



SPICER HILL WIND FARM

Environmental Statement Volume 1: Non-Technical Summary and Environmental Assessments

April 2008

Prepared by



On behalf of

J G PEARS LTD

PREFACE

This Environmental Statement accompanies the application by J. G. Pears Ltd. to Barnsley Metropolitan Borough Council (BMBC) to construct and operate a wind farm on land at Spicer Hill near Ingbirchworth, Penistone.

This Environmental Statement has been prepared by Arcus Renewable Energy Consulting Ltd on behalf of J. G. Pears and comprises the following:

- Environmental Statement Volume 1: Non Technical Summary and Environmental Assessments
- Environmental Statement Volume 2: Figures
- Environmental Statement Volume 3: Technical Appendices

Copies of the Environmental Statement can be consulted at:

Barnsley Metropolitan Borough Council
Barnsley Connects
The Civic
Eldon Street
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during office hours, Monday to Thursday 9.00 am to 5.00 pm and Friday 9.00 am to 4.30 pm.

Copies of the Environmental Statement including the Non Technical Summary can also be obtained from Arcus Renewable Energy Consulting Ltd. by calling on

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The full Environmental Statement can be purchased for £150.00 per copy. Alternatively full sets of the documents are available free of charge as Adobe Acrobat files on CD-ROM.

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NON TECHNICAL SUMMARY

INTRODUCTION

This Non Technical Summary (NTS) forms part of the Environmental Statement (ES) to accompany an application by J. G. Pears Ltd (The Developer) for a 5 turbine wind farm with a generating capacity of 5MW at Spicer Hill, approximately 1 km from Ingbirchworth, Barnsley. The location of the development site is shown in Figure 1.1 of this ES Volume 1.

The purpose of this NTS is to provide a summary of the main findings of the ES in non-technical language.

J. G. Pears Ltd is a long established company in this area of South Yorkshire specialising in the recycling of animal by-products for over 30 years. The company has recently been diversifying its core business to include renewable energy projects. As part of this process, renewable energy feasibility studies were carried out in respect of their landholdings and land at Spicer Hill identified as suitable for wind farm development.

Energy underpins virtually every aspect of the economy and society. However, the use of fossil fuels such as gas and coal, which currently provide the bulk of our energy, releases greenhouse gases (such as carbon dioxide) into the atmosphere which directly affects our climate. To help lessen the effects of climate change, greenhouse gas emissions must be reduced. One way of helping to achieve this is by generating energy from sources that emit low or even zero levels of greenhouse gases, such as renewable sources.

In order to meet international obligations, the UK is committed to reducing greenhouse gas emissions in an attempt to reduce the effects of climate change. The UK Government has recently set a commitment to cut the UK's carbon emissions by 60% by 2050, with a 26-32% reduction by 2020, against a 1990 baseline. Latest estimates show that total UK greenhouse gas emissions in 2006 had fallen 15% below 1990 levels while carbon dioxide emissions were 5% below 1990 levels in 2006 (*Meeting the Energy Challenge, A White Paper on Energy, May 2007, DTT*). Further action is therefore clearly needed to curb carbon dioxide emissions over the next few years if the Government's targets are to be met.

Another main objective is to move towards obtaining 10% of the UK's electricity supply from renewable sources by 2010, with an aspiration for 20% renewable energy generation by 2020. In 2006 electricity supplied from renewable sources stood at only 4.6% of the UK's total.

The Yorkshire and Humber Regional Strategy sets out the regional objective of meeting the government targets set out above. These are in the process of being revised and the new minimum target for installed renewable energy generating capacity in South Yorkshire is expected to be 47MW by 2010 and 160MW by 2021 South Yorkshire. The installed capacity of Spicer Hill Wind Farm will be between 5MW, which would depend on the specification of the wind turbine used, provide enough energy for approximately 2250 homes¹ and displace between 4436 and 10498 tonnes of CO₂² during each year of its 25 year operational life. This is based on the estimate that within different elements of the UK energy mix, 369g (Gas), 622g (Fossil Fuel) and 874g (Coal) of CO₂ are released per kilowatt-hour.

ENVIRONMENTAL IMPACT ASSESSMENT

An application for planning permission is made under The Town and Country Planning Act 1990 to BMBC. The ES has been prepared to accompany the planning application, in

¹ Assuming average annual domestic consumption at 4700kwh/year and a capacity factor of 30%

² The Digest of United Kingdom Energy Statistics (DUKE Stats) 2007: Carbon Dioxide Emissions from Power Stations in 2006

accordance with The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended).

Environmental Impact Assessment (EIA) is a process intended to ensure that development with potentially significant effects on the environment is granted permission only after full consideration of the likely significant environmental effects has been given and suitable mitigation or management measures identified.

CONSULTATION AND SCOPING

Following identification of the site as suitable for wind energy development, detailed studies of the Spicer Hill Wind Farm site were commissioned to establish the environmental sensitivity of the site. This was followed by a consultation exercise known as 'Scoping', where a wide range of consultees were required to comment on the proposals.

The aim of the Scoping process was to identify key environmental issues at an early stage, to determine which elements of the proposals were likely to result in significant effects on the environment and to establish the extent of survey and assessment required for the EIA.

Public exhibitions were held in Penistone at the start of March 2008 to provide an opportunity for local people to examine the proposals, explore issues of potential concern and offer comments, feedback and suggestions.

SITE SELECTION AND LAYOUT DESIGN

The suitability of the site was determined using a range of criteria, including

- wind characteristics
- availability of suitable grid connection
- construction considerations, including access / highway capacity and ground conditions
- planning policies
- landscape and visual considerations, including landscape designations and existing characteristics
- sensitivity to noise
- likely ecological importance
- existing land uses and infrastructure (e.g. service pipes, air traffic issues)

At an early stage of the project two different forms of wind farm development were considered

- a smaller number of large scale turbines (125m to tip)
- a larger number of smaller scale turbines (up to 85m to tip)

Following discussions with BMBC it was concluded that due to the prominence of the ridge and design and proximity of the existing Royd Moor Wind Farm that it was more likely that a larger number of smaller turbines would be the most acceptable option. This layout was refined as more environmental surveys were undertaken and consultation was undertaken.

The wind farm design evolved through an iterative process to ensure that it represented the "best fit" for the proposed site in terms of its appearance from many locations throughout BMBC and beyond and in terms of other environmental considerations.

THE PROPOSED DEVELOPMENT

The proposed wind farm will comprise

- 5 wind turbines and associated infrastructure including transformers and crane pads

- construction of on-site tracks
- construction of site entrance
- construction of new access tracks
- laying of underground cabling between turbines
- construction of a control building
- erection of one permanent anemometer monitoring mast
- construction of a temporary construction compound

Construction

Construction would be planned to take place over a 10 month period.

The proposed layout of the wind turbines is shown in Figure 1.2 of this ES Volume 1. The assessment is based on a turbine with a maximum rotor diameter of 56m, and maximum tower (hub) height of 56m. The total height to blade tip would not exceed 84m

The turbines would generate electricity in wind speeds between 3 and 25 m/s. At wind speeds greater than 25m/s (56mph) the turbines would shut down for safety and self-protection. Such high wind conditions occur for a maximum of approximately 1% of the year.

The proposed wind farm will be connected to the national grid via a new electrical control building on site. The grid connection is the responsibility of the grid operator and the application for the grid connection between the site control building and the national grid will be the subject of a separate planning application.

Operation

Each turbine has a computer controller that regulates every aspect of the turbine's performance. Routine site maintenance visits would take place regularly by personnel accessing the site in a four-wheel drive vehicle to ensure that the turbines are operating at their maximum efficiency. It is anticipated that routine servicing would take place twice per year with a main service at twelve monthly intervals and a minor service at six months.

Decommissioning

At the end of the 25-year planned life of the wind farm, it will either be removed and the site reinstated or a new planning application may be submitted to retain or modify the wind farm.

The decommissioning period for the wind farm is estimated to be around six to eight months, and will involve the removal of above-ground structures and the reinstatement to agricultural use of ground disturbed by the works.

ENVIRONMENTAL ASSESSMENTS

Energy and Planning Policy

BMBC will determine the planning application for Spicer Hill Wind Farm in accordance with planning policy set out in the relevant development plan which comprises a range of statutory planning documents. There may be other planning considerations that require to be taken into account in determining the application. The Council must therefore weigh the policy against these considerations to decide whether or not planning permission should be granted.

Currently, the development plan for this area comprises

- Regional Spatial Strategy 12 for Yorkshire and the Humber to 2016, Based on Selective Review of RPG 12 (December 2004) (RSS 12)
- Barnsley Unitary Development Plan (BUDP) Adopted 2000

Together these documents set out a range of policies covering issues such as climate change, renewable energy, built and natural environment and development in the countryside. The most relevant policies relate to climate change and renewable energy which set out renewable energy generation targets for the Region, as detailed above, and provide guidance on the main issues BMBC will consider when determining applications for wind farm developments. In summary these are

- Visual amenity
- Noise
- Access and Road Safety
- Ecology
- Archaeology
- Impact on agricultural land uses
- Shadow Flicker

The assessments contained within the Environmental Statement provide information regarding the likely significant impacts on the environment that would result from Spicer Hill Wind Farm. With appropriate design modifications, adopting best practice during construction and other environmental protection and enhancement measures, significant effects are limited to visual effects.

The assessment of visual effects resulting from the wind farm is summarised below. The assessment concludes that overall the visual effects of the proposed turbines are acceptable.

No significant effects are predicted on noise, access and road safety, ecology, archaeology, existing land use and shadow flicker.

Landscape and Visual Effects

An assessment has been carried out of the potential landscape and visual effects arising from the proposed wind farm at Spicer Hill.

The objective of the assessment has been to identify what the significant effects of the wind farm will be on the landscape and visual resource. A significant effect will occur where the wind farm causes a material change to the physical fabric of the wind farm site, to the landscape character of the surrounding area and to views, such that these 'receptors' become defined by the presence of the wind farm. A not significant effect will occur where changes brought about by the presence of the wind farm are not material and the existing characteristics of the wind farm site, the surrounding landscape character and views continue to prevail. In this instance the wind farm may have an influence but the influence will not be definitive.

The assessment has been carried out within a study area extending to a radius of 15km from the centre of the wind farm site. This has been determined from site visits and a range of computer generated graphic material which suggest this is the maximum radius within which a significant effect is likely to occur for the height and number of turbines proposed.

Effects on the landscape and visual resources of the study area arising from the presence of the wind farm can occur in one of four ways: firstly, physical effects on the fabric of the wind farm site (loss of trees etc); secondly, perceived effects on the surrounding landscape character; thirdly, effects on views; and fourthly, cumulative (in-combination) effects arising from the addition of the proposed wind farm to other wind farms. Assessment of cumulative effects considers wind farm developments that are within a 30km radius of the wind farm site

to take account of areas within the Spicer Hill Study area which may have visibility of other wind farms beyond the study area boundary.

The assessment has concluded that there will be significant effects on the following landscape and visual resources of the study area

- Ingbirchworth unit of the Upland Farmland landscape character type, extending for a distance of about 3km north and east of the wind farm site
- Area of Borough Landscape Value, extending for a distance of about 3km north and east of the wind farm site
- Ingbirchworth Conservation Area on either side of the A629
- houses on the western edge of Ingbirchworth and adjoining the A629
- small group of houses at Maythorn;
- local views from individual houses, farmsteads and roads, primarily to the north and east of the wind farm site, extending for a distance of about 3km
- landscape character and local views for a distance of about 3km east and west of the wind farm site, arising from the addition of Spicer Hill to Royd Moor, Hazlehead and Blackstone Edge wind farms

These effects are confined to the close vicinity of the wind farm site and arise from the addition of the turbines rather than other components associated with the development. The effects are considered to be adverse since they will not result in specific benefits to the affected landscape or views. Beyond those significant adverse effects identified above, the wind farm is likely to have an effect on some of the other landscape character areas or views within the study area but these are not judged to be significant.

Whilst those significant effects will result in material alterations to the localised landscape and visual resource in the vicinity of the wind farm site, the proposed development is nevertheless considered to be acceptable in the broader context. This is due to a number of factors that relate to both the design of the wind farm and the landscape setting within which it will be seen. These factors include the small number of turbines proposed, immediate proximity to Royd Moor wind farm, choice of turbines to closely match Royd Moor turbines, the generally large scale and elevated plateau landform of much of the study area in which the wind farm will be seen, vegetated nature of other parts of the study area that limits visibility, absence of significant effects on national planning designations, and lack of significant cumulative effects.

Ecology

An assessment of the effect of the wind farm on ecology was carried out based on desk and field study.

Surveys were undertaken to assess the range of habitats and species that occur on and around the site between August 2007 and March 2008. The majority of the development site consists of improved grassland and arable fields, which are widespread habitats of negligible ecological value. The only habitat identified of high ecological value was areas of isolated dry dwarf shrub heath and acid grassland mosaic, which is likely to degrade under current management regimes. This habitat is entirely avoided by the development, and will be enhanced through a habitat management plan, which will also improve the biodiversity value of other habitats onsite.

A preliminary visit revealed activity from a range of bat species on and around the development site. Although there are no roosts known on or near the site, there are areas that may be suitable for roosting. The development avoids potential roost structures and habitat features used by bats for foraging and commuting. However, a full bat survey and assessment will be completed before construction. Due to the nature of habitat present, no significant effect is anticipated.

Evidence of badger was found in the area and various measures will be implemented to ensure that there no significant impact upon them.

Historical records indicated that there may have been otter and water vole in the area however no signs of these species were detected during field surveys.

Consideration was given to all designated natural heritage sites in the vicinity of the proposal, the closest of which was Ingbirchworth Parish Council Designated Nature Reserve, immediately to the north of the site. Neither this, nor any other designated site will be affected by the development. There are no statutory designated sites for ecological interest on or near the development.

Overall, this site is not sensitive with respect to habitats and protected species, and will benefit from the proposed habitat management plan.

Ornithology

Wind farms can have an effect on bird populations as a result of construction activities, operation of the wind farm and decommissioning activities.

There are no sites designated for ornithological interests on or near the development site. The closest statutory site is the South Pennine Moors, which is designated both as a Special Protected Area (SPA) and Site of Special Scientific Interest (SSSI), located over 4km away. No bird important bird species relating to these designations were recorded during surveys.

Surveys to establish baseline bird activity, including breeding, wintering and flight activity, were undertaken at the site between May 2007 and March 2008.

No species of high conservation concern were recorded during any survey, and only small numbers of species of medium to low conservation concern were noted. These included kestrel, lapwing, curlew, oystercatcher, skylark, dunnoek, starling, linnet and yellowhammer, stonechat and willow warbler. The development is not predicted to have a significant impact on any of these species.

It is possible that the noise and visual disturbance associated with construction activities may temporarily displace a small number of breeding and foraging birds and disrupt the routines of others. Appropriate measures would be taken to avoid disturbance of any protected species during construction activities and therefore disruption to breeding attempts of species of high nature conservation value is unlikely.

The movement of the turbines blades can present a potential risk for birds in that birds may be struck and killed by their rotation. The species and levels of flight activity recorded at this site indicate that there will be a negligible collision risk to all species during the operational phase of the wind farm.

Overall, this site is not sensitive with respect to bird interest, and may benefit from the proposed habitat management plan.

Hydrology and Hydrogeology

The assessment has been based on a detailed desk study, walkover, and consultations with a range of organisations, including BMBC and The Environment Agency.

The geology of the site is predominantly underlain by sandstone, siltstone and mudstone rocks from the Westphalian period, identified as Pennine Lower Coal Measures. Rhythmic bands of Grenoside sandstone, Greenmore Rock and 80 Yard Rock also lie in the southern section of the site. The underlying superficial geology, gained from trial pit investigations,

shows undifferentiated mudstones, silt, weathered clay. Three main surface watercourses drain the site, identified as Anniat Royd Beck, Small Shaw Dyke and an unnamed tributary of Ingbirchworth Reservoir.

The site lies within the catchment area of all three of the abovementioned watercourses, which drain towards the northeast.

Potentially significant impacts on hydrology have been avoided through environmental protection measures incorporated into the project design and through the adoption of best practice measures during construction.

A range of measures will be in place during construction to prevent silt from entering watercourses on site. The project will not involve the winning of construction stone on site which avoids potential effects on geology and hydrogeology.

A Pollution Prevention Plan (PPP) will set out measures to be employed to avoid or mitigate against potential impacts for all phases of the development, and will also include an Incident Plan to be followed, should pollution occur. A nominated person will have specific responsibility for implementation of the PPP.

Method statements will also be applied, which will follow the principles laid out in relevant Environment Agency Pollution Prevention Guidelines (PPGs).

With the proposed mitigation measures, the potential effects of the wind farm on hydrology and hydrogeology are considered to be not significant.

Cultural Heritage and Archaeology

An assessment of the potential impact of the proposed development upon cultural heritage resources both within and outwith the site boundary has been undertaken.

The assessment started with the establishment of the baseline condition of the site, by means of accessing the Sites and Monuments Record (SMR) maintained by South Yorkshire Archaeological Advisory Service, as well as data on Scheduled Monuments, Listed Buildings and other nationally designated features held by English Heritage at the National Monument Record Centre. Records were collected for SMR sites to 1km around the site boundary to allow an assessment to be made of the potential for unknown, buried, archaeological remains to exist within the development. Data on nationally designated cultural heritage features was collected out to 15km from the proposed site boundary, to inform an assessment of the potential for indirect, that is visual effects upon the settings of such features.

The assessment shows that no Scheduled Ancient Monuments, Listed Buildings (of any Grade), Registered Historic Parks or Gardens or Battlefields lie within the development boundary in whole or in part. In addition, no features recorded on the SMR lie within the site boundary. Although the potential for buried archaeological remains cannot be discounted, the assessment (based on the known archaeological record from around the site) indicates that the likelihood of encountering significant remains is low. It is considered that this potential can be mitigated by the implementation of an appropriate programme of archaeological recording, for example by means of a watching brief during construction, leading to preservation by record.

Assessment of potential visual impacts upon the settings of cultural heritage features is based upon the distance to the feature from the nearest turbine, as well as the level of designation of the features. More detailed consideration of the setting of features (including tree cover, associated buildings, location within a built-up area, designed views etc.) has been undertaken to determine the final potential effect. Although the turbines will be visible from cultural heritage features at distance beyond the development boundary, the

assessment indicates that the actual effect upon the settings of such monuments and other features is likely to be of no more than "minor" significance.

Noise

An assessment of noise resulting from the construction, operation and decommissioning phases of the wind farm has been carried out.

Noise during construction and decommissioning will be managed through the use of best practice to ensure that effects are minimised as far as is reasonably practicable.

Operational noise has been assessed in accordance with relevant guidelines and in consultation with BMBC. A noise survey has been carried out at nearby properties to establish current noise levels in the area and to set limits for the proposed wind farm using the appropriate guidelines. The noise levels likely to occur at nearby properties under worst-case conditions have been predicted and assessed against these limits. All predicted noise levels are lower than the limits and are therefore considered to be not significant.

Cumulative effects resulting from the combined operation of the wind turbines at Royd Moor (the existing wind farm), Spicer Hill, Hazelhead (which has planning permission, but is not yet constructed and Blackstone Edge (currently the subject of a planning application) have been assessed and found to comply with relevant limits. No significant effects are predicted.

Socio-Economics, Tourism & Recreation and Land-Use

The assessment has been based on a detailed desk study and consultations with a range of organisations, including BMBC, Natural England, English Heritage, National Trust and British Horse Society.

The Spicer Hill Wind Farm will create an indirect economic benefit through offering construction tendering opportunities. It may also create indirect effects through employment opportunities in the supply. As a local employer, J. G. Pears Ltd will strive to source local suppliers and labour wherever practicable. Once the wind farm is operational, there will be approximately one or two full time equivalent & short term maintenance jobs created.

J G Pears Ltd proposes to establish a community fund to support sustainable/environmental projects throughout the operational life of the wind farm. The community fund would be established following consultation with and agreed with the BMBC and relevant Parish/Town councils.

There are a few local trails and a bridleways situated around the site. There will be no direct impact on any of these recreational resources during the construction, operation or decommissioning of the wind farm. Once operational, the wind farm may offer pre-arranged educational visits for schools as renewable energy is part of the National Curriculum in England.

Impacts on tourism and recreational do relate strongly to the attitudes of the individual experiencing the wind farm. Many studies undertaken across the UK have shown that the public is generally in favour of generating energy from renewable sources and that although uncertainty regarding proposals can generate apprehension, fears are generally allayed when the wind farm becomes operational.

The area containing the wind farm infrastructure is currently owned by the developer. The land is currently used for pastoral sheep grazing. Spicer Hill Wind Farm will utilise less than 7% of the land within the planning application boundary and existing agricultural practices will continue, although they will be managed in accordance with habitat management proposals to enhance the environment of the site.

Other Issues

Spicer Hill Wind Farm will have a positive benefit on carbon dioxide emission savings. Energy generated by the wind farm would have the potential to displace electricity generated from other sources such as fossil fuels.

Electricity supplied via the grid comes from a mix of fuel sources which will change over time and as such it is difficult to predict exactly how much carbon dioxide could be prevented from being released into the atmosphere.

Recently published Government figures³ indicate show that of the fossil fuels currently is use for generating electricity, gas produces least carbon dioxide (396.66g per kilowatt hour generated) and coal the most (874.74g per kilowatt hour generated). These figures do not include nuclear fuel. On this basis, Spicer Hill Wind Farm will prevent the release of between 4436 and 10498 tonnes of carbon dioxide during each year of its 25 year operational life.

Sensors and protection equipment will be fitted to turbines and operational procedures followed to mitigate any safety risks associated with extreme weather.

Shadow flicker is the term used to describe the effect that occurs when the shadow of a wind turbine blade passing a narrow opening (usually a window) appears to quickly turn on and off as blades pass the opening in succession resulting in a flicker. According to the Government Planning Guidance⁴, there are limited atmospheric conditions in UK during which shadow flicker can take place and occurrence relates to the position of the sun relative to the turbines and the window opening. The guidance advises that the distance over which this effect can occur is generally within ten times the rotor diameter of the proposed wind turbines. In the case of Spicer Hill Wind Farm, this effect could occur within 560m of the proposed turbines. A computer based model has been used to predict a worst-case scenario of the shadow flicker effects on the three properties within this distance. The model has predicted the time of year and time of day when effects could potentially occur at each property. For the very short periods of time identified, turbine monitoring and control systems will automatically identify when the atmospheric conditions and position of the sun are likely to result in shadow flicker effects and turbines will temporarily shut down the turbines to avoid the phenomenon.

SUMMARY

There are strong legislative and policy drivers for renewable energy development in the UK. Minimum targets have been set for Regions across England and in the case of South Yorkshire 160MW of installed capacity are required by 2021.

Spicer Hill Wind Farm, if granted planning permission, will be developed and operated by J. G. Pears Ltd. a long established local employer with strong links to the area and will assist South Yorkshire in reaching it's minimum target.

The only significant effects on the environment predicted as a result of the wind farm are landscape and visual effects in and around the site, and these will not be permanent as the development will be operational for a period of 25 years, then removed and the site restored.

No significant effects are predicted on ecology, ornithology, hydrology or cultural heritage. Predicted noise and traffic levels will not result in nuisance, and potential shadow flicker effects will be prevented through turbine control measures.

³ The Digest of United Kingdom Energy Statistics (DUKE Stats) 2007: Carbon Dioxide Emissions from Power Stations in 2006

⁴ Planning for Renewable Energy - A Companion Guide to PPS22

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A full list of accompanying figures is provided within Environmental Statement Volume 2: Figures.

Technical Appendices referenced in Chapters contained within this Volume may be found in Environmental Statement Volume 3.

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1 INTRODUCTION

1.1 THE PROPOSED DEVELOPMENT

J G Pears Ltd ("The Developer") is proposing to develop a wind farm at Spicer Hill, near Ingbirchworth, South Yorkshire. The location of the site is shown in Figure 1.1. The installed capacity of the wind farm will be up to 5MW, depending on the final wind turbine selected, and could provide enough energy for approximately 2600 homes¹.

The wind farm will consist of 5 wind turbines, with associated infrastructure including access tracks, control building and underground power cables. A meteorological mast will also be erected to monitor wind speed. The general site layout is shown on Figure 1.2.

An application for planning permission, accompanied by this Environmental Statement (ES), is being made under The Town and Country Planning Act 1990 to Barnsley Metropolitan Borough Council (BMBC). The wind farm falls within Schedule 2 of the Environmental Impact Assessment (England and Wales) Regulations 1999 (as amended) (EIA Regulations) and as such an Environmental Impact Assessment (EIA) of the proposed development has been undertaken by Arcus Renewable Energy Consulting Ltd (Arcus).

The wind farm will generate electricity for 25 years after which time it may be removed. Alternatively, the life of the wind farm may be extended subject to further environmental studies and new consents.

The wind farm will be connected to the grid via a new control building on site. If required, an application for the connection to the grid will be lodged separately under the relevant consenting procedures.

1.2 THE DEVELOPER

J G Pears Ltd is a long established company in this area of the South Yorkshire. With its head office in Penistone, the company has been specialising in the recycling of animal by-products for over 30 years.

In recent years, J G Pears Ltd has been actively exploring opportunities relating to expanding the core business to include renewable energy projects. As part of this process, renewable energy feasibility studies were carried out in respect of their landholdings.

The land at Spicer Hill was identified as suitable for a potential wind farm development based on a range of technical and environmental factors, and taking into account the presence of the existing Royd Moor Wind Farm. In addition to this, J G Pears Ltd is now involved in the feasibility stages of using Biomass to generate electricity.

1.3 DEVELOPMENT DRIVERS

1.3.1 Climate Change & Energy Supply

Energy underpins virtually every aspect of the economy. However, the use of fossil fuels such as gas and coal, which currently provide the bulk of our energy, releases greenhouse gases [such as carbon dioxide (CO₂)] into the atmosphere. The UK energy industry still relies on finite, diminishing sources of fossil fuel such as coal, oil and gas. In 2006, approximately 75% of the UK's electricity was generated from fossil fuel sources². The UK is currently

¹ Calculations based on current figures for average annual household electricity demand of 4,606 kWh (Digest of UK Energy Statistics, 2007); typical generating & capacity factor for wind turbines in the UK; and DEFRA published figures for a typical UK generation mix (<http://www.defra.gov.uk/environment/business/envrp/>)

² BERR UK Energy in Brief, July 2007- www.berr.gov.uk/energy/statistics/publications/dukes/page39771.html

responsible for the release of around 2% of the world's global greenhouse gas emissions³. UK energy industries are the largest single contributors to UK greenhouse gas emissions, contributing over a third (54 million tonnes) of the total amount of CO₂ in the UK.⁴

The demand for energy has increased to levels where the burning of fossil fuels is releasing enough greenhouse gases into the atmosphere to affect the climate. There is now scientific consensus that climate change is occurring, that it is at least in part attributable to human activity and that it poses a considerable global threat.

To help lessen the effects of climate change, greenhouse gas emissions must be reduced and international and national legislative drivers are evolving to provide a structure to achieve these reductions (further detail of these is provided in Chapter 3). One way of to achieve reduced emissions is by generating energy from sources that emit low or even zero levels of greenhouse gases, such as renewable sources.

1.3.2 Renewable Energy

Renewable energy is the term used to describe energy flows that occur naturally and continuously in the environment, such as energy from wind, waves or tides. The origin of the majority of these sources can be traced back either to the sun (energy from the sun helps drive the earth's weather patterns) or to the gravitational effects of the sun and the moon. This means that these sources are continuously replenished. The key issue is how to extract this energy as effectively as possible and convert it into a usable form.

1.3.3 Wind Power

Wind farms have a proven track record in generating renewable electricity on a commercial basis, having been in development for many years. The energy of the wind has been harnessed for centuries. Since the energy crisis of the mid 1970s, the use of wind turbines to generate electricity has expanded rapidly and is currently the fastest growing renewable energy resource. Installed electrical generating capacity of renewable sources in the UK rose by 11 per cent in 2006, mainly as a result of a 22 per cent increase in wind capacity⁵.

At the present time the UK wind industry (on and offshore) has an installed capacity of 2430 MW, enough energy to power the equivalent of 1,345,813 homes⁶. Other technologies currently lag behind wind farms in terms of their commercial development. Wind turbines generate electricity for 70-85% of the time. The proportion of time a wind turbine is generating depends on the average wind speed at the site. Turbines in the UK have an average capacity factor in the order of 27% i.e. over the course of the year the turbines produce around 27% of their theoretical maximum energy output.

In the short to medium term, wind farms are likely to be the only substantial new source of renewable energy which is both economically viable and environmentally acceptable. The Cabinet Office Performance and Innovation Unit has estimated that onshore wind could be the UK's cheapest source of electricity in 2020 (costing 1.5-2.5p/kWh, compared to 1.9-2.0p/kWh for gas, 3.0-3.6p/kWh for coal and 3.0-4.5p/kWh for nuclear)⁷.

³ Speech Elliot Morley "Tackling climate change- the UK approach", 2nd International Solar Cities Congress, Oxford, Monday 3 April 2006, www.defra.gov.uk

⁴ Digest of UK Energy Statistics 2006, <http://stats.berr.gov.uk/energystats>

⁵ Footnote 2

⁶ Wind Farms of the UK, www.bwea.com/ukwed/index.asp (It should be noted that the number of homes supplied may vary depending on wind speeds and household electricity consumption).

⁷ The Energy Review, February 2002

1.3.4 Spicer Hill Wind Farm Emissions Savings

From the typical UK electricity generation mix, 430 grams of CO₂ are released per kilowatt-hour of electricity generated⁸. Every kilowatt hour of wind energy produced therefore can be considered to displace this amount of CO₂ emissions. Based on these figures, with an installed capacity in the region of 5MW, the proposed Spicer Hill Wind Farm has the potential to contribute CO₂ emission reductions of 5160 tonnes during each year of its operational life, assuming the energy mix of fuel sources remain as it is currently. In reality the mix will change over time as fuel sources do. Actual CO₂ displacement will be between 4435 tonnes (assumes displacement of gas generation) and 10497 tonnes (assumes displacement of coal generation) each year.

Based on an estimated average annual household electricity consumption of 4606 kWh, the Spicer Hill Wind Farm would provide electricity for approximately 2600 households⁹.

1.4 ENVIRONMENTAL IMPACT ASSESSMENT

EIA is a process intended to ensure that developments with potentially significant effects on the environment should be permitted only after prior assessment of the likely significant environmental effects has been carried out and suitable mitigation or management measures identified.

Good practice advises that the EIA should be regarded as an iterative process rather than a unique, post design environmental appraisal. In this way the findings of the EIA can be used to inform the design of the project, achieving a 'best fit' within the environment. This approach was used for the Spicer Hill Wind Farm, and where potentially significant effects have been identified, every effort has been made to incorporate appropriate mitigation measures within the evolving design.

The provision of environmental information through an ES involves the compilation, evaluation and presentation of the likely significant effects of a proposed development. This document is intended to aid BMBC in considering and ultimately determining the planning application.

