FINAVON HILL ESTATE
WIND TURBINE

Environmental Report

Mr. J Sanderson (Finavon Hill Estate) &
Construction Partner Kilmac Construction Ltd

September 2014

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Finavon Hill Estate Wind Turbine

Environmental Report
Prepared for:

Mr. J Sanderson (Finavon Hill Estate) &
Construction Partner Kilmac Construction Ltd

Glendevon House
Old Gallows Road
Western Edge, Perth
PH1 1QE
Tel: 01738 620350

Prepared by:

Green Cat Renewables Ltd

Edinburgh Office
Midlothian Innovation Centre
Roslin,
EH25 9RE
Tel: 0131 440 6155

With contributions from:

GLM Ecology
Murray Archaeological Services

Checked By: Graham Donnachie	Date: 15/09/2014
Approved By: Stephanie Wood	Date:14/08/2014

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Preface

This Environmental Report (ER) seeks to assess the environmental effects of the proposed Finavon Hill Estate Wind Turbine, which comprises one wind turbine with a height of 67m to blade tip.

The development has been through a rigorous re-screening and design process since the original application (Council Ref: 12/00002/EIAL) for three 99.5m turbines was refused planning permission in October 2012.

Initial Re-Screening Discussions

On the 23rd of July 2013, a Screening/Scoping Opinion was requested from Angus Council as well as brief pre-application comments on a revised development based on three wind turbines with a reduced tip height of 74m, and a single turbine of 77m.

Angus Council provided a Screening Opinion in September 2013 under the Town and Country Planning Environmental Impact Assessment (Scotland) Regulations 2011 which focused mainly on the three wind turbine development of 74m to tip height. The Screening Opinion stated that *"the characteristics of the development are such that the proposal is unlikely to have significant environmental effects. The turbine number (3) and size at 77 metres are unlikely to attract any unusual environmental effects".* The Screening Opinion concluded that this development would not warrant an Environmental Impact Assessment, whereas a full EIA was required for the previously refused application of three 99.5m turbines. The development has already been through a full and thorough EIA process and the main concerns of the Planning Authority are fully understood.

Further Design Refinement

The Planning Authority made it clear in their correspondence that, in their opinion, the revised proposal did not go far enough, to alleviate their concerns or the original reasons for refusal. In response to this, the Applicant commissioned further design evolvement to reduce the scale of the development and explained to the local Planning Authority that a localised project would be followed through in order to safeguard existing and future activity at the Finavon Hill Estate.

Further development design and refinement has resulted in scaling the development down to a single wind turbine of 67m to tip height, with a 40m hub height. As well as significantly reducing the overall size and height of the turbine, its re-location has been resulted in altitude drop of 35m from the original turbine locations. This results in an gross reduction of 67.5m in tip height and 59m in hub height, all driven by the necessity of the applicant to satisfy the criteria of two separate changes in guidance documentation since the submission of the original application.

Benefits from Reduction in Scale

The re-location of the turbine to a lower elevation significantly reduces the impact on the surrounding landscape character and the impact upon visual amenity at the nearest residential properties, particularly those on the southern side of the hill.

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The Finavon ridgeline is over 14km in length and the proposed turbine has a horizontal extent of 54m. The turbine would occupy less than 1% of the Finavon ridgeline, having an insignificant impact on the horizontal extent of the ridgeline. From several viewpoints, the turbine appears marginally taller than some of the other features on the ridge, such as trees and pylons, however, this is not considered to be significant.

Given that Angus Council were of the opinion that an Environmental Impact Assessment was not required for a development of three turbines of 77m in height, it is considered that an Environmental Impact Assessment will not be required for a single turbine development of a lesser height and thus reduced environmental impact. Although it is not a formal Environmental Statement for the purposes of the Planning EIA Regulations (the Environmental Impact Assessment (Scotland) Regulations 2011), the present environmental report fully assesses the potential effects arising from the proposal, and refers directly to the known concerns of the Planning Authority.

Key Considerations

The following points represent what the Applicant considers as key considerations that the Planning Authority should give weight to during the decision making process:

- The Applicant has been diligent in their assessment and promotion of the site since August 2010, making significant financial investment in studies, reports and community consultation to the satisfaction of the Planning Authority, only to have been caught up in two separate changes in landscape capacity assessment guidance;
- These frustrations stem from having submitted an appropriate application at a time when current guidance indicated that the development of the three 99.5m turbines could be accommodated within the landscape (January 2012), then, during the planning application process the Angus Council Implementation Guidance (June 2012) was adopted suggesting that the landscape only had capacity for turbines of less than 80m in tip height;
- Now, having gone through a rigorous re-designing process of the scheme, further guidance has been introduced (November 2013) suggesting the capacity for wind turbines is reduced even further to turbines of no more that 50m in tip height; and
- Despite these revisions to guidance, the landscape has not altered in any way during the 3.5 years since initial assessment, but the guidance's suggest otherwise by reducing the capacity from turbines of 99.5m to tip height to turbines of 50m in tip height.

In summary, the magnitude of the changes adopted by the Applicant must be given due weight and consideration, even if the proposal exceeds the blanket suggestion of 50m across this particular Landscape Character Area. The Applicant believes that each site should be judged on its own merits as opposed to the broad brush approach of the Landscape Capacity Study. The Applicant is also of the belief that the legacy of the development cannot be ignored during the decision making process, particularly given the history and severity of design evolvement including the willingness of the Applicant to adhere to the guidance revisions wherever possible.

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1 Introduction

Mr Jeff Sanderson of Finavon Hill Estate and his construction partner Kilmac (the applicant) are proposing a single wind turbine of no greater than 67m to tip height, which will be located on the Finavon Estate, approximately 5km to the north east of Forfar, Angus.

Green Cat Renewables Ltd (the agent) is an environmental consultancy acting as agent on behalf of the applicant and is responsible for the assessments compiled in the Environmental Report (ER).

1.1 The Applicant

The proposed project is being developed by Finavon Hill Estate and Kilmac Construction, who are acting as construction partner on this development.

The Finavon Hill Estate is owned and operated by Jeffrey John Sanderson, who has been a resident of Angus for over 38 years. When Mr Sanderson purchased the estate in 1993 there was no residential, sporting or business activity on site. Following a significant financial and management investment, the Estate has seen a resurgence with the construction of seven houses and the development of a successful shooting business running alongside the farming activity.

Mr Sanderson has been looking at the promotion of a wind project since 2010 to help secure the future of the estate and to permit further investment in farming and in the construction of the consented "sporting lodge" to meet expansion requirements. This will also enable the employment of additional staff to support and permit the part retirement of Mr Sanderson in the near future as he reaches retirement age. As a result of the investment and ongoing development, the Finavon Estate is now a thriving community continuing to attract inward investment from sporting parties, in particular from London, Ireland and as far away as the United States of America. In mid-2010, Mr Sanderson identified Kilmac as a suitable local company to partner with him on the projects promotion.

The Kilmac Group is a Perth-based privately owned Construction Company formed in 2004, who diversified into the Renewables market and specialise in the promotion, construction and operation of onshore wind projects. Kilmac employ over 100 people predominately from within the Tayside area and see the Tayside area as their base and home. Almost 20% of their business now comes from the Renewables sector and over the next 3 years they see it becoming as much as 40%. Kilmac Construction has been instrumental in encouraging and securing apprenticeships across Tayside and plan on continuing this trend into renewable energy developments as and when they come on stream.

The Applicant believes that this development represents an excellent opportunity for local contractors and suppliers to benefit from the proposed development. The Kilmac Group, who has a strong track record of working with local businesses, will lead the construction and installation stages. This will support the ambition to retain as much economic value locally as possible. Letters from local businesses are attached in support.

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A key way in which the project can positively impact the local economy is through facilitating local employment training and apprenticeship schemes during the construction, and operational and maintenance phases. These schemes can be targeted at particular groups' e.g. young people and, in addition to helping develop new skills etc, will also help to build confidence in supported individuals.

A Live Example (June – Sept 2013)

During the South Inch play park project, Kilmac Construction recruited a total of nine apprentices/work experience positions in various construction and engineering disciplines. The apprenticeships were undertaken by young people from the local area that were ex-offenders, and all of whom had previously experienced barriers to accessing employment opportunities.

Subsequently, five of the apprentices have gone on to access full time employment with Kilmac Construction, six working directly for Kilmac Construction and three securing apprenticeship with local businesses. See the following link within the Perth and Kinross Council website for further detail:

http://www.pkc.gov.uk/article/7323/New-South-Inch-play-area-celebrates-environment-and-community

Whilst it is too early to comment on the extent of any local training and apprenticeship scheme being employed in the context of the proposed development, it is clear there is an opportunity for the proposed development to work with local employability partners, support the local youth employment agenda and contribute to the objectives of the Single Outcome Agreement through a focused training initiative.

1.2 Development Background

An application for a wind turbine development has previously been submitted and determined on the Finavon Estate land holding. The original application, submitted in January 2012, proposed a cluster of three wind turbines of up to 99.5m in tip height along the top of the ridgeline. This application (Council Ref: 12/00002/EIAL) was appealed to the DPEA on the grounds of non-determination in August 2012, after an agreed time extension for determination had lapsed.

In October 2012 this appeal was dismissed by the appointed Reporter and the application was refused (Appeal Ref: PPA-120-2019).

It was the opinion of the Reporter that the proposed development would cause an unacceptable adverse impact on the landscape as the turbines would appear out of scale with the medium scale landscape. The appointed Reporter also concluded that the proposed development would cause an unacceptable adverse impact on 13 of the 26 residential properties within 2km of the site location. These concerns were purely in relation to the visual impact and there was no significant concern in terms of noise or shadow flicker.

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The Reporter agreed with the submitted Environmental Statement (ES) that there would be no adverse impacts in relation to cumulative impact, natural heritage and cultural heritage interests.

Kilmac Energy in partnership with the Finavon Estate has considered the reasons given for the refusal of the original application and firmly believes that there is an opportunity to develop a more modest wind project on the site to support the longevity and growth of the business and support surrounding established local businesses promoting employment opportunities in future years.

As part of the pre-planning process for the revised application, detailed consultation with Angus Council was undertaken including two follow up meetings. The aim of this process was to discuss in detail a number of design options, address the key concerns of a future application and determine the likely acceptability of a wind turbine development on this site. The site was subject to a number of design iterations of which were discussed with the Council and other consultees. The feedback from the Council at this stage was critical to inform further iterations to the design, which are discussed in **Section 5**. The meetings also gave Angus Council the opportunity to thoroughly discuss the concerns of a potential wind turbine development on the site which would allow these issues to be addressed as part of the submitted application.

A minute of each meeting can be found in **Appendix 1**. These minutes detail who was in attendance at each meeting, the breadth of discussion which took place as part of the meetings and each minute was agreed and signed off by each party in attendance.

1.3 Rationale for Proposed Development

Given the current drive for renewable energy sources and sustainable development, the applicant feels that this is an opportunity to diversify into an area which takes advantage of the natural resources afforded by the sites location which will represent an opportunity to deliver future security to the shooting estate and provide a pipeline of construction and supply work for local businesses.

The proposed turbine manufacturer, EWT, estimate that the turbine is likely to annually generate approximately 1,800MWh of electricity, which based upon an average electricity consumption of 4,187[1] kWh per household, is enough electricity to provide power to approximately **430 homes**.

Over the turbine's 20 year lifecycle, the project is expected to result in a carbon saving of **~5,900 tonnes** and a CO_2 saving of **~21,800 tonnes** when compared to more traditional means of electricity generation, such as coal. The development is predicted to have a CO_2 payback time of approximately 4 months of operation.

We believe the proposal is consistent with the Government's renewable energy policy which includes the specific objective of promoting the interests of the rural economy:

[1] Sub-national local authority electricity consumption statistics 2005 to 2011, DECC worksheet, published 2012

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Scottish Government Policy
The Scottish Government is committed to reducing emissions through the requirements set out in the Climate Change (Scotland) Act 2009 and the 2020 Route Map for Renewable Energy in Scotland. The Routemap, published in July 2011, includes the latest targets for renewable electricity generation in Scotland.

The targets (and implications) set out within the document include:
100% electricity demand equivalent from Renewables by 2020 – the Routemap recognises that this is a 'formidable' goal but states the Scottish Government's determination to pursue this for economic and carbon benefits. The Routemap acknowledges that this potential will need to be recognised in a UK-wide regulatory framework.

500MW community and locally-owned renewable energy by 2020 – The Routemap states that the Feed in Tariff and the Renewable Heat Incentive should be used as a springboard to increase the scale of local ownership of renewable projects, allowing communities and rural businesses to take advantage of the significant potential revenue streams.

Summary
Every wind turbine in a rural area contributes to the local economy with the provision of additional income. However, a project such as this, where the local business is the developer, will give an even greater benefit to both the business and the local economy.

This project will:

- Support local businesses by creating a financial benefit to the Finavon Hill Estate and Kilmac Energy as market conditions are putting significant pressure on local businesses to diversify;
- Significantly reduce the embodied carbon emissions of the applicant;
- Aid in the delivery of the Scottish Government's renewable energy targets; and
- Will safeguard the current employment and create new opportunities for employment and apprenticeships, as detailed in the Socio-economic Assessment undertaken by Ekos Ltd.

1.4 Scope of the Environmental Report

In line with the EIA Directive and the local planning policies, this Environmental Report (ER) covers the key issues associated with the project, to a level of detail believed to be appropriate to the scale of the proposed development.

The structure of the ER is as follows:

- Details of the Proposed Development;
- Planning and Environmental Policy;
- Local and Socio-economic Benefit;
- Project Design Considerations;
- Ecology and Ornithology;
- Landscape and Visual Impact;
- Noise;

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- Cultural Heritage and Archaeology;
- Surface and Groundwater Hydrology;
- Existing Infrastructure, Telecommunications, Television, Aviation and Electromagnetic Safety; and
- Shadow Flicker;

Other issues, more commonly relevant to larger scale wind projects, and not raised as potential issues during the screening and subsequent meetings with the Council, have been scoped out of the assessment:

- Geology;
- Safety; and
- Tourism.

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2 The Proposed Development

2.1 Site Location and Project Layout

The proposed development is located approximately 5km north east of Forfar, Angus. The site has been identified for the construction and operation of a commercial turbine as a diversification opportunity on the privately owned agricultural land at Finavon Hill Estate. The site is shown in **Figure 2.1**.

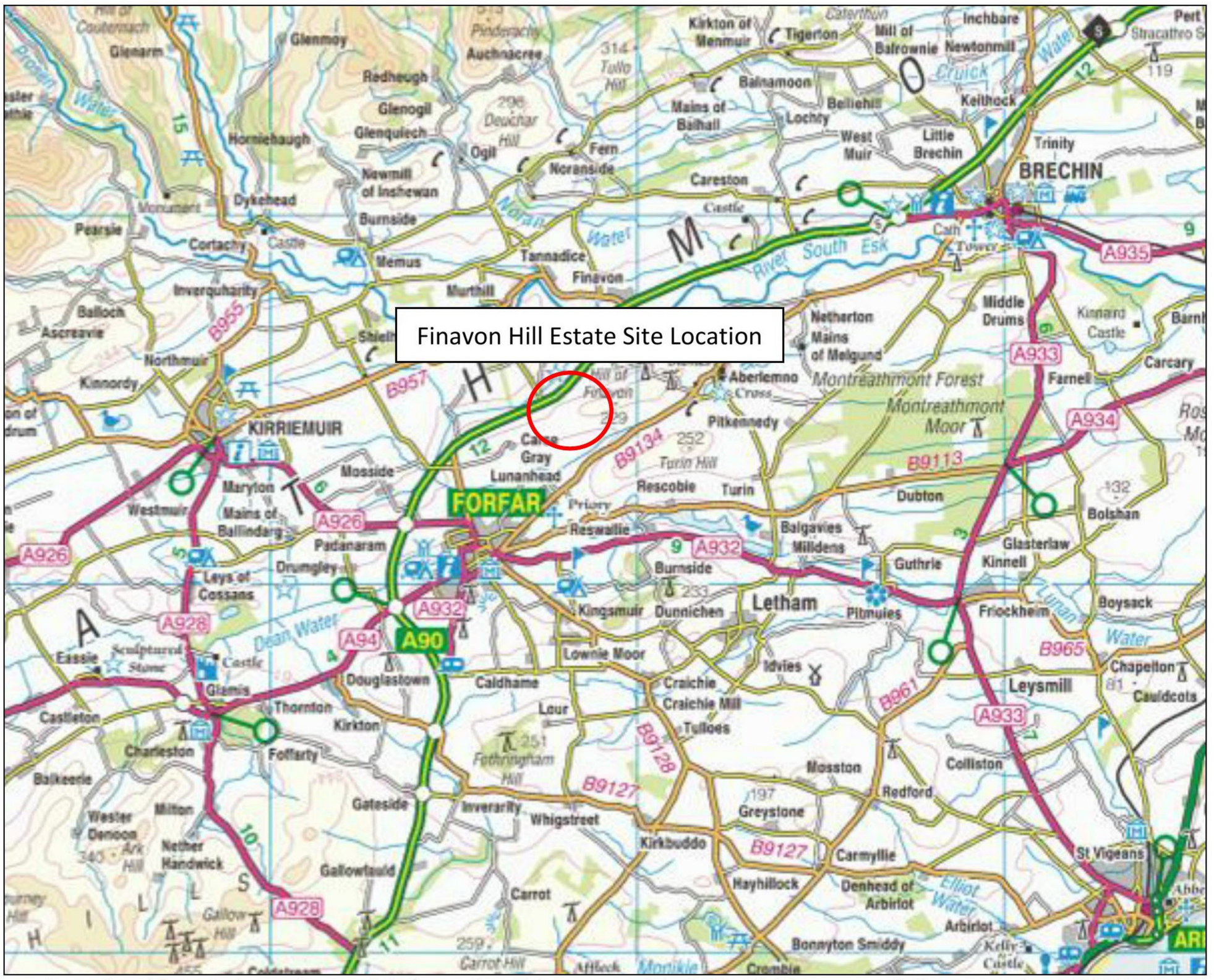

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Figure 2.1 – Proposed development location

The Finavon site is along a ~14km ridge in the centre of the Low Moorland Hills landscape character area sitting at ~187m AOD on the north side of the Hill of Finavon. The proposed site of the turbine is located 39m from the summit of the ridgeline (226 AOD), which is currently in an area of rough grassland and moorland. There is a mosaic of habitats present within the site, having been developed intensely by the landowner for shooting and conservation intents. Large areas of young trees, scrub and mature trees are also present. Around the local area the landscape is predominantly arable farmland and pastureland which sits on the lower slopes of the Hill of Finavon both to the north and to the south, this landscape tends to be flatter and gently rolling.

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The area occupied by the proposed development has been significantly reduced from the original application. The ridgeline of the Hill of Finavon is over 14km in length and this proposal has a maximum horizontal extent of 54m, therefore the turbine would occupy less than 1% of the Finavon ridgeline and as a result the turbine is not considered to have a significant or adverse impact on the horizontal extent of the ridgeline. The original application occupied a horizontal extent of 770m and as a result of the proposed development reductions the revised proposal has reduced the horizontal extent by 703m, which equates to a considerable reduction of 91.3%.

The existing land use, which is grazing, would continue around the wind turbine and its associated infrastructure.

The proposed site layout is shown in **Figure 2.2,** with the full site layout available in **APP 001.** The location of the proposed turbine is located approximately 155m to the north of the central turbine of the former application. This has resulted in an approximate 35m loss in elevation, down off the ridgeline, from the location of the highest elevated turbine in the original application, which has the result of significantly reducing the perceived visual impact of the development. The impact this has on the total heights of the development is a gross reduction of 67.5m from tip height and gross reduction of 59m to hub height, from the highest elevated turbine in the original application to the proposed turbine.

The design of the revised application and the assessment on visual impacts are discussed in **Section 5** and **Section 7** respectively.

The Ordnance Survey National Grid Reference for the propose turbine is: **E349020 N754970**.

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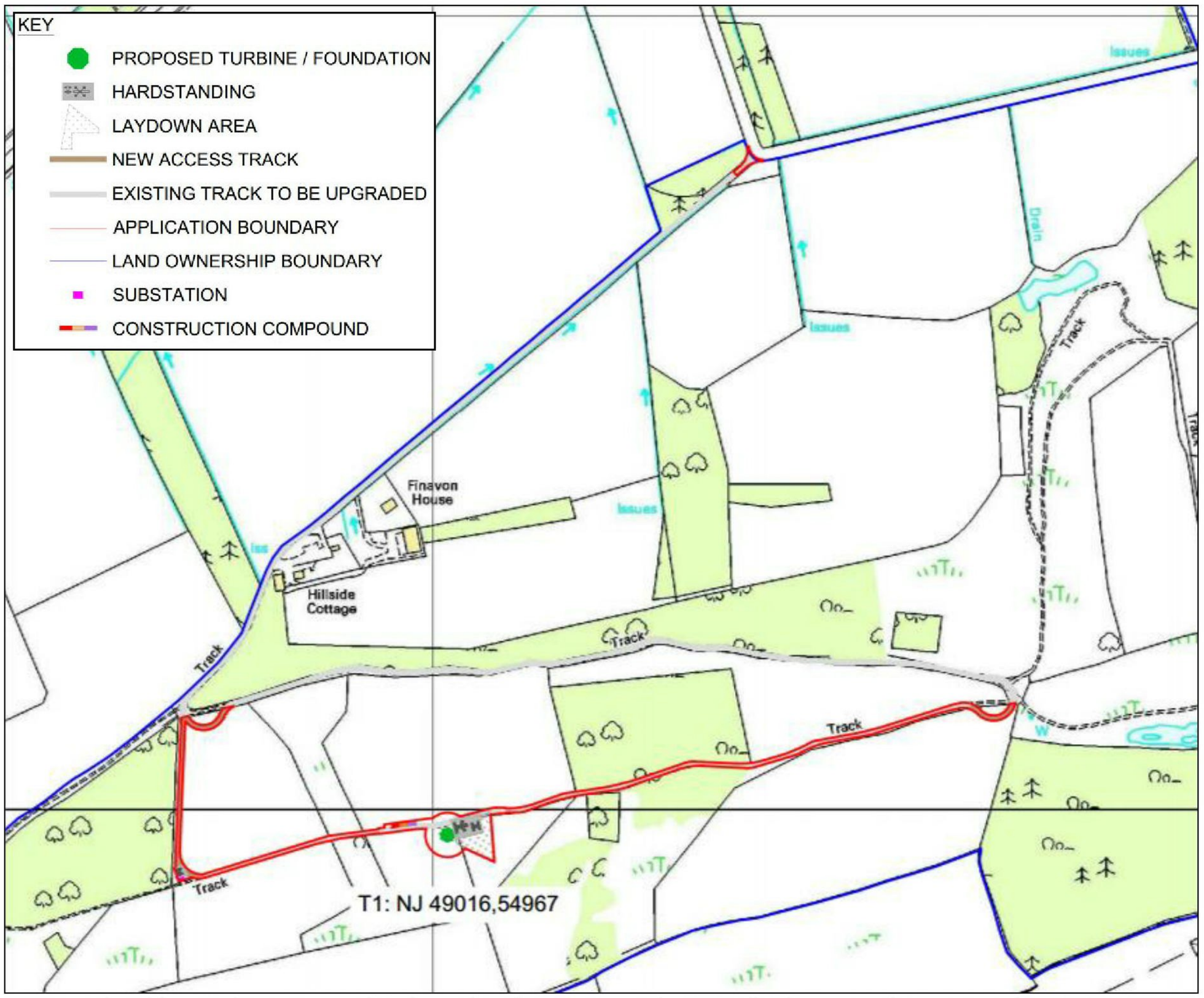

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Figure 2.2 – Site layout

2.2 Description of the Proposed Wind Turbine

A diagram of the principal dimensions of the EWT DW54, which is the most likely turbine for the development, is shown in **Figure 2.3**. The turbine will have a generating capacity of 500kW.

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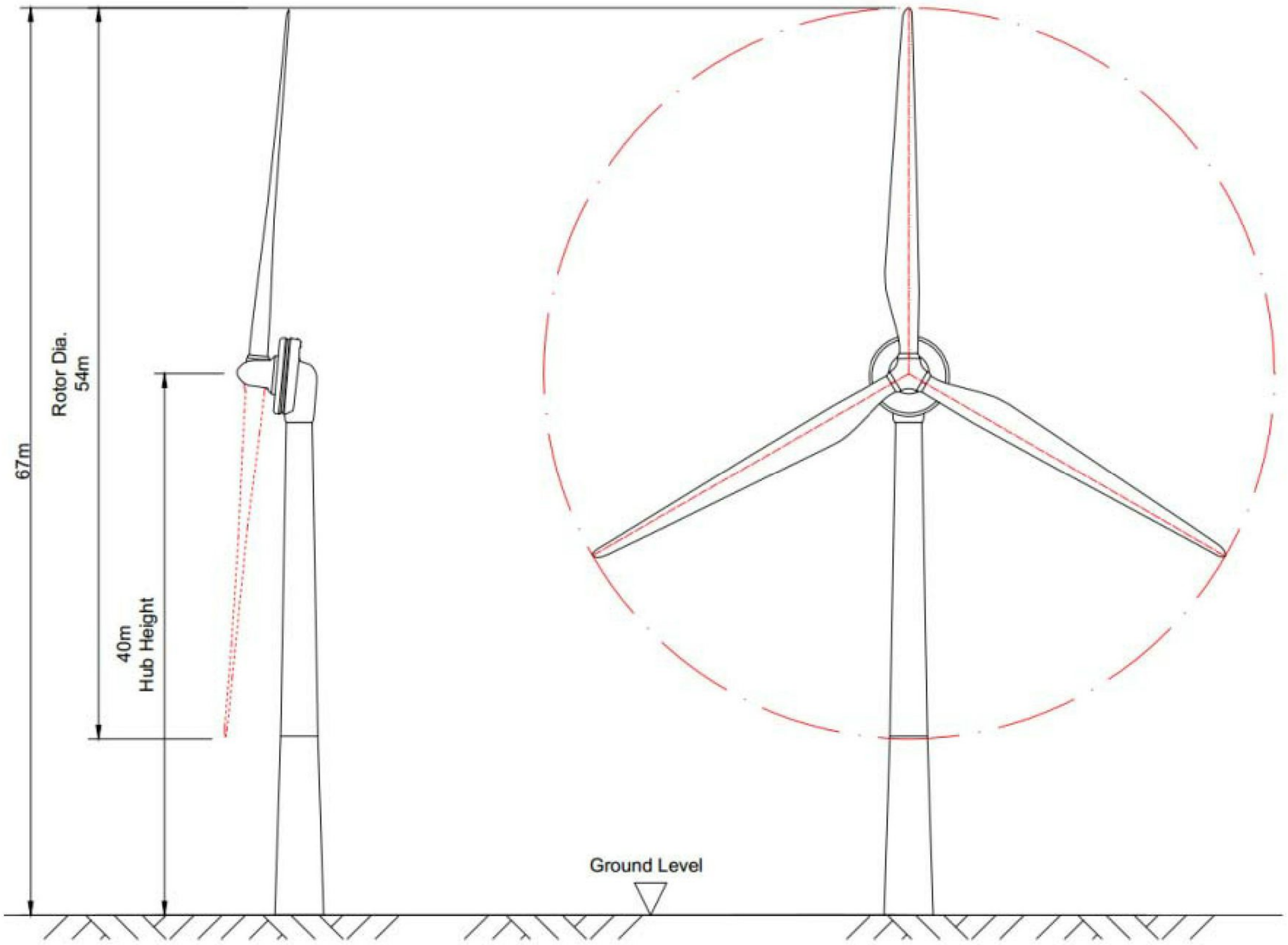

Figure 2.3 - EWT 54 wind turbine showing principal dimensions

The turbine proposed is an EWT DW54, incorporating tapered tubular towers and three blades attached to a nacelle housing containing the generator and other operating equipment. The turbine operation would be fully independent and automatic. EWT have been selected as the candidate turbine due to their growing reputation in the UK as a reputable, reliable and high yielding manufacturer. EWT are currently installing between 5 to 12 wind turbines a month throughout the UK and will be constructing the 100th 500kW model in the UK during the coming weeks. Unlike other wind turbine manufactures, a large amount of the components for the turbines, such as the towers, are manufactured in the UK.

It is proposed that the finish of the wind turbine, tower and blades will be semi-matt and will be pale grey in colour.

2.3 Associated Infrastructure

The nacelle housing contains the generator and other operating equipment. The transformer of the EWT will be located in a small cabin near the base of the turbine.

2.3.1 Site Tracks and Crane Hardstanding

As shown in **APP 001**, the construction of approximately 350m of new access track and the upgrade of approximately 2.5km of existing access track would be required for the purposes of providing access to the wind turbine. The track would be typically 4.0m wide with 0.5m shoulders on each side and would consist of crushed stone to an average depth of up to

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500mm. On corners, it will be necessary to construct wider areas of track to reflect the minimum bend-radii for the longest construction loads (the blades).

Appropriate drainage requirements would be incorporated where the site specific conditions make this necessary. If any areas of softer ground are encountered, the depth of crushed rock may need to increase to approximately 700mm and a layer of geotextile material embedded within the structure would be used.

The crane platform would be of similar construction to the access tracks, designed to withstand the maximum load bearing applied by the crane during the construction process.

Figure 2.4 shows the specification of the required crane hardstanding.

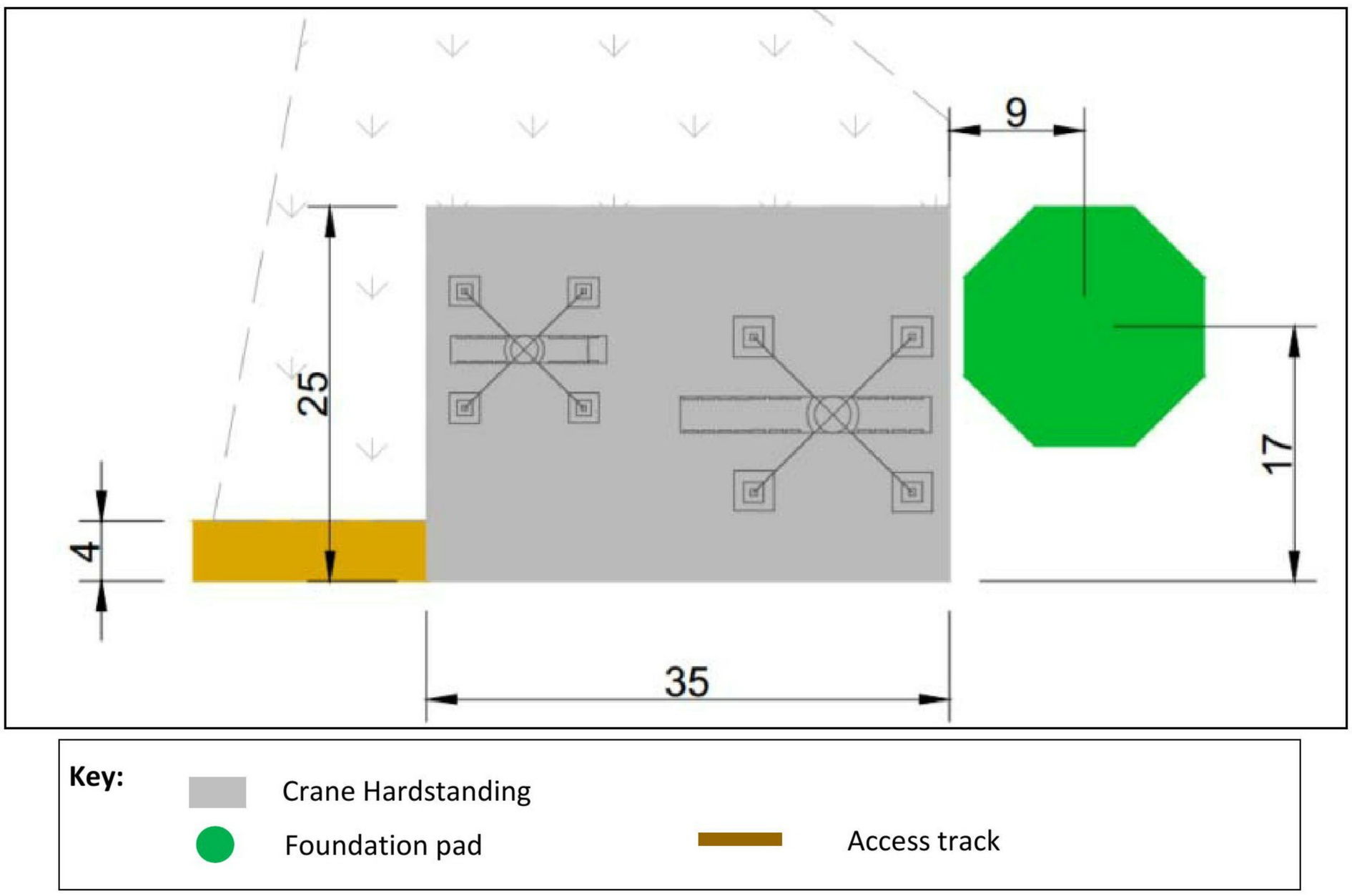

Figure 2.4 – Indicative crane hardstanding

Any excess earth excavated during the construction phase would be stored behind the foundations. Reinstatement of the track verges and the areas of hardstanding will be undertaken where appropriate. As there would be a continuing need to use the site tracks, the tracks will be left in place for the lifetime of the development.

2.3.2 Construction Compound

Kilmac Construction would set up a small compound for site offices, welfare facilities and storage of tools, located near the site entrance.

2.3.3 Turbine Foundation

A detailed foundation design will be subject to ground investigations to ensure the suitability of any design and will require agreement with the turbine manufacturer. From

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experience in the construction of this particular candidate machine and manufacturer, indicative foundations can be assumed, bearing in mind that this will be dependent on ground conditions. The likely foundation would have a diameter of up to 10.6m, and a depth of approximately 2.4m.

The turbine foundation will be covered by topsoil when construction is complete, leaving a plinth of about 5.2m in diameter just above the surface level, upon which the turbine would be bolted. Much of the excavated material will be used for this back-filling, and the topsoil would be reseeded.

2.3.4 Site Electrical Works

A grid connection with Scottish and Southern Energy (SSE) with a capacity for 6.9MW was secured during the course of the original application; therefore this offer is currently being revised for a connection of 500kW.

The wind turbine envisaged for use on this site produces electricity at 400 volts. Following consultation with SSE this will be transformed to 11kVTusing a transformer located at the base of the turbine. From the transformer, underground cable runs will link the turbine to a substation building, the location of which is shown in **APP-001**. It is anticipated that all cables will be buried, to avoid visual clutter on site.

2.4 Access to the Site

The turbine components are most likely to be landed at Aberdeen. This will be confirmed by the turbine manufacturer nearer the time of delivery. The Turbine Delivery Vehicles (TDVs) will then travel onto the existing road network, travelling south towards the site via the A90. No issues with access are anticipated.

The exact route will be confirmed in a 'Route Access Report' which will be submitted to the Council for approval prior to turbine construction and as part of a planning condition.

2.5 Construction Phase

2.5.1 Construction Programme

The construction phase would start after the financial and due diligence process has been completed and would be on-going for approximately 8 weeks, from construction of the access track through to erection and commissioning of the wind turbine. **Table 2.1** presents an indicative programme. **Please refer to the accompanying Socio-Economic Assessment undertaken by Ekos Ltd.**

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Table 2.1 – Indicative construction programme

Activity	Employment Opportunities	Duration	Timescale (weeks)							
			1	2	3	4	5	6	7	8
Construction Contract	- 1 x Foreman - Welfare/storage units	8 Weeks								
Developer	- 1 x Commercial manager	2 Weeks								
Stage 1: Compound Set Up	- 2 x Labourers - Excavator hire	2 days								
Stage 2: Roads, laydown area, hardstanding and crane pad construction Including drainage works	- 1 x Machine Operator - 2 x Labourers - Excavator hire - Roller hire - Dumper hire	4 weeks								
Stage 3: Foundations Including excavation, Reinforcement and structural concrete pour	- 2 x Joiners - 1 x Machine Operator - 2 x Labourers - 3 x Steel Fixers - Machine hire	2 weeks								
Stage 4: Turbine Erection Turbine delivery, erection and commissioning	- 2 x Crane Drivers - 2 x Labourers - 1 x Electrician - 2 x Crane hire	4 days								
Stage 5: On-site Cabling	- 1 x Machine Driver - 2 x Electricians	2 weeks								
Stage 6 - Landscaping	- 2 x Labourers - 1 x Machine Driver - 1 x Machine hire	3 days								

2.5.2 Construction Traffic

There are three distinct phases of the development:

- Construction;
- Operation; and
- Decommissioning

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Construction traffic
The traffic involved throughout the construction phase comprises the turbine component delivery vehicles, lorries with aggregates for the construction of new tracks and the crane hardstanding. There will also be deliveries for concrete, reinforcement steel and cabling, as well as personnel commuting.

It is likely that suitable material for the hardstanding and access road will be available on site or within the local vicinity. This would be sourced from an on-site borrow pit (subject to site investigation), using an internal road. This would be subject to a separate planning application. If this is not possible then the aggregate would be sourced from the most convenient local quarry.

A maximum of six abnormal load deliveries would typically be required to deliver the turbine components. The longest components are the turbine blades, which are around 24m in length and will require an extended trailer.

Operational traffic
Once erected the wind turbine would be operated and monitored remotely. Between two and four short maintenance visits are required per month, with longer visits for scheduled servicing every three months. These visits would be undertaken in light commercial vehicles.

Decommissioning traffic
The amount of site traffic during decommissioning would be much less than that required during construction.

2.6 Decommissioning

At the end of the development's operational life, the wind turbine would be decommissioned, the principal elements removed, and the site restored leaving little, if any, visible trace.

The wind turbine would be removed from the site and the foundations, tracks and hardstandings would be covered over with topsoil and reseeded. The cables would be de-energised and left in place, with any cable marker signs removed. The electrical substation building would be removed and the building demolished to ground level with the foundation covered with topsoil and reseeded.

The decommissioning process would take approximately two months to complete. A decommissioning programme would be agreed with the planning authority prior to the commencement of decommissioning works.

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3 Planning and Environmental Policy Context

An application for the development of a wind project should be assessed in the context of:

- National policy and guidance;
- The Local Planning Authority Development Plan; and
- Supplementary Planning Guidance.

The following section summarises the planning guidance and policies relevant to the determination of the Finavon Hill Estate Wind Turbine proposal.

3.1 National Planning Policy and Guidance

National planning policy and guidance is set out in the National Planning Framework (NPF); the Scottish Planning Policy (SPP); Circulars; the Scottish Historic Environment Policy (SHEP); Planning Advice Notes (PANs); and Design Advice Guidance.

A brief summary of national policy is presented below.

3.1.1 National Planning Framework

The National Planning Framework for Scotland 2 (NPF2) 2009, expresses the spatial aspect of the Governments Economic Strategy and confirms the importance of renewable energy to Scotland's energy mix.

It states that the, '*Government is committed to establishing Scotland as a leading location for the development of renewable energy technology and an energy exporter over the long term'* and that '*the aim of national planning policy is to develop Scotland's renewable energy potential whilst safeguarding the environment and communities*.'

3.1.2 Scottish Planning Policy

Scottish Planning Policy (SPP) is the statement of the Scottish Government's policy on nationally important land use planning matters. SPP aims to ensure the delivery of national renewable energy targets, and states that '*the commitment to increase the amount of electricity generated from renewable sources is a vital part of the response to climate change'.*

Following publication of the SPP, Scotland's renewable electricity target for the next decade was increased from 50% to 100% by First Minister Alex Salmond in July 2011. The Scottish Government has calculated that significantly higher levels of Renewables could be deployed by 2020 with little change to the current policy, planning or regulation framework in Scotland. A separate study for industry body Scottish Renewables, published in September 2010 reported similar conclusions.

SPP states that Development plans are required to guide development to appropriate locations and should '*support all scales of development associated with the generation of energy and heat from renewable sources, ensuring that an area's renewable energy*

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potential is realised and optimised in a way that takes account of relevant economic, social, environmental and transport issues and maximises benefits.'

2020 Routemap for Renewable Energy in Scotland

This action plan, published in July 2011, includes the latest targets for renewable electricity generation in Scotland. It is an update and extension to the Scottish Renewables Action Plan 2009.

It states that 100% of Scotland's electricity demand should be generated by renewable means by 2020. The targets (and implications) set out within the document are:

100% electricity demand equivalent from Renewables by 2020 – the Routemap recognises that this is a 'formidable' goal but states the Scottish Government's determination to pursue this for economic and carbon benefits. The Routemap acknowledges that this potential will need to be recognised in a UK-wide regulatory framework.

11% heat demand from Renewables by 2020 – currently Scotland generates 2.8% of heat demand from renewable sources.

At least 30% overall energy demand from Renewables by 2020 – the 100% electricity demand target by 2020 allows this update to the overall energy demand target figure.

500MW community and locally-owned renewable energy by 2020 – The Routemap states that the Feed in Tariff and the Renewable Heat Incentive should be used as a springboard to increase the scale of local ownership of renewable projects, allowing communities and rural businesses to take advantage of the significant potential revenue streams.

The Routemap states that, *"The Government is committed to the continued expansion of portfolio of onshore wind farms to help meet Renewables targets, with a robust planning system providing spatial guidance, a clear policy framework and together with a timely and efficient processing of Section 36 Electricity Act and planning applications".*

One of the main challenges identified in meeting these targets relates to 'Planning and Consents', with the Routemap identifying that there is a *'need to continue to streamline systems and work for greater speed and transparency, without sacrificing proper consideration of the impacts on the local environment'.*

3.1.3 A Low Carbon Economic Strategy for Scotland

The Low Carbon Economic Strategy (LCES) is an integral part of the Scottish Government's Economic Strategy to secure sustainable economic growth, and a key component of the broader approach to meet Scotland's climate change targets and secure the transition to a low carbon economy in Scotland.

The Strategy states that, "Opportunities exist for every business and industry to adapt to and exploit low carbon markets, and these should be reflected in business plans and industry-led strategies, focussing on two areas: saving money through efficiencies; and making money through new market opportunities".

