integrity of the designated area would not be compromised, or where any adverse impacts are clearly outweighed by social or economic benefits of national importance C. Development which impacts on Local Wildlife Sites or other nature conservation interest, including sites, habitats or species at risk as identified in the Local Biodiversity Action Plan, shall be assessed carefully to determine its acceptability balanced along with national – or local – social or economic considerations. D. Enhancement to nature conservation interests will also be encouraged in association with development and land se proposals ***The development will have no effect on designated sites, and survey work indicates that impacts on key species are unlikely.*** ***Further pre-construction survey work will ensure that the limited felling required will not have an impact on species (particularly red squirrel and common crossbill) that may have moved into the site in the interim.***
Policy STRAT DC 9 - Historic Environmental and Development Control	This policy may have some relevance to the project whereby "Protection, conservation, enhancement and positive management of the historic environment is promoted. Development that damages or undermines the historic, architectural or cultural qualities of the historic environment will be resisted; particularly if it would affect a Scheduled Ancient Monument or its setting, other recognised architectural site of national or regional importance, listed building or its setting, conservation area or historic garden or designed landscape." ***Consultation of the National Monuments Record and the West of Scotland Archaeology Service (WoSAS) Site and Monuments Record did not indicate the presence of cultural heritage sensitivities on site. Similarly no archaeological features were noted within the application boundary during the course of a walkover survey of the site.*** ***Although the development will introduce a new element into the landscape, it is not considered to have a significant impact on the setting of designated assets in the vicinity.***
Policy STRAT RE 1 – Wind Farm/Wind Turbine Development	Windfarm development is encouraged where it is consistent with STRAT DC 7, 8 and 9 whereby proposals shall be supported where it can be demonstrated there is no significant adverse effect on: • Local communities; • Natural environment; • Landscape character and visual amenity; • Historic environment; • Telecommunications, transmitting or receiving systems; and The Council will identify, with appropriate justification in the Local Plan (as referenced in Section 4.4.2 below), broad areas of search or, where appropriate, specific sites where wind energy development may be permitted. The Council will also indicate sensitive areas or sites which it is adjudged that for overriding environmental reasons, proposals for windfarm development would only be considered in exceptional circumstances in line with the criteria set out above. Issues associated with the cumulative

	impact of windfarm and wind turbine developments will be addressed. This will be done in partnership with the industry and other interested parties including local communities. ***The proposed development is not within an area identified as being 'sensitive' to wind energy development.***
Policy STRAT DC 8 – Landscape and Development Control	Development which, by reason of location, siting, scale, form, design or cumulative impact, damages or undermines the key environmental features of a visually contained or wider landscape or coastscape shall be treated as 'non-sustainable' and is contrary to this policy. Outwith the National Park particularly important and vulnerable landscapes in Argyll and Bute are those associated with: 1. National Scenic Areas 2. Historic landscapes and their settings with close links with archaeology and built heritage and/or historic gardens and designed landscapes 3. Landward and coastal areas with semi-wilderness or isolated or panoramic quality Protection, conservation and enhancement to landscape will also be encouraged in association with development and land use proposals ***The development will result in change of the local landscape, and will be visible from the North Arran National Scenic Area and the Knapdale / Melfort Area of Panoramic Quality as defined in the Local Plan. However, these impacts are assessed as being of minor significance.***

Table 3.3: Local plan policies

Local Plan	
Policy LP ENV 6 – Development Impact on Habitats and Species	In considering development proposals, the Council will give full consideration to the legislation, policies and conservation objectives that may apply to the following: • Habitats and species listed under Annex I, II and IV of the Habitats directive • Species listed under Annex 1 of the Birds Directive; • Species listed on Schedules 1,5 and 8 of the Wildlife and Countryside Act 1981, (and as amended by the Nature Conservation(Scotland) Act 2004); • Habitats and Species listed in the UK Biodiversity Action Plan; and • Habitats and Species which are widely regarded as locally important as identified in the Local Biodiversity Action Plan. ***Terrestrial ecological surveys and the programme of ornithological observations have revealed none of the above sensitivities on site. The only species of conservation importance noted on site was non-breeding common crossbill. Although some localised disturbance will occur during construction the development will not permanently displace the small population and should have no long term impact.***
Policy ENV 7 – Development Impact on Trees/Woodland	Policy seeks to safeguard trees and woodland throughout Argyll and Bute. ***The site lies within a small commercial conifer forest, in which felling is a standard aspect of management. The area of woodland lost to the development will be 0.4ha. However, the forest is currently in the process of progressive felling and restructuring in line with a long-term management plan agreed with Forestry Commission Scotland. This will therefore result in***

	significantly improved environmental quality.
Policy ENV 9 – Development impact on National Scenic Areas	Development in, or adjacent to, National Scenic Areas that would have a significant adverse effect on a NSA will be refused unless it can be demonstrated that: A. The objectives of the designation and overall integrity of the area will not be compromised B. Any significant adverse effects on the quality for which the area has been designated are clearly outweighed by social and economic benefits of national importance C. Where acceptable, development must also conform to Appendix A of the Local Plan In all cases the highest standards, in terms of location, siting, landscaping, boundary treatment, materials and detailing will b required within a NSA ***The development is neither in, nor adjacent to, a NSA. The turbine will be visible from the North Arran NSA but will have effects of minor significance***
Policy ENV 10 – Development Impact on Areas of Panoramic Quality	Development in, or adjacent to, an Area of Panoramic Quality will be resisted where its scale, location or design will have a significant adverse impact on the character of the landscape unless it is demonstrated that: A. Any significant adverse effects on the quality for which the area has been designated are clearly outweighed by social and economic benefits of National or regional importance B. Where acceptable, development must also conform to Appendix A of the Local Plan In all cases the highest standards, in terms of location, siting, landscaping, boundary treatment and materials will be required within Areas of Panoramic Quality. ***The development is neither in, nor adjacent to, an Area of Panoramic Quality (APQ).*** ***The turbine will be visible from the Knapdale / Melfort APQ, however the impacts are regarded as being of minor significance.***
Policy ENV 12 – Water Quality and Environment	Proposals that could affect the water environment will be assess with regard to potential impact on: • Water quality and quantity • Riparian habitats and wildlife ***A separation distance of >100m has been ensured between all parts of the development requiring significant excavation. No concrete work will occur within 150m of any watercourse. Construction will comply with SEPA best-practice guidance.*** ***Protected species surveys of the on-site watercourses, most notably the Whitehouse Burn, indicated potential for use by otter – although no sign was noted during the course of fieldwork.***
Policies ENV 11,13(a), 16 & 17 – Development Impact on Historic Gardens and Designed Landscapes, Listed Buildings and Scheduled Ancient Monuments, and Sites of Archaeological Importance	These policies collectively seek to safeguard historic assets and their settings. Developments that have an adverse impact on such assets and their settings will be resisted. ***The development will not have a significant adverse effect on the fabric or setting of historic assets.***

Policy LP REN 1 – Wind Farms and Wind Turbines	Windfarm developments will be supported in forms scales and sites where the technology can operate efficiently, where servicing and access implications are acceptable, and where the proposed development will not have an adverse impact directly, indirectly or cumulatively on the economic social or physical aspects of sustainable development. The policy sets out criteria against which applications will be assessed, including settlements and their settings, nature conservation, historic environment, landscape and amenity considerations, recreational and tourism interests, telecommunication constraints and peat stability. Windfarm policy maps provide location guidance for schemes **over 20MW but are not applicable to a lesser scale of development**. The Windfarm Map included in the Local Plan is provided at: http://www.argyllbute.gov.uk/content/planning/developmentpolicy/localplan/archivedlocalplans/modif4/mods4_1 The proposed development is located with a '**potentially constrained**' area for large scale (>20MW) windfarms. Potentially Constrained Areas where proposals will be neither generally supported nor resisted but considered on their merits taking account of the criteria referred to in (A) above and all other material considerations including any unacceptable adverse effect on Special Protection Areas, Special Areas of Conservation, and Ramsar sites; National Scenic Areas and Sites of Special Scientific Interest; and land within the Green Belt. ***The development will have a minor effect on the North Arran NSA, and no impact on the other designations noted above. Similarly, it falls well below the output threshold described in the policy.***

Supplementary guidance

3.6 Although the Local Plan commits the Council to producing supplementary guidance on the siting and design of wind energy developments, this is not yet available.

Emerging development plan

3.7 The Argyll and Bute Local Development Plan – which, on adoption, will supersede the existing Local and Structure Plans – is currently at a relatively early stage in its production process.

3.8 The Main Issues Report (MIR), currently out for public consultation, does not include specific discussion of small-scale wind energy – instead focussing on schemes over 20MW. However, the MIR continues to be supportive of appropriate wind energy development.

3.9 It is acknowledged that the local policy framework is not specifically designed to deal with smaller scale wind energy development, having been produced before recent changes in energy policy (i.e. the introduction of the Feed-in Tariff).

4 Landscape and Visual

INTRODUCTION

4.1 Landscape and visual impact assessment (LVIA) considers effects upon:

- landscape character and resources, including effects on the aesthetic values of the landscape, caused by changes in the elements, characteristics, character and qualities of the landscape; and
- visual amenity, including effects upon potential viewers and viewing groups caused by change in the appearance of the landscape as a result of the development.

4.2 Landscape character and resources are considered to be of importance in their own right and are valued for their intrinsic qualities regardless of whether they are seen by people. Impacts on visual amenity as perceived by people, are therefore clearly distinguished from, although closely linked to, impacts on landscape character and resources. Landscape and visual assessments are therefore separate, although linked processes.

4.3 This chapter presents an assessment of the landscape and visual impacts which are expected as a result of the installation of a single turbine at Whitehouse Burn near Whitehouse in Argyll and Bute.

SOURCES OF INFORMATION

4.4 The landscape and visual impact assessment was informed by data gathered from the following sources:

- Ordnance Survey maps (Explorer 357, 1:25,000);
- Landscape Assessment of Argyll and the Firth of Clyde, 1996, SNH Review Series No 78;
- Argyll and Bute Structure Plan 2002, Argyll and Bute Council;
- Argyll and Bute Local Plan, 2009, Argyll and Bute Council;
- field surveys;
- a computer generated zone of theoretical visibility model (ZTV);
- computer modelled wireline and photomontage images; and
- consultations with statutory bodies including SNH.

CONSULTATIONS

Scottish Natural Heritage (SNH)

4.5 A meeting between LUC and SNH was held on 18th November 2010 to discuss the likely sensitivities of the site and agree the scope of the landscape and visual impact assessment. Preliminary visualisations (ZTV and wirelines) were prepared and circulated prior to the meeting.

4.6 The SNH Area Officers raised the following point, in line with guidance provided by their regional landscape advisor:

- **Turbine height**: preliminary visualisations were prepared based on a 'worst case' scenario of a 3 turbine development with a maximum height of 120m to tip.
  As such a machine would be significantly larger than existing turbines on Kintyre, the visual effects would extend over a larger range and would appear out of balance with other turbines.
- **Potential for impacts on the North Arran National Scenic Area**: visibility of the development from northwest Arran, and the potential to affect the 'special qualities' of the NSA; potential for cumulative impacts on views.
- Additional viewpoints on Arran (Catacol and Lochranza) were suggested.
- **Sequential impacts on travellers' experience of Kintyre from the A83 and ferry routes**: concerns were raised regarding the effects on the experience of driving through Kintyre, particularly from the north. Similarly, the visibility of the site from the Islay ferry and the summer-only ferry from Lochranza to Claonaig was highlighted for consideration.
- **Potential for effects on users of the Kintyre Way.**
- **Extending pattern of 'windfarm' development from the 'central spine of Kintyre'.**

4.7 Partly as a result of this advice, and subsequent pre-application discussions with the planning authority, the following changes to the scheme / assessment were implemented:

- Adoption of single turbine scheme;
- Significantly smaller turbine (36m smaller, at 84m to tip) selected;
- Repositioning of turbine to slightly lower elevation to reduce visibility;
- Selection of viewpoints for wireframe and photomontage modelling.

Argyll and Bute Council (A&BC)

4.8 A pre-application discussion meeting was held between the developer, LUC and representatives of the planning authority to discuss the Council's Screening Opinion, the potential effects of the scheme and the necessary scope of assessment.

4.9 This confirmed that the scope of assessment was appropriate, and further viewpoints were added to deal with specific concerns – notably views from the western shore of West Loch Tarbert.

BACKGROUND INFORMATION

Site Survey and Work

4.10 A site visit was undertaken in September 2010. This was followed by a desk review of maps, plans and relevant documentation in order to determine the information set out in this chapter. More detailed field

work was undertaken in April and May 2011, when photography used in the assessment was taken.

4.11 The site surveys enabled examination of the local landscape character and landscape features, and familiarisation with the wider area, to identify landscape character, and to assess the impact from a series of identified representative viewpoints.

Landscape Policy Background

National Planning Context

4.12 The following statements of Scottish planning policy and planning advice are relevant to the landscape and visual impacts of the project.

- Paragraphs 125-141 of the Scottish Planning Policy;
- PAN 45[3];
- PAN 60[4];
- PAN 68[5]; and,
- PAN 42[6].

Regional Planning Context

4.13 The scheme lies within the area covered by the **Argyll and Bute Structure Plan 2002**. The following planning policies are relevant to the scheme in the context of impacts on landscape and visual resources:

- Policy STRAT DC 8 – Landscape and Development Control.

Local Planning Context

4.14 The scheme lies within the area covered by **Argyll and Bute Local Plan 2009**. The following local planning policies are relevant to the scheme in the context of impacts on landscape and visual resources:

- Policy ENV 9 – Development impact on National Scenic Areas; and
- Policy ENV 10 – Development Impact on Areas of Panoramic Quality.

Other Policy and Guidance

4.15 SNH's Strategic Locational Guidance for Onshore Wind Turbines in Respect of the National Heritage[7] identifies three zones of relative sensitivity for natural heritage interests. The site is in Zone 2, an area of medium natural heritage sensitivity.

3 Scottish Executive (2002) Planning Advice Note, PAN 45 (Revised): Renewable Energy Technologies

4 The Scottish Executive (1998) Planning Advice Note 60, PAN 60: Planning for Natural Heritage

5 Scottish Executive (1998) Planning Advice Note 68, PAN 68: Design Statements

6 Scottish Executive (1998) Planning Advice Note 42, PAN 42: Archaeology - the Planning Process and Scheduled Monument Procedures

7 Scottish Natural Heritage (2005) Strategic Locational Guidance For Onshore Wind turbines in Respect of The Natural Heritage; Policy Statement No. 02/02 updated May 2005

METHODOLOGY

4.16 The methodology used in the assessment is set out below.

Relevant Guidance

4.17 In undertaking the landscape and visual impact assessment, the following guidance was followed:

- Siting and Designing Windfarms in the Landscape (SNH 2010);
- Landscape Institute and the Institute of Environmental Management and Assessment (Second Edition 2002) Guidelines for Landscape and Visual Impact Assessment;
- SNH (March 2008) Guidance: Natural Heritage assessment of small scale wind energy projects which do not require formal Environmental Impact Assessment (EIA)[8];
- Scottish Natural Heritage's guidance on visual assessment of windfarms[9], and on the environmental impacts of windfarms and small scale hydro-electric turbines[10];
- SNH's guidance on the cumulative effect of windfarms[11]. (Note that a draft revised version has been the subject of consultation, but a revised version is yet to be published);
- SNH's Policy Statement on locational guidance for onshore windfarms[12].
- Horner & Maclennan/ Envision's guidance on Visual Analysis of Windfarms prepared for SNH[13].

Approach to the LVIA

4.18 The key steps in the methodology were as follows:

- the zone of theoretical visual influence (ZTV) of the project was defined by computer modelling;
- the landscape within this area and within the project site itself was described and sensitivity assessed;
- policy and designations relevant to landscape and visual impacts were identified;

[8] Scottish Natural Heritage (1999) Natural Heritage assessment of small scale wind energy projects which do not require formal Environmental Impact Assessment (EIA).

[9] Scottish Natural Heritage (2002) Visual Assessment of Windfarms Best Practice; University of Newcastle SNH Commissioned Report F01AA303A.

[10] Scottish Natural Heritage (2001) Guidelines on the Environmental Impacts of Windfarms and Small Scale Hydro-electric Schemes.

[11] Scottish Natural Heritage (2005) Guidance: Cumulative Effect of Windfarms.

[12] Scottish Natural Heritage (2002) Policy Statement No 02/02: Strategic Locational Guidance for Onshore Windfarms in Respect of the National Heritage. Updated May 2005.

[13] Scottish Natural Heritage (March 2006) Visual Representation of Windfarms, Good Practice Guidance. Prepared by Horner & Maclennan/ Envision.

- viewpoints across the ZTV were selected as representative of the range of views and types of viewer likely to be affected by the project, and the sensitivity of each view determined;
- wireline and photomontage images of the development from various viewpoints were prepared;
- the magnitude of change in the landscape (both in terms of direct changes to landscape features and changes to character of surrounding landscapes) was predicted; and
- the level of significance of impact on the landscape and viewpoints was evaluated.

4.19 Alongside the assessment of impacts, options for mitigation of identified impacts of the development were considered and practical measures agreed. Mitigation measures are therefore incorporated into the design, and the assessment reports the residual effects of the scheme, taking into account the embedded mitigation developed during this process.

Assessment of Sensitivity, Magnitude and Significance of Landscape and Visual Impacts

4.20 The assessment of landscape and visual impacts is typically based on three stages:

- classification of the sensitivity of the landscape and visual receptors to the development proposed;
- prediction of the magnitude of change in the landscape or the view; and
- evaluation of the significance of landscape and visual effects depending on the sensitivity of the landscape or viewer to change and the magnitude of change.

Sensitivity of Landscape and Visual Receptors

4.21 The sensitivity of a landscape is judged based on the extent to which it can accept change of a particular type and scale without adverse effects on its character. Sensitivity varys according to the type of development proposed and the landscape's individual elements, key characteristics, inherent quality or condition, value, and capacity to accommodate change, and on specific values (such as designations) that apply.

4.22 The sensitivity of a viewpoint depends upon the extent to which the visual receptors represented by that location can accept change without adverse effects upon the view. Viewer sensitivity depends on the context of the viewpoint, its importance, the current occupation and viewing opportunity of the people and groups of people being considered, and the number of people affected.