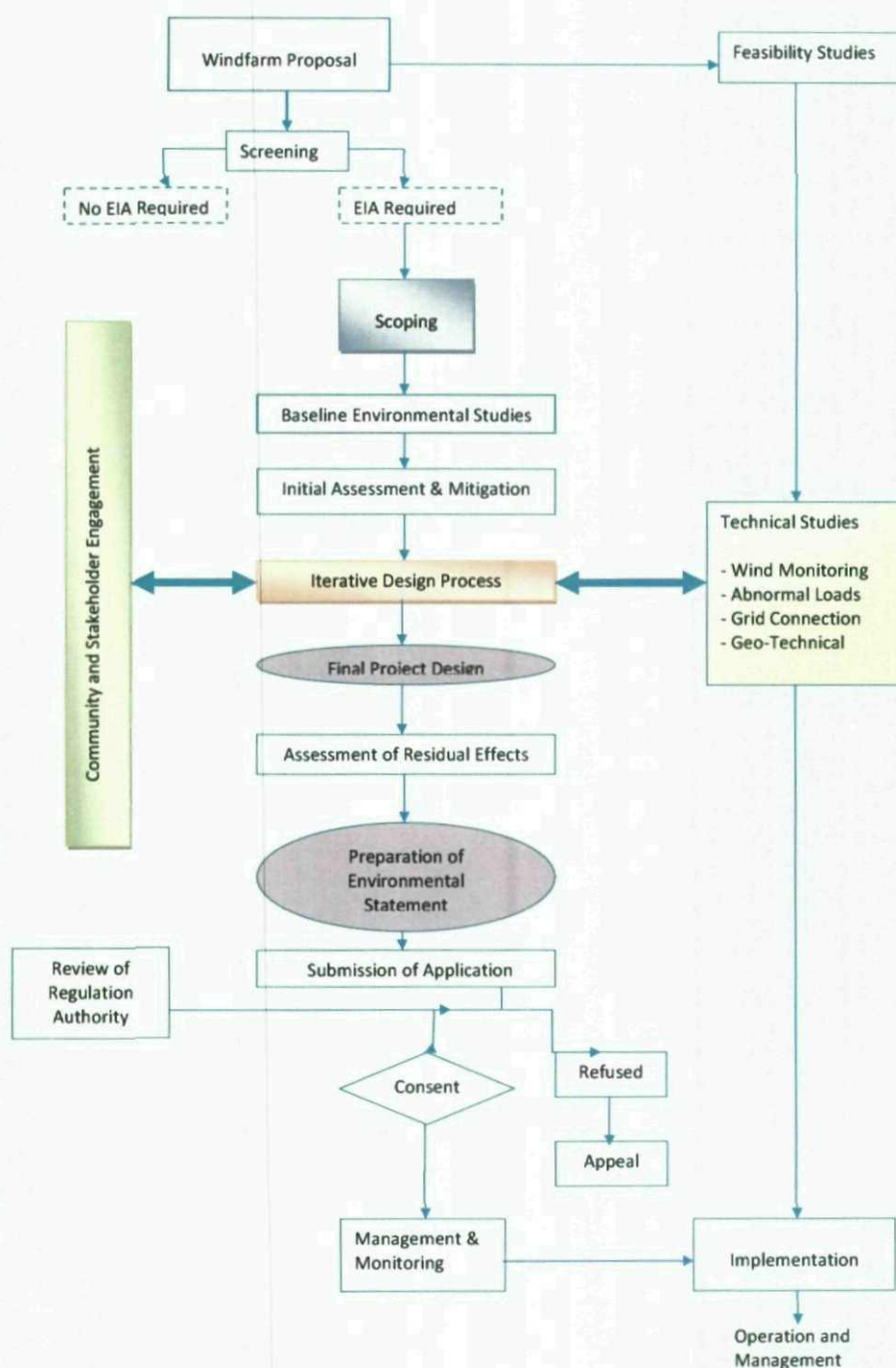
The preparation and production of this ES has been conducted in accordance with the latest Government Regulations and advice on good practice, comprising

- The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended)
- Planning Policy Statement (PPS) 22, 2004
- Planning for Renewable Energy: A Companion Guide to PPS 22, 2004
- Guidelines for Environmental Impact Assessment (Institute of Environmental Management and Assessment 2004)

Inset 1.1 EIA Process Diagram and the subsequent text provide further detail on the main stages of the EIA process.

⁸ Figure published by DEFRA (<http://www.defra.gov.uk/environment/business/envrp/>)

⁹ Calculations based on current figures for average annual household electricity demand of 4,606 kWh (Digest of UK Energy Statistics, 2007)

Inset 1.1 EIA Process Diagram**1.4.1 Screening**

The proposed Spicer Hill Wind Farm exceeds the thresholds set out in Schedule 2 of the EIA Regulations and is therefore a Schedule 2 development. In view of the nature and size of the proposed wind farm, the Developer considered that an EIA should be undertaken and therefore did not seek a Screening Opinion as to whether or not an EIA was required.

1.4.2 Scoping

The Scoping Report, prepared and issued to consultees in August 2007, set out preliminary technical information and likely significant environment effects with the aim of providing a structure for consultation regarding the approach to the EIA and the content of the ES. The aim of Scoping is to identify key environmental issues at an early stage, to determine which elements of the proposal are likely to cause significant environmental effects and to establish the work required for the preparation of the ES.

In adopting its formal Scoping Opinion the Planning Authority must also consult with certain statutory consultees. The consultees in turn have an obligation to provide any relevant information in their possession. Following submission of the Scoping Report to BMBC, further detailed consultation was undertaken by the specialist consultants to agree the assessment methodologies, survey areas and timings. Consultation responses with both statutory and non-statutory consultees are detailed within Chapters 4-14 as appropriate.

As part of the wider consultation process, public exhibitions were held on the 5th and 6th March 2008 in Penistone. The exhibitions provided an opportunity for local people to examine the proposals and explore issues of potential concern. All comments were fed into the iterative EIA process. The Developer is currently liaising with Parish Councils local to the site regarding more detailed discussions on the proposals.

1.4.3 Identification of issues

As a result of the scoping responses and on-going consultation, the following issues have been assessed in this ES

- landscape and visual amenity
- ecology
- ornithology
- hydrology and hydrogeology
- archaeology and cultural heritage
- noise
- access and traffic.
- socio-economics including recreation and tourism
- existing infrastructure including aviation and telecommunications
- shadow flicker

All elements of the wind farm including access tracks and associated infrastructure have been assessed in the ES.

1.4.4 Technical Assessment

Each of the technical assessments follows a systematic approach, with the principal steps as follows

- consultation with appropriate consultees to agree methodologies, timings etc;
- baseline studies;
- prediction of potential effects including cumulative effects;
- assessment of effects;
- identification of appropriate mitigation measures; and
- assessment of residual environmental effects (i.e. those remaining after proposed mitigation has been incorporated).

The prediction of potential environmental effects considers the construction, operation and decommissioning phases of the project as during each phase of development, different environmental effects may arise.

Each technical assessment considers the nature of effects and includes cumulative effects with other developments where appropriate. The purpose of EIA is to determine the likely *significant* effects of the development.

Significance is based on the structured evaluation of the three main criteria

- identifying the nature and form of any predicted environmental effects
- assessing the likelihood of identified effects
- assessing whether effects identified are significant

For the purposes of environmental assessment, 'effect' is generally considered in terms of:

- not significant – no detectable or material change to a location, environment, species or sensitive receptor
- minor – a detectable but non-material change to a location, environment, species or sensitive receptor
- moderate – a material, but non-fundamental change to a location, environment, species or sensitive receptor
- major – a fundamental change to a location, environment, species or sensitive receptor

This Environmental Statement generally follows this theoretical approach. Where specific technical assessment areas adopt a variation, this is identified within the methodology set out in the assessment chapter.

Within each assessment chapter the criteria for assessing significance of effects are made explicit. Each chapter also proposes measures to avoid, reduce or remedy significant adverse effects (mitigation measures). The assessment process concludes with an examination of residual effects after mitigation has been applied.

1.4.5 Mitigation

Where the assessment process identified potential significant adverse effects, mitigation has been proposed as part of the iterative design process in order to avoid, minimise or remedy these effects. Such measures included the consideration of alternatives; design evolutions, for example, movement or loss of turbines, access tracks and other infrastructure; and management and operational measures.

This strategy of avoidance, reduction and remediation is a hierarchical one which seeks

- Firstly to avoid potential effects
- Then where practicable and appropriate to minimise those which remain
- Lastly, where no other measures are possible, to put forward remediation measures

Each specialist consultant has identified appropriate mitigation measures. As indicated previously, these measures have largely been integrated into the overall design strategy (embedded mitigation) rather than "added on" to the proposals. By adopting a flexible and iterative approach to the design of the wind farm, the Applicant has been able to respond to the findings of consultation and environmental assessment work, and mitigate accordingly.

1.5 THE ENVIRONMENTAL STATEMENT

This ES presents the findings of technical environmental studies carried out as part of the EIA. It has been prepared in accordance with the EIA Regulations and comprises

- Environmental Statement Volume 1: Non Technical Summary and Environmental Assessments
- Environmental Statement Volume 2: Figures

- Environmental Statement Volume 3: Technical Appendices

Volume 1 (this document) is structured as follows

- The Non Technical Summary is provided before this chapter after the Preface
- This chapter provides an overview of the proposed wind farm project and environmental assessment methodology
- Chapter 2 provides details of the iterative design process and ultimate project specification and outlines the construction and decommissioning processes
- Chapter 3 outlines relevant national, regional and local energy and planning policies and
- Chapters 4-14 comprise individual technical assessment areas each containing commentary of likely significant effects, proposed mitigation measures, and subsequent residual effects

A Design and Access Statement has also been prepared which provides a summary of key aspects of project design and access arrangements. The Design and Access Statement does not form part of this ES.

1.6 THE PROJECT TEAM

The EIA has been project managed and compiled by Arcus, with technical input from several specialist consultants with wind energy expertise. Table 1.1 below identifies the team members and their responsibilities.

Table 1.1 Project Team

Area of Expertise	Consultant
Project Management	Arcus
Planning	Arcus
Socio Economics	Arcus
Landscape and Visual	RVA Design / Arcus
Ecology	Tim Outlaw / Cameron Ecology/Arcus
Ornithology	Tim Outlaw / Cameron Ecology/Arcus
Hydrology and Hydrogeology	Arcus
Archaeology and Cultural Heritage	Arcus
Noise	Arcus
Existing Infrastructure	Arcus
Shadow Flicker and Reflectivity	Arcus
Traffic and Transport	Carazon Consulting Ltd.
Geotechnical	Donaldson Associates
Other Issues	Arcus

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2 PROJECT DESCRIPTION

2.1 INTRODUCTION

This chapter outlines the process of site selection, iterative design process and describes the proposed development, its components and embedded mitigation. It also provides an indication of the proposed methods and timescales for the construction and decommissioning phases.

2.2 GENERAL DESCRIPTION

The proposal is to construct and operate a wind farm with an output of approximately 5MW comprising the following

- 5 wind turbines and associated infrastructure including transformers and crane pads
- construction of site entrance
- construction of new access tracks
- laying of underground cabling between turbines
- construction of a control building
- erection of one permanent meteorological monitoring mast
- construction of a temporary site compound

The proposed layout of the wind turbines is shown in Figure 1.2. This also shows the location of the access tracks, permanent and temporary anemometer masts, control building and location of site compound areas. The main access arrangement to the site from Whitley Road is shown on Figure 2.11.

Construction would take place over a period of approximately 10 months after which the wind farm would become operational and generate electricity for a 25 year period. After 25 years it would either be decommissioned or a fresh planning application lodged to extend its operational life. For the purposes of the application and this ES it is assumed that the wind farm would be decommissioned and the site restored (with the exception of access tracks) to a depth of 1m to its pre-development condition. Access tracks are likely to be left in situ as it is may be more environmentally harmful to remove and restore them than to leave them in place.

The candidate turbine provisionally selected for this site, would have a maximum hub height of 56m and a total height to blade tip of 84m. The final selection of turbine depends upon the technology available at the time of construction, statutory requirements of tendering, project economics and the desired output from the proposed wind farm. For the purposes of EIA as presented in this ES all assessments have evaluated the effects assuming worst-case and employing an assumed candidate turbine with the attributes and dimensions of a WinWinD WWD-1 which represents the maximum dimensions of the turbine proposed.

The wind farm would connect from the site control building to the grid. The grid connection will form the subject of a separate application. A study has been carried out which has indicated that there is capacity within the existing network and there are different options available for connecting the proposed turbines. Should planning permission be granted, further studies will be undertaken to determine the most acceptable method and route of connection and the relevant applications made.

The total area within the planning application boundary is approximately 28.1ha. It is estimated that the total land take of the wind farm comprising the turbine foundations, access tracks, control building, compound and hard-standings would be approximately 1.76ha or approximately 6.27% of the total application area which encompasses only part of the wider study area and landholding.

2.3 SITE SELECTION

J.G. Pears Ltd. existing land holding was reviewed to ascertain the viability of the development of wind farm development based on the following criteria

- wind characteristics
- availability of suitable grid connection
- construction considerations, including access / highway capacity and ground conditions
- planning policies
- landscape and visual considerations, including landscape designations and existing characteristics
- sensitivity to noise
- likely ecological importance
- existing land uses and infrastructure (e.g. service pipes, air traffic issues)

Spicer Hill was identified as the most suitable site within the available landholding based on the criteria listed above. The local planning policy framework of the area was then reviewed. The review concluded that there were no policy presumptions against wind energy development in this location and that through careful siting and design, a proposal could be developed which could meet the criteria for wind energy development set out in the development plan.

The site was then taken forward to the feasibility and design stage when a range of studies were undertaken to identify any constraints to development and inform the wind farm design.

2.4 DESIGN STATEMENT

2.4.1 *Iterative Design Process*

The purpose of a wind farm is to harvest energy from the wind. It is necessary to site a wind farm in an area with sufficient wind speeds and to try to locate individual turbines in the optimum position to maximise the wind yield whilst minimising environmental effects. Aesthetic considerations are also important with regard to the aspect of the wind farm from particular views.

The optimum layout of a wind farm depends upon a range of criteria. These vary depending on the type and size of turbine alongside the turbulence created by local ground conditions. In general, turbines are arranged in rows perpendicular to the prevailing wind. Technical considerations prescribe that the turbines be spaced at approximately four rotor diameters apart along rows with a distance of approximately five rotor diameters between rows. Such spacing limits the number of turbines which can be located in the site. The available capacity of the electricity grid into which a wind farm connects can also limit its size.

At the feasibility stage of the project two different forms of wind farm development were considered

- a smaller number of large scale turbines (125m to tip)
- a larger number of smaller scale turbines (up to 85m to tip)

Following discussions with BMBC it was concluded that due to the prominence of the ridge and design and proximity of the existing Royd Moor Wind Farm that it was more likely that a larger number of smaller turbines would be the most acceptable option.

An initial layout was developed, in advance of any detailed environmental studies on the basis of preliminary environmental constraints and known technical constraints, such as gradient. This layout was used as the basis for the Scoping exercise described in Chapter 1.

The combination of technical and environmental parameters has, through the iterative process of site design, allowed the development of the site layout shown in Figure 1.2. This represents the "best environment fit" within those parameters. This process has included detailed consultation with officers from BMBC, together with other statutory and non-statutory bodies.

The effects reported in this ES are those relating to the final design of the wind farm. This layout has evolved from the earlier layout iteration by avoiding, where possible, sensitive areas and developing appropriate mitigation measures for those areas where avoidance was not possible. The main stages of the iteration process are outlined below, highlighting some of the main issues considered and resolved during the development of the final layout.

Table 2.1 Principle Layout Iterations

Iteration	Description	Comment
Pre-Scoping Layouts	3 x 125m tip height turbines 6 x 80m to tip height turbines	Used for initial consultation with BMBC and to establish the capacity of the selected landholding for different forms of wind energy development
Scoping Layout	6 x 80m to tip height turbines	125m to tip turbines considered too tall to sit well with existing Royd Moor Wind Farm
Initial Layout	4 x 84m to tip height turbines	84m tip height offers more turbine choice and has little impact on landscape and visual considerations Turbines moved on to northern land parcel to avoid higher ridge on south
Final Layout	5 x 84m to tip height turbines	Final positions fixed taking account of landscape and visual, ecological and geotechnical constraints. Additional turbine provides better visual balance.

These layout iterations are shown on Figure 2.1.

Overall, there were relatively few iterations as part of the EIA and wind farm design process. This is largely as a result of the site selection process which identified this site. The detailed environmental surveys highlighted few physical environmental constraints to development. As a consequence the design has been driven largely by landscape and visual amenity considerations in combination with other technical constraints.

2.4.2 Embedded Mitigation

The results of the decisions made during the layout iteration process which reduce the overall environmental effects through the design of the wind farm are termed 'Embedded Mitigation'. In respect of Spicer Hill the measures include avoiding known constraints, including

- recorded archaeology
- residential property
- watercourses
- public roads and rights of way

These features will be discussed in greater detail within the appropriate technical assessments detailed in chapters 4-14 of this ES.

Stone required for the construction of the site will be imported from local quarries. Whilst importing stone for construction increases the volume of traffic for a short period, it prevents long term visual and ecological effects created by excavating borrow pits (small quarries) onsite.

The concrete required for the construction of the site will be imported ready mixed, in part due to the relatively small scale nature of the wind farm development. A concrete batching plant on site would introduce additional environmental effects in terms of visual effects as well as increasing risks to the hydrology and ecology of the area. A batching plant would also require the use of further hard-standing areas for storage of materials which may be extensive. The benefits in avoiding these effects were deemed to outweigh the additional traffic generated by importing the concrete ready mixed.

2.4.3 *Micro-siting*

In addition to the above, the continual refinement of the scheme will extend into the construction phase. Therefore it is established practice to seek agreement for the micro-siting of the turbines and other wind farm infrastructure within 50m of the approved centre point.

The eventual turbine positions would remain within the planning application boundary and would avoid blades over sailing it.

2.5 WIND TURBINES AND ASSOCIATED INFRASTRUCTURE

2.5.1 *Wind Turbines*

The scheme would consist of 5 three-bladed horizontal-axis machines with a hub height of up to 56m and a rotor diameter of up to 56m; the maximum height to blade tip would be no more than 84m. Figure 2.2 illustrates a typical turbine of these dimensions. The blades would be manufactured from fibre-reinforced epoxy and the tower from steel. The nacelle houses the gearbox and generator. Subject to agreement with BMBC the finish and colour of the turbines is likely to be semi-matt and pale grey.

The turbine would be of a variable speed type, so that the turbine rotor speed would vary according to the energy available in the wind. A typical turbine of this type would have a rotational speed of approximately 7.7 to 25.6 revolutions per minute generating power from all wind speeds between 3m/s and approximately 25m/s (9-56mph or force 3 to 9 (gale) on the Beaufort Scale). The turbines are computer controlled to ensure that the turbine faces directly into the wind and all times, ensuring optimum efficiency. Table 2.2 below shows the proposed turbine specifications.

Table 2.2 Proposed Turbine Specifications

Number of turbines	5
Anticipated turbine rated capacity (MW)	1
Site rated capacity(MW)	5
Number of blades	3
Tower style	Tapered Cylindrical
Maximum hub height (m)	56
Maximum blade diameter (m)	56
Maximum height to blade tip (m)	84
Revolutions per minute	7.7-25.6

The final selection of the turbine will be based on an assessment of the most suitable turbine available at the time of procurement and will be subject to competitive tendering.

2.5.2 Wind Turbine Foundations

The form of the wind turbine foundations would depend on

- Site geology
- Turbine location
- Turbine manufacturer and type
- Turbine manufacturer's foundation stiffness criteria

Based on the candidate turbine (WinWinD WWD-1) and preliminary site survey work, the anticipated geology of sandstone and shale on site suggests that gravity turbine foundations would be achievable. These would take the form of reinforced concrete foundations approximately 15m x 15m square and 2.5m deep, with a central plinth into which the turbine is anchored. Each foundation would contain approximately 225m³ of reinforced concrete. The foundation detail is shown on Figure 2.3

Trial pits have been carried out at each of the proposed turbine locations to ascertain whether the geology will bear the foundations as proposed. The trial pits indicate that the turbines are likely to be viable in the current positions, subject to detailed Site Investigation which would be carried out prior to construction, to determine whether micro-siting was required.

2.5.3 Turbine Erection Area

Each turbine requires an area of hard-standing to be built adjacent to the turbine foundation. This provides a stable base on which to lay down the turbine components ready for assembly and erection and to site the two cranes necessary to lift the three tower section, nacelle and rotor into place.

The turbine erection area would be left in place following construction in order to allow for use of similar plant should major components need replacing during the course of the wind farm's operational life. The hard-standing would be covered over with topsoil and allowed to naturally re-vegetate. The total area of hard-standing at each turbine location, including the turbine foundation and the turbine erection area would be approximately 968m² (22m X 44m). A typical turbine erection area is illustrated in Figure 2.4.

2.5.4 Control Building and Grid Connection

All wind farms need to be connected into the electricity grid though such connections are subject to a separate consenting process to wind farm developments. Each of the turbines would be connected to the control building which would be connected to the local electricity distribution system.

The control building, located approximately at NGR (420590, 405105), would comprise single storey building with a pitched roof which would house switchgear and metering, and protection and control equipment. It would also house a toilet facility for visiting maintenance staff. Rainwater would be collected via a gutter and inlet pipe to fill a header tank, the waste would be taken to a closed system and pumped out at regular intervals.

The control building would be finished in materials in-keeping with the local vernacular. Figure 2.5 provides an illustration of the control building.

Detailed electrical design will be undertaken to confirm the technical specification of the control building and associated switchgear, and indeed the ultimate connection point to the electricity distribution network.

2.6 ACCESS TRACKS AND TURNING AREAS

The main site access would be taken from Whitley Road as shown in 2.6. The access would be secured by a gate as shown on Figure 2.7. Access tracks would be constructed typically as shown in Figures 2.8a and 2.8b to access individual turbine locations. An estimated 1.7km of site access tracks would be required for the wind farm.

The tracks would have a nominal width of 5m and may have temporary passing places as required in order to facilitate traffic movement. At bends the track would be widened as appropriate depending on bend radius. Bends would be kept free from obstruction to allow a swept area for traversing by long loads.

Access tracks will comprise a geotextile base with crushed stone on top, to a depth appropriate for the ground conditions. A running surface of higher quality finer graded stone will be applied. It is anticipated that tracks will have a minimum thickness of 450mm.

A turning area will be located at each turbine to allow the safe movement of vehicles in forward gear across the site. The turning areas will be constructed in the same way as tracks to an estimated depth of 600mm.

Access tracks will be reduced in width following construction by laying topsoil on the shoulders of the tracks. The operational width of the tracks will be approximately 3m which is adequate for ongoing maintenance.

Turning areas will also be covered with topsoil and allowed to regenerate naturally. In both cases, a geotextile separator would be used between the surface of the stone and the topsoil to minimise cross contamination between soil fines and stone which could weaken the strength of the compacted stone.

2.6.1 Track Layout Design

Various constraints have influenced the site track layout design some of which are generic and some of which are site specific.

- track length is kept to a minimum
- gradients are to be kept to less than 10 degrees where possible to accommodate the requirements of delivery vehicles and to allow construction plant to move safely around the site
- track layout is designed to reflect contours, to avoid cross slopes and deep cut and fill sections into existing terrain
- tracks are routed to avoid potentially valuable environmental features

The final track design resulted from the optimisation of these constraints.

2.6.2 Earthworks & Track Alignment

Localised differences between required construction levels for tracks and the like and existing ground levels will dictate that some earthworks are required in the site.

At each turbine location the turbine erection hard standing would be constructed to cross falls not exceeding 1:100. Limitations placed on the relative heights of road, hard standing and foundation dictate that a wider area around the foundation and hard standing must be relatively level. On a sloping site such as this, some earthworks will therefore be required. The orientation of the hard standing, roads and foundation will be adjusted where possible parallel to the contours, to minimise the need for significant earthworks.

At turbine 1 the obvious approach route for the track is perpendicular to the field boundaries heading approximately northeast. This would be almost directly down the slope and as the erection and turning areas have to be almost flat (typically no more than 1% gradient) would result in extensive cut and fill. In order to avoid this the alignment is almost parallel to the contours for the main hard standing access, with a long radius bend approaching from the southeast – northwest axis of the track to turbine 3. This solution offers a compromise between extensive earthworks and sympathetic layout and land take. At the turning head beyond the turbine, some additional fill will be required beneath the track to make up levels where the existing ground slopes away. Similarly some cut is required on the other leg of the turning area.

In areas such as turbines 2, 3 and 5 earthworks will be minimal, with slight cut and fill on the up-hill and down-hill sites of the turbine erection area and the track which is adjoined. At turning heads adjacent to turbines 3 and 5, some additional fill will be required beneath the track to make up levels where the existing ground slopes away.

At turbine 4 earthworks will be required due to the steeper cross slope. There will be cut and fill to the up-hill and down-hill sides of the turbine erection area and the track which is adjoined. This cut into and fill out of the slope will most likely be into the shale which might be locally unstable in such situations. Stability assessment and calculations for construction loadings may be required and some mitigation may be necessary, for example replacement with crushed rock fill or netting.

It is anticipated that materials for use in cut and fill operations will be balanced on site. No additional material is expected to be imported or exported from site, as a result of these operations.

2.6.3 Drainage System

The purposes of the drainage system along roads and hard standings will be three fold

- convey existing field drainage / ditches under or around the new roads / features
- convey water course (and large ditches) under the road
- convey surface water across the road where ground slopes are significant or where ponding may otherwise occur as a result of road construction

Adjacent to cross slope roads a ditch will be placed on the up-slope side to intercept surface run-off. This will be conveyed under the road at regular intervals and disbursed back in into the ground by surface soakaways which will dissipate the flows back into the ground surface and vegetation.

Cross pipes would be laid as required in areas where the position of the site track could lead to ponding on one side. It is currently anticipated that crosspipes will be laid in the vicinity of the site entrance which is currently a marshy area of ground.

The advice of the site ecologist would be sought to ensure that the location and outfall of cross pipes and soakaways minimise vegetation damage or change.

The anticipated track layout will accommodate existing service by avoiding or bridging them where appropriate, and avoids water crossings.

Further details of measures which would be taken to manage run-off and avoid erosion are provided in Chapter 7 Hydrology and Hydrogeology.

2.6.4 Stone and Concrete Requirements and Sourcing

It is estimated that approximately 24,000 tonnes of stone would be required during the construction of the access track, turbine base and other infrastructure. Stone would be sourced from local quarries. These quarries would be selected prior to construction following a competitive tendering process. Importing stone for construction, while increasing traffic for a short period, would prevent the additional visual and potentially polluting effects of digging borrow pits on site, and would provide some benefits to the local community in terms of indirect economic benefits to the quarries selected.

An estimated 1300m³ of concrete is required for construction of the turbine foundations and control building. A concrete batching plant on site would introduce additional environmental effects in terms of visual effects and risks to hydrology and ecology. The batching plant would also require the use of further hard standing areas for storage of materials which may be extensive. Given these potentially harmful effects and relatively low volumes of concrete required, a batching plant has not been included in the project design. Concrete will be imported ready mixed for use on site.

2.6.5 Cabling

Underground cabling would link the turbines to each other and to the on-site control building. Detailed construction and trenching specifications would depend on ground conditions encountered. Typically cables would be laid in a trench approximately 1100mm deep and 610mm wide. To minimise ground disturbance cables would be along the side of the access tracks where practicable. Figure 2.9 shows a typical cable trench.

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

2.6.6 Meteorological Mast

One permanent meteorological mast will be erected at NGR 420571, 405048 to aid performance monitoring of the wind turbines and to collect and store meteorological data. The mast would be of lattice design and would have a maximum height of 56m. Figure 2.10 shows a typical meteorological mast.

2.6.7 Site Accommodation and Temporary Works

A temporary construction compound with approximate area of approximately 0.4ha would be located at NGR 420326, 404757 to provide space for

- temporary portable buildings (e.g. Portakabin) needed for site offices and welfare facilities for contractors
- septic tank and soakaway
- containers used for tool and equipment storage
- parking for up to 20 vehicles
- storage of components and materials

The site compound design is shown in Figure 2.11. The location has been selected to minimise environmental impacts, particularly areas of ecological, archaeological and hydrological interest, and on visibility grounds. It will also facilitate the contractor's on-site safety and security procedures.

The compound will be constructed using a geogrid base, or similar, in order to facilitate removal and reinstatement following the wind farm becoming operational. The compound would be designed so that any contaminated run-off would be directed to a central point and disposed of at an appropriate waste management facility. All portable buildings, machinery and equipment will be removed and the area fully restored in accordance with an approved method statement.

Other temporary fenced areas may be established for storage on the turbine crane pads as appropriate for security in remote parts of the site. These would not require any additional hard-standing areas.

Water for all construction activities would be supplied by a water bowser. Temporary effluent disposal facilities would be provided by 'portaloo' type facilities and emptied as required. There are no mains sewers or water pipes in the vicinity of the site.

2.7 WIND FARM CONSTRUCTION

It is estimated that construction would take approximately 10 months, subject to the final details of the scheme, weather and ground conditions, with a following month for testing and commissioning. The construction process would comprise the following principal activities

- site survey and preparation
- construction of access tracks and passing places
- remedial works to lengths of the public highway to facilitate turbine delivery
- construction of the contractors compound including temporary site office facilities
- construction of the crane pads
- construction of the turbine foundations
- construction of the site control building
- excavation of the cable trenches and cable laying
- delivery and erection of wind turbines and permanent meteorological mast
- testing and commissioning of the wind farm
- site restoration

Most of these operations would be carried out concurrently, although predominantly in the order identified, in order to minimise the overall length of the construction programme. In addition, development would be phased such that the civil engineering works would be continuing in some parts of the site whilst wind turbines are being erected elsewhere. Site restoration would be programmed and carried out to allow restoration of disturbed areas as early as possible and in a progressive manner.

Table 2.3 shows an indicative schedule of construction activities. Should the project be granted consent, a more detailed programme of works would be produced jointly with the appointed construction contractors and would be agreed with the local authority and any other relevant bodies prior to commencement to ensure full compliance with planning conditions.

Prior to the main construction works commencing on-site, enabling works would be required. These would be phased into the pre-construction period, and include

- off-site access consultation with regulatory authorities
- detailed site investigation works

Table 2.3 Indicative Construction Programme

Construction Activity	Months									
	1	2	3	4	5	6	7	8	9	10
Site Compound Set Up	■									
Site Tracks	■	■								
Erect Temporary Met Mast		■								
Turbine Crane Hard Standings			■	■						
Turbine Foundations			■	■	■	■				
Erect Control Building					■	■				
Erect Permanent Met Mast							■			
Install Site Cabling					■	■				
Install Switchgear/ Metering							■			
Install Transformers						■	■	■		
Turbine Erection						■				
Connection Commissioning								■		
Turbine and SCADA Commissioning									■	
Performance Testing										■
Site Reinstatement								■	■	■

In order to ensure that all the mitigation measures outlined in this ES are implemented, contractors would be provided with relevant documents pertaining to for example, pollution prevention measures, noise control measures and traffic management.

The contractor would maintain a clean and tidy site and manage the site area in accordance with best practice.

2.7.1 Waste management

As far as reasonably practicable, excavated stone or soil will be reused on-site, primarily for restoration of disturbed ground.

Topsoil would be removed from the surface of proposed construction locations around the site and stored. It would then be used as necessary for land reinstatement following construction. Any excess would be used by the landowner elsewhere or removed to a licensed waste disposal site. Other materials removed from site would also be disposed of in the same manner in accordance with duty of care procedures.