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Two of the objectives within the Strategy are particularly relevant to this application:

Objective 1: Sustainable and resource-efficient businesses. Helping all businesses in Scotland become more competitive by using resources more efficiently, proactively adapting to climate change impacts and generally adopting sustainable business practices.

Objective 2: Sustainable and competitive industries**.** Supporting Scotland's industries to exploit low carbon business opportunities to accelerate industry growth, build low carbon supply chains, diversify into new markets and technologies and promote long-term ambition and resilience.

3.1.4 Conserve and Save: Energy Efficiency Plan for Scotland

The Scottish Government published **"Conserve and Save: The Energy Efficiency Action Plan for Scotland"** in October 2010. This plan introduced, for the first time, a headline target to reduce final energy (end-use) consumption **by 12% by 2020** using a 2005-7 baseline as published by the Department of Energy and Climate Change (DECC).

The 2009 Consultation Document states that, "increasing energy costs are a significant business risk and affect both the direct energy costs for business and the cost of materials bought in. However, energy consumption is not on all management agendas".

The Plan identifies that energy efficiency can also indirectly assist with other targets including:

- **Reducing emissions -** Reduced energy consumption in the non-traded sector (i.e. excluding electricity consumption and heat use from large power stations) will lead to direct emission reductions that will contribute towards the 42% emission reduction target by 2020.
- **Renewable electricity targets -** As these are measured against gross consumption, reductions in energy use will mean that they can be met with lower levels of installed capacity. Therefore, the more expensive projects may not be required to meet our Renewables targets, with a positive effect on energy bills as the costs from these projects will not be passed through to consumers.
- **Long-term decarbonisation** - Power generation is included within the EU- ETS and is therefore traded. However, reductions in consumption, combined with development of energy smart technologies, will result in the most efficient path toward full decarbonisation.

3.1.5 Other Relevant National Policy Documents

Circulars provide statements of the Scottish Government's policy, and contain guidance on policy implementation through legislative or procedural change. PANs provide advice and information on technical planning matters.

Circulars

- 3/2011 The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2011.

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Advice and Guidance Notes

- PAN 1/2011 Noise and Planning;
- PAN 2/2011 Planning and Archaeology;
- PAN 45 (Renewable Energy) was superseded in February 2011 by Scottish Government web-based guidance on Renewables;
- PAN 51: Environmental Protection 1999;
- PAN 58: Environmental Impact Assessment;
- PAN 60: Planning for Natural Heritage 2000; and
- Managing Change in the Historic Environment guidance note series.

Scottish Government Web-Based Renewable Guidance

This online guidance replaced PAN 45 in February 2011. The two most relevant documents are:

- 'Onshore Wind Turbines', which sets out clear planning guidelines for local authorities, presenting technical information on wind turbine and assessment procedures; and
- 'Process for preparing spatial frameworks for windfarms', which provides guidance to local authorities on how to guide development through the production of spatial frameworks.

3.2 Local Planning Policy

The key local development documents for Angus are:

- TAYplan (Approved 2012); and
- Angus Local Plan Review (Adopted 2009).

In addition to the development plan a number of other publications are also particularly relevant to the consideration of the application. These include:

- Angus Windfarms Landscape Capacity and Cumulative Impacts Study (2008 and 2013);
- Angus Council Renewable Energy Implementation Guide (2012);
- Scottish Natural Heritage Landscape Character Assessments: Tayside (1999) and South and Central Aberdeenshire LCA (1998); and
- Scottish Natural Heritage Locational Guidance for Onshore Wind Turbines in Respect of the Natural Heritage.

3.2.1 TAYplan - Strategic Development Plan 2012-2032 (Approved 2012)

The TAYplan – Strategic Development Plan 2012-2032 (TAYplan) replaced the Dundee & Angus Structure Plan (2002) in June 2012. The plan embraces sustainability stating in the foreword '*We want to provide future generations with opportunities to improve their lives; what better legacy to leave our children. Therefore the mitigation of and adaptation to climate change, as the single greatest challenge facing humankind, is central to this Plan. We must shift to a low carbon and zero waste economy by using our land and resources more efficiently*.'

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This is embodied in the Vision and Objectives which aims to 'support the switch to a low carbon and zero waste economy' and to '*strengthen the economic base to support the renewable energy and local carbon technology sectors*'.

Renewable energy development is covered by Policy 6: Energy and Waste/ Resource Management Infrastructure which states:

To deliver a low/ zero carbon future and contribute meeting Scottish Government energy and waste targets.

A set of criteria for Local Development Plans is identified to ensure that all areas of search, allocated sites, routes and decisions on development proposals for energy and waste/ resource management infrastructure have been justified, on the basis of the following conditions[2]:

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

Policy 6 of TAYplan indicates that in determining proposals for energy development, consideration should be given to landscape sensitivity. Local Plan Policy ER5 (Conservation of Landscape Character) requires development proposals to take account of the guidance provided by the Tayside Landscape Character Assessment (TLCA), prepared for Scottish Natural Heritage (SNH) in 1999, and indicates that, where appropriate, sites selected should be capable of absorbing the proposed development to ensure that it fits into the landscape.

3.2.2 Angus Local Plan Review (adopted 2009)

The Angus Local Plan is the relevant local plan for the development and is therefore the prime policy against which applications are determined.

With regard to energy, the Angus Local Plan Review (ALPR) states that '*in terms of*

[2] Only those considerations relevant to the development at Hill of Finavon have been included in this report

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sustainable development, energy efficiency and non-polluting power generation are fundamental to establishing a stable and environmentally acceptable energy policy.'

The Plan recognises that the Scottish Government's target of electricity generation from renewable sources *'will require major investment in commercial renewable energy production and distribution capacity throughout Scotland.'*

Policy S1: Development Boundaries states that:

'(a) Within development boundaries proposals for new development on sites not allocated on Proposals Maps will generally be supported where they are in accordance with the relevant policies of the Local Plan.
(b) Development proposals on sites outwith development boundaries (i.e. in the countryside) will generally be supported where they are of a scale and nature appropriate to the location and where they are in accordance with the relevant policies of the Local Plan.
(c) Development proposals on sites contiguous with a development boundary will only be acceptable where there is a proven public interest and social, economic or environmental considerations confirm there is an overriding need for the development which cannot be met within the development boundary.'

Policy S6: Development Principles states that:

'Proposals for development should where appropriate have regard to the relevant principles set out in Schedule 1 which includes reference to amenity considerations; roads and parking; landscaping, open space and biodiversity; drainage and flood risk, and supporting information.'

Schedule 1 (b) of S6 requires that '*Proposals should not result in unacceptable visual impact*'.

The ALPR includes policies specific to landscape character, renewable energy developments and wind energy development:

Local Plan Policy ER5: Conservation of Landscape Character
Development proposals should take account of the guidance provided by the Tayside Landscape Character Assessment and where appropriate will be considered against the following criteria:

a) *Sites selected should be capable of absorbing the proposed development to ensure it fits into the landscape;*
b) *Where required, landscape mitigation measures should be in character with, or enhance, the existing landscape setting;*
c) *New buildings/ structures should respect the pattern, scale, siting, form, design, colour and density of existing development; and*
d) *Priority should be given to locating new development in towns, villages, or building groups in reference to isolated development.*

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It was the opinion of the Reporter appointed by the Scottish Ministers for the appeal that the original application of three 99.5m tall turbines did not comply with this policy. This revised application has factored the comments relating to the non-compliance of this policy into the design, see **Section 5**. The measures taken to ensure compliance with the policy include reducing the scheme to a single turbine (from three turbines), moving the single turbine off the ridgeline, resulting in a 35m lower elevation, and reducing the turbine to under 80m in tip height (the Angus Council Renewable Energy Implementation Guide (2012) states that landscape character is considered to have scope for turbines circa 80m in height). **The cumulative result of these alterations is a single turbine scheme that has a gross reduction of 67.5m in tip above ordnance datum.**

Local Plan Policy ER34: Renewable Energy Developments

Proposals for all forms of renewable energy development will be supported in principle and will be assess against the following criteria:

a) *The siting and appearance of apparatus have been chosen to minimize the impact on amenity, while respecting operational efficiency;*
b) *There will be no unacceptable adverse landscape and visual impacts having regard to landscape character, setting within the immediate and wider landscape, and sensitive viewpoints;*
c) *The development will have no unacceptable detrimental effect on any sites designated for natural heritage, scientific, historic or archaeological reasons;*
d) *No unacceptable environmental effects of transmission lines, within and beyond the site; and*
e) *Access for construction and maintenance traffic can be achieved without compromising road safety or causing unacceptable permanent and significant change to the environment and landscape.*

It was the opinion of the Reporter appointed by the Scottish Ministers for the appeal that the original application of three 99.5m tall turbines did not comply with section *b)* of this policy only which relates to landscape and visual impacts.

In order to ensure that the revised development does comply with this policy, significant reductions in the scale of the development have been implemented, including:

1. **Removing two turbines;**
2. **Relocating the proposed turbine off the ridgeline at a lower elevation (35m lower down hillside); and**
3. **Reducing the tip height of the turbine by 32.5m, and the hub height by 24m.**

All of the above have been implemented in order to address this issue. The impact of the single 67m turbine, which has been relocated to a lower elevation, on the landscape character, setting and sensitive viewpoints is not considered to be adverse. The landscape and visual impacts are considered to have significantly reduced from the original application as is detailed in **Section 7**.

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The revised development reaches the point in which any further reductions in elevation of turbine size would have a dramatic impact on the efficiency of the wind turbine and the viability of the development. Section *a)* of this policy puts significant importance on the operation efficiency of developments. Any further reductions in the scale of the development would put the compliance of this policy into jeopardy.

It is considered that the revised development now complies with policy ER34(b).

<u>Local Plan Policy ER35: Wind Energy Development</u>

Wind energy developments must meet the requirements of Policy ER34 and also demonstrate:

a) *The reasons for site selection;*
b) *That no wind turbines will cause unacceptable interference to birds, especially those that have statutory protection and are susceptible to disturbance, displacement or collision;*
c) *There is no unacceptable detrimental effect on residential amenity, existing land uses or road safety by reason of shadow flicker, noise or reflected light;*
d) *That no wind turbines will interfere with authorized aircraft activity;*
e) *That no electromagnetic disturbance is likely to be caused by the proposal to any existing transmitting or receiving system, or (where such disturbances may be caused) that measures will be taken to minimize or remedy any such interference;*
f) *That the proposal must be capable of co-existing with other existing or permitted wind energy developments in terms of cumulative impact, particularly on visual amenity and landscape, including impacts from development in neighbouring local authority areas;*
g) *A realistic means of achieving the removal of any apparatus when redundant and the restoration of the site are proposed.*

The Reporter concluded that the previous application was fully compliant with this policy. The reductions in the scale of the development are not expected to change the compliance with policy ER35.

As detailed in the Appeal Decision Notice for the original application at Finavon Hill Estate, the non-compliance with policies ER5 and ER34(b) consequently results in the non-compliance of policies S6 and S1(b) of the ALPR and policy 6 of the TAYplan. By addressing the issues raised in regard to policy ER5 and ER34(b), the development subsequently accords with policies S6 and S1(b) of the ALPR and policy 6 of the TAYplan.

The Finavon Hill Estate site lies within ‘Area 2 Lowland and Hills’ geographic area, as defined within the Tayside Landscape Character Assessment and cited in the Local Plan Review.

The Local Plan places the site in the Lowland and Hills which is identified as being of the lowest sensitivity to wind turbine development, subject to local sensitivities such as small scale landscape, skyline and habitats. The ALPR states that, ‘*The Lowland and Hills area is recognised as of generally lower sensitivity to turbines in terms of visual, landscape and natural heritage interests. However, there may be areas within the Lowland and Hills Area*

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where large turbines would have an unacceptable impact, or where properly sited and designed wind energy development can be accommodated in areas of higher natural heritage, landscape and visual sensitivity'.

3.2.3 Tayside Landscape Character Assessment (TLCA)

The Finavon Hill Estate site falls within the Low Moorland Hills Landscape Character Type (LCT), with the Broad Valley Lowlands immediately to the north of the site. Its key characteristics include its rich historic heritage, areas of extensive woodland, moorland character, scattered modern settlements and the combination of low, rounded hills and craggy, ridged upland.

The Low Moorland Hills Landscape Character Area covers much of the landscape between Forfar and Brechin, where this landscape is defined by the small hill summits at Hill of Finavon, Turin Hill, Pitscandy Hill and Dunnichen Hill. These hills tend to be rounded with arable farming taking place in the valleys between them and on the lower slopes. The scale of this landscape is medium with some areas of coniferous plantation particularly at Montreathmont Forest and some areas of policy woodland in the lower ground around the farmsteads and water courses.

3.2.4 Angus Windfarms Landscape Capacity and Cumulative Impacts Study (AWLCCIS)

In accordance with the TLCA, the AWLCCIS, originally published in September 2008 and updated in November 2013, places the Finavon Hill Estate Wind Turbine within the Low Moorland Hills landscape type, close to the boarder of the Broad Valley Lowland landscape type.

The AWLCCIS suggests that the Low Moorland Hills area is considered to have a medium-high landscape value, which together with its medium-high sensitivity, this gives an overall low capacity for windfarm development. The bordering Broad Valley Lowland landscape type is considered to have medium landscape value and character sensitivity, giving an overall medium capacity for windfarm development.

It is considered that large or medium windfarms would not be appropriate in this area due to scale and visual sensitivity limitations. It states that, *"Any windfarm development would have to be carefully sited and small scale to avoid prominent visibility and clashes of scale with the modest size hills"*. Given that this proposal is for a single turbine of 67m in height, the Finavon Hill Estate development is considered to be small scale and also avoids prominent visibility or clashes of scale with the Finavon Hill Estate.

In the AWLCCIS update of November 2013, the Low Moorland Hills LCA has been dived into two sub-areas on the basis of differences in landscape character and sensitivity: the Forfar Hills in the south and west and Montreathmont Mood in the north and east. Hill of Finavon lies within the Forfar Hills sub-area which is characterised by small steep hills and ridges set within a wider area of medium scale rolling farmland. Where the 2008 edition of the AWLCCIS suggests that there is low capacity for windfarm development, the updated document advises that there would only be capacity for small/medium and medium scale

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turbines, which would suggest that small groups of turbines under 50m would be appropriate in this area.

This advice is contrary to what is recommended in the Angus Council Renewable Energy Implementation Guide, as discussed below.

3.2.5 Angus Council Renewable Energy Implementation Guide (REIG)

The guide, which was approved on 14 June 2012, seeks to clarify the existing Development Plan policy and to assist in considering proposals against those policies. The Guide describes the existing character of the Low Moorland Hill as a '*Landscape with Views of Windfarms*', and states that the Acceptable Character in a future scenario would be for a '*Landscape with Occasional Windfarms'*, described as:

- *A landscape type or area in which windfarms or wind turbines are located or are very close to and visible. However they are not of such a size, number, extent or contrast in character that they become one of the defining characteristics of the landscape's character; and*
- *Visual receptors would experience occasional close-quarters views of a windfarm or turbines and more frequent background views of windfarms or turbines. Some turbines may or may not be perceived as being located in the landscape character area. No overall perception of windfarms being a defining feature of the landscape.*

The guide states that the LCT is *'Considered to have scope for turbines circa 80m in height which do not disrupt the principle ridgelines or adversely affect the setting of important landscape features and monuments such as Balmashanner Monument; and Finavon and Turin hillforts'*.

Both the AWLCCIS and the REIG indicate that there is capacity for turbine development within the Forfar Hills sub type landscape, however they recommend two different tip heights, 50m and 80m, in relation to the capacity of the area. Taking both of these guidance documents into consideration, the development seeks to provide a scheme which does not diminish the scale of this landscape or become a prominent and defining feature of the hill.

This is achieved by maintaining the impressive horizontal stretch of the Finavon ridgeline and not causing impact on its function as a backdrop and enclosure to the valleys to the north and south. It was important that any turbine on the site did not diminish the scale of the hills either vertically or horizontally nor significantly interrupt the ridgeline, and it was through careful design that a 67m turbine, whilst seen on part of the ridgeline did not alter its ability to function as a ridgeline nor diminish its scale. From many directions it would also not appear as the tallest feature on the ridgeline due to the existing pylons and trees that also breakup the ridgeline. The ridgeline is 14km long and the development will occupy 67m (0.47%) of this at worst case scenario and the scale of the development is now considered to be in keeping with the SNH 1/3rd ruling.

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3.3 Conclusions

The Scottish Government is supportive of this scale of renewable projects, particularly where these are locally owned and will support local businesses. The Scottish Government policy is clear that it looks to support renewable development and meet the ambitious targets set out in the 2020 Routemap for Renewable Energy in Scotland. The Finavon Hill Estate development will contribute to a significant number of Scottish Government targets, particularly the aim to deliver 500MW of locally owned developments by 2020.

In terms of Local Policy, Angus Council are supportive of renewable energy development where they are considered to be environmentally acceptable and they contribute to the development of a low carbon economy. It is considered that the potential local benefits, effectively resulting from the creation of a viable local business diversification, will be greater than any negative environmental effects.

A key consideration of this application must be that <u>over the lifetime of the development there have been two distinct changes in landscape capacity recommendations</u> through various guidance documents. The developer has been chasing compliance with chasing design guidance since the projects conception in August 2010.

1. August 2010: Prior to submission of the original application for three 99.5m turbines, the 1st edition of the AWLCCIS suggested that there was capacity in the landscape for a development of that scale. Full EIA work was instructed in accordance with this guidance.

2. The application was submitted in December 2011 and during the course of this application, the REIG was adopted (June 12) which suggested that capacity of the landscape should be limited to 80m. This application was subsequently refused and the design process for a revised submission was progressed.

3. The applicant then initiated further screening in August 13 and during the screening stages of the revised development, Angus Council indicated that a revised AWLCCIS was imminent. This document, published in November 2013, suggests that wind developments should be further limited to 50m in height.

All of these documents remain material considerations for the planning decision.

Delivering an economical and viable commercial development carries endless difficulties and challenges that require thorough assessment and management. This process is not made easier by sporadically changing guidance. It is appreciated that over time through further research and consideration the guidance can be amended and updated, however, in this case, it is considered particularly unusual and unreasonable to have such significant changes in guidance in such a short period of time. **The applicant finds it difficult to comprehend and decipher why the advice given in these guidance documents keeps changing when the cumulative picture or the landscape has remained unchanged**.

Despite the varying guidance, the applicant has sought to achieve an acceptable and compliant development whilst ensuring that it is also a viable and economical development.

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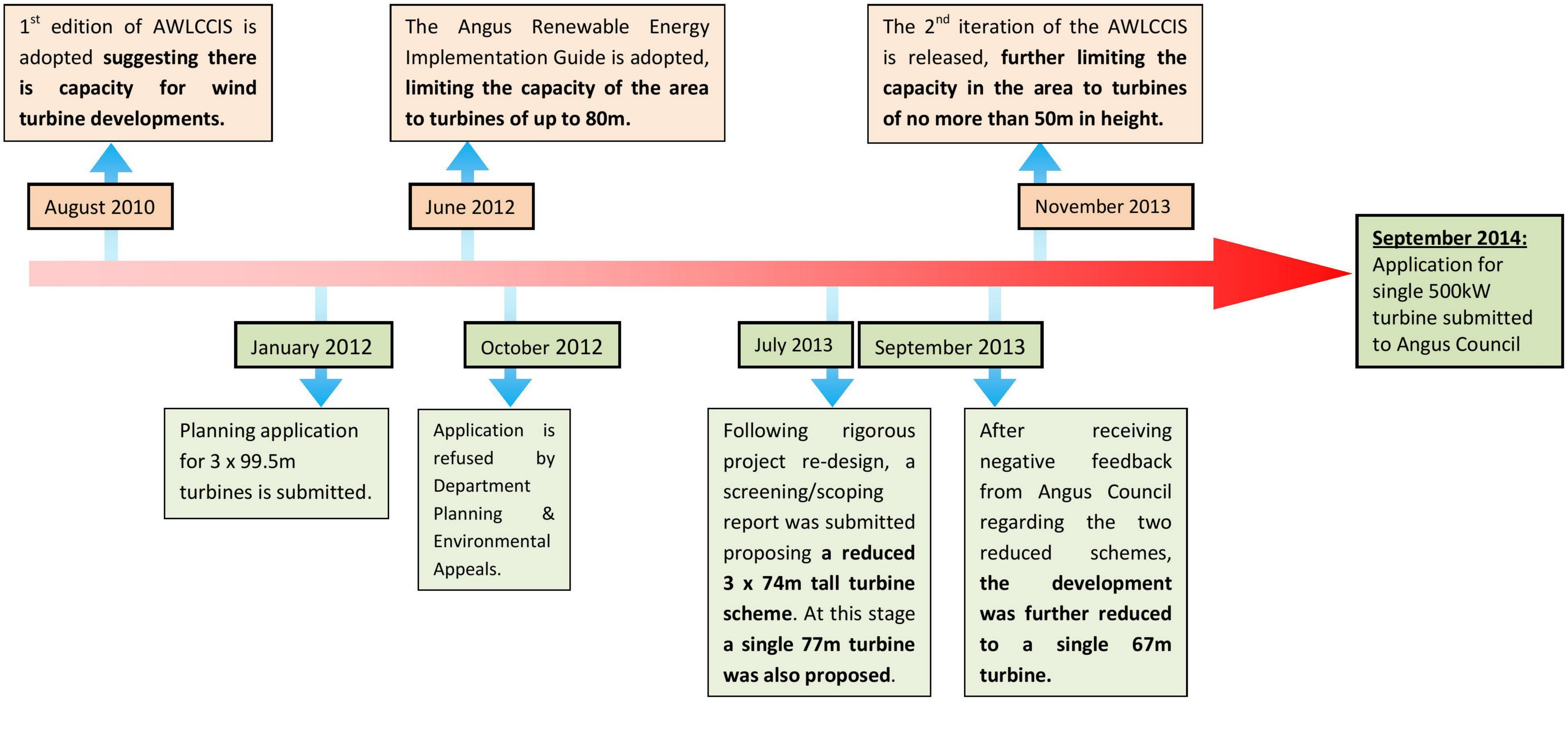
The timeline below demonstrates how the applicant has made alterations to the proposed scheme as a result of the change in guidance.

Timeline 3.1 – Development refinements as a result of guidance changes



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The feasibility and operational efficiency of developments is an important aspect of the ALPR, which states *"applicants should demonstrate that proposals are technically and financially feasible to prevent other deliverable proposals being blighted in the future by undeveloped consents"* and *"all forms of renewable energy development will be supported in principle* [where] *the siting and appearance of apparatus have been chosen to minimize the impact on amenity, while respecting operational efficiency"*.

The revised development has reached the point in which any further reductions in elevation or turbine size would have a dramatic impact on the efficiency of the wind turbine and the viability of the development.

The remainder of this document aims to demonstrate that the proposal is appropriate in terms of its size, scale and location and that it can be accommodated without significant environmental adverse impact.

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4 Local Economic Benefits

For a detailed assessment of the socio-economic development will bring to the local area and Angus, please see the accompanying report undertaken be Ekos Ltd, an independent economic and social research company. This report analyses the key economic, social and catalytic impacts predicted to be generated as a result of the development and should be considered as a key planning consideration.

See **Appendix 2** for supporting statements from key local businesses.

4.1 Construction / Decommissioning Phase Benefits

The construction of the proposal would represent a large capital investment in the local area. Whilst the supply chain for turbine components is largely located in mainland Europe, the site preparation works required as part of the construction present an opportunity to source materials, labour and plant from the local area.

Excluding the turbine component supply, the typical construction costs of a single turbine of the size and type proposed is in the region of £600,000. A recent report from Biggar Economics (2012), which assesses the economic impacts of the onshore wind sector as a whole, suggests that 45% of this would be spent in the UK and it is in our experience that the majority of this will be spent locally through the following:

- Contracts awarded to local firms for electrical works, civil engineering, fencing etc;
- Expenditure on hotels and services in the local area by contractors throughout the construction period; and
- Sourcing of appropriate materials such as crushed stone for the road surfaces and crane hardstandings from local suppliers.

Kilmac Construction will actively seek out opportunities to work with contractors and businesses in the local area prior to the construction phase. Preference will be given during any tendering procedures to local firms in order to maximise the extent to which the investment can be channelled into the local economy. Letters of support for the project from local suppliers have been included for reference.

At the end of the development's 20 year life span, the decommissioning phase of the development will involve an operation similar in size and timescale to the construction phase and would therefore present a similar level of opportunity for economic benefit in the local area.

4.2 The Local Economy – Business Diversification

Existing agricultural use of the site can continue undisturbed throughout the operational phase of the wind turbine.

The sale of electricity will lower business costs, increase the competitiveness of the business, allow further investment and safeguard existing jobs.

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As this is a joint venture, the landowner will benefit from the sale of electricity, which will help to offset current electricity expenditure, and will continue to support the established business with another income stream. This will provide more opportunity for the business to consolidate, invest and expand further.

A report on 'The economic benefits of on-farm wind energy clusters in Aberdeenshire' was prepared by SAC Consulting in June 2010, the findings of which are relevant to this locally owned wind turbine. A summary of the key findings are outlined below:

- On farm wind power generation represents a major opportunity to support rural incomes and employment in Aberdeenshire. **These benefits are greatest where projects are locally owned and managed**;

- Per MW of capacity developed farmer owned projects are likely to have a lower visual and environmental impact but a greater local economic and employment benefits;

- Wind projects on farms also have the benefit of protecting employment in existing businesses facing uncertainty over market returns and support payments; and

- Local businesses are particularly effective at recycling income into the local economy and thereby supporting local rural employment.

Although this study was conducted specifically in relation to Aberdeenshire farming businesses, we believe the findings have relevance on a locally owned development such as this.

4.3 References

Biggar Economics (2012), *Onshore Wind: Direct and Wider Economic Impacts*, Department of Energy and Climate Change/RenewableUK.

Scottish Agricultural College Consulting (2010), *The economic benefits of on-farm wind energy clusters in Aberdeenshire*'.

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5 Project Design Considerations

5.1 Site Specifics

The proposed location for a wind turbine on the land holding at the Finavon Estate was re-assessed following the refusal of the previous application (Council Ref: 12/00002/EIAL). The key factors that were highlighted in the Reporters Appeal Decision Notice and which required to be addressed as part of the re-design process include:

- Ensuring the development complies with all national and local policies;
- Significantly reducing the impact on the landscape character; and
- Significantly reducing the impact on the nearby residential properties.

Whilst addressing these key factors, it was important to maintain the following aspects which are vital to a wind turbine development:

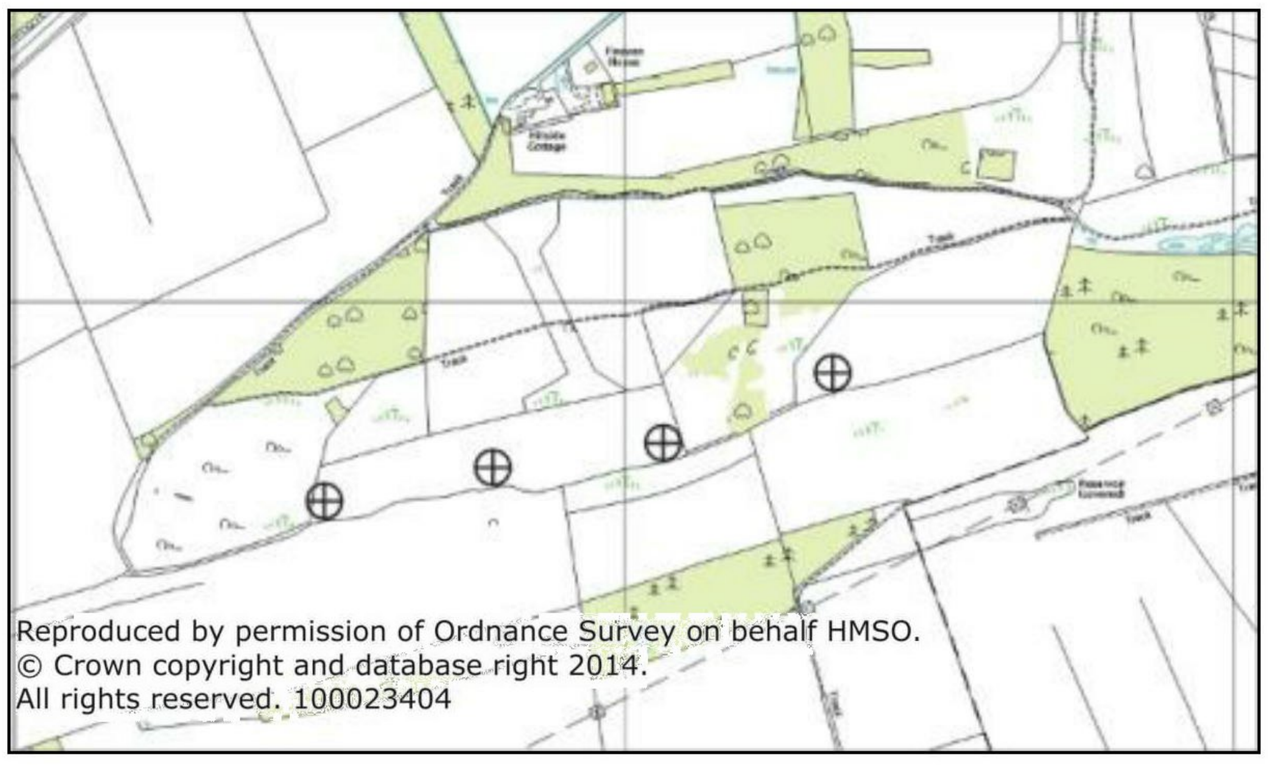
- A viable wind resource (6.9m/s);
- A suitable separation distance from nearby residences (930m over Finavon Hill);
- Nearby grid capacity (Grid Connection secured); and
- Provision for access (fully controlled by Finavon Estate).

5.2 Design Evolution

5.2.1 Original Design Process

The previous application was also subject to a rigorous screening and design process. The screening process considered a number of available options with a varying number of turbines of different sizes and capacities.

During the early stages of the process it was thought that the site could accommodate four 2.3MW turbines (**Figure 5.1**). However, the required spacing for four turbines of this size could not be adequately achieved without compromising the elevation of the western most turbine.



Figures 5.1 - 4 x 2.3MW turbines option

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Another option was to take forward a project comprising a higher number of smaller turbines of 800kW (**Figure 5.2**) but it was quickly determined that this number of turbines unacceptably increased the visual impact of project.

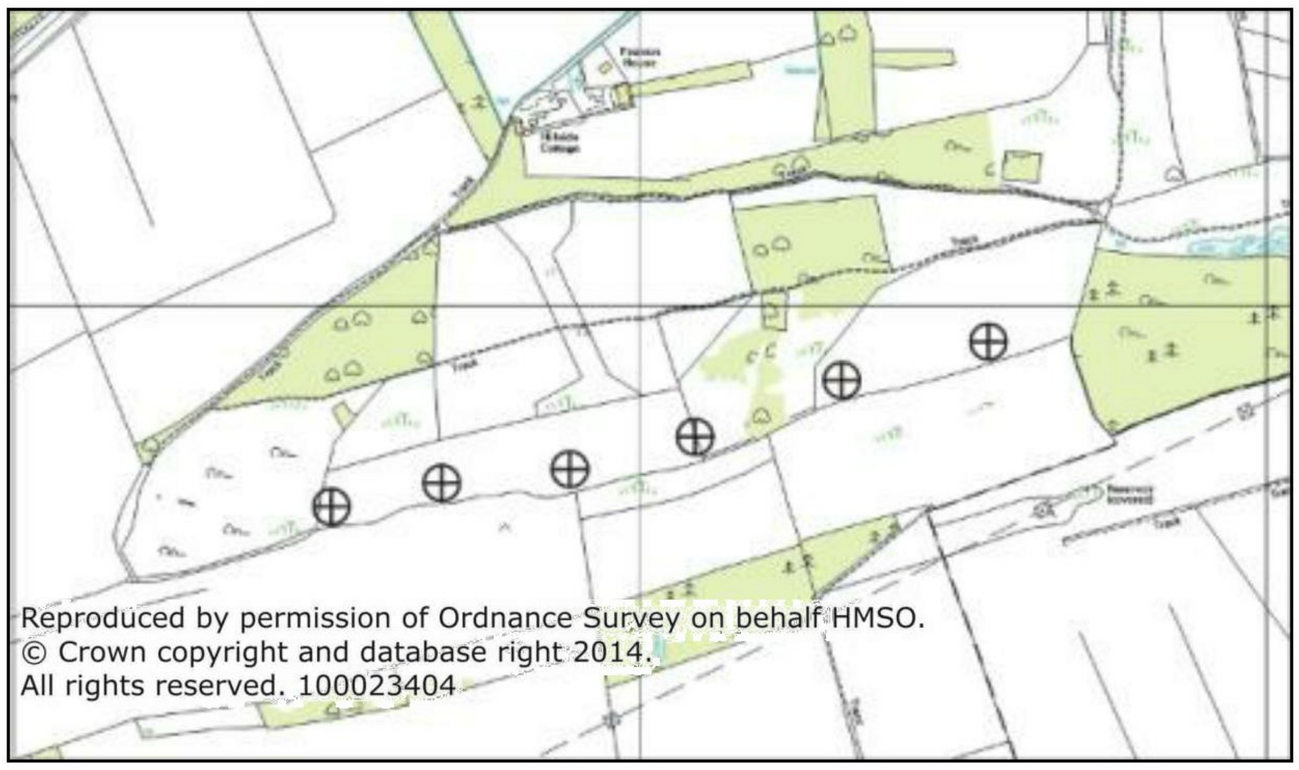

Figure 5.2 –6 x 800kW turbines option

It was subsequently concluded that the site could accommodate three 2.3MW turbines. Optimum spacing of the turbines with respect to noise and shadow flicker constraints and height of the topography determined the layout for which a planning application was submitted, as shown in **Figure 5.3**.

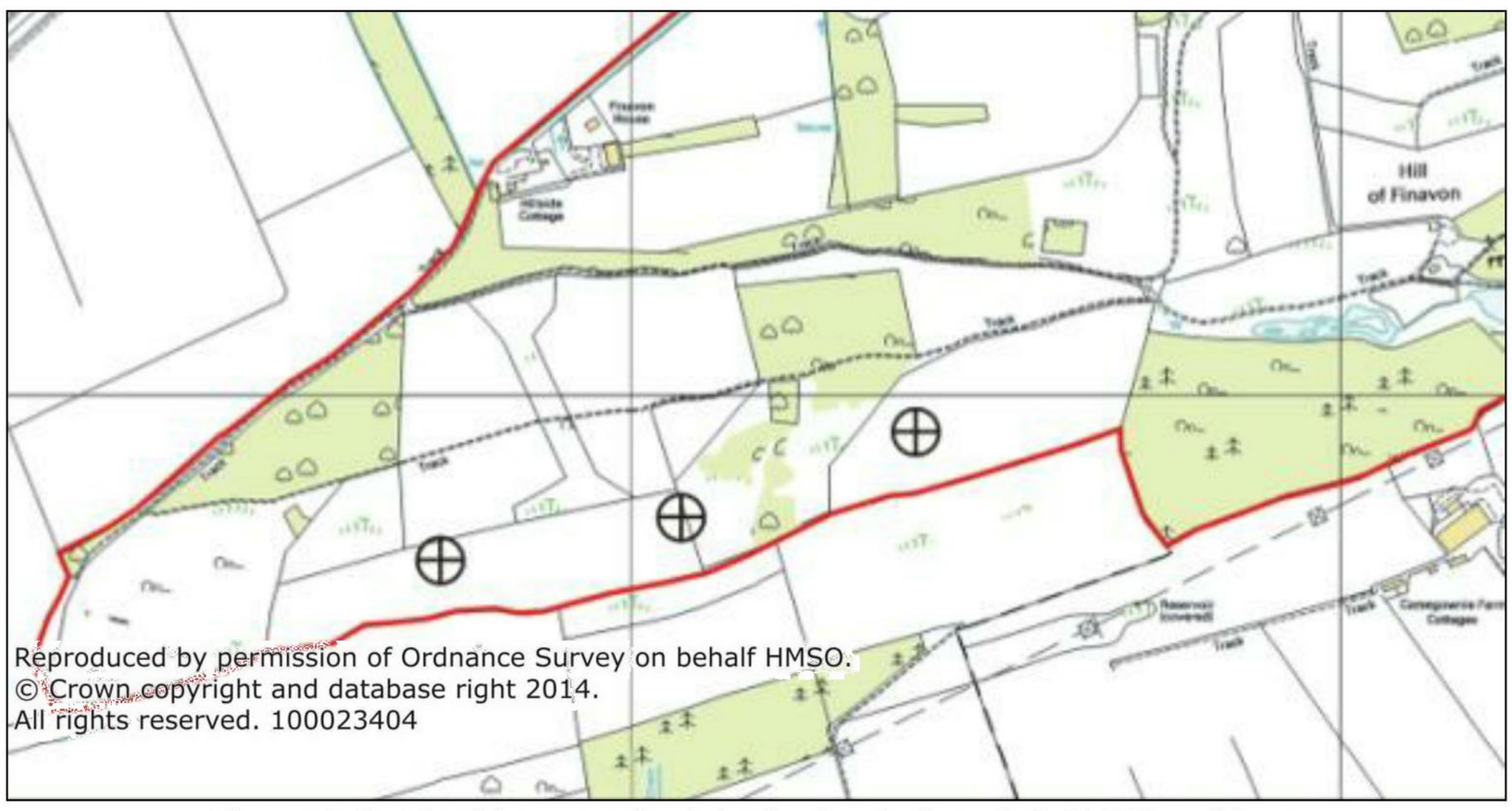

Figure 5.3 –Final layout of original submission, 3x2.3MW turbines

The layout shown in **Figure 5.3** was deemed to be the most appropriate for three turbines of 99.5m to tip. The layout met all the considered technical constraints, however, it was the opinion of the Scottish Minister's Reporter that the development would result in an unacceptable impact on the landscape and the amenity of the surrounding area and residential properties.

The overall aim of the site design is to achieve a layout that strikes the right balance in terms of optimising energy yield while remaining sympathetic to the landscape and views.

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5.2.2 Revised Project Design Process

Design Options

In light of the Reporters decision notice, the design of any further development on the site would therefore need to address the key issues raised as part of the refused application. Once the design had been narrowed to two design options, Angus Council were consulted for a Screening/Scoping Opinion of each. The two design iterations, which both saw the relocation of the turbines off of the summit of the Finavon Hill Estate to lower elevation, were presented to the Council:

1. Three turbines of 74m in tip height (50m hub height); and
2. A single turbine of 77m tip height (50m hub height).

Angus Council responded to the Screening/Scoping Request in September 2013 and formed the opinion that the reductions in scale did not go far enough to alleviate the concerns raised in the previous application. The Planning Officer stated that *"the 74m high turbines would still be out of proportion to the other elements of the landscape and these would appear out of place in the medium scale landscape. The turbines would still be sited on a hill top ridge and would not be consistent with the underlying character of the area. A development of the nature proposed would give rise to similar issues that the Council and the Reporter found unacceptable and would give rise to similar development plan issues."*

In this response, the Planning Officer also raised the matter that a new AWCCLIS was emerging by stating that *"the Council has recently commissioned a Strategic Landscape Capacity Assessment for Wind Energy in Angus in partnership with SNH. While that document remains in draft form and is yet to be published, the emerging document indicates that this general area could accommodate turbines of up to 50 metres only. It is likely to indicate that turbines should be located away from the smaller scale hills and hill slopes to avoid diminishing the apparent scale of the slopes or breaking the skyline. The Council Implementation Guide constraint of avoiding development on the principal ridgelines would also remain."*

Final Design Selection

Further design refinements were explored as a result of the screening feedback received. It was determined that the turbine should be relocated even further down the hill and further reduced in height. In regard to the Reporters comments, the final design iteration was significantly reduced from the original application as:

a) Reducing the capacity of the development from 6.9MW (three 2.3MW turbines) to a single 500kW turbine;

b) Relocating the turbine further north, so the turbine no longer sits at the summit of Finavon Hill and therefore is at a lower elevation:

- Revised proposal located at an elevation of approximately 187m AOD, resulting in a ~35m drop in base elevation from the turbine with the highest elevation from the original application (222m AOD).

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c) Significantly reducing the overall height of the turbine by 33m, from 99.5m to tip to 67m.

Table 5.1 indicates the key design iterations that the development has looked to progress through the project lifetime, demonstrating the significant reduction from the original planning application.

Table 5.1 – Key Development Design Iterations

Design Refinement	No. of Turbines	Capacity	Height of Turbine(s)	Turbine Height reduction	Ground Level (AOD)*	Ground level reduction	Overall Reduction in Height
Original Application	3	6.9MW	99.5m	-	222m	-	-
Proposed Scoping Option	3	2.4MW	74m	-25.5m	211m	-11m	-36.5m
Alternative Proposed Scoping Opinion	1	500kW	77m	-22.5m	187m	-35m	-57.5m
Final Consideration	1	500kW	67m	**-32.5m**	187m	**-35m**	**-67.5m**

With this design selection, the development reaches the point in which any further reductions in elevation or turbine size would have a dramatic impact on the efficiency of the wind turbine and the viability of the development.

The feasibility of developments is a critical aspect of the ALPR, which states *"applicants should demonstrate that proposals are technically and financially feasible to prevent other deliverable proposals being blighted in the future by undeveloped consents".*

Figure 5.4 shows how the development layout has evolved from the originally submitted layout.