4.23 Sensitivity is described as *low*, *medium* or *high* as defined in **Table 4.1**.

Table 4.1: Definitions of receptor sensitivity

Sensitivity	Receptor	Definition
High	Landscape	A landscape of particularly distinctive character or one that is highly valued for its scenic quality
	Visual	Viewers with proprietary interest and prolonged viewing opportunities, such as residential receptors
Medium	Landscape	A moderately valued landscape, perhaps a locally important landscape, tolerant of some change
	Visual	Viewers with a moderate interest in their environment such as users of recreational facilities
Low	Landscape	A landscape that is not valued for its scenic quality and is tolerant to change
	Visual	Viewers with a passing interest in their surroundings, e.g. motorists or workers in industrial premises

Magnitude of Change

4.24 The magnitude of change affecting a landscape or visual receptor depends on the nature, scale and duration of the particular change that is expected to occur. In a landscape, the magnitude of change depends on the loss, change or addition of any feature, or any change in the backdrop to, or outlook from, a landscape that affects its character. The effect on a view depend on the extent of visibility, degree of obstruction of existing features, degree of contrast with the existing view, angle of view, duration of view and distance from the development.

4.25 Magnitude of change is described as being *low, medium* or *high* as defined in **Table 4.2** below.

Table 4.2: Definitions of Magnitude of Change

Magnitude of Change	Receptor	Definition
High	Landscape	A substantial change in components of the landscape, or a major alteration in character
	Visual	Moderate changes affecting a large part of the view, or very substantial changes affecting a small part of the view
Medium	Landscape	Moderate changes in landscape components, or alterations in landscape character
	Visual	A small to moderate change within a large part of the view, or a large change to a small part of the view
Low	Landscape	A small change in components of the landscape, or virtually imperceptible alteration in character
	Visual	A small change in the nature of the view

Significance of Effects

4.26 Significance is determined by considering the sensitivity of the landscape or visual receptor and the magnitude of change expected as a result of the development. Each case is assessed on its own merits as significance is not absolute and factors unique to each circumstance need to be considered. However, the general principles underpinning the evaluation of significance are set out in Table 4.2 and Table 4.3 and these provide a guide to the application of professional judgement and experience in each individual case.

4.27 The level of significance of effects is described as being *not significant (none), minor, moderate* or *major*.

Table 4.3: Significance of Landscape and Visual Effects

Levels of Significance of Landscape and Visual Impacts	
Major	Changes substantially affecting the character or views of the landscape or the elements therein. For example a major impact is likely when a receptor of high sensitivity is affected by a high magnitude of change
Moderate	Change affecting, to a lesser degree, the character or views of the landscape or the elements therein. For example a moderate impact is likely when a receptor of medium sensitivity is affected by a medium magnitude of change
Minor	Slight change affecting the character or views of the landscape or specific elements therein. For example a minor impact is likely when a receptor of low sensitivity is affected by a small magnitude of change
None	No or minimal perceptible change, affecting the character or views of the landscape or specific elements therein. Note that this includes locations where there will be no impacts

NB. This scale is a continuum and the given level is based on many variables, weighed up by the application of professional judgement and experience, on a case by case basis

BASELINE

Designated Landscapes

4.28 The nearest National Scenic Area (NSA) lies at a minimum distance of 10km away. Two NSAs are present in the study area:

- North Arran (approximately 10km away);
- Knapdale (approximately 12km away).

4.29 The **Knapdale NSA** will not be affected by a change in view, as the central elevated ridge running through Knapdale creates a visual shadow.

4.30 The Special Qualities of the North Arran NSA are provided below.

Special Qualities of the North Arran NSA

- *A mountain presence that dominates the Firth of Clyde*
- *The contrast between the wild highland interior and the populated coastal strip*
- *The historical landscape in miniature*
- *A dramatic, compact mountain area*
- *A distinctive coastline with a rich variety of forms*
- *One of the most important geological areas in Britain*
- *An exceptional area for outdoor recreation*
- *The experience of highland and island wildlife at close hand*

Scotland's Scenic Heritage (1978) notes that '*Arran makes a major contribution to the wider landscape character of the Firth of Clyde, its highland mountains being particularly outstanding in a southern setting and adding greatly to the scenic enjoyment of Bute, Ayrshire and Kintyre*.'

It also notes that views to these neighbouring areas '*add to the quality of the scene in Arran.*'

Local landscape designations

4.31 Three **Areas of Panoramic Quality** (formerly Regional Scenic Areas) defined by the Argyll and Bute Local Plan lie within 8.5km of the site, as illustrated in **Error! Reference source not found.**:

- Knapdale/Melfort (approximately 5.5km at closest point);
- West Kintyre Coast (approximately 7.5km at closest point);
- Bute and South Cowal (approximately 8.5km at closest point).

4.32 It is understood that local landscape designations are not being reviewed as part of the LDP process.

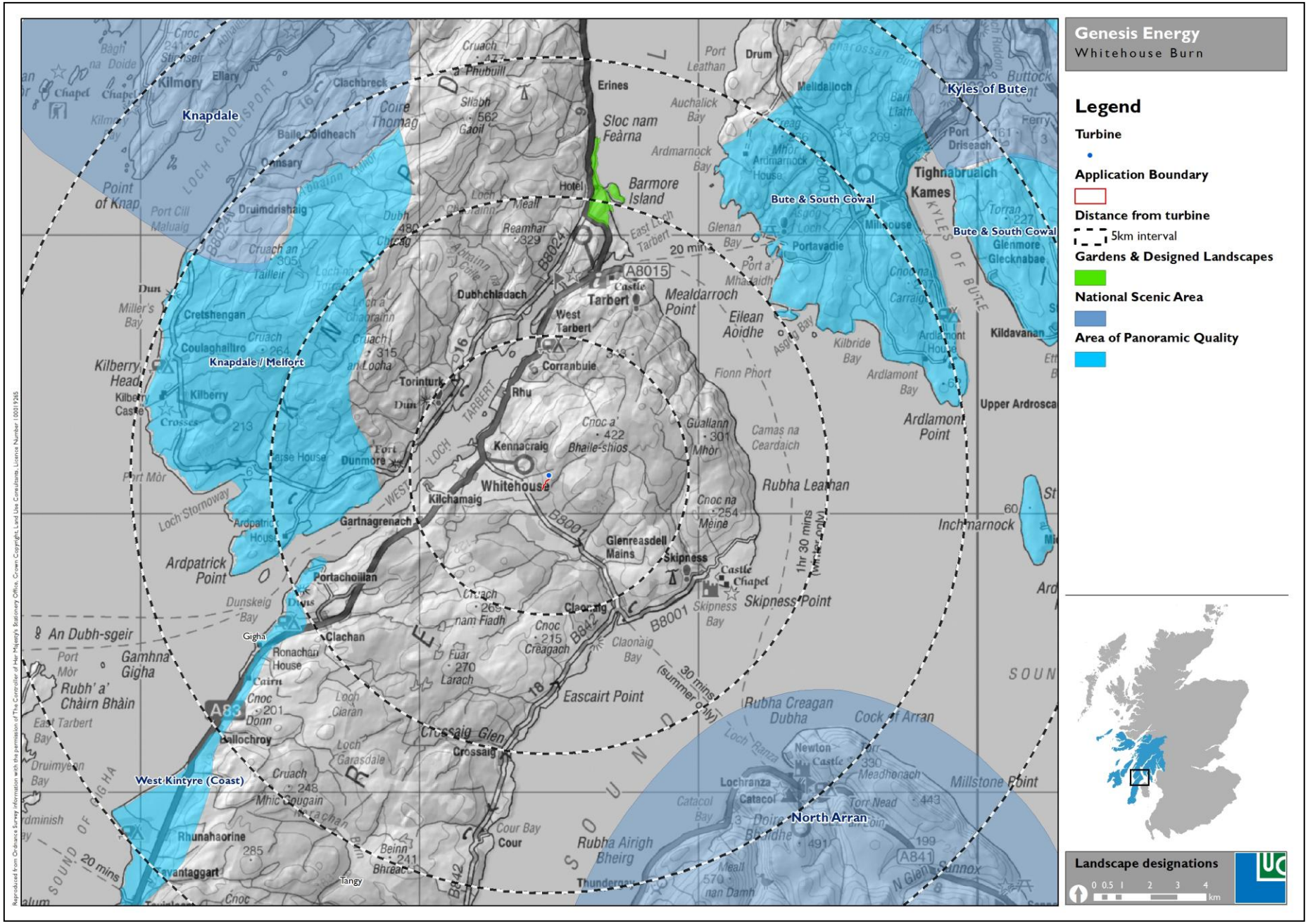

Figure 4.1: Landscape designations

Landscape Context

4.33 As described in the *Landscape Assessment of Argyll and the Firth of Clyde* (1996), by Environmental Resources Management on behalf of Scottish Natural Heritage, the site is within the **Upland Forest Moor Mosaic**, located to the east of the **Rocky Mosaic** landscape character type. The key characteristics identified within the assessment for this landscape character type are listed below:

Upland Forest Moor Mosaic

- *Upland plateau with rounded ridges, craggy outcrops and an irregular slope profile;*
- *Upland Lochs;*
- *Winding narrow glens and wider river valleys;*
- *Extensive, large-scale mosaic of forestry plantations and small areas of open moorland ;*
- *No field boundaries;*
- *Very few buildings; occasional isolated dwellings on edges of moor; and*
- *Little access; roads typically follow shorelines.*

4.34 The Upland Forest Moor Mosaic landscape comprises relatively low knobbly moorland hills and rock outcrops, with large blocks of plantation forest on their lower slopes.

4.35 Panoramic views are available from the hills across the hill and moorland landscape, and directed down the sea lochs to the sea. Roads are infrequent, contained within the glens or running along the loch edges and are occasionally enclosed by woodland which can limit views. Scattered, isolated farmsteads and small villages are also located within sheltered glens or along the coastal edges. Lower down on the roads views are contained by the hills which rise above them, and in places by extensive coniferous plantations.

4.36 Within the character area within which the site is located, views to the south extend along the Mull of Kintyre out into the sea, with the islands of Bute, Gigha, and, further away, Islay, visible in the distance.

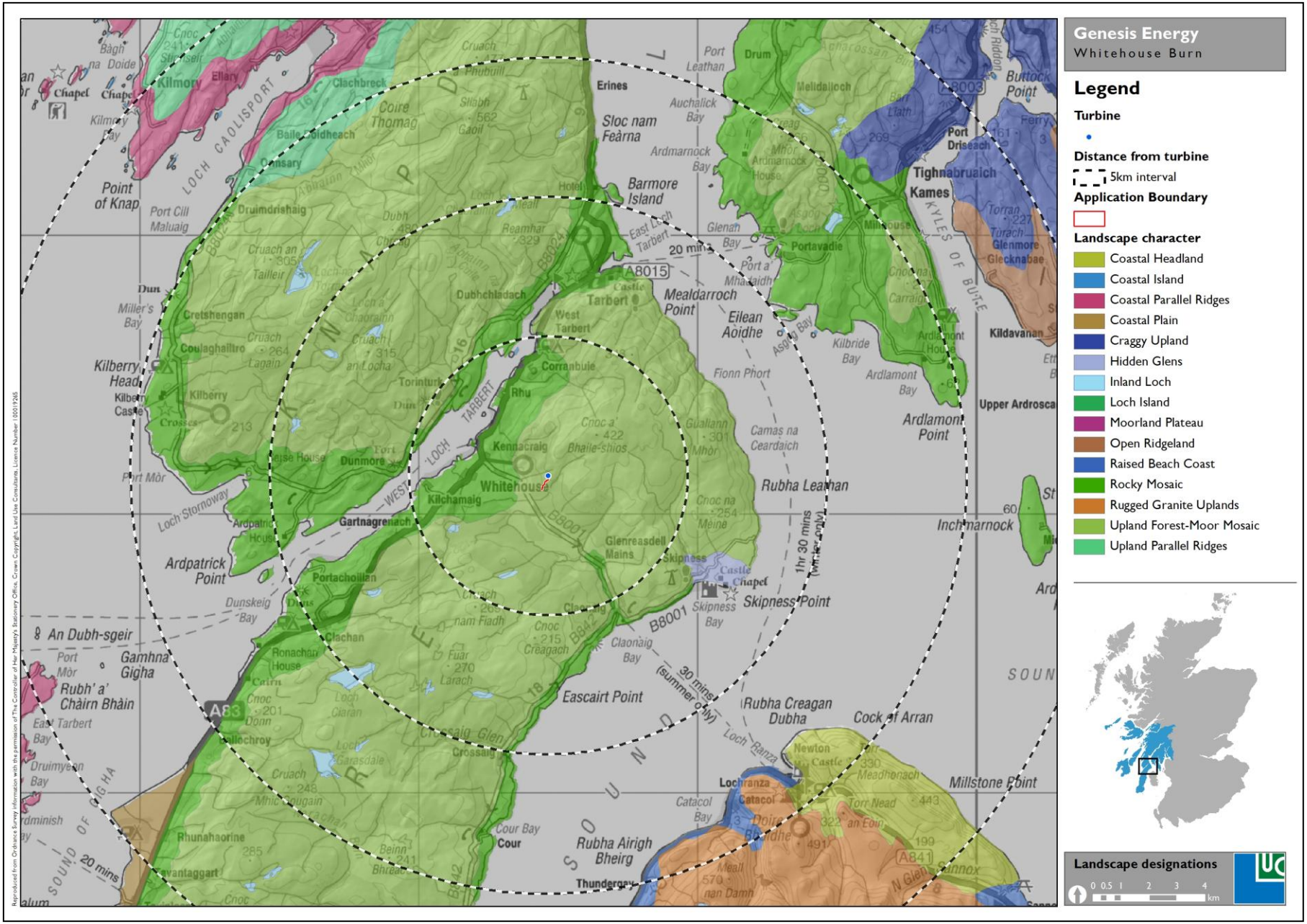

Figure 4.2: Landscape character

Baseline Landscape Character of the Site

4.37 The landscape character of the site itself is typical of the wider landscape but is locally characterised by the presence of the large blocky coniferous forest plantation rising up the hill either side of Whitehouse Burn, and rock outcrops at the north of the site. This is a man-made landscape in terms of its land cover (See **Figure 4.2**).

4.38 The wind turbine will be located so as to capture the wind, higher up within the forest on the south west facing flanks of Cnoc a' Bhaile-shios (422m AOD at its summit). The upper slopes of the site afford views to the coasts of West Loch Tarbert to the southwest, the Sound of Bute to the southeast and the Isle of Arran beyond. The views from the lower parts of the site are largely contained by the coniferous forest, or are focused along the glen.

4.39 The landscape has an open and exposed character, with a remote feel. Roads around the site are infrequent, and are slightly elevated on glen sides. Open views are focused along the glen in some areas, whilst in others, forest can limit views. There are some isolated farmsteads and small hamlets close to the site. These are located within the glen, along the A8001, or along the coastal edges, including Whitehouse and Claonaig.

4.40 Burns including Whitehouse Burn and its tributaries drop down through the forest to the glen floor to the southwest of the site. To the west, the A83 passes along the edge of the coast of West Loch Tarbet.

4.41 From the elevated areas of the site existing wind turbines at Deucheran Hill, Beinn an Tuirc, and Gigha are visible to the south and southwest respectively.

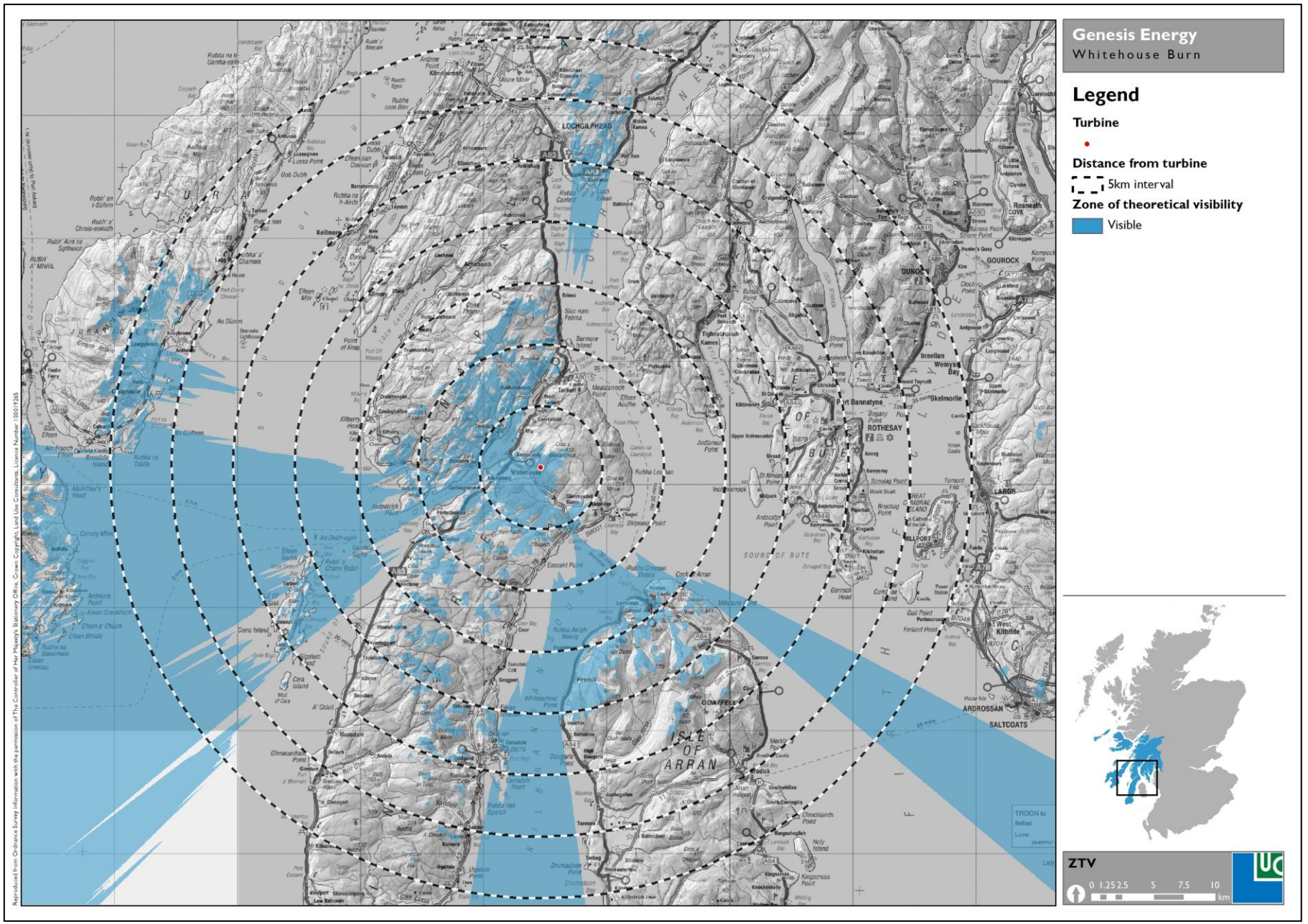

Figure 4.3: Zone of theoretical visibility

Visual Baseline

4.42 The baseline visual environment is described with reference to people who may view the proposed development. These are referred to as visual receptors, and may include residents, recreational users of the local area (including people using Public Rights of Way), and travellers on local routes.