2.7.2 Site specific safety and emergency procedures

This would be initially addressed as part of the pre-tender process. Under the Construction (Design and Management) Regulations 1994 the selected construction contractor is required to prepare a Construction Phase Health and Safety Plan.

An Operation and Maintenance Manual for the design life of the wind farm would also be prepared by the contractor which would cover all operational and decommissioning safety related procedures.

2.8 OPERATION

Wind farm operation would be overseen by suitably qualified local contractors who would visit the site regularly to carry out maintenance. The following turbine maintenance would be carried out along with any other maintenance required by the manufacturer's specifications

- initial service
- routine maintenance and servicing

- gearbox oil changes
- blade inspections

Routine servicing would take place twice per year with a main service at twelve monthly intervals and a minor service at six months. Servicing would include the performance of tasks such as maintaining bolts to the required, adjustment of blades, inspection of blade tip brakes and inspection of welds in the tower. In addition oil sampling and testing from the main gearbox would be required and oil and components replaced at regular intervals. Other visits to the site would take place approximately once per month to ensure that the turbines are operating at their maximum efficiency. In the event of any unexpected events on site, such as the failure of a generator or gearbox, appropriate maintenance works would be carried out.

Ongoing track maintenance would generally be undertaken in the summer months when tracks are dry. Safe access would be maintained all year round.

2.8.1 Site Signage

The wind farm would have a series of signs to provide directions and also information on health and safety including a sign at the site entrance showing the Developers' name and the name of the wind farm.

Each of the turbines is likely to have a sign indicating turbine number, potential hazards and an emergency contact telephone number. Signage would be erected at the proposed control building with the operators' name, health and safety information and an emergency telephone number.

The final location and design of the proposed signage would be agreed prior to the wind farm becoming operational.

2.9 DECOMMISSIONING

The wind farm has been designed to have an operational life of 25 years. At the end of this period the wind farm would either be decommissioned, or an application made to extend its operational life.

When dismantling and removing the turbines, the bases would be removed to a depth of approximately 1m below ground level and all the cables cut at the same depth and left in the ground. Typically decommissioning would involve the removal of the upstand plinth and the top surface of the foundation base. The area would then be reinstated with a final layer of topsoil over the foundation.

Demolition of the control building would involve the removal of the equipment followed by the demolition of the building.

Roads would either be left for use by the landowner or covered with topsoil. No stone would be removed from the site. This approach is considered to be less environmentally damaging than seeking to remove all foundations, cables and roads entirely.

It is estimated that decommissioning a wind farm of this size would take approximately 6 -8 months.

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3 ENERGY AND PLANNING POLICY

This chapter sets out the policy framework surrounding the proposed Spicer Hill Wind Farm. The chapter is intended to provide a general overview of the energy and planning policy that will be used by decision makers in determining the planning application.

The chapter does not present an assessment of the acceptability of the proposed wind farm in planning policy terms, in order to preserve the neutrality of this Environmental Statement (ES) however where possible it draws attention to the findings of the various technical assessments contained within the ES, in particular identifying any significant effects predicted on the receptors relevant to each policy issue.

The Chapters sets out the following

- legislative drivers at the national and international level
- development plan policy comprising RSS and UDP
- material policy considerations.

3.1 LEGISLATIVE DRIVERS

3.1.1 *International and European Context*

The Intergovernmental Panel on Climate Change's Fourth Assessment Report 2007 states: *"Warming of the climate system is unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level."*

Under the Kyoto Protocol, participating countries have agreed to limit or reduce their emissions of greenhouse gases and have been assigned targets stipulating the maximum amount that they can emit over year over the period of commitment (2008-2012)¹.

In March 2007 The European Council agreed to a common European strategy for energy security and tackling climate change. This includes a binding target of reducing greenhouse gas emissions by 20% by 2020 and by 30% in the context of international action.

The EU's 2001 Renewables Directive aims to increase the share of electricity produced from renewable energy sources in the EU to 21% by 2010, thus helping the EU reach its target of 12% overall energy consumption supplied by renewables by 2010.

European Union (EU) (2001) Directive 2001/77/EC relates to the promotion of electricity produced from the renewable energy sources. This Directive, issued in September 2001, commits Member States to the setting of national targets from renewable sources in terms of a proportion of total electricity consumption. The UK's target is set at 10% of all electricity produced to be from renewable energy sources by 2010.

3.1.2 *UK Context*

The United Kingdom is committed to reducing greenhouse gas emissions by 12.5% from 1990 levels by 2008-2012 as part of the Framework Convention on Climate Change. However, the UK Government has set a domestic target for reduction of CO₂ emissions beyond the commitment to the European Union. The domestic target aims to reduce CO₂ emissions to 20% below 1990 levels by 2010.

¹ Kyoto Protocol to the United Nations Framework Convention on Climate Change, 1997

In 2003 the Energy White Paper "Our Energy Future- Creating a Low Carbon Economy" was published, in which the Government announced a goal to cut CO₂ emissions by 2050 with 'real progress' by 2020. In "Meeting the Energy Challenge - A White Paper on Energy (May 1997) the UK Government reiterated its commitment to cut the UK's carbon emissions by 60% by 2050 and by 26-32% by 2020 against a 1990 baseline.

In July 2006 the Energy Review was published by the Department of Trade and Industry. Annex D contains a "Renewables Statement of Need". This states:

"New renewable projects may not always appear to convey any particular local benefit, but they provide crucial national benefits. Individual renewable projects are part of a growing proportion of low-carbon generation that provides benefits shared by all communities both through reduced emissions and more diverse supplies of energy, which helps the reliability of our supplies. This factor is a material consideration to which all participants in the planning system should give significant weight when considering renewable proposals. These wider benefits are not always immediately visible to the specific locality in which the project is sited. However, the benefits to society and the wider economy as a whole are significant and this must be reflected in the weight given to these considerations by decision makers in reaching their decisions."

The Renewables Statement of Need, preceded the draft Climate Change Bill which was published in March 2007. It would create a new legal framework for the UK to achieve mandatory emissions reductions and if approved, the UK is likely to become the first country in the world to establish this type of legislative framework for such a long-term and significant carbon reduction.

The Government has a target of 10% of the UK's electricity supply to come from renewable sources by 2010, with an aspiration for 20% renewable generation by 2020. In 2006 electricity generated from renewable sources stood at only around 4.6% of the UK's total². The UK Government now plans to review its renewable energy strategy in order to meet the UK share of the EU renewables target³.

This target has been quantified at the regional level through the inclusion of targets in the RSS discussed below.

3.2 PLANNING POLICY FRAMEWORK

National planning policy in England is set out in a series of Planning Policy Statements (PPSs). These statements set out the Government's objectives in respect of planning for a wide range of issues and are used by Planning Authorities in formulating development plans and determining planning applications.

There is a legislative requirement for development to be in accordance with the development plan unless material considerations indicate otherwise. Material considerations include a wide range of factors such as public opinion and emerging planning policy. PPSs are material considerations and as such, the key documents are highlighted alongside other considerations at section 3.3.

The Development Plan for the proposed Spicer Hill Wind Farm comprises the following:

- Regional Spatial Strategy 12 for Yorkshire and the Humber to 2016, Based on Selective Review of RPG 12 (December 2004) (RSS 12)
- Barnsley Unitary Development Plan (BUDP) Adopted 2000

² BERR UK Energy in Brief, July 2007- www.berr.gov.uk/energy/statistics/publications/dukes/page39771.html

³ UK welcomes EU climate change proposals www.defra.gov.uk/news/2008/080123a.htm

Development planning in England is currently undergoing reform. The current system of Development Plans is being replaced by Local Development Frameworks (LDFs) which will comprise a number of documents setting out the overall development strategy for the Council. The LDF will comprise a range of Development Plan Documents, such as the Core Strategy, alongside other documents which are not Development Plan Documents.

Barnsley Metropolitan Borough Council (BMBC) is producing a Local Development Framework to replace the BUDP and has recently adopted the Statement of Community Involvement (SCI) which will form part of the LDF. The SCI is not a Development Plan Document. The SCI sets out how and when members of the public can become involved in the planning decisions and applications and provides information about the LDF.

A replacement Regional Spatial Strategy is also in production and is anticipated this year. A summary of the key relevant issues is provided at section 3.3.2.1 but are not expanded upon due to the draft status of the document and likelihood of change.

The key Development Plan policies pertaining to the proposed Spicer Hill Wind Farm are set out below.

3.2.1 Climate Change and Renewable Energy

Document	Relevant Policies
RSS 12	S5 Climate Change S6 Sustainable Use of Physical Resources R12 Energy Generation, Transmission and Supply
BUDP	ES12 Wind Energy Generation ES12 A Turbine colouring ES12 B Decommissioning ES12 C Safeguarding of existing wind farms

RSS Policy S5 requires plans and strategies to include policies and proposals that will help reduce the Region's greenhouse gas emissions by at least 20% below 1990 levels by 2010 and by at least 25% below 1990 levels by 2015, as required by the Regional Economic Strategy⁴. In conjunction with this, the RSS sets the objective of increasing electricity consumption from renewable sources in Yorkshire and the Humber to 9.4% by 2010 and 22.5% by 2020.

In order to achieve the greenhouse gas reduction and increased renewable energy consumption targets Policy R12 quantifies the targets for installed renewable energy generation across the Region.

By 2010, Yorkshire and the Humber should have an installed renewable energy generation capacity of 674MW. Within South Yorkshire, the target is 100MW⁵.

The existing Royd Moor Wind Farm has an installed generation capacity of 5.85MW, and has been in operation since 1993. Consent has recently been given for a three turbine scheme at Hazelhead, with a maximum output of 7.5MW.

UDP Policy ES12 sets out the Council's approach to determining renewable energy applications and is supplemented by policies ES12A, ES12B and ES12C which are specific to wind energy developments. Policy ES12 comprises criteria that will be considered when determining a renewable energy application. In summary, these are

- visual amenity

⁴Yorkshire Forward (2006) Regional Economic Strategy for Yorkshire and the Humber 2006-2015

⁵ It should be noted that these targets are most likely to be revised upwards when the Draft RSS is approved later this year (See section 3.3.2.1)

- noise
- access and road safety
- ecology
- archaeology
- impact on agricultural land uses
- shadow flicker

This Environmental Statement contains assessments of the likely significant effects resulting from the wind farm on each of the above criteria alongside a range of other considerations.

Policies ES12 A and B require turbine colouring and decommissioning to be agreed. Policy ES12 C relates to the safeguarding of wind flow at existing wind farm sites.

In addition to these policies the Barnsley UDP indicates that within BMBC *"the most significant source of renewable energy is from wind because the more elevated areas, especially in the western half of the Borough on the fringe of the Peak District National Park, have sufficiently high annual mean wind speeds to make the establishment of wind turbines viable"*.

The proposed Spicer Hill Wind Farm lies within this area adjacent to the existing Royd Moor Wind Farm.

3.2.2 On Site Policy Allocations

Document	Relevant Policies
BUDP	WR10 Greenbelt GS9 Greenbelt GS7 Greenbelt WR12 Area of Borough Landscape Value GS13 Area of Borough Landscape Value M14 Protection of Mineral Reserves WR25 Minerals Consultation

The above policy allocations apply to the proposed wind farm site. Policies relating to greenbelt and the area of borough landscape value are considered further in section 3.2.3, Landscape and Visual Amenity.

Policy M14 seeks to avoid the sterilisation of mineral reserves. This is supported by policy WR25 which identified the proposed Spicer Hill Wind Farm site as a Minerals Consultation Area. This chapter does not consider the acceptability of the proposed wind farm in policy terms however it should be noted that less than 7% of the planning application site would be impacted by development. The wind farm would be operational for a period of only 25 years and would not prevent the extraction of minerals at a later date.

3.2.3 Landscape and Visual Amenity

Document	Relevant Policies
RSS 12	N3 Landscape Character
BUDP	ES12 Wind Energy Generation WR10 Greenbelt GS9 Greenbelt GS7 Greenbelt WR12 Area of Borough Landscape Value GS13 Area of Borough Landscape Value BE6 Design Standards

RSS Policy N3 requires the quality, diversity and local distinctiveness of landscape character of the region to be protected and enhanced.

The proposed wind farm lies within an area that is covered by policy allocations WR10 and WR12. These policy allocations are specific to parts of the western rural area of the Council including the application site and refer to general policies GS9 and GS13 respectively for further guidance.

Policy G7 asserts a presumption against development in the greenbelt that will conflict with the purpose of including the land in the greenbelt and refers to policies G8 -G8E and G9 as those most relevant to determining such applications. Policies G8-G8E refer specifically to buildings in the greenbelt and are not relevant to the proposal. Policy G9 however refers to visual amenity stating the development in the greenbelt must not have a significant impact on the visual amenity of the greenbelt. In the area of the proposed Spicer Hill Wind Farm coincides with the Area of Borough Landscape Value which is protected by policies WR12 and GS13 which state that within this area conservation and enhancement of the landscape will be an important consideration. Development will be permitted only where there is no loss of valuable landscape features and where overall landscape character is conserved where possible.

Landscape and visual effects of the wind farm are presented in Chapter 4. The assessment concludes that parts of the Area of Borough Landscape Value may be significantly affected by the proposed wind farm due to the fact that it includes the development. The designation covers an extensive area of the western rural are of BMBC however significant effect relating to this designation will extend no more than 3km from the site as the magnitude of change beyond this is such that there will be no material effect on landscape character.

Policy BE6 seeks to achieve good standard of design in all forms of development. The iterative design process adopted in respect of the Spicer Hill Wind Farm proposal is discussed in Chapter 2 of this ES. The Design and Access Statement provides further information on this.

3.2.4 Ecology

Document	Relevant Policies
RSS 12	N1
BUDP	ES12 Wind Energy Generation GS15 Habitats GS16 Nationally Designated Sites GS17 Internationally Designated Sites GS18 Locally Designated Sites WR13 Safeguarding sites of local nature conservation interest

The ecological effects of the wind farm are identified and assessed in chapters 5 and 6, Ecology and Ornithology respectively.

Policy N1 requires local planning authorities to identify and develop policies for areas important to conservation of biodiversity. The provisions of policy ES12 are outlined above.

BUDP policies GS15, GS16, GS17 and GS18 all afford different levels of protection to ecologically designated sites ranging from sites of local importance, such as a Local Nature Reserve, to internationally designated site such as Special Protection Areas (SPAs).

There are no designations within or immediately adjacent to the proposed wind farm. The closest SSSI, SAC and SPA are all approximately 4km from the site.

Policy WR13 identifies a number of small sites within the area surrounding the proposed wind farm site that will be safeguarded from development which would cause disturbance, pollution and other damage. No significant effects are predicted on any of these sites as a result of the wind farm development.

The Ingbirchworth Nature Reserve, is the closest of these areas to the site lying to the north of Spicer House Lane, north of the site. This site is considered a valued ecological receptor by the assessment however due to its limited size and poor connectivity to other areas it is regarded as having local importance. No significant effects are predicted on this designation.

Chapter 6 identifies no significant effects on ornithology as a result of the proposed wind farm.

3.2.5 Hydrology and Hydrogeology

There are no specific policies relating to the hydrological environment. Although it make no specific provision for the hydrological environment, BUDP Policy ES12 detailed above is the most relevant policy to highlight in considering these effects.

There are no significant hydrological effects predicted as a result of the Spicer Hill Wind Farm.

3.2.6 Cultural Heritage

Document	Relevant Policies
RSS 12	N2 Historic and Cultural Resources
BUDP	ES12 Wind Energy Generation BE1A Development affecting conservation areas BE2 Development affecting the special character of listed buildings BE3 Archaeological Sites BE4 Preservation of archaeological sites through recording

RSS Policy N2 encourages the preservation and enhancement of the historic environment. BUDP policies BE1A, BE2, BE3 and BE4 seek to achieve this objective through detailed policies regarding specific elements of the historic environment.

Policy BE1A sets out a list of criteria for determining development affecting conservation areas. The Cultural Heritage assessment (Chapter 8) confirms that there are no effects resulting from the wind farm that will impact upon the historical integrity of any conservations areas within the study area. As a landscape feature however the Landscape and Visual assessment considers that parts of the designation may receive views of the wind farm which could result in a significant effect in those areas of the designation. However, Chapter 4 also states that, in overall terms the landscape and visual effects of the development are considered to be acceptable.

Policy BE2 states that planning permission will not be granted for development which would adversely affect the special architectural or historic interest character of listed buildings.

Policies BE3 and BE4 seek to preserve nationally important archaeological remains in situ, stating that where development affects remains of lesser importance a preservation through recording may be appropriate when considered against other factors, including the need for the development.

Chapter 8 assesses the effect of the proposed wind farm on cultural heritage resources in and around the site. No effects on setting are predicted and the development will not directly impact upon any known archaeological sites. A programme of preservation through recording is recommended should features of archaeological interest be discovered during construction.

3.2.7 Noise

Document	Relevant Policies
BUDP	ES1 Polluting Development ES12 Wind Energy Generation ES13 Enforcement of Planning Control

The RSS contains no particularly relevant policies regarding the issue of wind farm noise.

BUDP Policy ES12 states that the effect of the wind farm on residential amenity as a result of noise will be considered as part of the determination process.

Policies ES1 and ES13 relate to all forms of development, rather than wind farm development alone, however they remain relevant as they state a presumption against development that would result in noise pollution and outlines the enforcement action that will be taken if permitted uses breach acceptable limits.

Chapter 9 quantifies the noise that would be generated from the proposed wind farm, both on its own and in combination with other existing and proposed wind farms. All predicted limits are within the relevant guidelines and it is anticipated that planning conditions will be applied to ensure that the limits are as predicted.

Furthermore, BMBC has received only two noise complaints in respect of the existing wind farm at Royd Moor, over its 15 year operational life. Both of these complaints were investigated by Regulatory Services and no further action was taken.

3.2.8 Miscellaneous Issues

Document	Relevant Policies
RSS	N5 Agriculture and environmental support measures for sustainable land management

Policy N5 seeks to ensure that where development of agricultural land is necessary, areas of poorer quality agricultural land is used and to promote sustainable management which includes integration of, amongst other things, biodiversity, renewable energy and recreational and access objectives.

The land at Spicer Hill is Grade 3 pasture land and is considered to be largely unsuitable for arable farming. Grazing will continue on the land during the operational phase of the wind farm as the development footprint accommodates less than 7% of the planning application boundary and less of the total landholding.

3.3 OTHER MATERIAL POLICY CONSIDERATIONS

3.3.1 Planning Policy Statements

The purpose of Planning Policy Statements and their predecessors Planning Policy Guidance (PPG) is outlined above. The following documents are relevant to the proposed development

- PPS1 Delivering Sustainable Development (2005)
- PPS Planning and Climate Change: A Supplement to PPS 1 (2007)
- PPS7 Sustainable Development in Rural Areas (2004)
- PPS9 Biodiversity & Geological Conservation (2005)
- PPG15 Planning and the Historic Environment (1994)
- PPG16 Archaeology and Planning (1990)
- PPS22 Renewable Energy (2004)
- PPS23 Planning and Pollution Control (2004)

- PPG24 Planning and Noise (1994)
- PPS25 Development and Flood Risk (2006)

Of the above PPG15, PPG16 and PPG24 predate PPS22. PPS1 is of relevance to all development proposals. PPS7 sets out the Government's objectives for rural areas which include

- raising the quality of life and the environment in rural areas
- promote more sustainable patterns of development
- promote the development of the English regions by improving their economic performance so that all are able to reach their full potential and
- to promote sustainable, diverse and adaptable agricultural sectors

PPS7 also specifies that when preparing development plans and in determining planning applications for development in the countryside, local planning authorities should provide for renewable energy in these areas in accordance with PPS22.

PPS9 provides protection of biodiversity and geological conservation through the planning system. These policies complement, but do not override, other national planning policies and should be read in conjunction with other relevant statements of national planning policy.

PPG15 provides a full statement of Government Proposals for the identification and protection of historic buildings, conservation areas and other elements of the historic environment. It is designed to complement the guidance within PPG16.

PPG16 sets out the Government's policy on archaeological remains on land and how they should be preserved or recorded both in an urban setting and in the countryside. It also gives advice on the handling of archaeological remains and discoveries through the development plan and development control systems, including the weight to be given to them in planning decisions and planning conditions.

The key guidance for the proposed development is contained within PPS22 which advises on Renewable Energy. The following extracts set out advice which appears to be of particular relevance to the proposed development:

Paragraph	Extract
Paragraph 1 (i) "	Renewable energy developments should be capable of being accommodated throughout England in locations where the technology is viable and the environmental, economic, and social effects can be addressed satisfactorily.
Paragraph 1(ii)	Regional Spatial Strategies and local development documents should contain policies designed to promote and encourage rather than restrict the development of renewable energy resources.
Paragraph 1 (iv)	The wider environmental and economic benefits of all proposals for renewable energy projects, whatever their scale, are material considerations that should be given significant weight in determining whether proposals should be granted planning permission.
Paragraph 1 (v)	<i>Regional planning bodies and local planning bodies should not make assumptions about the technical and commercial viability of renewable energy projects.</i>
Paragraph 1 (viii)	Development proposals should demonstrate any environmental, economic and social benefits as well as how any environmental and social impacts have been minimised through careful consideration of location, scale, design and other measures.

Paragraph	Extract
Paragraph 2 – 3	The Regional Spatial Strategy should include the target for renewable energy capacity in the region... Targets should be expressed as the minimum of installed capacity in the region, expressed in megawatts... Targets should be reviewed on a regular basis and revised upwards (if they are met) subject to the region's renewable energy resource potential... The fact that a target has been reached should not be used in itself as a reason for refusing planning permission for further renewable energy projects.
Paragraph 14	Regional planning bodies and local planning authorities should not create "buffer zones" around international or nationally designated areas and apply policies to these zones that prevent the development of renewable energy projects.
Paragraph 15	Local landscape and local nature conservation designations should not be used in themselves to refuse planning permission for renewable energy developments. Planning applications for renewable energy developments in such areas should be assessed in criteria based policies set out in local development documents, including any criteria that are specific to the type of area concerned.

PPS23 advises that any consideration of the quality of land, air or water and potential effects arising from development, is capable of being a material planning consideration, in so far as it may arise from or may affect any land use.

PPG24 guides local authorities in England on the use of their planning powers to minimise the adverse effects of noise. It outlines the considerations to be taken into account in determining planning applications both for noise-sensitive developments and for those activities which generate noise.

PPS25 sets out Government policy on development and flood risk. Its aims are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas of highest risk. Where new development is, exceptionally, deemed necessary in such areas, policy aims to make it safe, without increasing flood risk elsewhere, and, where possible, reducing flood risk overall.

3.3.2 Emerging Planning Policy

3.3.2.1 Draft RSS 12

The Draft RSS, The Yorkshire and Humber Plan, was the subject of an Examination in Public in May 2007. It was subsequently issued for consultation with the Secretary of State's changes in late 2007. The final RSS is expected to be approved later this year.

The Yorkshire and Humber Plan, Draft Revised Regional Spatial Strategy Incorporating The Secretary Of State's Proposed Changes for Public Consultation 2007 contains a number of potentially relevant policies however the key policy, is that which sets out the Region's approach to renewable energy development. It states that the Region will maximise renewable energy capacity by delivering a Regional grid connected installed capacity of 708MW by 2010 and 1862MW by 2021. This is divided in to Sub-Regional targets and in the case of South Yorkshire a target of 47MW by 2010 and 160MW by 2021 have been set.

The Region set out a commitment to annually monitor planning permissions and development *"taking action accordingly in order to ensure the regional and sub-regional targets are exceeded"* thus clearly establishing that these targets are minimum rather than maximum requirements.

Other Draft RSS policies that may be relevant to the proposed Spicer Hill Wind farm are summarised below:

No	Title	Summary
YH1	Overall Approach and Key Spatial Priorities	Sets out the Region's primary aims with respect to economy, community and environmental resources.
YH2	Climate Change and Resource Use	Sets out ways in which greenhouse gas emissions will be reduced, including through the increase of renewable energy capacity in the Region.
YH9	Green Belts	Permits local planning authorities to review their greenbelt boundaries in order to deliver the Core Approach set out in Policy YH1.
LCR1	Leeds City and Sub Region Policy	Sets out key issues for the Leeds City Region which includes Barnsley. It includes the objectives of protecting various aspects of the natural environment and maximising renewable energy generation.
E7	Rural Economy	Aims to facilitate the rural economy through a range of measures including rural diversification that being social, economic or environmental benefit.
ENV2	Water Resources	Aims to safeguard water resources and encourage efficiency.
ENV3	Water Quality	Aims to maintain high standards of water quality through a range of measures including not permitting development likely to have an adverse effect on surface or ground water.
ENV15	Green Infrastructure	Aims to identify protect and enhance areas and networks of green infrastructure across the Region.
ENV7	Agricultural Land	Seeks to guide development on agricultural land, where necessary, to the poorest quality land.
ENV8	Biodiversity	Aims to safeguard and enhance biodiversity and geological heritage.
ENV9	Historic Environment	Aims to safeguard and enhance the historic environment
ENV10	Landscape	Aims to safeguard and enhance identified landscapes and related assets of regional, sub-regional and local importance.

3.4 SUMMARY

This Chapter has set out relevant development plan policies and other energy and planning policy considerations relative to the planning application for Spicer Hill Wind Farm drawing attention to the findings of the technical assessment contained within this Environmental Statement.

4 LANDSCAPE AND VISUAL EFFECTS

4.1 INTRODUCTION

This chapter provides an assessment of the potential effects on the existing landscape and visual amenity arising from the proposed Spicer Hill Wind Farm (hereafter referred to as the wind farm site).

In assessing the landscape and visual effects of the wind farm site, the study seeks to establish

- the existing landscape features, or components, of the wind farm site and its surroundings, the role of the site in the wider landscape setting and in particular its visual role
- the potential impacts on those landscape components and on the wider visual role arising from the wind farm development, whether direct or indirect, beneficial or adverse, temporary or permanent
- those mitigation measures that could be incorporated into the wind farm proposals to avoid or reduce any undesirable impacts
- the significance of any residual impacts remaining
- the overall acceptability of the wind farm site in landscape and visual terms

The assessment is based on the wind farm layout illustrated on Figure 1.2.

4.1.1 Chapter Structure

The chapter is arranged into seven sections

- section 4.2 (Information Sources and Methodology Overview) sets out the broad approach to the assessment and identifies existing studies and other information relevant to the study area
- section 4.3 (Baseline Conditions) sets out the existing situation with regard to the landscape character and quality of the wind farm site and surrounding landscape, its visibility and those landscape/visual receptors likely to be sensitive to the proposed development
- section 4.4 (Description of the Proposed Development) describes the key features of the wind farm site and identifies elements that could cause potential impacts on landscape character and visual amenity. Measures included in the final proposals to mitigate adverse impacts are also described
- section 4.5 (Prediction and Evaluation of Effects) assesses the potential impact of the wind farm site on the character and quality of the landscape and on views, viewers and visual amenity during the construction, operational and decommissioning stages as appropriate, this section also considers whether the impacts identified are significant or not, as required under the Environmental Impact Regulations
- section 4.6 (Cumulative Effects) considers the potential effects of the wind farm site in combination with other operational, consented and submitted wind farm sites, upon the character and quality of the landscape and on views, viewers and visual amenity
- section 4.7 (Summary of Effects) summarises the key findings of the assessment
- section 4.8 (Statement of Significance) considers the overall acceptability of the wind farm site in landscape and visual terms

A series of Figures have been prepared in support of the assessment and are included at the end of this chapter. These illustrate: Site Location and Landscape Study Area (Figure 4.1); Regional Landscape Character (Figure 4.2); Landscape Character Types (Figure 4.3); Landscape Planning Designations (Figure 4.4); Zones of Theoretical Visibility (Figures 4.5-4.6); Cumulative Zones of Theoretical Visibility (Figures 4.32-4.36); Photographic, Wireline

and Photomontage Viewpoints (Figures 4.7a-4.4.31). Figures 4.37a-4.45b have been prepared to illustrate potential cumulative effects through cumulative wirelines.

4.1.2 Consultation

Consultation has formed an important part of the assessment process. A Scoping exercise was undertaken as described in Chapter 1. Responses relevant to landscape and visual assessment were received from English Heritage, Garden History Society, Natural England, National Trust, Peak District National Park Authority and BMBC. A public exhibition was also held in March 2008 at which additional comments were received.

Initial concerns raised by BMBC related to the type, height and configuration of turbines in relation to the adjoining operational wind farm at Royd Moor, and the potential effects this would have on

- the landscape character of the surrounding area
- the Peak District National Park and Area of Borough Landscape Value
- views from properties in the vicinity of the wind farm site
- cumulative views, particularly in relation to the Royd Moor Wind Farm and nearby scoping site at Blackstone Edge

These have been addressed through the subsequent assessment process and in the evolution of the turbine layout. During this process further consultation has been held with BMBC in respect of viewpoint selection and turbine layout. Key mitigation measures embedded into the final layout include

- movement of turbines away from the highest and most visible southern edge
- reduction in turbine numbers to achieve the best environmental fit within the constraints of the site
- selection of turbine type and height to closely match the existing Royd Moor turbines
- refinement of the turbine layout so that the proposal appears as a logical extension to the Royd Moor Wind Farm rather than a separate development

4.2 INFORMATION SOURCES AND METHODOLOGY OVERVIEW

The assessment has been carried out utilising a methodology based upon current best practice contained in the following source documents:

- Guidelines for Landscape and Visual Impact Assessment. (GLVIA) Second Edition. Prepared by The Landscape Institute and The Institute of Environmental Management & Assessment (2002)
- Landscape Character Assessment: Guidance for England and Scotland. Prepared by The Countryside Agency and Scottish Natural Heritage (2002)
- Visual Assessment of Windfarms: Best Practice. Prepared by the University of Newcastle (2002) (SNH commissioned report F01AA303A)
- Guidelines on the Environmental Impacts of Windfarms and Small Hydroelectric Schemes. Published by Scottish Natural Heritage (2001)
- Cumulative Effects of Windfarms. Version 2 (revised 13 04 05). Published by Scottish Natural Heritage

Landscape is an important national resource. It is a product of the interaction between a range of physical and biological influences (including geology, topography, flora and fauna), human activity (land use, land management and settlement) and historical and cultural associations. These elements combine to produce distinctive local character, which people experience and attach values to. How the landscape is perceived is therefore an important sensory factor to be taken into account when carrying out landscape assessments.

The assessment consequently comprises two interrelated studies

- an assessment of the impact on the landscape resource, in other words changes to existing landscape features of the site and to the character and quality of the wider landscape setting arising from the wind farm site
- an assessment of the impact on the visual resource, in other words changes to views, viewers and visual amenity arising from the wind farm site

4.2.1 Landscape Impact Assessment

Landscape impacts are a consequence of changes in the physical fabric of the landscape as a result of development that may affect the character and, in turn, the value placed on it (GLVIA paragraph 2.14). Assessment of landscape impacts therefore needs to consider

- physical impacts upon specific landscape elements and features of the wind farm site e.g. woods, trees, walls, hedgerows etc
- effects upon the overall pattern or combination of elements that make up the landscape fabric and contribute to the character and value of an area, giving it a particular sense of place
- impacts upon areas of acknowledged special interest e.g. AONB, Scenic Areas, AGLV etc

Landscape impact assessments require a balance of objective and subjective techniques. Objective techniques involve the measurement and quantification of the various components that make up the environment, to establish the 'character' of an area. Subjective techniques rely more on judgement and responses on the part of the assessor to establish the aesthetic characteristics or 'quality' of the area.