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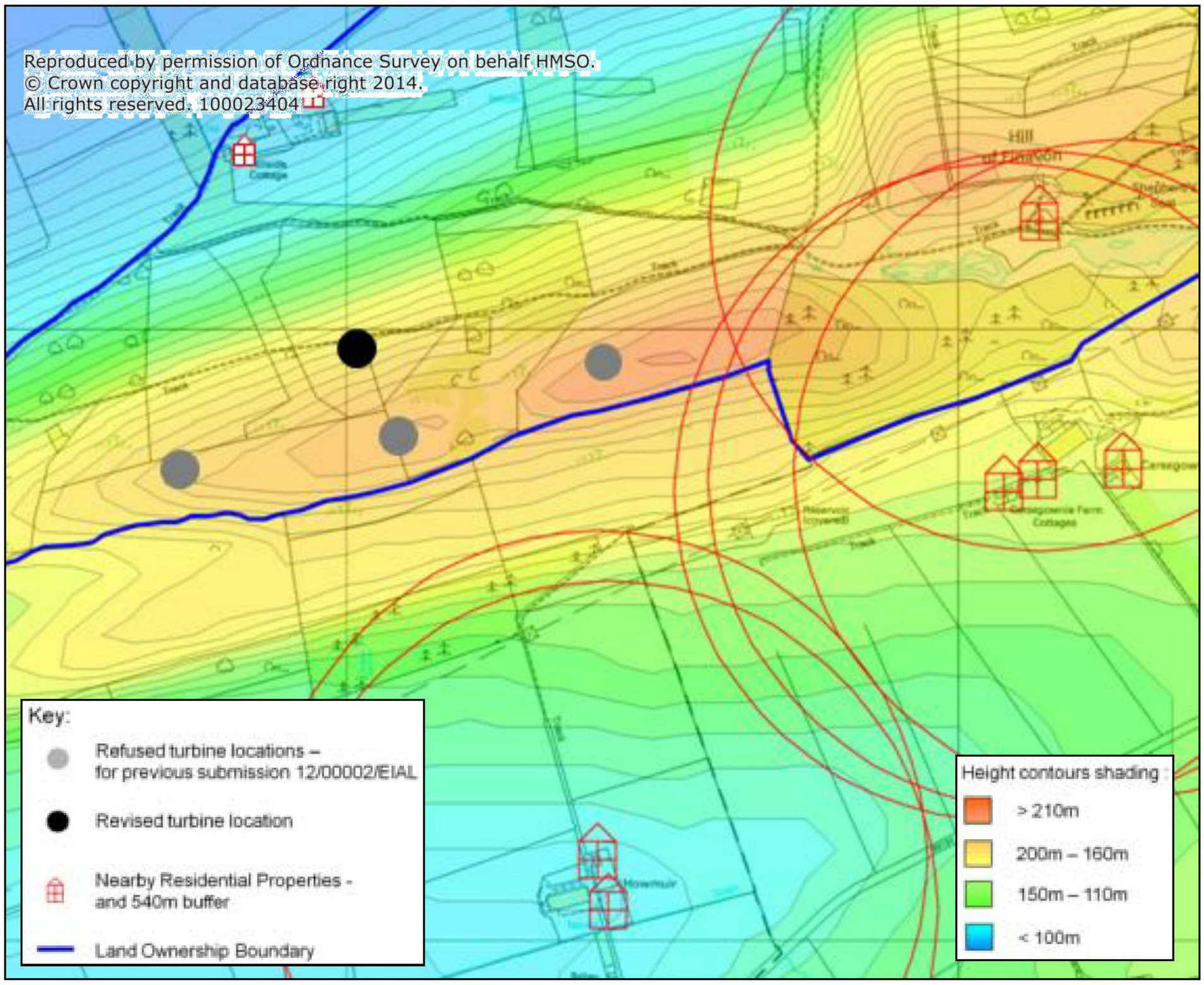

Figure 5.4 – Revised development layout showing original layout

The elevation drawing shown in **Figure 5.5** presents a comparison between the EWT DW54 proposed at Finavon Hill Estate and the originally proposed Enercon E70s, demonstrating the reduction in turbine size.

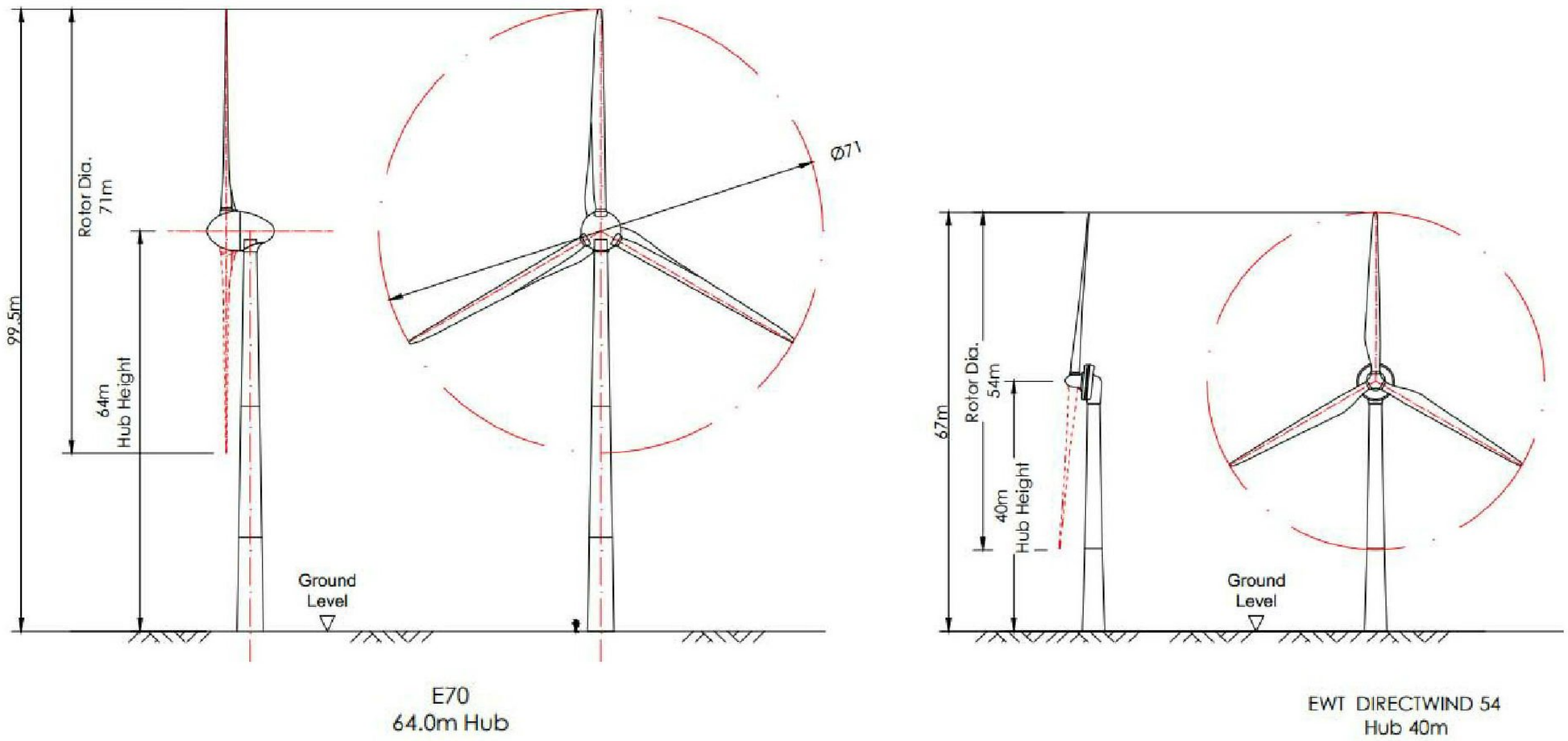

Figure 5.5 – E70 and EWT54 Elevation Comparison

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When the reduction in turbine elevation is considered, the effects of the turbine height reduction are greater, as demonstrated by the elevation comparison in **Figure 5.6**. This figure shows the height and elevation of the original three turbines in comparison to the proposed single turbine.

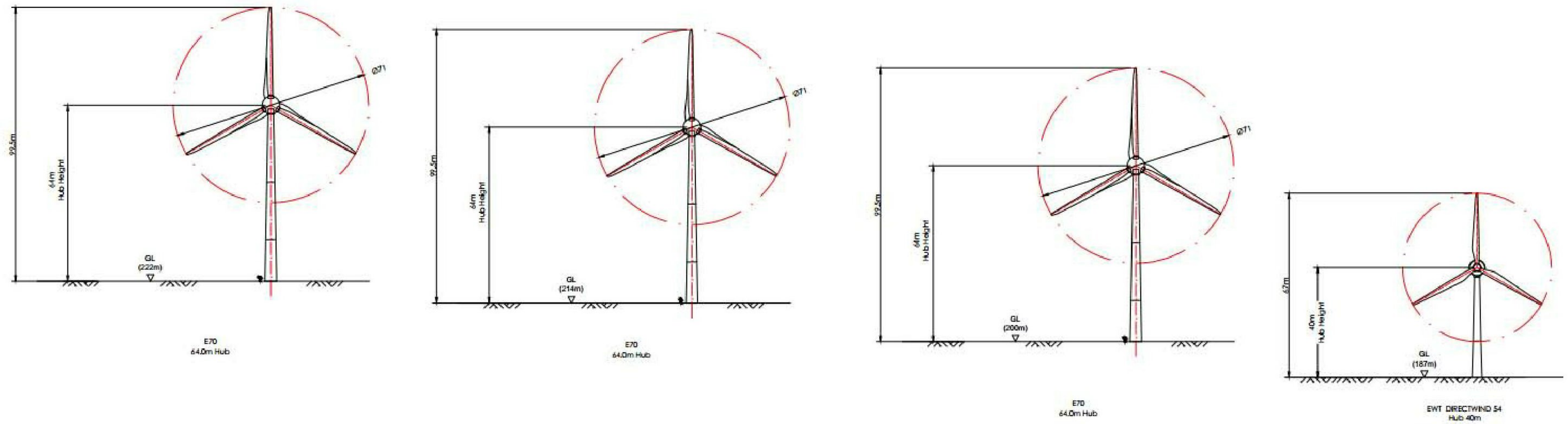

Figure 5.6 –Elevation and Height Comparison of Original Application to Revised Application

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By further comparison, it is demonstrated in **Figure 5.7**, the difference in gross reduction between the highest of the original application turbines to the proposed single 67m turbine.

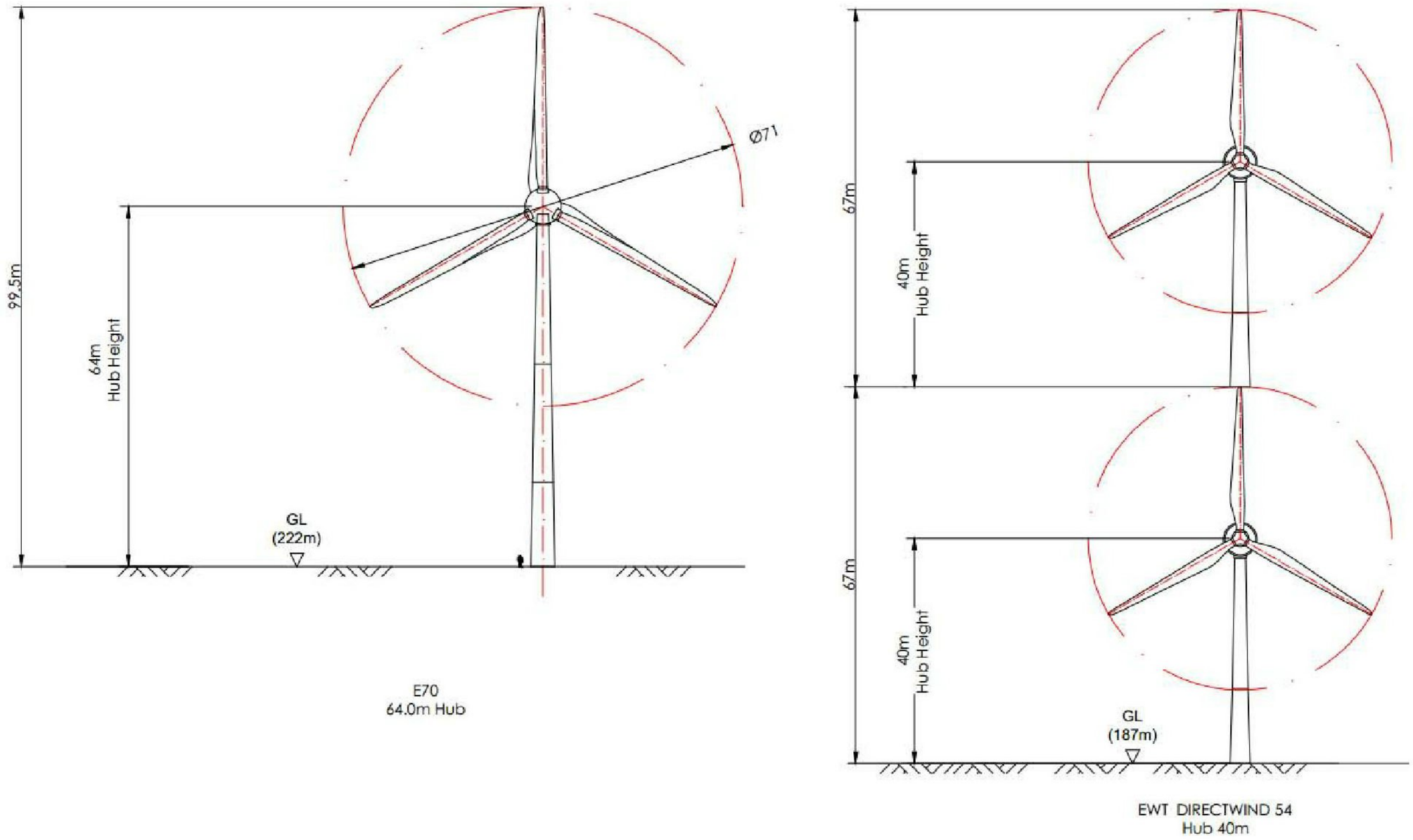

Figure 5.7 –Comparison in elevation between the different applications

The difference between the highest elevated turbine from the original application and the revised single 67m turbine is 67.5m. As demonstrated by Figure 5.7, this is equivalent to stacking two of the proposed 67m turbines on top of one another and they would still be 0.5m under the height of the original application. This clearly demonstrates the significance and severity of the reductions made to the development.

For clarity, this is calculated by:

Elevation of highest of original application turbines = 222m AOD

+

Plus the height of the originally proposed turbines = 99.5m

=

321.5m

Elevation of proposed single turbine = 187m AOD

+

Plus the height of the proposed turbine = 67m

=

254m

The difference between the two = **67.5m**

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The final design results in a development which is believed to address the concerns of the Reporter in the Appeal Decision Notice which relate specifically to potential impact on the surrounding residential properties and the local landscape.

To reinforce the significance of these reductions, **Figure 5.8**, **5.9, 5.10 & 5.11** display photomontages comparing the theoretical views to be experienced from a number of the key viewpoints as a result of relocating the turbines and reducing the overall heights. An A3 version of these montages can be found in within the **Landscape Figures** which accompany this report.

Figure 5.5 – Viewpoint from the B9134 at Howmuir

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Figure 5.6 – Viewpoint from Bogindollo

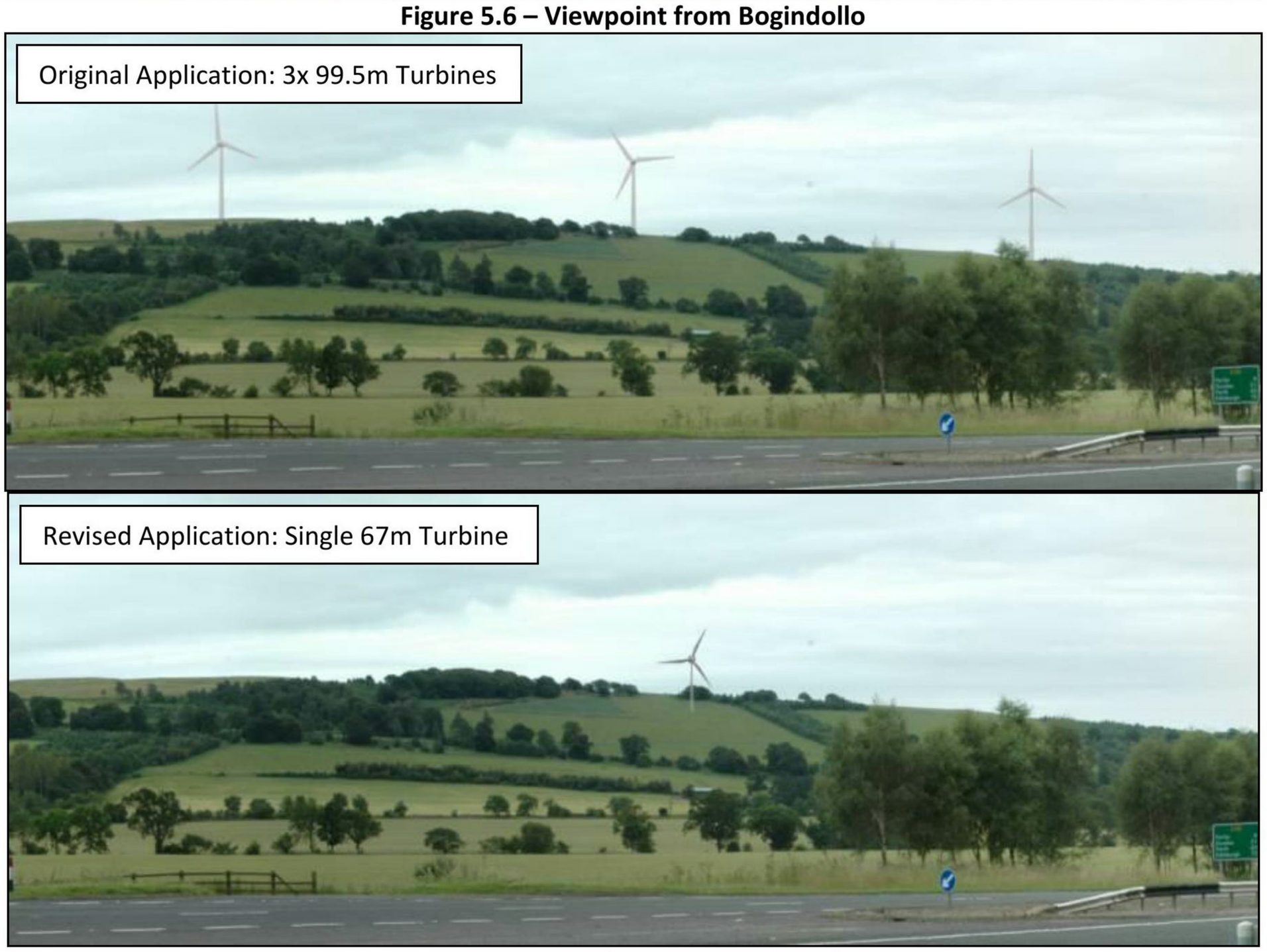

Figure 5.7 – Viewpoint from West Mains of Finavon

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Figure 5.8 – Viewpoint from Forfar

Impacts on the Scale and Character of the Landscape

As discussed above, when height and elevation reductions are considered, the gross reduction from the height of the highest of the original application turbines to the revised proposed turbine is 67.5m. Effectively, this means that two of currently proposed turbines could be stacked on top of one another and still be 0.5m less in height than the original application, clearly demonstrating the significance of the reductions.

This directly addresses the concern raised by the Reporter that with regard to the vertical scale of a wind development since SNH guidance suggests that the turbines should appear *'typically less than one third'* above the perceived height of the underlying hill. This is achieved by the reduction in turbine height. **Figure 5.9** and **Figure 5.10** displays the visible height of the hill (in red) from two different viewpoints, and demonstrates that the proposed turbine is substantially less than one third of the height of the hill. **Figure 5.9** also demonstrates that the turbine would not be the tallest feature on the hill from this particular location.

The Reporter also suggests that the development should *'avoid prominent visibility and clashes of scale with the modest hill size'*, which has again been addressed by the development design refinements.

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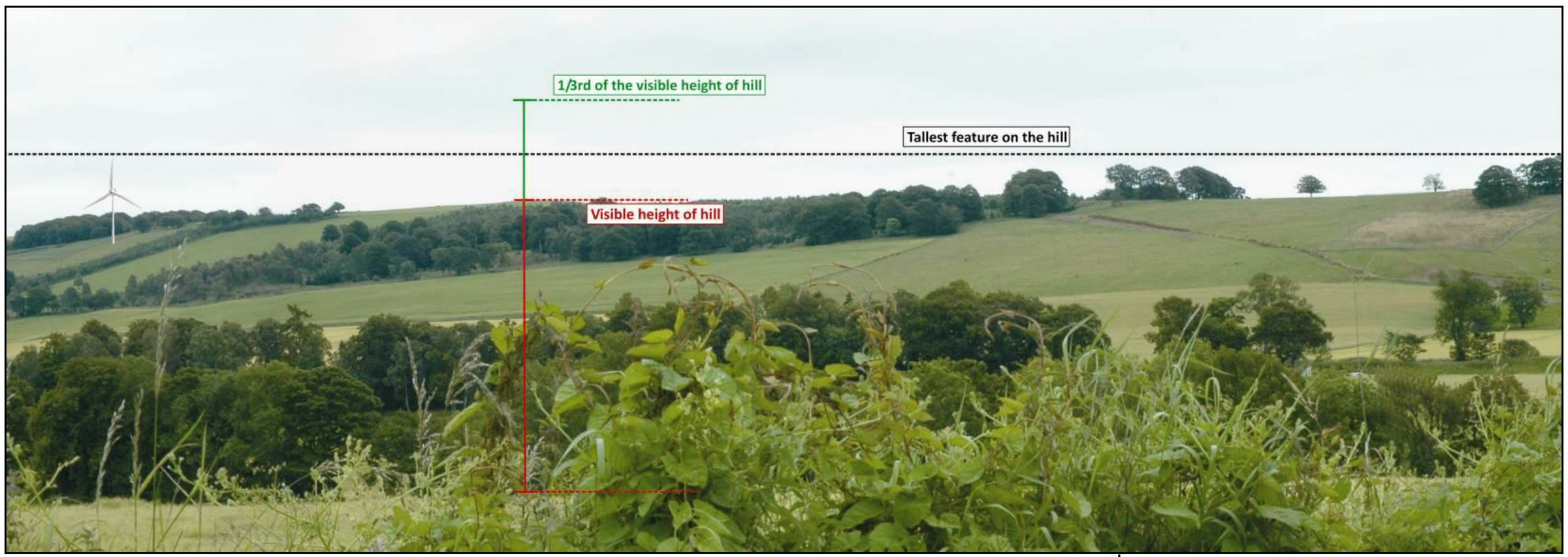

Figure 5.9 – Viewpoint from Bogindollo demonstrating the SNH 1/3rd ruling

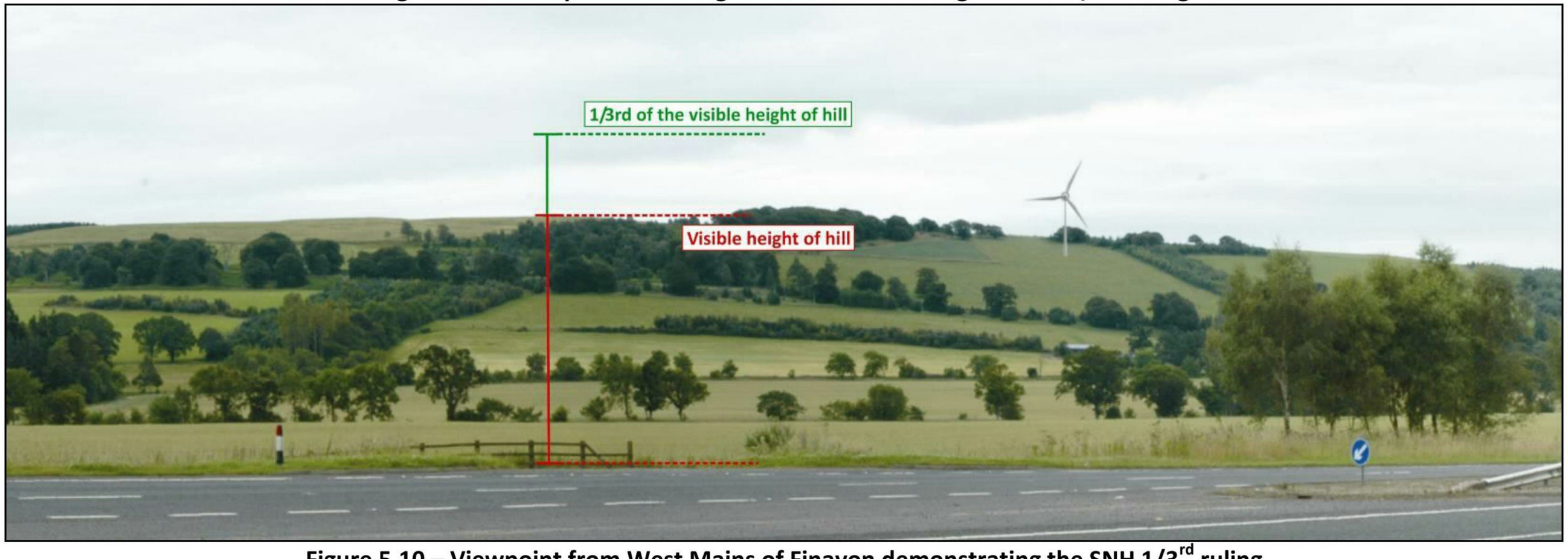

Figure 5.10 – Viewpoint from West Mains of Finavon demonstrating the SNH 1/3rd ruling

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The Reporter also highlighted that *'in relation to Landscape Character Type LCT12* [in which the site is situated]*, the guidance indicates that there is scope for turbines circa 80m in height which do not disrupt the principal ridgelines or adversely affect the setting of important landscape features and monuments such as Balmashanner Monument and Hill of Finavon and Turin Hill forts.'* It is considered in the context of the latest supplementary guidance that the scale of this turbine model is more in keeping with the medium scale landscape, and is in keeping with SNH's vertical scale guidance in which the turbines should not appear greater than one third of the hill.

Impacts on Residential Amenity

With the reduction to a single turbine and the relocation of the turbine to a lower altitude to the north side of the hill, a greater separation distance from the nearest 3rd party residential properties has been achieved. **Table 5.1** shows the difference between the separation distances from the original application to the revised scheme.

Table 5.1 – Distances from nearest residential properties

3rd Party Property	Distance to nearest turbine (original location)	Distance to turbine (revised location)	Difference in separation distance between both applications
Shepherd's Seat	770m	1140m	**+370m**
Carsegownie Farm Cottages	700m	1080m	**+380m**
Howmuir	760m	930m	**+170m**

By increasing the separation distance between the nearest 3rd party properties and the turbine, it is considered that the impact on the surrounding residents will be significantly reduced, particularly when the reduction in turbine height and elevation are considered.

The effects on all surrounding residential properties will be reconsidered in terms of potential visual, noise and shadow flicker impacts, the results of which are presented in **Section 7, 8** and **10** respectively.

Further Discussion with Angus Council

Following on from the Screening/Scoping Opinion received in September 2013 and the further refinement to the design of the development, two meetings were held with Angus Council. These meetings were held in order to thoroughly discuss the positive and negative aspects of the proposed development. The minutes of these meetings can be found in **Appendix 1**. The outcome of the meetings identified that the council had four stand-out reasons for concerns of the original application. These reasons were as follows:

- Visual impact on the Finavon Hill Ridgeline;
- Visual impact on Turin Hill fort;
- Impact on the amenities of the nearest residents; and
- Scale of the proposal within that landscape character.

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During the meetings it was discussed whether the revised proposal address these concerns. It is contended by the applicant that all of these concerns have been fully addressed and are no longer significant concerns. **Table 5.2** below aims to demonstrate how the latest single turbine proposal addresses the four main concerns indicated by Angus Council.

Table 5.2 – The four main concerns of the Council addressed

Council Concerns with Original Application	How new project design addresses these concerns
Visual impact on the Hill of Finavon Ridgeline	The ridgeline of Hill of Finavon is approximately 14km in length and rises to 225m in altitude. The latest proposal would occupy a total of 54m of the horizontal aspect and 67m of the vertical aspect, which equates to less than 1% and approximately 38% respectively. Whilst breaking the horizon of the ridgeline cannot be avoided from some locations and viewpoints, it is considered that the turbine will not detract or interrupt the appreciation of the ridgeline. Current features such as electricity pylons, and trees, already rise above the horizon of the ridgeline yet do not impact on the function of the ridgeline. The turbine will not impact on the function of the ridgeline, which provides enclosure and backdrop to valleys to the north and south of the site, and more than the electricity pylons already do. This is further discussed in **Section 7**. It is the applicants' view that the existing pylons will assist the visual acceptance of the development.
Visual impact on Turin Hill fort	From Turin Hill fort, the turbine has been located further down the far side of the hill, which results in significantly reduced visibility of the development. The turbine will also now be back-dropped by the landscape, therefore avoids breaking the horizon. Please see **VP09** of the Landscape Figures.
Impact on the amenities of the nearest residents	Impact on residential properties and their amenities has been dramatically reduced as demonstrated and outlined in **Table 5.1**. Please see **Section 7.12** for the full residential assessment.
Scale of the proposal within that landscape character	It is considered that the proposed turbine now complies with the SNH guidance that the scale should be typically less than one third the height of surrounding landscape features from the majority of viewpoints. From a number of directions, the electricity pylons or the trees that currently break the ridgeline appear taller than the proposed turbine, therefore making it not the tallest feature on the ridgeline. The reduced scale turbine is now also more in keeping with the medium scale landscape. The Councils concern on the scale of the proposal stems from the original application and the latest version of the AWLCCIS. See **Section 7.6.3.**

The Applicant contends that all issues raised by the Scottish Ministers Reporter and Angus Council have been addressed by the revised and significantly reduced development.

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5.3 Other Site Considerations

All of these factors were taken into account when finalising the project design.

Wind resource

A 50m anemometer has been monitoring onsite wind speeds for a period of approximately 2 years. The results of the wind monitoring have influenced the choice of candidate turbine and the chosen height of the turbine. Despite the reduction in wind speed resulting from the reduction in elevation and turbine height, we believe that the choice of turbine model and height strikes an appropriate balance between optimising electricity generation on the site whilst keeping the impact on environmental issues to a minimum.

Grid capacity

A grid connection is currently under amendment with Scottish and Southern Energy (SSE). Capacity for 6.9MW was secured during the course of the original application; therefore the offer is currently being revised for a connection of 500kW.

Onsite Access

The track was designed to be as straightforward as possible following existing field tracks in order to minimise the impact on areas for grazing. As the site is enclosed and well screened by woodland, no adverse visual impact from access tracks or other infrastructure is expected.

Communication Links

Consultation was undertaken with all of the operators with electromagnetic links in the area. The nearest link identified is operated by Arqiva, who identified a link approximately 895m from the proposed turbine. Due to the separating distance, the turbine is not predicted to impact on the operation of this microwave link.

No other links have been identified in the vicinity of the site.

Ecology

An extensive series of ecology surveys was undertaken as part of the original three turbine application, of which a summary of the results which are presented in **Section 6** and the full EcIA is presented in **Appendix 3.** The turbine has been located so that there is a separation distance of at least 50m between the blade tips and the nearby wooded policies, which is good practice in terms of potential bat movements.

Cultural heritage

The nearest features were identified and the turbine located taking into account possible direct and indirect impacts. Although Historic Scotland did not objected to the original application raised concerns on the impact the development would have on Finavon Hill fort and Turin Hill fort. The reduction in the scale of the development has addressed this issue. The results are presented in **Section 9**.

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6 Ecology and Ornithology

6.1 Introduction

A full set of ecological surveys and assessments were conducted in relation to the original three turbine submission. This considered the potential effects of the proposed wind cluster on the nature conservation interests on and around the proposed site, sets out the findings of the various surveys carried out and provides an assessment of impact on key sensitive species. These assessments were carried out by Garry Mortimer PhD, GLM Ecology, an experienced field ecologist with several years experience of ecological assessments at windfarm sites.

This section sets out the findings of the original surveys, considers the comments of statutory consultees to the original application and provides a revised assessment on the results of the surveys due to the installation of a single turbine 67m in height. and therefore the overall nature conservation interests on and around the proposed site.

6.2 Summary of Original Surveys

The EcIA has been carried out according to current guidance published by the Institute of Ecology and Environmental Management (2006), which is recognised as best practice. These guidelines set out a process of identifying the value of each ecological receptor and then characterising the effects that are predicted, before discussing the effects on the integrity or conservation status of the receptor, proposed mitigation and residual effects.

The guidance and regulations adopted during the process of the EcIA are set out in **Section 1.2** of **Appendix 3** where the original EcIA can be viewed in full. **Section 1.4** of **Appendix 3.** describes the evaluation criteria for ecological features in great detail, sets out the criteria used to determine the magnitude of effects and clarifies the significance criteria.

6.2.1 Site Background and Context

An initial desk based search, walkover survey and scoping report was carried out when designated sites, associated protected species and habitats at a local and regional level have been identified. The following internationally designated sites were identified within 20km from the site:

- Montrose Basin SPA;
- Loch of Kinnordy SPA;
- Firth of Tay and Eden SPA; and
- Loch of Lintrathen SPA.

Within 5km of the site, the following sites identified were;

- Turin Hill SSSI;
- Rescobie & Balgavies Lochs SSS1; and
- Restenneth Moss SSSI.

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6.2.2 Scope of Ecological Assessments

The scope of the EcIA was derived from the initial site background and context study, the local knowledge and experience of the ecologist. SNH were consulted at the scoping stage and an agreement was made on the required scope of the surveys. The EcIA considers the following issues:

- Breeding Birds;
- VP Surveys;
- Winter Walkover Surveys;
- Badger;
- Otter;
- Bats; and
- Phase 1 habitat.

6.2.3 Site Description

The site at Finavon is a ridge that runs from SW-NE. The location of the proposed turbine is improved grazing between small areas of mature deciduous woodland. There is a mosaic of habitats present with the site having been developed intensely by the landowner for shooting and conservation interests. Large areas of young trees, scrub and mature trees are present. On the periphery of the site on the north and south, arable fields are present. There is a network of rough tracks across the site. There are two relatively recently formed fishing lakes on site and the odd burn. **Section 1.6** of **Appendix 3** includes photographs of the areas mentioned.

6.2.4 Summary of Predicted Impacts

Breeding Birds

There was a good breeding species list of predominantly common woodland birds. There is a mosaic of differing habitats on site and the list reflects this. Most species were recorded near habitation, woodland or near water. Predictably there was very little breeding on the open fields near proposed turbine location.

No significant impact on high sensitivity species can be expected. The magnitude of impact is considered to be negligible and overall the significance of impact to be no more than negligible.

Schedule 1 Raptors

No raptors were recorded breeding or were observed in the general area during the surveys. It is not considered that there is any breed present within a 2km buffer zone of the site.

Wintering Birds

No geese were recorded foraging on site at any time. No signs of geese were recorded on site during any surveys and it is apparent that the site is not utilised for foraging. The geese predominantly tend to fly to the south of the site in the general direction of Montrose Basin. When they fly in this area along the glen they are often below the height of the ridge and below the base of the proposed turbines.

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Schedule 1 raptors do not use the habitat to forage over the winter periods. The loss of a small area of improved grassland would not have an adverse affect on any wintering birds given the species present.

Bats
The majority of the site, apart from open fields, would be considered good bat foraging habitat. They forage predominantly along the woodland edge and young trees next to areas of the proposed access track. The proposed turbine is located in an area of open grazing fields with approximately 90m separation from vegetation or trees. No roosts were found, however there is a multitude of suitable mature trees and the occasional building present. Considering the observations noted, no significant impact on high sensitivity species can be expected.

Badgers
Given that no signs of badger were recorded no significant impact on this species can be expected.

Otters
Given that no signs of otter were found recorded no significant impact on these species can be expected.

Habitats
A total of eleven habitats are present within the site area, of which improved arable fields cover a large proportion of the site. No nationally or internationally protected habitats were identified in this assessment. All habitat loss both temporary and permanent would be associated with the arable and improved grassland. This habitat has little wildlife value and occurs abundantly over the site, regionally and nationally. The impacts on the habitats are expected to be small.

There is habitat on the site which would support protected species including the woodland for badgers and red squirrels and farm buildings for bat species. The majority of these features are situated mainly over the north and east site and so it is anticipated direct or indirect impacts are low.

6.3 Statutory Consultees Comments

In relation to the original submission for three turbines of up to 99.5m in height, SNH stated:

"This is a small scope proposal of 3 turbines and as we agree with the conclusions of the Environmental Statement:

- *That it does not affect a protected site or species; and*
- *Regarding the potential impacts on landscape.*

We do not intend to offer detailed advice or comment."

In response to the Appeal against the non-determination of the application, Angus Council offered the following comments in relation to the impact on the natural heritage:

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"The proposal does not comply with accepted best practice guidance to minimise impact on bats. On this basis I consider that the proposal has the potential to have an adverse impact on a European Protected Species and as such the proposal is contrary to Policy ER4 of the Angus Local Plan Review.

I have no reason to doubt the appellant's conclusions in relation to other natural heritage interests, including birds."

It should be noted that the latest proposal for a single turbine does comply with accepted best practice guidance to minimise impact on bats which advocates a minimum separation distance of 50m between any bat habitat features and the blade tip of a wind turbine. The proposal achieves a separation distance of 64m.

The Appeal Decision Notice, written by a Reporter appointed by the Scottish Ministers, also provides comments on the impact on natural heritage:

"The appellant submits, therefore, that the positioning of the turbines within the minimum separation distance from the woodland edge recommended in TIN051 will have no adverse impact on bats. There is no evidence that the proposal would have a significant adverse impact on any other valuable habitats or species. Accordingly, I am satisfied that the proposal complies with policy ER4 of the ALPR.

Policy ER35(b) specifically requires that wind energy development should not cause unacceptable interference to birds, especially those that have statutory protection. The ES indicates that the proposed turbines would have minimal impact on breeding and wintering birds. SNH has raised no objection in relation to protected species. Based on this evidence, I am satisfied that the proposal complies with policy ER35(b) of the ALPR."

6.4 Predicted Impact of Single Turbine

Given that the proposed development has been significantly reduced in size, scale and capacity, it is anticipated that the turbine will have a lesser impact on ecological and ornithological interests. The revised proposal complies with the best practice guidance for minimising impacts on bats, which was raised as a potential concern for the original application.

6.5 Conclusions

It is proposed to construct a single wind turbine and associated infrastructure on an area of improved grazing land situated in Angus. A range of ecological assessments have been undertaken to investigate the ornithological and other ecological interest of the site and it is concluded that potential for this to be adversely affected by the current proposal is extremely unlikely.

The full EcIA that was conducted as part of the original application can be found in **Appendix 3**.

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7 Landscape and Visual Impact

7.1 Introduction

A landscape and visual impact assessment (LVIA), including a cumulative LVIA, has been undertaken for this project in accordance with the relevant EIA Regulations. This section reports on the potential landscape and visual effects of the proposed Finavon Hill Estate Wind Turbine. The proposed development is a single turbine scheme, 40m to hub, 67m to blade tip located 25m off the summit of the ridgeline in farmland on the Hill of Finavon to the north east of Forfar, Angus.

The aim of the assessment process is to promote the best "environmental fit" for the development through consideration of the existing landscape resource, the potential landscape and visual effects, design alternatives and any mitigation that might be possible. The assessment process will refer to landscape value and in particular landscape designations and related planning policy, as well as landscape character and capacity for windfarm development at this site.

7.1.1 Summary of Scope

Consultation has been undertaken with the Council and statutory consultees through a screening and scoping process. The site location was the subject of a previous application in 2012 which included three larger turbines (99.5m to tip height) as discussed in **Section 1**. Further consultation was conducted with representatives from Angus Council to discuss and agree the scope of the Landscape and Visual assessment, choice of assessment viewpoints, design options, and mitigation. The minutes from the meetings held with Angus Council can be found in **Appendix 1**.

The scope of the assessment **Table 7.1** has been established on the basis of professional judgement and the consultation process.

Table 7.1 - Scope of the Landscape and Visual Assessment

Landscape Issues	**Description**
Landscape Character	The effects of the proposed development on the landscape character and quality of the site area, as defined by the *Tayside Landscape Character Assessment* and site survey.
Landscape Elements	Direct or physical effects on landscape elements.
Visual Issues	**Description**
Local Community	Views from the local rural community, particularly from residential properties near the site and from local settlements which lie within the ZTV. Views from roads and popular tourist / walker destinations and hilltops will also be taken into consideration.
Landscape Designations	Views from the Cairngorms National Park, National Scenic Areas, Areas of Great Landscape Value, Gardens and Designed Landscapes as well as views from other areas of landscape character as perceived by people
Tourist Destinations	Views from popular outdoor tourist destinations which entail an appreciation of the landscape tourist destinations, and the setting of features and the visitor experience.
Major Transport Routes	Transport routes including the A90, B9134 and the B957.
Cumulative Assessment	The cumulative assessment includes viewpoint assessment within the Study Area where simultaneous and/or successive views of more than one wind energy development may be achieved, and sequential cumulative assessment, where more than one wind energy development may be viewed along transport routes (simultaneous or successive).

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7.2 Guidance

The methodology for the landscape and visual impact assessment (LVIA) and the cumulative landscape and visual assessment (CLVIA) has been undertaken in accordance with the methodology set out below and conforms with *The Guidelines for Landscape and Visual Impact Assessment*, Third Edition (Landscape Institute and IEMA, 2013).

Additional guidance has been taken from the following publications:

- *The Tayside Landscape Character Assessment*, Land Use Consultants, 1999;
- *Cairngorms Landscape Assessment*, Turnbull Jeffrey Partnership, 1996;
- *South and Central Aberdeenshire Landscape Character Assessment*, Environmental Resources Management, 1998;
- *Implementation Guide for Renewable Energy Proposals, Angus Council, June 2012;*
- *Siting and Designing Windfarms in the Landscape*, Scottish Natural Heritage, Version 1, December 2009;
- *Visual Representation of Windfarms Good Practice Guidance,* prepared by Horner + Maclennan and Envision for Scottish Natural Heritage, The Scottish Renewables Forum and the Scottish Society of Directors of Planning, March 2007
- *Landscape Character Assessment: Guidance for England and Scotland* (Countryside Agency and Scottish Natural Heritage publication, produced by the University of Sheffield and Landuse Consultants), 2002;
- *Guidance: Cumulative Impacts of Onshore Wind Developments,* Scottish Natural Heritage Advisory Service, Version 3, March 2012;
- Landscape Character Assessment Topic Paper 6 - Techniques and Criteria for Judging Capacity and Sensitivity, Countryside Agency and Scottish Natural Heritage, 2004;
- *Photography and Photomontage in Landscape and Visual Assessment*, Landscape Institute Advice Note 01/2011, 2011;
- *Strategic Landscape Capacity Assessment for Wind Energy in Angus,* Ironside Farrar and Scottish Natural Heritage, November 2013.