Zone of Theoretical Visibility

4.43 Guidance requires generation of a ZTV to 30km radius for turbines over 50m high to their tips. A ZTV map (indicating potential visibility up to the turbine tips) for the project is included as Figure 4.3. A higher resolution version is included within **Annex 1**.

4.44 The ZTV represents the maximum extent of potential visibility, taking no account of screening by buildings or vegetation. Surface land uses, as well as manmade topography such as that associated with road and rail cuttings are likely to further reduce visibility of the proposals.

4.45 The ZTV indicates potential continuous visibility in an arc from the west, across West Tarbert Loch, through to the south across a 4km to 5km radius, although this will be reduced by the extensive areas of commercial coniferous forest in practice, particularly to the west.

4.46 From the north through to the east there will be more restricted visibility, falling to no visibility beyond a 1km to 2km radius and when dropping down to the coast in the southeast. From further away, theoretical visibility is more intermittent, concentrated upon areas of open water on the Sound of Gigha and the Sound of Bute, the stretch of coast along the west of West Loch Tarbert and extending up to the southeast facing slopes and hilltops of Knapdale.

4.47 Potential visibility is also available from scattered locations across hilltops and from north facing slopes of the hills running through the Mull of Kintyre, including the north-eastern areas of the Isle of Gigha and the Isle of Arran, including Meall Mor, Meall nan Damn, and Mullach Buidhe.

Visual Receptors

Residents

4.48 The closest residential properties are located to the south and southwest of the site, along the B8001. Spion Kop lies approximately 1km from the site boundary and Lonlia lies at a distance of 1.2km.

4.49 The small settlement of Whitehouse lies 2.9km to the west of the site. Residential properties facing east are likely to have filtered views towards the site, with most properties being well screened by trees and buildings within the settlement. A number of scattered properties along the A83 coastal road to the north and south of Whitehouse may also have filtered views towards the site.

4.50 A cluster of residential properties at Claonaig, located approximately 5km to the southeast of the site, are also likely to have views towards the site across the open moorland hills, with blocks of forest.

Recreational Users

4.51 Views will be available to people undertaking recreational activities such as walking, horse riding and cycling, including along the **Kintyre Way national trail** and the **National Cycle Route 73** (following the B8001 and B8024).

4.52 **The Kintyre Way** national trail runs through the hills flanking Cnoc a' Bhaile-shios to the east of the site at a distance of 2.7km at the closest point.

4.53 The **National Cycle Route 73** between Claonaig and Grogport, which follows the B842 coastal road along the western side of Kintyre, is in visual shadow and views of the proposal are unlikely to be available from any section of the route.

Road Users

4.54 Road users relevant to the assessment include travellers on the B8001 to the south of the site. The ZTV indicates that views are also likely to be possible from the coastal roads following the loch edges either side of West Loch Tarbert (the A83 and the B8024).

4.55 Woodland and the presence of vegetation along the A83 coastal road will also serve to limit some views along the western side of Kintyre in approaches to Whitehouse.

Representative Viewpoints

4.56 **Table 4.4** below provides a list of the viewpoints selected as representative of the range of views available within the study area. For a project of this size, significant effects are unlikely beyond about 15km from the site, so the majority of viewpoints are from closer locations, with a small selection being chosen to represent the wider area. These were agreed with SNH and the local authority. The locations are shown on **Figure 4.4**.

Table 4.4: Representative viewpoints

No	Name	Grid Reference	Reason for selection
1	Spion Kop	183833 660839	Representative of close range views from nearby residential property, the B8001 and National Cycle Route 73 to the south of the site
2	Lonlia Property	183841 660486	Representative of close range views from nearby residential property, the B8001 and National Cycle Route 73 to the south of the site
3	Whitehouse	181766 661436	Representative of views from the settlement and the A83 coastal road
4	Kennacraig Pier	181933 662458	Representative of views from the coastal margin of West Loch Tarbert and the terminal of the ferry link to the Isle of Gigha Photomontage requested by Council as key viewpoint for tourists and local people using ferry link

No	Name	Grid Reference	Reason for selection
5	Kintyre Way	183646 656289	Representative of medium range views from the long distance footpath, the Kintyre Way, to the south of the site. Photomontage requested by Council and SNH to assess effects on key access and recreation route
6	Kennacraig to Islay Ferry Route	179324 660935	Representative of views on the ferry link approaching Kintyre from the Loch of Tarbert. Requested by SNH
7	Skipness Parish Church, Claonaig	187064 656631	Viewpoint at Grade B listed building within the settlement of Claonaig, and representative of views from the A8001and National Cycle Route 73 to the south of the site Photomontage produced to determine effects on Listed Building
8	B8024 near Torinturk	182125 666297	Representative of views across Loch Tarbert from the coastal road and the National Cycle Route 78
9	Lochranza to Claonaig Bay Ferry Route	189233 654338	Representative of views from the ferry link between North Arran and Kintyre. Requested by SNH
10	Ardpatrick House	175569 659519	Representative of views from the southern coastal area of Knapdale/Melfort Area of Panoramic Quality Photomontage requested by Council
11	Newton Point, Arran	193139 651536	Viewpoint located within the North Arran RSA Photomontage location chosen as key public viewpoint, marked on OS maps and signposted
12	Lochranza Pier, Arran	192627 650968	Representative of views from the settlement of Lochranza and the North Arran NSA Photomontage requested by SNH to assess effects on key tourist location
13	Catacol Bay	191033 649453	Representative of views from the North Arran NSA. Photomontage requested by SNH to assess impact on views from west side of the NSA

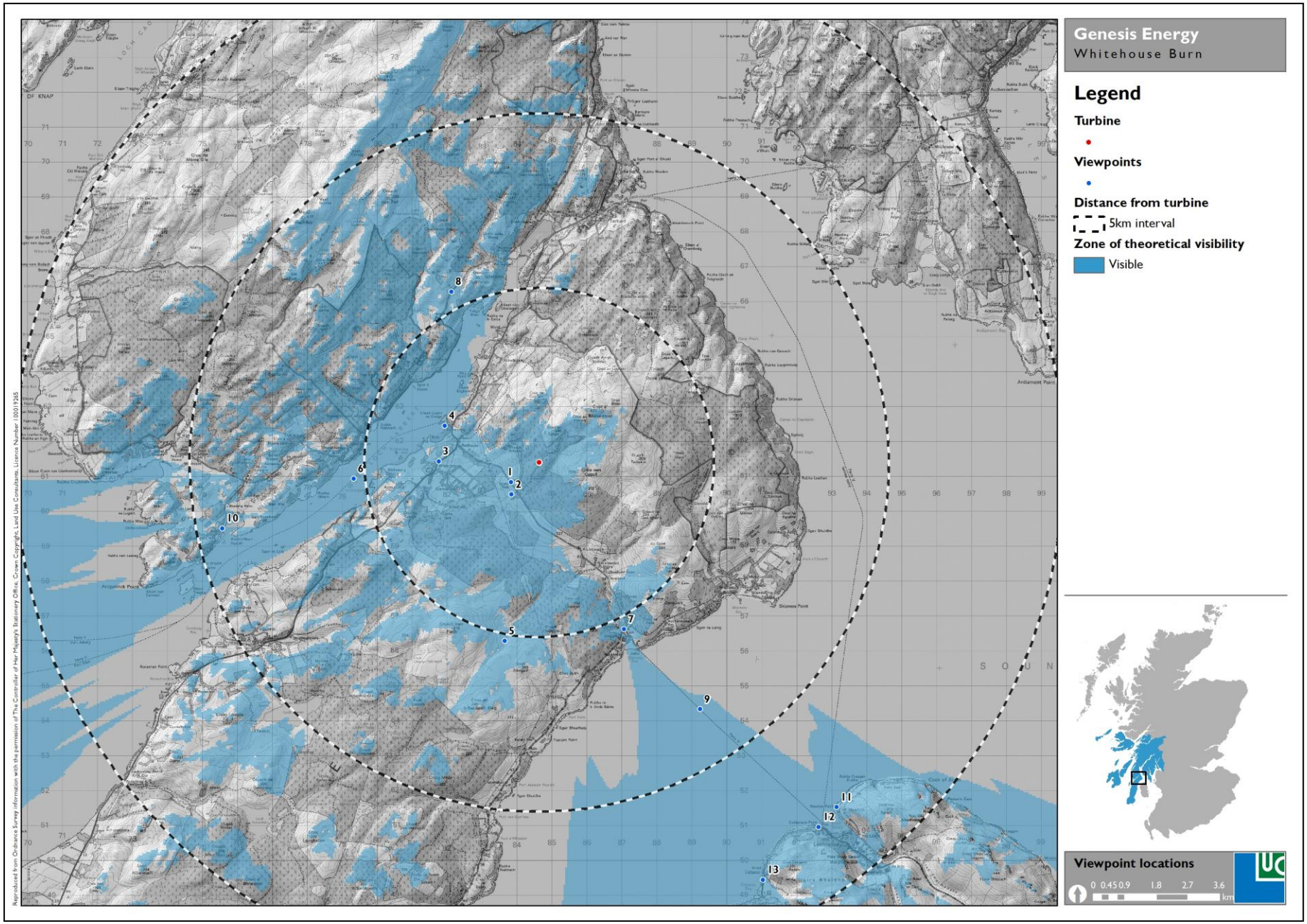

Figure 4.4: Viewpoint location

POTENTIAL IMPACTS

Permanent

4.57 The following long term actions would contribute to potential landscape and visual impacts which arise from the project:

- the introduction of a tall wind turbine. The turbine would permanently displace a small area of forest, and would be accompanied by an area of hard standing for a crane;
- upgrading of the existing forest track to the turbine (approximately 550m long, with a crushed stone surface);
- the presence of a transformer /small substation; and
- any signage required for health and safety purposes.

4.58 The proposed wind turbine has the potential to cause impacts on the landscape of the immediate areas and on the visual amenity of receptors within close vicinity of the site, and at more sensitive locations at greater distances. This will be moderated to some extent by the presence of the surrounding forest plantation.

4.59 Measures to mitigate these potential impacts are detailed below and include micro-siting the turbine and track, and agreement of its design details (turbine colour (grey) and design, position of the generator, linkage in to the grid etc).

Construction

4.60 During construction, there are potential short term landscape and visual impacts arising from the presence of activities on the site including:

- localised clearance of vegetation, topsoil stripping and storage;
- the upgrading of the existing access route through the forest (to be surfaced with crushed stone), and cable trench working corridors, parallel to the track;
- machinery and material storage;
- plant movements;
- excavation for the foundations and cable trenches;
- in-situ concrete works including falsework, shuttering and reinforcement for buried foundations; and
- tall cranes used in the erection of the turbine.

4.61 There is also the potential for short and medium term impacts during restoration and decommissioning. Restoration of disturbed areas will be an important aspect of scheme mitigation, and will include restoration of soils along the sides of the access track and around the turbine, as well as removal/spreading of any surplus soil and rock, and grading of land form into the surrounding topography.

Operational

4.62 Maintenance activities will be limited and no significant potential impacts are anticipated.

MITIGATION MEASURES

4.63 Design principles which were followed are set out below:

Mitigation by Design

- the turbine site has been chosen so as to locate within the northern/north-western edges of the site, to reduce the likelihood of significant effects upon the North Arran NSA, as Coire nan Capull serves to reduce visibility from this direction;
- the positioning of the turbine has sought to avoid visual dominance from villages and the closer residential properties;
- careful positioning of the substation within an area of forest is proposed to minimise visibility;
- the turbine site has been chosen so that it occupies an area where it will not require displacement of important landscape features;
- its location is such that existing track infrastructure can be used;
- low level development can be concealed within the forest;
- the turbine will be dull grey in colour;
- the transformer (if external) will be a dull grey olive green;
- the hardcore used to improve the surface the track will be locally sourced crushed rock.

4.64 Mitigation measures which will be provided alongside the development of the wind turbine are set out below:

Construction

- maintenance of existing trees along the B8001 will be ensured to retain a visual screen between the road and the site;
- construction vehicles will not be permitted to track across areas outside the construction area;
- disturbed subsoil and topsoil would be kept separate. Topsoil will be scraped from the working area (to a depth of about 200mm) at the outset and will be stored in a low uncompacted bund away from disturbance;
- materials and machinery will be stored tidily during the works. Tall machinery including the crane will not be left in place for longer than required for construction purposes, in order to minimise its impact in views;
- there will be no lighting of the works site;
- the road providing access to site will be maintained free of dust and mud;

- on completion of construction, all remaining construction materials will be removed from the site;
- any remaining spoil heaps will be graded to match existing contours;
- topsoil will be replaced, as the top soil horizon, and will be graded, so that the finished ground level ties in with the level and character of the surrounding topography.

Restoration

- natural recolonisation of plant materials from the existing seedbank will be favoured over seeding. If seeding is required to assist in rapid revegetation, then appropriate native grass and flora species suitable for a woodland habitat will be used.

Mitigation during Operation

- lighting will not be used; and
- the turbine and its environment will be maintained in a clean and uncluttered state. Machinery etc will not be stored on hard standing adjacent to the site or along the access track.

ASSESSMENT OF RESIDUAL EFFECTS

4.65 The assessment of residual effects is split into **Effects Upon The Landscape** and **Effects Upon Visual Amenity**.

Effects on the Landscape

4.66 High resolution visualisations are available in a separate document, **Annex 1** to this report.

National Designations

4.67 Examination of the ZTV map indicates that the northwest coastal fringes and northwest facing slopes of the hills at the north of the Isle of Arran, within the North Arran NSA, will be affected by a change in view, with visibility reducing further inland.

4.68 The nationally designated landscape **North Arran NSA** of **high** sensitivity will be affected by an indirect **low** magnitude of change, resulting in an effect of **minor** significance.

Regional Designations

4.69 The ZTV indicates that the lower coastal margins of West Loch Tarbert and the southeast facing slopes within the southern portion of the Knapdale/Melfort Area of Panoramic Quality would be affected by a change in views looking eastwards towards Kintyre. Visibility will reduce further inland, and will be limited to that from upper elevated slopes. The eastern and northern parts of the area will enable no theoretical visibility.

4.70 **Viewpoint 10: Ardpatrick House** is representative of views from the southern, coastal area of the area (see **Table 4.5**).

4.71 The regionally designated landscape **Knapdale/Melfort Area of Panoramic Quality** of **high** sensitivity will be affected by an indirect **low** magnitude of change, resulting in an effect of **minor** significance.

4.72 The ZTV indicates that a limited area of the **West Kintyre Coast Area of Panoramic Quality** coastal fringe may be affected by a change in view. The area is of **high** sensitivity will be affected by an indirect **low** magnitude of change, resulting in an effect of **minor** significance.

Registered Parks and Gardens

4.73 A single Registered Park and Garden falls within the study area. The Stonefield Castle Hotel Inventory listed Historic Garden and Designed Landscape lies approximately 8.2km to the north of the site. The ZTV indicates that no views will be possible from this area as the asset is wholly screened by topography.

Effects on the Physical Landscape and Landscape Character

4.74 The introduction of the new structure would have impacts upon the landscape and on the views experienced by people living, working or visiting in the surrounding area. The turbine would be a new tall man made feature in the area, and a new land mark in views. It would add movement to the character of the landscape when in operation.

4.75 It would result in a **medium** magnitude of change, affecting a landscape of **medium** sensitivity. Locally the change would be of **moderate** significance. Significance would diminish with increasing distance from the site.

4.76 The landscape character areas described in the *Landscape Assessment of Argyll and the Firth of Clyde* have been adopted as the most appropriate source for describing the baseline landscape character, against which the assessment was carried out. Under this classification, the development falls within the Upland **Forest Moor Mosaic character type**.

4.77 Within the immediate surrounding area, the introduction of the development will add a further vertical structure within an area where overhead power lines and small communication mast are present. The development will be seen in the context of a landscape modified by forestry activity and the existing development listed above. It is therefore considered that the development may alter the perception of landscape character within the immediate surrounding area.

4.78 The overall sensitivity of the Upland Forest Moor Mosaic is given as **medium** in the *Landscape Assessment of Argyll and the Firth of Clyde*, due to the modified nature of the landscape. This is an extensive character area occurring across a large area within Kintyre and Mid Argyll.

4.79 Development of this site will introduce a further vertical element into a landscape modified by forestry and some existing development. This is judged to be a **medium** magnitude of change, and the effects on the Upland Forest Moor Mosaic are therefore judged to be locally **moderate**.

- Overall sensitivity of the Upland Forest Moor Mosaic character area: **medium**;

- Overall magnitude of change to the Upland Forest Moor Mosaic character area: **low**;
- Significance of overall effects on Upland Forest Moor Mosaic character area: **minor**.

4.80 The overall sensitivity of the adjacent character area of **Rocky Mosaic** is given as **high** within the *Landscape Assessment of Argyll and the Firth of Clyde*. The published assessment points to the small scale, and largely unspoilt nature of the character area as characteristics that make it sensitive to change.