4.2.2 Visual Impact Assessment

Visual impacts relate solely to changes in the composition of available views of the landscape and the effects of those changes on people (GLVIA paragraph 2.15). Assessment of visual impacts therefore needs to consider

- direct impacts of the development upon views of the landscape through intrusion or obstruction
- the reaction of viewers who may be affected e.g. residents, walkers, road users etc
- the overall impact on visual amenity

As with landscape assessments, visual impact assessments require a balance of objective description and subjective judgement on the part of the assessor when establishing the degree of visibility of an area and the effect on it by development.

4.2.3 Assessment of Impact

The landscape and visual assessment described in this chapter follows a five-stage process as outlined below

- a desk top study and field survey of the wind farm site and surrounding area
- analysis of the information gathered to establish the landscape character and quality of the site and surrounding area, its overall visibility and viewers likely to be affected by the proposed development
- identification of likely impacts arising from the wind farm site and ways to avoid or minimise them as part of the design process
- assessment of impacts and effects on the landscape resources of the site, on the character and quality of the surrounding landscape and on views, viewers and visual amenity arising from the finalised wind farm proposals

A judgement on the overall significance of the effects identified i.e. whether significant or not.

A significant effect is one that will result in a material change to the appearance or perception of a particular landscape or to a view. Significance is described in the GLVIA (paragraph 7.39) as being a function of the

- *sensitivity* of the affected landscape and visual receptor
- *scale or magnitude* of change that they will experience

Definitions for the above are given in the GLVIA (paragraphs 7.16-7.23 and 7.31-7.37). In summary these are

- *sensitivity* – ‘vulnerability of a sensitive receptor to change’
- *sensitive receptor* – ‘physical or natural resource, special interest or viewer group that will experience an impact’
- *magnitude* – ‘size, extent and duration of an impact’

These definitions recognise that landscapes vary in their capacity to accommodate different forms of development according to the nature of the receiving landscape and the type of change being proposed.

The assessment methodology is described in more detail within the introduction to Sections 4.3 (Baseline Conditions), 4.5 (Prediction and Evaluation of Effects) and 4.6 (Cumulative Effects).

4.3 BASELINE CONDITIONS

4.3.1 Introduction

The baseline analysis aims to record, classify and evaluate the existing landscape elements and features in the vicinity of the wind farm site. It also establishes the extent of visibility of the site. This process helps gain an understanding of the key components or characteristics of the study area and is instrumental in identifying valued and potentially sensitive landscape and visual receptors against which the predicted landscape and visual impacts of the proposed wind farm can be assessed.

The baseline assessment has involved

- desk based study of current Ordnance Survey mapping (1:50,000 scale), planning designations and landscape character assessments undertaken by others, to define the broad character of the study area and identify any valued landscape receptors
- desk based study of current Ordnance Survey mapping (1:50,000 scale) to establish the theoretical visibility of the wind farm site and to identify any valued visual receptors
- identification and field survey of a set of representative viewpoints against which the effects of the proposed wind farm are later assessed.

The area of study considered in this chapter extends for a radius of 15km from the centre of the wind farm site. A 30km radius was initially considered but, following a preliminary appraisal, it was subsequently agreed with BMBC to reduce this to 15km. This ascertained that whilst the wind farm may be visible beyond this radius, significant effects are unlikely to occur particularly when taking into account the presence of Royd Moor wind farm. The study area is identified on Figure 4.1.

This section sets out

- a description, or record, of the landscape elements and features of the wind farm site and its surroundings
- a classification of the landscape surrounding the wind farm site into areas of distinct and recognisable type and character
- an analysis and evaluation of the characteristics, qualities and sensitivities of the character types identified. This involves a level of judgement in attaching a value to the landscape
- an overview of relevant landscape planning designations and other special interests that apply to the wind farm site and surrounding area
- the extent of visibility of the wind farm site
- the identification of potentially sensitive views within the surrounding area, from which representative viewpoints are selected

4.3.2 The Wind Farm Site and Surrounding Area

The key physical landscape elements, or components, of the wind farm site and surrounding area that may be affected by the proposed development are described below. These are set out under key headings for ease of reference. Comments on condition, or quality, and importance, or value, of particular features are given where relevant. These are considered further with reference to the evaluation of landscape character described later on in this section.

4.3.2.1 Landform and Drainage

Wind Farm Site

The site occupies a locally prominent ridge of high ground on the eastern foothills of more extensive upland plateaux. Immediately to the south and west the land drops away steeply into the Upper Don valley, but to the north and east it dips more gently as a series of stepped terraces as the landform progressively descends.

The site initially comprised two land parcels, effectively divided into two by Whitley Road, an unclassified road that follows the ridgeline. The larger of the two parcels of land sits on the more gentle and less exposed dip slope with its boundaries defined by Spicer House Lane to the east, by Royd Moor Wind Farm and Whitley Road to the south and by walled field enclosures to the west and north. Within these boundaries the landform steps down from a high of about 340m AOD on Whitley Road to around 300m AOD adjoining Spicer House Lane. A small stream flows south-west to north-east through this part of the site and further sub-divides it.

The smaller parcel of land, which no longer forms part of the site, occupies the crest of the ridgeline and part of the steeper scarp slope below. Whitley Road defines the boundary to the north with walled field enclosures defining the remaining boundaries. Here the landform reaches a maximum height of around 360m AOD adjoining Whitley Road where a number of rocky outcrops occur. It then descends steeply to around 320m AOD at the southern most extent of the site where several springs emerge and form small streams further down the hillside.

Surrounding Area

To the north and east, the gently undulating landform continues to descend where it is dissected by a number of streams that have created quite deeply incised valleys. These streams eventually drain into one of three river systems around the edge of the study area notably the Calder to the north, the Deane to the east and the Don to the south-east.

Immediately east of the wind farm site one of the streams has been dammed to create several small reservoirs, including Broadstone, Ingbirchworth, Royd Moor and Stone Dike.

To the immediate south and west, the landform descends steeply into the Upper Don valley where it forms a relatively wide and flat-bottomed floor with the fast flowing River Don running through it. The level of the valley floor is about 250m AOD. Beyond the valley the landform rises up again equally as steeply to around 500m AOD where it forms a ridge of higher ground. This ridgeline forms the edge of a more extensive area of high rolling plateaux and hills that lies further to the west, collectively known as the Pennines.

This upland area occupies much of the western and southern parts of the study area where it corresponds with an underlying geology of hard-wearing Millstone Grit. This has given rise to a fairly uniform and large-scale landscape of open, rounded hills of generally undramatic appearance, punctuated by vertical rocky edges and peaks. Numerous channels dissect the plateaux tops and these drain into more deeply incised valleys. Several of the larger valleys have been flooded to form reservoirs of which the Upper Derwent is the most significant within the study area.

4.3.2.2 Land Use and Vegetation

Wind farm Site

The site is in agricultural use as rough grassland and improved pastures grazed by sheep, cattle and horses. The typically small-scale and strongly rectangular pattern of fields are generally delineated by dry stonewalls. However, most have fallen into disrepair and are reinforced by post and wire fencing.

A number of stunted trees are dotted across the larger of the two parcels of land that make up the site. A small belt of broadleaved trees also follows the course of the minor stream where they form a strong linear feature.

Surrounding Area

Rough grassland and improved pastures remains the predominant land use in the immediate vicinity of the wind farm site, with the distinctive pattern of rectangular fields enclosed by stonewalls. Tree cover is sparse and limited to the occasional clump of broadleaved trees and mixed shelterbelts. One of these has been planted alongside Whitley Road to screen a small, disused quarry that adjoins the western site boundary. Other detracting influences in the immediate vicinity include a coal depot and small nursery with several poly tunnels. Power lines on poles also follow the ridgeline and many of the minor roads.

Royd Moor Wind Farm adjoins Whitley Road and effectively separates the two parcels of land that make up the wind farm site. It comprises of 13 three-bladed turbines some 54m to blade tip (35m to hub). These are arranged in two staggered rows of six and seven turbines that are parallel with the road and generally in keeping with the rectilinear field pattern.

On more lower lying areas further to the north and east there is more arable land combined with the permanent pastures. The small to medium size pattern of fields are generally enclosed by dry stonewalls, although hedgerows increasingly prevail further east. Tree cover is noticeably more evident with a relatively strong framework of hedges, hedgerow trees and small woodlands within a predominately farmed landscape.

In the Upper Don valley immediately to the south and west, many of the steeper valley sides are particularly well wooded with both broadleaved and coniferous woodland. Small, enclosed pastures cover much of the valley floor and lower slopes and together with the high woodland cover convey the impression of a well-managed and quite intimate rural scene.

Further to the west and south the improved pastures and woodland gives way to the high rolling plateaux. Here, unenclosed heather moor and grass moorland is the dominant land cover. Tree cover is virtually absent except for the more sheltered gullies where some semi-natural broadleaved vegetation occurs. Coniferous planting is generally limited to the major valleys associated with water catchment reservoirs.

A number of man-made influences exist, which detract from the generally unspoilt rural character of the study area. Telecommunications masts are particularly prevalent, notably the 330m high Emley Moor mast some 8km north of the wind farm site, which dominates views in all directions. Other masts are noticeable features around the fringes of the upland plateaux in the west. Overhead pylons introduce further vertical elements within the Upper Don valley and to the south and east of Penistone where they are visible from long distances. Other intrusions include quarrying in parts of the Upper Don valley and numerous modern and large-scale agricultural buildings.

Further to the east, beyond the study area, steam plumes from a number of coal-fired power stations are noticeable features on the distant skyline.

4.3.2.3 Settlements and Communications

Wind Farm Site

One isolated farmstead, Spicer House, occurs within the larger of the two parcels of land, close to the boundary with Spicer House Lane and adjacent to the tree-lined stream that crosses the site. Here the dipping landform and wooded vegetation provides a measure of shelter from the prevailing winds and screens views of Royd Moor wind farm.

Surrounding Area

Several scattered farmsteads and residential properties are also located in close proximity to the site. These include Brown's Edge Farm, Annat Royd Farm and Royd Moor Farm, all leading off Spicer House Lane, whilst Whitley House and Eagle Nest adjoin Whitley Road. Immediately below the ridgeline, along Hollin Lane, Small Shaw, Flash House Farm, Illiona Cottage and Middle Cliff all have partial views of Royd Moor wind farm.

Slightly further afield, to the east, north and west, lie the hamlets of Inbircworth, High Flatts, Maythorn and Crow Edge. All of these settlements have views of Royd Moor Wind Farm to varying degrees. To the immediate south are the larger settlements of Penistone, Thurstone and Millhouse Green, all sited within the Upper Don Valley. Very few views exist of Royd Moor Wind Farm from these built-up areas.

Within the wider study area settlement is largely confined to the valleys by the steep topography of the valley sides. The valleys are heavily populated with industrial towns and urban areas, the largest of which include Huddersfield in the north, Barnsley in the east and the outskirts of Sheffield in the south-east. In contrast, the upland plateaux of the Pennines are largely devoid of settlement except for a handful of hamlets and isolated farmsteads within the valley bottoms and around the lower fringes.

Major lines of communication are mostly confined to the valleys. Strategic roads include the A628, which links the M1 at Barnsley with the Manchester conurbation via Penistone; the A629 and A616, which both link Huddersfield with Sheffield passing to the east and west of Penistone respectively; and the A635, which links Barnsley with the Manchester conurbation via Holmfirth. Views of the existing Royd Moor Wind Farm are possible from sections of all of these routes. The M1 motorway just encroaches into the eastern part of the study area and has some glimpsed views of Royd Moor Wind Farm between junctions 37 and 39 on the limit of the study area.

Beyond the valleys, an informal network of unclassified roads connects the many small communities and isolated properties that are scattered across the lower lying eastern parts of the study area.

The Pennine Way long distance footpath just encroaches into the far west of the study area where it follows a broadly north-west to south-east direction along the highest parts of the upland plateaux. Panoramic views are possible from along the route and include some long distance views of Royd Moor Wind Farm in the vicinity of Wassenden Head Moor and Bleaklow.

The Trans Pennine Trail also crosses the study area in a broadly east-west direction following more low-lying areas south of Barnsley to Penistone. West of Penistone the trail rises up the head of the Upper Don Valley to follow a route parallel with the A628 across the Pennines to Manchester. Views of Royd Moor Wind Farm between Barnsley and Penistone are mostly curtailed by intervening topography and vegetation. To the west of Penistone, however, the wind farm is generally visible where the route follows a more elevated and less vegetated section at the head of the Don valley in the vicinity of Thurlston Moor.

4.3.3 Landscape Character

4.3.3.1 Approach

Following on from the identification of the landscape elements, features and characteristics of the wind farm site and surrounding area, an assessment has been made of the way in which these components interact to create landscape character and how this is perceived. This involves a process of classifying the landscape into identifiable character types and units, or areas, analysing their key characteristics and evaluating their importance. It also takes account of more perceptual qualities that give a uniqueness or sense of place to a particular area.

Character type is a generic term and refers to similar or broadly homogeneous patterns of landform, vegetation, land use and settlement that can occur in different places in different parts of the country. Character area refers to a specific geographical location, which although sharing the same generic characteristics as a landscape type, has its own individual or unique character. The distinction is reflected in the naming of character types and areas, the former having generic names such as 'High Plateaux', with the latter having specific names such as 'The Pennines'.

Particular reference was made to the 'Countryside Character Initiative' as commissioned by The Countryside Agency (now Natural England). This published document has identified, mapped and described the distinctive landscape character areas for the whole of England in a national/regional context. Of the 159 Joint Character Areas (JCA) identified, three occur within the 15km radius study area.

Consultations were also carried out with the planning departments of those local authorities within the study area, including the Peak District National Park Authority, to determine whether any county/district wide landscape character assessments have been prepared. The consultations confirmed that the following assessments are of relevance to the study area

- Barnsley Borough Landscape Character Assessment (May 2002)
- Landscape Character Assessment of Wakefield District (October 2004)
- South Pennines Landscape Character Assessment (March 1999)

For the purposes of this assessment an overview is given of the national/regional landscape character to demonstrate how the study area relates to the larger scale. This is followed by a summary description of the character types/areas identified at a county/district level.

Detailed character assessments at a more local level have not been considered necessary in view of the potential for wind farms to impact over a wide area.

The descriptions given in this section draw heavily upon those landscape character studies identified above and visits to the study area in October and November 2007. For each character type/area described reference is made to their key characteristics (landform, land-use, vegetation and settlement). These are usually positive features but can also be negative and are important indicators of the current condition of the landscape. If they were to be lost or changed there would be consequences for the current character of the landscape. As such key characteristics are seen as potentially sensitive landscape receptors that could be affected directly or indirectly by the proposed development.

This is followed by a judgement of the value, or importance, of each character type to the people or users who are likely to be affected by the wind farm development. This is based on the criteria given in Table 4.1 below, as adapted from 'Landscape Character Assessment: Guidance for England and Scotland' and the GLVIA, where value is assessed as being a function of various perceptual characteristics. These include: landscape intactness; condition or quality; scenic beauty; tranquillity or wildness; rarity or representativeness; nature conservation interests or cultural associations; and any known consensus about importance, in other words, factors that give an area a sense of place.

These characteristics give an indication of the capacity for each character type/area to accept change without adverse effect on its character, and are a measure of sensitivity. It is recognised that value and sensitivity to change generally coincide e.g. high value landscapes, at a national or local level, are generally more sensitive to change than low value landscapes. This is considered further in the introduction to the prediction and evaluation of effects section.

Table 4.1: Classification of Landscape Value

Category	Typical Criteria	Typical scale and group affected
Exceptional	Distinctive and balanced patterns of landform and land cover evident No obvious human intervention or management No detracting features Strong perception of scenic beauty Possessing tranquil and/or remote qualities Rare landscape resource Distinct natural/cultural heritage features worthy of conservation Strong consensus about importance	International National
High	Distinctive and balanced patterns of landform and land cover evident Some human intervention or management evident and appropriate Occasional detracting features Strong perception of scenic beauty Tranquil and/or remote qualities evident Rare landscape resource Distinct natural/cultural heritage features worthy of conservation Strong consensus about importance	National Regional Local
Medium	Recognisable and mostly balanced patterns of landform and land cover Land use or management evident and generally appropriate Some detracting features General perception of scenic beauty Tranquil and/or remote qualities outweighed by more settled characteristics More frequently occurring landscape resource Some natural/cultural heritage features worthy of conservation General consensus about importance	Regional Local Special Interest
Low	Distinguishable patterns of landform & land cover often masked by	Local

Category	Typical Criteria	Typical scale and group affected
	land use Land use or management dominant but generally appropriate Detracting features Some perception of scenic beauty Widespread or representative landscape resource Some natural/cultural heritage features worthy of conservation Some consensus about importance	Special Interest
Poor	Weak pattern of landform and land cover often masked by land use Lack of intervention or management has resulted in degradation Frequent detracting features Little or no perception of scenic beauty Degraded landscape resource Few or no features worthy of conservation Little or no consensus about importance	Local Special Interest

4.3.3.2 Regional Landscape Character

A total of three Joint Character Areas (JCA) fall within the study area. These are identified on Figure 4.2 with their key characteristics summarised in Table 4.2 below.

The wind farm site itself lies within JCA 37, Yorkshire Southern Pennine Fringe, which forms a relatively narrow spine running north-west to south-east through the study area. This regional landscape marks the transition from the Pennine Uplands in the west to the lower, undulating landscapes of the Nottinghamshire, Derbyshire and Yorkshire coalfield to the east. The most striking aspect of this 'foothills' landscape is the strong contrast between industrial towns and villages within strong valley forms and the pastoral agriculture of the surrounding hills.

The underlying Millstone Grit of the upland plateau dips west to east and is deeply dissected by a number of rivers that have created steep-sided valleys. Settlement patterns have been strongly influenced by this dominant landform with towns and transport corridors largely confined to the lower valley sides and bottoms. The valleys possess a strong industrial heritage associated with the textile industry and other local industries. Chimneys associated with mills and factories often form focal points, whilst terraces of stone-built houses are packed into the valley bottoms and spread up the sides. On the steeper slopes broadleaved woodlands form a visual backdrop to the towns.

In contrast, the surrounding hills are mostly treeless and characterised by rough grazing and moor on the higher ground with extensive areas of enclosed pastures around the less elevated fringes. Here the industrial towns give way to small hamlets and scattered farmsteads built from local 'gritstone'. The landscape possesses a more remote quality even though the towns are never far away and are generally visible in views.

Table 4.2 Regional Landscape Character

Character Area	Summary of Characteristic Features
JCA 37 Yorkshire Southern Pennine Fringe	• Eastern slopes of the Pennines, dropping from upland in the west down to the east, dissected by numerous steep-sided valleys • Extensive urban influences from the matrix of large and small towns • Close conjunction of large-scale industry, urban areas and transport routes with open countryside • Predominance of local sandstone and 'gritstone' as a building material, notably in large and dominant industrial buildings • Urban development mainly confined by valleys creating dramatic interplay of views between settlements and surrounding hillsides • Predominately pastoral farming with strong linear pattern of walled enclosures on plateaux • Predominately broadleaved woodlands on steep valley sides forming important backdrops to industrial areas • Impression of a well-wooded landscape even though tree cover is relatively sparse overall • Dense network of roads, canals and railways
JCA 38 Nottinghamshire. Derbyshire, Yorkshire Coalfield	• Widespread evidence of industrial activity, including mine buildings, former spoil heaps and iron and steel plants • Complex mix of built-up areas, industrial land, dereliction and farmed open countryside • Many areas affected by urban fringe pressures creating <i>fragmented and downgraded landscapes</i> • Substantial areas of intact farmed landscape in both arable and pastoral use, including area west of Barnsley • Small, fragmented remnants of pre-industrial landscape and semi-natural vegetation, including areas of woodland and river valleys • Ever present urban influences from major cities, smaller industrial towns and mining villages • Widespread influence of transport routes, including the M1 and M62 • Rolling landform of low hills, escarpments and broad valleys • Local variation in landscape character reflecting variations in underlying geology • Strong cultural identity arising from history of coal mining and heavy industry
JCA 51 Dark Peak	• Dramatic character created by sharply defined, elevated and vast plateaux with 'gritstone ridges' and edges and long uninterrupted views • Wild and remote semi-natural character created by blanket bog, <i>dwarf shrub heath and heather moorland with rough grazing and lack of habitation</i> • Contrasting valley heads created by combination of sheltered, deeply incised cloughs with fast flowing streams around margins of plateaux and greater diversity of vegetation, including semi-natural broadleaved woodland • Cultivated character to less elevated margins with dispersed farmsteads, gritstone wall boundaries and small scale of enclosure • Major valleys dominated by reservoirs and coniferous woodland • Buildings and small settlements constructed from local gritstone with typical blackened appearance.

4.3.3.3 Landscape Character Types and Areas

Within the broad regional landscape framework described above, more detailed landscape character types have been identified at a county/district level together with the local areas, or units, in which they occur. These are identified on Figure 4.3 and summarised in Table 4.3 below. For each character type, a judgement has been made of the landscape value based on Table 4.1.

Table 4.3 Landscape Character Types and Areas

Character Type and Character Area	Summary of Characteristic Features
A Unenclosed Moorland A1 Heyden Unenclosed Moorland A2 Meltham & Wessenden Unenclosed Moorland A3 Midhope & Howden Unenclosed Moorland A4 Shining Clough & Bleaklow Unenclosed Moor A5 Thurlston & Langsett Unenclosed Moorland A6 Wharnccliffe Unenclosed Moorland	High rolling plateaux (generally above 300m AOD), large in scale, subdivided by deep cloughs containing dikes or, where dammed, large reservoirs Unenclosed moorland extensively grazed by sheep Absence of trees Open and exposed with expansive views Sense of remoteness and wildness Occasional man made influences by way of communication masts occurring as strong vertical elements Sparsely populated but often views to nearby urban areas Value assessed as: High
B Upland River Valley B1 Upland Don River Valley B2 Wooded Don River Valley	Moderately steep to steep valley sides with relatively narrow valley floor Visually contained and of a human scale Valley sides often densely wooded with broadleaved woodlands Predominately pastoral uses with fields bounded by stone walls Small-scale field patterns in valley bottoms increasing in size higher up the valley sides Fast flowing rivers with evidence of past exploitation for power (sluices, weirs and old mill buildings) Scattered stone farmsteads, hamlets and villages line valley sides Important communication routes for roads, railways and pylons Value assessed as: Medium-High
C Lowland River Floor C1 Upper Dearne Lowland Valley Floor	Flat valley floor with gently sloping sides Water present in form of rivers, lakes, reservoirs and canals Frequent residential settlement on valley sides Past and present industrial/commercial activity common on valley floors Important communication routes for roads, canals and railways Woodland and scrub evident associated with wet ground Value assessed as: Low
D Coalfield Estatelands D1 Bretton & Woolley Coalfield Estatelands	Variable landform of strong undulations and gentle, even slopes Predominately arable farming and settlement Significant areas of relatively intact farm land, but many urban fringe locations show signs of landscape decline Field boundaries defined by a mixture of stonewalls, hedgerows, post and rail fencing or not at all. Low tree cover creates sense of exposure Settlements are typically former colliery villages or towns Past history of mining and industry but still retains a rural character Country Parks are a distinctive feature converted from former country estates Value assessed as: Medium
E Settled Wooded Farm land E1 West Barnsley Settled Wooded Farm land E2 East Huddersfield Settled Wooded Farm land	Gently rolling landform crossed by small streams as tributaries to larger rivers in adjacent character types Mixed arable and pasture fields defined by hawthorn hedges and some stone walls Prominent broadleaved woodland cover Substantial areas of intact farm land free from effects of urban development Settlement ranging from isolated houses and farmsteads to large towns and urban areas Other farmed areas strongly influenced by the proximity to urban edges Communication masts and pylons are detracting features Value assessed as: Medium-High

Character Type and Character Area	Summary of Characteristic Features
F. Upland Farm land F1. Ingbirchworth Upland Farm land F2. Holmfirth & Meltham Upland Farm land F3 Penistone & Stocksbridge Upland Farm land F4 Wharnccliffe Upland Farm land	Moderate to steep upland slopes (generally above 200m AOD) fringing open moorland Distinctive undulating or 'stepped' landform Exposed with some sense of remoteness Predominately improved pastures grazed by sheep enclosed by a strong, geometric network of intact gritstone walls Field sizes typically small in lower, sheltered locations and larger on more elevated slopes Distinct absence of trees, except in the shelter of incised valleys and around farmsteads Settlement limited to scattered farmsteads but with urban areas nearby Past industrial activity indicated by presence of disused mines and quarries Occasional detracting features by way of masts and wind farm s Value assessed as: Medium-High
G Settled Valleys G1 Colne Settled Valley G2 Holme & Hall Dike Settled Valleys G3 Fenlay Settled Valley	Deeply incised narrow valleys dissecting the high moorland plateau Main valleys are crowded with towns with origins in the early industrial age Stone terraced weavers cottages line the valley sides Distinctive local architecture relating to the textile industry Ancient woods survive on the steeper valley sides and in cloughs Patchwork of pastoral farm land enclosed by distinctive gritstone walls forms a rural backdrop to the settled areas Value assessed as: Medium
H Reservoir Valleys H1 Broomhead & Moore Hall Reservoir Valley H2 Dale Dike & Agden Reservoir Valley H3 Derwent Reservoir Valley H4 Torside & Woodhead Reservoir Valley	Deeply incised landform dissecting the high moorland plateaux Visually contained and of a more human scale Dominated by large artificial water bodies Victorian engineering structures with ornate detailing Extensive woodland planting to valley sides, including coniferous blocks Sense of remoteness Valuable recreational resource Value assessed as: High

The wind farm site itself lies within the Upland Farm land landscape character type and the Ingbirchworth unit within this type. This character type and unit is described in the Barnsley Borough Landscape Character Assessment as being typical of the broader regional landscape character of the Yorkshire Southern Pennine Fringe.

This is an area of upland hill country with a characteristic stepped landform that exhibits scarp and dip slopes, some reaching 300-400m AOD. Its network of intact gritstone walls creates a strong and distinctive geometric field pattern. Field sizes vary according to the elevation with the older, smaller, fields located in lower and more sheltered areas and the larger, later, enclosures found on the higher ground. Woodland cover is relatively low, although ribbons of deciduous woodland, mainly beech and sycamore, thrive in the shelter of the incised valleys of the streams that drain south to the River Don.

Settlement is limited to dispersed farmsteads and small stone hamlets on the edge of the area, many with past associations with the woollen industry. Other past industrial activities are indicated by the presence of disused mines and quarries.

Views are panoramic, stretching over the valley of the adjoining River Don character area to the south and west and into Denby Dale to the north. The existing wind farm at Royd Moor is a prominent feature in many views as are telecommunications masts and pylons generally.

4.3.4 Landscape Planning Designations

A detailed discussion on the planning context relevant to the wind farm site, including a summary of national, regional and local planning policy, is given in Chapter 3.

This section considers the significance of any landscape planning designations (National Park, Scenic Areas etc) and other special interests (Historic Parks and Gardens, Conservation Areas etc) that apply to the study area. These are relevant to the assessment of landscape character since they are generally associated with landscapes perceived to be important, or high value, and potentially sensitive to change, whether at a national or local level. For this reason they are normally included in the representative viewpoint selection and considered as separate landscape receptors so that the effects of the wind farm can be specifically assessed and, if necessary, avoided or reduced.

The following structure plan and local plan information was reviewed for the purposes of identifying any landscape planning designations and other special interests within the 15km radius study area

- BMBC Unitary Development Plan (adopted December 2000)
- Kirklees MC Unitary Development Plan (adopted March 1999)
- Wakefield MC Unitary Development Plan First Alteration (adopted January 2003)
- Peak District National Park Local Plan (adopted March 2001)

Further detail on relevant planning policy can be found in Chapter 3. Additionally, English Heritage was consulted for any registered parks and gardens within the study area. Designated areas and other special interests identified from this information are illustrated on Figure 4.4 and summarised below.

4.3.4.1 Landscape Designations

At a national level, one designation falls within the study area, but beyond the boundaries of the wind farm site. The Peak District National Park lies approximately 1.5km to the south-west of the site, at its closest point, where it is separated by the incised valley of the River Don. This national landscape designation covers much of the western and southern parts of the study area where it coincides with the elevated 'Pennine' plateaux of the Dark Peak regional landscape and the Unenclosed Moorland at the county/district level. Its eastern boundaries generally correspond with the lower foothills and valleys that adjoin the upland plateaux and which exhibit much more settled patterns of land cover and land use.

Within the boundaries of the National Park the policy conveys the need to conserve and enhance the natural beauty; wildlife and cultural heritage generally outweigh the needs of development. In the more remote and wilder areas, defined as the Natural Zone, development will only be permitted in exceptional circumstances, usually where it is essential to the national interest. In areas of open countryside outside of the Natural Zone, development may be permitted provided it does not harm the valued characteristics of the area and is essential for agriculture, forestry, recreation, tourism or mineral working. Housing and other employment opportunities will normally only be permitted in designated settlements.

Apart from the extreme eastern edges and a number of the major valleys, the majority of the National Park within the study area is defined as Natural Zone and is judged to be of high value based on Table 4.1. Views of the existing Royd Moor Wind Farm are possible from the more elevated areas within the National Park at distances up to 15km.

At a regional/local level, one Area of Borough Landscape Value covers much of the remaining open countryside to the west of Barnsley, and includes both the proposed wind farm site and existing Royd Moor wind farm. In neighbouring Kirklees Metropolitan Council,

significant areas of open countryside beyond the settled valleys and major urban areas are similarly designated as Areas of High Landscape Value.

Within these designations development will normally only be permitted where there is no loss of valuable landscape features; where the nature, form and design of the development is sympathetic to the area; and where the overall character and appearance of the area is conserved and wherever possible enhanced. Whilst these designations encompass a number of landscape character types of varying quality, they are judged to be of a high value based on Table 4.1.

In addition to these landscape designations there is also extensive Green Belt land on the outskirts of the urban areas and major settlements within the study area. The primary purpose of the Green Belt is to protect open land between settlements and the character and quality of protected land is often variable. As such no particular significance is attached to this designation in the assessment of landscape character, other than to note that much of it coincides with Areas of Borough Landscape Value/High Landscape Value identified above.

4.3.4.2 Special Interests

The effects of the wind farm of the historical interest of registered parks and gardens and conservation areas is assessed in Chapter 8. This chapter considers the landscape effects relative to the designations. Five registered parks and gardens have been identified within the 15km radius study area. These are at Bretton Hall Country Park and Sculpture Park, Cannon Hall Country Park, Locke Park, Wentworth Castle and Wortley Hall. Views of the wind farm site and Royd Moor Wind Farm from these locations are mostly screened by a combination of landform, vegetation and buildings. Glimpsed views of Royd Moor Wind Farm are possible from more elevated parts of Bretton Hall Country Park and Sculpture Park, at a distance of about 10km, where gaps in vegetation occur.