7.3 Assessment Methodology

7.3.1 Defining the Study Area

An overall Study Area of 35km radius from the turbine has been established following consultation with Angus Council and guidance in the Council's Implementation Guide. The study area was further defined for each part of the assessment process as follows:

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Landscape and Visual Impact Assessment (LVIA) – the study area was restricted to the application site, access routes, and the potential Zone of Theoretical Visibility (ZTV) from where there may be a view of the development at up to 35km distance from the site centre. The main focus of the assessment with respect of landscape and visual receptors would be 10km which would be the distance within which significant effects of the proposed development are most likely to be experienced. This has been informed with reference to the findings of field surveys and viewpoint analysis, as well as from professional experience from previous assessments.

Cumulative Landscape and Visual Impact Assessment (CLVIA) - considered existing wind energy development proposals that have permissions, and those that are currently the subject of undetermined applications within a search area of 60km radius of the site centre, these windfarms are mapped on **Figure 7.7**. An initial assessment of the cumulative visibility of these windfarms within the Cumulative Search Area was then undertaken in order to determine which have the potential to contribute to a significant cumulative effect following addition of the Finavon Hill Estate Turbine. Many of these developments were scoped out of the assessment at this stage due to the lack of combined visibility or long distance from the proposed site such that they would not contribute to significant cumulative effects. The detailed assessment, therefore, focuses on those sites with potential for significant cumulative effects in combination with the Finavon Hill Estate Turbine.

A Zone of Theoretical Visibility (ZTV) was created using the ReSoft © Wind Farm computer software to identify areas that have potential visibility of any part of the proposed wind turbine calculated to blade tip and hub-height. The ZTV however, does not take account of built development and vegetation, which can significantly reduce the area and extent of actual visibility in the field and as such provides the limits of the visual assessment study area.

Figure 7.4 illustrates the ZTV to a hub height of 40m at 1:250,000 scale. **Figure 7.5** illustrates the ZTV to a tip height of 67m at this scale. **Figure 7.6** illustrates the ZTV segments to blade tip at a more detailed scale.

7.3.2 Baseline Landscape and Visual Resource

This part of the LVIA refers to the existing landscape character, quality or condition and value of the landscape and landscape elements on the site and within the surrounding area, as well as general trends in landscape change across the study area. A brief description of the existing landscape character and land use of the area which includes reference to settlements, transport routes, vegetation cover, as well as landscape planning designations, local landmarks, and tourist destinations.

7.3.3 Assessing Landscape Effects

Landscape Effects are defined by the Landscape Institute as "*changes to landscape elements, characteristics, character, and qualities of the landscape as a result of development*". The potential landscape effects, occurring during the construction and operation period, may therefore include, but are not restricted to, the following:

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- Changes to landscape elements: the addition of new elements or the removal of trees, vegetation, and buildings and other characteristic elements of the landscape character type;
- Changes to landscape quality: degradation or erosion of landscape elements and patterns, particularly those that form characteristic elements of landscape character types;
- Changes to landscape character: landscape character may be affected through the incremental effect on characteristic elements, landscape patterns and qualities and the cumulative addition of new features, the magnitude of which is sufficient to alter the overall landscape character type of a particular area; and
- Cumulative landscape effects: where more than one windfarm may lead to a potential landscape effect.

The development may have a direct (physical) effect on the landscape as well as an indirect effect or effect perceived from out with the landscape character area. Landscape effects are assessed by considering the sensitivity of the landscape against the degree of change posed by the development. The sensitivity of the landscape to a particular development is based on factors such as its quality and value and is defined as high, medium or low. Examples of landscape sensitivity and criteria are described below:

High Sensitivity – This would primarily be rare landscapes, or landscapes which have been afforded either a national or local designation such as National Parks, National Scenic Areas or Areas of Great Landscape Value. These landscapes can be fairly dramatic in terms of scale and may feature a number of attractive landscape features, including mature woodland, intricate gorges and river valleys, prominent summits or features of cultural heritage. Man-made features or modifications to the landscape will be minimal and the landscape may have a wild or remote feeling to it;

Medium Sensitivity – This would include landscapes which are still relatively attractive and generally rural but do contain some man-made elements. It may be landscapes which have been modified to accommodate farming practices and landscapes which include more prominent settlement pattern and road networks. These landscapes may also contain woodland including plantation forestry and shelterbelts; and

Low Sensitivity – This would only be reserved for landscapes which may be deemed unattractive due to heavy modification and prominent man made features, such as industrial units.

The magnitude, or degree of change considers the scale and extent of the proposed development, which may include the loss or addition of particular features, and changes to landscape quality, and character. Magnitude can be defined as high, medium, low or negligible, examples of magnitude are shown below:

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High Magnitude – This would be a major change to baseline conditions, where the character of the landscape may be altered from its existing state into a landscape with windfarms;

Medium Magnitude – This would be a noticeable change in the baseline condition but not necessarily one which would be enough to alter the character of the landscape and will generally diminish with distance;

Low Magnitude – This would be a minor change to the baseline conditions where the development would be readily missed by a casual viewer and any character of the landscape would remain intact; and

Negligible Magnitude – This would be a change which would be difficult to notice and the baseline conditions are likely to remain almost as they were.

The level of effect is determined by the combination of sensitivity and magnitude of change as shown in **Table 7.2**.

Table 7.2 Magnitude and Sensitivity Matrix for assessing Overall Level of Effect

Sensitivity	Magnitude of Change			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor/Negligible

7.3.4 Assessing Visual Effects

Visual effects are recognised by the Landscape Institute as a subset of landscape effects and are concerned wholly with the effect of the development on views, and the general visual amenity. The visual effects are identified for different receptors (people) who will experience the view at their places of residence, during recreational activities, at work, or when travelling through the area. These may include:

- Visual effect: a change to an existing view, views or wider visual amenity as a result of development or the loss of particular landscape elements or features already present in the view; and
- Cumulative visual effects: the cumulative or incremental visibility of similar types of development may combine to have a cumulative visual effect. Either:
  - Simultaneously - where a number of developments may be viewed from a single fixed viewpoint simultaneously within the viewer's field of view without moving;
  - Successively - where a number of developments may be viewed from a single viewpoint successively by turning around at a viewpoint, to view in other directions; and
  - Sequentially - where a number of developments may be viewed sequentially or repeatedly from a range of locations when travelling along a route.

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The general principles adopted for the assessment of visual effects were taken from *The Guidelines for Landscape and Visual Impact Assessment* Third Edition, produced by the Landscape Institute, 2013. This guidance outlines the approach to define a 'sensitivity' for a given view and a 'magnitude of change' that would be caused by the development in question over its lifetime. A matrix in the Guidance is then used to assess the overall 'level of effect'. This matrix is the same format as used to understand landscape effects and can be seen in **Table 7.2**. Examples of visual sensitivity are highlighted below:

> **High Sensitivity** – These include residential receptors, such as views from individual properties or views from within settlements. Views from both recreational locations, such as hill summits, long distance footpaths, cycle paths and tourist locations such as castles and visitor centres are also considered to be of high sensitivity;
>
> **Medium Sensitivity** – This would include most other visual receptors such as views from roads, other areas of landscape which would not be classed as recreational areas and views from areas within settlements which would not be considered residential; and
>
> **Low Sensitivity** – This would cover views experienced by people at work and views where the existing view is already dominated by significant man made features.

In the context of this project, the effects during operation are always direct and long term (reversible after the operational phase of 20 years). Effects may also be non-cumulative or cumulative. None of the visual effects relating to this project have been considered positive in order to present a worst case view of any effects, although it should be noted that surveys have consistently shown that the majority of people are positively disposed to windfarm development once it is built.

Viewpoint Analysis Method

Viewpoint analysis is used to assist the LVIA from selected viewpoints within the study area. The purpose of this is to assess both the level of visual impact for particular receptors and to help guide the assessment of the overall effect on visual amenity and landscape character. The assessment involves visiting the viewpoint location in good weather and viewing wireframes and photomontages prepared for each viewpoint location. Illustrated turbines always face the viewer to give a worst case impression of the development under consideration. As far as possible the viewpoints have been selected to meet the following criteria:

- A balance of viewpoints to the north, south, east and west;
- A range of near middle and distance views of the development;
- A proportion representing areas known locally where people use the landscape, such as prominent hill tops or footpaths; and
- A proportion representing designated areas.

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A wide range of viewpoints have been studied as part of this assessment and 18 viewpoints have been illustrated with photomontages to assist the assessment for the proposed development. **Table 7.3** below provides a summary of the viewpoint locations and rationale for their selection.

Table 7.3 Summary of locations selected for Viewpoint Assessment

Viewpoint	Reason for Initial Selection	Distance
1. Balmashanner	Located at the war memorial within Forfar to the south west of the development. View is representative of residents of Forfar and visitors to the memorial.	6.1km
2. Forfar	Located in a park just off the B9134 on the eastern edge of Forfar to the west of the development. View is representative of residents of Forfar.	3.6km
3. B9134 at Howmuir	Located on the B9134 and the junction to the Howmuir property to the south of the site. View is representative of road users in the area.	1.1km
4. Borgado	Located on the western edge of the small settlement of Bogardo to the north east of the site. View is representative of residents of the village.	1.3km
5. West Mains of Finavon	Located on the A90 at the junction to West Mains of Finavon. View is representative of view experienced by road users on the A90.	1.5km
6. Bogindollo	Located at the settlement of Bogindollo just off the A90 to the north east of the development. View is representative of residents of the settlement.	1.5km
7. Hill of Finavon Fort	Located at the summit of the Hill of Finavon to the east of the development. View is representative of hill walkers in the area.	1.5km
8. Tannadice	Located on the minor road between Tannadice and Broom to the north of the site. View is representative of local road users.	4.1km
9. Turin Hill Fort	Located at the summit of Turin Hill at the fort to the south of the site. View is representative of hill walkers in the area.	2.5km
10. A932	Located on the A932 near the Lochs of Rescobie and Balgavies to the south of the site. View is representative of road users and walkers in the area.	4.7km
11. Brechin	Located on North Latch Road on the western edge of Brechin to the north east of the site. The view is representative of residents of Brechin.	11.0km
12. White Caterthun Fort	Located at the White Caterthun Road to the north of the site. View is representative of hill walkers and visitors to the fort.	12.2km
13. Airlie Monument	Located at the Ailrie Memorial which sits at the summit of Tulloch Hill. View is representative of hill walkers and tourists.	13.2km
14. Cat Law	Located at the summit of Cat Law to the north west of the development. View is representative of walkers in the area.	9.4km
15. Hill Kirriemuir	Located at the summit of Hill of Kirriemuir on the eastern edge of the settlement. View is representative of residents of Kirriemuir.	9.4km
16. Kinpurney Hill	Located at the summit of Kinpurney Hill outside Newtyle to the south west of the site. View is representative of hill walkers in the area.	21.0km
17. Glamis Castle	Located on the upper floors of Glamis Castle to the south west of the development. View is representative of visitors to the castle.	21.1km

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Viewpoint	Reason for Initial Selection	Distance
18. A90Bridge north of Forfar	Located on a minor road as it crosses the A90, chosen to represent the impact on the ridgeline at Finavon Hill.	6.4km

Methodology for Production of Visualisations

With the view selected, the locations were confirmed and then photographed with a digital Single Lens Reflex (SLR) camera set to produce photographs equivalent to that of a manual 35 mm SLR camera with a fixed 50mm focal length lens. In accordance with the SNH guidance *Visual Representation of Windfarms Good Practice Guidance,* panoramic images were produced from these photographs to record a 76° angle of view illustrating the typical extent of view that would be experienced by the viewer at the viewpoint when facing in one direction and also provides an indication of the visual context of the proposed development. The wider 360° of each view were also taken into account, particularly for the hill summit viewpoints. As well as these photomontages, Angus council also requested single frame visualisations equivalent to those of a 70mm manual SLR, these have been included in the visualisation production.

Each view was illustrated using a panoramic photograph, a wireline and, in some cases, a photomontage. Wirelines and photomontages were produced using Resoft© WindFarm software and utilising 50m² Ordnance Survey Digital Terrain Mapping (DTM) height data covering the study area.

The Landscape and Visual Impact Assessment has been undertaken using a candidate turbine, the EWT E54 the Wirelines and photomontages were modelled using the dimensions of the candidate turbine including a hub height of 40m and tip height of 67m. The Landscape Figures may be viewed as a separate A3 appendix which accompanies this report.

Visual Assessment of Settlements and Residential Properties

All settlements within the study area have been assessed with regards to the level of visual impact the development will have on them. The sensitivity for each of the settlements is considered to be high in accordance with Guidelines for Landscape and Visual Impact Assessment, 2013.

An assessment of the visual amenity of residential properties within 2km of the wind turbine was undertaken. Specific attention was paid to those properties which were deemed to have significant visual effects on their residential amenity caused the larger three turbines scheme. Individual residential properties have been assessed from public roads and footpaths within the area and the assessment represents a 'best estimate' of the likely visual effects. In line with the guidance from the Landscape Institute[3], the views from upper floor windows are considered to be of lesser importance, but the garden and public areas are included as well as the visual context in which views are experienced. In addition to this all settlements within the study area have been assessed and level of effect noted.

[3] Paragraph 6.36 page 114 in 'Guidelines for Landscape and Visual Impact Assessment. Third Edition.' Landscape Institute and Institute of Environmental Management and Assessment. April 2013.

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Visual Assessment of Main Transport Routes
A route assessment has been undertaken which explores the visual impact of the development on views experienced by road users along major transport routes in the area and assumes that the viewer would be travelling at speed.

It also includes assessment of any National Cycle Routes, Long Distance Footpaths and locally valued footpaths which fall within the study area. This part of the assessment has been considered cumulatively along with all other wind energy development within the study area.

Cumulative Landscape and Visual Assessment
In addition to the Landscape Institute methodology for LVIA, the cumulative landscape and visual assessment (CLVIA) has considered the emerging guidance from Scottish Natural Heritage's *Assessing the Cumulative Impact of Onshore Wind Energy Developments,* Scottish Natural Heritage, March 2012. The CLVIA is however, not a substitute for individual windfarm landscape and visual impact assessment.

Predicting Cumulative Landscape Effects
The assessment considers the extent to which the proposed development, in combination with others, may change landscape character through either incremental effect on characteristic elements, landscape patterns and quality, or by the overall cumulative addition of new features. Identified cumulative landscape effects are described in relation to each individual Landscape Character Area and for any designated landscape areas that exist within the study area.

Predicting Cumulative Visual Effects
The assessment of cumulative visual effects involves reference to the cumulative visibility ZTV maps and the cumulative viewpoint analysis. Cumulative visibility maps are analysed to identify the residential and recreational locations and travel routes where cumulative visual effects on receptors (people) may occur as a result of the proposed development.

With potential receptor locations identified, cumulative effects on individual receptor groups are then explored through viewpoint analysis, which involves site visits informed by wireline illustrations that include other wind developments. Travel routes are driven to assess the visibility of different wind developments and inform the assessment of sequential cumulative effects that may occur along a route or journey.

Cumulative Viewpoint Analysis
Each viewpoint has been assessed cumulatively in order to understand whether or not the proposed development introduces a cumulative impact on the view from that location. All visible operational, consented and undetermined planning application wind energy projects are considered along with the Finavon Hill Wind Turbine development and a level of cumulative magnitude is assigned. The level and significance of cumulative visual effects is determined in the same manner as the main LVIA, using the previous matrix shown in **Table 7.2**.

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7.4 Landscape Design Considerations

7.4.1 Project Description

The Finavon Hill Estate Wind Turbine would include the construction of a single turbine in the Low Moorland Hills landscape on the Finavon Estate, this would be the section of the landscape which makes up the Forfar Hills sub type. The turbine would be 40m in hub height and 67m to blade tip and positioned 25m below the ridgeline.

7.4.2 Landscape Design Considerations

In accordance with SNH's *Strategic Locational Guidance for Onshore Wind Farms*, the site location would lie within Zone 1, which is described as follows:

> *Zone 1: Lowest natural heritage sensitivity identifies areas at the broad scale with least sensitivity to wind farms, with the greatest opportunity for development, within which overall a large number of developments could be acceptable in natural heritage terms, so long as they are undertaken sensitively and with due regard to cumulative impact.*

However, this assessment is the result of a broad based study and provides an indication only. The Finavon Hill Estate site has been subject to LVIA in accordance with the relevant EIA Regulations.

7.4.3 Landscape Capacity

In 2012 Angus issued the '*Implementation Guide for Renewable Energy Proposals*' which gave guidance on turbine location and turbine height. The Development is located within the Low Moorland Hills LCT and within the Forfar Hills sub type with it describes as being a 'Landscape with Views of Wind farms' and had the capacity to become a 'Landscape with Occasional Windfarms' where it stated that the Forfar Hills was:

> *Considered to have scope for turbines circa 80m in height which do not disrupt the principle ridgelines or adversely affect the setting of important landscape features and monuments such as Blamashanner Monument, and Finavon and Turin hillforts.*

Whilst this is still considered to be a material planning consideration, additional guidance has since been in the form of the '*Strategic Landscape Capacity Assessment for Wind Energy in Angus'*. This also provides capacity recommendations for the Low Moorland Hills LCA and the Forfar Hills sub type. The implementation guide indicates that turbines circa 80m would be suitable within this landscape, however the landscape capacity document suggests a blanket approach over the whole area. This is non site specific and states that there would only be capacity for small/medium and medium scale turbines, which would be turbines under 50m in height and is described below:

> *A varied landscape of small steep hills and rolling/undulating farmland. Both the higher visual sensitivity and complex, modest scale landforms indicate that only small groups of turbines up to 50m would be appropriate to this area.*

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Consideration should be given to the following:

- Both documents indicate that there is capacity for wind turbine development within the Forfar Hills sub type landscape, however they give two different tip heights of 50m and 80m regarding the appropriate capacity.
- Taking this guidance on board the development should seek to provide a scheme which does not diminish the scale of this landscape or become a prominent feature and defining feature of the hill.
- In order to do this, the impressive horizontal stretch of the Finavon ridgeline should be maintained and still function as a backdrop and enclosure to the valleys to the north and south.
- The final design of the development selected a 67m tall turbine as, despite being above the 50m guidance set out in the Landscape Capacity Assessment, it was well with the 80m recommendation in the Angus Council Implementation Guide and is now sited 25m below the existing ridgeline.

It was important to the design that any turbine did not diminish the scale of the hills either vertically or horizontally nor significantly interrupts the ridgeline, and it was decided that a single 67m turbine, whilst seen on part of the ridgeline did not alter its ability to function as a ridgeline nor diminish its scale.

7.4.4 Layout Design

The design of the project, especially turbine location, has been considered through consultation with the project engineers and visually through the use of the viewpoints and the potential to impact on the Finavon Hill Estate ridgeline. The proposed, broad location has been chosen as it is considered to represent the best compromise between technical and environmental considerations as well as the feedback received from the previous three turbine application, which was deemed to be out of scale with the surrounding topography.

The revised position of the turbine off the summit of the ridge was selected as it would lower the overall height in the landscape of the turbine tip, thus impacting less on the ridgeline. It is considered that the turbine only interrupts the ridge briefly and is not considerably higher than the summit of the hill. Moving the turbine off the ridge also significantly reduces the visual impact and impact on residential amenity on properties and roads to the south of the development as well as limiting its impact to blade tips on Turin Hill Fort. Please refer to **Section 5** for a detailed explanation of the design process.

7.4.5 Turbine Selection

The LVIA has been assessed on the basis of a turbine up to a maximum height of 67m. The primary reason for this was the negative feedback received on the 99.5m turbines as well as the guidance given within the Implementation Guide, which specifies that this landscape has the capacity to contain turbines of 80m to tip height.

The relationship between the turbine and the rounded linear hill of the local landform, landscape scale, and views from the surrounding settlements, in conjunction with the on-site constraints are the major factors affecting the design. The turbine was specifically

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chosen and located in order to maintain a 1:3 with the vertical scale of the topography, which is suggested in the SNH document 'Siting and Designing Windfarms in the Landscape'.

Other likely design considerations include the following:

- Modern turbines will be used that have a simple and balanced appearance with three blades and tapered, non-lattice towers; and
- The turbines will be semi-matt and pale grey in colour to reduce its contrast with the background sky under most weather conditions.

7.4.6 Construction Activities

Temporary landscape and visual effects would occur during the construction period, and would result from the visibility of construction activity, use of lay down areas, and site compounds. The landscape and visual effects would be of a low to negligible magnitude of change and not be significant.

The lay down area and compound would be located in a field adjacent to the proposed turbine location. During the construction period the landscape and visual effects would be significant due to the movement and contrast of men and machinery in this area. These effects would be temporary and fully restored on completion.

All disturbed areas resulting from the construction (around turbine bases, access tracks and on site compounds and lay-down areas) will be restored upon completion of the construction period.

7.4.7 Decommissioning

All of the visible, above ground structures (turbines, substation and grid connection) will be removed upon decommissioning, thus rendering the landscape and visual effects of the development as reversible. There would therefore, be no landscape and visual effects remaining after decommissioning.

7.5 Baseline Position

Information on the existing landscape and visual resource, or baseline landscape and visual conditions, has been collected by reference to Local Plans, OS maps and relevant literature, including the Tayside Landscape Character Assessment and the Cairngorms Landscape Character Assessment as well as information gathered from field surveys.

7.5.1 Broad Landscape Context

The study area for the proposed development (**Figure 7.1**) is located within the Tayside Landscape Character Assessment. The Tayside area stretches inland from the coast and Tay estuary encompassing the city of Dundee and the route of the River Tay until it meets the Cairngorms National Park in the north. The area features a number of settlements particularly along the Broad Valley Lowland Area, including Blairgowrie, Coupar Angus, Forfar, Kirriemuir and Brechin. Dundee and other larger settlements such as Arbroath and Perth further out from the site are not predicted to have any views of the project. The area includes a variety of landscapes, ranging from large areas of intensively farmed arable land to the major uplands.

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Figure 7.1 illustrates the various landscape characters types, which have been classified and assessed by Scottish Natural Heritage and their consultant landscape architects. It can be seen from **Figure 7.1** that the site study area is covered by two different area reports.

The proposed development site is located in The Tayside Lowlands Regional Landscape Character Area as defined by the Tayside Landscape Character Assessment document. Within the Tayside Lowlands the site is within the Low Moorland Hills landscape character type. This landscape area is described as follows:

> *"These hills comprise a combination of the more resistant components of the Old Red Sandstone series and areas of volcanic rocks. The resistant sandstone is clearly visible where crags form outcrops on the Hill of Finavon and Turin Hill. Elsewhere, however, the landform is rounded and smooth. Along the southern side of the River South Esk the northern boundary of the resistant lavas is visible as a steep, straight escarpment running west from the coastal cliffs south of Montrose towards Farnell. Rescobie Loch and Balgavies Loch, both of which are of importance for nature conservation, lie in a narrow valley between Turin Hill and Dunnichen Hill. These lochs feed the Lunan Water which flows eastwards to the coast.*
>
> *Although lying just 100-150 metres above the surrounding lowland farmland, these hilltops have a very different character, in part reflecting their more recent reclaimation and improvement. In agricultural terms, the ridges of the Dunnichen Hill, Hill of Finavon and Turin Hill are categorized as Class 6(2) compared with the surrounding farmland which falls into Classes 3 or even 2. The poorer nature of the eastern part of these hills is reflected in their healthy character (including the survival of gorse and bracken along field boundaries), the existence of large areas of coniferous woodland (other lowland is regarded as being too productive to put into woodland) and the presence of wetland areas. Place names such as Muirton, Muirside, Mostonmuir and Rossie Moor all point to the past or current heathland character.*
>
> *Settlement on the Low Moorland Hills is limited to a dispersed pattern of farmsteads on the unforested part of Montreathmont Moor. However, there is extensive landscape evidence of earlier phases of human activity. This includes the dramatic Iron Age hillforts sited on the craggy summits of the Hill of Finavon and Turin Hill. Nearby, at Aberlemno, are some of the finest examples of Pictish sculptured stones and crosses in southern Scotland. Also near Aberlemno stands Melgund Castle, a 16th century, four storey stronghold. The concentration of these sites, spanning two millennia, points to the significance of these hills, marking the divide between the lowland route of Strathmore and the coastal lowlands to the south. Modern encroachments onto these hills are limited to a handful of telecommunication masts. Extensive sand and gravel working takes place at the western foot of Turin Hill, and there were recent proposals to extract igneous rock from Dunnichen Hill. The hilltops provide fine viewpoints looking*

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northwards across the valley lowland to the Highland Foothills and the Highlands themselves."

Immediately to the north of the proposed site, lies an area of landscape referred to as the Broad Valley Lowlands, also part of the Tayside Lowlands regional character area, this area is the location where the majority of the theoretical visibility is predicted and is described as:

"These areas share a common geological structure, based on the broad band of Old Red Sandstone that runs south-west to north-east through the heart of Tayside. Bounded by harder schists and grits to the north and lavas to the south, and already lowered by downfaulting, this soft rock was easily eroded by the ice sheets which extended across the region during period of glaciation. These created much wider and deeper valleys than the scale of existing rivers might suggest. At the end of the last Ice Age, retreating ice sheets deposited a considerable amount of drift within these valleys, much of which was further modified by meltwater flows below or around the ice. This created the complex local topography of outwash terraces, eskers and dry valleys that occur in many places today. Much of the glacial material was locally derived and have given rise to the distinct red soils that are visible when fields are ploughed. Brighter reds tend to be found further north and east.

While surviving standing stones and other monuments point to the prehistoric use of these areas, most of the present landscape has been substantially modified since medieval times. Valleys such as Strathmore had comprised extensive areas of rough grazing, scrub woodland and unproductive wetland. The process of draining and improving the land was begun in the 10th century when groups of monks came to the area. One of the principle centres was Coupar Angus where a major Cistercian Abbey was founded in 1164, and many of the processes of improvement entered new phase with the parliamentary enclosure of the 18th and 19th centuries, creating the structure of rectilinear fields that are evident today. A characteristic of this period of enclosure was the planting of many trees (oak, beech, chestnut and ash) along field boundaries. These would have given shelter and provided a source of building timber and firewood. Up to 200 years later, where they survive these mature (or even over-mature) trees make a critical contribution to the rich character of the Broad Valley Lowlands. The large estates, with their baronial mansions and castles, designed landscapes, pleasure grounds, ornamental woodlands, avenues and policies make an equally important contribution.

The 19th century also saw the rationalization of estates, including the creation of new villages to accommodate farm workers, and the arrival of the railways. Market towns such as Kirriemuir, Coupar Angus and Forfar experienced growth during this period, reflected in their inner suburbs of Victorian terraces and villas. Agriculture has continued to develop. More and more land has been brought into production. Flood defences have been constructed along rivers allowing arable cultivation to spread into the floodplain. The fertility of the soil, allied to

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favourable climate conditions have favoured the cultivation of cereals, oil seed rape, soft fruit and potatoes."

In addition to these there are also a number of other landscape character areas that are included within the study area. Below **Table 7.4** summaries all landscape character areas that are situated within the study area.

Table 7.4 - Key Characteristics of Landscape Character Areas

Name	Key characteristics
Tayside Landscape Character Assessment	
Highland Summits and Plateaux	Are areas of upland separating the principal glens with vegetation patterns that closely reflect the altitude and exposure, including heather, grassland, blanket bog and arctic alpine plant communities. There is little or no settlement and most of the area is managed as open moorland. This area is one of the most remote and wildest landscapes within the UK.
Mid Highland Glens	These are the mid sections of the principle Highland Glens and contain a concentration of agricultural activity on narrow but distinct valley floors. There is a predominance of rough grazing, bracken, heather moorland with substantial areas of commercial coniferous forestry.
Highland Foothills	This is a complex geological structure resulting from its position along the line of the Highland Boundary Fault. It features whale backed hills, winding gorge like main river valleys and is a gateway to the Angus Glens. A complex landscape which features glimpses of the Highlands and lowland areas.
Dipslope Farmland	Is an extensive area of land, generally sloping from the north-west to the south-east and is dominated by productive agricultural land. It features low woodland cover, except for the large estates and along river corridors. Settlement pattern in the area is dispersed and includes some suburban development.
Igneous Hills	This character covers the Sidlaw Hills to the north and west of Dundee comprising of hard volcanic rock. It features short burns and rivers flowing from short steep glens with a few larger glens through the hills. It is a generally open landscape of mostly conical summits dominated by grass moorland and areas of forestry.
Firth Lowlands	This landscape is predominantly flat and fertile, it is enclosed by the steep Sidlaws escarpment to the north and bounded by the Firth of Tay to the south. It features large rectangular fields with decaying structure of hedges and hedgerow trees and is a well settled area.
Lowland Basin	The Montrose Basin is a large, rounded estuarine basin formed near the mouth of the River South Esk. The basin is tidal, revealing extensive mudflats at low tide with an area of low lying, drained farmland which extends inland, while the basin is separated from the sea by Montrose, located on a low peninsula split of land less than 2km wide.
Urban Areas	The urban area would include Dundee and its surroundings to the south of the site. Set within the dipslope farmlands and located along the estuary of the River Tay this area is characterised by its transport corridors, high rise residential flats, industrial areas and housing estates.
Fife Landscape Character Assessment	
Upland Foothills	These are highly conspicuous foothills which define the edge of other landscape types and the extent of the view. They are natural slopes which are gentler and less pronounced than the Upland Slopes but usually steeper and higher than the lowland hills. Features include gullies, narrow glens, woodland and an abundance of farmsteads.
Coastal Flats	The Coastal Flats are flat, low lying, open, large scale, exposed coastal landscapes at sea level, which are intensively cultivated, geometrically laid out and large to medium scale. Landcover is predominantly arable fields and forestry plantations with a variety of other land uses such as industrial and other built developments.
Coastal Terrace	These are mostly flat or gently sloping landforms which sit above and slope towards the Coastal Flats and coast, lying below the Coastal Hills. The landscape is either extensively built upon or relatively undeveloped comprising large, open, undulating, arable fields with infrequent or more regular steadings. The area contains some policy planting and shelterbelts around the larger houses and designed landscapes.
Coastal Hills	These have a close association with the coast, either through views of the sea, the Firths or the estuaries or indirect coastal experiences of sounds, smell etc. They are predominantly large, open, undulating arable fields which often have no fields boundaries and little vegetation cover.
South and Central Aberdeenshire Landscape Character Assessment	

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Name	Key characteristics
The Mounth	This is a large scale landscape of smooth rolling landform and rounded summits, which contains substantial highland outcrop forming a prominent undulating ridge that dominates views south of Aberdeen. It has heavily forested edges and extensive areas of moorland and grasses.
Howe of the Mearns	This landscape is almost uniformly flat with intensive agriculture within large geometric fields where mixed farming lends a colourful tapestry to views. The area is home to a major corridor of road and rail links.
Garvock and Glenbervie	This is a large scale landscape with open rolling ridges and large fields of arable land and pasture or red soils, presenting a tapestry of colours. Man made features include radio masts which are prominent on high points and scattered settlement pattern.
Kincardine Links	This is an area of raised beaches backed by low cliffs and a gently sloping agricultural hinterland. The cliff slopes are well vegetated with grasses and scrub and the raised beaches encompass open farmland, marsh and reedbed, with little woodland, as well as a narrow sandy fringe. Expansive views across the sea are fundamental to the character of this landscape.

7.5.2 Land use and Landscape Change

The study area is dominated by pasture land particularly around the site and intensive agriculture within the valleys either side of the Finavon Hill. To the north west the edges of the Cairngorms National Park and mountain range are located and due to its unique character and high landscape value, has a real sense of remoteness and unspoiled character containing limited man made features. Further east the landscape becomes busier featuring more manmade elements as the landscape becomes flatter and more coastal in nature. Generally speaking, over time, the fields have become larger with the removal of hedgerows, woodland, wetland and traditional field boundaries to increase productivity.

7.5.3 Local Landscape Character

The Finavon Hill Estate site is along a small ridge in the centre of the Low Moorland Hills landscape character area sitting at ~210m AOD at the summit of Finavon Hill. The site is currently in an area of rough grassland and moorland. Around the local area the landscape is predominantly arable farmland and pastureland which sits on the lower slopes of Finavon Hill both to the north and to the south, this landscape tends to be flatter and gently rolling. As the landscape gets steeper areas of coniferous plantations are common on the slopes, leading up to the rough grassland which covers the summit. More common of the northern slopes are areas of deciduous shelterbelt separating pastureland. Within the site itself there is a small cluster of mixed woodland, which would sit between two of the turbines. In the wider area the landscape to the north and south of the site takes on a valley character with the River South Esk, Lemno Burn and A90 running along parallel to the hill and within this sits a number of small clustered settlements and some policy woodland. To the south Finavon Hill and Turin Hill create a narrower valley, within which farmsteads are the more prominent typology. Man made features other than farm infrastructure include a line of electrical pylons which run along the southern edge of Finavon Hill.

Landscape Elements and Features

Landscape elements are the component parts of the landscape, such as trees, woodland and ponds that combine to form areas of landscape character. Often these characteristic elements may be distinctive to a particular regional area of landscape character or more localised area of landscape character type. The main elements of landscape character

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across the region include, some small areas of coniferous plantation, arable fields and pastureland with some dry stone dykes. Shelterbelts and policy woodland is also a common feature with mature woodland featuring around the numerous small villages in the area as well as along the edges of the River South Esk. Forfar and Brechin are two settlements which act as focal points for development, industry and retail. Between these two settlements there are a few farmsteads and hamlets that keep the area from having a 'remote' feel as activity is present in most directions.

7.5.4 Broad Visual Context

The visual character of the landscape to the west of the study area is of rolling agricultural land which sits within the Strathmore valley and contains settlements, roads, rivers and a patchwork of fields and woodland. Views to the north west are dominated by the large scale topography of the Cairngorms mountain range which form vast peaks that are in complete contrast to the views south. To the east the landform changes and becomes flatter and more coastal, with views tending to be out over the North Sea or along the coastline.

Weather conditions

Changing weather patterns and local climatic conditions will influence the visibility of the wind turbine in terms of the extent of view, the colour and contrast of the turbine and thus the perceived visual impact. There will be periods of low visibility (fog, low cloud, and bright sunny conditions that are accompanied by haze generated by temperature inversions) as well as periods of high visibility in clear weather. In some instances and from some locations the wind cluster may be 'back-lit' (e.g. appearing darker in colour during sunset/sunrise and periods of pale or white blanket cloud) and in other circumstances may appear to be 'up-lit' (e.g. during stormy periods that combine dark clouds and bright sunshine).

7.5.5 Landscape Planning Designations

The study area for the proposed development as shown in **Figure 7.2** is primarily located within Angus Council although there is also part of the study area within Fife Council, Aberdeenshire Council, Dundee City Council and the Cairngorms National Park. The local development plans contain a number of policies which seek to protect landscape resources, and although there are no designations on the site itself, the study area includes a number of designated landscapes that are relevant to this assessment. The key landscape planning designations are illustrated in **Figure 7.2**.

Landscape planning designations and policies are considered in the determination of the sensitivity of landscape and visual receptors as they provide an indication of value ascribed to the landscape or visual resource.

Those designated landscapes that overlap the ZTV (and may potentially have views of the proposed development) have been considered as part of this assessment and are listed in **Table 7.5**. Other planning policies and designated landscapes outwith the ZTV have been excluded from this study.

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Table 7.5 - Landscape Planning Designations

Designation	Description
National Parks	**Cairngorms National Park** is located ~21km to the north of the proposed development and covers only a small amount around the north west edge of the study area.
National Scenic Area (NSA)	**Cairngorms Mountains NSA** is located within the National Park on the northern edge of the study area, ~28km away. The designation is within the area of Aberdeenshire within the study area. This designation is covered by **Policy Env\5A** in the Aberdeenshire Local Plan.
Area of Landscape significance (ALS)	**Aberdeenshire ALS** is a large section of landscape covering much of the area adjacent to the national park within Aberdeenshire. This designation covers the Howe of the Mearns landscape and is located ~18km to the north east of the proposed site. This designation is covered by **Policy Env\5A** in the Aberdeenshire Local Plan. **Coastal ALS** is the narrow section of landscape sitting along the coast around the settlement of St Cyrus. This designation covers most coastal areas within Aberdeenshire and is located ~24km to the south west of the proposed site. This designation is covered by **Policy Env\5A** in the Aberdeenshire Local Plan.
Gardens and Designed Landscapes (GDL)	(Listed in the Inventory of GDL for Scotland) are designated for their unique combinations of horticultural, landscape, scenic and historic interest. This designation is covered by **Policy ER20** in the Angus Local Plan and **Policy 47** in the Perth & Kinross Eastern Area Local Plan, **Policy 16** of the Dundee Local Plan and **Policy Env\20** of the Aberdeenshire Local Plan. **Ascreavie**, is located ~15km to the west. **Airlie Castle**, is located ~19km to the west. **Cortachy Castle**, is located ~9km to the north west. **Glamis Castle**, is located ~11km to the south west. **Drumkilbo**, is located ~21km to the south west. **Camperdown House**, is located ~25km to the south west. **Balgay Park**, is located ~26km to the south west. **Baxter Park**, is located ~24km to the south. **Guthrie Castle**, is located ~8km to the south east. **House of Pitmuies**, is located ~9km to the south east. **Brechin Castle**, is located ~10km to the east. **The Guynd Angus**, is located ~15km to the south. **Kinnaird Castle** is located ~13km to the east. **House of Dunn** is located ~20km to the east. **Craig House** is located ~21km to the east. **Dunninald Castle** is located ~20km to the east. **Edzell Castle** is located ~17km to the north east. **The Burn** is located ~19km to the north east. **Fasque House** is located ~25km to the north east.

7.5.6 Wind Energy Development Included in the CLVIA

The cumulative assessment includes existing wind energy development (those operating or under construction), proposals with planning permission, and those that are currently the subject of undetermined applications within a 60km radius of the Hill of Finavon site. Other known pre-application wind energy development proposals have been identified as part of the assessment process and considered in outline only, due to the more limited information available in connection with these proposals.

The list of other wind energy development sites to be included in the assessment has been confirmed with Angus Council and SNH and compiled from known wind energy

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development planning applications and formal requests for scoping opinions held by the various planning authorities.

Wind energy development included or referred to in this assessment out to 60km are listed in **Table 7.6** and illustrated on a plan in **Figure 7.7**.

Table 7.6 Summary of Key Wind Energy Projects within 60km Cumulative Study Area

Development Name	Scale of Project (Single turbine, Cluster or Windfarm)	Distance to Project (approx. in km)
Operational Projects		
East Memus	Single Turbine	~8km
White Top	Single Turbine	~8km
Pickerton	Single Turbine	~8km
Balhall Lodge	Single Turbine	~9km
Meathie Farm	Wind Cluster	~9km
North Mains of Cononsyth	Single Turbine	~11km
Ark Hill	Windfarm	~17km
Hill of Stracathro	Single Turbine	~18km
Scotston Hill	Single Turbine	~20km
Tullo	Windfarm	~30km
Drumderg	Windfarm	~32km
Consented projects		
Carsgownie	Single Turbine	~2km
Broom Farm	Single Turbine	~6km
Crainathro Farm	Single Turbine	~7km
Dunswood	Single Turbine	~8km
Gallow Hill	Single Turbine	~9km
Afflochie Farm	Single Turbine	~9km
Hillhead of Ascurry	Single Turbine	~9km
Govals	Windfarm	~12km
Frawny	Windfarm	~14km
Projects in Planning		
Kalula House	Single Turbine	~5km
Forfar Golf Course	Single Turbine	~6km
Cotton of Pitkennedy	Single Turbine	~6km
Balnacake	Single Turbine	~8km
East Drums	Single Turbine	~10km
Glenhillock	Single Turbine	~10km
Nathro Hill	Windfarm	~14km
Arbike	Wind Cluster	~16km
Bamff Hill	Windfarm	~26km
Tullymurdoch	Single Turbine	~27km

7.6 Assessment of Landscape Effects

7.6.1 Introduction

Landscape Effects are defined by the Landscape Institute as "*Change in the elements, characteristics, character, and qualities of the landscape as a result of development.*" These effects are assessed by considering the landscape sensitivity against the magnitude of change. A matrix is used to guide the evaluation or level of effect as illustrated in **Table 7.2**.

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The type of effect may also be described as temporary or permanent, direct or indirect, cumulative and positive, neutral, or negative.

7.6.2 Direct Effects on Local Landscape Character

Landscape Sensitivity of Local Landscape Character

The landscape is somewhat man modified with the busy A90 immediately to the north and a line of electricity pylons running just south of the site. The area does not have any sense of wildness or remoteness about it with Forfar being so close and farmsteads scattered across much of the landscape. The general landcover for much of the area is rough grassland used for grazing and the overall feel is one of a fairly uniform landscape with little or no significant features. There are small farmsteads particularly to the south of the site and the A90 runs along the foot of Hill of Finavon to the north. The quality of the landscape is generally medium.

In terms of landscape value, within the study area, the landscape area is not covered by any designations but may be valued locally. Overall the landscape value is medium.

The overall sensitivity of the local landscape character is considered to be medium.

Magnitude of Change

During operation and construction, the Finavon Hill Estate wind turbine would occupy and directly affect a minor area of the local landscape character leading to a low overall magnitude of change. There would be no loss of any significant landscape features as a result of the turbine, with the actual development footprint being particularly negligible. The magnitude of change is considered to be low, which would result in the overall level of direct landscape effects on the local landscape character resource being **moderate/minor** and not significant, long term (reversible) and negative.

7.6.3 Indirect Effects on Hill of Finavon Ridgeline

The ridgeline is an important landscape feature which makes up part of the Low Moorland Hills LCA and provides a backdrop and enclosure to the Strathmore Valley to the north and the Lemno Water Valley to the south. Its horizontal extent can be visible from the landscape to the north, where it extents for ~14km in length and at its highest point is 229m AOD. The ridgeline runs from Forfar in the west to Brechin in the east and the A90 runs along its northern edge. It is considered to be one of the principle ridgelines within Angus and as such is of a high sensitivity as a landscape feature.