4.81 The visibility of the site across this area is limited due to screening by landform as well and the presence of woodland and forestry within the character area. The development is therefore unlikely to affect this adjacent character area and the magnitude of change is judged to be **low**, the effects on the Rocky Mosaic are therefore judged to be **minor**.

- Overall sensitivity of the Rocky Mosaic character area: **high**;
- Overall magnitude of change to the Rocky Mosaic character area: **low**;
- Significance of effects on the Rocky Mosaic character area: **minor**.

EFFECTS ON VISUAL AMENITY

Visual Receptors

4.82 The wind turbine would be seen from fixed locations and as people move through the area, including in boats across the lochs and sea.

4.83 **Table 4.4** provides a list of viewpoints selected to represent the range of opportunities which people would have to see the turbine from different types of location, distances and directions. A summary of the predicted nature of change is provided in **Table 4.5** below.

4.84 The viewpoints are illustrated in **Annex 1**, all illustrating both a 90 degree and a 50 degree view, with a turbine which is 60m tall to hub with 48m rotor diameter (84m to blade tips).

Table 4.5: Assessment of Effects on Viewpoints

Key: H = Residential, R = Recreational, W = Workers, T = Traveller
See **Annex 1** for wirelines and photographs from representative viewpoints.

Viewpoint Number, Type and Figure Number	Location	Existing View	Receptor Sensitivity	Description of Change in View	Magnitude of Change in View	Significance of Effect
Viewpoint 1 H, R, T Wireline in **Viewpoint 1, Annex 1**	Spion Kop Kennels The B8001 and National Cycle Route 73	The view to the north extends over a gently rising area of rough grazing to the north of the B8001 enclosed by post and wire fencing. The open area of grazing is fringed with dense coniferous forest and backed by a low, gently undulating forested hill. The evenly forested profile of the hill is broken to the northwest by the open moorland and uneven profile of Cnoc an Tobair. Existing vertical structures include a line of telegraph poles, following the B8001, and a powerline which crosses the view, east to west, in this direction.	High	The turbine would be visible in close-range, open views to the north above the skyline formed by the low forested hills. Whilst there are existing man-made vertical structures present in the view, the scale of the turbine in relation to the landform and landscape features and the relative proximity of the turbine give rise to a high magnitude of change when looking in the direction of the development. The introduction of a turbine in this location is considered to represent a medium to high magnitude of change overall.	High	Major
Viewpoint 2 H, R, T Wireline in **Viewpoint 2, Annex 1**	Lonlia Property The B8001 and National Cycle Route 73	Short range views to the north extend up towards the B8001 and a dense block of coniferous forest beyond, fringed with gorse along the roadside. Views to the south and west overlook a large, open area of rough grazing that gives way to low moorland hills with large blocks of forest to the south. Views to the west are of greater depth, taking in distant views to Knapdale/Melfort hills.	High	The turbine would occupy an elevated position on the skyline to the north, on the gently undulating profile of the low forested hills. Views towards the turbine will however be largely screened by the coniferous forest to the north of the B8001, with only the upper tips potentially being visible above the tree line.	Low	Minor

Viewpoint Number, Type and Figure Number	Location	Existing View	Receptor Sensitivity	Description of Change in View	Magnitude of Change in View	Significance of Effect
Viewpoint 3 H, R, T Wireline in **Viewpoint 3, Annex 1**	Whitehouse A83	To the east, views look across a gently sloping topography comprising a mosaic of rushy pasture, scrub with gorse, broad-leafed woodland and small enclosures of open pasture fringed with broad-leafed trees. The ground drops gently down to a broad, shallow valley, the floor of which is obscured by the intervening landform. Beyond this the land rises again and extends up to a long, undulating line of low moorland and forested hills which form the skyline in the distance. A powerline crosses the view, offset from the A83 and set below the skyline.	High	The hub, blades and most of the tower of the turbine will be seen in open views to the moorland and forested hills that enclose views to the northeast. The introduction of a turbine will introduce a further vertical man-made structure into the view, set above the skyline and of a relatively larger scale than the existing structures. The turbine will be a visible feature in the landscape, although set within the context of varied topography, including the existing scrub and woodland in the near and middle-distance. The magnitude of change is therefore considered to be medium overall.	Medium	Moderate
Viewpoint 4 H, R, T Wireline and Photomontage in **Viewpoint 4, Annex 1**	Kennacraig pier - ferry link to the Isle of Gigha	The view east looks along the causeway leading to the pier from the B83. A belt of broad-leafed trees lines the road, beyond which the topography rises to a rounded hill partly covered in mixed broad-leafed and coniferous trees. A series of low undulating hills extend beyond the wooded hill to the southeast, with the lower slopes comprising open areas of rough grazing and moorland and large blocks of continuous coniferous forest extending across the horizon. A power line runs through the view in this direction, set below the skyline, following the pier and extending into the middle distance across the open grassland into the distance.	High	The hub and tips of the turbine would be visible on the skyline to the east, set above the skyline visible slightly to the southeast (right) of the densely wooded hillside north of Kennacraig. The introduction of the single turbine will add a further man-made vertical structure to the view looking east, on a skyline broken by mixed broadleaf and coniferous trees. The main direction of view is however to the southwest, where long views of great depth are afforded across Loch Tarbert. The magnitude of change is considered to be low overall in this location.	Low	Minor

Viewpoint Number, Type and Figure Number	Location	Existing View	Receptor Sensitivity	Description of Change in View	Magnitude of Change in View	Significance of Effect
Viewpoint 5 R Photomontage and Wirelines in **Viewpoint 5, Annex 1**	Kintyre Way - southeast of Cruach nam Fiadh	From the lower flanks of Cruach nam Fiadh, the view north is of simple composition extending across a large area of continuous open moorland to the irregular profile of Coire nan Capull in the distance. Large blocks of uniform coniferous forest lie on the lower, undulating slope of the hill in the middle distance and on the slopes flanking Coire nan Capull. The B8001 is visible in the distance to the northeast, where the view extends into the shallow valley. A large scale powerline is visible set below the horizon to the northeast.	Medium	The turbine will be visible in full above a large swathe of forest to the south (left) of the Cnoc an Tobair, breaking across the skyline at the far end of the ridgeline formed by Coire nan Capull, Cnoc a Bhaile-shios and Cnoc an Tobair. The turbine will introduce a tall vertical man-made feature onto an otherwise undeveloped skyline, although seen in the context of existing large man-made structures. It is not considered that the turbine will diminish the perceived scale of the hills as they are viewed in this direction. Whilst a visible feature, the turbine will form a relatively small element within a large-scale, broad view at this location. The overall magnitude of change is considered to be low.	Low	Minor
Viewpoint 6 R, T Wireline in **Viewpoint 6, Annex 1**	Kennacraig to Islay Ferry Route	Not illustrated	High	The wireline indicates that the turbine will be visible above the skyline in views to the east. It will be set above the low undulating moorland hills with forest that back views across the open loch to the wooded coastline of Kintyre. The turbine is likely to be a visible element on a largely undeveloped skyline. However it will form a relatively small feature in the long views of great depth afforded along Loch Tarbert. The magnitude of change is considered to be low overall.	Low	Minor

Viewpoint Number, Type and Figure Number	Location	Existing View	Receptor Sensitivity	Description of Change in View	Magnitude of Change in View	Significance of Effect
Viewpoint 7 H, R, T Photomontage/Wireline in **Viewpoint 7, Annex 1**	Skipness Parish Church, Claonaig	The view looks across a small area of rushy grassland to a cottage and a rear garden, beyond which the land drops down into a small incised valley of the Water of Claonaig. The view extends along the valley, lined with broad-leafed woodland to low, interlocking hills topped with coniferous forest.	High	The blade tips of the turbine will be visible above the forested hill in the far distance, set above the skyline. At this distance the blade tips are likely to be barely discernable and therefore it is considered that there will be no magnitude of change in this location.	None	None
Viewpoint 8 H, R, T Wireline in **Viewpoint 8, Annex 1**	B8024 near Torinturk National Cycle Route 78	Not illustrated	Medium	The wireline indicates that the upper tower, hub and blades of the turbine will be visible set above the skyline on the long, uneven ridgeline that extends across the horizon to the southeast. The introduction of the turbine is likely to give rise to a medium magnitude of change from this location, situated as it is on a prominent ridgeline to the east.	Medium	Moderate
Viewpoint 9 R Wireline in **Viewpoint 9, Annex 1**	Lochranza to Claonaig Bay Ferry Route	Not illustrated	High	The wirelines indicates that the hub and tips of the turbine will be visible above the skyline, on the long, even profile of Kintyre in long views across the open water. It will introduce a man-made element into an otherwise undeveloped section of the skyline. At this distance however, the turbine will form a very small element within the large scale, panoramic views afforded from this location.	Low	Minor
Viewpoint 10 H, R Photomontage/Wireline in **Viewpoint 10, Annex 1**	Ardpatrick House Knapdale/Melfort Area of Panoramic Quality	The view east extends over a coastal margin of grassland with low gorse thickets, giving way to sandflats and a minor water channel that lies in the foreground of the small, rocky peninsular of Rubha a Bharra. Beyond this a low ridgeline of moorland and forested slopes are visible in the distance.	High	At this distance, the turbine will be discernable as a very small feature within a large scale view of great depth, although it may draw the eye as it breaks across a skyline that is otherwise undeveloped in this location.	Low	Minor

Viewpoint Number, Type and Figure Number	Location	Existing View	Receptor Sensitivity	Description of Change in View	Magnitude of Change in View	Significance of Effect
Viewpoint 11 R Photomontage/Wireline in **Viewpoint 11, Annex 1**	Newton Point, Arran North Arran NSA	The view looks across a short section of rough grassland, with gorse in the foreground, to a narrow section of rocky coastal outcrop that drops down to the open sea. A wide vista takes in the open water of the Kilbrannan Sound with the long low profile of Kintyre on the horizon in the distance.	High	The hub and tips of the turbine will be visible above the low, long skyline in views west across the large expanse of water to Kintyre. At this distance the turbine will be a very small, but discernable element within the large scale, panoramic views afforded from this location. The magnitude of change is considered to be low.	Low	Minor
Viewpoint 12 R Photomontage/Wireline in **Viewpoint 12, Annex 1**	Lochranza Pier, Arran North Arran NSA	The view overlooks a narrow margin of rocky coastline and stone beach in the foreground. Beyond this a large expanse of open water extends out towards Kintyre, which forms a long, low landmass on the horizon to the west with an undulating profile of moorland hills.	High	The hub and tips of the turbine will be visible above the low, long skyline in views west across the large expanse of water to Kintyre. At this distance the turbine will be a very small, but discernable element within the large scale vista afforded from this location. The magnitude of change is considered to be low.	Low	Minor
Viewpoint 13 R Photomontage/Wireline in **Viewpoint 13, Annex 1**	Catacol Bay, Arran North Arran NSA	The view looks across a stone beach in the foreground, fringed with gorse to the north (right hand side) above which seaward facing buildings and trees within Lochranza are visible. To the northwest and west, open views across a large expanse of open water extend towards the long, low profile of moorland hills of Kintyre on the horizon.	High	The turbine will be a very small feature at this distance, occupying a minimal proportion of the large vista afforded from this location.	Low	Minor

SUMMARY OF IMPACTS UPON VIEWS

Summary of Impacts upon Views

4.85 The turbine would result in a high magnitude of change at Spion Kop which is of high sensitivity and therefore will give rise to an impact of major significance at this location. Of the remaining viewpoints assessed, the turbine would result in a medium magnitude of change at Viewpoint 3 Whitehouse and Viewpoint 8 Kintyre Way, both of high sensitivity, giving rise to impacts of moderate significance. From all other viewpoints impacts will be minor, or there will be none.

4.86 Views of the single turbine will be seen from short sections of roads passing through the immediate area to the west and south of the site, scattered properties and hamlets, and from hill tops, as well as from the sea, and the island of Arran beyond, to the east.

4.87 Areas from which the turbine will be visible include the following:

- the nearest property below the site about 900m away at Spion Kop, and another slightly further away at Lonlia. From Spion Kop open, close range views of the turbine on the hill will be possible. Coniferous forest immediately north of the B8001 will largely screen views from Lonlia;
- residential properties at Whitehouse, to the west of the site, from which residents will have largely filtered views;
- roads including the B8001, from where travellers will see the turbine as they pass through the landscape to the south of the development. Intermittent views will also be afforded from a short stretch of the A83 on approaching and leaving Whitehouse and Kennacraig; and
- a long distance footpath, The Kintyre Way, where views will be seen from a short section, as the route passes to the southeast of Cruach nam Fiadh.

4.88 As with effects upon the landscape, significance would diminish with increasing distance from the site.

4.89 The smaller components of the development (ie the transformer) are unlikely to be visible outside the property boundary due to screening by forest. Operational activities (occasional visits for maintenance) are likely to have little or no impact.

CUMULATIVE LANDSCAPE AND VISUAL EFFECTS

4.90 The assessment of cumulative landscape and visual impacts is required to identify the *additional* impacts that may arise as a result of schemes being present in the landscape and in views in combination with one another. The remit of cumulative impact assessment is not to examine total impact significance, but is focussed upon the relationship between different developments. Effects can be:

- combined (schemes seen in combination);
- successive (schemes seen one after the other, ie when turning ones head to look in the other direction); and
- sequential (schemes seen one after the other when travelling through the landscape along roads or paths); and
- perceptual (these are recognised as being a factor of an awareness of the presence of turbines, despite the fact that they may not be visible).

4.91 The nearest operational windfarm is located 18km to the south of the site, at Deucheran Hill. There is the potential for a visual relationship between the proposal and the existing development in long distance views from the wider landscape, but it is very unlikely that effects will be significant at this distance, especially as the turbine being considered in this assessment is single. A further operational windfarm, The Beinn an Tuirc Windfarm and Beinn an Tuirc Extension, is located 27km to the south of the site. Again, it is unlikely that cumulative effects arising from a single turbine will be significant at this distance.

4.92 The nearest known windfarm proposal (Meall Mhor) is located 11.5km to the northwest of the site, for which an application has been submitted. Relative positioning in relation to topography means that there are unlikely to be any areas where Meall Mhor and the proposed turbine will be visible in either combined or successive views.

4.93 A further proposal awaiting a decision lies 12km to the south of the site, Cour Windfarm. From areas where the windfarms will both be visible, including distant views from North Arran to the east of the site, the proposed single turbine will be seen in successive views, rather than combined views. The minimum separation distance of 11.5km between the proposed single turbine and this application suggests that cumulative effects are unlikely to be significant.

4.94 Sequential views of the proposed turbine with Deucheran Hill and Beinn an Tuirc may be possible when travelling north- and south-bound along the A83 between Kennacraig and Killean. The proposed turbine is of a significantly smaller scale that these existing developments and likely to be seen in brief, intermittent views along a short section of the A83 between Whitehouse and Kennacraig. It is therefore not considered that the addition of the proposed development will give rise to significant cumulative impacts on the A83 coastal road.

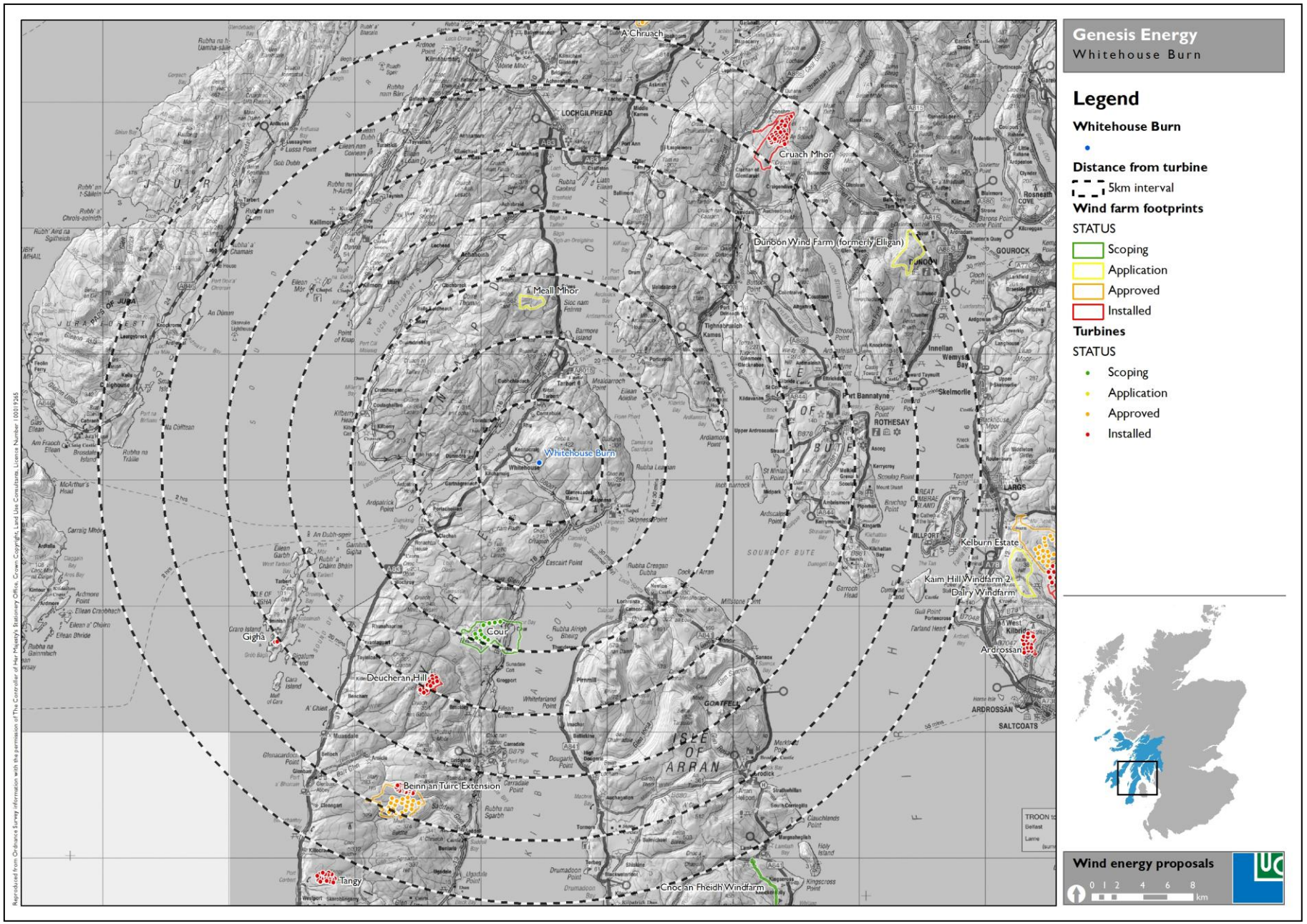

Figure 4.5: Wind farm proposals

SUMMARY OF LANDSCAPE AND VISUAL IMPACTS

A single turbine 84m high to the tip will be present in the landscape and in views.