Within the study area, some forty-eight settlements are listed as Conservation Areas. This statutory designation applies to areas of the built environment considered to be of historical and/or architectural value by virtue of a particular building vernacular, street pattern and/or focal points. Planning permission will not normally be granted for any development that adversely affects the character, quality and/or setting of these areas. All are judged to be of a locally high value based on Table 4.1.

The majority of the Conservation Areas are located in the valleys where the combination of steep-sided slopes, vegetation and general built-up nature precludes views of the wind farm site and existing Royd Moor wind farm. Whilst significant effects are unlikely from the proposed wind farm, they are considered in the assessment of effects.

4.3.5 Baseline Visibility of the Wind farm Site

4.3.5.1 Approach

To establish the likely visibility of the wind farm site and assist with the assessment of potential landscape and visual effects, zones of theoretical visibility (ZTVs) have been prepared for the wind farm. These are illustrated on Figures 4.5 (hub height) and 4.6 (blade tip height).

ZTVs relate to the zone within which the site and the proposed development are likely to be visible based on an observer height of 1.8m. This corresponds with the height of a typical adult person on foot. ZTVs are computer generated from a digital terrain model of the study area (1:250,000 scale) and intervisibility software, with a 3-D model incorporated of the individual wind turbines at the proposed heights.

ZTVs do have limitations, which need to be borne in mind when considering the theoretical visibility indicated. Firstly, ZTVs illustrate the effect of bare topography on limiting views of the wind farm site and do not take into account the screening effects of surface features including minor landform, built development and vegetation. Secondly, ZTVs are not distance sensitive in that they do not take account of increasing distance on visibility, the magnitude of change arising or the significance. The nature of what can be seen at 3km will differ markedly from what can be seen at 10km, but this will not be distinguished by a ZTV. Thirdly, whilst ZTVs may indicate the number of turbines visible at a particular location, they do not distinguish whether the turbines are seen at full height or from just the blade-tips. This can also have a considerable effect on the magnitude of change and significance. Nevertheless ZTVs are a useful tool in representing the worst-case scenario when predicting the likely visibility of a development. They are particularly useful as a basis for selecting viewpoints where there may be significant impacts for which further assessment is required.

Following on from the desk based studies more focused fieldwork was undertaken to test the validity of the ZTV, taking account of the additional screening effect afforded by buildings, vegetation and other surface features. This exercise also involved identifying key viewpoints from where the wind farm site is likely to have a significant impact. The fieldwork was conducted from publicly accessible areas only and, as such, was constrained by the level of access afforded. The study is therefore an assessment of the site's visibility from roads, public footpaths and other public open spaces. At the baseline stage the visibility of the proposed wind farm is not considered, but views of the existing Royd Moor Wind Farm are noted.

The fieldwork was undertaken in October and early November 2007. Weather conditions were mostly sunny with good visibility. Given the time of year, the seasonal screening effects afforded by deciduous vegetation when in leaf was still evident. Additional views of the wind farm site may well be possible at other times of the year when leaf cover is not present.

Baseline visibility analysis was carried out from areas extending up to 15km radius from the edge of the wind farm site, as previously agreed with BMBC. Areas beyond this distance with views of the wind farm site are judged to be not significant. This is due, in part, to the presence of Royd Moor wind farm, plus also the small number of turbines proposed, intervening distance, presence of screening features and the variable effects of weather.

Photographs were taken of the wind farm site from a range of locations, distances and directions. All photographs were taken with a digital SLR camera using a 50mm lens on a 35mm camera format as recommended in the GLVIA (appendix 9). Photographs have then been joined to represent a 90-degree vision splay, or panorama, of the existing view.

A total of 25 photographic locations were selected in consultation with BMBC as being representative of the landscape and visual resources of the study area for further consideration in the assessment of effects. For each viewpoint a computer generated wireline has been produced of the wind farm model set within an impression of the landform. Photomontages were also prepared from some of these wirelines to provide a more representative image that illustrates the likely effect of the wind farm on the particular photographic view following construction. The final set of photographic viewpoints, wirelines and photomontages are illustrated on Figures 4.7a to 4.45b.

4.3.5.2 Baseline Visibility

In general terms, visibility across the study area contrasts strongly between the upland plateaux, where expansive views are possible, and the valleys where views are channelled by the enclosed sides and further restricted by the built-up nature of the valley floors and often high incidence of broadleaved woodland on the steeper slopes.

From within the wind farm site 360° views are possible across much of the surrounding area. To the north and east visibility extends across the lower lying but undulating landform as far as the distant horizon. The view is one of a predominately farmed landscape of mixed pasture and arable land, with the small to medium-sized fields enclosed by stone walls and hedgerows. *Hedgerow trees and small woodland areas are also relatively widespread and convey the impression of a well-wooded landscape.* Farmsteads, isolated houses, hamlets and larger urban areas on the outskirts of Barnsley are conspicuous features of the higher ground but, overall, the area retains a strong rural character. Intrusive features include the Emley Moor mast, which dominates views to the north, as well as the steam plumes of more distant coal-fired power stations in the east.

To the west and south views extend across the Upper Don valley as far as the ridgeline that defines the eastern valley sides and high plateaux beyond. This roughly coincides with a north-west to south-east line that includes West Nab (500m AOD), Black Hill (582m AOD), Upper Dead Edge (499m AOD), Round Hill (496m AOD), Margery Hill (546m AOD) and Edge Mount (395m AOD). Beyond this ridgeline some glimpsed views are possible of more distant isolated hilltops associated with the high Pennine plateaux.

The view is a contrasting one of small-scale enclosed pastures on the valley floor and lower slopes with sizeable blocks of mixed deciduous and coniferous woodland on the steeper sides. These give way to the open moors of the high plateaux beyond. Settlement and communication routes are confined to the valley floor, although traffic on the A628 is particularly noticeable where the route rises up the head of the valley. Other intrusive features include pylons following the valley floor and communications masts on the edges of the plateaux.

Available views towards the wind farm site and Royd Moor Wind Farm are mainly obtained from high ground on the edge of the upland plateaux to the west and south, from the ridgelines of lower lying areas to the north and east, and in the immediate vicinity of the site.

From the ridge of high ground that extends from West Nab to Edge Mount on the eastern edge of the Pennine plateau, west and south of the wind farm site, the existing Royd Moor turbines are visible features of the skyline at distances up to about 15km. From these vantage points the turbines are distinguishable as a compact group within a wider panorama. This includes views from a short section of the Pennine Way, which encroaches into the far west of the study area. In most of the views the turbines appear evenly spaced with blade movement evident. Emley Moor mast is also prominent in these views.

From the north and east, the undulating nature of the landform in conjunction with deeply incised valleys and relatively dense woodland cover is such that visibility is more limited and largely confined to the minor ridgelines where breaks in vegetation occur. From Flockton around to West Bretton and the western edge of Barnsley, Royd Moor Wind Farm is visible in glimpsed views. However, they are generally seen in context with Emley Moor mast, which dominates views from these directions. Within the more densely populated valleys, views are completely curtailed by a combination of the steeply sloping sides, dense built-up nature of the valley floors and the relatively dense woodland cover on the upper slopes.

In the more immediate vicinity of the windfarm site views are particularly constrained by landform. West of the site, within the Upper Don valley, Royd Moor windfarm is a conspicuous feature on the ridgeline, with individual tower detail and blade movement clearly evident. *This includes views from Carlecotes, Crow Edge and individual properties immediately below Royd Moor in the vicinity of Catshaw, albeit turbine visibility from these latter properties is limited to the hubs and blade tips.* From more enclosed parts of the valley to the immediate south turbine visibility is virtually curtailed. This includes views from the larger settlements of Penistone, Thurlstone and Millhouse Green. On the more gentle dip slopes to the north and east of the windfarm site where vegetation is sparse, Royd Moor

turbines are conspicuous features of views from the scattering of houses and hamlets, including from Ingbirchworth and Maythorn. From Spicer House, on the edge of the windfarm site, views of Royd Moor turbines are screened by the orientation of the farmhouse, outbuildings and existing tree belt at the northern end of the site.

4.3.5.3 Representative Viewpoints

A brief overview of the representative viewpoints is given below with reference to location, distance from the wind farm site and reason for selection. A detailed analysis of these viewpoints is given in Table 4.9 at the end of this chapter. This analysis suggests that the transition from significant effects to not significant effects is around 3km from the site.

The findings from this analysis have been applied to the prediction and evaluation of effects section with regard to impacts on landscape resources (fabric, character, designations and special interests) and visual receptors (settlements, roads, open spaces).

- **Viewpoint 1:** Spicer House, on the site boundary with Spicer House Lane. Stationary view from the isolated residential property and a transient view for users of the unclassified road adjoining the site.
- **Viewpoint 2:** B6106 Hollin Lane, Catshaw, about 1km south of the site. Stationary views from several isolated houses directly below the site and transient view from the road.
- **Viewpoint 3:** Viewing area, Royd Moor Hill, some 1km south-east of the site. Stationary viewpoint from a popular viewing area offering 360-degree views.
- **Viewpoint 4:** A629 Ingbirchworth, about 2km east of the site. Stationary view from residential properties and transient view from the road.
- **Viewpoint 5:** A616 Crow Edge, some 1.5km west of the site. Stationary view from residential properties and transient view from the road.
- **Viewpoint 6:** Trans Pennine Trail, approximately 2km due south of the site. Slow transient and sequential view for walkers and other users approaching the site from the east.
- **Viewpoint 7:** Low Common, Holmfirth, about 3.5km north-west of the site. Representative view for isolated properties in the vicinity.
- **Viewpoint 8:** Recreation ground, Penistone, some 4km south-east of the site. Stationary view for users of the recreation ground and representative view from properties on the built-up edge of the town.
- **Viewpoint 9:** A628/A629 roundabout, about 5km east of the site. Transient view from the road when approaching from the east.
- **Viewpoint 10:** A628, Fiddler's Green, about 6.5km south-west of the site and within the National Park. Transient view from the road and slow transient view for walkers using local footpath.
- **Viewpoint 11:** Pike Lowe, Midhope Moors, some 7.5km due south of the site and within the National Park. Slow transient view from a popular walking hill.
- **Viewpoint 12:** Emley Moor Mast, Kirkburton, about 8km to the north of the site. Stationary view from a popular viewing area.
- **Viewpoint 13:** Triangulation point 541m, Howden Edge, approximately 8.5km south-west of the site, within the National Park. Slow transient view from a popular walking hill.
- **Viewpoint 14:** A629/B6462 Thurgoland, about 8.5km south-east of the site. Transient view from the road and stationary views from properties.
- **Viewpoint 15:** Swains Head, Howden Edge, approximately 8km south-west of the site, within the National Park. Slow transient view from a popular walking hill.
- **Viewpoint 16:** High Stones, Howden Edge, about 10.5km due south of the site, within the National Park. Slow transient view from a popular walking hill.
- **Viewpoint 17:** M1 motorway at Kexbrough, some 10.5km east of the site. Transient view from the motorway.

- **Viewpoint 18:** Bretton Country Park, some 11km north-east of the site. Slow transient view from sculpture park.
- **Viewpoint 19:** Black Hill; Pennine Way, about 12.5km due west of the site, within the National Park. Slow transient and sequential view for hill walkers and other users using the national trail.
- **Viewpoint 20:** West Nab, Meltham Moor, some 13km north-west of the site, within the National Park. Slow transient view from popular walking hill.
- **Viewpoint 21:** B6118, Kirkheaton, about 13km due north of the site. Transient view from the road.
- **Viewpoint 22:** Wain Stones, Pennine Way, approximately 14km south-west of the site, within the National Park. Slow transient and sequential view for hill walkers and other users using the national trail.
- **Viewpoint 23:** A6195, Hoyland, about 16.5km east of the site. Transient view from the road.
- **Viewpoint 24:** Brook Hill Lane, Charlecotes, approximately 3km west of the site. Stationary views from residential properties.
- **Viewpoint 25:** A628, Daisy Hill Farm, some 3km due south of the site. Transient view from the road.

A number of other viewpoints were initially considered for inclusion but as views of the existing Royd Moor Wind Farm were obscured by vegetation and/or landform they were later discarded. These included viewpoints at Junctions 36/37/38 of the M1 motorway, Cannon Hall Park, Stainborough Castle tower and Castle Hill near Almondbury.

The effects of the wind farm site on identified landscape and visual receptors are considered further in the prediction and evaluation of effects section.

4.3.6 Summary

Valued landscape resources within the wind farm site boundaries are limited to the strong rectilinear pattern of drystone walls and the broadleaved tree belt and stream beside Spicer House.

The landscape character of the wind farm site and its immediate setting is described in the Barnsley Borough Landscape Character Assessment as being Upland Farm land. This local character type is representative of the wider regional landscape that corresponds with a narrow band of foothills and incised valleys along the eastern edge of the Pennines. The most striking aspect of this landscape is the contrast between the enclosed and densely populated valleys, which have a strong industrial heritage, and the open, pastoral farm land of the surrounding hillsides.

Many other man-made influences exist that detract from the natural beauty of the area. These include pylons and communication masts, which are visible from long distances. The higher land also provides opportunities for wind farms and, indeed, one operational wind farm exists within the study area at Royd Moor, immediately adjacent to the proposed wind farm site.

One national landscape planning designation exists within the study area, although it excludes the wind farm site. The Peak District National Park covers much of the land in the west and south where it corresponds with an extensive area of high moorland plateaux and semi-natural wilderness, highly valued as an environmental resource and for recreation. Beyond the National Park boundaries much of the remaining study area has also been designated an Area of Borough Landscape Value/High Landscape Value by BMBC and neighbouring Kirklees MC for reasons of the scenic value attached to it. Both the existing Royd Moor Wind Farm and proposed wind farm site fall within this regional landscape designation.

The high moorland plateaux in the west and south of the study area limits visibility of the proposed wind farm site and existing Royd Moor Wind Farm to the eastern edges of the National Park from where expansive views are possible. Views towards the wind farm site from the north and east are limited to low ridgelines by the lower lying landform and relatively dense woodland cover. Within the heavily populated valleys views are effectively curtailed by a combination of the deeply incised landform, built-up nature of the valley bottoms and woodland cover on the steeper slopes.

4.4 PROJECT DESCRIPTION AND MITIGATION

4.4.1 Principal Elements

The proposed development consists of 5 wind turbines each measuring up to 56m to hub height and 84m to the blade tip in the vertical position, based on a 56 m rotor diameter. These are maximum heights and have been selected for the purposes of establishing a worst-case scenario in relation to landscape and visual effects. A meteorological mast (maximum 56m high) will also be required together with a control building (substation) and compound. Other ancillary works will include providing access tracks within the site to reach the turbines.

A detailed description of the wind farm proposal, including site selection, technical siting requirements and construction details, is given in Chapter 2, and shown on Figures 2.2-2.11. The key elements of the scheme that are likely to give rise to landscape and visual impacts are summarised below under construction, operational and decommissioning stages. This is followed by a description of those measures that have been incorporated into the final scheme to mitigate these effects as part of an overall design strategy.

4.4.2 Construction Stage

The principal activities that may give rise to potential effects during the construction stage are

- possible minor upgrading of existing unclassified roads leading to the site
- possible upgrading of existing farm tracks within the site
- limited loss of improved pastures within the site
- possible sourcing of construction materials on site for access tracks
- provision of permanent access tracks and cable runs within the site
- provision of a temporary contractors compound and site cabins
- erection of temporary site cranes including concrete pads
- erection of the wind turbines including concrete bases
- construction of the control building/substation and compound
- erection of the meteorological mast

The wind farm will be connected to the electricity grid however this will be the subject of a separate application and is excluded from this assessment.

It is anticipated construction activities will be carried out over a 10 month period. Disturbance of the landscape fabric will be small scale, essentially limited to the footprint occupied by the wind turbines, substation and access tracks. Impacts on the wider landscape character and on visual amenity will be mostly limited to views of the temporary cranes and turbines under construction.

4.4.3 Operational Stage

Potential effects during the operation of the wind farm may arise from the presence of the following features

- site access tracks
- wind turbines and, to a lesser extent, the meteorological mast
- control building

The operational life of the wind farm is anticipated to be 25 years. During this period the turbines, meteorological mast, substation and access tracks will all be apparent.

4.4.4 Decommissioning Stage

Potential effects arising from the decommissioning of the wind farm at the end of its operational life will be limited to the temporary presence of cranes and other equipment required to dismantle the turbines, mast, substation and other above-ground features. The turbine bases will be cut out to below ground level and covered with topsoil, whilst the access tracks will either be left in situ for subsequent use or be covered with topsoil, subject to agreement with the landowner.

The decommissioning stage will be limited to a few months and at the end of the process no visible surface features will remain, apart from the access tracks where these are retained.

4.4.5 Mitigation

The design of the wind farm has sought to incorporate mitigation measures from the outset to avoid or minimise any significant negative (adverse) effects on the surrounding landscape and on visual amenity. This has been conducted through a range of turbine layouts using ZTVs and wirelines to assess the likely impacts. A range of measures have been considered, which are either an intrinsic part of the final scheme (defined in para 5.3 of the GLVIA as Primary Mitigation) or have been specifically included in order to offset the impact of any residual negative (adverse) effects of the final development (defined by the GLVIA as Secondary Mitigation). Examples of primary mitigation relative to a wind farm development include means of access; turbine layout; type, height and colour of turbines; design and location of ancillary facilities. Secondary mitigation might involve additional off-site measures such as habitat creation or screen planting.

The GLVIA sets out four main areas of mitigation (paras 5.9-5.12)

- avoidance (e.g. to prevent an impact from occurring)
- reduction (e.g. to make an impact smaller in terms of extent/degree/intensity)
- remediation (e.g. to put right an impact)
- compensation (e.g. to make amends where an impact cannot be avoided)

The principal aim is to avoid negative impacts and, ideally, this is best achieved at the design stage where alternative designs can be considered to achieve the best environmental fit. Where negative impacts cannot be avoided then other strategies of reduction and remediation need to be explored, or, where a negative effect cannot be mitigated to an acceptable degree, other compensatory measures may be introduced to offset the negative effect. These are considered below in relation to the key elements of the wind farm identified in 4.4.2 and 4.4.3 as likely causes of adverse effects on landscape and visual amenity.

4.4.5.1 Site Access

The turbine components will be delivered to the wind farm site using the existing road network. Access is expected to be via the A628, followed by the local road network, i.e. Royd Lane through Millhouse Green or Thurlstone to the site entrance at Whitley Road.

New tracks to access the turbines, control building and meteorological mast are required they will follow the existing pattern of walled field enclosures, as far as practicable. The

location of access tracks is shown of Figure 1.2. Tracks will be typically 5 metres wide and constructed from graded stone using materials sourced from a local quarry rather than from borrow pits excavated on site.

4.4.5.2 Wind Turbine Layout

The siting of the turbines has been derived through a number of iterations using computer-generated ZTVs and wirelines to assess differing arrangements, numbers and heights of turbines, whilst taking account of baseline conditions and other technical considerations. The various layout options considered are illustrated on Figure 2.1.

The initial layout prepared at scoping stage utilised both parcels of land on either side of Whitley Road. However, following a preliminary appraisal and consultation with BMBC turbines were omitted from the southern and most visible parcel. This was partly to avoid additional impacts on properties immediately below the site but also to avoid elongating turbines along the ridgeline when seen in conjunction with Royd Moor Wind Farm. This was particularly apparent with the initial layout, which had potentially significant effects on the Upper Don valley and Peak District National Park.

Subsequent design iterations have therefore concentrated on the larger triangular parcel of land beyond the ridge where the proposed turbines generally appear behind those of the neighbouring Royd Moor Wind Farm in more sensitive views from the south and west. Here the emphasis has been placed on achieving a layout that complements the formal nature of the Royd Moor development, takes account of site constraints and minimises overall visibility.

As part of this exercise careful consideration was given to turbine height and spacing to ensure an acceptable balance was achieved between existing and proposed turbines. Layouts involving four, five and six turbines were considered in both single and staggered rows to reflect the regimented layout of the existing scheme. The main iterations are shown on Figure 2.1. At the same time a range of turbine heights was assessed from the smallest commercially available (40m hub with 52m rotor diameter) up to largest considered to be acceptable in relation to Royd Moor turbines (56m hub with 56m rotor diameter).

Layouts were examined from a number of viewpoints around the site and adjusted to reduce visibility and enhance the composition of what remained visible. Overall, five turbines was considered to be the optimum number as a double staggered row. Little appreciable difference was noted in the range of heights examined with all turbines visible. However, the larger sizes appeared to give a better balance with the existing Royd Moor turbines particularly in more sensitive views to the south and west where the proposed turbines sit at a slightly lower elevation compared to the existing wind farm.

The final layout has sought to achieve a design that fits with the Royd Moor development, whilst also responding to the site constraints. In so doing, the layout has sought to avoid or reduce impacts on the particular scenic qualities of the study area and on views from nearby residential properties than might otherwise be the case with a separate, stand-alone scheme.

4.4.5.3 Wind Turbine Form and Colour

The final turbine type and manufacturer has yet to be determined and, will be agreed with BMBC. However, it is anticipated the turbines will closely match those turbines at Royd Moor wind farm. These comprise a three-bladed type mounted on a tapering, tubular steel tower and painted in an off-white colour with a semi-matt finish to reduce glare. Additionally, no company logos or advertisements will be displayed on any part of the turbines.

In order to avoid visual clutter and maintain the simplicity of the turbines all transformers will be housed in the towers. The concrete foundations required to support the turbines will also be set below the finished soil level in order that vegetation can be restored right up to the base of each tower.

4.4.5.4 Ancillary Features

The meteorological mast will be a free-standing lattice tower structure positioned towards the southern edge of the site facing the prevailing wind.

The control building will comprise a single storey building with a pitched roof as illustrated in Figure 2.5. It will be located amidst the turbines adjacent to the access track linking turbines 1 and 4. Final materials for the control building will be agreed with BMBC, but it is anticipated they will be similar to the Royd Moor control building and reflect the local building vernacular. All cable runs leading from the turbines to the control building will be below ground. The temporary construction compound will be located adjacent to the site entrance at Whitley Road.

The mitigation measures described above have been incorporated into the final design that forms the basis of this ES. The potential effects described in the following section take account of these measures and thus represent residual effects arising from the wind farm that would remain for the duration of its operational life.

4.5 PREDICTION AND EVALUATION OF EFFECTS

4.5.1 Introduction

Having identified the baseline conditions of the wind farm site and surrounding area in the previous section, this section describes and evaluates the changes in the character and quality of the landscape and views that are expected to result from the wind farm during its construction, operational and decommissioning stages. This section of the impact assessment aims to

- identify those potential landscape and visual impacts that would result directly or indirectly from the wind farm site on a range of sensitive receptors
- estimate the likely scale or magnitude of impacts
- assess their significance

The criteria used for establishing the sensitivity of identified sensitive receptors and the magnitude of change is described below, together with the criteria for establishing the overall significance. This is derived from an approach advocated in the GLVIA (paras 7.14-7.50). The assessment of impact is divided into two sections. The first section considers the scale, nature and duration of impacts on the landscape resource arising from the wind farm site in terms of

- effects on landscape features or fabric of the site e.g. loss of trees
- effects on the wider landscape character and quality
- effects on areas of acknowledged interest

The second section considers the scale, nature and duration of changes on the visual resource arising from the wind farm site in terms of

- views of the landscape affected by intrusion or obstruction
- viewers who may be affected
- effect on visual amenity

A judgement on the overall significance of the effects identified i.e. whether significant or not.

A significant effect is one that will result in a material change to the appearance or perception of a particular landscape or to a view. Significance is described in the GLVIA (paragraph 7.39) as being a function of the

- *sensitivity* of the affected landscape and visual receptor
- *scale* or *magnitude* of change that they will experience

Definitions for the above are given in the GLVIA (paragraphs 7.16-7.23 and 7.31-7.37). In summary these are

- *sensitivity* – ‘vulnerability of a sensitive receptor to change’
- *sensitive receptor* – ‘physical or natural resource, special interest or viewer group that will experience an impact’
- *magnitude* – ‘size, extent and duration of an impact’

These definitions recognise that landscapes vary in their capacity to accommodate different forms of development according to the nature of the receiving landscape and the type of change being proposed.

The assessment methodology is described in more detail within the introduction to Sections 4.3 (Baseline Conditions), 4.5 (Prediction and Evaluation of Effects) and 4.6 (Cumulative Effects).

4.3 BASELINE CONDITIONS

4.3.1 Introduction

The baseline analysis aims to record, classify and evaluate the existing landscape elements and features in the vicinity of the wind farm site. It also establishes the extent of visibility of the site. This process helps gain an understanding of the key components or characteristics of the study area and is instrumental in identifying valued and potentially sensitive landscape and visual receptors against which the predicted landscape and visual impacts of the proposed wind farm can be assessed.

The baseline assessment has involved

- desk based study of current Ordnance Survey mapping (1:50,000 scale), planning designations and landscape character assessments undertaken by others, to define the broad character of the study area and identify any valued landscape receptors
- desk based study of current Ordnance Survey mapping (1:50,000 scale) to establish the theoretical visibility of the wind farm site and to identify any valued visual receptors
- identification and field survey of a set of representative viewpoints against which the effects of the proposed wind farm are later assessed.

The area of study considered in this chapter extends for a radius of 15km from the centre of the wind farm site. A 30km radius was initially considered but, following a preliminary appraisal, it was subsequently agreed with BMBC to reduce this to 15km. This ascertained that whilst the wind farm may be visible beyond this radius, significant effects are unlikely to occur particularly when taking into account the presence of Royd Moor wind farm. The study area is identified on Figure 4.1.

Table 4.4a: Classification of Sensitive Landscape Receptors and Impact Magnitude

Sensitivity (Capacity of a landscape at a particular location to accept change)		Magnitude (Degree of change to landscape character arising from the development)	
Class	Typical Criteria	Class	Typical Criteria
Very High	Little or no capacity for change: Exceptional quality, value & rarity. International or National scale e.g. Designated landscapes with no or limited potential for substitution or enhancement.	Very Large	Loss of or introduction of features that totally change key landscape elements or characteristics of the baseline landscape.
High	Low capacity for change: High quality, value and rarity. National, Regional, Local scale e.g. Designated landscapes with limited potential for substitution or enhancement.	Large	Loss of or introduction of features that significantly change key landscape elements or characteristics of the baseline landscape.
Medium	Some capacity for change: Medium quality, value and rarity. Regional, Local scale e.g. Undesignated landscapes but with valued features and some potential for substitution or enhancement.	Medium	Loss of or introduction of features that have a conspicuous or noticeable change to key landscape elements or characteristics of the baseline landscape.
Low	Reasonably high capacity for change: Low quality, value and rarity. Local scale or special interest e.g. Landscapes identified as having some redeeming features and scope for substitution or enhancement.	Small	Loss of or introduction of features that have an apparent or perceptible change to key landscape elements or characteristics of the baseline landscape.
Very Low	High capacity for change: Low quality, value and rarity. Local scale or special interest e.g. Weak or degraded landscapes identified as having considerable scope for substitution or enhancement.	Very Small	Loss of or introduction of features that have an inconspicuous or barely perceptible change to key landscape elements or characteristics of the baseline landscape.
		Negligible	Loss of or introduction of features that results in nil change to the landscape.

Table 4.4b: Classification of Sensitive Visual Receptors and Impact Magnitude

Sensitivity (Capacity of people at particular locations to accept change)		Magnitude (Degree of change to views as a result of the development)	
Class	Typical Criteria	Class	Typical Criteria
		Very Large	Loss of or introduction of features that dominate or command the baseline view. Includes views obstructed by development.
High	Low capacity for change: Occupiers of residential properties with views likely to be affected by the development and people engaged in outdoor activities whose attention is focussed on the landscape e.g. walkers, hikers, users of country parks etc.	Large	Loss of or introduction of features that are prominent or stand out in the baseline view. Includes views obstructed by development.
Medium	Some capacity for change: People engaged in outdoor pursuits whose attention is focussed on their activity e.g. golf, water based activities etc.	Medium	Loss of or introduction of features that are a conspicuous or noticeable element of the baseline view.

Sensitivity (Capacity of people at particular locations to accept change)		Magnitude (Degree of change to views as a result of the development)	
Low	Reasonably high capacity for change: People travelling through an affected landscape e.g. by car.	Small	Loss of or introduction of features that are an apparent or perceptible element of the baseline view.
Very Low	High capacity for change: People at their place of work or users of commercial facilities whose attention is focussed on their activity e.g. retail centres.	Very Small	Loss of or introduction of features that are an inconspicuous or barely perceptible element of the baseline view.
		Negligible	Loss of or introduction of features that results in nil change to the baseline view.

The permanence of effects is also variable. The effects on the landscape and visual resource that result from the presence of the wind farm are reversible as the turbines will be removed during the decommissioning stage. Whilst the underground cabling, turbine bases and access tracks will remain, these will have no residual landscape and visual effects. Thus whilst the operational effects of the wind farm are long term, as noted above, they are also temporary.

In order to avoid unnecessary repetition, the construction and decommissioning stages are not considered further in the assessment of effects. Similarly, the duration and permanence of the operational effects is not reiterated and can be assumed to be 'long term' and 'temporary' unless stated otherwise.

4.5.5 Significance of Effects

The overall significance of effects is judged against sensitivity and the magnitude of change, whereby a higher level of significance is usually attached to large-scale effects and effects on sensitive or high value receptors. This is set out in Table 4.5 below as a matrix, with degrees of sensitivity on the left and impact magnitude along the top. For example, a medium impact (adverse or beneficial) on a landscape or view of high sensitivity, is judged to be of moderate significance (adverse or beneficial) overall.

For the purposes of this assessment, effects assessed as being of moderate significance, or higher, are considered to be equivalent to 'significant' effects that are required to be identified under the Environmental Impact Regulations. These are highlighted in a pale grey tone in Table 4.5. Effects assessed as being of slight-moderate significance, or less, are generally considered to be not significant.

Table 4.5: Classification of Significance

Sensitivity (of the landscape and/or view to change)	Magnitude of Change (adverse or beneficial)					
	Very Large	Large	Medium	Small	Very Small	Negligible
Very High	Substantial-Severe	Substantial	Moderate-Substantial	Moderate	Slight-Moderate	Slight
High	Substantial	Moderate-Substantial	Moderate	Slight-Moderate	Slight	Neutral-Slight
Medium	Moderate-Substantial	Moderate	Slight-Moderate	Slight	Neutral-Slight	Neutral
Low	Moderate	Slight-Moderate	Slight	Neutral-Slight	Neutral	Neutral
Very Low	Slight-Moderate	Slight	Neutral-Slight	Neutral	Neutral	Neutral

The criteria used to define significance thresholds in Table 4.5 are given below:

Severe: adverse	Large scale effects at complete variance with the scale and pattern of the landscape. Loss of valued elements or characteristics to landscapes of highly distinctive character. Introduction of intrusive elements, which dominate the view. Effects cannot be mitigated. Major issue in the decision making process.
Substantial: adverse	Large scale effects at considerable variance with the scale and pattern of the landscape. Loss of valued elements or characteristics to landscapes of distinctive character. Introduction of intrusive elements, which are a significant feature of the view. Effects cannot be fully mitigated. Important issue in the decision making process.
Moderate: adverse	Medium scale effects at variance with the scale and pattern of the landscape. Loss of valued elements or characteristics to landscapes of recognisable character. <i>Introduction of intrusive elements which are a noticeable feature of the view.</i> Effects may not be fully mitigated. Potentially Important issue in the decision making process.
Slight: adverse	Small scale effects at some variance with the scale and pattern of the landscape. Loss of valued elements or characteristics to landscapes of undistinguishable character. Introduction of intrusive elements, which are a minor feature of the view. Effects capable of being mitigated. Unlikely to be an important issue in the decision making process.
Neutral:	No discernible effects (adverse or beneficial) on landscape elements, characteristics and/or on views.
Slight: beneficial	Small scale effects that fit in with the scale and pattern of the landscape Improvement or removal of damaged or degraded elements to landscapes of distinctive character. Introduction of elements, which are a minor and positive feature of the view. Unlikely to be an important issue in the decision making process.
Moderate: beneficial	Medium scale effects that fit well with the scale and pattern of the landscape. Improvement or removal of damaged or degraded elements to landscapes of recognisable character. Introduction of elements, which are a noticeable and positive feature of the view. Potentially Important issue in the decision making process.
Substantial: beneficial	Large scale effects that fit very well with the scale and pattern of the landscape. Improvement or removal of damaged or degraded elements to landscapes of undistinguishable character. Introduction of elements, which are a significant and positive feature of the view. Important issue in the decision making process.