Magnitude of Change

The reduction from three turbines to a single, smaller turbine has drastically reduced the visual envelope created by the development and now sits off the top of the ridgeline, located down the northern slope of the Hill of Finavon. From the majority of views the vertical scale of the turbine is consistent with the guidance offered in the SNH document '*Siting and Designing Windfarms in the Landscape'*, in that it is inside one third of the vertical scale of the hill. Keeping within this ratio limits any diminishing effects on the scale of the landscape as well as removing any overbearing effects.

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While the previous development occupied approximately 1km of the horizontal aspect of the ridgeline, which is approximately 14km in length, the new scheme only occupies the diameter of the blades (54m) and therefore only a negligible extent of the ridgeline is actually impacted.

There are some views to the north around Tannadice where the entire ridgeline is visible in its full extent and from here **Viewpoint 8** demonstrates the limited impact the development has on the ridgeline as a whole. The scale of the ridgeline is not diminished and as such, if the development were to be constructed, it would still function as a backdrop to views from both the north and south as well as providing enclosure to the valleys of Strathmore and Lemno. It is an important ridgeline and the development is sympathetic to this, only affecting a negligible section and keeping in scale with the topography, whilst still allowing it to function its primary duties.

From the south the ridgeline is even less affected which can be seen in a few of the **Viewpoints** (**3** and **9**), effects here on the character of the ridgeline are now almost negligible.

The capacity study and the implementation guide both indicate that developments should not interrupt the principle ridgelines. Any turbine, whether it is 20m or 120m, in this landscape (which has capacity for development) would affect the ridgeline and interruption should not have a zero tolerance policy i.e. if the turbine rises above the horizon the threshold is broken. Whilst the turbine is visible rising above the ridgeline from some viewpoints, by virtue of its scale and location, it does not significantly interrupt the ridgeline and does not significantly affect either its character or function. Plantation forestry which can be found intermittently along the ridge also currently interrupts the horizon. As a whole the magnitude of change on the ridgeline would be low, resulting in a **moderate** level of effect which would not be significant.

7.6.4 Indirect Effects on the Wider Low Moorland Hills LCA/Forfar Hills

Landscape Sensitivity of Low Moorland Hills LCA/Forfar Hills

The Low Moorland Hills Landscape Character Area covers much of the landscape between Forfar and Brechin, where this landscape is defined by the small hill summits at Hill of Finavon, Turin Hill, Pitscandy Hill and Dunnichen Hill. These hills tend to be rounded with arable farming taking place in the valleys between them and on the lower slopes. The scale of this landscape is medium with some areas of coniferous plantation particularly at Montreathmont Forest and some areas of policy woodland in the lower ground around the farmsteads and water courses. The quality of the landscape is generally medium.

In terms of landscape value, within the study area, the landscape area is not covered by any landscape designations. Overall the landscape value is medium.

The Landscape Capacity study indicates a number of features which influence the 50m height capacity, these include the following:

- Providing a backdrop to the settlement of Forfar;

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- Defining the southern edge of the South Esk section of Strathmore;
- Visual influence over the A90;
- Proximity of features such as Finavon Hillfort, Turin Hillfort, Aberlemno Standing Stones;
- Scattered Settlement across the farmland; and
- The distinctive Rescobie Lochs and the A932.

The overall sensitivity of the Low Moorland Hills LCA is considered to be medium.

Magnitude of Change

During operation, the Finavon Hill Estate wind turbine would occupy and directly affect only a negligible area of the Low Moorland Hills, however it may be visible from across the character area indirectly affecting its character. The ZTV shows that visibility would cover most of the character area, particularly affecting the area immediately around the site and the landscape around Montreathmont Forest. Its location to the north of the ridge which is flanked by two small valleys to the north and south, mean that there would be visibility within these areas, however is much restricted to the south and views from within the B9134 valley would typically be of blade tips and would be an indistinct feature on its character. The following sections will address the impact the development has on the defining characteristics of the landscape type and those which have influenced the capacity study.

Whilst the turbine will be visible from parts of Forfar as can be seen in **Viewpoint 2** it will not be a significant impact and is seen rising from behind the horizon, with much of the tower screened. The turbine is in scale with the vertical extent of the ridge and does not diminish it, a fairly lengthy horizontal extent is visible and again only marginally affected. This impact would not be sufficient to alter the perceived scale of the ridge or its ability to provide a backdrop to the settlement of Forfar.

The full ~14km runs along the southern edge of the South Esk section of Strathmore and as previously discussed the development would only affect a 54m section of this ridgeline. As can be seen in a number of the viewpoints the turbine when visible is in scale with the vertical extent and does not diminish its scale. Whilst visible from much of the south Esk area the turbine is only a minor feature and is affect on the horizon brief. Again it is unlikely that a turbine of this height would affect the hill's ability to define the southern edge of this landscape particularly as its scale does not diminish the perceived scale of the hills when viewed from the north.

Whilst visible from the A90, significant views would only be experienced as the route passes the site directly, at which point views would be oblique. Even when the turbine is visible it does not alter the hill or ridgeline's ability to provide an edge to this route and the impact on a busy commuter route should not really have an influence on the scale or capacity of the landscape.

The hillforts and standing stones have been assessed as part of the Cultural Heritage Assessment (**Section 9**) and no significant effects were found from Finavon Hillfort, Turin

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Hillfort or Aberlemno Standing Stones, the latter of which is outwith the ZTV and would have no views of the turbine. The impact on both Finavon and Turin Hillforts is greatly reduced with Turin having only blade tip visibility which is backdropped by the foothills to the north and Finavon having significant screening provided by vegetation. The setting of these features along with Balmashanner Monument and the White and Brown Caterthun would remain intact and significantly screened from most. The hill and the surrounding landscape would still provide setting to these features and the addition of the turbine would not impact on the landscapes ability to do this.

There are a number of smaller settlements across the landscape, however most receive no views of the development with the hills at Finavon and Turin providing screening from places such as Aberlemno, Rescobie and Guthrie. Most views occur in the wider open landscape of the Broad Valley Lowland to the north, however even here the turbines tends to be a minor feature which is seen in scale with the surrounding topography. The setting of settlements within the Low Moorland Hills is almost unaffected by the development and as such will not impact on this feature of the wider LCT.

Due to the reduced scale of the development there are now no views predicted from the Rescobie Lochs or the A932 and as such this area and these features of the LCT remain intact and unaffected. Thus the development's impact on this aspect of the character of the Low Moorland Hills is no existent and they still contribute to the character area as a whole.

Considering the impact the development has on the landscape, viewed alongside the landscape features and the features which make up this landscape the magnitude of change is considered to be medium, which would result in the overall level of direct landscape effects on the Low Moorland Hills character resource being **moderate** and not significant, long term (reversible) and negative.

7.6.5 Indirect Effects on Neighbouring Landscape Character Areas

Neighbouring areas of landscape character are formed by Lowland River Valleys, Lowland Hills, Highland Foothills and Broad Valley Lowlands.

None of these areas would be directly affected by the turbine and there would be no direct effects on the key physical characteristics that form the areas landscape character or their quality and integrity. However, the turbine may be visible from these areas and as such could indirectly affect the landscape character where particular views or scenic qualities are noted as a key characteristic of the landscape. Alternatively, the turbine could be frequently visible and particularly prominent in the landscape such that the addition of this new feature affects the character of the area. Located on a small local hill at the eastern edge of the Strathmore valley the development is likely to only affect the immediate landscape, with views from the board valley lowlands, despite being predicted across the entire landscape character only limited to the areas immediately north. Areas further east and west inside this character will have distant views and generally be indistinct.

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Table 7.8 - Indirect Landscape Effects on Neighbouring Landscape Character Areas

Landscape Character Area	Assessment
Tayside Landscape Character Assessment	
Broad Valley Lowlands	The Broad Valley Lowland is the Strathmore area which runs diagonally across the study area, encompassing Alyth, Kirriemuir, Forfar and Brechin. A number of Major transport routes pass through this landscape including the A90, the A94, and the A926. The ZTV indicates the majority of the landscape will receive views of the development. This landscape character is within ~2km of the development and most areas will see the turbines visible against the sky sitting on the northern slopes of the Hill of Finavon. The landscape character area is considered to be of medium sensitivity due to the relatively developed nature of the landscape, with a number of substantially sized settlements and major road networks. Overall the magnitude of change would be low and the overall level of effect would be **moderate/minor**, indirect, negative and reversible. Viewpoints 2, 5, 6, 8, 11, 13 and 15 all show examples of what the development will look like from sections of this landscape. None of these viewpoints were found to have significant levels of effect.
Highland Summits and Plateaux	The Highland Summits sit to the northern edge of the study area as the topography begins to rise towards the Cairngorms Mountain range. The ZTV predicts that there would be very little visibility of the project from within this character and that the only views would be from the summit of brief areas on south facing slopes. Any visibility would be at over ~13km and would not affect the character of this remote landscape as the turbines will be associated with the busier lowland landscape of Strathmore. Viewpoint 14 from Cat Law shows a typical view from one of the summits. The landscape character area is considered to be of high sensitivity due to its remote nature. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Mid Highland Glens	The Mid Highland Glens sit between the Highland Summits and as such have limited visibility of the project, only a small area around the southern slopes of the Hill of Wirren would have any visibility and would be at ~19km distance. As a result of this the impact on the character would be limited. The landscape character area is considered to be of high sensitivity due to parts being within the Cairngorms National Park (should be noted that there are no views from within the designated parts). Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Highland Foothills	These areas form a transition between Strathmore and the Cairngorms and are located to the east and west of the site. The ZTV indicates that there would be some small areas of visibility at hill summits Tullo Hill and Deuchar hill, both of which would be at ~9km distance. The landscape character area is considered to be of medium sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **minor**, indirect, negative and reversible
Dipslope Farmland	Dipslope Farmland comprises the landscape surrounding the northern edge of Dundee containing settlements such as Letham and Tealing. ZTV coverage would be limited the landscape south of the A932 and the area of landscape around Colliston. The landscape sits immediately south of the Low Moorland Hills, although hills such as Turin Hill will screen the development leaving only occasional blade tips visible. The landscape character area is considered to be of medium sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **minor**, indirect, negative and reversible.
Igneous Hills	The Igneous Hills form the Sidlaw Hill range which sit between Dundee and the Strathmore valley. Despite their relative higher topography visibility from this landscape is limited with views only available from the summits such as Ark Hill, Castleward, Carlunie Hill and Kinpurney Hill. Viewpoint 15 from Kinpurney Hill shows an example of the visibility from the Igneous Hills. The landscape character area is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Firth Lowlands	There are no views of the development from within this landscape character area. Therefore there would be no indirect effects on its character.
Lowland Basin	This area is located ~12km to the east of the site and covers the landscape between Brechin and the coast at Montrose. The ZTV indicates that there will be some visibility around the Montrose Basin and the settlement of Montrose. At this distance and with the relatively flat landscape it is likely that any views of the turbines will be screened by the abundance of vegetation in the area. The landscape character area is considered to be of high sensitivity. Overall the magnitude of change would be low and the overall level of effect would be **moderate**, indirect, negative and reversible.

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Landscape Character Area	Assessment
Urban Areas	There are no views of the development from within this landscape character area. Therefore there would be no indirect effects on its character.
Fife Landscape Character Assessment	
Upland Foothills	There are no views of the development from within this landscape character area. Therefore there would be no indirect effects on its character.
Coastal Flats	There are no views of the development from within this landscape character area. Therefore there would be no indirect effects on its character.
Coastal Terrace	There are no views of the development from within this landscape character area. Therefore there would be no indirect effects on its character.
Coastal Hills	There are no views of the development from within this landscape character area. Therefore there would be no indirect effects on its character.
South and Central Aberdeenshire Landscape Character Assessment	
The Mounth	This is one of the most northern landscapes within the study area sitting within Aberdeenshire, located ~23km from the development. As it is a more upland landscape the ZTV indicates that there will be occasional scattered visibility from some areas, although at this distance effects are unlikely. The landscape character area is considered to be of high sensitivity as it forms part of an ALS. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Howe of the Mearns	Howe of the Mearns landscape is situated within Aberdeenshire and is located ~17km distance from the nearest turbine. It is a continuation of the Strathmore valley, which means that because of its lowland nature the ZTV indicates visibility across the area, however at these distances effects would be very limited and screened by intervening vegetation for much of the area. The landscape character area is considered to be of high sensitivity as it forms part of an ALS. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Garvock and Glenbervie	This is a similar landscape to the previous one, however visibility is much more limited and again at these distances any effects would not be prominent or distinct. The landscape character area is considered to be of medium sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **minor**, indirect, negative and reversible.
Kincardine Links	There are no views of the development from within this landscape character area. Therefore there would be no indirect effects on its character.

7.6.6 Indirect Effects of Landscape Planning Designations

The site area is not designated and there would be no direct effects on designated landscape areas. Any landscape effects therefore would be limited to indirect effects on the views and visual character experienced from within these areas, whilst viewing towards the turbine. The assessment below considers if these effects on the views would lead to an indirect effect on the landscape character and valued features and characteristics for which these areas are designated.

The assessment of the overall indirect effects experienced by people viewing the wind turbine from within these areas is provided in **Table 7.9**. The sensitivity of all designated landscapes considered as part of this assessment has been considered as high.

Table 7.9 - Indirect Landscape Effects on Landscape Planning Designations

Designation	Assessment
National Park	

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Designation	Assessment
Cairngorms National Park	The National Park a small section of the overall study area to the north east of the site, it is situated ~21km. The ZTV indicates that visibility would be very rare and that views may only be found from summits such as Driesh and Ben Tirran where the development would be at considerable distance, viewed against the landscape and indistinct. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
National Scenic Area	
Cairngorms National Scenic Area	There are no views of the development from within this designation and its setting and character would remain intact.
Area of Landscape Significance	
Aberdeenshire ALS	The ALS stretches across much of the Aberdeenshire section of the study area covering the eastern foothills of the Cairngorms. The designation is situated ~18km distance from the development. Theoretically most of the designation will have views of the development along the southern edge only, however at this distance effect will be unlikely and the development indistinct, likely screened by intervening vegetation from most areas. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor** and not significant.
Coastal ALS	The ALS covers the Aberdeenshire coast around the settlement of St Cyrus, stretching north out with the study area. The designation is situated ~24km distance from the development to the north east. Theoretically there would only be one small area of visibility around the southern edge of St Cyrus, however at this distance there will be no notable effects. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor** and not significant.
Gardens and Designed Landscapes	
Ascreavie Gardens	There are no views of the development from within this designation and its setting and character would remain intact.
Airlie Castle	There are no views of the development from within this designation and its setting and character would remain intact.
Cortachy Castle	Cortachy Castle is situated ~9km to the north west of the nearest turbine and sits at the southern end of Glen Clova where it meets Glen Posen on the B955. There is ZTV coverage across most of the designation, however due to the amount of mature woodland in these areas views of the turbines will be screened from the castle itself and most other areas. Viewpoint 13 is located in the vicinity of the designation and would show potential visibility when not screened by the woodland. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Glamis Castle	Glamis Castle is situated ~11km to the south west of the development and dates from the late 17th century containing 'outstanding' values in most categories, with ties to the royal family. The ZTV predicts that there will be visibility across the designation. As with many GDLs Glamis Castle contains a rich network of mature policy woodland, which will provide screening from the development. No views from the castle itself have been found, other than the potential for views from the upper floors which are inaccessible to the public, which can be seen in Viewpoint 16. Any glimpses from the grounds through gaps in the woodland will be similar views to the ones shown in Viewpoint 16. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Drumkilbo	This Garden and Designed Landscape is situated ~21km to the south west of the development on the A94 to the east of Meigle. Although the ZTV indicates that there will be visibility throughout the designation, the estate is densely populated by mature policy woodland, which will screen out any potential views. The only possible views of the turbines would be at the entrance to the estate on the A94, where the turbines viewed at considerable distance and indistinct. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
Camperdown House	There are no views of the development from within this designation and its setting and character would remain intact.

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Designation	Assessment
Balgay Park	There are no views of the development from within this designation and its setting and character would remain intact.
Baxter Park	There are no views of the development from within this designation and its setting and character would remain intact.
Guthrie Castle	There are no views of the development from within this designation and its setting and character would remain intact.
House of Pitmuies	There are no views of the development from within this designation and its setting and character would remain intact.
Brechin Castle	Brechin Castle is situated ~10km to the east of the development on the outskirts of the settlement of Brechin. The ZTV indicates that there may visibility from the northern half of this estate. Along the edge of the estate on the B9134 there will be visibility similar to that seen in Viewpoint 11 from Brechin. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.
The Guynd Angus	There are no views of the development from within this designation and its setting and character would remain intact.
Kinnaird Castle	There are no views of the development from within this designation and its setting and character would remain intact.
House of Dunn	There are no views of the development from within this designation and its setting and character would remain intact.
Craig House	There are no views of the development from within this designation and its setting and character would remain intact.
Dunninald Castle	There are no views of the development from within this designation and its setting and character would remain intact.
Edzell Castle	There are no views of the development from within this designation and its setting and character would remain intact.
The Burn	There are no views of the development from within this designation and its setting and character would remain intact.
Fasque House	Fasque House is situated ~25km to the north east of the proposed development within Aberdeenshire. The ZTV indicates that only the north eastern corner of the grounds would have theoretical visibility. In this instance the amount of mature woodland and the distance to the development would mean there would be no real views of the turbines. The landscape designation is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, indirect, negative and reversible.

7.7 Assessment of Visual Effects

Visual effects are recognised by the Landscape Institute as a subset of landscape effects and are concerned wholly with the effect of the development on views, and the general visual amenity. The assessment has been conducted in periods of fine weather and assumes good visibility and limited seasonal leaf cover.

7.7.1 ZTV and Visual Receptors

A blade tip ZTV is illustrated in **Figure 7.3** and indicates the maximum potential visibility of the wind turbine, assuming there are no trees, woodland or buildings within the area (i.e. a bare earth scenario). It is likely that this percentage would be reduced further by the screening effect of trees, woodland, and buildings on the ground, particularly in relation to settlements.

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Due to the topography of the area, with the valley of Strathmore running diagonally from the south west to the north east, the ZTV coverage is limited to certain areas. Around the site to about ~3km there will be visibility, although Turin Hill to the south does limit closer range views in that direction particularly along the route of the A932. The ZTV also predicts a band of visibility along the Strathmore valley, and due to the Sidlaw Hills and the Cairngorm foothills, restricts any further visibility to either the north or the south. Low lying coastal areas around the Montrose Basin and inland at the Howe of the Mearns will also have potential visibility however this will be at over ~20km. **Figure 7.5** illustrates the ZTV at a more detailed scale.

The ZTV clearly shows that the views of this windfarm will be mainly within 5km to 10km around the site of the proposed wind turbines in all directions. There is more visibility predicted further out as areas within the Strathmore valley and a few scattered upland areas to the north and south are also shown to be covered. Views after this reaching out the 30km study area would be limited. However there would be theoretical visibility nearer the coast at Montrose and on the edges of the study area to the north east.

The key visual effects to be addressed include the following:

- Visual effects on the views experienced by local communities;
- Visual effects on the views experienced by users of footpaths and general recreational areas/ tourist destinations;
- Visual effects on the views experienced by road users along the main transport routes.

7.7.2 Viewpoint Analysis

Viewpoint analysis has been undertaken for each of the viewpoints and is reported in **Appendix 4**. A summary of the results of the viewpoint analysis is provided in **Table 7.10** and this analysis reveals that the reduction in scale of the project means that there are now no significant effects found from any of the 18 locations.

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Table 7.10 - Summary of Viewpoints Analysis

Location	Assessment			Distance from Development
	Sensitivity	Magnitude	Overall Impact	
1. Balmashanner	High	Low	**Moderate**	Viewpoint located at ~6.1km distance
2. Forfar	High	Low	**Moderate**	Viewpoint located at ~3.6km distance
3. B9134 at Howmuir	Medium	Low	**Moderate/Minor**	Viewpoint located at ~1.1km distance
4. Borgado	High	Negligible	**Moderate/Minor**	Viewpoint located at ~1.3km distance
5. West Mains of Finavon	Medium	Low	**Moderate/Minor**	Viewpoint located at ~1.5km distance
6. Bogindollo	High	Low	**Moderate**	Viewpoint located at ~1.5km distance
7. Hill of Finavon Fort	Medium	Low	**Moderate/Minor**	Viewpoint located at ~1.5km distance
8. Tannadice	Medium	Medium	**Moderate**	Viewpoint located at ~4.1km distance
9. Turin Hill Fort	High	Low	**Moderate**	Viewpoint located at ~2.5km distance
10. A932 at Rescobie Loch	Medium	-	-	Viewpoint located at ~4.7km distance
11. Brechin	High	Low	**Moderate**	Viewpoint located at ~11.0km distance
12. White Caterthun Fort	High	Negligible	**Moderate/Minor**	Viewpoint located at ~12.2km distance
13. Airlie Monument	High	Negligible	**Moderate/Minor**	Viewpoint located at ~13.2km distance
14. Cat Law	High	Negligible	**Moderate/Minor**	Viewpoint located at ~17.9km distance
15. Kirriemuir Hill	High	Low	**Moderate**	Viewpoint located at ~9.4km distance
16. Kinpurney Hill	High	Negligible	**Moderate/Minor**	Viewpoint located at ~21.0km distance
17. Glamis Castle	High	Negligible	**Moderate/Minor**	Viewpoint located at ~12.1km distance
18. A90 Bridge north of Forfar	Medium	Low	**Moderate/Minor**	Viewpoint located at ~6.4km distance

7.7.3 Visual Effects during Construction and Operation

Visual Effects during Construction

The visual effects of the development during the construction period would mostly be limited to 'close-range views' from where it would be possible to view noticeable ground-based activities and the movement of construction vehicles. The main visual receptors able to view the ground based construction activities would be limited to the farm steadings within the local area.

The visual effects of the construction would begin with the establishment of a Contractor's compound and increase incrementally over the construction period with the most visible effects associated with the erection of the turbine. The construction activity would be limited to a relatively small area. The specific construction activities have been assessed earlier in **Section 7.4** Landscape Design Considerations and no significant negative residual effects are anticipated.

Visual Effects during Operation

Post construction and during operation, the appearance of the windfarm site would recover a calmer visual character with negligible levels of maintenance activity visible on site from the nearest visual receptors, and no significant visual effects likely.

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The visibility of the turbines, however, would extend over the study area affecting a range of visual receptors including residents, road users, tourists, and people undertaking recreational activity. The visual effects of the wind turbine on views and visual amenity during operation are assessed in the following sections.

7.7.4 Residential Properties and Settlements

The following assessment considers the views from settlements, and the likely visual effects that could be experienced from the main living rooms and garden areas of residential properties, but excludes rooftops and upper windows. The illustrated viewpoints have been selected to represent views from where the windfarm would be most visible within the villages or along the edges of the villages.

All settlements and residential properties have been judged to be of high sensitivity.

Visual Effects on Settlements

Many of the settlements within the study area will gain very limited, or no views of the turbine due to the concentration of buildings and other urban features and the landform of the area. Of the 29 settlements within the study, 16 of these would not be over lapped by the ZTV and will therefore receive no views of the development. Settlements that have been predicted to receive views are likely to only have views of the development from open areas, prominent hill tops within settlements and from the settlements edges, as it is likely that woodland and the built environment will screen outward views from the settlement.

Table 7.11 - Visual effect on settlements within the ZTV

Settlement	Distance	Visual Assessment
Settlements <10km from Finavon Hill Estate Wind Turbine		
Oathlaw	1.9km	Oathlaw is a small cluster of houses 1.9km to the north west of the development. The ZTV indicates that the entire settlement will have views of the development, when visible, the turbine will be viewed occupying a minor extent of the view, on the slopes facing the settlement. Some screening is provided by mature woodland in and around the settlement. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be low and the overall level of effect would be **moderate**, direct, negative and reversible.
Milton of Finavon	1.8km	There are properties either side of the bridge over the River South Esk which make up Milton of Finavon and Finavon, which at the closest would be 1.8km from the turbine to the north east. The entire area around these settlements will have theoretical views, however the area is heavily wooded so most views will be subject to screening from the shelterbelts and policy woodland. Where visible the turbine will appear just off the horizon, visible against the sky on the right side of the hill summit. There, it will comprise of a minor extent of the view, which is well within the scale of the surrounding landscape. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be low and the overall level of effect would be **moderate**, direct, negative and reversible.
Lunanhead	2.6km	Lunanhead is a small settlement on the outskirts of Forfar to the south west of the development at 2.6km distance. The ZTV indicates that the entire settlement may have views of the turbine, however it is likely that view will be restricted to the area around Carseview Terrace and the adjacent small park. When visible the turbine will appear rising from behind the horizon, visible against the sky comprising of a minor extent of the overall view and partially screened by boundary planting along the settlement edge. The topography will also provide additional screening and it will only be blade tips views that exist. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct,

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Settlement	Distance	Visual Assessment
		negative and reversible.
Crosston	3.0km	As a result of the reduced scale of the development there are no longer any views predicted from Crosston.
Forfar	3.6km	Fofar is a larger settlement situated on the A90 to the south west of the development at 3.6km distance. The ZTV indicates that there are potentially views from all across the settlement, however with extensive built development, views will be restricted. **Viewpoints 1** and **2** show the worst case scenarios from within Forfar, where more prominent views would occur along the eastern edge of the settlement. Views are restricted by the topography at Finavon Hill and the development will likely only have blade tip visibility in most instances. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be low and the overall level of effect would be **moderate**, direct, negative and reversible.
Tannadice	3.7km	Tannadice is a small settlement to the north of the proposed development situated at 3.7km distance from the turbine. The ZTV indicates that there will be visibility throughout the settlement, however most open areas are tucked down behind some localised topography, meaning views towards the site are rare. **Viewpoint 13** illustrates the worst case scenario for views from Tannadice, from behind the settlement, where the development is seen occupying a minor extent of the view. From the area around Tannadice the full extent of the ridge is visible and the development its seen in scale with its surroundings. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct, negative and reversible.
Kingsmuir	5.3km	Kingsmuir is situated 5.3km to the south west of the proposed development just outside Forfar. There is a significant amount of vegetation along the north eastern edge and many of the properties are orientated in the opposite direction away from the vegetation. The limited views available will see only blade tips with the turbine mostly screened by the topography and only comprising only a negligible extent of the view. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct, negative and reversible.
Dunnichen	6.0km	No views are predicted from Dunnichen.
Padanaram	6.5km	Padanaram is situated 6.5km to the west of the proposed development on the western edge of Forfar. The ZTV indicates that the entire settlement will have theoretical visibility although most properties would be located on the A926 and therefore have either north or south facing views. From open areas where the turbine may be seen it would be visible on the horizon and comprise only a negligible extent of the view and in scale with the local landscape, with the summit of Finavon Hill Estate seen to the right of the view. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct, negative and reversible.
Letham	6.7km	No views are predicted from Letham.
Memus	7.3km	Memus is located 7.3km to the north west. The ZTV shows that theoretically the entire settlement will have visibility of the turbine. However with the level of intervening vegetation both around the settlement and between Memus and the development, the turbine will be screened from the majority of views. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct, negative and reversible.
Craichie	7.5km	No views are predicted from Craichie.
Ogil	7.8km	Ogil is located 7.8km north of the nearest turbine. The ZTV indicates that there will be theoretically visibility across the settlement. Mature deciduous woodland surrounds the settlement and is common within the surrounding landscape, which limit any long range views, particularly to the south. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct, negative and reversible.

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Settlement	Distance	Visual Assessment
Kirriemuir	9.4km	The settlement of Kirriemuir is located 9.4km to the west of the development and sits within the valley of Strathmore. The Gairie Burn cuts through the settlement creating a small valley through the centre. The ZTV indicates that most of the eastern edge of the settlement, except for the area around the Gairie Burn, will have some visibility of the development. **Viewpoint 15** shows a worst case scenario for Kirriemuir taken from high on Kirriemuir Hill, most other views will sit lower and are likely to be screened by vegetation and other buildings. There will however be some open views on the outer periphery of the settlement around the B957, where the turbine will appear on the side of Finavon Hill Estate, occupying a negligible extent of the view and in scale with the landscape. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct, negative and reversible.
Settlements between 10-15km from Finavon Hill Estate Wind Turbine		
Kirkton of Menmuir	10.0km	This settlement is located 10.0km to the north east of the development. The ZTV indicates that there will be visibility on the western side of the settlement. However, any views would only be blade tips which will be screened by intervening vegetation and generally the development will be an indistinct feature in views. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be **moderate/minor**, direct, negative and reversible.
Douglastown	10.1km	As a result of the reduced scale of the development there are no longer views predicted from Douglastown.
Friockheim	10.8km	As a result of the reduced scale of the development there are no longer views predicted from Friockheim.
Brechin	10.9km	Brechin is one of the larger settlements in the area and is situated 10.9km to the north east of the development. The ZTV shows that the majority of the settlement will have potential views of the turbines, areas to the south along the South River Esk will not have any views. **Viewpoint 9** is indicative of potential views of the development from the western edge of the settlement, where views are more likely. The development is seen on the side of Finavon Hill Estate where it will appear in scale with the adjacent topography and will generally be a minor feature. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be moderate/minor, direct, negative and reversible.
Kirkbuddo	11.0km	As a result of the reduced scale of the development there are no longer views predicted from Kirkbuddo.
Little Brechin	11.2km	As a result of the reduced scale of the development there are no longer views predicted from Little Brechin.
Glamis	12.8km	Glamis is situated 12.8km distance to the south west of the development. The ZTV indicates that there will be theoretical visibility across the settlement, however the significant amounts of mature policy woodland will screen any views towards the development. The settlement is considered to be of high sensitivity. Overall the magnitude of change would be negligible and the overall level of effect would be moderate/minor, direct, negative and reversible.
Carrot	13.5km	No views are predicted from Carrot.
Settlements between 15-20km from Finavon Hill Estate Wind Turbine		
Edzell	16.6km	As a result of the reduced scale of the development there are no longer views predicted from Edzell.
Tealing	17.8km	No views are predicted from Tealing.
Inverkeilor	17.8km	No views are predicted from Inverkeilor.
Wellbank	17.9km	No views are predicted from Wellbank.
Arbroath	18.0km	No views are predicted from Arbroath.
Rottal	19.5km	No views are predicted from Rottal.

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Settlement	Distance	Visual Assessment
Kellas	19.5km	No views are predicted from Kellas.
Settlements over 20km from the development are unlikely to be visually affected by the turbine		

Visual Effects on Residential Properties

A total of twenty six residential properties were assessed within a radius of 2km of the turbine as part of the previous assessment. These included properties within the valleys which sit either side of Finavon Hill. The assessment considered the theoretical visibility in conjunction with the properties main and secondary views as well as views from the garden area, taking into account any vegetation or woodland which may surround the property. In the original assessment 13 of these were considered to have significant effects whilst the remaining 13 did not. Those properties where the impacts were not considered significant have been scoped out of the current assessment on the basis that any impacts will be further reduced by virtue of the reduced scale of the development.

An assessment of the closest residential properties within 2km of the nearest turbine is provided in **Table 7.12** and a location map showing their positions on a detailed ZTV can be seen in **Figure 7.6**.

Table 7.12 - Predicted Visual Effects on Residential Properties

Property	Description
1 Baggerton	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
2 Carsebank Cottage South	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
3 Carsebank Cottage North	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
4 West Carsebank	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
5 Carsebank	This is a traditional style two storey stone property, situated ~1.2km from the turbine. It's primary views would be to the south looking over the valley below, however there are rear windows facing north. There would only be limited vegetative screening from this location despite the setting of the property within mature trees. The theoretically visibility would be a significant reduction from the original application and only a single blade tip would be seen rising from the horizon. This would equate to a negligible extent of the horizontal view and minor extent of the vertical view and generally would be indistinct in most instances. Oblique views from the rear windows are likely, however the limited visibility would not dominate these views nor significantly alter them. There will be open views from the garden areas to the rear of the property. The magnitude of change will be low, resulting in a **moderate** level of effect which will not be significant.
6 Clochtow	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
7 Blackgate	The property at Blackgate is a modern single storey bungalow, which is situated at ~1.8km distance from the turbine to the south west. The property faces north and is located on the B9134. The property is set within a cluster of mature mixed woodland, however the main windows do have a view over the landscape to the north. The property will experience views from their main window, however the views will be oblique with the turbine off to the left hand side of the view and would not be the main focus of the view. When visible the turbine will comprise of a minor extent of the view, being visible against the sky and mostly screened by the topography with only a single blade visible. The magnitude of change is considered to be low, resulting in a **moderate** level of effect which will not be significant.

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Property	Description
8 Myrestone 1	This is a miners row style cottage property with white washed walls and a pitched roof, it is very linear in fashion and a single storey. It is situated ~1.2km distance from the turbine to the south. The main views of the property face over the B9134 on which the property sits. There would be rear windows and the main garden is also to the rear of the property, where there is no vegetation of any significance. From this location the turbine would be seen rising from behind the summit of the Hill of Finavon to the rear of the property. The turbine would appear against the sky and be significantly screened by the topography, with only a blade tip visible. The primary views of the property is to the south and therefore will have no views, however views from the garden and rear windows will have direct views of the development where it will occupy a minor extent of the vertical view and a negligible extent of the horizontal view. The magnitude of change will be low, resulting in a **moderate** level of effect which will be not significant.
9 Myrestone 2	This is a two storey traditional cottage which sits immediately adjacent to Property 8 and is situated ~1.2km from the turbine to the south on the B9134. The primary view is to the south over the main road and there is no significant vegetation around that will provide any screening. The effects will be very similar to that of the previous property with direct views from the rear garden and windows and no view from the main windows. The magnitude of change will be low, resulting in a **moderate** level of effect which will not be significant.
10 Pitscandy New House	This property is a new build single storey bungalow which is set back from the main road, located ~1.3km from the turbine to the south. The primary view of the property is along the valley to the west, however there are side windows facing north towards the site and the garden and driveway areas are fairly open with no significant vegetation. Although not visible from the main windows there will be visibility from the garden and driveway, where the turbine will comprise a minor extent of the view and seen against the sky across the valley on the ridge at Finavon Hill, where it will be significantly screened by the topography and only have blade tip visibility. The magnitude of change will be low, resulting in a **moderate** level of effect which will not be significant.
11 B9134 Cottages	There are two single storey cottages that sit on the B9134 between Myrestone and Howmuir. They are south of the proposed development and sit ~1.1km from the turbine. Both cottages are similar in style sitting low in the landscape, white wash finish and pitched roof. The main view from both is over the main road to the south and there is little or no vegetation to the rear of the cottages. A blade tip of the turbine will be seen rising from behind the horizon at the Hill of Finavon, where it will occupy a minor extent of the view. Although not visible from the main windows, there will be direct view from the rear gardens and any rear windows. The magnitude of change will be negligible, resulting in a **moderate/minor** level of effect which will not be significant.
12 Howmuir 1	This is a single storey traditional stone cottage which is situated ~0.9km from the turbine to the south. The cottages primary views are to the south although there are also windows to the rear there is no vegetation around the property. The turbine will be significantly screened by the local topography despite its relative distance to the property. It will be visible seen rising from behind the ridge to the north and comprise only a minor extent of the view, where a blade tip will be visible against the sky. It may be the case that the view from the rear windows is into the hillside and views of the turbine would only begin above the level of the window, resulting in no views from the windows. There will be views from the garden areas and drive way, where the blade will be seen sweeping over the horizon, although only occupying a minor extent of the view. The magnitude of change will be low, resulting in a **moderate** level of effect which will not be significant.
13 Howmuir 2	This is a two storey stone house which is located ~0.7km south of the turbine. The primary views of the property are to south and there are also windows to the rear and a garden area to the north and east. There is some vegetation around the property which will provide an amount of screening. Theoretically the turbine will be somewhat screened by the topography, although seen at close proximity, where a blade tip will be seen rising from the horizon. Again particularly from the ground floor the views are likely to be into the hillside and the turbine will be above the viewer and obliquely visible, however the turbine may appear more prominent from the upper floors. From the garden area there will be some limited screening provided by the vegetation. The magnitude of change will be low, resulting in a **moderate** level of effect which will not be significant.
14 Carsegownie 1	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
15 Carsegownie 2	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.

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Property	Description
16 Carsegownie 3	This is a larger property than the previous two and sits slightly to the east of the others facing south along the valley. The property is located to the east of the turbine and is ~0.8km distance from the nearest turbine. Although there is plenty of mature woodland around the property most is to the south and would not provide any screening. As a result of the reduced scale of the development there will now be no visibility of the turbine from this property or its environs. As such there will be no change to its existing views and the magnitude of change will be none.
17 Back Hill of Turin	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
18 Parkfold 1	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
19 Parkfold 2	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
20 Finavon House	This is a traditional two storey white wash farm house which is situated ~0.5km distance from the turbine to the north of the site. The main view of the property is to the north, although there are garden area and rear windows. Some mature woodland around the property may provide screening. There is a secondary property which sits directly adjacent to Finavon House. The development will not be visible from the main windows, however there will be views from the secondary windows and rear garden, where the turbine will sit above the viewer and comprise a significant extent of the vertical view. Whilst this would be a prominent feature it would only effect one aspect of the property. The magnitude of change is considered to be high, resulting in a **major** level of effect which will be significant.
21 Clatterha	Clatterha consists of two traditional single storey cottages which are situated ~1.1km from the turbine to the north of the development. The property's main views are to the south over the A90, however between the main road and the building there is a significant amount of vegetation and woodland. Theoretically the turbine will all be visible in full just off the summit of Hill of Finavon, where it appears within the 3:1 ratio when compared with the vertical extent of the ridge. This means that the turbine is not a dominant feature and would not diminish the scale of the hill when viewed from this location. The scheme will comprise of a minor to moderate extent of the view, however views from the main windows of the western property are screened by vegetation. The other property will have direct views towards the development. The magnitude of change is considered to be low, resulting in a **moderate** level of effect which would not be significant.
22 West Mains of Finavon 1	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
23 West Mains of Finavon 2	This is a traditional style two storey farm house with white wash finish situated ~1.6km distance from the turbine to the north east adjacent to the West Mains of Finavon. The main view is to the south west and there is some edge planting around the property which may provide some screening from the ground floor and garden areas. Theoretically the turbine would comprise of a minor extent of the view and be visible against the sky, sitting just off the ridge at Hill of Finavon. The upper floors are expected to have direct views of the turbine, while the ground floors and garden areas will receive some screening from mature woodland. The turbine appears in scale with the surrounding landscape and would not be a prominent or overbearing feature. The magnitude of change is considered to be low, resulting in a **moderate** level of effect which will not be significant.
24 Easter Oathlaw	Easter Oathlaw consists of two, two storey traditional farmhouses which are located to the north west of the development at ~1.6km distance. The primary view of the property is to the south and there is some edge planting and vegetation along the southern edge. Theoretically the turbine would comprise of a minor extent of the view where it would be seen just off the summit of Hill of Finavon and viewed against the sky, seen in full. The development would be in scale with the surrounding landscape and would not be a dominant feature. The magnitude of change is considered to be low, resulting in a **moderate** level of effect which will not be significant.
25 Bogindollo Farm	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.
26 Shepherds Seat	No significant effects were previously found from this property and as a result of the reduced scale of the development, any effects would be greatly reduced and remain non significant.

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In summary, out of the thirteen properties which were reassessed only one was found to have significant visual effects, which was the property belonging to the developer of the wind turbine. The new development moved the turbine off the ridge to the north and away from these properties and this along with a smaller turbine has greatly reduced the impact, with only a blade tip typically seen rising above the horizon.

7.7.5 Assessment of Major Tourist and Transport Routes

An assessment of the potential for visual effects from all major routes within the study area has been undertaken and includes the following:

- A90 between Tealing and Brechin;
- B9134 between Forfar and Brechin;
- B957 between Kirriemuir and Finavon

A90 Tealing to Brechin

The A90 is a major transport route which connects Dundee to Aberdeen and cuts over the eastern edge of the Sidlaw Hills just north of Tealing. The route then passes by the western edge of Forfar, before turning east and travelling along the northern edge of Finavon Hill and on towards Brechin. After Brechin the route becomes more coastal with occasional glimpses over the North Sea. At its closest point the route is ~0.8km distance away from the turbine. The area assessed runs for ~32km and is considered to have medium sensitivity due to its large scale as well as being a busy industrial route with many heavy vehicles.

Theoretically the Finavon Hill Estate turbine will be visible from the entire route with the exception of a small section around the junction with the B9127 and the first couple of kilometres in the south. Travelling north only small distant glimpses of the turbine are predicted, although the relatively high embankments along this route would screen the development until the junction with the A926. From here there are more open direct views of Finavon Hill where it is seen on the near slopes of the hill in full, however the turbine would not be out of scale with the landscape nor a prominent feature. The turbine will be visible for ~5km or 6km, gradually increasing in visibility until Bogindollo where any views will become oblique, after this the turbine will be behind the viewer. In the opposite direction views are less screened between Brechin and Finavon and there are no high embankments, however the turbine will be visible in more distant views until around Nether Careston where there are occasional shelterbelts and areas of mature coniferous woodland. The hill and ridgeline will still provide enclosure to this route and the turbine will never be an overbearing feature, always appearing in scale with the surrounding topography. The magnitude of change for the route as a whole would be low, resulting in a **moderate/minor** level of effect which would not be significant.

B9134 Forfar to Brechin

The B9134 runs along the southern edge of Hill of Finavon in the valley created by Hill of Finavon and Turin Hill connecting Forfar and Brechin. The route is relatively rural being characterised by the numerous farmsteads on the lower slopes of Finavon Hill and the edges of either settlement. The route passes through a few small settlements including Lunanhead, Crosston and Netherton. At its closest point the route is ~0.9km distance away

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from the nearest turbine. The area assessed runs for ~16km and is considered to have medium sensitivity due to its importance as a local road.