- It will become a new man-made landscape feature, adding movement to the landscape, and a new landmark in views.
- Associated infrastructure will be locally visible (eg transformer), but will largely be concealed by trees.
- The turbine will not significantly affect any nationally or regionally designated landscapes, notably the NSAs and Areas of Panoramic Quality. Any potential effects on the North Arran NSA and the Knapdale/Melfort Area of Panoramic Quality have been minimised through layout design.
- It will be of simple design, with no external advertising, no lighting and minimal signage.
- The land around the base and used to access the site, and disturbed through the creation of cable trenches will be restored upon completion of the work.
- No significant landscape features will be lost.
- The turbine will be visible from residential properties around the site including from Spion Kop, Lonlia (largely screened by forest) and residential properties at Whitehouse with windows facing to the northeast. From the closest location (VPs 1) it will give rise to up to a moderate visual impact, as the change will be clearly evident as a prominent new feature in some views, at close range.
- Some localised significant effects are predicted in views along recreational routes, the Kintyre Way and the National Cycle Route 73.
- Although cumulative effects will occur, it is not considered that the single turbine would make a significant contribution to cumulative landscape or visual effects.

5 Ecology

5.1 The following section outlines the ecological potential of the proposed wind turbine at Whitehouse Burn. Details of nearby designated sites are presented along with historical records of protected species in the local area. In addition, a summary of the findings of a site visit carried out in September 2010 by LUC are presented, concluding with an appraisal of the site's potential to support habitats of conservation value and protected species. Implications of the assessed nature conservation value of the site in the context of the development are discussed.

DESIGNATED SITES

5.2 There are no designated nature conservation sites (statutory or non-statutory) within the proposed site boundary. There are three statutory designated nature conservation sites found within 5km of the site.

5.3 A single site with international statutory designation, **Tarbert Woods Special Area of Conservation (SAC)**, was identified within 5km. The SAC lies 2km to the northeast of the site. The site is designated for the coastal strip of fragmented broad-leaved woodland it supports, with good stands of old sessile oak woods, which are very important for their oceanic bryophyte communities. Amongst the 180 bryophyte species recorded are 47 Atlantic species, including *Sematophyllum micans* and *Plagiochila atlantica*.

5.4 In addition to the SAC, there are two Sites of Special Scientific Interest (SSSI) within 5km of the site. **Tarbert to Skipness Coast SSSI** occupies the same area as the SAC and is also designated for the coastal strip of broadleaved woodland mainly of ancient or long established origin. It is also used by golden eagle *Aquila chrysaetos* and hen harrier *Circus cyaneus,* and supports breeding populations of golden plover *Pluvialis apricaria*, curlew *Numenius arquata* and snipe *Gallinago gallinago* and large numbers of black grouse *Tetrao tetrix*. **Glen Ralloch to Baravalla Wood SSSI** (5km to the north), includes four discrete fragments of semi-natural broadleaved woodland (Glen Ralloch, Dubhcladach, Garbh-airde Mhor and Baravalla). The oceanic climatic influence, and the long history of tree cover, both contribute to the ranking of these woodlands as one of the best in southern Argyll for their bryophyte and lichen communities. Liverworts present include rare and western species such as *Radula voluta* and *Leptoscyphus cuneifolius*.

5.5 The development is unlikely to directly or indirectly affect any of the designated sites.

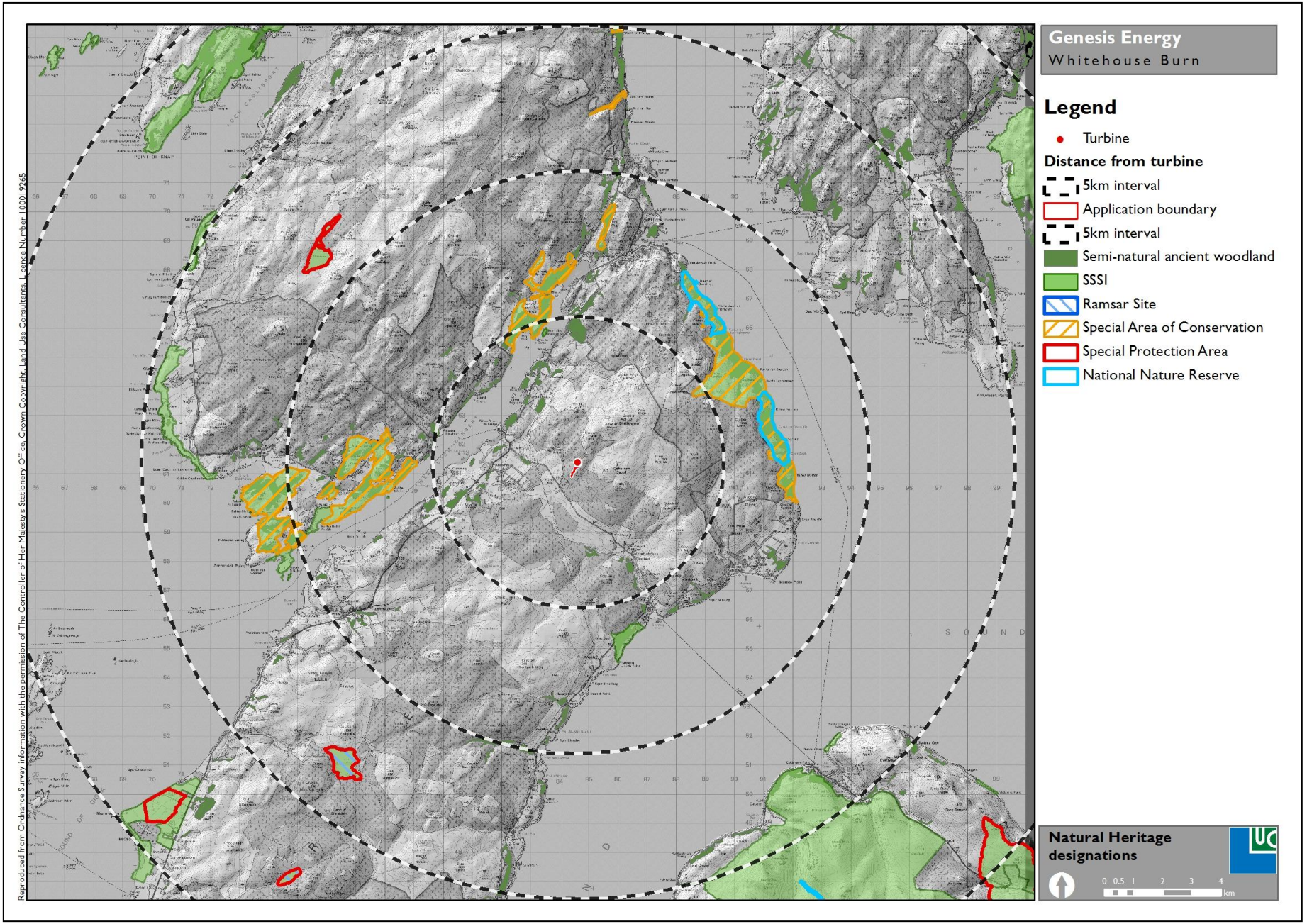

Figure 5.1: Natural heritage designations

HABITAT DESCRIPTION

5.6 Much of the woodland is dominated by densely planted, commercial conifers predominately consisting of Sitka spruce *Picea sitchensis* with two small areas of larch *Larix spp.* The lower lying crop is mature with a younger crop established in the north. Two rides cross the centre of the site and these and an open area to the north comprise dry heath dominated by heather *Calluna vulgaris* and few other species.

5.7 Two water courses are found within the property boundary, the Whitehouse Burn runs along the southwest of the site and the Red House Burn emerges in the north east. The Whitehouse Burn is a substantial watercourse. In its upper reaches it is typically narrow (c. 1m) with slow homogenous stretches. Width increases downstream to approximately 2m, with pool, riffle and rapid habitats in the lower reaches and number of small waterfalls and deep ravines in some sections.

5.8 As per SNH guidance, the turbine base and construction area will be located more than 50m from the nearest watercourse. All areas where concrete work and deep excavation are required (e.g. turbine base, substation and crane pad) are located at a distance of more than 100m from the nearest watercourse.

PROTECTED SPECIES

Otter and Water vole

5.9 The otter *Lutra lutra* is a species of European importance, protected by the Conservation of Habitats and Species Regulations 2010.

5.10 The water vole *Arvicola terrestris* is fully protected by the Nature Conservation (Scotland) Act 2004.

5.11 Both watercourses on site are suitable for otter, providing potential shelter opportunities and prey populations. Otter has been recorded (1991) on the Whitehouse Burn where it flows under the road[14]. There are a limited number of slower flowing sections of watercourse with adjacent peaty banks and marshy habitats suitable for water voles although the extent of this habitat on site is quite limited and there are no historical records of the species on or close to the site.

5.12 No otter sign was noted during the walkover survey.

Badger

5.13 Badger *Meles meles* and its setts are protected in the UK by the Protection of Badgers Act 1992.

5.14 There are no specific records of badger in the general area[15]. Most of the site is under coniferous forest on wet peat-based substrates which generally provide unsuitable habitat for badger and construction of setts. It is therefore unlikely that the site supports badger setts. Badgers may be

[14] www.nbn.org.uk
[15] www.nbn.org.uk

resident in drier farmed areas within 5km of the site and may forage along the forest edge adjacent to open areas in the north and south of the site.

5.15 Again, no signs of badger were noted on the site during the inspection.

Red Squirrel

5.16 Red squirrel *Sciurus vulgaris* are protected under the Wildlife and Countryside Act 1981 (as amended).

5.17 The site does not provide ideal red squirrel habitat, with much of the forest area dominated by homogenous stands of Sitka spruce. There is some variation in the age of planting in the forest block – 34 years in the southern two-thirds, and 23 years in the northern third of the forest. This variation, along with the presence of two small areas of larch in the southern part of the forest, could provide a more suitable species mix and food supply for red squirrel. Red squirrels have been recorded within the Corranbuie Forest approximately 1km north west of the site between 1960 and 1994[16].

Bats

5.18 All British bats are species of European importance and are protected by the Conservation of Habitats and Species Regulations 2010.

5.19 Plantation forests and upland habitats are not considered to be optimal sites for bat species both in terms of roosting and foraging opportunities. However, there is a lack of information regarding bat use of coniferous forests and upland habitats, particularly for migration at the end of summer.

5.20 The site is unlikely to provide any opportunities for roosting bats. However, the properties at Spion Kop and Lonlia may provide potential roost locations off site, whilst there is potential for the Whitehouse Burn to provide a foraging habitat for bat species and the woodland edges to provide suitable flight/transit lines. Consequently, the turbine has been located well away from these potential receptors to avoid adverse impacts.

Pine Marten and Wildcat

5.21 Pine marten *Martes martes* are protected under the Wildlife and Countryside Act 1981 (as amended). Historically pine marten has been recorded in the area (1736 -1899)[17] although there are no recent records of the species from the general area.

5.22 Wildcat *Felis silvestris* is a species of European importance, protected by the Conservation of Habitats and Species Regulations 2010. Wildcat has been recorded in the area (1960 -1994)[18] although there are no specific records from within the site.

5.23 The south area of the site has potentially suitable habitat for pine marten which prefer mature forest usually coniferous with plenty of cover. Wildcat prefer varied habitat on the edge of moorland and forest. Plantation forest

[16] www.nbn.org.uk
[17] www.nbn.org.uk
[18] www.nbn.org.uk

especially in the early stages is considered an important habitat for wildcat. There is some habitat potential for wildcat in the north area of the site.

Reptiles

5.24 Three common species of reptile are found in Scotland; the adder *Vipera berus*, slow worm *Anguis fragillis* and common lizard *Zootoca Vivpara.* All reptiles in the UK are protected by the Wildlife and Countryside Act 1981 (as amended).

5.25 The majority of the site itself is covered in coniferous forest which provides few shelter, basking and foraging opportunities for reptile species. Adder and common lizard have been recorded in the general area and may be present at low densities in suitable areas of habitat or may periodically pass through site during foraging activity.

Invertebrates

5.26 Coniferous plantations have low importance for invertebrate populations and usually support common or alien species that have little conservation value. The dry heath, woodland margins and the watercourses on site are areas of greater significance but are very limited in extent on the site.

HABITAT LOSS

5.27 The development site comprises:

- 0.4ha of non-native conifer forest (Sitka spruce);
- 0.04ha of degraded dry heath; and,
- 0.3ha of existing track.

5.28 The conifers within the development footprint will be felled in line with Forestry Commission Scotland best practice guidance. Detailed discussion with SNH confirmed that more extensive surveys would not be required.

5.29 Early consideration of ecological issues was fed into the constraints mapping and site design processes, ensuring that:

- No new watercourse crossings are required;
- A 50m buffer, plus rotor sweep, has been applied – and significantly exceeded – to watercourses to protect potential bat flight lines[19];
- The same 50m buffer has been applied to watercourses – and exceeded – to prevent disturbance of protected species and avoid the potential for pollution (particularly in areas where concrete works are required);
- Turbine is located away from larger areas of open ground habitat within the forest to minimise loss of relatively undisturbed habitat;
- Areas of deeper peat have been avoided;

[19] In line with Natural England Technical Information Note TIN051(2009) '*Bats and onshore wind – Interim guidance*' as recommended by SNH.

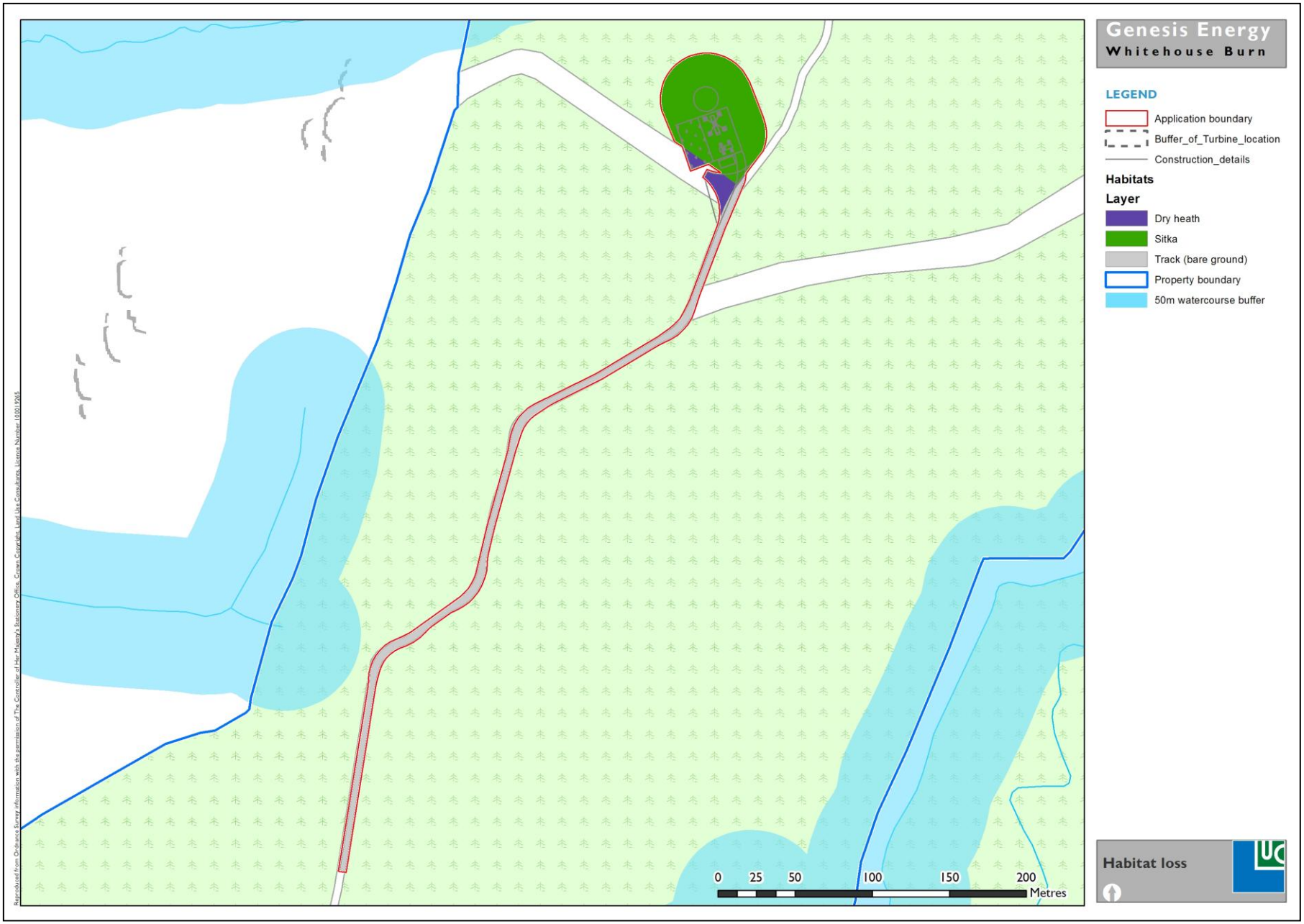

Figure 5.2: Habitat loss

RECOMMENDATIONS

5.30 A scope of works for an ecological impact assessment was devised, as advised in SNH's Guidance on Natural Heritage assessment of small scale wind energy projects which do not require formal Environmental Impact Assessment (EIA) (March 2008).