4.5.6 Operational Effects on Landscape Fabric

This section considers the physical changes to the baseline landscape fabric of the site that will arise from the wind farm development. Landscape fabric is the physical pattern of elements such as vegetation, landform, land use and other features that combine to create landscape character. The effects of a development on landscape fabric are those that alter the physical pattern of elements. These effects are restricted to the landscape within which the development is located as it is within this area that the physical pattern of elements will alter, for instance through loss of vegetation, re-contouring or changes to land use.

For those landscape elements, or receptors, where an effect is predicted an assessment is made of their sensitivity to the wind farm. This is followed by a description of the impact arising from the wind farm and an assessment of the magnitude of change. Both the sensitivity and magnitude of change are assessed against Table 4.4a, from which a judgement is made of the level of significance, based on Table 4.5. Indirect effects arising

from the visible presence of the wind turbines and ancillary features on the wider landscape are considered in the following section with respect to landscape character.

A summary of predicted operational effects on the landscape fabric of the wind farm site is given in Table 4.7 at the end of this chapter. This identified just one landscape element existing on the wind farm site that will undergo physical effects. This is the agricultural land that covers the whole of the site.

4.5.6.1 Agricultural Land

Sensitivity

Agricultural land of the type identified in the baseline conditions section and which covers the wind farm site is a characteristic component of this particular landscape. As a resource, however, it is neither rare nor unusual within the wider locality. Whilst the quality, or condition, of the agricultural land is generally good in that it is well managed, its overall value is considered to be low. Furthermore, it can be easily replaced following operations on site, both during the construction and decommissioning stages, as it does not require a lengthy regeneration period. This combination of factors results in a low sensitivity.

Magnitude of Change

The introduction of the wind turbines, access tracks and substation will result in some unavoidable loss of agricultural land, the effects of which will last until the end of its operational life. However, the amount of land lost will be relatively small and it will be possible to mitigate these effects through the restoration of the agricultural land immediately following completion of the construction and decommissioning stages. The magnitude of change is therefore assessed as very small.

Significance of Effect

The significance of the physical effect of the wind farm on the agricultural land of the site is assessed as neutral and will not be significant.

4.5.7 Operational Effects on Landscape Character

Through the landscape character process and definition of designated areas the landscape can be divided into areas that are considered to be important or valuable. However, although the character of these areas is largely defined by what occurs within them, the perception of them is also influenced by the context of their setting. Hence the perception of a landscape can alter by the visible presence of an uncharacteristic feature in the wider view, even though the affected landscape may not be physically altered. The influence that views of a development will have on the perception of a particular area will be dependent on the inherent characteristics of the area, the nature of the development, the extent that it will be visible and the intervening distance.

This section considers the mainly indirect effects of the wind farm on the perception of those landscape character types and areas, or receptors, identified in the baseline section of this chapter. Only those character types that will gain visibility of some, or all, of the wind farm have been assessed and, of these, only those where the effect on perception is judged to be significant are considered here. Character types with no available views of the wind farm and whose perception will remain unaltered have been excluded from the assessment process.

This has been determined by initial reference to the ZTVs (Figures 4.5-4.6) and an analysis of the extent of visibility indicated. From this sieving exercise a short list of character areas has been identified with potential for significant effects for which further assessment is

required. Analysis of the representative viewpoints and computer generated wirelines, as well as other plans and photographs, has then been carried out for the short listed receptors to identify the presence of screening features that might limit visibility and so determine likely levels of impact and significance.

For each receptor where a significant effect is predicted an assessment is made of its sensitivity to the proposed development. This is followed by a description of the changes to the landscape arising from the wind farm and an assessment of the magnitude of change. Both the sensitivity of the baseline landscape and the magnitude of change are assessed against the criteria given in Table 4.4a. From this, an assessment of the level of significance has been determined with reference to Table 4.5.

Many of the landscape character types included in the assessment are extensive and the effects of the wind farm can vary widely across a single character type. The distinction between areas where effects may be significant and where effects will not be significant within the same character type is of particular importance in the assessment. Where this is likely to be the case, the initial assessment has sub-divided the character type into separate areas, or units, which express the differing effects of the wind farm. Where possible the units reflect those that have been identified in other landscape character assessments and are named accordingly.

A summary of predicted operational effects on all landscape character types within the study area is given in Table 4.7 at the end of this chapter. This initial assessment identified one unit of one landscape character type to have potential for a significant effect on landscape character arising from the wind farm. This is the Ingbirchworth unit of the Upland Farm land character type.

The initial assessment found that the other units of this character type and all of the other landscape character types do not have potential to undergo significant effects on landscape character. This is for a number of reasons, including lack of visibility, orientation of landform, screening by vegetation, distance, small number of turbines proposed and, in particular, the presence of Royd Moor Wind Farm in available views.

4.5.7.1 Upland Farm land: Ingbirchworth Unit

Upland Farm land is a relatively narrow landscape character type that adjoins the eastern, lower slopes of the Pennines. For the purposes of this assessment it has been divided into four units as the influence of the wind farm varies widely. This assessment focuses on the Ingbirchworth unit, which covers the wind farm site and a discrete area surrounding it. Viewpoints 1-5 and 24 are located within this unit. The other units lie further away with more limited visibility, and the initial assessment considered them not to have potential for significant effects.

Sensitivity

Upland farm land is an elevated pastoral landscape of moderate to steep slopes with pronounced ridgelines that are often stepped or terraced. The landscape is characterised by a strong, rectilinear pattern of fields enclosed by gritstone walls and lanes. Tree cover is distinctly absent and settlement is limited to small groups of houses and a scattering of stone farmsteads. Many of the farms have modern agricultural buildings that stand out in the open landscape. Other unfamiliar and large-scale features include occasional communications masts and Royd Moor wind farm.

The quality of this landscape character unit is generally good with many of its fundamental features and characteristics being retained. However, some of the features that do remain are often not maintained to the highest standard, such as the gritstone walls. In addition, the introduction of incongruous features such as Royd Moor Wind Farm and modern

agricultural buildings has eroded some of the innate character. Whilst this lowers the sensitivity, the agricultural character of the existing landscape unit is still judged strong enough to be of a medium-high classification.

Magnitude of Change

The magnitude of change will vary across the character type depending upon a number of factors, of which the degree of visibility obtained and distance from which views are obtained are the most important. Analysis of the viewpoints and site visits suggests that where clear and unobstructed views are obtained from up to around 3km from the site, then the magnitude of change would normally be large or very large. This is because the scale, colour, vertical form and movement of the turbines would provide a notable change to the baseline characteristics that would have an immediately apparent and prevailing influence on the landscape character.

However, the presence and close proximity of Royd Moor Wind Farm will ensure that the magnitude of change is less. From the south and west, within this radius, the lower lying landform relative to the site limits visibility such that the proposed turbines will not be seen at full height. In addition, the small number of turbines proposed ensures they will only occupy a relatively small proportion of the ridgeline that is a prominent feature of views from this direction. More importantly, the proposed turbines will mostly be seen behind Royd Moor Wind Farm where the height and spacing of the towers and diameter of the blades shares sufficient similarity that they will read as part of a slightly larger group (See viewpoints 2, 3 and 24 for representative views). As such where clear, direct and open views are possible within a radius of about 3km, the magnitude of change is judged to be very small or small.

In views from the north and east the proposed turbines stand in front of Royd Moor at a similar elevation to the immediate surrounding area with limited vegetation to screen or filter views. Here the presence and larger size of the proposed turbines will be more apparent (See viewpoints 1 and 4 for representative views). However, even in these views the proposed turbines will tend to read as part of a larger group rather than a completely separate site. Thus, where clear and unobstructed views are possible within a radius of about 3km, the magnitude of change is judged to be medium or large.

Significance of Effect

The variation in magnitude of change ensures that the significance of the effect will also vary across the landscape character unit. Where the magnitude of effect is judged to be medium or large, as described above, there will be a significant effect on the landscape character of the Upland Farm land Ingbirchworth unit, with the proposed turbines resulting in a material change to the way in which the landscape character is perceived.

Elsewhere within this unit the effect will be not significant as the wind farm will not have a material and definitive effect on landscape character. Some effect on the landscape character may be apparent, depending on local conditions, but the defining characteristics of the landscape character unit will continue to prevail.

4.5.8 Operational Effects on Designated Areas and Special Interests

This section considers the additional effects of the wind farm site on a specific group of landscape planning designations such as Regional Scenic Areas and other designated features including Historic Gardens. These landscape receptors have a particular character or setting that distinguishes them from surrounding areas and has contributed to their designation. They are generally perceived as having heightened sensitivity to change. As with the landscape character areas described above, any change in this perception will be dependent on available views of the wind farm from all, or part, of the designated area.

Thus only those designations and special interests with some visibility of the wind farm have been assessed and, of these, only those where the effect on perception is considered to be significant are considered here.

A summary of predicted operational effects on all landscape planning designations and other special interests assessed is given in Table 4.7 at the end of this chapter. This initial assessment identified one landscape designation and one Conservation area to have potential for a significant effect arising from the wind farm. These are the BMBC Area of Borough Landscape Value and Ingbirchworth Conservation Area.

The initial assessment found that the other landscape planning designations and special interests do not have potential to undergo significant effects. This is for a number of reasons, including lack of visibility, orientation of landform, screening by vegetation, distance, small number of turbines proposed and, in particular, the presence of Royd Moor Wind Farm in available views.

4.5.8.1 Area of Borough Landscape Value

The Area of Borough Landscape Value extends across most parts of the study area that lie within BMBC to the west of the M1 motorway, and includes the wind farm site. The designation encompasses two broad landscape character types, settled wooded farm land and upland farm land, as well as a narrow swathe of upland river valley, and shares many of their characteristics.

Sensitivity

This is a predominately rolling, rural landscape of irregular fields and narrow lanes bounded by hedgerows, hedgerow trees and small wooded areas that create a sense of enclosure and limit visibility. On more elevated and exposed areas to the west, hedgerows give way to gritstone walls and more open characteristics. The settlement pattern is based around small traditional villages surrounded by scattered farm s and hamlets, although larger urban areas exert an increasing influence around the eastern edge of the designation. Overhead pylons also cross the designation and are detracting features.

The quality of this landscape designation is good with substantial areas of farmed countryside remaining intact and free from the effects of urban encroachment. Some characteristic features have been eroded such as hedgerows and gritstone walls and those that do remain are not always maintained to the highest standard. In addition, the introduction of incongruous features such overhead pylons, modern farm buildings and Royd Moor Wind Farm has further eroded some of the innate character. Whilst this lowers the sensitivity, the rural character of the designation is still judged strong enough to be of a high classification.

Magnitude of Change

As noted in the baseline conditions section, development within this designation will normally only be permitted where

- there is no loss of valuable landscape features
- the nature, form and design of the development is sympathetic to the area
- the overall character and appearance of the area is conserved and wherever possible enhanced

As far as loss of valuable landscape features is concerned, the initial assessment (Table 4.7) identified this to be limited to the localised loss of agricultural land to accommodate the turbine bases, control building and access tracks. Further detailed assessment of the effects on landscape fabric, has established this to be not significant.

In terms of the nature, form and design of the development being sympathetic to the area, clearly the introduction of wind turbines into a landscape designated for its scenic qualities has the potential to be unsympathetic. That said, the presence of Royd Moor Wind Farm has established a precedent whereby these structures are considered to be acceptable. Furthermore, the layout of the proposed wind farm and choice of turbines has deliberately sought to achieve a close fit with Royd Moor so that it appears as a logical extension to the existing wind farm rather than a stand-alone development. In this respect, the proposed wind farm is considered to be sympathetic to the area.

As for conserving and enhancing the character of the area, the ZTV shows continuous theoretical visibility extending for a radius of about 3km around the wind farm site. An analysis of the viewpoints suggests that this would normally result in a large or very large magnitude of change within a radius of about 3km, as the turbines would have a definitive influence on the perceived character of the designation. However, the presence of Royd Moor Wind Farm ensures the magnitude will be less and similar to that predicted for the Ingbirchworth unit of the Upland Farm land landscape character type.

Significance of Effect

The variation in magnitude of change ensures that the significance of the effect will also vary across the landscape designation. Where the magnitude of effect is medium or large (within a 3km radius) there will be a significant effect on the Area of Borough Landscape Value, with the proposed turbines resulting in a material change to the way in which the landscape character of the designation is perceived.

Elsewhere within this designation the effect will be not significant as the wind farm will not have a material and definitive effect on landscape character. Some effect on the landscape character may be apparent, depending on local conditions, but the defining characteristics of the landscape designation will continue to prevail.

4.5.8.2 Ingbirchworth Conservation Area

Sensitivity

The Conservation area covers the southern built-up edge of the settlement extending to both sides of the A629. It comprises of two distinct areas, the first containing a number of properties adjoining the A629 in a linear manner and orientated towards the wind farm site. The second area contains a more compact group of houses and larger farm houses, set back from the road in a shallow valley that is well vegetated. Views towards the wind farm site from this second group of properties are mostly curtailed by rising landform and vegetation. However, properties adjoining the A629 presently have visibility of Royd Moor Wind Farm, as seen in viewpoint 4. Whilst this lowers the sensitivity, the Conservation area is still judged to have a high classification.

Magnitude of Change

The magnitude of change to the setting of the Conservation area will vary according to visibility of the proposed wind farm. That part of the designation that is set back from the A629 and benefiting from screening by landform and vegetation will gain no visibility. However, for properties adjoining the A629 the proposed turbines will be seen in front of Royd Moor Wind Farm at closer proximity (2km).

The magnitude of change arising for these properties would normally be large or very large as the turbines would dominate the baseline view. However, the presence of Royd Moor Wind Farm in the same views will reduce the magnitude of change as the defining characteristics of the view have already been altered. Thus where clear and unobstructed views are possible the magnitude of change is judged to be medium.

Effects on views for those parts of the village not designated as a Conservation area are considered in the following section.

Significance of Effect

The variation in magnitude of change ensures that the significance of the effect will also vary across the conservation area. Where the magnitude of effect is medium, as described above, there will be a significant effect with the proposed turbines resulting in a material change to the way in which the setting of the conservation area is perceived.

4.5.9 Summary of Operational Effects on Landscape Receptors

The initial assessment (Table 4.7) identified no significant effects on the landscape fabric of the wind farm site. This is due to the nature of the site and the development, with effects limited to localised loss of agricultural land to accommodate the turbine bases, control building and access tracks.

Of the eight landscape character types initially assessed, significant effects are predicted for just one unit of landscape character in which the proposed wind farm is sited, namely the Upland Farm land Ingbirchworth unit. Further detailed assessment of this unit concluded that significant effects are likely to be limited to the north and east of the wind farm site for a distance up to 3km, as within this area, the proposed turbines are likely to have an apparent influence on the character of the landscape where they are visible. Elsewhere within this unit the effects will generally not be significant due to a combination of visibility, distance, small number of turbines proposed and the presence of Royd Moor Wind Farm in available views.

Three landscape planning designations have also been assessed. Of these, the initial assessment predicted significant adverse effects for the BMBC Area of Borough Landscape Value, which covers the wind farm site. Further detailed assessment of the designation concluded that significant effects are likely to be similar to those identified for the Ingbirchworth landscape character unit and limited to the north and east of the site for a distance of about 3km. Elsewhere within this designation the effects will generally not be significant due to a combination of visibility, orientation of landform, screening vegetation, distance, small number of turbines proposed and the presence of Royd Moor Wind Farm in available views.

A further forty-eight Conservation Areas have been assessed. Of these, only the setting of the Ingbirchworth Conservation Area is predicted to have significant effects and only then in a localised part of the designation adjoining the A629.

The other landscape character types, designations and special interests were found in the initial assessment to have no potential for significant effects. This is due to a variety of reasons including lack of visibility, orientation of the landform, screening by vegetation, distance, small number of turbines proposed and the presence of Royd Moor Wind Farm in available views.

4.5.10 Operational Effects on Visual Receptors

The assessment of visual effects considers changes that will arise to the composition and character of views within the study area and the effect this has on people. This includes residents, those experiencing the landscape (for example, walkers) and those simply passing through it as part of a journey.

The assessment of effects on views is divided into two parts. The first of these identifies the effects that the wind farm will have on the principal visual receptors within the 15km radius

study area. These are the main settlements, major roads, important rights of way and open spaces where people gather. Each of the principal receptors has been included in the assessment as a specific receptor.

The second part of the assessment broadly identifies effects on local views. The settlement pattern of the study area has resulted in a low-density but fairly continuous development of hamlets, individual houses, farmsteads and local roads in the general vicinity of the wind farm site. These visual receptors are too numerous to be included as specific receptors, but are nonetheless important to the overall assessment. Effects on these local views are drawn from the assessment of the principal receptors.

The assessment of effects on the principal visual receptors has been determined by initial reference to the ZTVs (Figures 4.5-4.6) and an analysis of the visibility indicated. From this sieving exercise a short list of settlements, routes and open spaces have been identified with potential for significant effects for which further assessment is required. Analysis of the representative viewpoints and computer generated wirelines in conjunction with site visits has then been carried out for the short listed receptors to identify the presence of screening features that might limit visibility and so determine likely levels of impact and significance.

For each receptor where a significant effect is predicted an assessment is made of its sensitivity to the proposed development. This is followed by a description of the changes to the views arising from the wind farm and an assessment of the magnitude of change. Both the sensitivity of the baseline landscape and the magnitude of change are assessed against the criteria given in Table 4.4b. From this, an assessment of the level of significance has been determined with reference to Table 4.5.

A summary of predicted operational effects on the principal visual receptors within the study area is given in Table 4.8 at the end of this chapter. The initial assessment demonstrated both the limited visibility that the wind farm has on these receptors, despite the high visibility indicated on the ZTV, and the mitigating effect of Royd Moor Wind Farm in available views. Only a few of the identified receptors will gain some visibility of the proposed turbines and, of these only two settlements are predicted to undergo significant effects. These are the settlements of Ingbirchworth and Maythorn. The initial assessment found that none of the other settlements have potential to undergo significant effects. This is for a number of reasons, including lack of visibility, orientation of landform, screening by vegetation, distance, small number of turbines proposed and, in particular, the presence of Royd Moor Wind Farm in available views.

Nine roads are included as principal receptors: the A616, A628, A629, A635, A636, A637, A642, A6024 and M1 motorway. Effects are predicted for most of these roads, in particular the A616 and A629, but these are not judged to be significant due to a combination of factors including screening vegetation, distance, angle of view, moving nature of the viewer, small number of turbines proposed and the presence of Royd Moor Wind Farm in available views.

Two long distance public rights of way are also included as principal receptors: the Pennine Way and the Trans Pennine Trail. Effects on these routes are not predicted to be significant due to distance, large-scale nature of the landform in which the proposed turbines are seen, small number of turbines proposed and the presence of Royd Moor Wind Farm in available views.

One open space is included as a principal receptor, at Penistone recreation ground. Whilst it will gain some visibility, it is not judged to be significant due to the limited extent of the views, small number of turbines proposed and the presence of Royd Moor Wind Farm in available views.

Each of the principal receptors that are predicted to undergo significant effects are assessed in detail below in order to determine the extent and significance of the effect.

4.5.10.1 Ingbirchworth

This village lies approximately 1.5km to the east of the wind farm site at its closest point. The view gained from here is represented in viewpoint 4.

Sensitivity

The village has a high sensitivity to change due to its residential nature.

Magnitude of Change

The magnitude of change will vary throughout the village depending on visibility gained of the proposed turbines. Many properties have very limited or no visibility of the wind farm site due to the screening effects of a local landform, vegetation and intervening buildings.

The village has, however, extended along the A629 and northwards onto a local crest of higher ground where properties do have clear and unobstructed views of the wind farm site on rising ground. From these locations houses on the built-up edge will gain visibility of all five turbines, mostly at full height, as indicated in the viewpoint. This would normally result in large magnitude of change due to the proximity of the site, direct nature of the outlook, orientation of the views and relatively large proportion of the available view occupied by the turbines. The scale, colour, vertical form and movement of the turbines would provide a notable change to the baseline view that would have an immediately apparent and prevailing influence.

However, the established presence of Royd Moor Wind Farm in these views will have a mitigating effect. The proposed turbines will be seen in close proximity to Royd Moor where they will read as part of a slightly larger group, albeit the proposed turbines will be seen in front of the existing wind farm and extend further along the ridgeline. As such the magnitude of change is judged to be medium.

Significance of Effect

The effect will vary according to the magnitude of change. Many properties will undergo no effect due to a lack of visibility. Some properties may undergo some change but the effect will be not significant due to limited visibility. For those properties that do gain clear and unobstructed views of the proposed turbines in conjunction with Royd Moor Wind Farm the effect will be moderate, and thus significant, due to the high sensitivity of the receptor.

4.5.10.2 Maythorn

This small hamlet lies approximately 1.5km to the north-west. The view gained from here is represented in viewpoint 7, albeit the viewpoint is another 1km distant.

Sensitivity

The hamlet has a high sensitivity to change due to its residential nature.

Magnitude of Change

As with Ingbirchworth, the magnitude of change will vary depending on visibility of the wind farm. The majority of properties are at a similar elevation as the wind farm site and have unobstructed views towards it. This would normally result in large or very large magnitude

of change due to the proximity of the site, direct nature of the outlook, orientation of the views and relatively large proportion of the available view occupied by the turbines.

However, the presence of Royd Moor Wind Farm in these views will have a mitigating effect. The proposed turbines will be seen in close proximity to Royd Moor where they will read as part of a slightly larger group, albeit the proposed turbines will be seen in front of the existing wind farm and closer to the settlement. As such the magnitude of change is judged to be medium.

Significance of Effect

For those properties that gain views of the proposed turbines in conjunction with Royd Moor wind farm, the effect will be moderate, and thus significant, due to the high sensitivity of the receptor.

4.5.10.3 Effects on Local Views

As well as identifying significant effects on principal visual receptors, the assessment of visual effects also identifies effects on local views. This part of the assessment focuses on the area in close proximity to the wind farm site where significant visual effects are most likely to occur. The assessment of effects on local views does not assess effects on specific properties, but draws conclusions as to the likely effects that the wind farm development will have on views from within this area.

Effects on local views have been identified through an analysis of the ZTVs and representative viewpoints (Table 4.9), along with site survey of the area where significant effects are most likely to occur. The ZTVs, viewpoint assessment and site survey indicate this area to be contained within a radius of approximately 3km from the wind farm site. Within this radius, the proximity of the proposed turbines to the viewer and the contrast of their scale, form, colour and movement with the visual setting mean they will generally have a material effect on high sensitive visual receptors, where clear, open and direct visibility is obtained.

Beyond 3km radius the effects of the wind farm are reduced and are unlikely to be significant. The most important and predictable factor in this reduction in effect is the increased distance of the wind farm site from the viewer, which ensures that the turbines are seen as smaller components that occupy a smaller proportion of available views. This is particularly the case in views to the west of the wind farm site. Additionally, the small number of turbines proposed and the presence of Royd Moor Wind Farm in available views combine to ensure the effects of the proposed wind farm are limited beyond this distance.

4.5.10.4 Distribution of Significant Effects on Local Views

Other than the settlements of Ingbirchworth, Millhouse Green, Thurlston and Upper Denby, the area within an approximate radius of 3km of the wind farm site is not heavily populated, but has a fairly continuous, low-density pattern of individual houses, farmsteads and small hamlets as well as a comprehensive network of minor roads, tracks and footpaths. Vegetation cover is limited and sporadic, whilst the landform varies from moderate to steep slopes and narrowly incised valleys.

To the north of the site, between Victoria and High Flatts, the ridgeline on which the wind farm sits continues as a spur of high ground. Settlement consists of scattered farms, houses and small groups of houses, including Maythorn and High Flatts. Many of these properties gain long views towards the wind farm site due to the open nature of the landform and general lack of screening vegetation. Royd Moor Wind Farm is a dominant feature of many of these views and will have a mitigating effect. In views from this direction the proposed turbines will be seen in front of Royd Moor turbines at full height. The layout and spacing of

the proposed turbines sits less comfortably with the existing wind farm than when seen from other parts of the surrounding area and appear somewhat at variance to it. This is seen in viewpoint 7, which is just beyond 3km. Consequently, some of the houses in this area are likely to undergo significant effects arising from the proposed wind farm, including a scattering of properties immediately south of High Flatts.

To the east of the site, between High Flatts and Penistone, the landform dips away more gently as a series of undulating ridges and valleys. With the exception of Ingbirchworth village and Upper Denby, on the limit of the radius, development is sporadic. Visibility of the wind farm site is similar to that obtained from northern parts, although vegetation is slightly more widespread and has some limiting effect. Royd Moor Wind Farm is also a dominant feature of views generally. Viewpoint 4 is located in this part of the study area and illustrates the type of effect the proposed wind farm will have when clearly seen in views. Some houses in this area are likely to undergo significant effects arising from the proposed wind farm, particularly those occupying higher ground along the minor road that links Upper Denby with High Flatts. Some properties in Ingbirchworth will also experience significant effects, as previously identified.

The area to the south of the site, between Penistone and Millhouse Green, is the most populated part. Here, the landform descends steeply from the ridgeline occupied by the wind farm site into the narrowly incised valley corridor of the River Don. This section of the upland valley is almost entirely built-up, however, the steep valley sides and wooded slopes effectively curtail all views towards the wind farm site. On the higher ground above the valley, settlement is limited to a scattering of houses and farmsteads, including Royd Moor farm. However, in most instances views are orientated away from the site or are restricted by local landform. Very few, if any, of these properties will undergo significant effects.

Visibility of the wind farm site from the west, between Millhouse Green and Victoria, continues to be restricted by the prominent ridgeline that defines the Don valley, as seen in viewpoints 5 and 6. Development is sporadic and limited to occasional farmsteads and small groups of houses on the lower slopes above the valley floor, including Catchaw and Crow Edge. Whilst views are possible across the valley towards the wind farm site, the proposed turbines are unlikely to be seen at full height. At close range the steep landform limits views to the hubs and blade tips. Additionally, the proposed turbines will be seen in context with Royd Moor wind farm, which is visible on the ridgeline. In most views from this direction the proposed turbines will be seen behind those of Royd Moor and appear as part of a slightly larger group that occupies a relatively small proportion of much wider views. The few houses and farmsteads in this area are likely to be affected by the proposed turbines to some degree, but the effects are unlikely to be significant.

4.5.11 Summary of Operational Effects on Visual Receptors

The initial assessment (Table 4.8) identified two principal visual receptors, both settlements, which have the potential to undergo significant effects as a result of the wind farm development. These are Ingbirchworth and Maythorn. Further assessment of these receptors concluded that, for those parts of both settlements that gain direct views of the wind farm site, the effects were likely to be significant, even allowing for the presence of Royd Moor wind farm. For other parts of these settlements where there is no visibility, or limited visibility, the effects will not be significant.

The other principal visual receptors included in the initial assessment were found to have no potential to undergo significant effects. This is due to a variety of reasons including lack of visibility, orientation of the landform, screening by vegetation, distance, small number of turbines proposed and the presence of Royd Moor Wind Farm in available views.

There are likely to be significant effects on local views within approximately 3km radius of the wind farm site. However, these will be limited to the north and east where the landform

and lack of screening vegetation allows longer views towards the site and the proposed turbines are seen at full height in front of Royd Moor wind farm. To the south and east of the wind farm site the steep nature of the landform limits or curtails most views and the proposed turbines are mostly seen behind Royd Moor wind farm. As such, significant effects on local views from the south and west are unlikely to occur within this distance.

4.6 CUMULATIVE EFFECTS

4.6.1 Introduction

Having assessed the landscape and visual effects of the wind farm site as a stand-alone development in the previous section, this section considers the additional cumulative effects that might arise from the addition of Spicer Hill to other wind farm developments in the surrounding area. Individually, the effects of these wind farms may not be significant, but when considered together they may create an unacceptable effect on landscape and visual amenity (GLVIA paragraphs 7.12-7.13).

The degree and significance of a cumulative impact arising from the addition of Spicer Hill is dependent on the value, quality and character of the existing landscape or visual receptor, the importance of the landscape or visual receptor, the nature of the viewers, the location of the wind farm site in relation to other wind farms, the degree to which it will add to the developed skyline, the number and scale of wind farms seen at the same time, the distance from the landscape or visual receptor, the extent of the landscape or visual receptor affected by wind farm visibility, and the magnitude of change arising from Spicer Hill itself.

A significant cumulative effect will occur where the addition of Spicer Hill will result in the impression of a landscape or view that is defined by the presence of more than one wind farm and is characterised primarily by wind farms so that other patterns and components are no longer definitive. This varies from the definition of a significant effect in the stand-alone assessment, where the effect of Spicer Hill by itself may result in a material change to the baseline landscape or visual receptors. If Spicer Hill by itself is judged to have a significant effect, it does not necessarily follow that there will also be a significant cumulative effect. This is because it is the addition of Spicer Hill to the cumulative situation of other existing and proposed wind farms that is assessed here, and not the overall cumulative situation with Spicer Hill included.

As with the previous section, this section of the assessment aims to

- Identify those additional landscape and visual impacts that would result directly or indirectly from the addition of Spicer Hill to the existing cumulative situation of the study area
- Estimate the likely magnitude of impacts
- Assess their significance

The approach used is described below. This is derived from a general approach to landscape and visual impact assessment advocated in the GLVIA, as set out in the previous section and applied here. This has been supplemented with more specific guidance on cumulative effects as published by Scottish Natural Heritage (Cumulative Effects of Wind Farm s. Version 2. April 2005).

4.6.2 Approach

SNH guidance identifies three types of cumulative landscape and visual effects, which should be assessed. These are:

- i) Combined (Static) Cumulative Visual Effects – Where two or more wind farms can be observed from the same viewpoint, either at the same time and in the same direction as

a 90° arc of view (simultaneous visibility) or by the observer turning his or her head so that they are seen in succession through a 180° or 360° view (successive visibility)

ii) Sequential Cumulative Visual Effects – Where it is not possible to observe two or more wind farms from the same viewpoint. Instead the observer is required to move to another viewpoint in order to see a second, or more, wind farms. Sequential viewpoints are typically associated with a route or journey

iii) Cumulative Landscape Impacts – These are effects on the surrounding landscape character and on areas of acknowledged value

SNH guidance recommends all wind farms within the study area that are operational, have the benefit of a planning permission (consented), or are awaiting determination of a planning application are assessed against these effects. These sites are listed in Table 4.6 below and are identified on Figure 4.36. This also defines the study area, which, for the purposes of assessing cumulative effects, is extended to cover a radius of 30km from the wind farm site. Experience shows that significant cumulative effects may occur beyond the 15km radius study area for the stand-alone assessment, but are unlikely to occur where there is more than 30km between wind farm sites.