Theoretically the Finavon Hill Estate turbine will be visible from along the much of the route with the exception of an area of ~2km around the settlement Crosston and intermittently between Crosston and Brechin. For traffic travelling east towards Brechin they would experience direct views of the turbine but they would be significantly screened by the topography and only blade tips being visible. The turbine would not be a dominant feature and would be seen against the sky, in scale with the landscape. As the route passes the farm at Myrestone the views will become oblique before disappearing out of view. For traffic travelling in the opposite direction views would be indistinct and intermittent visibility between Brechin and Crosston where the turbine goes completely out of view for ~2km. Beyond this the views will be direct, however most of the tower will be screened by the topography and only the blade tip would be visible for ~1.5km, before passing to the rear of the viewer. The magnitude of change would be low, resulting in a **moderate/minor** level of effect which would not be significant.

B957 Kirriemuir to Finavon

The B957 is a local road which connects Kirriemuir with the A90 at Finavon. It is a predominantly rural route characterized by dry stone dykes, arable farmland and pastureland and a number of farmsteads. There are some areas of woodland along the route particularly around Forest Muir and Newbarns, where there are mature orchards and also in the section of road between Tannadice and Finavon. At its closest point the route is ~2.5km distance away from the nearest turbine. The area assessed runs for ~12km and is considered to have medium sensitivity due to its predominantly agricultural nature.

Theoretically the turbine is visible along the entirety of the route. Traffic travelling east will see the turbine directly but in the distance for much of the beginning of the route where the turbine will be seen just off the ridge at the Hill of Finavon. Here it will appear as a minor feature on the skyline and as part of the wider landscape, comprising only minor levels of the view, despite being continuously visible. After Kilnhill not only would the view become more oblique but the mature woodland at Forest Muir will provide screening to any views in the direction of the development. For a short period between Foreside of Cairn and Craigeassie the turbine will be slightly more prominent sitting obliquely above the viewer to the south, this effect would only last ~2km as the turbine disappears behind the viewer. Between Tannadice and Finavon the turbine will be screened by the mature woodland. The magnitude of change would be low, resulting in a **moderate/minor** level of effect which would not be significant.

7.8 Assessment of Cumulative Visual Effects

Two or more windfarms are required for the occurrence of a cumulative visual effect. This assessment has therefore considered the development of Hill of Finavon in addition to the other windfarm sites in the landscape in order to test the landscape capacity of the area and provide conclusions for the CLVIA relevant to this proposal.

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Figure 7.7 shows the location of all of the windfarms currently operational, consented, in planning and at the scoping stage within a 60km radius of the proposed turbine at the Finavon Hill Estate.

From this overall picture, it can be seen that the majority of other proposals are situated either to the south of the site in the hills behind Dundee, or to the north east associated with the Aberdeenshire coastal landscapes. In a similar landscape to the Hill of Finavon there is the Ark Hill project which is now operational and the consented schemes at Govals and Frawny. Further to the west there are a couple of larger development constructed including Drumderg and Locklebank. There are also a few single turbine and small scale schemes similar to Finavon seen at Mains of Cononsyth and East Memus.

A series of potential cumulative ZTVs (based on submission status) are illustrated in **Figure 7.8** showing the potential cumulative ZTV for each of the known windfarms. The findings from the analysis of the cumulative visibility maps and cumulative viewpoint assessment have been used to form a conclusion as of the level of overall cumulative visual effects during operation as experienced by various receptors.

Scoped Windfarm Sites
Due to the uncertainty of projects at the scoping stage as turbine numbers, locations and heights are either unknown or subject to change cumulative ZTVs have not been produced. Any cumulative impact would not be a true representation of what may happen in reality.

Cumulative Viewpoint Assessment
Each viewpoint assessed as part of the viewpoint assessment has also been considered cumulatively with all other wind energy projects identified within the 60km cumulative study area. A summary of potential cumulative visibility assessment from each of the viewpoints is provided in **Table 7.14.** Further detail can be found in the viewpoint assessment located in **Appendix 4.** Each of the viewpoint locations has been divided into 76° sectors and assessed through examination of computer wireframes.

Table 7.14 - Summary of Cumulative Viewpoint Analysis

Viewpoint No.	Sensitivity	Magnitude	Level of Effect
VP1. Balmashanner			
Finavon and Operational Wind farms	High	Low	Moderate
Finavon and Operational, Consented Wind farms		Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP2. Forfar			
Finavon and Operational Wind farms	High	-	-
Finavon and Operational, Consented Wind farms		Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP3. B9134 at Howmuir			
Finavon and Operational Wind farms	Medium	Negligible	Minor
Finavon and Operational, Consented Wind farms		Low	Moderate/Minor

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Viewpoint No.	Sensitivity	Magnitude	Level of Effect
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate/Minor
VP4. Borgado			
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Negligible	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP5. West Mains of Finavon			
Finavon and Operational Wind farms		Negligible	Minor
Finavon and Operational, Consented Wind farms	Medium	Negligible	Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate/Minor
VP6. Bogindollo			
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Negligible	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP7. Hill of Finavon Fort			
Finavon and Operational Wind farms		Low	Moderate/Minor
Finavon and Operational, Consented Wind farms	Medium	Low	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate/Minor
VP8. Tannadice			
Finavon and Operational Wind farms		Negligible	Minor
Finavon and Operational, Consented Wind farms	Medium	Low	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate/Minor
VP9. Turin Hill Fort			
Finavon and Operational Wind farms		Low	Moderate
Finavon and Operational, Consented Wind farms	High	Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Medium	Moderate/Major
VP10. A932			
Finavon and Operational Wind farms		-	-
Finavon and Operational, Consented Wind farms	Medium	-	-
Finavon and Operational, Consented, Planned Wind farms		-	-
VP11. Brechin			
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP12. White Caterthun Fort			
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP13. Airlie Monument			

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Viewpoint No.	Sensitivity	Magnitude	Level of Effect
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP14. Cat Law			
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Low	Moderate
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate
VP16. Kinpurney Hill			
Finavon and Operational Wind farms		Negligible	Moderate/Minor
Finavon and Operational, Consented Wind farms	High	Negligible	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Negligible	Moderate/Minor
VP17. Glamis Castle			
Finavon and Operational Wind farms		-	-
Finavon and Operational, Consented Wind farms	High	-	-
Finavon and Operational, Consented, Planned Wind farms		-	-
VP18. A90 Bridge north of Forfar			
Finavon and Operational Wind farms		Negligible	Minor
Finavon and Operational, Consented Wind farms	Medium	Low	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate/Minor

Cumulative Assessment of Major Tourist and Transport Routes

An assessment of the potential for cumulative effects from all major routes within the study area has been undertaken and includes the following:

- A90 between Tealing and Brechin;
- B9134 between Forfar and Brechin;
- B957 between Kirriemuir and Finavon

A summary of significance of impact is outlined in **Table 7.15** at the end of the assessment.

A90 Tealing to Brechin

Operational

Near the beginning of the route there will be visibility of Tealing, however this will disappear to the rear fairly quickly. Views of Drumderg are limited with the only section of the route that has any views being a small section as it passes by Forfar, where Drumderg is visible in the distance and in the opposite direction from Finavon. As the route passes by Finavon Hill with the turbine to the right, Tullo is theoretically visible directly in front of the viewer,

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however views were found to be limited and often screened by vegetation, these receptors may also have glimpses of East Memus, White Top and Balhall Lodge, however these will be fairly indistinct and often screened by woodland. After this there will be some distant visibility of Hill of Stracathro as the route passes Hill of Finavon for ~5km, the two schemes will not be visible simultaneously and Hill of Stracathro is fairly minor in views, once it becomes more prominent Finavon is well behind the viewer. There will be limited sections of the route where Arkhill and or Scotston Hill will be visible. This would primarily be for a few kilometres as the route passes by Forfar, with south bound traffic having views towards these two projects at which point Finavon would be unseen to the rear of the viewer. When visible they will appear on the horizon partially screened by the topography. There would be some sense of sequential visibility as the route passes by Finavon Hill and the turbines will be sitting adjacent to the viewer, seen obliquely, then a short distance later Ark Hill will come into view. The cumulative magnitude of change when considering operation projects is **low**.

Consented

After the route passes Tealing, there will be views of both Frawny and Govals, however at this point there will be no visibility of Finavon, which only comes into view once these schemes are to the rear. After the routes passes through Forfar there will be oblique visibility of a number of small scale projects, including Gallows Hill and Broom Farm. For a period of ~4km it will be theoretically possible to view these alongside Finavon, although it will appear on the opposite side of the road and simultaneous visibility will be limited. At this point there are longer range views of Steelstrath and Whitefield of Dun, where Finavon would be to the rear. When travelling in the opposite direction, these schemes again will appear in views between Brechin and Fofar, where Finavon is seen to the left, often screened and of minimal impact. After these and Finavon disappear to the rear there will be views of Govals and Frawny. The cumulative magnitude of change will remain **low**.

Planned

Travelling north the Nathro Hill scheme will dominate views for almost the entire route between Tealing and Brechin, direct visibility to begin with turning to oblique as the routes passes by Finavon. Directly across from Finavon Kalula House and West Cottage will be oblique visible and partially screen by vegetation. The cumulative magnitude of change will remain **low**.

B9134 Forfar to Brechin

Operational

Approximately the second half of the route will have distant views towards Drumderg and Ark Hill when travelling west, roughly between Fordmouth and Forfar. Views of Finavon would be limited as the turbine will be significantly screened by topography and in the rare cases of simultaneous visibility along this route Finavon will be well screen and Drumderg and Ark Hill distant indistinct features. As the route gets closer to Drumderg, Finavon will sit behind the viewer and out of sight. For traffic travelling in the opposite direction after the route passes Finavon a short while later Tullo and Hill of Stracathro will theoretically come into view, seen directly and in the distance. Theoretically west bound traffic leaving Brechin will have some views of East Memus for ~6km. In most cases the single turbine will blend into the landscape behind and generally be an indistinct feature, views are slightly

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more prominent briefly just before Aberlenmo, however the turbine then goes out of view. The cumulative magnitude of change when considering operation projects is **negligible**.

Consented

The Carsgownie turbine will be the most prominent development along this route and there will be direct visibility for much of the route travelling south west, however views of Finavon would be well screened with only the occasional blade tip seen. After the route passes Carsgownie Finavon would be slightly more prominent, seen obliquely with Carsgownie now to the rear. Once past Aberlenmo there will be direct and distant views of Whitefield of Dun and Steelstrath, however Finavon would be to the rear. Travelling in the opposite direction, the two turbines would be seen simultaneously for ~3km, however both will be afforded significant levels of screen and neither individually nor the combination of both would cause significant effects. The cumulative magnitude of change would become **low**.

Planned

There will be some oblique visibility to north east bound traffic at the very beginning of the route, however this would quickly disappear to the rear. At this point there would be some visibility of Balnacake as the route passes this site and oblique views of East Drums, although at this point Finavon is to the rear. There will be some occasional oblique visibility of Cotton of Pitkennedy and when travelling south west will theoretically appear simultaneously with Finavon, however at this point views of Finavon are likely to be indistinct. The cumulative magnitude of change would remain **low**.

B957 Kirriemuir to Finavon

Operational

The ZTV indicates there will be direct views towards Tullo and Hill of Stracathro for traffic travelling east between Kirriemuir and Craigeassie. In most cases any views were found to be screened and when visible fairly distant and limited, although views would be direct. Balhall Lodge would also be visible in these views, although is of limited impact and not visible simultaneously with Finavon. Theoretically both Ark Hill Scotston Hill is visible for most of the route, however it would only affect west bound traffic and be highly screened by topography for much of the route sitting in the distance at which pointy Finavon would be to the rear of views. The cumulative magnitude of change is considered to be **negligible**.

Consented

Obliquely to the let of views when travelling east there will be views of East Memus, White Top Dunswood and Broom Farm, at which point Finavon is seen to the right, occupying a minor section of the view. During this stretch between Kirriemuir and Oathlaw there will also be views towards Steelstrath and Whitefield of Dun. When travelling in the opposite direction these schemes including Finavon would e to the rear of the viewer but there will be longer range views towards Govals. The cumulative magnitude of change would become **low**.

Planned

Nathro Hill would be a dominant feature seen above the viewer from the entire route when travelling east at first views would be direct then become more oblique, at which point Finavon would be seen obliquely out the opposite window. Kalula House and Wet Cottage

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would be visible in the more immediate ground and be visible in the same view as Broom farm and Dunswood. Travelling in the opposite direction these schemes would be to the rear of the viewer for the majority of the route. The cumulative magnitude of change would become **medium**.

Table 7.15 - Summary of Cumulative Viewpoint Analysis

Route	Sensitivity	Magnitude	Level of Effect
A90 Tealing to Brechin			
Finavon and Operational Wind farms	Medium	Low	Moderate/Minor
Finavon and Operational, Consented Wind farms		Low	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate/Minor
B9134 Forfar to Brechin			
Finavon and Operational Wind farms	Medium	Negligible	Minor
Finavon and Operational, Consented Wind farms		Low	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Low	Moderate/Minor
B957 Kirriemuir to Finavon			
Finavon and Operational Wind farms	Medium	Negligible	Minor
Finavon and Operational, Consented Wind farms		Low	Moderate/Minor
Finavon and Operational, Consented, Planned Wind farms		Medium	Moderate

7.9 Summary of Assessment Conclusions

Introduction

The proposed Finavon Hill Estate Wind Turbine is located in an area of farmland on the summit of Hill of Finavon. The methodology for the landscape and visual impact assessment (LVIA) adopted the guidelines set out by the Landscape Institute and the Institute for Environmental Management and Assessment. Consultation was conducted with representatives from Angus Council to discuss and agree the scope of the assessment and choice of assessment viewpoints.

Landscape Design

The project would include one turbine with a typical hub height of 40m and a typical turbine height of 67m to blade tip.

The associated infrastructure of site access tracks and substation has been carefully designed with the access road and the substation located sensitively to minimise visual impact. There will be no significant effects resulting from the construction and operation of the associated infrastructure, although negative effects are anticipated during the temporary construction period. These would be restored and mitigated on completed of the construction period.

Landscape Assessment

The proposed Finavon Hill Estate Wind Turbine is located within the Mounth Highlands Regional Landscape Character Area and is part of the Low Moorland Hills landscape

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character type, within the Tayside Landscape Character Assessment and would affect a proportion of part of this area. As an area of farming practice within a generally scenic area, this area has a medium landscape sensitivity and there would be no direct significant or unacceptable effects on the landscape character area, although there would be indirect effects relating to its visibility across the landscape character type. The ridgeline at Finavon Hill is an important feature, which provides containment and backdrop to both the Strathmore and Lemno Water valleys. Whilst the development would appear rising above this ridgeline any interruption would not be significant nor out of scale with the topography and as such the ridgeline still functions to this effect, without alteration to its character.

Considering the wider area, the assessment has concluded that there would be no significant indirect effects from any of the other landscape character areas within the study area.

Effects on Designated Landscapes
The landscape of the site area is not designated and is of medium landscape value as an area of, rough grassland and moorland. The assessment has concluded that there would be no significant indirect landscape effects on designated landscape areas including the Cairngorms National Park, Areas of Great Landscape Value, National Scenic Areas, and Gardens and Designed Landscapes.

The viewpoint analysis is contained in **Appendix 4** Landscape and Visual Impact and indicates that there would be no significant visual effects occurring from any of the viewpoint locations. The conclusions from the viewpoint assessment have been used to form a view as to the level of overall visual effects within the study area.

Visual Effects: Construction Period
There will be no significant visual effects resulting from the construction period and visibility of the ground based activity. Views of concentrated areas of construction could however lead to a temporary and negative effect that in some cases may appear more disruptive than the finished development. Post construction, the appearance of the site would recover a calmer visual character with negligible levels of activity visible on site from the nearest visual receptors.

Visual Effects: Operational Period
The only significant visual effect found during the assessment was from the property at Finavon House which is owned and occupied by the developer. Previously, up to thirteen properties and the settlement of Oathlaw as well as a number of viewpoints were predicted to experience significant visual effects, however as a result of the reduction in scale of the development and the moving of the turbine to the northern slopes of the hill these have been mitigated and now there would be no significant effects found from any of these receptors.

Cumulative Landscape and Visual Effects
With regards to currently operational projects there is very little cumulative impact as a result of Finavon due to both its limited impact and the distance to other schemes, which tend to be fairly indistinct in areas where Finavon is more prominent. The most prominent

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schemes would be Ark Hill, Drumderg and Tullo which are all over ~15km distance, the latter two over ~30km distance.

Once consented schemes are added there are a number of small scale projects located to the north within the valley floor which would be visible alongside Finavon, however with the majority of receptors situated between these schemes and Finavon views don't tend to be simultaneous which are Finavon of the other schemes to the rear of the viewer.

This would add Nathro Hill to the scene which would be the most prominent development in the area and affect a number of views. As such it is likely that there will be some simultaneous visibility with Finavon, but again due to the location of the two scenes these views will be fairly distant at which point t the impact of Finavon is negligible. In views where Finavon is an obvious feature (ie within 1km) Nathro tends to be to the rear of the viewer.

7.10 Conclusion

The scheme has been greatly reduced from the previous application to combat the impact on landscape and visual receptors. The impact on residential amenity has been vastly reduced, with now only one property (the landowner) having significant effects. The properties to the south have almost no visibility of the turbine due to the reduced height and new positioning whilst receptors to the north would see the turbine in scale with the landscape. The LVIA has concluded that the impact on the landscape character and in particular the ridgeline at Finavon Hill would not be significantly impacted on, with any interruption minor. Generally the turbine would be a fairly minor feature within most views and not significant

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8 Noise

8.1 Introduction

This section considers the potential difference in noise impacts and effects associated with the proposed single EWT DW54 500kW.

8.2 Potential Impacts

Noise can have an effect on the environment and on the quality of life enjoyed by individuals and communities. The impact of noise can therefore be an important consideration in the determination of planning applications. Noise impacts can arise from three distinct areas of the windfarm development:

- The construction of the windfarm;
- During operation of the windfarm; and
- Resulting from increased traffic flow during the construction and operation stages.

Given the scale of the development, construction noise will be short term and generally will not increase background noise levels beyond the recommended limits set out by the World Health Organisation and the former Department of the Environment. As such, a construction phase noise assessment has been scoped out.

There are currently no built projects within 10km of the proposed wind development. The nearest consented project is approximately 7.8km away and the nearest project in the planning system is located approximately 4.5km from the proposed turbine at Finavon Hill. As such, cumulative noise impact has been scoped out of this assessment.

8.3 Terminology

The symbols used for noise levels in this report are:

- L_{WA} is the A-weighted sound power level, a measure of the total sound energy emitted by a source of noise;
- $L_{A,eq}$ is the A-weighted equivalent continuous sound pressure level, which is a measure of the total ambient noise at a given place at a given time; and
- $L_{A90,10min}$ is the A-weighted sound pressure level exceeded for 90 per cent of the time in the averaging time period specified, in this case 10 minutes, and is the normal index used for background noise level measurements.

The wind speeds referred to in this report:

- v_{10} are standardised wind speeds at 10m height above ground level and used to determine the correlation between wind speed and noise levels.

8.4 Guidance

Guidance for assessing operational noise from windfarms is given in:

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- 'ETSU-R-97: the Assessment and Rating of Noise from Wind Farms (1997), The Department of Trade and Industry (usually referred to as the Noise Working Group Recommendations); and
- 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise', May 2013, IOA.

8.5 Summary of Previous Noise Assessment

The previous proposal assessed the operational noise impacts associated with three Enercon E70 turbines.

Based on the size of the previous application and the proximity to the nearest third party properties, Angus Council Environmental Health Department recommended that background noise monitoring be undertaken to determine the likelihood of noise related complaints and to establish noise related planning conditions, should it be consented.

The measured sound power levels for the E70 turbine operating in Mode II at a v_{10} wind speed of 10ms^{-1} were used to calculate the sound pressure levels at neighbouring properties. The octave band levels are given in **Table 8.1.**

Table 8.1 – Octave band sound power levels for the Enercon E70 at v_{10} wind speed of 10ms^{-1}

Octave Band (Hz)	63	125	250	500	1000	2000	4000	8000
Sound Power Level (dB(A))	88.2	96.8	99.3	97.9	96.4	93.1	86.2	78.6
Total [dB(A)]	104.5							
Uncertainty [dB(A)]	0.9							
IOA Uncertainty [dB(A)]	1.5							

The noise assessment undertaken for the previous application concluded that the predicted wind turbine noise levels would be below the derived noise limits based on the measured background noise levels, and that the development could be accommodated in terms of noise.

In response to the noise impact assessment for the original three turbine application, there was some discussion between Green Cat Renewables and Angus Council's Environmental Health Department regarding the methodology of the assessment and the adoption of the best practice guideline. The conclusion of these discussions was that any noise concerns could be mitigated by appropriate planning conditions, as is stated by the Scottish Ministers Report who determined the appeal on non-determination:

"The council has suggested appropriate conditions that would ensure that noise emission levels at the closest residential properties would comply with the guidance in ETSU-R-97. I find that, subject to the conditions suggested by the council, the proposal would not have a detrimental effect on residential property by reason of noise. Consequently, I conclude that the proposed development could meet the specific requirements of policy ER35(c) of the ALPR."

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8.6 Updated Assessment

The current proposal consists of a single EWT DW54. As the development has scaled down significantly, it is proposed that noise limits derived from background noise levels will not be required and that the turbine can be accommodated in terms of noise.

8.6.1 Baseline

Eight of the nearest receptors have been identified as potentially sensitive to noise impact. These are shown on the map in **Figure 8.1**

Operational noise calculations have been run to predict noise levels at the identified receptors discussed above and shown in the figure below.

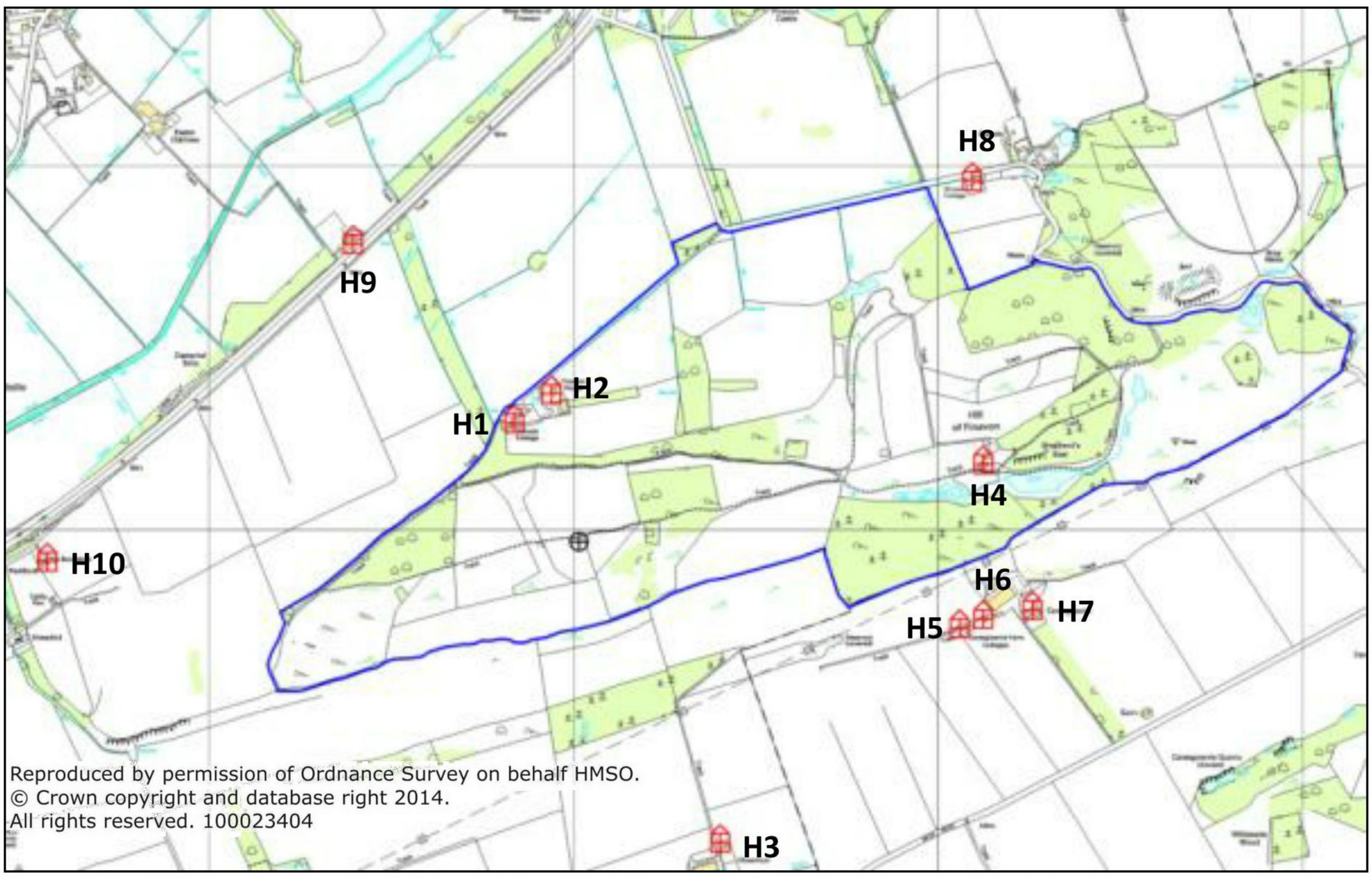
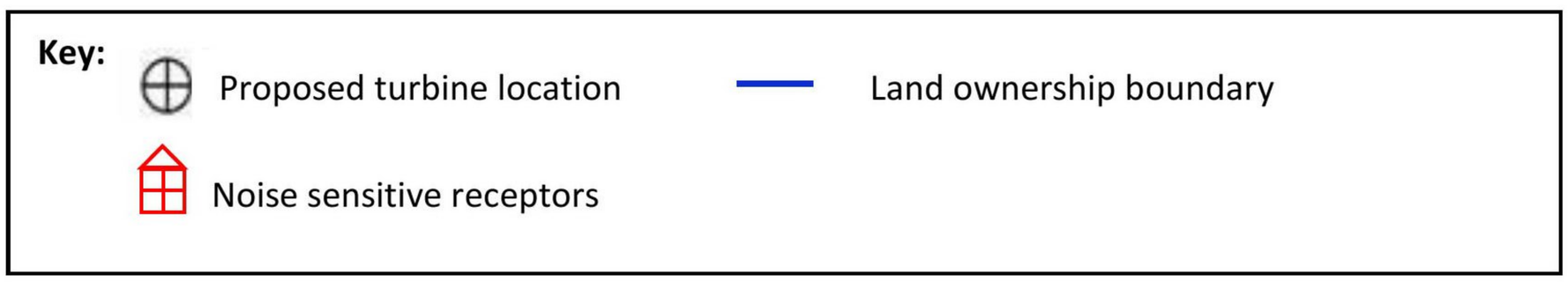


Figure 8.1 - Site layout showing proposed turbine locations and nearest noise sensitive receptors



The IOA recommends that a margin of 1.645 times the measurement uncertainty value at each wind speed should be used as a clear indication that suitable uncertainties have been incorporated[4].

[4] IOA: A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise, Issue 1, May 2013, page 20.

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The development has been re-assessed in terms of noise for an EWT DW54 turbine operating in 500kW mode at a v_{10} wind speed of 10ms^{-1}. The octave band sound power levels are given in **Table 8.2**

Table 8.2 – Octave band sound power levels for the EWT DW54 at v_{10} wind speed of 10ms^{-1}

Octave Band (Hz)	63	125	250	500	1000	2000	4000	8000
Sound Power Level (dB(A))	83.0	89.0	93.0	97.0	95.0	92.0	90.0	84.0
Total [dB(A)]	101.6							
Uncertainty [dB(A)]	1.1							
IOA Uncertainty [dB(A)]	1.8							

8.6.2 Choice of Propagation Model

The International Standard ISO 9613, 'Acoustics – Attenuation of Sound During Propagation Outdoors - Part 2', noise propagation model has been used for the turbine noise calculations. L_{Aeq} noise propagation was modelled using WindFarm v4.2.1.7 by ReSoft. L_{A90} levels were derived by subtracting two decibels from the L_{Aeq} values as per the ETSU-R-97 guidance.

The input parameters shown in **Table 8.3** have been used and are consistent with the IOA best practice guidance.

Table 8.3 – Propagation input parameters

Atmospheric Attenuation Assumptions	
Temperature (°C)	10
Humidity (%)	70
Ground Attenuation Assumptions	
Attenuation factor, G	0.5 (semi-soft ground)
Receptor height (m)	4.0

The attenuation of noise as it travels through the air varies with frequency. The atmospheric attenuation coefficients used in the assessment, corresponding to the assumptions in **Table 8.3**, are tabulated in **Table 8.4.**

Table 8.4 – Attenuation coefficients used for the noise propagation model

Octave Band (Hz)	63	125	250	500	1000	2000	4000	8000
Attenuation Coefficient	0.0001	0.0004	0.0010	0.0019	0.0037	0.0097	0.0328	0.1170

8.7 Predicted Impacts & Effects

The ETSU-R-97 guidelines indicate that for single turbines or turbines located far from the nearest properties, a simplified approach can be taken. If it can be demonstrated that the noise levels due to the turbine would not exceed 35dB(A) $L_{A90,10min}$ at the nearest sensitive receptors, then that in itself would provide sufficient protection of amenity for those receptors.

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ETSU allows for a higher fixed lower limit of 45dB(A) where it can be demonstrated that a property has a financial interest in the wind development. Properties H1 – Finavon Cottage and H2 – Finavon House have a demonstrable financial interest in the development. As such, the higher noise limit of 45dB(A) would apply at these properties.

The calculated $L_{A,eq}$ and derived $L_{A90,10min}$ levels, including uncertainty factor, levels are shown in **Table 8.5**.

Table 8.5 - Predicted noise levels at nearby properties

ID	Property Name	Easting	Northing	Distance from Turbine (to 10m)	L_{Aeq} [dB(A)]	$L_{A90, 10min}$ [dB(A)]
1	Finavon Cottage*	348840	755290	370	40.7	38.7
2	Finavon House*	348940	755370	410	39.6	37.6
3	Howmuir	349400	754140	910	31.5	29.5
4	Hill of Finavon	350130	755180	1130	29.2	27.2
5	Carsegownie Cottage 1	350060	754730	1070	29.8	27.8
6	Carsegownie Cottage 2	350130	754760	1130	29.2	27.2
7	Carsegownie	350260	754780	1260	28.1	26.1
8	Hillview Cottage	350100	755960	1470	26.5	24.5
9	Clatterha Smithy Cottages	348400	755790	1030	30.3	28.3
10	The Bungalow	347560	754910	1460	26.5	24.5

**Indicates a receptor which has a financial interest in the proposed development*

As can be seen, none of the third party properties are expected to experience noise levels greater than the ETSU-R-97 guidelines fixed lower noise limit of 35dB(A).

H1 - Finavon House and H2 - Finavon Cottage are not expected to experience noise levels greater than the ETSU-R-97 guidelines fixed lower noise limit of 45dB(A) for financially involved properties.

8.8 Mitigation

No mitigation is proposed as the 35dB(A) fixed lower noise limit set out by the ETSU-R-97 guidelines is not predicted to be breached at any third party property. Both financially interested properties, H1 - Finavon House and H2 - Finavon Cottage meet the higher ESTU-R-97 fixed lower noise limit for financially involved properties.

8.9 Conclusions

Wind turbine noise calculations have been carried out to assess the significance of noise impact from the proposed scheme on residential amenity.

Wind turbine noise levels at all third party properties comfortably meet the ETSU-R-97 fixed lower noise limit of 35dB(A). Wind turbine noise levels at financially involved properties meet the ETSU-R-97 fixed lower noise limit of 45dB(A) for such properties.

It is concluded that this proposal can be accommodated in terms of noise.

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9 Cultural Heritage/Archaeology

9.1 Introduction

Cultural heritage is represented by a wide range of features, both above and below ground, which result from past human use of the landscape. Cultural heritage and archaeology features can include features such as buildings, earthwork monuments and artefact scatters as well as sub-surface archaeological remains and landscape features such as field boundaries and industrial remains.

The aim of this study is to identify elements of archaeological and cultural heritage value that may be impacted upon by the proposed wind turbine at the Finavon Hill Estate.

9.2 Guidance

- SPP – Historic Environment
- Scottish Historic Environment Policy (SHEP) 2011
- Managing Change in the Historic Environment guidance note series –Setting
- Pan 2/2011 – Planning and Archaeology

9.3 Methodology

This study will assess the archaeological and cultural heritage implications of the proposed turbine, by examining current evidence for buried archaeological remains and upstanding monuments on the proposed development area and its immediate surroundings. The potential indirect impact of the proposed windfarm on the settings of designated heritage assets within a 5km radius of the site will also be assessed.

In the preparation of this assessment, a range of historical and technical data was collected and analysed. The following sources were consulted:

- Historic Environment Record (HER);
- National Monuments Record Scotland (NMRS);
- Aerial photograph collection held by the Royal Commission on the Ancient and Historical Monuments of Scotland (RCAHMS);
- National Library of Scotland (Map Library); and
- Historic Scotland's database of; Listed Buildings, Scheduled Monuments (SMs), Gardens and Designed Landscapes (GDLs), Conservation Areas, Inventory Battlefields, World Heritage Sites and monuments proposed for scheduling.

9.3.1 Approach

A phased approach to the assessment was adopted:

Direct Impact

The area most at risk of direct impact was assessed to be land 50m either side of the access track and within 200m of the proposed wind turbine location (**Figure 9.2**).

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Indirect Impact

The indirect visual impact on the setting and character of known cultural heritage sites has been considered within this assessment. Nationally significant features such as: Scheduled Monuments, Gardens and Designed Landscapes, 'A' Listed Buildings, Inventory Battlefields, and World Heritage Sites were considered within 5km of the proposed wind turbine. Regionally significant features such as 'B' listed buildings, and conservation areas were considered to 2km of the proposed turbine **(Figure 9.3).**

Analysis of a computer model of the proposed single wind turbine, and existing landform (DTM) was used to produce a zone of theoretically visibility (ZTV). The ZTV was used to assess the likelihood and severity of potential indirect visual impacts of the wind turbine at the cultural heritage sites identified within the study area. However, the ZTV is a bare earth model that does not take into account screening from the natural and built environments, therefore visibility of the development from areas within the ZTV may not always be possible.

Cultural Heritage and Archaeology Figures

Analysis of a computer model of the proposed single wind turbine, and existing landform was used to produce a zone of theoretically visibility (ZTV). Wirelines and photomontages have been used where appropriate to assess the potential indirect visual impacts of the wind turbine at sites of cultural heritage interest. It should be noted that the ZTV is a bare earth model that does not take into account screening from the natural and built environments, therefore it represents a worst case scenario.

Angus Council expressed a level of concern relating to the indirect impact on the Hill of Finavon fort and Turin Hill fort in relation to the original application. Photomontages were included to demonstrate the likely impact from these features in the original submission and these photomontages have been reproduced as part of this submission to demonstrate the significant reduction in impact. These can be found in the Landscape Figures which accompanies the present Environmental Report.

Historic Maps

Historic maps held at the National Library of Scotland (Map Library) and aerial photographs were consulted as part of the desk based assessment.

Table 9.1 - Historic maps of the proposed wind turbine location

Map	Date	Notable Historic Changes
Roy Highlands	1747-52	Area is not depicted on the map.
OS Six Inch	1843-1882	Hillside cottage is depicted on the map. The field in which the turbine is located is forested.
OS One Inch	1885-1900	Hill is called, 'Hill of Finhaven'.
OS Six Inch	1892-1905	No changes discernible.
Bartholomew Half Inch	1897-1907	No changes discernible.
Bartholomew Survey Atlas	1912	No changes discernible.
Bartholomew Half-Inch	1926-1935	No changes discernible.
OS 1: 25, 000	1937-61	No changes discernible.
Air Photos	1944-1950	The field in which the turbine will be located is now de-forested.
OS One Inch	1945-1948	No changes discernible.
OS One Inch	1955-61	Area of forestry is further felled.

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Information Gaps

An attempt has been made to consult all readily available documentary sources. However, it is possible that there may be other documentary sources held by RCAHMS and the National Archives of Scotland, which have not been consulted as part of this assessment.

9.3.2 Assessment Criteria

The following general criteria outlined in **Tables 9.2** and **9.3** have been used in the assessment of significance of any direct or indirect impact on any site of cultural heritage importance.

Table 9.2 – Sensitivity of cultural heritage and archaeological features

Sensitivity	Definition
High	Category A listed buildings Scheduled Monuments Non-statutory List of sites likely to be of national importance Gardens and Designed Landscapes World Heritage Sites Inventory Battlefields
Medium	Category B listed buildings Category C listed buildings Archaeological sites on the Sites and Monuments Record (of regional and local importance) Conservation Areas
Low	Archaeological sites of lesser importance Non-Inventory Gardens and Designed Landscapes

Table 9.3 - Magnitude of cultural heritage and archaeological effects

Magnitude	Definition
High	Any number of wind turbines and/or ancillary development that would result in: • the removal or partial removal of key features, areas or evidence important to the historic character and integrity of the site, which could result in the substantial loss of physical integrity; and/or • a substantial obstruction of existing view by the addition of uncharacteristic elements dominating the view, significantly altering the quality of the setting or the visual amenity of the site both to and from.
Medium	Any number of wind turbines and/or ancillary development that would result in: • the removal of one or more key features, parts of the designated site, or evidence at the secondary or peripheral level, but are not features fundamental to its historic character and integrity; and/or • a partial obstruction of existing view by the addition of uncharacteristic elements which, although not affecting the key visual and physical relationships, could be an important feature in the views, and significantly alter the quality of the setting or visual amenity of the site both to and from.
Low	Any number of wind turbines or ancillary developments that may result in: • a partial removal/minor loss, and/or alteration to one or more peripheral and/or secondary elements/features, but not significantly affecting the

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	historic integrity of the site or affect the key features of the site; and/or • an introduction of elements that could be intrusive in views, and could alter to a small degree the quality of the setting or visual amenity of the site both to and from.
Negligible	Any number of wind turbines or ancillary developments that may result in: • a relatively small removal, and/or alteration to small, peripheral and/or unimportant elements/features, but not affect the historic integrity of the site or the quality of the surviving evidence; and/or • an introduction of elements that could be visible but not intrusive in views, and the overall quality of the setting or visual amenity of the site would not be affected both to and from.

The level of both direct and indirect effects that the proposed wind turbine may have on the surrounding features of historical significance is determined by the combination of their sensitivity and magnitude of change. The following matrix is used to determine the overall significance of effect.

Table 9.4 – Significance of effect matrix

Sensitivity	**Magnitude of Change**			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor/Negligible

9.3.3 Site Background and Context

Development Operation and Decommissioning

After the 25 year life span of the development, the project will be decommissioned and the surrounding landscape will be returned to its original state.

The Original Application (12/00002/EIAL)

The original application was for 3 E70s, of 99.5m to tip height. The current application is for a single turbine of 67m to tip. The reduction in both turbine number and tip height is expected to significantly reduce the potential indirect visual impact of the proposed development. The locations of the pervious application compared to the current application are shown in **Figure 9.1** below.

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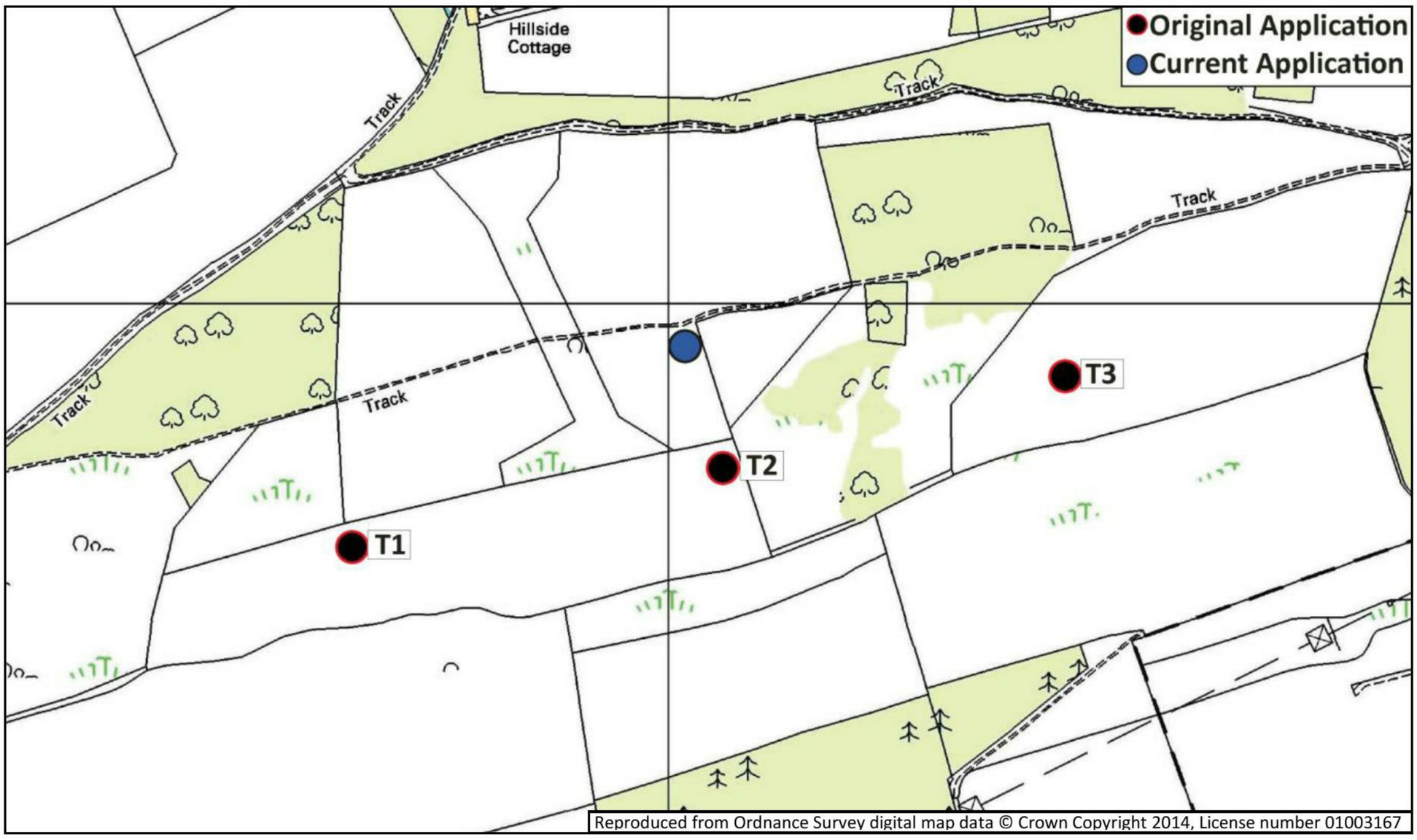

Figure 9.1 - Locations of the original and current applications

During the early stages of the original development, detailed consultation with a number of consultees, mainly Historic Scotland, was undertaken. Historic Scotland did not offer any objection to the original application although Angus Council expressed some concern regarding the impact on the Finavon Hill and Turin Hill forts. Viewpoints were taken from these hill forts and have been re-produced for this application.