5.31 In discussion with SNH, it was concluded that habitat loss (beyond the felled area of Sitka spruce) would be so minimal that a Phase 1 habitat survey would not yield meaningful results and would be disproportionate to the impact of the development on habitat values. During site inspections, the area of forest ride concerned was noted as being species-poor heather (*Calluna vulgaris*) dominated dry heath. It is probable that the presence of the conifers and mounding/drainage works undertaken during planting have altered the local hydrological regime and resulted in significant drying of the immediate area. Similarly, the deep shade created in the ride by the adjacent conifers further reduces the potential for variation in vegetation communities.

5.32 The principal risk presented by the project in terms of terrestrial fauna is in relation to red squirrel. Although Sitka spruce is not ideal habitat, and no sign was noted during site inspections, there is potential for the species to make use of the forest.

5.33 It is recommended that a feeding sign survey is conducted for red squirrel in advance of construction to ensure that this species has not moved in to the area since the initial fieldwork was undertaken and that dray sites are not affected by felling or disturbance. The applicant would welcome the inclusion of a suitable planning condition to secure this work, in consultation with SNH and the local authority.

POTENTIAL SCHEME IMPACTS

5.34 The majority of the site is dominated by coniferous plantation, a common and widespread habitat with low ecological value. As such, the scheme has been designed to minimise losses of other, more valuable, habitats – most notably blanket bog.

5.35 Felling of the conifers within the development site could provide some small-scale opportunities for restoration of heath habitats that were previously lost within the plantation. The development will not result in fragmentation of important habitats or result in any loss of key connectivity.

5.36 Impacts on the water environment are likely to be satisfactorily mitigated by the generous buffer zones afforded by the site design, substantially reducing the potential for impacts on otter, water vole and other aquatic species. Similarly, appropriate storage of topsoil and deployment of anti-siltation devices will further reduce the potential for pollution. Fuelling and lubrication of machinery should also take place offsite to reduce the potential for hydrocarbon contamination, and machinery should be equipped with the necessary spill kits.

6 Ornithology

INTRODUCTION

6.1 MacArthur Green Ltd was commissioned by Land Use Consultants (LUC) to carry out bird surveys at the proposed Whitehouse wind turbine site, near Kennacraig at the north of the Kintyre peninsula, Argyll & Bute (hereafter referred to as 'the Site').

6.2 The surveys were commissioned to inform an appraisal into the likely ornithological impacts that would arise should the development progress through the planning process. A number of survey methods were employed in order to establish as thorough a baseline dataset as possible.

6.3 The property as a whole covers an area of approximately 96ha and is situated approximately 2km south east of Kennacraig. The development site itself covers some 0.73ha.

6.4 Following a screening exercise, in which Argyll & Bute Council (in consultation with Scottish Natural Heritage (SNH)) deemed that the development did not require a full Environmental Impact Assessment (EIA), it was decided that a more concise appraisal of the potential ornithological issues on Site would be sufficient. The Council requested that the following specific issues be addressed[20]:

- Impacts upon the Kintyre Goose Roosts SPA;
- Impacts upon the local population of Red-Throated Diver;
- Impacts upon Hen Harrier, Merlin and Golden Eagle; and
- Impacts upon Black Grouse, Crossbill and Barn Owl.

6.5 This section of the report provides an overview of the ornithology study. MacArthur Green's full report, including observation data and flight-line mapping is included as **Appendix 2**.

LEGAL PROTECTION

6.6 All wild birds and their eggs are protected by law. Specific levels of protection are determined by a species' inclusion on certain lists.

METHODOLOGIES

Consultations and Desk-Based Study

6.7 The following resources were consulted with regards the ornithological interests on and adjacent to the Site:

- Published papers relevant to this study;
- RSPB Black Grouse Officer;
- Scottish Natural Heritage (SNH) Site Link (www.snh.gov.uk/sitelink) – Data on designated sites; and

[20] Argyll & Bute Council Wind Turbine Development, Whitehouse Burn - 'Screening Opinion'. 11/03/2011.

- NBN Gateway (www.searchnbn.net) – Information relating to Schedule 1, Annex 1 and Red and Amber List bird species in OS Tile NR86.

Field Survey

6.8 Given the limited extent of the development proposals (i.e. a single turbine and an upgrade of an existing access track), and following discussions with SNH, a scaled down (from current SNH guidance requirements bird survey programme was agreed in order to address the potential ornithological issues. The following surveys were undertaken at the Site. These adhered to standard field method guidelines and are described in detail within Appendix D of MacArthur Green's full report, **Appendix 2** to this document:

- Flight Activity Vantage Point Survey (VP);
- Upland Breeding Bird Survey (BBS);
- Woodland Point Count;
- Diurnal Breeding Raptor Survey; and
- Black Grouse Survey.

6.9 The VP survey extents were based upon recommendations described within SNH guidance (2010), with alterations made to reflect the limited nature of the development proposals. It was agreed that halving the total amount of time spent undertaking these surveys would be sufficient (i.e. 18 hours per VP per survey season). It was also agreed that this survey effort would be subject to review should initial findings suggest greater coverage would be required.

6.10 Each of the above surveys was carried out beyond the Site extents for a distance specific to that method – e.g. 2km buffer for the breeding raptor survey. Details of these extents are listed within Appendix B and illustrated within Figure 1 of Appendix D (within **Appendix 2** of this document). These extents are hereafter referred to as the 'survey area' within this document.

6.11 The relative importance of the data collected was determined by the specific level of protection assigned to those species recorded, coupled with their perceived susceptibility to impacts by the windfarm. The resulting 'Target Species' and 'Secondary Species' lists are a standard assessment tool for windfarm ornithological studies (see Appendix D). Following consultation with the relevant guidance (SNH, 2006) and by virtue of the accepted reduced risk of collision posed to certain species, the Common Crossbill has been removed from the Target Species list for the purposes of collision risk assessments within this report.

Survey Constraints

6.12 At the time of writing this report, surveying had been ongoing for six months. Data from the remaining seven months of the year is to be collected and as such represents an information gap at this point. The results and conclusions that follow are therefore subject to review within the context of an incomplete data set, and this is addressed as appropriate.

6.13 Commercial forestry operations commenced on Site during Spring 2011 (albeit approximately 600m from the proposed turbine location) and it is recognised that this may have created a bias in the results given the disturbance that will have arisen from the forestry activities and the subsequent change in local bird distribution. The results are discussed in this context within the Conclusions of this chapter.

RESULTS

Consultations and Desk-Based Study

6.14 Information gathered from the consultation exercise revealed the presence of a known Golden Eagle territory, with the territory centre approximately 5km to the east of the Site. In addition, information provided by the RSPB suggests the presence of several Black Grouse leks within 5km of the Site, with the closest being approximately 1km to the south. Finally, the NBN Gateway and BTO's Bird Tracker service suggested the presence of the following Target Species within the Site and its environs:

- Barn Owl (within 10km)
- Crossbill (10km)
- Tern species (10km)
- Wader species (10km)
- Peregrine Falcon (10km)
- Red Kite (2km)
- Short-eared Owl (10km)
- White-tailed Eagle (2km)

6.15 Information obtained from a source local to the Site suggests the likely presence of the following additional species within 2km of the Site:

- Golden Eagle
- Hen Harrier
- Diver Species

FIELD SURVEY

6.16 Survey work commenced on the 15th December 2010 and is ongoing. All surveys have been undertaken by suitably qualified and experienced surveyors, and during suitable weather conditions (as described within Appendix D, within **Appendix 2** of this document **–** Survey Methodologies). The Schedule 1/Annex 1 surveys were carried out by an appropriately licensed surveyor.

6.17 The results of the field surveys and consultation exercise are illustrated within the Figures 1 - 3. The individual survey methods revealed the following results:

Flight Activity (Vantage Points (VPs))

6.18 A total of five species have recorded during the VP surveys, including two Target Species. The Target Species observed were Golden Eagle (eight flights) and Hen Harrier (one flight) (Figures 2 & 3). None of these observations were from within 250m of the Site. The full results are detailed within Appendix D within **Appendix 2** of this document**.**

Breeding Raptor Survey

6.19 No breeding raptors were identified as being present on Site. A single Sparrowhawk was observed during surveying, but no evidence of breeding recorded.

6.20 A pair of Golden Eagles were frequently observed around the triangulation point approximately 2km to the north east of the Site however they were not found to be breeding within the vicinity of the Site.

Breeding Birds Survey

6.21 The upland BBS recorded two breeding species and three non-breeding species. No Annex 1 or Schedule 1 breeding birds were recorded (full details are presented in Appendix D within **Appendix 2** of this document).

Woodland Point Counts

6.22 Woodland point counts were undertaken at 10 locations (see Figure 1), and recorded the presence of seven bird species. These included non-breeding Common Crossbill and Lesser Redpoll in forestry surrounding the proposed turbine location (Point Count locations 4, 5, 7 and 10). Full details are presented in Appendix D within **Appendix 2** of this document**.**

Black Grouse

6.23 No Black Grouse have been observed from within the survey area.

Migratory Movements

6.24 No notable migratory movements were recorded during the surveys.

CONCLUSIONS

6.25 The findings of the ornithological survey work carried out at Whitehouse between December 2010 and mid-May 2011 suggest that the Site is of negligible importance to Target Species, both in terms of flight activity and nesting. The only species of nature conservation importance recorded on Site has been the Common Crossbill, with a small non-breeding population observed. Both Golden Eagle and Hen Harrier have been observed off Site, in excess of 2km from the proposed turbine locations.

6.26 The habitat on Site is assessed as being unsuitable for colonisation by any of the Target Species considered during such studies, with monoculture plantation forestry being exclusively dominant. The wider area appears suitable for Black Grouse, and it is possible that the species may utilise the

plantations in the area for feeding and shelter, although none were recorded during surveys.

6.27 It has been recognised that the data collected thus far only represents a proportion of the data required to accurately assess the use of a site across a full year. However, given the lack of overall activity observed, and especially during key periods (i.e. migration and early breeding season), it is considered unlikely that the development will have any significant impacts upon any bird populations in the area. This approach has been approved by SNH.

6.28 In addressing the specific concerns raised in response to initial correspondences with Argyll and Bute Council (see Introduction), the following appraisals are made:

Impacts upon the Kintyre Goose Roosts SPA:

6.29 No geese have been recorded overflying the Site and it is therefore considered that the proposed development will have no impact upon any of the populations for which the SPA is designated.

Impacts upon the local population of Red-Throated Diver:

6.30 No divers were observed during any of the surveys and it is therefore considered that the proposed development will have no impact upon any diver species.

Impacts upon Hen Harrier, Merlin and Golden Eagle:

6.31 Both Hen Harrier and Golden Eagle were observed outwith the Site (in excess of 2km from the proposed turbine location), with no flight activity recorded over the Site. In addition, no breeding activity of any raptor was observed from within 2km of the Site. It is therefore considered that the development will have no impact upon any raptor species.

Impacts upon Black Grouse, Crossbill and Barn Owl:

6.32 No Black Grouse or Barn Owl were observed during surveying, with habitat generally unsuitable for the latter. It is therefore considered that the development will have no impact upon either species.

6.33 Common Crossbill were observed within the forestry surrounding the proposed Site, feeding amongst the Sitka spruce on what was a relatively bountiful seed crop.

6.34 It is therefore recommended that pre-construction surveys are undertaken on trees within the development footprint to ensure that any active nest sites are identified and are protected from disturbance (through micro-siting and/or sympathetic timing of works to avoid the breeding period for the species). With the application of these mitigation measures, and given the relatively low-level habitat loss planned (0.73ha of land to be developed), it is considered that the proposed development will have no impact upon the Common Crossbill population on Site.

6.35 As discussed within the Survey Constraints section above, the commencement of forestry operations to the south west of the proposed turbine location was identified as having the potential to cause a change in

local bird behaviour and distribution, and subsequently impact the bird survey results. Given the lack of activity prior to the commencement of these works, especially within the vicinity of the affected area, it is considered unlikely that the works will have caused a significant bias to the bird survey results. Again, this was discussed with SNH to ensure the acceptability of the approach.

REFERENCES

Brown, A. F. & Shepherd, K. B. (1993) A method for censusing upland breeding waders. *Bird Study*, 40: 189-195.

Gilbert, G., Gibbons, D. W. & Evans, J. (1998) *Bird Monitoring Methods*. RSPB, Sandy.

Hardey, J., Crick, H., Wernham, C., Riley, H. & Thompson, D. (2005 in prep): *Raptors: a field guide to survey and monitoring*. Edinburgh: The Stationery Office.

Langston, R.H.W & Pullan, J.D. (2003) *Windfarms and birds: analysis of Windfarms on birds, and guidance on environmental assessment criteria and site selection issues.* Royal Society for the Protection of Birds/Report by bird life international to the Council of Europe (Bern Convention), Council of Europe Report T-PVS/Inf (2003) 12.

Scottish Natural Heritage (2010) *Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities.*

Scottish Natural Heritage (2006) *Assessing significance of impacts from onshore Windfarms on birds outwith designated areas.*

Scottish Natural Heritage (2009) *Environmental Statements and Annexes of Environmentally*

Sensitive Bird Information.

Scottish Natural Heritage (2009) *Strategic Locational Guidance for Onshore Wind Farms in Respect of the Natural Heritage.* Policy Statement No. 02/02 (First published 2002 and updated March, 2009).

7 Historic environment

INTRODUCTION

7.1 This review of historic environment significance and potential is based on publicly accessible and published material, and the results of a walkover survey of the forest. As the majority of the property has been afforested over the last 30 years, it is likely that much of the near-surface archaeological value of the site has been obscured or destroyed.

7.2 A pre-afforestation survey (Fojut 1979) conducted in advance of the first phase of planting, held by the National Monuments Record, was examined to determine whether any remains of importance had been recognised on site. The data holdings of the NMRS, part of the Royal Commission on the Ancient and Historical Monuments of Scotland, and West of Scotland Archaeology Service (WoSAS) were also examined.

DESIGNATED ASSETS

Scheduled Monuments

7.3 There are seven Scheduled Monuments (SMs) within 5km of the site boundary, as set out in Table 7.1 below.

Table 7.1: Scheduled monuments within 5km of the site

Index No.	Name	Class	Approx. Distance (km)
3183	Eilean Araich Mhoir	Dun	2.7
3281	Glenreasdell Mains	Chambered cairn	3.1
3874	Cnoc Dubh na Leitreach	Cairns	4.5
3656	Escart	Standing stones	4.5
2421	Dun a Choin Duibh	Dun	4.6
3651	Cnoc na Sgratha	Cairn	4.8
3674	Leamnamuic	Dun	4.8

7.4 The closest of these is Eilean Araich Mhoir, the remains of a 'dun' – a relatively small later prehistoric settlement enclosed by a thick drystone wall – in this case encircling the summit of a small peninsula. The remains of the wall are much-reduced with little of the original face visible. The enclosing outwork is similarly reduced.

7.5 Although the position of the monument at c. 10m AOD affords views towards the site – and the turbine will be intermittently visible – an element of screening is provided by trees in the foreground. The dun's setting, and most significant relationships, are with the bowl of Kennacraig Bay and out into West Loch Tarbert. Its strongly maritime location and focus significantly reduce the importance of longer distance views to the hinterland to the east.

Similarly, its local setting – which contributes most to its significance and public appreciation – is formed by the foreshore and native woodlands between the monument and the A83. The proposed development will therefore result in a minor change in the local landscape which will have a negligible impact on the character and significance of the asset.

7.6 Of the remaining SMs within the 5km buffer area, the site is not visible from Glenreasdell Mains chambered cairn, Escart standing stones or the Cnoc na Sgratha cairn. Similarly, the duns at Dun a' Choin Duibh, and Leamnamuic, and Cnoc Dubh na Laitreach cairns are situated within dense commercial woodland and views are screened by trees.

Listed Buildings

7.7 There are five Listed Buildings within 5km of the site boundary, as indicated in Table 7.2 below.

Table 7.2: Listed buildings within 5km of site

HBNUM	Name	Cat.	Approx. Distance (km)
12028	Spion Kop Kennels	C(S)	0.2
12027	Gartnagrenach farmhouse	C(S)	4.0
18407	Glenreasdell Mains, Claonaig	C(S)	2.9
18406	Skipness Parish Church, Claonaig	B	4.7
18245	Dunmore House	B	4.9

Spion Kop Kennels

7.8 Spion Kop Kennels is located 1km from the proposed development site. It is a C(S) Listed Edwardian (c.1905) kennel building associated with the Glenreasdell Estate[21]. While it has been converted into additional accommodation for the neighbouring house, it retains its architectural interest and functions as a landmark on the B8001.

7.9 However, its key relationships are with the Glenreasdell Estate to the south, rather than with the proposed development site and its environs. It is of no more than local architectural importance and key views of the asset – from the road, against the backdrop of open ground, hills and sky – will be unaffected by the proposed development. Although the turbine will be clearly visible from the building, and will appear on the skyline, it will not become a dominant feature of the building's setting.

Dunmore House

7.10 Dunmore House, a B-Listed Scots Baronial tower, lies 5.4km from the site. The turbine will be visible from the upper levels, however the policy woodlands surrounding the now burnt-out tower offer a considerable degree of screening in ground level views. Impacts are considered to be minor,

[21] Only the kennel building itself is specifically named in the Listing document – the associated house has been heavily modified and extended.

since, where visible through the trees, the development would affect a very small proportion of the building's visual envelope and would not interrupt key views or associations.

Skipness Parish Church

7.11 The B-Listed Skipness Parish Church sits on a shoulder of land above the Claonaig Water, adjacent to the B8001. It is most commonly viewed either from the road, being approached from either the north or south.

7.12 Blade tips will only be visible in views of the church from immediately adjacent to the extension abutting the western gable (as illustrated in **Viewpoint 7**, **Annex 1**) or in fleeting glimpses by travellers heading north on a c.50m section of the B842 after the bridge over the Claonaig Water, and before the junction with the B8001. They will create a very minor change in the landscape and will be obscured in most views of the church by the building itself. North of the church itself, the blade tips will be obscured by trees in the foreground of views.

7.13 Similarly, the most significant views from the church are out across the Kilbrannan Sound to the mountains of north Arran, which are framed by local topography. These tightly-bounded views from the church, formed be the hills on either side of the valley of the Claonaig Burn, are the most significant aspect of the Church's setting and will be unaffected by the proposed development.

Other Listed Buildings

7.14 The ZTV indicates that the C(S)-Listed Gartnagrenach Farmhouse and Glenreasdell Mains have no visibility of the turbine.