All wind farms within this extended area that are operational, consented or are currently undetermined as of a cut-off date of 31 January 2008, are identified. For each site a 15km radius circle is drawn around it to illustrate the extent of individual ZTVs and potential overlapping. However, for the subsequent assessment of cumulative effects only those wind farm sites for which ZTV extends into the 15km radius study area for Spicer Hill are considered, as listed in the Table below.

Table 4.6: Wind farm Proposals With Overlapping ZTVs Within 15km Radius Of The Wind farm Site As 31 January 2008

Wind farm Site	Planning Authority	Status	No of Turbines	Blade Tip Height (m)	Distance (approx) See note below
Blackstone Edge	BMBC	Planning	3	125	500m
Hazlehead	BMBC	Consented	3	100	2.5km
Royd Moor	BMBC	Operational	13	54	100m
Sheephouse Heights	BMBC	Planning	5	-	5.5km

Wind farm details obtained from developer applications and BMBC

Distance is calculated from the edge of Spicer Hill Wind Farm site to the nearest turbine on an adjacent site.

From this base information a cumulative ZTV has been prepared for each site in combination with Spicer Hill. These are illustrated on Figures 4.32 to 4.35. Each ZTV covers a radius of 30km from the wind farm site and is calculated to blade-tip based on information made available at the time of the assessment. A further cumulative ZTV has been prepared to show Spicer Hill added to all operational, consented or undetermined wind farm sites. This is illustrated on Figure 4.36. The ZTVs have been analysed to ascertain the extent of potential overlapping, or cumulative visibility, firstly with Spicer Hill added to those operational and consented sites, followed by Spicer Hill added to those undetermined sites.

A series of wirelines have also been prepared to illustrate the potential cumulative effects of Spicer Hill when added to those operational, consented and undetermined wind farms as seen from a number of viewpoints. These are illustrated on Figures 4.37a to 4.45b. A total of nine viewpoints have been agreed with BMBC as best representing cumulative effects from a range of viewing orientations and distances. These have been selected from the original viewpoints assessed in the previous section and are listed below, together with their

approximate distance from Spicer Hill. An analysis of these cumulative viewpoints is given in Table 4.10 at the end of this chapter.

- Viewpoint 3: Royd Moor viewing area (1km to closest wind turbine)
- Viewpoint 4: Ingbirchworth/A629 (1.75km to closest wind turbine)
- Viewpoint 5: Crow Edge/A616 (1.75km to closest turbine)
- Viewpoint 6: Trans Pennine Trail (2km to closest wind turbine)
- Viewpoint 7: Low Common, Holmfirth (3.5km to closest wind turbine)
- Viewpoint 9: A628/A629 (5km to closest wind turbine)
- Viewpoint 11: Pike Lowe, Midhope Moors (7.5km to closest turbine)
- Viewpoint 15: Swains Head/Howden Edge (8km to closest wind turbine)
- Viewpoint 20: West Nab, Meltham Moor (13km to closest wind turbine)

For each viewpoint two wirelines have been prepared. The first wireline represents the theoretical view an observer would have of two or more wind farms from the viewpoint without turning his or her head, illustrated as a 90° arc of view centred on Spicer Hill (simultaneous visibility). The second wireline represents the theoretical view an observer would have of two or more wind farms from the same viewpoint but having to turn his or her head to do so, illustrated as a 360° arc of view (successive visibility).

In all cases Spicer Hill (proposed) turbines are shown in dark blue, whilst Royd Moor (operational) turbines are shown in Red, Hazlehead (consented) turbines are shown in purple, Blackstone Edge (undetermined) turbines are shown in green and Sheephouse Heights (undetermined) turbines are shown in light blue.

4.6.3 Cumulative Wind Farm Visibility: Spicer Hill with Operational and Consented Sites

This section considers the potential effects that the addition of Spicer Hill will have on those operational wind farm sites that form the baseline cumulative visibility. Wind farm sites with the benefit of a planning consent, but not yet erected, are also considered here in view of their likely imminent construction. These sites are

- Royd Moor (operational) -13 turbines adjoining Spicer Hill
- Hazlehead (consented) – 3 turbines approximately 2.5km west of Spicer Hill

4.6.3.1 Cumulative Effects of Spicer Hill with Royd Moor and Hazlehead

The cumulative ZTV for Spicer Hill in combination with Royd Moor (Figure 4.32) shows remarkable similarity, as would be expected given the immediate proximity of these sites to each other. Whilst the degree of overlap is indicative of widespread cumulative visibility, in reality the five proposed turbines will appear as part of a slightly larger wind farm in views from around the study area. This is borne out by the stand-alone assessment where Royd Moor forms part of the baseline conditions. The height of the turbines is also of sufficient similarity to allow visual integration, with Royd Moor turbines 35m to hub with a 40m rotor diameter and Spicer Hill turbines slightly larger at 56m to hub with a 56m rotor diameter. This similarity is evident from the various cumulative viewpoints, but particularly 5, 6, 11 and 15, where, in the corresponding wirelines, the height, spacing and rotor diameter of Spicer Hill turbines is almost indistinguishable from those of Royd Moor. As such, whilst the addition of Spicer Hill to Royd Moor will result in some localised cumulative effects, these are not considered to be significant.

The cumulative ZTV for Spicer Hill in combination with Hazlehead (Figure 4.34) shares many similarities with Royd Moor above, as would be expected given their relative proximity to each other. The essential differences relate to localised areas lying immediately north and east of Spicer Hill, extending for a distance of about 5km. Here landform generally precludes views of Hazlehead sited within the Upper Don Valley and therefore cumulative effects will not occur, as only Spicer Hill will be visible. To the immediate south and west of

Spicer Hill, within the Upper Don valley, both sites are visible and potential for significant cumulative effects exists by virtue of the greater separation between them, such that they read as separate sites, and the enclosed nature of views within the valley. However, the number of turbines visible in available views is small (8 no.) and therefore any cumulative effects are likely to be localised. Beyond the valley, the small number of turbines will generally be seen in the context of open and expansive scenery where they will occupy a small proportion of available views. As such, whilst Spicer Hill in combination with Hazlehead may result in some significant, but localised, cumulative effects within the Upper Don Valley, beyond the valley the effects will not be significant.

When all three wind farms are considered together in views from around the study area, the location of Spicer Hill ensures that it is almost indistinguishable from Royd Moor and cannot be discerned as a separate wind farm site. Cumulative visibility within the study area will continue to be affected by Royd Moor in combination with Hazlehead and the addition of the five proposed turbines will not significantly increase the wind farm influence. In this context, Spicer Hill will have no significant cumulative effects as the addition of the site to those operational and consented sites will not result in the impression of a landscape or view that is defined by the presence of more than one wind farm and is characterised primarily by wind farms to the extent that other patterns or components are no longer definitive.

4.6.4 Cumulative Wind farm Visibility: Spicer Hill with Undetermined Sites

This section considers the potential cumulative effects that the addition of Spicer Hill will have on those submitted, but not as yet consented, wind farm application sites. These are considered separately in view of uncertainties surrounding their progress through the planning process, which may result in changes to a layout, a refusal or even the withdrawal of an application. The undetermined sites are

- Blackstone Edge - 3 turbines approximately 1km north-west of Spicer Hill
- Sheephouse Heights - 5 turbines approximately 5.5km south-east of Spicer Hill

4.6.4.1 Cumulative Effects of Spicer Hill with Blackstone Edge and Sheephouse Heights

The close proximity of Spicer Hill to Blackstone Edge is such that the five proposed turbines appear as part of a larger wind farm in views from around the study area. This is largely borne out by the cumulative ZTV for Spicer Hill in combination with Blackstone Edge (Figure 4.33). This shows a close similarity between both sites, with the only appreciable difference being additional visibility of Blackstone Edge turbines from the upper slopes of the densely populated valleys that lie to the north. Blackstone Edge turbines are larger than those of Spicer Hill at 80m to hub with a 90m rotor diameter, but in the majority of cumulative viewpoints both sets of turbines appear balanced and integrated, if somewhat elongated overall. This is evident in viewpoints 3, 4, 7 and 9. As such, the addition of Spicer Hill to Blackstone Edge is considered to have no significant cumulative effects.

The cumulative ZTV for Spicer Hill added to Sheephouse Heights (Figure 4.35) shows areas of overlapping visibility as well as distinct areas where one or other wind farms is visible. The latter relates primarily to the lower lying valleys that separate the high ground on which these sites are located. Where overlapping visibility occurs cumulative effects will arise by virtue of the distance that separates these sites such that they read as distinctly separate wind farms in views from within the study area. However, the combined number of turbines (10 no.) is small and they will generally be seen in the context of open and expansive scenery where they will occupy a small proportion of available views. As such whilst Spicer Hill in combination with Sheephouse Heights will result in cumulative effects, these are not judged to be significant.

When all three wind farms are considered together, the location of Spicer Hill relative to Blackstone Edge is such that it cannot be discerned as a separate wind farm site and,

therefore, it will not increase the wind farm influence to any significant degree. Cumulative visibility within the study area will continue to be affected by a slightly larger Blackstone Edge in combination with Sheephouse Heights. In this context, Spicer Hill will have no significant cumulative effects as the addition of the site will not result in the impression of a landscape or view that is defined by the presence of more than one wind farm and is characterised primarily by wind farms to the extent that other patterns or components are no longer definitive.

4.6.5 Cumulative Wind farm Visibility: Spicer Hill with Operational, Consented and Undetermined Sites

This section considers the potential cumulative effects that the addition of Spicer Hill will have on those operational, consented and undetermined wind farm sites together.

4.6.5.1 Cumulative Effects of Spicer Hill with Royd Moor, Hazlehead, Blackstone Edge and Sheephouse Heights

The cumulative ZTV for all five wind farm sites (Figure 4.36) shows that most overlapping and potential for significant cumulative effects occurs within a radius extending up to about 3km from the wind farm site. Within this radius the magnitude of change will vary depending on the amount of visibility gained of two or more sites. In certain locations views will be curtailed by landform, vegetation and buildings. In other locations some limited visibility will be obtained but this will not be significant. Where clear and unobstructed views are possible of two or more wind farms then the effects are likely to be significant. This can be seen in cumulative viewpoints 4 and 5 in particular where the addition of Spicer Hill to Royd Moor and Blackstone Edge will result in an array of turbines that start to dominate the ridgeline above the Upper Don Valley. In localised views to the east and west of these sites cumulative effects are likely to be significant.

Beyond this radius, the proximity of Spicer Hill to Royd Moor and Blackstone Edge in particular is such that these sites will increasingly appear as a relatively compact cluster in views that are open and expansive. In addition Spicer Hill is almost indistinguishable and cannot be discerned as a separate site, as can be seen in cumulative viewpoints 9, 11, 15 and 20. Thus cumulative visibility within the study area will continue to be affected by Royd Moor, Hazlehead, Blackstone Edge and Sheephouse Heights, and the addition of five proposed turbines will not significantly increase the wind farm influence. In this context, Spicer Hill will have no significant cumulative effects beyond 3km as the addition of the site to those operational, consented and undetermined sites will not result in the impression of a landscape or view that is defined by the presence of more than one wind farm and is characterised primarily by wind farms to the extent that other patterns or components are no longer definitive.

4.6.6 Summary of Cumulative Wind farm Effects

The assessment has shown that the addition of Spicer Hill to the existing operational and consented cumulative situation will not result in any significant cumulative effects. This is due to the visual and physical integration between Spicer Hill and Royd Moor, which ensures that Spicer Hill will always appear as part of a slightly larger wind farm rather than a separate site and, thus, will not make a significant addition to the baseline cumulative situation.

The assessment has also shown that the addition of Spicer Hill to those undetermined wind farm sites will not result in any significant cumulative effects. This is because of the close proximity between Spicer Hill and Blackstone Edge, which also ensures that Spicer Hill will appear as part of a larger wind farm site rather than a separate site, with no significant addition to the cumulative situation.

An assessment of Spicer Hill in combination with all operational, consented and undetermined sites has shown some potential for localised significant cumulative effects in close range views to the immediate east and west of the wind farm site, extending for a radius up to about 3km. Here Spicer Hill in combination with Royd Moor, Hazlehead and Blackstone Edge will have a greater visible presence that is likely to convey the impression of a landscape or view that is defined by wind farms. Beyond this distance cumulative effects are unlikely to be significant.

4.7 SUMMARY OF EFFECTS

The landscape and visual assessment has looked at the potential effects that the wind farm may have on the physical landscape elements of the wind farm site itself, on the landscape character of the study area, and on key visual receptors within the study area. The assessment has also considered the additional effects of the wind farm site when added to other existing and proposed wind farm developments within the study area. Significant effects have been identified in respect of the following

- Ingbirchworth unit of the Upland Farm land landscape character type, extending for a distance of about 3km north and east of the wind farm site
- Area of Borough Landscape Value, extending for a distance of about 3km north and east of the wind farm site
- Ingbirchworth Conservation Area on either side of the A629
- houses on the western edge of Ingbirchworth and adjoining the A629
- small group of houses at Maythorn
- local views from individual houses, farmsteads and roads, primarily to the north and east of the wind farm site, extending for a distance of about 3km
- landscape character and local views for a distance of about 3km east and west of the wind farm site, arising from the addition of Spicer Hill to Royd Moor, Hazlehead and Blackstone Edge

These effects arise from the addition of the turbines rather than other components of the wind farm development and are considered to be adverse since they will not result in specific benefits to the affected landscape or views.

Beyond those significant adverse effects identified above, the wind farm is likely to have an effect on some of the other landscape character areas or views but these are not judged to be significant.

4.8 STATEMENT OF SIGNIFICANCE

The assessment of effects on the landscape and visual resource of the study area has demonstrated that the proposed Spicer Hill Wind Farm development will have localised significant effects on landscape character and views within close proximity of the wind farm site. Whilst these local effects are considered to be significant, in the wider context the proposed wind farm is judged capable of being accommodated without bringing about an unacceptable change to the landscape and visual resource of the study area. This acceptability is due in part to the design of the wind farm and the landscape and visual context in which it will be seen.

There are two aspects of the wind farm design that are of particular importance, notably the number and layout of turbines proposed and the way in which they will be seen in views from around the study area. This is a relatively small wind farm in terms of turbines and, in general terms, the fewer the turbines the lower the landscape and visual impact. This is because the turbines will be seen from fewer locations and will only occupy a small proportion of views, leaving more of the view unaffected.

The layout and appearance of the turbines is equally important, since well designed wind farms that avoid gaps, clusters, overlapping and notable scale differences are generally less prominent and more acceptable than those that do not. These factors have been taken into account in the design of Spicer Hill, as has its close proximity to Royd Moor wind farm. The objective has been to create an even and regular grouping that responds to the regimented layout of Royd Moor with turbine type and height selected to match Royd Moor turbines as far as is practicable. The result of this embedded mitigation is a reduced effect on the landscape and visual resources of the study area as the proposed turbines appear as a logical extension to Royd Moor rather than a distinctly separate site.

The context in which the turbines will be seen is fundamental to its acceptability for several reasons. Landscapes that are large in scale, open with relatively uniform land cover generally have a greater capacity to accommodate wind farms since they avoid awkward scale comparisons that can arise with landscapes that are small scale, intimate or enclosed. This is generally the case in views towards the wind farm site where the turbines are seen against the backdrop of a large scale and elevated plateau landform where they appear as relatively small features.

The presence of screening features, particularly vegetation, can also play an important role in reducing wind farm visibility. The level of vegetation found across the study area is relatively sparse, but in more sheltered northern and eastern parts the higher incidence of wooded areas and hedgerows does afford screening and filtering of views that might otherwise be significant.

In planning designation terms the wind farm is considered acceptable as it will not have significant effects on any nationally designated areas, including the Peak District National Park and those Registered Parks and Gardens identified within the study area. At a regional level, localised significant effects of the Barnsley Area of Borough Landscape Value have been identified but are considered to be acceptable.

The absence of significant cumulative effects is another important consideration in the acceptability of the wind farm site since it increases the ability of the landscape and visual resource to accommodate the wind farm. In this respect the close visual and physical integration that is achieved with Royd Moor Wind Farm in particular ensures that Spicer Hill does not increase the wind farm influence within the study area.

The above aspects of the proposed wind farm in combination with the landscape and visual attributes of the study area combine to make the proposed Spicer Hill Wind Farm acceptable in landscape and visual terms. This is despite the presence of localised significant effects that will occur in close proximity to the wind farm site.

**Table 4.7: Summary of Predicted Operational Effects on Principal Landscape Receptors Within 15km Radius Study Area
(Site Fabric, Landscape Character, Landscape Designations and Special Interests)**

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Site Fabric			
Landform	Within site boundary	None	No, as no change to existing situation.
Drainage	Within site boundary	No impact on above ground watercourses.	No, as no change to existing situation.
Land Use	Within site boundary	Localised loss of improved pastures and rougher grazing to accommodate access tracks, turbine bases and sub station.	No, there may be some very limited effect, but this will not be significant.
Vegetation	Within site boundary	None	No, as no change to existing situation.
Features	Within site boundary	None	No, as no change to existing situation.
Landscape Character Areas			
A. Unenclosed Moorland	1.5-15km S-W	The ZTV shows variable theoretical visibility with east facing slopes gaining views towards the site, mainly from distances of between 5km and 15km away. The character is a transitional one with open moorland merging with lower lying areas to the east. Man-made influences are largely absent although Emley Moor mast provides a strong influence in views. Royd Moor windfarm also has a visible presence (VP 11, 13, 15, 19, 20 and 22 represent the character). The combination of distance, open and large-scale nature of the receiving landscape and presence of other detracting features will reduce the influence of the proposed turbines. In most views the turbines will occupy a small part of an extensive skyline and form a relatively minor component in the view. For the area that lies closest to the site (1.5-5km) and forms part of the Thurlston & Langsett unit, the proposed turbines will generally be seen behind Royd Moor windfarm and read as part of a slightly larger group rather than as new intrusive features in the landscape (VP 10 is representative of this unit).	No, there may be some effect, but this will not be significant due to: The large-scale and open plateau landform that provides the context in which the proposed turbines will be seen; Small part of the available views occupied by the proposed turbines; Distance from the site, which is mostly beyond 5km. Small number of turbines proposed; Presence of Emley Moor mast, which is a noticeable feature of views towards the site; Presence of Royd Moor windfarm in views, which visually integrates the proposed turbines.
B. Upland River Valley	2-15km S-SE	The ZTV shows patchy theoretical visibility extending over a narrow corridor from just west of Penistone to Thurgoland, 2-9km south of the site. Visibility along this section is in fact very limited due to screening by local landform, vegetation and buildings. Long views towards the site are mostly limited to a 1-2km section at the limit of the character area immediately west of Penistone, about 2km south	No, there may be some effect, but this will not be significant due to: Limited visibility as shown on the ZTV; Further screening by local landform, vegetation and buildings; Small number of turbines proposed; Presence of Royd Moor windfarm in views, which visually integrates the proposed turbines.

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
		of the site. Here the site is seen as part of an extensive ridgeline that defines the valley sides. Royd Moor windfarm occupies a small proportion of the ridgeline. The proposed turbines are generally seen behind those of Royd Moor with the height and spacing of the towers and diameter of the blades sharing sufficient similarity that they will appear as part of the existing windfarm rather than as new intrusive features in the landscape (VP 6 represents the character area).	
C. Lowland River Floor	10-15km NE	The ZTV shows limited, patchy theoretical visibility, which is gained from around 8km away.	No, there is unlikely to be any effect due to: Limited visibility as shown on the ZTV; Further screening by woodland, hedgerows and motorway on embankment; Distance from the site, which is a minimum of 8km.
D. Coalfield Estatelands	10-15km NE	The ZTV shows limited, patchy theoretical visibility, which is gained from about 10km away.	No, there is unlikely to be any effect due to: Limited visibility as shown on the ZTV; Further screening by woodland and hedgerows; Distance from the site, which is a minimum of 10km.
E. Settled Wooded Farmland	2.5-15km N-E	The ZTV shows patchy theoretical visibility across the character area, the majority of which lies 5-15km from the site. Visibility is limited due to the relatively low-lying landform and dense network of wooded areas and hedgerows that characterises the area (See VP 12). For one small area that lies closest to the site (2.5-5km) the landform is also orientated away from it. Where views are available, the proposed turbines will be seen in close association with Royd Moor windfarm and will appear as part of a slightly larger group rather than as new intrusive features.	No, there may be some effect but this will not be significant due to: Patchy visibility as shown on the ZTV; Further screening by local landform, woodland and hedgerows; Distance from the site, which is mostly beyond 5km; Small number of turbines proposed; Presence of Royd Moor windfarm in views, which visually integrates the proposed turbines.
F. Upland Farmland: F1. Ingbirchworth unit	Within and surrounding the site	The site lies within this unit and the ZTV shows continuous visibility. VP 1 represents this unit.	Yes, parts of the character unit in close proximity to the site maybe significantly affected by windfarm visibility.
F. Upland Farmland: F2. Holmfirth and Meltham unit	1.5-15km NW	The ZTV shows patchy theoretical visibility on south-east facing slopes that overlook densely populated valleys, at distances beyond 5km. For one small area that lies close to the site (1.5-5km) the landform is orientated away from it. Where views are available, the proposed turbines will be seen in close association with Royd Moor windfarm and appear as part of a slightly larger group rather than as new intrusive features in the landscape.	No, there may be some effect, but this will not be significant due to: Limited visibility as shown on the ZTV; Distance from the site, which is mostly beyond 5km; Small number of turbines proposed; Presence of Royd Moor windfarm in views, which visually integrates the proposed turbines.
F. Upland Farmland: F3. Penistone and Stocksbridge unit	2.5-10km SE	The ZTV shows relatively high theoretical visibility over elevated areas south of Penistone. The landform here is generally orientated north-east away from the site. Royd Moor windfarm is also a feature of existing views. The proposed turbines will be	No, there is likely to be some effect but this will not be significant due to: Orientation of the landform; Small number of turbines proposed; Presence of Royd Moor windfarm in views, which visually integrates the

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
		mostly seen from behind the existing windfarm, which will reduce their influence.	proposed turbines.
F. Upland Farmland: F4. Wharnccliffe unit	10-15km SE	The ZTV shows patchy theoretical visibility, which is gained from around 10km away.	No, there is unlikely to be any effect due to: Very limited visibility as shown on the ZTV; Further screening by local landform, vegetation and buildings; Distance from the site, which is a minimum of 10km.
G. Settled Valleys	5-15km NW-N	The ZTV shows very limited, patchy theoretical visibility, which is gained from around 10km away.	No, there is unlikely to be any effect due to: Very limited visibility as shown on the ZTV; Further screening by local landform, vegetation and buildings; Distance from the site, which is a minimum of 10km.
H. Reservoir Valleys	10-15km S-W	The ZTV shows there is no windfarm visibility from within this character area.	No, as no change to existing situation.
Landscape Designations			
Peak District National Park	1.5km closest point, extending over most of southern and western parts of the study area	The ZTV shows patchy theoretical visibility across the highest parts of the designation, extending for a distance of about 10km from the eastern boundary. The Park encompasses an open and expansive landscape dominated by rough grassland, heather and moor. Man-made influences are largely absent although Emley Moor mast provides a strong influence in views from the eastern edge of the Park. Royd Moor windfarm is also a visible feature in many views. The proposed turbines will cover a small part of an extensive skyline when seen from the Park and will form a minor component in views. The presence of Royd Moor windfarm will also reduce their visual influence, as they will generally seen behind the existing windfarm in views from this direction and read as part of a slightly larger group. (See VP 10, 11, 13, 15, 19, 20 and 22 for representative views).	No, there may be some effect, but this will not be significant due to: - The large-scale and simple plateau landform that provides the context in which the proposed turbines will be seen; - Small part of the available views occupied by the proposed turbines; - Distance from the site, which is mostly beyond 5km. - Small number of turbines proposed; - Presence of Emley Moor mast, which is a noticeable feature of views towards the site; - Presence of Royd Moor windfarm in views, which visually integrates the proposed turbines.
Area of Borough Landscape Value	Within and surrounding the site, extending across much of eastern parts of the study area	The ZTV shows continuous theoretical visibility extending for a radius of about 4km around the site. Occasional shelterbelts and local landform will provide some screening, but within this radius the proposed turbines are likely to have some definitive influence on the perceived character of the designation (See VP 1-9 for representative views). At greater distances, the small number of turbines proposed coupled with the close relationship with Royd Moor windfarm, increasing incidence of screening	Yes, parts of the landscape designation in close proximity to the site maybe significantly affected by windfarm visibility.

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
		vegetation and proximity of more extensive built development is such that, whilst the proposed turbines will have some effect on the character of the designation, it is unlikely to be significant (See VP 14, 17 and 18 for representative views).	
Area of High Landscape Value	2.5km closest point, extending over northern parts of the study area	The ZTV shows very patchy theoretical visibility extending across this designation but at distances generally beyond 5km from the site. At this distance the small number of turbines proposed combined with the close relationship with Royd Moor windfarm, relatively high incidence of screening vegetation and proximity to heavily populated areas is such that, whilst the turbines will have some effect on the character of the designation, it is unlikely to be significant. Emley Moor mast also provides a strong influence in views from the north (See VP 12 and 21 for representative views).	No, there may be some limited effect, but this will not be significant due to: • Limited visibility as shown on the ZTV; • Further screening provided by woodland and hedgerows; • Distance from the site, which is mostly beyond 5km; • Small number of turbines proposed; • Presence of Emley Moor mast, which is a prominent feature of views towards the site; • Presence of Royd Moor windfarm in available views, which visually integrates the proposed turbines.
Special Interests:			
Registered Parks and Gardens			
Bretton Hall	9.0km closest point to NE	The ZTV shows theoretical visibility extending over rising ground that lies to the north of Lower Lake and is orientated towards the site. This part of the grounds contains the main hall and is also the location for Yorkshire Sculpture Park. The closest views are gained at a distance of about 10km from the site. In reality views are screened or filtered by dense woodland that characterises the historic grounds, although it is just possible to see Royd Moor windfarm where gaps in the vegetation occur. VP 18 represents views from here.	No, there may be some limited effect, but this will not be significant due to: • Limited visibility as shown on the ZTV; • Further screening provided by woodland both within and beyond the grounds; • Distance from the site, which is a minimum of 10km; • Small number of turbines proposed; • Presence of Royd Moor windfarm in available views, which visually integrates the proposed turbines.
Cannon Hall	6.5km closest point to NE	The ZTV shows theoretical visibility extending over southern parts of the grounds that contains the hall and ornamental lakes. In reality the site is not visible from here due to the low-lying landform and dense woodland that characterises the grounds. Some glimpsed views of Royd Moor windfarm are possible from the local road that defines the western boundary of the estate.	No, there may be some very limited effect, but this will not be significant due to: • Limited visibility as shown on the ZTV; • Low-lying enclosed landform; • Further screening provided by woodland both within and beyond the grounds; • Distance from the site, which is a minimum of 6.5km; • Small number of turbines proposed; • Presence of Royd Moor windfarm in available views around the perimeter of the estate.
Locke Park	12.5km closest point due east	The ZTV shows theoretical visibility extending across this small urban park on the edge of Barnsley. In reality views towards the	No, there is unlikely to be any effect due to: • Limited visibility as shown on the ZTV;

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
		site are screened by intervening buildings and vegetation.	• Further screening provided by buildings and vegetation; • Distance from the site, which is a minimum of 12.5km.
Wentworth Castle	10.5km closest point due east	The ZTV shows theoretical visibility extending up to the western boundary of the grounds. However, dense woodland along this boundary curtails all views towards the site. It is not even possible to see Royd Moor windfarm from the top of the ornamental tower that sits within the grounds forming part of Stainborough Castle.	No, there is unlikely to be any effect due to: • Very limited visibility as shown on the ZTV; • Relatively low-lying enclosed landform; • Further screening provided by dense perimeter vegetation; • Distance from the site, which is a minimum of 10.5km.
Wortley Hall	11.0km closest point to SE	The ZTV shows theoretical visibility extending up to the western boundary of the grounds. In reality the site is not visible from here due to the relatively low-lying landform and dense woodland that characterises the grounds and surrounding area.	No, there is unlikely to be any effect due to: • Very limited visibility as shown on the ZTV; • Relatively low-lying enclosed landform; • Further screening provided by woodland both within and beyond the grounds; • Distance from the site, which is a minimum of 11km.
Conservation Areas			
Almondbury Common	10.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Armita Bridge	11.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Barnsley Town Centre	13.0km to E	The ZTV shows no visibility.	No, due to lack of visibility.
Bolsterstone	10.0km to SE	The ZTV shows almost no visibility.	No, due to lack of visibility.
Brigholmelee	12.5km to SE	The ZTV shows no visibility.	No, due to lack of visibility.
Butterley	5.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Cawthorne	7.5km to E	The village occupies a low lying area and is shown on the ZTV to have high theoretical visibility. In reality views are precluded by intervening buildings.	No, due to lack of visibility.
Farnley Tyas	8.0km to NW	The village occupies a local ridge and is shown on the ZTV to have theoretical visibility. In reality views are curtailed by buildings and intervening vegetation.	No, due to lack of visibility.
Fulstone	5.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Helme	12.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Hepworth	4.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
High Bradfield	13.5km to SE	The ZTV shows no visibility.	No, due to lack of visibility.
High Burton	8.0km to N	The village occupies an elevated position on the side of a deeply incised valley and is shown to have theoretical visibility. In reality views will be curtailed by intervening buildings.	No, due to lack of visibility.
High Hoyland	8.0km to NE	The village occupies a low lying area and is shown on the ZTV to have high theoretical visibility. In reality views are precluded by intervening buildings and vegetation.	No, due to lack of visibility.
High Flatts	2.0km to N	The village occupies a north-east facing slope and is orientated away from the site. The ZTV indicates limited fringe visibility along the southern western edge, but this lies outside of the Conservation Area.	No, due to lack of visibility.
Hinchcliffe Mill	8.0km to W	The ZTV shows no visibility.	No, due to lack of visibility.
Holme	9.5km to W	The ZTV shows no visibility.	No, due to lack of visibility.
Holmfirth	6.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Honley	9.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Hopton Hall	13.0km to N	The ZTV shows no visibility.	No, due to lack of visibility.
Hoylandswaine	5.0km to E	The village occupies an east facing slope and is orientated away from the site. The ZTV indicates limited fringe visibility along the western edge, but there is in fact no visibility from here.	No, due to lack of visibility.
Ingbirchworth	1.5km to E	The hamlet occupies a minor valley below the site that has been dammed to create a small reservoir. The western edge of the village is just 1.5km from the nearest turbine although it sits below the dam in well-wooded surroundings. The remainder of the village adjoins the A629, which is more elevated with less screening vegetation. The ZTV shows continuous theoretical visibility.	Yes, parts of the hamlet with visibility may be significantly affected by views of the additional turbines.
Kirkburton	7km to N	The ZTV shows no visibility.	No, due to lack of visibility.
Langsett	4.5km to S	The ZTV shows no visibility.	No, due to lack of visibility.
Low Bradfield	14.0km to SE	The ZTV shows no visibility.	No, due to lack of visibility.