The Reporters Appeal Decision Notice for the original application stated that *"I am content that the proposed development would only have a medium impact on Turin Hill fort from a cultural perspective.* The Reporter also went on to say that "*I am not persuaded that the proposed development would damage the integrity of the setting of this hill fort when viewed from the surrounding area."* Overall the Reporter contended that the indirect impact on surrounding cultural heritage features from original application was not adverse or significant.

Direct Impact Assessment, Archaeological Walkover Survey

From an initial assessment of the development area at the scoping stage of the project, it was clear that a number of known archaeological constraints may have existed on the site and are registered on both the National Monuments Record of Scotland and the Historic Environment Record. Murray Archaeological Services was commissioned to undertake an archaeological walkover survey in regard to the footprint of the original development to assess the survival, nature and location of any archaeological remains on the site. The walkover survey was undertaken on the 15th of June 2011.

The full survey results including map of the sites and their locations in relation to the original development are presented in **Appendix 5**.

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9.4 Baseline

9.4.1 Direct Impact

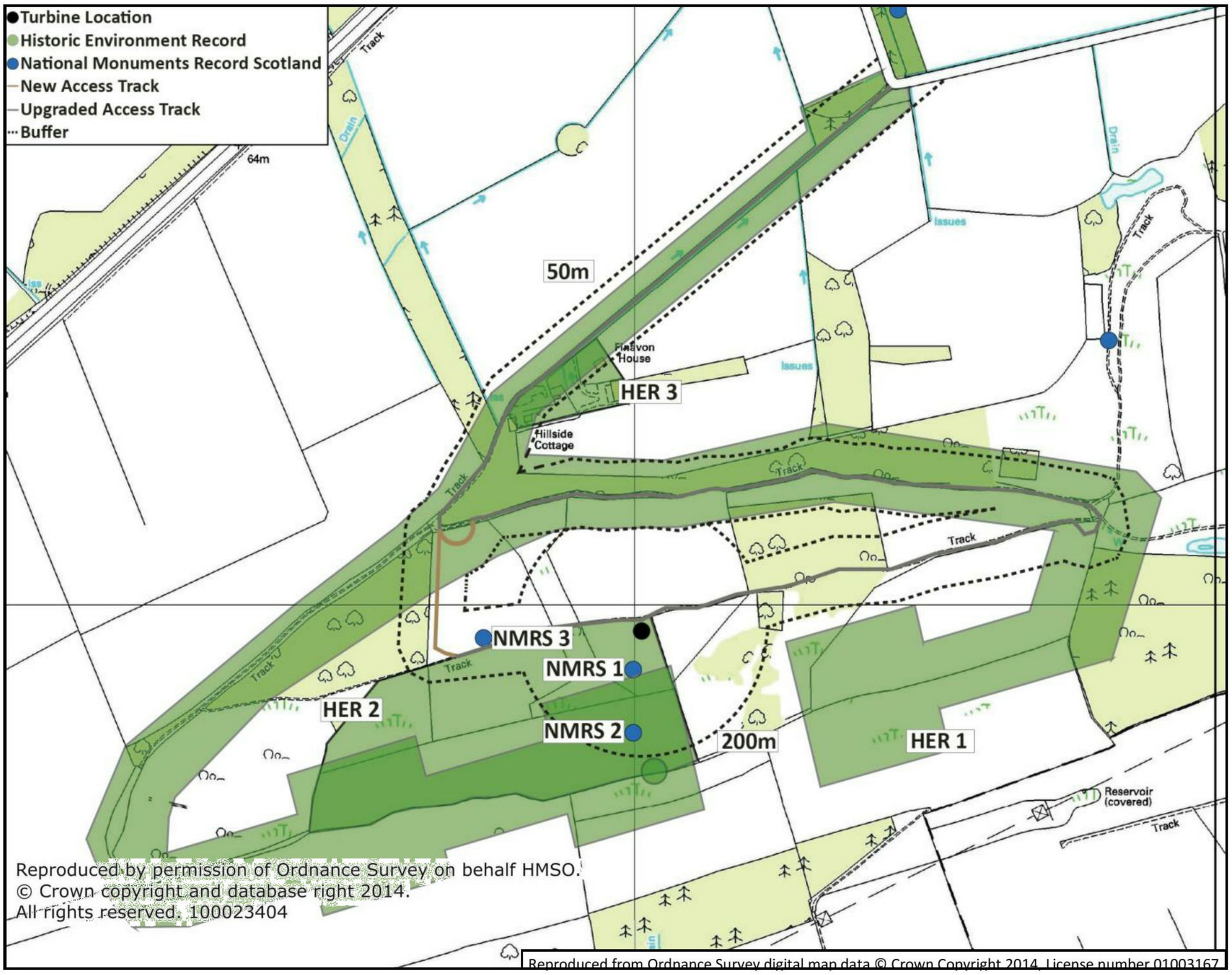

Figure 9.2 – Features of historical significance within 200m of the turbine & 50m of the access track

As can be seen in **Figure 9.2** above there are 6 features within the direct impact study area, the locations of these features are shown in **Figure 9.2** and brief descriptions of these features are in **Table 9.5** below. Features HER 2/ NMRS1, NMRS 2, & HER 3 have previously been assessed by Murray Archaeological Service Ltd, **Appendix 5**.

Table 9.5 - Cultural Heritage features within 200m of the wind turbine and 50m of the access track

NMRs/HER number	Site number	Distance	Name	Description
HER 1	NO45NE0074	~90m	Hill of Finavon	An archaeological assessment was carried out of this site in June 2011 in advance of a proposed wind development. A walkover survey and desk based assessment were carried, but this did not identify any new sites within the development area. Previously recorded sites within the development area were assessed and it is advised that due to the poor condition of the surviving archaeology, they will not be adversely affected by the proposed development.
HER 2/ NMRS 1	NO45SE 73	~0/75m	Hill of Finavon	Remains of rig and furrow; recorded by J Sherriff in 1982. Most of the SW end of the hill is covered with

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				rig and furrow cultivation.
HER 3	NO45NE0065	~0m	Hillside	Remains of a farmstead. On both the 1st and 2nd edition OS maps (c.1846 and c.1888) a small farmstead of three buildings and three attached enclosures are shown.
NMRS 2	NO490 548	~160m	Hill of Finavon	In an area of rig and furrow (NO45SE 73) there is a sandstone boulder measuring 0.7m x 0.8m which has 17 cup-marks on its upper surface.
NMRS 3	NO45SE 388	~10m	Hill of Finavon	NO 4876 5494 (centred on) A walkover survey was undertaken on 15 June 2011 as part of an assessment of a proposed windfarm site. No previously unidentified archaeological features were recorded.

Hill of Finavon (HER 1) represents the area covered by the walkover survey carried out by Murray Archeological Services Ltd in June 2011, this area covers the original access tracks and turbine locations for the previous three turbine application.

Hill of Finavon (HER 2/NMRS 1) spans a number of modern agricultural fields and is situated upon the south eastern flank of Hill of Finavon. Hillside (HER 3) covers the farm steading titled 'Hillsde Cottage', the feature is immediately adjacent to an existing farm track. Hill of Finavon (NMRS 2) is situated within a modern agricultural field. Hill of Finavon (NMRS 3) is located upon a modern field boundary alongside an existing farm track.

9.4.2 Indirect Visual impacts

'B' listed buildings and conservation areas

All 'high' sensitivity features, with the addition of 'B' listed buildings and Conservation Areas were considered out to 2km from the proposed development. The study has found four 'B' listed buildings and three SMs within 2km of the proposed wind turbine. No Conservation Areas, 'A' listed buildings, Inventory Battlefields, World Heritage Sites or GDLs were found within this radius. The locations of these features are shown in **Figure 9.3** and brief descriptions of the features are given in **Table 9.6**.

'A' listed Buildings, SMs, GDLs, Inventory Battlefields, and World Heritage Sites

Within 5km of the project an additional, 2 'A' listed buildings, and further 19 SMs were identified. No World Heritage Sites, GDLs or Inventory Battlefields were found to be located within 5km of the proposed single wind turbine. The locations of the historic features are shown in **Figure 9.3** above and brief details of the features are given in **Table 9.7** below.

As seen in **Figure 9.3**, a number of the identified features fall outside of the ZTV and therefore will not be at risk of indirect visual impact. **Table 9.6** provides a description of each feature within the study radius and details the rationale applied for assessing the feature against indirect visual impacts or scoping the feature out of the assessment, depending on variables such as theoretical visibility and the individual setting of the feature. Within **Table 9.6** features of historical significance that will be considered further within the assessment have been marked in green, the features that will not be considered further have not been coloured.

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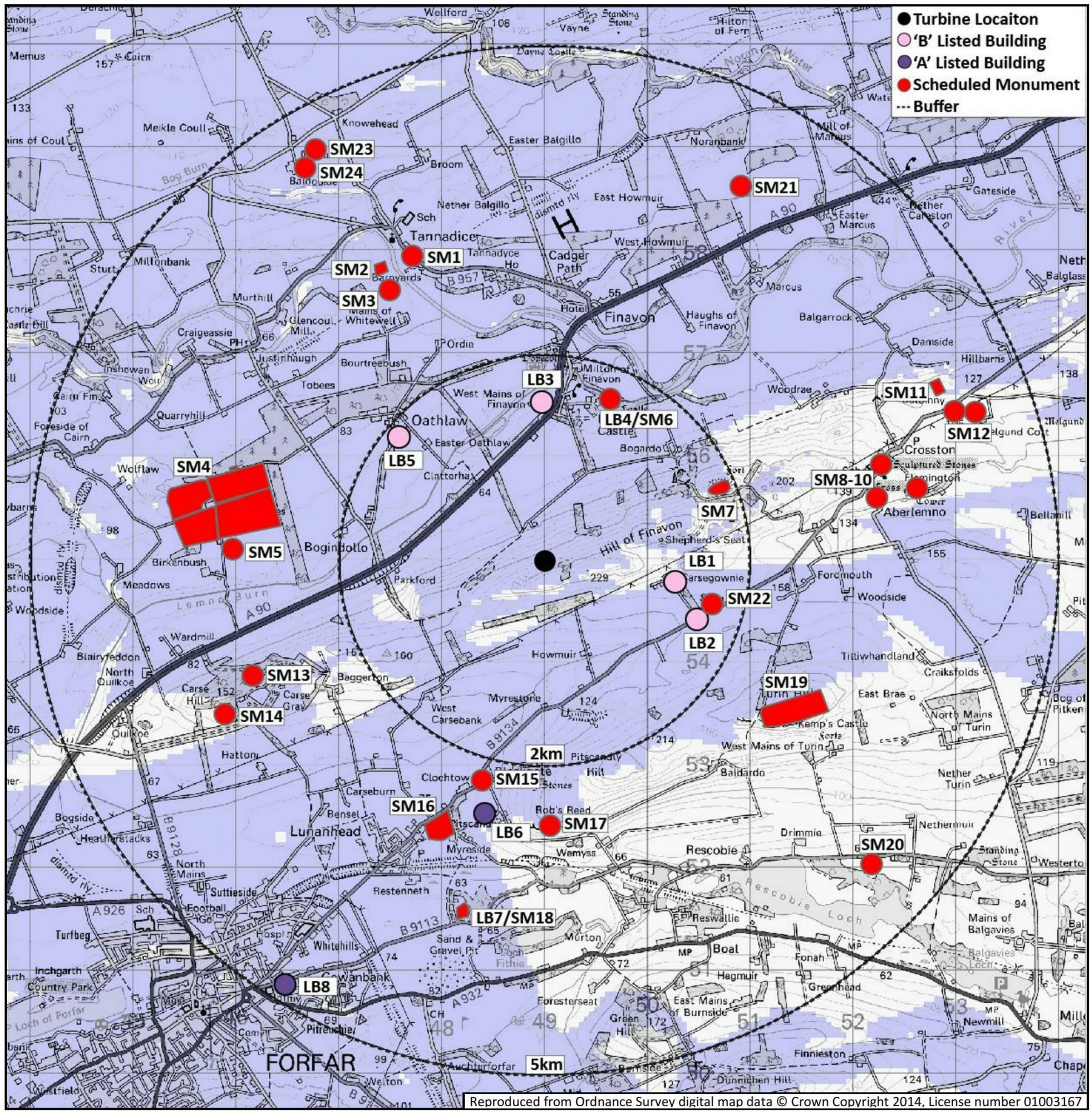

Figure 9.3 – Features of historical significance within 5km, showing area of theoretical visibility.

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Table 9.6 – Features of historical significance within 5km of the project

LB/SM/ GDL no.	HBNUM/ Index no.	Distance	Name	Listing & Description		Theoretical Visibility	Rationale for further assessment
LB 1	4954	~1.3km	Carsegownie Farmhouse	'B'	Two-storey lairds' house, E-plan dating 17th century, remodelled and extended c. 1840. Harl and slate with inset stone. AC.EC 1680	Yes	The farmhouse has theoretical views of the proposed wind turbine. Due to the close proximity of the feature to the development and the open views available to the north-west, the potential indirect visual impacts of the turbine will be assessed further.
LB 2	4923	~1.6km	Carsegownie – Entrance Gates	'B'	Square classic piers in V-jointed ashlar with ball finials mounted on sculptured bases and inscribed M.O. and G.C. Late 17th or early 18th century with flank walls and gates. c. 1840.	Yes	The localised setting of the feature is such that there are open views to the north-west, in the direction of the development. The potential indirect impacts of the proposed development will be assessed further in **Section 9.5**.
LB 3	17726	~1.5km	West Main Farmhouse	'B'	Two-storey, harl and slate with pedimented centre bay and single-storey wings. Early 19th century.	Yes	The farmhouse has theoretical views of the proposed development. The localised setting of the farmhouse is a functional one; potential indirect impacts will be assessed further in **Section 9.5**.
LB 4/ SM 6	17723/ 2464	~1.6km	Old Castle of Finavon	'B'	Five-storey tower house ruin, L-plan with vaulted basement and corbelled angle turret. Picturesque. Very overgrown. The monument consists of the remains of a substantial fortified mansion built for the Lindsay earls of Crawford in the fifteenth, sixteenth and seventeenth centuries.	Yes	The ruinous castle has theoretical views of the single turbine. The current setting of the castle is within mature woodlands that will restrict long distance views either to or from the feature. No significant adverse impacts upon the features current setting are predicted. This feature will not be considered further within this assessment.
LB 5	17719	~1.8km	Oathlaw Parish Kirk	'B'	Small oblong, gothic, rubble and slate with crowtepped gables and battlemented bell-tower. 1815, with later session house. 15th century tombstone and inset stones 1673 and 1758.	Yes	The localised setting of the kirk is within the hamlet of Oathlaw. The listed building is expected to have theoretical views of the single turbine. The potential indirect impacts of the development will be assessed further in **Section 9.5**.
LB 6	17657	~2.5km	Pitscandly House	'A'	Two-storey classic mansion house, harl and slate, pedimented centre bay with moulded and pedimented doorpiece; back wings, (one vaulted), enclosing sunk courtyard. Interesting interiors. May date late 17th century.	Yes	The mansion house has theoretical views of the proposed development to the north north-east. The potential indirect impacts of the single turbine will be assessed further.
LB 7/ SM 18	11386/ 90246	~3.5km	Restenneth Priory	'A'	13th cent. chancel and remains of nave and claustral buildings; Romanesque tower with	Yes	The proposed single turbine is theoretically fully visible to the north north-east of the proposed development. The potential indirect

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LB/SM/ GDL no.	HBNUM/ Index no.	Distance	Name	Listing & Description		Theoretical Visibility	Rationale for further assessment
					later broach spire. Parish kirk to 1591. Picturesque site.		visual impact of the single turbine will be assessed further.
LB 8	31604	~4.8km	Lowson Memorial Parish Church Jamieson Street	'A'	A Marshall Mackenzie (Aberdeen) 1912-14. Late Scots gothic, cruciform, red snecked rubble, details culled from Elgin, Aberdeen Greyfriars, St. Monance and other sources. 5-bay nave with aisles.	Yes	The localised setting of the church is upon the eastern periphery of Forfar. The church's urban setting is such that the predominant views from the building are into the surrounding townscape. The buildings in the town will prevent any long distance views in the direction of the single turbine. No significant adverse impacts upon the church's urban setting are predicted. This feature will not be assessed further within this assessment.
SM 1	6355	~3.2km	Barnyards, enclosure	The monument comprises the remains of an enclosed settlement of prehistoric date represented by cropmarks visible on oblique aerial photographs.		Yes	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 2	6371	~3.2km	East Mains of Whitewell, souterrains	The monument comprises the remains of a group of souterrains of later prehistoric date represented by cropmarks visible on oblique aerial photographs.		Yes	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 3	6372	~3.0km	East Mains of Whitewell, barrow and pits	The monument comprises the remains of a barrow and pits of prehistoric date represented by cropmarks visible on oblique aerial photographs.		Yes	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 4	2308	~2.6km	Battledykes, Roman camp	The monument comprises a Roman temporary camp, represented by cropmarks visible on oblique aerial photographs and, in part, as an upstanding earthen bank.		Yes	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 5	7234	~3.0km	Battledykes, cairn	The monument comprises a burial cairn of prehistoric date, visible as a low, tree-covered mound. The monument lies in arable farmland, on a small natural eminence at around 75m OD. It consists of a low stony circular mound, some 40m in diameter and up to around 1.5m in height.		Yes	The current setting of the cairn is within a modern agricultural field. The cairn itself is currently tree covered, creating a private localised setting with no long distance views from the feature. This feature will not be assessed further within this assessment.
SM 7	139	~1.7km	Finavon, fort	The monument comprises the remains of a vitrified fort of later prehistoric date. The fort is an elongated oval in shape, measuring		Yes	The fort is in a prominent position upon the Hill of Finavon. The current setting of the fort gives rise to panoramic views in all directions. Historic Scotland has raised concerns over the potential

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LB/SM/ GDL no.	HBNUM/ Index no.	Distance	Name	Listing & Description	Theoretical Visibility	Rationale for further assessment
				approximately 150m by 40m internally, within a vitrified wall some 6m thick.		indirect visual impact of the original application but offered no objection ultimately. The potential visual impact of the proposed development will be assessed further taking into account the concerns of Historic Scotland.
SM 8	90004	~3.4km	Aberlomno Cross slab and symbol stones	The monument comprises two symbol stones and a cross slab of Pictish date. The stones occupy a series of three roadside recesses. Only the SW example, the cross slab, is thought to be in its original position.	No	The stones have open settings, lying immediately adjacent to the B9134 to the west and a modern agricultural field to the east. The cross slab and symbol stones that comprise the SM do not have theoretical views of the development. The current settings of the historic features are not expected to be adversely impacted by the proposed development. The SM will not be considered further within this assessment.
SM 9	5447	~3.6km	Flemington Tower, Aberlemno	The monument consists of the remains of an L-plan towerhouse of early seventeenth century date with eighteenth century modifications.	No	The tower falls outwith the single turbines ZTV. The remains of the tower are within the hamlet of Flemington. The immediate setting of the tower forms part of a modern farmsteading. The current localised setting of the tower is not expected to be adversely impacted by the proposed development. This feature will not be considered further within this assessment.
SM 10	90003	~3.6km	Aberlemno churchyard cross slab	The monument comprises a cross slab of Pictish date. The stone stands in Aberlemno churchyard. It comprises an upright slab, some 2.3m high by about 1.3m wide at the bottom, tapering to about 0.9m wide at the top by about 0.2m thick.	No	The churchyard cross slab falls outwith the ZTV of the proposed developments ZTV. The immediate setting of the cross slab is within the walled Aberlemno churchyard. The current setting of the cross slab will remain unaffected by the proposed single turbine.
SM 11	6357	~4.0km	Balbinny, enclosure	The monument comprises the remains of an enclosed settlement of prehistoric date represented by cropmarks visible on oblique aerial photographs	No	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 12	6471	~4.2km	Melgund Cottage, cairn	The monument comprises the remains of a cairn and enclosure of prehistoric date. The enclosure is represented by cropmarks visible on oblique aerial photographs, while the cairn survives as a grassed-over stony mound.	No	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 13	4461	~3.0km	Carse Grey, stone setting	The monument is the remains of a setting of four stones (of the type known as 'four poster') of the late Neolithic/earlier Bronze Age. Three stones still	Yes	The stones have theoretical visibility of the proposed development. The current setting of the SM is within mature woodlands. The woodlands that surround the stones will restrict any long distance

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LB/SM/ GDL no.	HBNUM/ Index no.	Distance	Name	Listing & Description	Theoretical Visibility	Rationale for further assessment
				stand, situated in a hand-planted forest, immediately adjacent to a forest track. The stones are about 3.6m apart.		views either to or from the SM. This feature will not be considered further within this assessment.
SM 14	6311	~3.5km	Carse Grey, settlement and souterrains	The monument comprises the remains of an unenclosed settlement and souterrains of prehistoric date represented by cropmarks visible on oblique aerial photographs.	Yes	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 15	149	~2.2km	Blackgate Smithy, stone circle	The monument comprises the remains of a stone circle of Neolithic or Bronze Age date represented by two standing stones and several fallen slabs.	Yes	The stone circle has theoretical views of the proposed development. The current setting of the stone circle is within the hamlet of Blackgate. The surrounding buildings within the hamlet of Blackgate that comprise the urban setting of the feature are expected to screen potential views both to and from the proposed turbine. The single turbine is not expected to adversely impact upon the current setting of the SM or the way in which it is understood in the landscape. This feature will not be considered further within this assessment.
SM 16	5934	~2.6km	Myreside, henge, enclosure and barrows	The monument comprises the remains of a henge, an enclosure and a series of barrows of prehistoric date represented by cropmarks visible on oblique aerial photographs	Yes	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 17	2869	~2.6km	Rob's Reed, fort	Rob's Reed is a dun, a single-walled enclosure, 32.0m in diameter overall and 16.0m internal diameter. The wall is now represented by a heap of small stones, overgrown with grass and spread to 7.7m.	Yes	Historic Scotland originally raised some concerns over the potential indirect visual impact of the original development on the fort but offered no objection. The potential impact of the single turbine will be assessed further.
SM 19	142	~2.5km	Turin Hill, fort	Remains of a hillfort; also known as Kemp's Castle. An Iron Age complex consisting of two forts and three circular homesteads.	Yes	The localised setting of the fort is upon the summit of Turin Hill. The elevated position of the fort gives rise to panoramic views. Historic Scotland originally raised concerns over the potential indirect visual impacts of the previous development. They did not object to the original application. The potential indirect effects of the proposed single turbine will be assessed further.
SM 20	4584	~4.3km	Haresburn Croft, burial mound	The monument comprises a burial mound of prehistoric date, visible as a grass-covered mound. It is being rescheduled in order to reflect more	No	The burial mound falls outside of the ZTV. The immediate setting of the burial mound is within a modern agricultural field. The SM is immediately adjacent to the B9113 to the north. To the south and

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LB/SM/ GDL no.	HBNUM/ Index no.	Distance	Name	Listing & Description	Theoretical Visibility	Rationale for further assessment
				precisely the probable extent of buried archaeological deposits around the upstanding mound.		west of the SM is mature woodlands which create a more enclosed setting.. The current setting of the SM is not expected to be adversely impacted. This feature will not be assessed further.
SM 21	4103	~4.0km	Noronbank, timber hall	Cropmarks of a probable timber hall; recorded during aerial reconnaissance by the RCAHMS in 1976. The cropmarks represent what may be the wall-trench of a rectangular timber building measuring about 27m x 8m internally. This may be a Neolithic timber building, such as those at Balbridie, Crathes Castle and Claish, Stirling.	Yes	The potential impact upon this feature has been assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 22	5947	~1.6km	Carsegownie, cairn	The monument comprises the remains of a burial cairn of prehistoric date, surviving as a low, grassed-over, stony mound. The monument lies at around 160m OD on the SW side of the saddle between Turin Hill and Finavon Hill.	Yes	The cairn has theoretical views of the proposed development. The current setting of the cairn is within a modern agricultural field. The feature itself is covered by a pocket of mature trees. The localised setting of the SM is immediately adjacent to a road, with a woodland shelter belt to the east. The intervening woodland shelter belt will restrict any long distance views in the direction of the development. This feature will not be assessed further.
SM 23	6315	~4.6km	Baldoukie, souterrains	The monument comprises the remains of several souterrains of later prehistoric date represented by cropmarks visible on oblique aerial photographs.	Yes	The potential impact upon this feature has been more thoroughly assessed by Murray Archaeological Services Ltd, please refer to **Section 9.7** and **Appendix 5** for further details.
SM 24	6314	~4.5km	Law of Baldoukie, barrow	The monument comprises the remains of a barrow of prehistoric date surviving as a low mound in an arable field. It comprises the remains of a barrow some 22m in diameter by 1.1m high. The barrow has been somewhat reduced by ploughing but may still be expected to contain evidence for burial and associated ritual practices of the later Neolithic or of the Bronze Age.	Yes	The current localised setting of the barrow is within a modern agricultural field. The barrow has theoretical views of the proposed single turbine. The potential indirect impacts of the development will be assessed further.
			Carried forward to assessment			
			Not carried forward to assessment			

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In summary, the following features will not be considered further within this assessment for reasons noted in **Table 9.6**:

- LB: 4/SM 6 & 8
- SM: 5, 8-10, 13, 14-16, 20 & 22

Further Assessment
The following features were considered to potentially be subject to some level of indirect visual impact, and will be considered further within the assessment:

- LBs: 1-3, 5, 6 & (7/ SM 18)
- SMs: 7, 17, 19, &24
- The potential indirect impact of the development upon sub-surface remains, SMs: 1-4, 11, 13, 14, 16, 21 &23, has been assessed by Murray Archaeological Services Ltd in **Section 9.7** and **Appendix 5.**

The settings of the features in which a potential for indirect impact has been identified are described in more detail below.

'B' Listed Buildings

- Carsegownie Farmhouse (LB 1): the localised setting of the farmhouse is within a modern, functional farm. The orientation of the building suggests that the predominant views from the listed building are to the south. An electricity pylon runs to the north west of the farmhouse on a north-east to south-west axis, adding an industrial element to the setting of the farmhouse. The wider setting of the farm is within modern agricultural farmland.

- Carsegownie – Entrance Gates (LB 2): the localised setting of the entrance gates are at the south easterly end of the Carsegownie access track. The location of the gates at the end of the farm track suggests that they uphold their original functional setting. The gates are immediately adjacent to the B9134, to the south-east there is a woodland shelter belt to the north-east of the gates.

- West Main Farmhouse (LB 3): the localised setting of the farmhouse is within its associated working farm. The house has a functional setting with the predominant views being into the surrounding farm buildings. To the north-west the farmhouse has a more open setting. The A90 passes ~100m to the south-east of the listed building, adding an industrial element to the setting of the house. There is a woodland shelter belt to the south of the listed building, restricting long distance views in this direction.

- Oathlaw Parish Kirk (LB 5): the immediate setting of the parish kirk is within its associated walled graveyard. The kirk is located on the eastern periphery of the hamlet of Oathlaw. The wider setting of the parish kirk is within modern agricultural farmland. There are a number of woodland shelter belts to the south-east of the kirk.

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'A' listed buildings

- Pitscandly House (LB 6): the main façade of the building is orientated to the south-west. To the rear of the house the views are across the gardens associated with the house. The views from the main façade of the house are across the manicured lawn bordered by mature trees. The mature woodlands that border the garden are expected to restrict outward views at ground level, creating a secluded setting.

- Restenneth Priory (LB 7/ SM 18): the localised setting of the ruinous priory is within a tree-lined field that restricts long distance views from the feature itself. The mature trees that border the priory create a private setting. The field in which the priory is set is bordered by the B9113 to the south, and is located ~1.5km to the north-east of Forfar.

SMs

- Finavon, fort (SM 7): the fort is situated upon the summit of Finavon Hill, the elevated position of the feature characterises its setting. There are a number of vertical manmade structures in the locality of the fort that contribute to its current setting, the telecommunications masts to the south south-east and west north-west. The other vertical manmade structure is the electricity pylon that passes to the south-east of the fort on a north-east to south-west axis. Both the telecommunications mast and the electricity pylons add an industrial element to the current setting of the fort.

- Rob's Reed, fort (SM 17): the current localised setting of the fort is within a modern agricultural field, upon the southern flank of Pitscandly Hill. The comparatively elevated position of the fort allows for long distance views from the feature to the south. There are a number of woodland shelter belts to the north of the fort. There are modern roads, and farm steadings in the vicinity of the SM. The wider setting of the fort is within modern agricultural land.

- Turin Hill, fort (SM 19): the localised setting of the fort is upon the summit of Turin Hill. The comparatively elevated position of the fort gives rise to panoramic views in all directions. In long distance views to the north-west a manmade vertical structure in the form of an electricity pylon runs on a north-east to south-west axis, adding an industrial element to views in this direction.

- Law of Baldoukie, barrow (SM 24): the immediate setting of the barrow is within a modern agricultural field. The wider setting of the barrow is within modern agricultural farmland. There are a number of intervening woodland shelter belts to the south-east of the SM.

9.5 Evaluation of Effects

9.5.1 Direct Effects

The potential for direct impacts upon the key features on site have been assessed by Murray Archaeological Services Ltd. The walkover was originally carried out for three

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turbines in differing locations to the current single turbine application; see **Figure 9.1** and **Appendix 5, Illus 2, pg 6.**

"Only three of the archaeological assets identified in the SMR were located within or adjacent to the proposed development site. The settlement at Hillside as shown on the 1st OS map (NO45NE65) has been largely destroyed and will not be further affected by any widening of the track. There is no verification of the rig and furrow cultivation recorded in 1982 (NO 45 SE 74) and it was not visible during the walkover survey. As a result it is not considered that there is any risk to an identifiable archaeological asset.

The recorded cup-marked stone (NO 45 SE 74) may be identified with a worn sandstone block with no observable cup-marks at 349042, 754751; this is within the possible line of the track or soil clearance for proposed turbine 2. There will be no direct impacts on any SAM or Listed Buildings as a result of this development. It does not impact on any Conservation Areas, Gardens & Designed Landscape or World Heritage Sites", **Appendix 5, Section 5.1, pg 13.**

Table 9.7 - Effects and Evaluation of Significance: Direct Effects

Feature	Distance	Sensitivity	Magnitude	Significance	Comment
NMRS 2 Hill of Finavon	~160m	Medium	Negligible	Negligible	The feature lies outwith the developments direct impact footprint. No adverse impact upon the feature is predicted.
NMRS 3 Hill of Finavon	~10m	Medium	Negligible	Negligible	The feature is immediately adjacent to an existing access track. In line with the current proposals, the access track is not due to be upgraded. No direct impacts upon the feature are predicted.
Direct effect on presently unrecorded archaeology	Unlikely	Unknown	Unknown	Unknown	The small areas of intrusive works are unlikely to have a significant impact on archaeological remains.

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9.5.2 Indirect Effects within 5km

Table 9.8- Effects and Evaluation of Significance: Indirect Effects Features 5km

Name	Distance	Sensitivity	Magnitude	Significance	Comment
LB 1 Carsegownie Farmhouse 'B' Listed	~1.3km	Medium	Negligible	Moderate/ Minor	The blade tip of the proposed single turbine will be visible to the west north-west of the farmhouse. A line of electricity pylons runs between the project site and the listed building. The electricity pylon adds an industrial element to the view, and occupies the horizontal and vertical views in this direction. The main views from the building are to the south, into the surrounding farm buildings. The proposed single turbine is not predicted to adversely impact upon the current functional setting of the farmhouse.
LB 2 Carsegownie – Entrance Gates 'B' Listed	~1.6km	Medium	Negligible	Moderate/ Minor	Only the blade tip of the proposed single turbine is expected to be visible in views to the west north-west of the entrance gates. Electricity pylons runs between the project site and the listed building. The proposed single turbine is not predicted to detract from the current setting of the gate or the way in which it is understood within the landscape.
LB 3 West Main Farmhouse 'B' Listed	~1.5km	Medium	Negligible	Moderate/ Minor	The full extent of the proposed single turbine is expected to be visible in views to the south of the farmhouse. The intervening shelter belt to the south of the farmhouse is expected to prevent long distance views in the direction of the proposed turbine. No significant adverse impacts upon the current setting of the farmhouse are predicted.
LB 5 Oathlaw Parish Kirk 'B' Listed	~1.8km	Medium	Negligible	Moderate/ Minor	The full extent of the proposed single turbine is expected to be visible in views to the south-east of the kirk. Intervening woodland shelter belts are expected to restrict long distance views in this direction. No significant adverse impacts upon the current setting are predicted.
LB 6 Pitscandly House 'A' Listed	~2.5km	High	Negligible	Moderate/ Minor	A blade tip of the proposed single turbine is theoretically visible to the north of the house. The setting of the house comprises of an extensive garden area surrounded by mature trees that will provide substantial screening of the development at ground level. The blade tip of the proposed development is likely to be visible in oblique view from the upper floors of the house. Given that the main façade of the house faces south-west, the project is expected to be visible in views from the northern section of the house. No significant adverse impact upon the current setting of the house is predicted.
LB 7/ SM 16 Restenneth Priory 'A' Listed	~3.5km	High	Negligible	Moderate/ Minor	A blade tip of the single turbine is expected to be visible in views to the north of the priory. The setting of the 'A' listed ruin comprises open, extensive grounds surrounded by mature trees, creating a secluded private setting. There are no long distance views either to or from the priory. No significant adverse impacts upon the current setting of the priory are predicted.
SM 7 Finavon, fort	~1.7km	High	Low	Moderate	Due to the landform characteristics of Hill of Finavon the full vertical extent of the turbine will not be visible. The tower of the proposed single wind turbine is expected to be visible in views to the south-west of the fort. As shown in **Viewpoint 7**, due to screening by vegetation and mature trees only the blade of the single turbine is expected to be visible. Electricity pylons are visible from the

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Name	Distance	Sensitivity	Magnitude	Significance	Comment
					fort to the west of the view; consequently there is a pre-existing manmade structure in views to the south- west of the fort. The single turbine will occupy a narrow extent of the horizontal and vertical views available in this direction. No significant adverse impacts upon the current setting of the fort are expected. See **Viewpoint 7** of the Landscape Figures.
SM 17 Rob's Reed, fort	~2.6km	High	Low	Moderate	The hub of the proposed development will be visible in views to the north of the fort. The single turbine will occupy a narrow extent of the horizontal and vertical views available. There are a number of woodland shelter belts to the north of the fort that may restrict views of the proposed single turbine. There is an electricity pylon that passes the site on a north-east to south-west axis; this manmade vertical structure will be in the same viewing direction as the development. No significant adverse impacts upon the current setting of the fort are predicted.
SM 19 Turin Hill, fort	~2.5km	High	Low	Moderate	Due to the elevated position of the fort upon the summit of Turin Hill there are long distance views available in the direction of the development. The hub of the single turbine is theoretically visible in views to the west north-west of the fort. Due to screening provided by vegetation and mature trees, only the blade tip of the proposed turbine is expected to be visible, See **Figure 7.17**. To the north-west, the direction of the development, there is a manmade vertical structure in the form of electricity pylons that run on a north-east to south-west axis. The turbine will occupy a narrow extent of the horizontal and vertical views in this direction. The current setting of the fort is not expected to be adversely impact by the proposed development. **See Figure 7.17, VP-09** of the Landscape Figures.
SM 24 Law of Baldoukie, barrow	~4.5km	High	Negligible	Moderate/ Minor	The current setting of the barrow is within a modern agricultural field, with no screening available in the immediate locality. Due to the comparatively elevated position of the turbine, the turbine is theoretically fully visible from the SM. Due to the intervening distance between the barrow and single turbine it is expected that the development will appear as part of the wider landscape. No significant adverse impacts upon the current setting of the barrow are expected.

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9.6 Mitigation Incorporated into the Proposed Development

Planning guidance (SPP – Historic Environment) states that it is Government policy to protect and preserve archaeological sites and monuments in situ wherever feasible. Where preservation in situ is not possible planning authorities should ensure that an appropriate level of excavation, recording, analysis, publication and archiving is carried out before and/or during development.

Permanent Land-take and Operation

While this assessment has found no indication of the survival of any archaeological features or deposits that are not visible above ground level, it is nevertheless possible that such features do exist within the application area.

In the event that archaeological features are encountered, a suitable program of archaeological works will be implemented to the satisfaction of the planning authority.

Restoration

No restoration measures are currently proposed.

9.7 Summary of Predicted Impacts and Effects

9.7.1 Direct Impact

Current proposals indicate that the turbine location directly impacts upon an HER, **Figure 9.2**. This potential direct impact has been assessed by Murray Archaeological Services Ltd. It was concluded that although recorded in 1982, the rig and furrow cultivation was not visible during the archaeological walkover survey. Consequently, it was not considered that the development would pose a direct impact upon any known historic features.

9.7.2 Indirect Visual Impact

Sub-surface remains

The potential impact of the proposed development upon cropmark sites has been assessed by Murray Archaeological Services Ltd. *"Cropmark sites Table 3 nos 1,2, 3,4 ,11,* [12], *14, 16, 21,* 23 *are not upstanding in the landscape so although some such as the henge at Myreside (Table 3 No 16) or the prehistoric timber hall at Noronbank (Table 3 No 21) may have had very specific orientation to contemporary landscape features, this will not be adversely affected by the visual impact of the proposed development."* **Appendix 5, Section 5.2, pg 14-15.**

2km study radius

The closest feature of historical significance to the development is Carsegownie Farmhouse (LB 1). Only the blade tip of the proposed development is theoretically visible from both Carsegownie Farmhouse (LB 1) & Carsegownie – Entrance Gates (LB 2). The proposed development is not expected to adversely impact upon the current settings of either LB 1 or 2.

The current functional setting of West Main Farmhouse (LB 3) is expected to remain unaffected by the proposed development as an intervening woodland shelter belt is

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expected to restrict long distance views in the direction of the proposed development, leaving the farmhouses functional setting unaffected by the turbine. Similarly, although the full extent of the proposed single turbine is predicted to be visible from Oathlaw Parish Kirk (LB 5) the surrounding vegetation and intervening mature woodland shelter belt are expected to prevent long distance views in the direction of the project, no significant adverse impact upon the current setting of the kirk are predicted.

5km study radius

The blade tip of the proposed single turbine is predicted to be visible from both; Pitscandly House (LB 6) & Restenneth Priory (LB 7/SM 16). The current settings of both 'A' listed buildings are characterised by their locations within gardens or fields bordered by mature vegetation and woodlands. The screening provided by the localised settings of the features is expected to restrict long distance views in the direction of the development. The blade of the proposed development is expected to be visible in oblique views from the upper floors of the northern section of Pitscandly House (LB 6). Potential views of the development are not expected to detract from the current setting of the house.

In their scoping response to the original three turbine application Historic Scotland and the Archaeology Service raised particular concerns over the potential indirect visual impact of the development upon; Finavon fort, Turin Hill fort, and Finavon Castle. The conclusions drawn within the original assessment were that the proposed 3 x 100m turbine application would have a **Moderate** level of impact upon both Finavon and Turin Hill fort. It is considered that the reduction in both turbine number and tip height has lessened the overall impact upon the Scheduled Monuments of concern.

The current setting of Finavon Hill Fort (SM 7) gives rise to panoramic views in all directions. The immediate setting of the fort is such that there are manmade vertical elements in the form of both telecommunications masts and electricity pylons in the same viewing direction as the single turbine. The manmade vertical structures add an industrial element to the forts current setting. As shown in **Viewpoint 7,** due to intervening screening provided by vegetation and woodland only the blade of the development is expected to be visible in views to the south-west of the fort.

The current setting of Finavon Castle within mature woodland will restrict long distance views to or from the SM. The hub of the proposed single turbine is expected to be theoretically visible in views to the north-west of Turin Hill Fort (SM 11). The electricity pylons that cross the site on a north-east to south-west axis add an industrial element to the forts current setting. The localised setting of the fort is such that there are panoramic views available; the single turbine will occupy a narrow extent of the 360 views available from Turin Hill Fort, **Figure 7.17, Viewpoint 9.** As shown in **Viewpoint 9,** due to intervening screening provided by vegetation and woodland only the blade of the development is expected to be visible.

Similarly, the hub of the single turbine is expected to be visible from Rob Reed's fort (SM 15) in views to the north of the SM. Like both Turin and Finavon Hill forts electricity pylons will occupy the views in this direction. The proposed single turbine will only occupy a narrow extent of the horizontal and vertical views available.

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The full extent of the proposed single turbine is expected to be visible in views to the south-east of the SM Law of Baldoukie, barrow (SM 24). At ~4.5km from the historic feature, it is expected that the proposed development will appear as part of the wider landscape. No significant adverse impact upon the feature is predicted.

The magnitude of indirect visual impact on cultural sites beyond 5km from the single wind turbine is assessed to be **negligible**. The intervening distance will result in the development appearing as part of the wider landscape where the quality of the setting could be altered to a small degree.

It is acknowledged that the woodland and vegetation that currently restricts potential views of the single turbine from a number of the historic features within the study radius is subject to change. External factors such as; felling, disease and wind damage are out with the applicants control. The assessment has assessed the historic features current settings at the time of the application submission, but recognises that screening provided by vegetation and woodland is potentially subject to change.

9.8 Conclusion

No direct effect has been identified on any known features of cultural heritage interest according to current proposals. The potential for the development to encounter previously unrecorded features is considered to be unlikely being limited by the small extent of intrusive works associated with the proposed development.