Conservation Areas

7.15 The closest Conservation Area to the site is Tarbert, some 6km to the north. However, it is entirely screened by topography and will not be subject to any visual impact.

NON-STATUTORY DESIGNATIONS

Historic Gardens and Designed Landscapes

7.16 The closest Inventory-listed designed landscape is that of Stonefield Castle Hotel, over 8km from the site boundary. However, it has no intervisibility with the site due to its relatively low-lying situation and screening by the ridgeline to the north of the site.

RECORDED SITES

7.17 Neither the National Monuments Record or the West of Scotland Archaeology Service Sites and Monuments Record notes the presence of any sites of archaeological interest within the development boundary or the contiguous forest area.

1979 Pre-afforestation Survey

7.18 A survey conducted in advance of the initial tranche of planting on the site (Fojut 1979) did not indicate the presence of any sensitive assets in the vicinity.

PREVIOUSLY UNRECORDED SITES

7.19 Field inspection of property revealed a single, previously unrecorded monument.

7.20 Located at NR 8456 6063, a small, unroofed drystone building abutting the boundary dyke – which forms the eastern edge of the property – was noted. It measured 2.1 by 1.8m externally with walls standing to around 0.7m, with some evidence of collapse. No formal entrance survives, but may have been located in the southeast corner. Similarly, no clear evidence of a roof structure was visible.

7.21 It does not bear any obvious evidence of function, and appears too small to be a shieling hut. However, its likely 18th-19th century date – given its relationship with the boundary dyke – suggests that it may be connected with upland land management or grouse-shooting. (However, no other grouse-butts were noted in the area.) While its size and proximity to a watercourse could suggest an expedient building to house possible illicit still, its location on a formal land division in a relatively open location makes this unlikely.

7.22 The development will have no impact on either the fabric or setting of this monument.

Figure 7.1: previously unrecorded structure

RECOMMENDATIONS

7.23 The proposed development is very unlikely to have a physical impact on archaeological remains, given the history of the site. Nevertheless, it may be appropriate to undertake a watching brief during soil stripping and excavation works. This would enable the identification and recording of any features uncovered.

7.24 It is anticipated that necessary work would be secured through appropriate conditions attached to the planning permission, in consultation with West of Scotland Archaeology Service. Given the likely scale of both the development and impacts, extensive pre-application investigations would be disproportionate.

7.25 It is recommended that felling works in advance of construction be conducted in line with the FCS Forests and Archaeology Guidelines. Should any cultural heritage sites be identified in the course of this work, appropriate recording by suitably qualified professionals will be required – with any additional work agreed in advance with the planning authority and WoSAS.

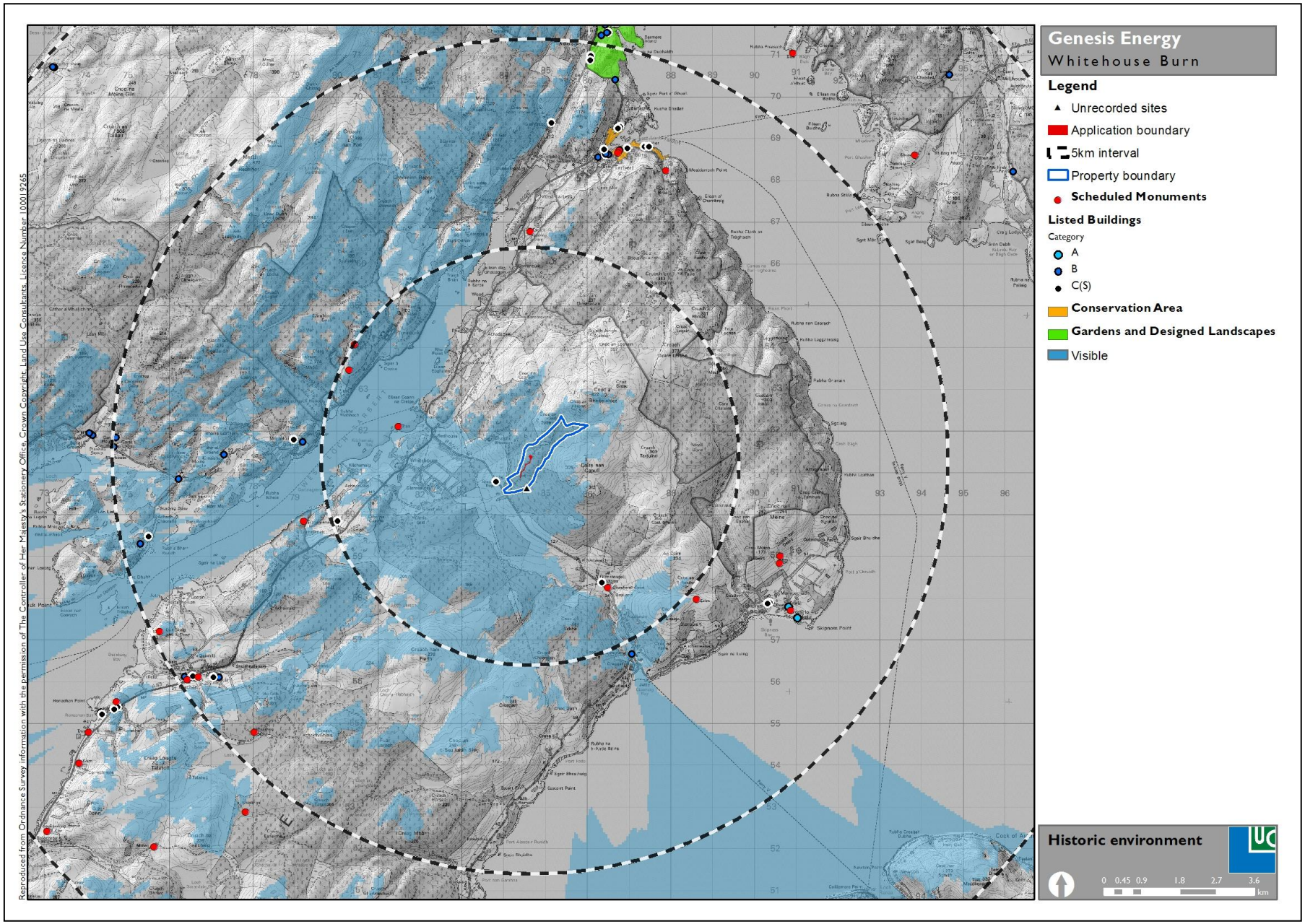

Figure 7.2: Historic environment

8 Noise

SUMMARY

8.1 Operational noise impact from the proposed development has been assessed. Typical wind turbine noise levels have been predicted based on sound power level data for an Enercon E48 turbine with a hub height of 60 m in accordance with Planning Advice Note 1/2011 (Scottish Government, 2011): 'Planning and Noise' and ETSU-R-97: 'The Assessment and Rating of Noise from Wind Farms' (Department for Trade and Industry (DTI), 1996a).

8.2 The assessment shows that the predicted **wind turbine noise levels at all residential properties comfortably meet the ETSU-R-97 simplified noise limit** of 35 dB LA90 for 10 m height wind speeds of up to 10 m/s by a margin of 6.5 dB.

INTRODUCTION

8.3 A single wind turbine development has been proposed on land east of Kennacraig, Kintyre. Genesis Energy has commissioned this noise assessment to consider the impact of the scheme on the surrounding area and in particular on nearby residential properties.

8.4 The assessment has been carried out according to the recommendations of ETSU-R-97, *The Assessment and Rating of Noise from Wind Farms*, as referred to in PAN 1/2011, *Planning and Noise*, as the method by which noise from windfarms should be assessed.

8.5 Predicted noise levels, based on the use of an Enercon E48 800 kW turbine with a hub height of 60 metres and noise data warranted by the manufacturer, have been compared with proposed noise limits contained within ETSU-R-97.

8.6 Due to the location of the scheme, and the consequent low levels of predicted noise at the nearest residential properties, baseline noise measurements are not required for the ETSU-R-97 assessment. Predicted noise levels have been compared with the simplified noise limit which applies in such situations.

Noise Impact from Windfarm Developments

8.7 Noise is generated by wind turbines as they rotate to generate power. This only occurs above the 'cut-in' wind speed and below the 'cut-out' wind speed. Below the cut-in wind speed there is insufficient strength in the wind to generate efficiently and above the cut-out wind speed the turbine is automatically shut down to prevent any malfunctions from occurring. The cut-in wind speed at turbine hub height for the Enercon E48 is 3 metres per second (m/s) and the cut out wind speed is between 28 and 34 m/s.

8.8 The principal sources of noise are from the blades rotating in the air (aerodynamic noise) and from internal machinery, normally the gearbox (if the machine is not a direct drive model) and, to a lesser extent, the generator

(mechanical noise). The blades are carefully designed to minimize noise whilst optimising power transfer from the wind. It should be noted that the proposed Enercon E48 turbine is a direct drive model without a gearbox.

Noise in the Environment

8.9 Although the source noise levels are fairly low and of a benign nature, windfarms are generally situated in rural environments where there are few other sources of noise. When wind speeds are high this is not a problem since any noise is masked by wind induced noise effects, particularly that of the trees being blown. At lower wind speeds, however, or in particularly sheltered locations, the wind induced background noise may not be sufficient to mask any noise from the turbines. However, under these conditions, the generated noise levels may be so low as to generate very little impact.

8.10 Noise levels are normally expressed in decibels. Noise in the environment is measured using the dB(A) scale which includes a correction for the response of the human ear to noises with different frequency content. Planning Advice Note PAN1/2011 [1] (Scottish Government, 2011) states that '*For noise of a similar character, a change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving and doubling the loudness of a sound*'. Table 1 shows noise from wind turbines in the general context of noise in the environment.

Table 8.1 - Examples of Indicative Noise Levels[22]

Source/Activity	Indicative noise level, dB (A)
Unsilenced pneumatic drill (at 7m distance)	95
Heavy diesel lorry (40km/h at 7m distance)	83
Modern twin-engine jet (at take-off at 152m distance)	81
Passenger car (60 km/h at 7m distance)	70
Office environment	60
Ordinary conversation	50
Quiet bedroom	35
Modern twin-engine jet (at take-off at 152m distance)	81

NOISE PLANNING GUIDANCE

Planning Advice Note PAN1/2011, Planning and Noise

8.11 PAN1/2011 indentifies two sources of noise from wind turbines; mechanical noise and aerodynamic noise. It states that 'good acoustical design and siting

[22] Taken from PAN 1/2011 *Planning and Noise* [1]

of turbines is essential to minimise the potential to generate noise'. It refers to the 'web based planning advice' on renewables technologies for onshore wind turbines.

Web Based Planning Advice, Onshore Wind Turbines

8.12 The web based planning advice on onshore wind turbines [2] re-iterates the sources of noise as 'the mechanical noise produced by the gearbox, generator and other parts of the drive train and the aerodynamic noise produced by the passage of the blades through the air' and that 'there has been significant reduction in the mechanical noise generated by wind turbines through improved turbine design'. It states that 'the Report, "The Assessment and Rating of Noise from Wind Farms" (Final Report, Sept 1996, DTI), (ETSU-R-97), describes a framework for the measurement of windfarm noise, which should be followed by applicants and consultees, and used by planning authorities to asses and rate noise from wind energy developments, until such time as an update is available'. It notes that 'this gives indicative noise levels thought to offer a reasonable degree of protection to windfarm neighbours, without placing unreasonable burdens on windfarm developers, and suggests appropriate noise conditions'.

ETSU-R-97, The Assessment and Rating of Noise from Windfarms

8.13 ETSU-R-97, The Assessment and Rating of Noise from Wind Farms [3], presents the recommendations of the Working Group on Noise from Wind Turbines, set up in 1993 by the Department of Trade and Industry as a result of difficulties experienced in applying the noise guidelines existing at the time to windfarm noise assessments. The group comprised independent experts on wind turbine noise, windfarm developers, DTI personnel and local authority Environmental Health Officers. In September 1996 the Working Group published its findings by way of report ETSU-R-97. This document describes a framework for the measurement of windfarm noise and contains suggested noise limits, which were derived with reference to existing standards and guidance relating to noise emission from various sources.

8.14 ETSU-R-97 recommends that, although noise limits should be set relative to existing background, and should reflect the variation of both turbine and background noise with wind speed, this can imply very low noise limits in particularly quiet areas, in which case "it is not necessary to use a margin above background in such low-noise environments. This would be unduly restrictive on developments which are recognised as having wider global benefits. Such low limits are, in any event, not necessary in order to offer a reasonable degree of protection to the windfarm neighbour."

8.15 For day-time periods, the noise limit is 35-40 dB(A) or 5 dB(A) above the 'quiet day-time hours' prevailing background noise, whichever is the greater. The actual value within the 35-40 dB(A) range depends on the number of dwellings in the vicinity; the effect of the limit on the number of kWh generated; and the duration of the level of exposure.

8.16 For night-time periods the noise limit is 43 dB(A) or 5 dB(A) above the prevailing night-time hours background noise, whichever is the greater. The

43 dB(A) lower limit is based on a sleep disturbance criteria of 35 dB(A) with an allowance of 10 dB(A) for attenuation through an open window and 2 dB(A) subtracted to account for the use of LA90 rather the LAeq (see Paragraph 8.20).

8.17 Where the occupier of a property has some financial involvement with the windfarm, the day and night-time lower noise limits are increased to 45 dB(A) and consideration can be given to increasing the permissible margin above background. These limits are applicable up to a wind speed of 12 m/s measured at 10 m height on the site.

8.18 Quiet day-time periods are defined as evenings from 1800-2300 plus Saturday afternoons from 1300-1800 and Sundays from 0700-1800. Night-time is defined as 2300-0700. The prevailing background noise level is set by calculation of a best fit curve through values of background noise plotted against wind speed as measured during the appropriate time period with background noise measured in terms of LA90,t. The LA90,t is the noise level which is exceeded for 90% of the measurement period 't'. It is recommended that at least 1 week's worth of measurements is required.

8.19 Where predicted noise levels are low at the nearest residential properties, as is the case here, a simplified noise limit can be applied, such that noise is restricted to the minimum ETSU-R-97 level of 35 dB LA90 for wind speeds up to 10 m/s at 10 m height. This removes the need for extensive background noise measurements for smaller or more remote schemes.

8.20 It is stated that the LA90,10min noise descriptor should be adopted for both background and windfarm noise levels and that, for the windfarm noise, this is likely to be between 1.5 and 2.5 dB less than the LAeq measured over the same period. The LAeq,t is the equivalent continuous 'A' weighted sound pressure level occurring over the measurement period t. It is often used as a description of the average noise level. Use of the LA90 descriptor for windfarm noise allows reliable measurements to be made without corruption from relatively loud, transitory noise events from other sources.

8.21 ETSU-R-97 also specifies that a penalty should be added to the predicted noise levels, where any tonal component is present. The level of this penalty is described and is related to the level by which any tonal components exceed audibility.

8.22 With regard to multiple windfarms in a given area ETSU-R-97 specifies that the absolute noise limits and margins above background should relate to the cumulative effect of all wind turbines in the area contributing to the noise received at the properties in question. Existing windfarms should therefore be included in cumulative predictions of noise level for proposed wind turbines and not considered as part of the prevailing background noise.

IoA Bulletin Article, Prediction and Assessment of Wind Turbine Noise

8.23 Institute of Acoustics Bulletin Vol 34 no. 2 [4] contains an agreement, jointly authored by a number of consultants working in the wind turbine sector for developers, local authorities and third parties, on an agreed methodology for addressing issues not covered by ETSU-R-97. This includes a methodology for

dealing with wind shear and an agreed method for noise predictions. These will be referred to in the relevant sections below.

BLADE SWISH (AERODYNAMIC MODULATION)

8.24 The noise limits prescribed in ETSU-R-97 take into account the fact that all wind turbines exhibit the character of noise described as blade swish, to a certain extent. DTI Report W/45/00656/00/00, The Measurement of Low Frequency Noise at Three UK Windfarms [5], concluded that "*the common cause of complaints associated with noise at all three wind farms is not associated with low frequency noise, but is the audible modulation of the aerodynamic noise, especially at night*". It suggests that "*it may be appropriate to re-visit the issue of aerodynamic modulation (AM) and the means by which it should be assessed*".

8.25 As a result, Salford University recently carried out a study, jointly commissioned by Defra, BERR (formerly the DTI) and the CLG, to investigate AM of wind turbine noise. The results were published by way of report NANR233, Research into Aerodynamic Modulation of Wind Turbine Noise, [6] which concluded that AM was only considered to be a factor at 4, and at a possible further 8, of the 133 sites (all the sites in the UK operational at the time of the study) considered. At these 4 sites, it was considered that conditions associated with AM might occur between about 7 and 15% of the time. In a statement accompanying the published report, the Government states that it 'continues to support the approach set out in Planning Policy Statement (PPS) 22 – Renewable Energy. This approach for local planning authorities to ensure that renewable energy developments have been located and designed in such a way to minimise increases in ambient noise levels, through the use of the 1997 report by ETSU to assess and rate noise from wind energy developments'.

8.26 Although the mechanisms which cause amplitude modulation effects are not completely understood there appear to be certain factors which would appear to make high levels of aerodynamic modulation more likely. These include a close separation distance between turbines sited in a line, especially where such a line points towards residential properties; unusual topography, such as turbines situated on an escarpment or sheltered by the landscape; and turbines on towers shorter than would normally be specified for a given rotor diameter.

INFRASOUND

8.27 Infra-sound is defined as noise occurring at frequencies below that at which sound is normally audible, ie. at less than 20 Hz, due to the significantly reduced sensitivity of the ear at such frequencies. In this frequency range, for sound to be perceptible, it has to be at a very high amplitude and it is generally considered that when such sounds are perceptible then they can cause considerable annoyance.

8.28 Wind turbines have been cited by some as producers of infra-sound. This has, however, been due to the high levels of such noise, as well as audible low frequency thumping noise, occurring on older 'downwind' turbines of which

many were installed in the USA prior to the large scale take up of wind power production in the UK. Downwind turbines are configured with the blades downwind of the tower such that the blades pass through the wake left in the wind stream by the tower resulting in a regular audible thump, with infra-sonic components, each time a blade passes the tower. Virtually all modern turbines, including this proposed turbine, are of the upwind design; that is with the blades up wind of the tower, such that this effect is eliminated.

8.29 The DTI Low Frequency Noise Study referred to in Paragraph 8.24 concluded that '*infrasound noise emissions from wind turbines are significantly below the recognised threshold of perception for acoustic energy within this frequency range. Even assuming that the most sensitive members of the population have a hearing threshold which is 12 dB lower than the median hearing threshold, measured infrasound levels are well below this criterion*'. It goes on to state that, based on information from the World Health Organisation, '*there is no reliable evidence that infrasound below the hearing threshold produce physiological or psychological effects*' and that '*it may therefore be concluded that infrasound associated with modern wind turbines is not a source which may be injurious to the health of a wind farm neighbour*'.

LOW FREQUENCY NOISE

8.30 Noise from modern wind turbines is essentially broad band in nature in that it contains similar amounts of noise energy in all frequency bands from low to high frequency. As distance from a windfarm site increases the noise level decreases as a result of the spreading out of the sound energy but also due to air absorption which increases with increasing frequency. The means that although the energy across the whole frequency range is reduced, higher frequencies are reduced more than lower frequencies with the effect that as distance from the site increases the ratio of low to high frequencies also increases. This effect may be observed with road traffic noise or natural sources such as the sea where higher frequency components are diminished relative to lower frequency components at long distances. At such distances, however, overall noise level is so low, particularly for single turbine sites, that any bias in the frequency spectrum is insignificant.

NOISE PREDICTIONS

8.31 Noise predictions have been carried out using International Standard ISO 9613, Acoustics – Attenuation of Sound During Propagation Outdoors. The propagation model described in Part 2 of this standard [9] provides for the prediction of sound pressure levels based on either short-term down wind (ie. worst case) conditions or long term overall averages. Only the worst-case down wind condition has been considered in this assessment, that is - for wind blowing from the proposed turbine towards the nearby houses. When the wind is blowing in opposite direction noise levels will be significantly lower, especially where there is any shielding between the turbine and the houses.

8.32 The ISO propagation model calculates the predicted sound pressure level by taking the source sound power level for each turbine in separate octave bands and subtracting a number of attenuation factors according to the following:

Predicted Octave Band Noise Level =

$$L_w + D - A_{geo} - A_{atm} - A_{gr} - A_{bar} - A_{misc}$$

8.33 These factors are discussed in detail below. The predicted octave band levels from the turbine are summed together to give the overall 'A' weighted predicted sound level.

L_W - Source Sound Power Level

8.34 The sound power level of a noise source is normally expressed in dB re:1pW. Noise predictions are based on warranted sound power levels for the proposed Enercon E48 800 kW turbine. These variable speed turbines are available in a number of different reduced power modes whereby the maximum noise output is reduced by 'capping' the power output by, in turn, restricting the rotational speed. These predictions have been carried out assuming the turbines are operating un-restricted, with sound power level values as shown in Table 2 taken from Enercon data provided at Appendix E, including a safety factor recommended by Enercon.

Table 2 – Enercon E48 Warranted Turbine Source Sound Power Levels

Standardised* 10m Height Wind Speed (m/s)	Sound Power Level (dB L_{WAeq})
4	90.5
5	95.2
6	99.3
7	102.0
8	102.8
9	103.5
10	103.5

* Wind speed corrected from hub height to 10m height assuming ground roughness of 0.05m.

8.35 The ETSU-R-97 noise limits assume that the wind turbine noise contains no audible tones. Where tones are present, a correction should be added to the measured or predicted noise level before comparison with the recommended limits. The audibility of any tones can be assessed by comparing the narrow band level of such tones with the masking level contained in a band of frequencies around the tone called the critical band. The ETSU-R-97 recommendations suggest a tone correction, which depends on the amount by which the tone exceeds the audibility threshold. There is no known tonal content requiring a tonal penalty for this turbine.

8.36 The octave band noise spectrum used for the noise predictions is shown in Table 4, taken from results of a measurement on a sample turbine produced by WIND-consult[7].

Table 4 - Octave Band Noise Spectrum for 10m Height Wind Speed of 10 m/s

Octave Band Centre Frequency (Hz)	63	125	250	500	1k	2k	4k	8k
Octave Band Sound Power Level (dB(A))	80.0	85.8	94.7	98.2	99.3	93.8	89.0	86.0

D – Directivity Factor

8.37 The directivity factor allows for an adjustment to be made where the sound radiated in the direction of interest is higher than that for which the sound power level is specified. In this case the sound power level is measured in a down wind direction, corresponding to the worst case propagation conditions considered here and needs no further adjustment.

A_{geo} – Geometrical Divergence

8.38 The geometrical divergence accounts for spherical spreading in the free-field from a point sound source resulting in an attenuation depending on distance according to:

$$A_{geo} = 20 \times \log(d) + 11$$

where d = distance from the turbine

The wind turbine may be considered as a point source beyond distances corresponding to one rotor diameter.

A_{atm} - Atmospheric Absorption

5.9 Published values of 'α' from ISO9613 Part 1 [10] have been used, corresponding to a temperature of 10°C and a relative humidity of 70%, the values specified in the Acoustics Bulletin article *'Prediction and Assessment of Wind Turbine Noise'*, which give relatively low levels of atmospheric attenuation, and subsequently worst case noise predictions as given in Table 5.

Table 5– Atmospheric Absorption Coefficients

Octave Band Centre Frequency (Hz)	63	125	250	500	1k	2k	4k	8k

Atmospheric Absorption Coefficient (dB/m)	0.0001	0.0004	0.0010	0.0019	0.0037	0.0097	0.0328	0.1170

A_{gr} - Ground Effect

8.39 Ground effect is the interference of sound reflected by the ground interfering with the sound propagating directly from source to receiver. The prediction of ground effects are inherently complex and depend on the source height, receiver height, propagation height between the source and receiver and the ground conditions. The ground conditions are described according to a variable G which varies between 0 for 'hard' ground (includes paving, water, ice, concrete & any sites with low porosity) and 1 for 'soft' ground (includes ground covered by grass, trees or other vegetation). The Prediction and Assessment of Wind Turbine Noise agreement suggests that use of G = 0.5 and a receptor height of 4m will generally result in realistic estimates of noise emission levels at receptor locations downwind of wind turbines where predictions are based on manufacturers warranted noise data. These are the assumptions which have been used here.

A_{bar} - Barrier Attenuation

8.40 The effect of any barrier between the noise source and the receiver position is that noise will be reduced according to the relative heights of the source, receiver and barrier and the frequency spectrum of the noise. The barrier attenuations predicted by the ISO 9613 model have, however, been shown to be significantly greater than that measured in practice under down wind conditions. The results of a study of propagation of noise from windfarm sites carried out for ETSU [11] concludes that an attenuation of just 2 dB(A) should be allowed where the direct line of site between the source and receiver is just interrupted and that 10 dB(A) should be allowed where a barrier lies within 5 m of a receiver and provides a significant interruption to the line of site. It should be noted that no barrier attenuation has been used in any of the noise predictions carried out.

A_{misc} – Miscellaneous Other Effects

8.41 ISO 9613 includes effects of propagation through foliage, industrial plants and housing as additional attenuation effects. These have not been included here and any such effects are unlikely to significantly reduce noise levels below those predicted.

PREDICTED NOISE LEVELS

8.42 Noise predictions were carried out for a 2 km by 2 km grid centred on the site for a wind speed of 10 m/s at 10 m height. The results are plotted in the form of noise contours shown in Figure 1. It should be noted that this

represents downwind propagation in all directions simultaneously, which clearly cannot happen in practice. The proposed turbine location (E184630 N661400) and nearest residential property, Spion Kop (E183812 N660803), are also marked on the Figure.

8.43 The predicted turbine noise L_{Aeq} has been adjusted by subtracting 2 dB to give the equivalent L_{A90} as suggested in ETSU-R-97.

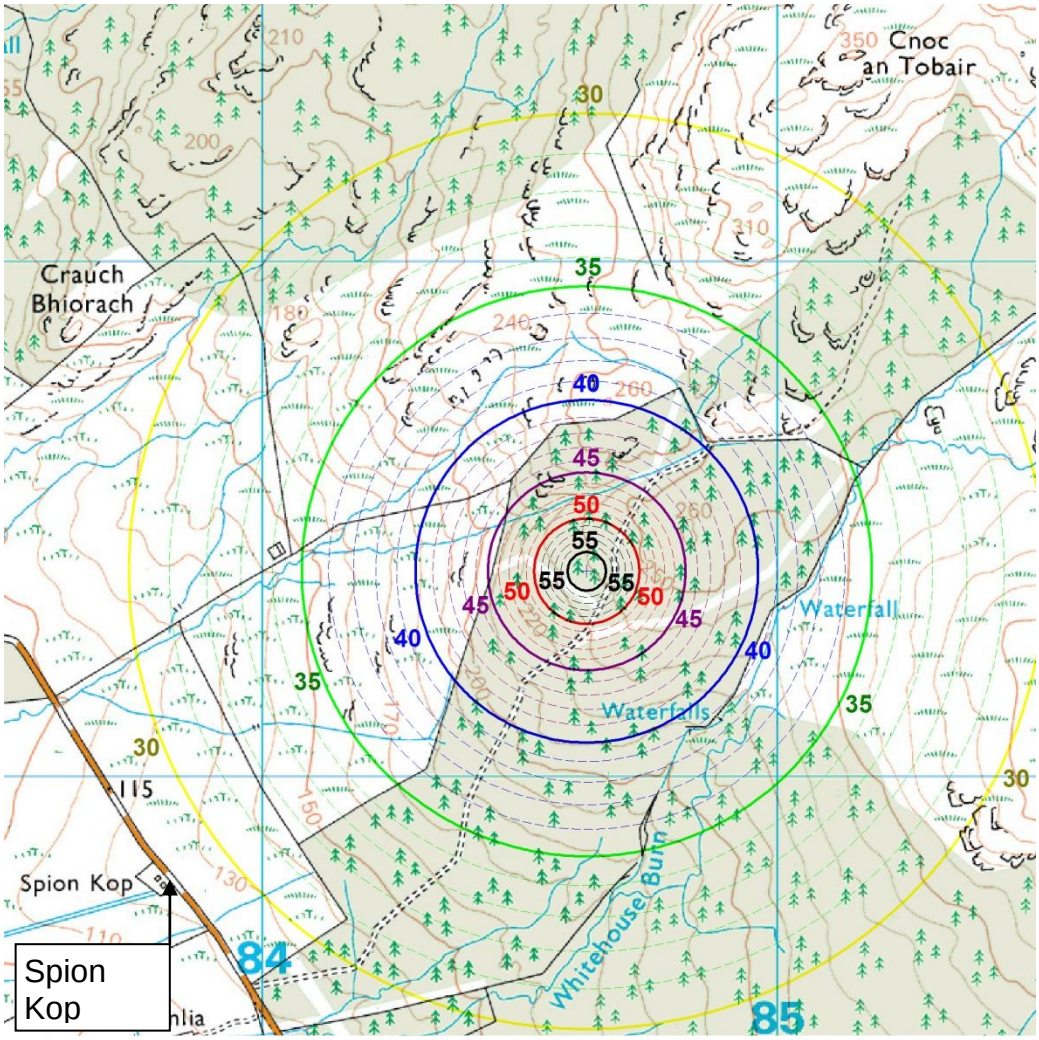

Figure 8.1:Noise Contours for Standardised Wind Speed of 10 m/s at 10 m Height

It should be noted that these contours represent worst-case downwind conditions and assume no attenuation from any barriers. For upwind propagation noise levels will be significantly lower. The 35dB rated noise contour represents the ESTU-R-97 simplified criterion.

NOISE IMPACT ASSESSMENT

Operational Noise Impact Assessment

8.44 It can be seen from Figure 1 that no un-involved residential properties fall within the predicted 35dB LA90 rated contour for the proposed turbine. The highest predicted rated noise level at any residential dwelling is 28.5 dB LA90 at Spion Kop to the south west of the site which is lower than the ETSU-R97 simplified noise limit (see Paragraph 8.19 (above)) by 6.5 dB.

8.45 Factors affecting the likelihood of significant amplitude modulation effects are discussed at Paragraph 8.26 (above). It should be noted that any effects caused by the interaction of multiple turbines will not a occur at a single turbine site such as this. In addition, it should be noted that the ratio of tower height to rotor diameter is large and there are no significant topographical features at this site, further reducing the likelihood of such effects.

8.46 Planning conditions regulating noise from the site to not exceed 35 dB L_{A90} up to a standardised 10 metre height wind speed of 10 m/s, and a means to regulate tonal content, could be considered by the local planning authority to protect residential amenity.

CONCLUSIONS

8.47 An assessment of the likely noise impact of the proposed Whitehouse Burn wind turbine has been carried out.

8.48 Worst case downwind turbine noise levels at the closest residential locations to the site have been predicted based on warranted sound power level data for an Enercon E48 wind turbine.

8.49 The assessment has been carried out by comparing predicted rated noise levels with noise limits described in ETSU-R-97, *Assessment and Rating of Noise from Wind Farms*, as referred to in PAN 1/2011.

8.50 The assessment shows that the predicted wind turbine noise levels at all residential properties meets the ETSU-R-97 simplified noise limit under all conditions by a margin of 6.5 dB.

References

[1] Planning and Noise, Planning Advice Note 1/2011
Scottish Government, 2011

[2] Onshore Wind Turbines, http://www.scotland.gov.uk/Topics/Built-Environment/planning /National-Planning-Policy/themes/renewables/Onshore [16 May 2011].
Scottish Government, 2010

[3] ETSU-R-97, The Assessment and Rating of Noise from Wind Farms
ETSU for the Department of Trade and Industry, 1996

[4] Acoustics Bulletin Vol 34 No.2, Prediction and Assessment of Wind Turbine Noise,
Bowdler et al., Institute of Acoustics, March/April 2009,

[5] W/45/00656/00/00, The Measurement of Low Frequency Noise at Three UK Windfarms
Department of Trade and Industry, 2006

[6] DEFRA NANR233, Research into amplitude modulation of wind turbine noise
Moorhouse et al., University of Salford, July 2007

[7] WIND-consult measurement report no. WICO 439SEC04/07, 24th January 2006

[8] Planning Policy Statement PPS22, Renewable Energy.
Office of the Deputy Prime Minister, 2004

[9] ISO 9613-2, Acoustics - Attenuation of Sound During Propagation Outdoors, Part 2: General Method of Calculation
International Organization for Standardization, 1996

[10] ISO 9613-1, Acoustics - Attenuation of sound during propagation outdoors Part 1: Method of calculation of the attenuation of sound by atmospheric absorption.
International Organization for Standardization, 1992

[11] ETSU W/13/00385/REP, A Critical Appraisal of Wind Farm Noise Propagation
Department of Trade and Industry 2000

9 Technical issues

9.1 This section provides a summary of the measures undertaken to address technical constraints acting on the proposal. The majority of this work was undertaken independently from the main environmental appraisal and is therefore included as a series of appendices.

CONSTRUCTION AND SHORT-TERM IMPACTS

9.2 Given the nature of small-scale wind energy development, it is not possible to supply an environmental management plan or construction method statement at this time. Although these will be drawn up in accordance with SEPA's guidelines, they will be strongly influenced by the standard working practices and approach of appointed turbine suppliers and contractors.

9.3 As noted above, protection of the water environment was a key consideration in site selection and layout – ensuring that all construction works respect a minimum 50m buffer from watercourses (in practice, far greater for the most significant works) and avoiding the need for new crossings. If appropriate, a sustainable drainage solution will be implemented in consultation with the planning authority and SEPA.

9.4 The developer supports the need for strong environmental protection and would welcome the use of appropriate conditions to secure the supply of this information before the commencement of any preparatory or construction works. As such, the developer undertakes to ensure that the eventual method statement, environmental management plan, restoration and monitoring procedures are developed in consultation with the planning authority and relevant agencies.

ACCESS AND TRANSPORT

9.5 Although not specifically requested in the Council's Screening Opinion, an assessment of potential transport routes for turbine components was undertaken to ensure impacts on Kintyre's community are minimised. This comprised a visual inspection of the likely haulage route and Swept Path Analysis (SPAn) of potential 'pinch points.'

Preferred route

9.6 To maximise sustainability, and reduce impacts on users of the public road network, it is anticipated that the turbine components will be delivered by sea to Campbeltown – a precedent established by other wind farms in the area.

9.7 The components will then be loaded onto suitable vehicles and transported to the site, via the A83 from Campbeltown and the B8001 from Whitehouse to the site entrance.

Swept Path Analysis

9.8 An outline transport assessment and computer-generated SPAn for each of the three potential pinch-points are included as **Appendix 3**.

9.9 This was conducted by PMSS Consulting and commissioned separately from the main body of the assessment work.

WIND RESOURCE

9.10 A wind resource analysis was commissioned by the developer separately from the environmental assessment work. It is attached as **Appendix 4**.

9.11 Broadly, the exposure and aspect of the site create ideal conditions for a wind turbine of this scale to operate efficiently.

GRID CONNECTION

9.12 The proposal benefits from a location immediately adjacent to existing 33kV overhead lines with capacity to accommodate a development of this scale (but no larger). The development will not therefore necessitate new distribution infrastructure, reducing consequent environmental and landscape impacts.

9.13 Consequently, a grid connection offer from Scottish Hydro Electric Power Distribution (SHEPD) (DRN459).

TELECOMS AND AVIATION

9.14 Consultation with the Civil Aviation Authority (CAA), National Air Traffic Services (NATS) and Ministry of Defence (MoD) undertaken directly by the developer indicated no significant constraints in relation to radar and aviation.

9.15 Consultation with OFCOM undertaken directly by the developer indicated the presence of a Cable & Wireless plc microwave link crossing Spion Kop forest. This, and the necessary buffer distance of 70m, were fed into the constraints mapping and design process to ensure that impacts are avoided. A separation distance of 361m has been achieved.

APPENDIX 1

SITE DESIGN INFORMATION

APPENDIX 2

FULL ORNITHOLOGY REPORT

APPENDIX 3

TRANSPORT AND SWEPT-PATH ANALYSIS