The proposed single turbine has been assessed has having a **moderate** overall impact upon Finavon Hill Fort, Turin Hill Fort and Rob Reeds Fort. Within regards to the other features of historical significance within 5km of the proposed single turbine the impact of the development has been assessed as **moderate/minor**.

The archaeological walkover survey was originally carried out for threes turbines of 100m to tip height. Murray Archaeological Services Ltd concluded that, *"In accordance with the Angus Local Plan Review guidelines (Policy ER 19) the proposed development does not have a direct physical or major visual adverse effect on any recorded cultural assets or their settings."* **Appendix 5, Section 7.**

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10 Surface and Groundwater Hydrology

10.1 Introduction

This chapter presents the impact assessment of the proposed development on the water environment. The assessment has considered the development impacts on water quality, drainage and flood risk.

Understanding surface and groundwater environments is critically important to designing a successful project. Surface water includes watercourses, water bodies and run-off. Surface water provides important water resources for potable and other supply, amenity, aesthetic value, conservation, ecological environments and recharge to groundwater systems. Groundwater includes all water stored in permeable underground strata (or aquifers). Groundwater is also an important resource, providing more than a third of the potable water supply in the UK. In addition it provides essential baseflow to rivers and wetland areas, often supporting important ecological systems.

Although hydrological issues are likely to be relatively minor at this site, the risk of pollution or disruption of watercourses, groundwater bodies and private water sources within or near the site needs to be assessed and appropriately mitigated where necessary.

10.2 Potential Impacts

The potential impacts this development could have on the water environment of the site and the area around are broadly summarised as follows:

- Disruption to surface and subsurface run-off and watercourses;
- Sedimentation, erosion, and production of silt-laden run-off;
- Chemical pollution of watercourses or groundwater;
- Increase in run-off; and
- Lowering of the water table.

These impacts could occur during the construction, operational lifetime, and decommissioning of the development. They can potentially have many adverse effects to ecology and human amenity.

10.3 Guidance

Statutory, general, national and local guidance consulted during this assessment is listed as follows:

- SPP7: Flooding & Drainage
- SEPA Policy No.19: Groundwater Protection Policy for Scotland
- SEPA Pollution Prevention Guidance Notes (PPG):
    - PPG 1: General guide to the prevention of water pollution;
    - PPG 2: Above Ground Oil Storage Tanks;
    - PPG 5: Works in, near or liable to affect watercourses;

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  - PPG 6: Working at construction and demolition sites;
  - PPG 21: Pollution incident response planning;
- SEPA Water quality classification interactive database (2009 data);
- CIRIA Report C532: Control of Water Pollution from Construction Sites; and
- CIRIA Report C502: Environmental Good Practice on Site.

10.4 Methodology

The method adopted to assess the impact on the water environment was:

- Determination of the baseline hydrological conditions and the sensitivity of the site and adjacent receptors;
- Review of the proposed development to determine the predicted impacts posed by the development itself;
- Evaluation of the significance of predicted impacts, taking into account impact magnitude (before and after mitigation) and baseline environmental sensitivity.

The assessment is primarily a desk-based study using qualitative assessment based on professional judgement and published material. The assessment also included consultations with statutory bodies, principally SEPA, the Local Planning Authority, and the land owner's own knowledge of the site were also utilised. A site walkover was also conducted by a suitably qualified engineer to support these findings and to check for any hydrological features that may be missing from the desk-based study.

Sources of information consulted included:

- Ordnance survey 1:10,000 map data;
- BGS – Hydrogeological Map of Scotland 1:625,000;
- BGS – Groundwater Vulnerability Map of Scotland 1:625,000;
- Consultation with statutory and non statutory organisations.

Given the scale of the development, a conservative study boundary of 1km radius around the turbine, has been used for this assessment. All sensitive receptors within this 1km study boundary, which can be seen in **Appendix 6 Figure 10.1,** have been identified and the impacts assessed.

The analysis of the significance of each impact is based on its magnitude, scale and the likelihood of occurrence. A significance rating of *'High', 'Medium', 'Low'* or *'Negligible'* is then given to each impact. By conducting this analysis before and after mitigating factors are taken into account, the significance of the predicted impact and the residual impact is determined.

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10.5 Baseline

This section presents an overview of the baseline water environment at the site, including: the location and quality of surface and groundwater resources, drainage, and flood risk. **Figure 10.1** (attached as an appendix) shows the local context of the site.

10.5.1 Terrain Description

The site is approximately 5km north east of Forfar and is located near the summit of the Hill of Finavon. The land around the site is mostly arable farmland, particularly on the lower slopes of the Hill of Finavon, with rough grazing grassland and woodland on the higher ground. The Hill of Finavon, the summit of which lies 510m to the east of the site at an elevation of 224m above sea level, is the dominant terrain feature in the area. The land falls steadily downhill to the north with slopes of 20-25%. To the south of the ridge there is a very steep drop, and then gentler downward slopes of approximately 20%. The track and turbine lie at elevations of between approximately 73m and 205m above sea level.

10.5.2 Hydrology

Any run-off generated by rainfall on the proposed track hardstanding areas currently tends to flow downhill to the north, as can be seen in the run-off catchment area shown on **Figure 10.1**. There is an intricate network of open and subsurface field drains and road-side ditches down-gradient of the site to the north which captures all water running off the northern slopes of the Hill of Finavon. This drainage network channels the run-off into the Lemno burn, which passes the site 1150m to the northwest at its nearest point. The Lemno burn flows into the River South Esk approximately 1.8km downstream of the site. There is a pond located 870m to the east of the proposed turbine location. Analysis of the local topography suggests that run-off generated by rainfall on the locations where new track is to be built does not flow into this pond.

From the OS 1:10,000 map data and through discussions with the landowner and the local council, it has been established that there are no private water supplies nor any wells or springs within the study boundary. This was supported by the site walkover. Although, the OS 1:10,000 map data does indicate that there is a well within the study boundary this was found to be extinct.

10.5.3 Local water supplies

All properties within 1km of the proposed development have been identified. It was determined that none of the properties in the study boundary draw from the water table as all are mains-fed. The properties considered are tabulated below.

Table 10.1 - Properties within 1km of development

ID	*Property*	*NGR*
1	Finavon House	353950, 750380
2	Hillside Cottage	353880, 750330
3	Shepherd's Seat	355130, 750180
4	The Bungalow	352550, 750060
5	Myrestone	354010, 748580

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10.5.4 Surface and Groundwater Classification

The Scottish Environment Protection Agency (SEPA) classifies all significant waters in Scotland. There are no classified surface water features located within the study boundary. The nearest classified surface water feature has been identified as the Lemno Burn located approximately 1150m to the north-west of the proposed turbine.

SEPA have classified the Lemno Burn as 'Moderate'. This means SEPA have "*classified this water body as having an overall status of Moderate ecological potential with High confidence in 2008 with overall ecological status of Moderate and overall chemical status of Pass*".

SEPA also classifies significant groundwater bodies, which, at the proposed site, are Brechin bedrock and localised sand and gravel aquifers. The quality of the groundwater has been classified as "*Poor with High confidence and the quantity of groundwater has been classified as Poor with Medium confidence in 2008*".

10.5.5 Flooding Risk

From the Indicative River & Coastal Flood Map (available on the SEPA website) it can be seen that there is no areas deemed to be at risk from flooding within the study boundary. The nearest area deemed to be at risk from flooding is small areas along the banks of the Lemno Burn approximately 1150m to the northwest of the proposed turbine location. The project is unlikely to have any impact on the flooding risk of these areas.

10.5.6 Hydrogeology

The BGS Groundwater Vulnerability Map of Scotland 1995 (1:625000) indicates that the strata beneath the site are highly permeable with soils of intermediate leaching potential. "*These include soils with a moderate ability to attenuate diffuse contaminants or in which it is possible that some non-adsorbed diffuse contaminants and liquid discharges could penetrate the soil layer*".

The BGS Hydrogeological Map of Scotland 1988 (1:625,000) indicates that the project is located in a region underlain by 'quaternary sands and gravels', an aquifer in which intergranual flow is significant. The hydrogeological map describes this aquifer as *"Sand and gravel of glaciofluvial origin form terraced and gently sloping moundy ground and are of sand and silt grade through to cobble grade. The groundwater potential of these deposits varies according to the thickness of saturated material. Groundwater chemistry is variable but mineralisation is usually weak. The exposed shallow nature of the groundwater places it at risk from diffuse and point-source pollutants."* The 'Geology of Britain viewer' available on the BGS website (www.bgs.ac.uk) indicates that, more specifically, the site is underlain by "*Arbuthnott-garvock Group - Sandstone With Subordinate Conglomerate, Siltstone And Mudstone*". This is lithologically described as: *"Sandstone predominates, interbedded with clast-supported conglomerate with well-rounded boulders, cobbles and pebbles predominantly of lava, psammite and quartzite in the northeast and adjacent to the Highland Boundary Fault. Siltstone and mudstone are interbedded with the sandstone, e.g. in the Dundee area and Strathallan. Piles of andesitic, basaltic and rhyolitic lavas, locally very thick, are interbedded with conglomerate and sandstone in many areas. Lenses and thicker*

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formations of volcaniclastic sandstone are interbedded with conglomerate in the Stonehaven area and are associated with lavas elsewhere. Calcrete near top in many areas".

The 'Geology of Britain viewer' indicates that there is a superficial layer of Glacial Sand and Gravel in the region.

10.5.7 Confirmation of baseline conditions

Intrusive ground investigations will be completed prior to turbine construction to gain site specific information such as groundwater levels, soil permeability and geology.

10.6 Predicted Impacts

This section presents an assessment of impacts on the water environment which may occur during the construction, operational and decommissioning phases of the development. The sensitive receptors are identified and the predicted impacts are assessed and their significance rated.

Details of the site and the works to be conducted can be found in **Section 2 The Proposed Development**. **Appendix 6, Figure 10.1** provides a plan of the development.

10.6.1 Sensitive Receptors

The identification of sensitive receptors, taking into account baseline conditions, is summarised in **Table 10.2** below. It should be noted that a distinction has been made between properties that draw water from the water table, and the overall condition of the water table itself.

Table 10.2 - Sensitive Receptors

Receptor	Comment
Watercourse	The Lemno Burn has moderate ecological potential
Groundwater	The region is located in an area underlain by highly permeable strata

10.6.2 Predicted Construction Impacts

The most disruption, and therefore the greatest risk of impact to the water environment, will occur during the construction phase of the project.

Disruptions to flow paths

The development does not require the crossing of any streams or other surface watercourses, and so there is no risk of a watercourse being hydraulically impeded. As such, a drop in hydraulic gradient of a watercourse is predicted to be of negligible significance.

However, there could be active subsurface field drains around the site which may be affected during track excavation and construction. Furthermore, the track and associated drainage could impede existing surface run-off routes, particularly during periods of heavy rainfall. The impact caused by these disruptions to flow is predicted to be of low significance.

Sedimentation and Erosion

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It is predicted there may be an impact caused by erosion of track and hardstanding surfaces and of excavated spoil material. This could lead to sediment being carried with the run-off and reaching a watercourse. Cable laying also has the potential to damage soils and introduce new drainage pathways which could generate silt laden run-off. The amount of the resultant suspended solids pollution will be greater during heavy rainfall events, although the dilution potential of the watercourses is also at its greatest during these periods. At times of low flow, it is very unlikely that silt could reach a watercourse. The significance of this impact is considered to be low.

Increase in run-off

Construction of the access tracks, substation and crane hardstandings will result in localised changes to the surface water hydrology. The cambered tracks may interrupt natural flow paths. The new track will also shed water more quickly than the existing ground. An increase in run-off in the area can compound various other predicted impacts, such as chemical pollution, erosion and sedimentation. Furthermore, increased run-off could add to a flood risk in the area.

Due to the small area of tracks and hardstanding in the site, there will be only a very slight increase to run-off. It is unlikely any run-off would affect the small flood areas on the banks of the Lemno Burn that passes to the north of the site. The magnitude of the impact is taken to be low.

Chemical Pollution

There are several potential sources of chemical pollution to both surface water and groundwater during the construction phase of the development. The spillage or leakage of construction associated oil, grease, fuel, concrete, cement, foul water or other chemicals can have a serious negative impact on the quality of surface water and/or or groundwater. Run-off or groundwater could also carry spills or leakages resulting in pollution of a sensitive receptor. Local topography limits the potential for polluted run-off to travel, so polluted run-off contaminating a watercourse is predicted to be of medium significance.

Due to the high permeability of the strata beneath the site, groundwater travel is likely to be significant, so polluted run-off contaminating groundwater is predicted to be of medium significance.

Lowering of the water table

Given what is known about the ground conditions in the area and the extents of the excavation works, groundwater is not expected to enter the foundation excavations. As such, dewatering should not be required and therefore the groundwater table would not be affected by the works. Furthermore, General Binding Rule (GBR) 15 (from the Water Environment (Controlled Activities) (Scotland) Regulations 2005) states that "(d) groundwater shall not be abstracted from any excavations, well or borehole that are within 250 metres of any abstraction that is not for the sole purpose of dewatering an excavation". Therefore, any private water supply outwith a 250m 'dewatering boundary' is not predicted to suffer an impact. There is a presumption that cable trenches and access roads may disrupt the groundwater flow directions by creating shallow drainage and preferential

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pathways and, as such, a further boundary of 100m around cable trenches and access tracks has been applied.

10.6.3 Predicted Operational Impacts

There will be a few on-site activities during operation of the wind turbine relating to regular maintenance or repair of the machines. During these activities there will be a need to bring small quantities of oil, greases and other materials on to the site. The substation, access tracks and crane hardstanding will result in localised changes to the surface water hydrology for the duration of the project, with the potential effects of erosion, sedimentation and increased run-off as discussed in **Section 10.6.2 Construction Impacts**.

10.6.4 Predicted Decommissioning Impacts

The activities during decommissioning are broadly similar to those during construction, however, the level of activity will be less as some of the roads and sub-surface elements will be left in place.

10.7 Mitigation

The potential impact of the project on water quantity is minimal, so the mitigation measures focus on preventing water pollution. There are a number of recognised best practices and measures to mitigate and eliminate the predicted impacts previously discussed. A full intrusive ground investigation will be carried out to provide data for designing appropriate mitigating measures before construction begins.

10.7.1 Construction

The following measures will be implemented to manage the predicted impacts at the site during the construction phase. Construction will be carried out according to SEPA and CIRIA guidance for site works.

Disruption to existing flow

There are no crossings of burns or streams required in the development, and there will be no impeding of a surface watercourse. Should subsurface field drains be discovered during track excavation, there will be a design in place for drains to run under the track, thereby minimising disruption to existing field drainage paths.

Sedimentation and Erosion

During construction of the track, drainage will be controlled by placing drainage ditches on the uphill slopes. All earth bunds, soil and waste material storage areas will be located as far as possible from site watercourses and will be well managed to minimise run-off and erosion. The project drainage will be designed such that access tracks will be cambered to shed surface water into a suitable drainage system.

Adoption of sustainable drainage principles, such as making use of vegetation to slow water flows and filter sediments, should minimise the risk of sediments reaching watercourses. The new drainage network will be kept separate from the existing field drain network to avoid any potentially contaminated run-off from the new infrastructure discharging into local watercourses. If this is not practical, drains will be installed along the length of the tracks which would feed into a soak-away. The soak-away would incorporate an overflow

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for periods of heavy rainfall. A possible drainage layout solution is shown on **Figure 10.1.** Methods incorporated are designed to be sustainable and to cope with storm events.

To minimise disturbance impacts, cables will be laid in small trenches along the side of the access tracks as far as possible. Trenches will be dug during drier periods, as far as practicable, and spoil material will be temporarily placed on the uphill slope to reduce the likelihood of run-off entering the excavations. The electric cables will be laid quickly and backfilled to minimise water ingress to the trenches. Their actual impact in terms of creation of new drainage pathways, or damage to soil profile, is likely to be negligible provided the best practice methods are followed.

Chemical Pollution

Construction traffic will use specified roads and parking areas at all times, where practicable, to reduce compaction and associated run-off in the wider area. Appropriate control measures, such as shallow vegetated channels, will be installed to convey haul road and hardstanding run-off and treat pollutants.

Concrete will be delivered in ready-mix wagons which will only be allowed to 'wash-out' in designated areas where suitable control measures are in place. Full details of the foundation construction will be provided in the construction method statement. We anticipate this being required as a planning condition. Once construction is complete and the soil has been replaced over the foundation and reseeded, the change to surface water run-off and risk of pollution is predicted to be negligible.

A pollution incident response plan will be developed in accordance with SEPA PPG 21. Spill response measures will be put in place to ensure that any accidental spillages at the surface can be contained and quickly removed from site.

All fuel and other chemicals will be stored and managed in accordance with best practice procedures. Best practice is included in SEPA Pollution Prevention Guidance Notes (PPGs). All fuel will be stored in a bunded container. Oil spill kits will be stored in the site office. All oils, greases and chemicals will be stored in a locked bunded container near the site office. Where oils and diesel are brought on to site for refuelling or maintenance, these operations will be carried out in designated areas of hardstanding located at least 20m from the nearest watercourse or drain. Standard methods will be adopted within these designated areas that minimise the risk of spillage. Contingency plans will also be in place for dealing with any spillage that may occur.

Any contaminated material encountered during construction will be dealt with according to environmental best practice, following suitable chemical analysis. Such material will be contained, treated, or disposed of, to a suitably licensed disposal facility.

Implementation of the procedures described above will mitigate the significance of a chemical pollution impact to low.

Increase in run-off

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Adoption of sustainable drainage, as discussed in the Sedimentation and Erosion section above, will allow for the capture of run-off from the site, and render impacts caused by run-off negligible.

Lowering of the water table

Should planning permission be granted, an intrusive investigation will be carried out and groundwater monitoring standpipes installed at the locations of each of the turbines. The investigation will include an assessment of the ground permeability and water potential. Mitigating measures for any potential dewatering and disposal of groundwater will be provided in a construction method statement.

10.7.2 Operation

The proposed mitigation for the construction of the access roads will continue to function through the life of the project. Routine maintenance for the roads will be carried out in summer months when the tracks are dry. Operational best practice procedures will continue to be adopted, with the risk of water pollution from such activities considered to be negligible.

The proposed mitigation for fuels and chemicals used during the construction phase would be applied at all relevant times during the lifetime of the project. The concrete used will be of a high grade that is not prone to leaching alkalis. As such the ongoing risk of pollution on the site after construction is considered to be very low.

10.7.3 Decommissioning

It is envisaged that detailed method statements, in compliance with relevant current legislation, will be drawn up prior to decommissioning. However, similar mitigation methods to those employed during construction (updated to take account of legislation current at the time of decommissioning) are likely to be appropriate.

10.8 Assessment of Residual Impact

The residual impacts after mitigating factors have been taken into account are analysed with respect to their significance. **Table 10.3** below includes a summary of the residual impacts, and it can be seen that there are no residual impacts of major significance expected to occur as a result of the development.

Table 10.3 - Summary of Impact Assessment

Project Element	Effect	Sensitive Receptor	Initial Significance	Description of Mitigation	Residual Significance
Crossing of a watercourse	Drop in hydraulic gradient	Watercourses	Negligible	No crossings of a watercourse are required - no mitigation required.	Negligible
Access Track & cabling; Hardstandings	Disruption to field drainage flow paths	Watercourses	Medium	Incorporating lateral drainage across tracks in design	Negligible
	Erosion and the generation of silty run-off	Watercourses	Low	Implementation of a Sustainable Drainage system to capture run-off. Adherence to best practice procedures.	Negligible

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	Increase in run-off adding to flooding	Watercourses	Low	Implementation of a Sustainable Drainage system to capture run-off.	Negligible
Keeping and using concrete, chemicals/ fuel onsite; refuelling.	Polluted run-off contaminating a watercourse	Watercourses	Medium	Implementation of a Sustainable Drainage system to capture run-off. Adherence to best practice procedures in the handling, use and storage of fuel, oils and chemicals. Concrete will be delivered in ready mix wagons. Wagons only to 'wash-out' in areas where suitable control measures are in place.	Low
	Polluted run-off contaminating groundwater	Groundwater	Medium	Implementation of a Sustainable Drainage system to capture run-off. Adherence to best practice procedures in the handling, use and storage of fuel, oils and chemicals. Concrete will be delivered in ready mix wagons. Wagons only to 'wash-out' in areas where suitable control measures are in place.	Low
	Polluted run-off contaminating potable water supply	Private Water Supply	Negligible	Run-off will not flow near any private water supplies - no mitigation required. Concrete will be delivered in ready mix wagons. Wagons only to 'wash-out' in areas where suitable control measures are in place.	Negligible
Excavation of track and foundation	Dropping of the water table harming potable water supply	Private Water Supply	Negligible	Private water supplies are outwith the area of effect of dewatering - no mitigation required.	Negligible

10.9 Conclusion

A desk-based study and site walkover were conducted to establish the baseline water environment of the site, whereby predicted impacts caused by the development were identified. The majority of potentially significant negative impacts on water quality are only predicted to occur in the short term through potential increased sedimentation and pollution during the construction phase. Although there is a slight risk of spillages of concrete or chemicals reaching a local potable water source during maintenance work, the risk is held to be greater during the construction phase. The same would apply to the risk of contamination of groundwater. It is anticipated that the adoption of best practice management and control procedures by all site personnel, and the implementation of the mitigation methods proposed, will bring these risks down to acceptable levels.

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11 Existing Infrastructure, Telecommunications, Television, Aviation and Electromagnetic Interference

11.1 Introduction

Operational wind turbines have the potential to interfere with:

- Communications networks that use electromagnetic signals;
- Civil aviation radars;
- Safeguarding radars operated by the MOD; and
- Other types of infrastructure including high pressure pipes.

The potential impact of the proposed wind turbine on this infrastructure is considered in this chapter.

11.2 Guidance

Guidance for assessing the potential impact of wind turbines on electromagnetic infrastructure is given in:

- Scottish Planning Policy, Subject Policy: *Renewable Energy*, Scottish Government, 2010;
- Tall structures and their impact on broadcast and other wireless systems, Ofcom, 2009; and
- Windfarms assessment tool, BBC

Guidelines and publications for assessing potential impact on aviation activities are:

- Wind Energy and Aviation Interim Guidelines, BWEA, 2002;
- CAP 428 - Safety Standards at Unlicensed Aerodromes, CAA, 2004; and
- CAP 764 – Policy and Guidelines on Wind Turbines, CAA, 2012.

11.3 Methodology

A list of consultees with telecommunications, television and other infrastructure interests in the area was identified based upon advice given in Scottish Planning Policy. These consultees are listed in **Table 11.1**. Those with aviation interests, such as MoD, NATS, BAA and CAA, no longer comment on pre-application developments but will provide a comment during the planning process.

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Table 11.1 – Infrastructure, telecommunications and other infrastructure consultation

Consultee	Response Received	Comments
Ofcom	Yes	Identified one link operated by Arqiva Ltd
Arqiva	Yes	1 link found in area - not affected
JRC	Yes	No objection
Atkins (Scottish Water)	Yes	No objection

11.4 Assessment of Impact

Civil aviation and Ministry of Defence (MoD)

The original application for three 99.5m turbines at a higher elevation did not raise any objections from any aviation consultees. Therefore, a smaller single turbine located at a lower elevation is not predicted to cause any significant impact on infrastructure of aviation interest.

Telecommunications

Ofcom have identified one Arqiva link in the vicinity of the proposed development. Further correspondence with Arqiva established that the turbine is located approximately 895m from the link and it would not be affected by the development.

No other links were identified in the vicinity of the site and as such no interference with telecommunications links in the area is anticipated.

Television

The digital switchover for the whole of the UK has been completed.

A 2009 Ofcom report stated that:

"*Digital television signals are much better at coping with signal reflections, and digital television pictures do not suffer from ghosting. However a digital receiver that has to deal with reflections needs a somewhat higher signal level than one that has to deal with the direct path only. This can mean that viewers in areas where digital signals are fairly weak can experience interruptions to their reception should new reflections appear.*

Over time, this problem is expected to diminish as the power of transmitters is increased as digital switchover continues across the UK. However, higher transmitter powers will not be a solution in all situations which means that reflections may still affect digital television reception in some areas, although the extent of the problem should be far less than for analogue television."

There are a number of technical solutions available in the event that interference is proven to be an issue as a result of the operation of the turbine. If there are any impacts they are considered to be of temporary nature until a technical alternative can be put in place. Overall, any potential effects on television are considered to be negligible.

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11.5 Impacts, Issues and Mitigating Actions

No issues have been identified which require mitigation or action.

11.6 References

BBC, *Windfarm assessment tool*
http://www.bbc.co.uk/reception/info/windfarm_tool.shtml (accessed August2012).

British Wind and Energy Association (BWEA), Civil Aviation Authority (CAA), Department of Trade and Industry (DTI), (2002), *Wind Energy and Aviation Interests – Interim Guidelines*, BWEA, CAA, DTI.

Civil Aviation Authority (2004), *CAP 428 – Safety Standard at Unlicensed Aerodromes (Including Helicopter Landing Sites)*, Civil Aviation Authority.

Civil Aviation Authority (2012), *CAP 764 – CAA Policy and Guideline on Wind Turbines,* Civil Aviation Authority.

digitaluk http://www.digitaluk.co.uk/ (accessed March 2012)

Ofcom (2009), *Tall structures and their impact on broadcast and other wireless services*, Ofcom.

Scottish Government (2010), *Scottish Planning Policy*, Scottish Government.

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12 Shadow Flicker

This section of the report looks at the proposed development in the context of possible effects on local amenity caused by shadow flicker on residential and commercial properties.

12.1 Background

Tall structures such as wind turbines cast shadows. The shadows vary in length according to the sun's altitude and azimuthal position. Under certain combinations of geographical position and time of day, the sun may pass behind the rotor of a wind turbine and cast a moving shadow over neighbouring properties. Where this shadow passes over a narrow opening such as a window, the light levels within the room affected will decrease and increase as the blades rotate, hence the shadow causes light levels to 'flicker' - an effect commonly known as 'shadow flicker'.

Whilst the moving shadow can occur outside, the shadow flicker effect is only experienced inside buildings where the shadow passes over a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. A single window in a single building is likely to be affected for a few minutes at certain times of the day for short periods of the year. The likelihood of this occurring and the duration of such an effect depend upon:

- The direction of the residence relative to the turbine(s);
- The distance from the turbine(s);
- The turbine hub-height and rotor diameter;
- The time of year;
- The proportion of day-light hours in which the turbine operates;
- The frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon); and
- The prevailing wind direction.

The further the observer is from the turbine the less pronounced the effect will be. There are several reasons for this:

- There are fewer times when the sun is low enough to cast a long shadow;
- When the sun is low it is more likely to be obscured by either cloud on the horizon or intervening buildings and vegetation; and,
- The centre of the rotor's shadow passes more quickly over the land reducing the duration of the effect.

At a distance, the blades do not cover the sun but only partly mask it, substantially weakening the shadow. This effect occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest and so only a weak effect is observed at a distance from the turbines.

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12.2 Methodology

Identification of Receptors

The former PAN45[5], now replaced by the Scottish Government's web based renewables advice, suggests that shadow flicker should not pose problems beyond a distance of 10 rotor diameters from a wind turbine. In this instance this equates to a maximum of 540m. Some Local Authority Guidelines (such as those published by Aberdeenshire Council) suggest that some effect of shadow flicker may be felt up to 1km away from the turbine. Beyond 1km no effects are expected to occur.

As such, the area within 10 rotor diameters of the turbines has been classed as Zone 1 and the area between 10 rotor diameters (540m) and 1km has been classed as Zone 2.

Furthermore, the Department of Environment and Climate Change (DECC)[6] studies have shown that in northern latitudes shadows from wind turbines can only be cast 130 degrees either side of north relative to the turbine due to the orientation of the earth's axis and the positioning of the sun.

This equates to a region of 50 degrees either side of due south where a wind turbine will never cast a shadow. Properties within this region will experience no shadow flicker effects, regardless of distance from the turbine.

Modeling of windows

Receptors situated within Zone 1 (within 10 rotor diameters) are modelled with a single window measuring 4m x 4m. Receptors situated within Zone 2 (the area between 10 rotor diameters and 1000m) are modelled with a single window measuring 2.4m x 1.2m.

The orientation of each window has been included in the model, measured in terms of degrees from north. This means, for example, that if a window faces due south it is 180 degrees from north.

Model Conditions

Calculations have been carried out using ReSoft's WindFarm software. This models shadow flicker effects by using simple geometric considerations: the position of the sun at a given date and time; the size and orientation of the windows that may be affected; and the size of the turbine that may cast the shadows. The model adopts a conservative approach by assuming that:

- The turbine is facing the sun at all times of the day;
- It is always sunny;
- The turbine is always operating; and
- There is no local screening.

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[5] Scottish Executive Planning Advice Note, PAN45 (revised 2002): Renewable Energy Technologies, Wind Power, http://www.scotland.gov.uk/library/pan/pan45-04.asp, para. 64, 01/11/05

[6] Update of UK Shadow Flicker Evidence Base, by PB Power, commissioned by DECC (2011) http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/Energy%20mix/Renewable%20energy/ORED/1416-update-uk-shadow-flicker-evidence-base.pdf

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Correction Factors

Correction factors which take into account actual annual hours of sunlight for the area, hours of turbine operation, and average yaw angle have been applied to the initial theoretical results in order to reach more realistic overall potential levels of shadow flicker effect.

The correction factors are derived from the following:

- The annual average amount of sunlight for the Finavon Hill area, which is ~1,564 hours. This has been estimated from the 1981-2010 met office mapped[7] average sunlight hours for Leuchers – the nearest met office station. This means that on average over a year, it is sunny for ~35% of daylight hours.

- The rotor of a modern machine can be expected to turn approximately 90% of the time.

- According to the Danish Wind Energy Association website, shadow flicker is reduced to 63% of the maximum possible if the wind turbine is assumed to be randomly yawed relative to the sun position.

The corrected results are therefore 20% of the uncorrected total (0.35 x 0.90 x 0.63= 0.20). Results are presented both with and without the 20% correction factor for comparative purposes.

Assessment of Impact

Northern Ireland's Best Practice Guidance to Renewable Energy[8], which has been approved by DECC[9], states that an acceptable shadow flicker level at residential properties is 30 hours per year.

Table 12.1 shows the impact assessment matrix that was used in this assessment, which is based upon this guidance.

Table 12.1 – Impact Assessment Matrix

Receptor Location	Theoretical Hours of Impact- >30h	Theoretical Hours of Impact- <30h	Theoretical Hours of Impact- Zero
Distance to Turbine < 10 Rotor Diameters (Zone 1)	High	Medium	Negligible/None
Distance to Turbine < 10 Rotor Diameters (Zone 2)	Medium	Low	

[7] http://www.metoffice.gov.uk/climate/uk/averages/19812010

[8] Best Practice Guidance to Planning Policy Statement 18: Renewable Energy, Department of the Environment (Northern Ireland), (2009). http://www.planningni.gov.uk/index/policy/policy_publications/planning_statements/planning_policy_statement_18__renewable_energy__best_practice_guidance.pdf

[9] Update of UK Shadow Flicker Evidence Base, DECC (2011) http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/Energy%20mix/Renewable%20energy/ORED/1416-update-uk-shadow-flicker-evidence-base.pdf

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12.3 Baseline

Two properties were identified within Zone 1. One property was identified within Zone 2. These receptors are listed in **Table 12.2**. Where two façades of a property are expected to experience some level of shadow flicker both orientations have been provided.

Table 12.2 – Residential properties within study area

ID	Property Name	Distance to nearest turbine (to 10m)	Orientation of façade 1 (degrees from north)	Orientation of façade 2 (degrees from north)
1	Finavon House	~410m	~143°	~233°
2	Finavon Cottage	~370m	~157°	-
3	Howmuir	~910m	~342°	-

H3 is located within 50 degrees of south and, as previously mentioned, will not experience any shadow flicker effects. It has therefore been omitted from the assessment. **Figure 12.1** below shows the 10 rotor diameters (540m boundary) and the 1km boundary with the three properties identified forming the baseline for the analysis.

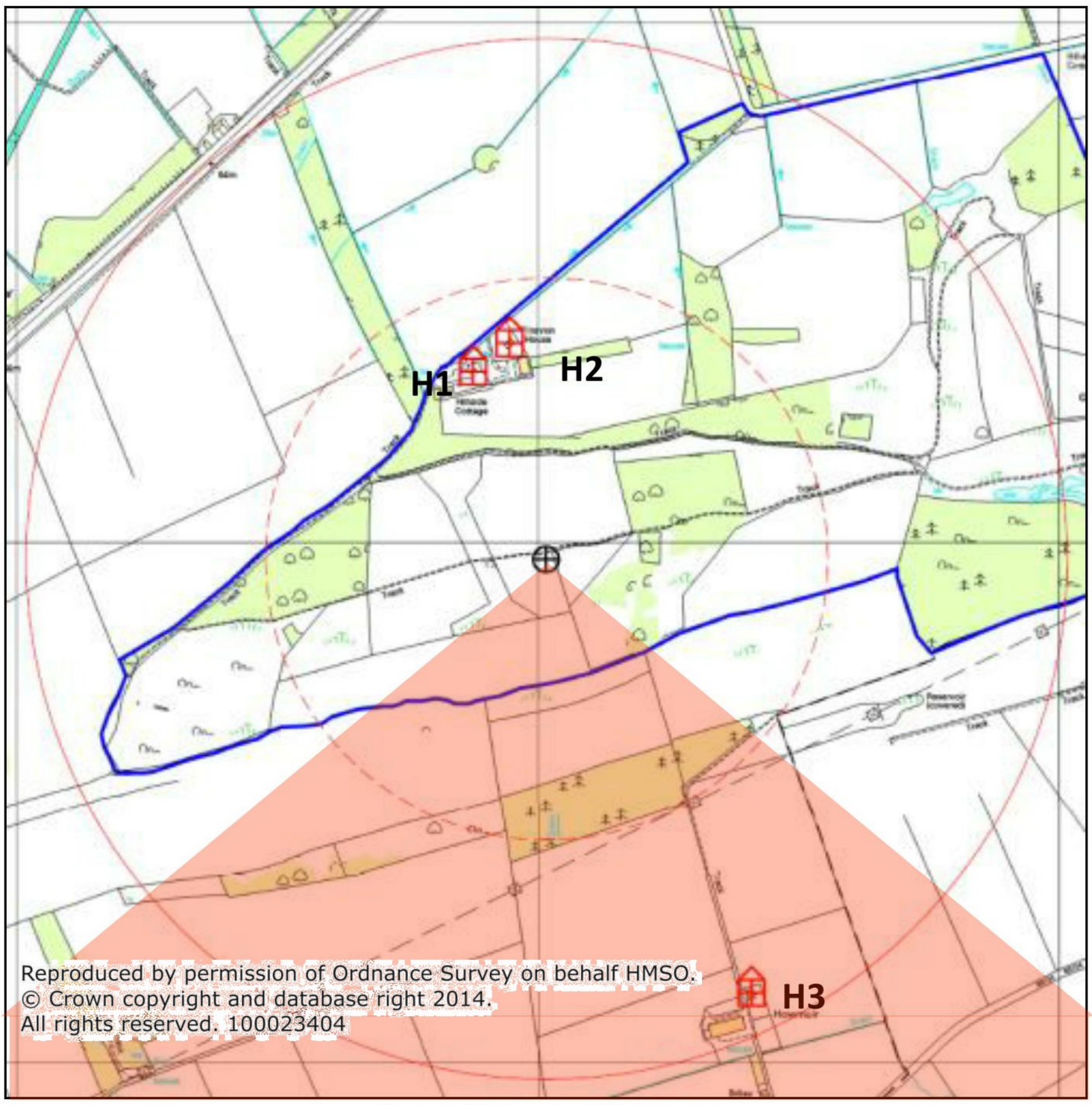

Figure 12.1 - Baseline map

Key:

- 10 rotor diameters (540m) Boundary
- 1000m Boundary
- Landownership Boundary
- Receptors
- Turbine
- 50° from south

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12.4 Results and Assessment

The calculation results, both theoretical and corrected, along with the resulting impact assessment based on the assessment matrix above, are given in **Table 12.3** below.

Table 12.3 – Impact Assessment

ID	Days per year	Max. hours per day	Mean hours per day	Total hours per year		Impact (based on Uncorrected Figures)
				Uncorrected	Corrected	
1 – Finavon House	54	0.55	0.43	23.5	4.7	**Medium**
2 – Finavon Cottage	52	0.60	0.47	24.5	4.9	**Medium**

Based on each receptor's location and the predicted theoretical hours of impact, receptors 1 and 2 are predicted to experience a **medium** significance of shadow flicker impact. Receptor 1 and 2 are predicted to experience 23.5 and 24.5 hours of theoretical shadow flicker per year respectively. When more realistic climatic factors are considered, as outlined in **Section 12.2**, Receptors 1 and 2 are expected to experience 4.7 and 4.9 hours of shadow flicker respectively.

Receptors 1 and 2 are owned and occupied by the Finavon Estate and as such, a medium level of impact is considered acceptable as both properties have a financial interest in the proposed development.

Receptor 3 is predicted to experience **no** shadow flicker impact. Receptor 3 is inside 50 degrees either side of south and is thereby situated within the zone in which shadow flicker will not occur at northern latitudes.

The resulting shadow map is shown in **Figure 12.2**.

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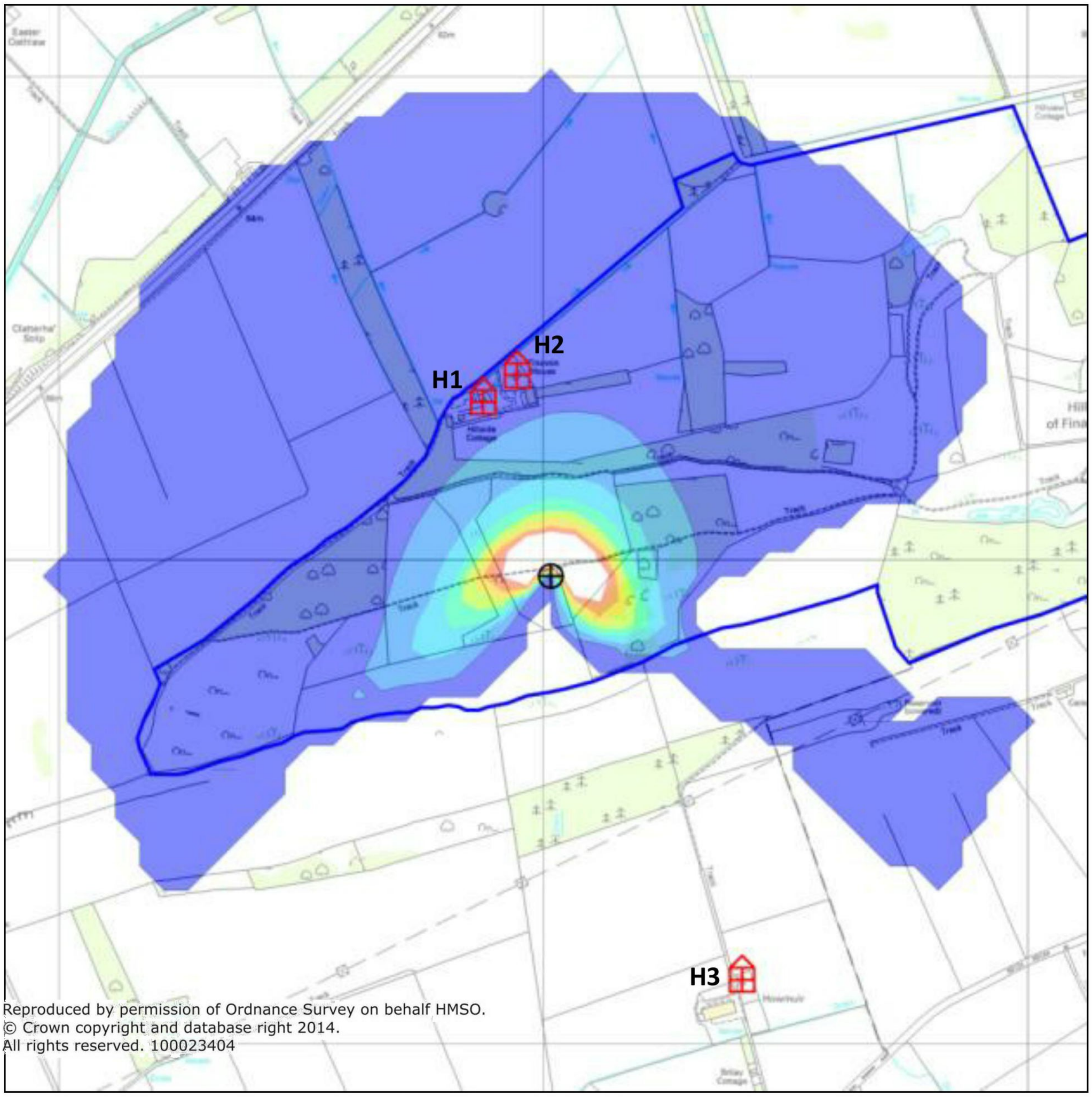

Figure 12.2 - Shadow Map

Key:

Annual hours of theoretical shadow flicker

- 170h +
- 140-170h
- 110-140h
- 80-110h
- 50-80h
- 30-50h
- 0-30h

Receptors

Proposed Wind Turbine

Landownership Boundary

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12.5 Summary and Conclusion

All of the potentially sensitive residential properties surrounding the site have been identified and a mathematical model was run using conservative assumptions to calculate the theoretical potential effect of shadow flicker at the identified receptors.

An assessment of the impact was derived based on the predicted magnitude of impact before and after taking into account certain correction factors.

Receptors 1 and 2, which are representative of the financially involved parties in the proposed development, are predicted to experience 23.5 and 24.5 hours of theoretical shadow flicker respectively. This results in **medium** significance of impact. When realistic climatic conditions are applied these properties are predicted to experience no more than 4.9 hours of shadow flicker.

Receptor 3, which is representative of the only third party property within the 1km study area, is predicted to experience **no** shadow flicker impact.

It is concluded that the development will have a negligible impact from shadow flicker.

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