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Meltham	11.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Midhopestones	6km to SE	The ZTV shows no visibility.	No, due to lack of visibility.
Netherthong	8.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Netherton	11.0km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Oldfield	8.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Penistone	4.0km to SE	The town sits beside the River Don in a deeply incised section of valley where it has extended up the lower slopes, particularly south of the river. The ZTV shows high theoretical visibility, but in reality visibility from within the settlement will be curtailed by buildings and vegetation.	No, due to lack of visibility.
Roundhill	11.5km to NE	The ZTV shows no visibility.	No, due to lack of visibility.
Shepley	4.5km to N	The ZTV shows no visibility.	No, due to lack of visibility.
Skelmanthorpe	5.5km to NE	The village occupies a north facing slope and is mostly orientated away from the site. The ZTV indicates limited fringe visibility along the southern edge, but in reality buildings and vegetation will curtail any views from within the settlement.	No, due to lack of visibility.
South Crosland	11.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Stanborough Castle	10.5km to E	The ZTV shows limited visibility extending up to the western boundary.	No, due to lack of visibility.
Thurstone	2.5km to SE	The village sits beside the River Don in a deeply incised section of valley in close proximity to the site. The ZTV shows some theoretical visibility, but in reality views are all but curtailed by the steeply rising landform, wooded nature of the steeper slopes and by buildings.	No, due to lack of visibility.
Thurstonland	6.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Thunder Bridge	6km to N	The ZTV shows no visibility.	No, due to lack of visibility.
Totties	5.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.

Landscape Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Upper Cumberworth	3.5km to N	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Upper Denby	2.5km to NE	The hamlet occupies an elevated position in close proximity to the site and is shown on the ZTV to have high theoretical visibility. However, views from within the settlement will be curtailed by building and vegetation.	No, due to lack of visibility.
Upper Midhope	5.5km to S	The ZTV shows theoretical visibility, but there is in fact no visibility from here due to local landform and coniferous planting around Langsett Reservoir.	No, due to lack of visibility.
West Bretton	11.5km to NE	The ZTV shows theoretical visibility, but there is in fact no visibility from here due to local landform and woodland associated with in Bretton Park.	No, due to lack of visibility.
Wilshaw	9.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Wooldale	6.5km to NW	The ZTV shows no visibility.	No, due to lack of visibility.
Wolley	13.5km to NE	The ZTV shows no visibility.	No, due to lack of visibility.
Wortley	11km to SE	The village occupies a low-lying area and is shown on the ZTV to have high theoretical visibility. In reality views are precluded by local landform, buildings and vegetation.	No, due to lack of visibility.

Table 4.8: Summary of Predicted Operational Effects on Principal Visual Receptors Within 15km Radius Study Area (Settlements, Routes and Open Spaces)

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Main Settlements			
Barnsley	11.0km E to outskirts	ZTV indicates some theoretical visibility, but this is largely limited to the built-up edges. Visibility will be further reduced by intervening landform and vegetation, as well as distance. The visible presence of Royd Moor windfarm will also have a mitigating effect. VP 17 shows representative view from here.	No, there may be some limited effect, but this will not be significant. Refer to VP 17 assessment for full description.
Bolsterstone	10.0km to SE	The ZTV shows almost no visibility from the hamlet	No, due to lack of visibility.
Carlecotes	3.0km to W	The hamlet occupies rising ground orientated towards the site. Much of the settlement is screened by broadleaved woodland, however, Royd Moor windfarm is visible from a small number of properties where they have unobstructed views. The ZTV indicates theoretical visibility across the hamlet, but in reality this will be limited to those properties that presently have views of Royd Moor. The proposed turbines will be seen in front of the existing windfarm and from slightly closer range. VP 24 shows representative view from here.	No, there may be some effect, but this will not be significant. Refer to VP 24 assessment for full description.
Cawthorne	7.5km to E	The village occupies a low-lying area and is shown on the ZTV to have high theoretical visibility. In reality views are precluded by intervening landform and vegetation.	No, due to lack of visibility.
Catshaw	1.2km to W	One of the closest hamlets to the site but with visibility largely curtailed by steeply rising landform. Royd Moor windfarm is just visible from some properties, albeit mostly from blade tip. The ZTV indicates theoretical visibility, but this will be limited to the hubs and blades, which will be seen behind those of Royd Moor and appear as part of the same group. VP 2 shows representative view from here.	No, there may be some effect, but this will not be significant. Refer to VP 2 assessment for full description.
Clayton West	7.0km to NE	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Crow Edge	1.5km to W	One of the closest hamlets to the site but with visibility largely curtailed by steeply rising landform. Royd Moor windfarm is visible from some properties where they are orientated towards the site with unobstructed views, but the turbines are mostly seen from hub height. The ZTV indicates theoretical visibility but this will be limited to the hubs and blades, albeit they will be seen in front of Royd Moor and at slightly closer range. VP 5 shows representative view from here.	No, there may be some effect, but this will not be significant. Refer to VP 5 assessment for full description.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Darton	12.0km to E	The village occupies an elevated position on the outskirts of Barnsley and is shown on the ZTV to have high theoretical visibility. In reality views will be limited to the built-up edge and further reduced by intervening vegetation and distance. The visible presence of Royd Moor windfarm in any available views will also reduce the visual influence of the proposed turbines	No, there may be some effect, but this will not be significant due to: • Screening by buildings, which prevents visibility from within the settlement; • Screening by intervening woodland associated with Cawthorne Park; • Small number of turbines proposed; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines; • Distance from the site, which ensures that, if the turbines are visible, they will form minor components in views.
Denby Dale	2.0km to NE	The ZTV shows almost no visibility from the town.	No, due to lack of visibility.
Dodworth	10.0km to E	The ZTV shows almost no visibility from the town.	No, due to lack of visibility.
Emley	5.0km to NE	The hamlet is located on a local ridgeline and houses on the southern edge may gain some visibility. VP 12 shows representative views from here.	No, there may be some effect, but this will not be significant. Refer to VP 12 assessment for full description.
Ferry Bridge	9.5km to N	The village occupies an elevated position on the side of a deeply incised valley and is shown on the ZTV to have high theoretical visibility. In reality, views will be restricted to the southern built-up edge and further limited by intervening vegetation and distance. In addition, Emley Moor communications mast dominates views in the general direction of the site. The visible presence of Royd Moor windfarm in any available views will reduce the visual influence of the proposed turbines.	No, there may be some effect, but this will not be significant due to: • Screening by buildings, which prevents visibility from within the settlement; • Screening by intervening vegetation; • Small number of turbines proposed; • Presence of Emley Moor mast, which dominates views in the direction of the site; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines; • Distance from the site, which ensures that, if the turbines are visible, they will form minor components in views.
Flockton	10.5km to NE	The ZTV shows almost no visibility from the village.	No, due to lack of visibility.
Grange Moor	10.5km to N	The hamlet occupies an elevated position and is shown on the ZTV to have high theoretical visibility. In reality, views will be restricted to the southern built-up edge and further limited by intervening vegetation and distance. In addition, Emley Moor communications mast dominates views in the general direction of the site. The visible presence of Royd Moor windfarm in any available views will also reduce the visual influence of the proposed turbines.	No, assessment generally as for Ferry Bridge.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Hepworth	4.0km to NW	The ZTV shows no visibility from the settlement.	No, due to lack of visibility.
High Bradfield	13.5km to SE	The ZTV shows no visibility from the hamlet.	No, due to lack of visibility.
High Burton	8.0km to N	The village occupies an elevated position on the side of a deeply incised valley and is shown on the ZTV to have high theoretical visibility. In reality, views will be restricted to the southern built-up edge and further limited by intervening vegetation and distance. In addition, Emley Moor communications mast dominates views in the general direction of the site. The visible presence of Royd Moor windfarm in any available views will also reduce the visual influence of the proposed turbines.	No, assessment generally as Ferry Bridge. Refer also to VP 12 assessment for full description.
High Flatts	2.0km to N	One of the closest hamlets to the site, but mostly occupying sloping landform orientated away from the site. A small number of properties on the southern edge have clear and unobstructed views of Royd Moor windfarm. The ZTV shows some theoretical visibility on the southern fringe where the proposed turbines will be seen in front to Royd Moor at slightly closer distance.	No, there may be some effect but this will not be significant due to: Limited visibility; Small number of turbines proposed; Presence of Royd Moor windfarm in available views.
Holmfirth	6.5km to NW	The ZTV shows no visibility from the valley settlement. Applies also to outlying settlements on the valley sides, including Holme, Holmbridge, Hinchcliffe Mill, Upperthong, Netherthong, Scholes, Wooldale, Thongsbridge, Thurstonland and Brockholes.	No, due to lack of visibility.
Honley	9.5km to NW	The ZTV shows no visibility from the settlement.	No, due to lack of visibility.
Hoylandswaine	5.0km to E	The village occupies an east-facing slope and is orientated away from the site. The ZTV indicates limited fringe visibility along the western edge, but there is in fact no visibility from here.	No, due to lack of visibility.
Huddersfield	10.0km N to outskirts	The ZTV shows virtually no visibility from the town.	No, due to lack of visibility.
Ingbirchworth	2.0km to E	The village occupies a minor valley below the site that has been dammed to create a small reservoir. The western edge of the village is just 1.5km from the nearest turbine but sits below the dam in well-wooded surroundings. The ZTV shows high theoretical visibility, but in reality views will only be obtained from properties adjoining the A629 and to the north of the reservoir where the landform is more elevated with less screening vegetation. The visible presence of Royd Moor windfarm in views will also have a mitigating effect. See VP 4 for representative view.	Yes, parts of the village with visibility may be significantly affected by views of the additional turbines.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Kexbrough	10.5km to E	The village occupies locally high ground beside the M1 and is shown on the ZTV to have high theoretical visibility. In reality visibility will be largely curtailed by local landform and woodland immediately to the west associated with Cawthorne Park. Some properties on the southern built-up edge are likely to gain some oblique views, but visibility in general will be dominated by proximity to the motorway. VP 17 shows representative views from here.	No, there may be some effect, but this will not be significant. Refer to VP 17 assessment for full description
Kirkburton	7.0km to N	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Kirkheaton	13.0km N	The village occupies an elevated position on the side of a deeply incised valley and is shown on the ZTV to have high theoretical visibility. In reality, views will be restricted to the southern built-up edge and further limited by intervening vegetation and distance. In addition, Emley Moor communications mast dominates views in the general direction of the site. The visible presence of Royd Moor windfarm in any available views will also reduce the visual influence of the proposed turbines. VP 21 shows representative views from here.	No, there may be some effect, but this will not be significant. Refer to VP 21 assessment for full description.
Langsett	4.5km to S	The ZTV shows no visibility from the hamlet.	No, due to lack of visibility.
Low Bradfield	14.0km to SE	The ZTV shows no visibility from the hamlet.	No, due to lack of visibility.
Lower Cumberworth	4.5km to NE	The village occupies a low-lying area and is shown on the ZTV to have high theoretical visibility. In reality views are precluded by intervening landform and vegetation.	No, due to lack of visibility.
Maythorn	1.5km to NW	One of the closest hamlets to the site occupying the crest of a local ridgeline with properties orientated towards the windfarm having unobstructed views. The ZTV shows high theoretical visibility although the visible presence of Royd Moor windfarm will have a mitigating effect. VP 7 shows representative views from here.	Yes, parts of the hamlet with visibility may be significantly affected by views of the additional turbines.
Meltham	11.5km to NW	The ZTV shows no visibility from the village.	No, due to lack of visibility.
Middlestown	12.5km to NE	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Midhopestones	6.0km to SE	The ZTV shows no visibility from the hamlet.	No, due to lack of visibility.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Millhouse Green	1.5km to S	The village sits beside the River Don in a deeply incised section of valley in close proximity to the site. The ZTV shows some theoretical visibility, but in reality views are largely curtailed by the steeply rising landform. Royd Moor windfarm is visible in some views on the northern built-up edge, but only from hub height. The proposed turbines will be seen behind those of Royd Moor.	No, there may be some effect, but this will not be significant due to: - Screening by buildings, which prevents visibility from within the settlement; - Screening by intervening landform, which curtails most views towards the site; - Small number of turbines proposed; - Presence of Royd Moor windfarm in any available views from this direction.
Netherton	12.5km to NE	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Oxspring	6.5km to SE	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Penistone	4.0km to SE	The town sits beside the River Don in a deeply incised section of valley where it has extended up the lower slopes, particularly south of the river. The ZTV shows high theoretical visibility, but in reality the majority of views will be curtailed by buildings, vegetation and the steeply rising landform. Royd Moor windfarm is visible in views from some properties on the built-up edge of the town, south of the river, and from the recreation ground. The proposed turbines are positioned behind those of Royd Moor in views from this direction. VP 8 shows representative view from here.	No, there may be some effect, but this will not be significant. Refer to VP 8 assessment for detail description.
Shelley	5.5m to N	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Shepley	4.5km to N	The ZTV shows no visibility from the village.	No, due to lack of visibility.
Silkstone	8.0km to E	The ZTV shows no visibility from the village.	No, due to lack of visibility.
Silkstone Common	8.5km to E	The ZTV shows no visibility from the village.	No, due to lack of visibility.
Skelmanthorpe	5.5km to NE	The village occupies a north-facing slope and is mostly orientated away from the site. The ZTV indicates limited fringe visibility along the southern edge, but in reality any views will be limited by intervening vegetation and landform.	No, there may be some effect, but this will not be significant due to: - Screening by buildings, which prevents visibility from within the settlement; - Screening by intervening landform and vegetation; - Small number of turbines proposed; - Presence of Royd Moor windfarm in any available views, which has a mitigating effect.
Stocksbridge	7.5km SE to outskirts	The ZTV shows virtually no visibility from the town.	No, due to lack of visibility.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Thornhill Edge	13.5km to N	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Thurgoland	8.5km to SE	The ZTV shows virtually no visibility from within the village, although the wirelines indicate some visibility on the north-eastern edge. VP 14 shows representative view from here.	No, there may be some effect, but this will not be significant. Refer to VP 14 assessment for detail description.
Thurlstone	2.5km to SE	The village sits beside the River Don in a deeply incised section of valley in close proximity to the site. The ZTV shows some theoretical visibility, but in reality views are all but curtailed by the steeply rising landform and wooded nature of the steeper slopes. Royd Moor windfarm may be visible in some views on the northern built-up edge, but only from hub height. The proposed turbines are positioned behind those of Royd Moor in views from this direction.	No, there may be some effect, but this will not be significant due to: • Screening by buildings, which prevents visibility from within the settlement; • Screening by intervening landform, which curtails most views towards the site; • Small number of turbines proposed; • Presence of Royd Moor windfarm in any available views from this direction, which sits directly in front of the proposed turbines and has a mitigating effect.
Upper Cumberworth	3.5km to N	The ZTV shows virtually no visibility from the village.	No, due to lack of visibility.
Upper Denby	2.5km to NE	The hamlet occupies a local ridge of high ground with most of the settlement positioned beyond and below the ridgeline orientated away from the site. A small handful of properties on the southern edge do have some visibility of Royd Moor windfarm. The ZTV shows continuous theoretical visibility but in reality this will be limited to those properties on the southern edge that already have views of the existing windfarm.	No, there may be some effect, but this will not be significant due to: • Screening by buildings, which prevents visibility from within the settlement; • Screening by local landform, which further limits views towards the site; • Small number of turbines proposed; • Presence of Royd Moor windfarm in any available views.
Upper Hepton	13.5km to N	The ZTV shows no visibility from the village.	No, due to lack of visibility.
Upper Midhope	5.5km to S	The ZTV shows theoretical visibility, but there is in fact no visibility from here due to local landform and coniferous planting around Langsett Reservoir.	No, due to lack of visibility.
Victoria	2.5km to W	Royd Moor windfarm is visible from some properties where they are orientated towards the site with unobstructed views, but the turbines are mostly seen from hub height due to the steeply rising landform. The ZTV indicates some theoretical visibility but this will be limited to the hubs and blades, albeit they will be seen in front of Royd Moor and at slightly closer range.	No, there may be some effect, but this will not be significant, due to: - Limited visibility; - Small number of turbines proposed; - Presence of Royd Moor windfarm in available views.
West Bretton	11.5km to NE	The ZTV shows theoretical visibility, but there is in fact no visibility from here due to local landform and woodland associated with in Bretton Park.	No, due to lack of visibility.
Wharndcliffe	14.0km to SE	The ZTV shows no visibility from the village.	No, due to lack of visibility.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
Whitley Lower	12.5km to N	The ZTV shows no visibility from the village.	No, due to lack of visibility.
Wolley	13.5km to NE	The ZTV shows no visibility from the village.	No, due to lack of visibility.
Wortley	11.0km to SE	The village occupies a low-lying area and is shown on the ZTV to have high theoretical visibility. In reality views are precluded by local landform and vegetation.	No, due to lack of visibility.
Routes: Major Roads			
M1 Motorway	17km section in study area	The motorway just encroaches into the far east of the study area between J36 and J39. The ZTV shows theoretical visibility along much of this section, but in reality views are limited by vegetation, local landform and where the route passes in cutting. Available views therefore tend to be glimpsed and fleeting. Between J37 and J38 some visibility is possible for a short distance where the motorway crosses the River Dearne on a low embankment, but the site is 10km distant and the view is at an oblique angle to the viewer. The presence of Royd Moor turbines in these views also has a mitigating effect (See VP 17).	No, there may be some very limited effect, but this will not be significant due to: • Short sections of visibility; • Acute angle of views; • Further screening by vegetation and local landform; • Moving nature of the viewer; • Small number of turbines proposed; • Distance from the site, which is a minimum of 10km; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines.
A616	32km section in study area	The A616 runs through the central part of the study area in a NW to SE direction, passing to the west of the site. The ZTV shows continuous theoretical visibility for a short 5km section between Victoria and the roundabout junction with the A628. Here the route emerges from a deeply incised valley to the north and crosses a ridge of high ground, passing within 1.5-4km of the site, before continuing south within another valley corridor. This section of road is largely devoid of vegetation and the site is clearly visible as part of a higher ridgeline that runs parallel with it. Royd Moor windfarm occupies part of this ridgeline and dominates views from the road, albeit views are generally angled. The proposed turbines will generally be seen behind those of Royd Moor with the height and spacing of the towers and diameter of the blades sharing sufficient similarity that they will appear as part of the existing wind farm (See VP 5).	No, there may be some effect, but this will not be significant due to: • Relatively short section of visibility; • Acute angle of views; • Moving nature of the viewer; • Small number of turbines proposed; • Presence of Royd Moor windfarm, which dominates views from this section of the road and visually integrates the proposed turbines;
A628	30km section in study area	The A628 runs east to west through the study area from J37 of the M1, passing through Penistone to the south of the site. The ZTV indicates patchy visibility from the motorway to Penistone, but in reality local landform and vegetation curtails all views until just east of the town at the roundabout junction with the	No, there may be some effect, but this will not be significant due to: • Short sections of visibility; • Acute angle of views; • Moving nature of the viewer; • Small number of turbines proposed;

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
		A629 (See VP 9). Here the proposed turbines are seen briefly directly in front of Royd Moor windfarm before the traveller descends quickly into the Don valley and leaves the site behind. The road continues through a deeply incised section of the valley at Penistone and it is not until it reaches Fulshaw, a kilometre or so west of the town, that the site becomes visible again (See VP 25). The ZTV shows continuous visibility from here as far as Fidler's Green, a distance of about 7km (See VP 10). This section of road is largely devoid of vegetation and the site is clearly visible as part of an extensive ridgeline that defines the valley sides. Royd Moor windfarm occupies a small proportion of this ridgeline and is clearly noticeable to travellers even though the angle of views is acute. The proposed turbines will generally be seen behind those of Royd Moor with the height and spacing of the towers and diameter of the blades sharing sufficient similarity that they will mostly appear as part of the existing windfarm.	• Presence of Royd Moor windfarm, which visually integrates the proposed turbines.
A629	27km section in study area	The A629 runs through the central part of the study area in a NW to SE direction, broadly parallel with the A616, but passing to the east of the site. The ZTV shows near continuous theoretical visibility from High Flatts to Wortley, a distance of about 13km, although in reality there is no visibility beyond Thurgoland (10km max). Visibility commences at High Flatts where the route emerges from a deeply incised valley on to a gently dipping scarp slope and passes to within 1.5km of the site as it continues south towards the roundabout junction with the A628 (5km). This section of road is largely devoid of vegetation and the site is clearly visible on the right at a slightly higher elevation. Royd Moor windfarm is particularly noticeable in views from along this section and will have a mitigating effect on the proposed turbines, which will generally be seen directly in front of the existing windfarm in views from this direction. At Ingbirchworth roadside vegetation and buildings provide a periodic screen and filter (See VP 4) before visibility becomes apparent again as far as the roundabout junction with the A628. Beyond the roundabout the site passes behind the traveller and out of site. From Thurgoland travelling in the opposite direction, the site comes in and out of view as the road dips and rises with the more undulating landform until reaching the roundabout junction with the A628.	No, there may be some effect, but this will not be significant due to: • Short sections of visibility; • Acute angle of views; • Moving nature of the viewer; • Small number of turbines proposed; • Presence of Royd Moor windfarm, which dominates sections of the route and visually integrates the proposed turbines.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
A635	31km section in study area	The A635 runs east to west across the study area, broadly following a route parallel with the A628, but passing to the north of the site through Holmfirth. The ZTV shows patchy visibility between the eastern edge of the study area and the junction with the A629, to the east of Holmfirth, a distance of about 15km. In reality this is even more limited due to screening vegetation, local landform and buildings. Where there is some visibility, this is at an angle to the viewer. Beyond the A629 junction there is no visibility for several kilometres as the route descends into a deeply incised valley and passes through Holmfirth. As it rises out of the valley to cross over the Pennines views are possible for a short section in the vicinity of Wessenden Moor, but only for travellers heading in the opposite direction.	No, there may be some limited effect, but this will not be significant due to: • Shorts sections of visibility; • Angled nature of views; • Further screening by vegetation, local landform and buildings; • Moving nature of the viewer; • Small number of turbines proposed; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines.
A636	11km section in study area	The A636 links the A635 at Denby Dale with the M1 motorway at J39. The ZTV shows near continuous theoretical visibility from just north of Denby Dale as far as the roundabout junction with the A637, a distance of about 7km. This section of route follows a narrowly incised, well-wooded and heavily populated valley. In reality visibility is limited to a 1-2km section in the vicinity of the A637 junction and only then as brief views to travellers heading south towards Denby where views are directly ahead. The closest views are gained from around 10km away. The presence of Royd Moor windfarm in these views will reduce the influence.	No, there may be some very limited effect, but this will not be significant due to: • Shorts sections of visibility; • Further screening by local landform, buildings and vegetation; • Moving nature of the viewer; • Small number of turbines proposed; • Distance from the site, which is a minimum of 10km; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines.
A637	14km section in study area	The A637 crosses the north-eastern part of the study area and links the A642 at Grange Moor with Barnsley. The ZTV shows near continuous theoretical visibility for the section between the A642 junction and J38 of the M1, a distance of about 8km. However, local landform and intervening vegetation will have a limiting effect on views generally. In addition, the closest views gained are at a distance of 11km and the views are at an oblique angle to the viewer. The presence of Royd Moor windfarm in any available views will also reduce the visual influence of the proposed turbines. Beyond J38 the ZTV shows patchy visibility and in reality this is even more limited by local landform and vegetation. There will be little, if any visibility, between the motorway junction and Barnsley.	No, there may be some very limited effect, but this will not be significant due to: • Shorts sections of visibility; • Angled nature of views; • Further screening by local landform and vegetation; • Moving nature of the viewer; • Small number of turbines proposed; • Distance from the site, which is a minimum of 11km; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines.

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
A642	14km section in study area	The A642 crosses the northern part of the study area where it links Huddersfield with Wakefield. The ZTV shows some patchy theoretical visibility between Grange Moor and the built-up edge of Huddersfield, a distance of about 5km. However, local landform, buildings and intervening vegetation will have a limiting effect on views generally. In addition, the closest views gained are at a distance of 10km and the views are at an oblique angle to the viewer. The presence of Royd Moor windfarm in any available views will also reduce the visual influence of the proposed turbines.	No, there may be some very limited effect, but this will not be significant due to: • Short sections of visibility; • Angled nature of views; • Further screening and filtering by local landform and vegetation; • Moving nature of the viewer • Small number of turbines proposed; • Distance from the site, which is a minimum of 10km; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines.
A6024	15km section in study area	The A6024 crosses the western part of the study area where it links the A628 with Holmfirth and on to Huddersfield. The ZTV indicates one short section of theoretical visibility in the vicinity of Holme Moss viewing area, extending to no more than 1km distance. This is some 11km from the site where the view is also at an oblique angle to the traveller. The presence of Royd Moor windfarm in the views will also reduce the visual influence of the proposed turbines.	No, there may be some very limited effect, but this will not be significant due to: • Very short section of visibility; • Angled nature of views; • Moving nature of the viewer; • Small number of turbines proposed; • Distance from the site, which is a minimum of 11km; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines.
Routes: Major Walking Routes			
Pennine Way	19km section on edge of study area	This route just encroaches into the far west of the study area, coming to within 12.5km of the site at its closest point in the vicinity of Black Hill. The ZTV shows theoretical visibility from this location for a distance of 1-2 km. The proposed turbines will cover a small part of an extensive skyline when seen from here and will form a minor component in the view. In addition, the presence of Royd Moor windfarm in the view will reduce their visual influence (See VP 19). Some additional visibility is indicated in the vicinity of Wain Stones, at a greater distance, but this is of a very limited nature (See VP 22).	No, there may be some very limited effect, but this will not be significant due to: • Very limited visibility as shown on the ZTV; • The large-scale and simple plateau landform that provides the context in which the proposed turbines will be seen; • Small part of the available view occupied by the proposed turbines; • Small number of turbines proposed; • Distance from the site, which is a minimum of 12.5km; • Presence of Royd Moor windfarm, which visually integrates the proposed turbines.
Trans Pennine Way	40km section in study area	This route runs east to west across the study area, passing to the south of the site where it comes to within 2km at its closest point in the vicinity of Penistone. The ZTV shows patchy visibility from the eastern edge of the study area as far as Penistone, where the route mostly follows a disused railway line across low lying terrain. This, in combination with intervening vegetation, means that very few long views, if any, are obtained of the site. At Penistone the	No, there may be some limited effect, but this will not be significant due to: • Short sections with visibility; • Mostly low lying and enclosed landform through which the route passes; • Further screening by trackside vegetation; • Small number of turbines proposed; • Presence of Royd Moor windfarm in available views, which

Visual Receptor	Distance to Nearest Turbine	Description of Predicted Impact	Further Assessment Required?
		route continues along the dismantled railway through the deeply incised valley where all views are curtailed. West of the town, the ZTV indicates continuous visibility as far as the crossing of the A628 near Fidler's Green, a distance of about 7km. However, much of this section continues to follow a dismantled railway line where tall vegetation lines the route and limits views to occasional breaks (See VP 6). Only where the route departs from the railway line on to the moors are views possible where the proposed turbines are seen in close association with Royd Moor windfarm. The closest views are gained at a distance of 5km.	Integrates the proposed turbines.
Open Spaces:			
Penistone Recreation Ground	4.0km to SE	The recreation ground sits on rising ground on the built-up edge of the town that extends south of the river. The ZTV shows high theoretical visibility, although in reality views are screened and filtered by built development and vegetation associated with a disused railway that runs beside it. Additionally, Royd Moor windfarm is visible in available views (See VP 8). The proposed turbines will mostly be seen behind those of Royd Moor in views from this direction.	No, there may be some limited effect, but this will not be significant due to: • Limited visibility; • Further screening by local landform, buildings and vegetation; • Small number of turbines proposed; • Presence of Royd Moor windfarm in available views, which integrates the proposed turbines.

Table 4.9: Representative Viewpoint Analysis

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
Viewpoint 1 Spicer House E: 420524 N: 405603 Elevation: 299m Distance to nearest turbine: 350m approx	LCT: Upland Farmland (Ingbirchworth unit) Landscape Designation: Area of Borough Landscape Value The view extends a short distance due south across rising ground within the wind farm site as far as the ridgeline on which Royd Moor turbines sit. Land cover comprises walled and improved pastures with some areas of rougher grazing. A broadleaved tree belt in the foreground lines a small, incised stream and generally filters views. Royd Moor wind farm is just visible behind and above the tree belt as a single row of evenly spaced towers with rotating blades. However, from Spicer House views of the turbines are screened by outbuildings and the orientation of the farmhouse. To the left of the view, out of shot, more expansive views are possible across a gently dipping landform with land cover mostly comprising pastoral farmland and woodland, intermixed with isolated properties, villages and larger urban areas on the outskirts of Barnsley. Emley Moor mast is a prominent feature of these views with more distant coal-fired power stations also visible.	Landscape: High Local residents: High Local road users: Low	Landscape: A direct effect on the LCT and ABLV. All 5 turbines are visible at close range where they appear as large elements in the landscape, albeit as a compact and reasonably balanced group. Royd Moor turbines are also visible immediately behind such that the proposed turbines read as part of a larger grouping. This has some mitigating effect in reducing the magnitude of change to the character of the site and surrounding area. Visual: From Spicer House views of the additional turbines will remain screened by the orientation of the property and outbuildings. All 5 turbines will be dominant in views from Spicer House Lane and other local roads. However, they will be seen in context with the existing Royd Moor windfarm and generally appear as part of a slightly larger group. This has a mitigating effect in reducing the magnitude of change on views.	Landscape: L Local residents: N Local road users: L	Landscape: Mo/Su Local residents: N Local road users: SI/Mo	Yes No No
Viewpoint 2 B6106, Hollin Lane, Catshaw E: 420264 N: 403610 Elevation: 273m Distance to nearest turbine: 1.2km approx	LCT: Upland Farmland (Ingbirchworth unit) Landscape Designation: Area of Borough Landscape Value The view extends a short distance due north where it is contained by the ridgeline that encloses the Upper Don valley. Landcover comprises walled and improved pastures that give way to rough grazing on the steeper slopes. Tree cover is mainly limited to belts of both broadleaved and coniferous plantations with occasional groups of trees around farmsteads. All thirteen Royd Moor turbines	Landscape: High	Landscape: A direct effect on the LCT and ABLV. The rising nature of the landform is such that whilst all 5 turbines are visible above the ridgeline they are not seen at full height. Additionally, the proposed turbines are seen in close context with Royd Moor windfarm and are contained within the spread of the existing turbines. The height and spacing of the towers and diameter of the blades is also such that they achieve a near seamless integration with Royd Moor. This has a considerable mitigating effect on changes to	Landscape: VS	Landscape: SI	No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
	are visible above the ridgeline as two overlapping rows of evenly spaced towers and blades, one row slightly more visible than the other. From scattered farmsteads and houses immediately below the windfarm, turbine visibility is more restricted by the rising landform.	Local residents: High Local road users: Low	the character of the site and surrounding area. Visual: Although the proposed turbines will introduce new vertical features on the skyline they are almost indistinguishable from Royd Moor turbines and read as part of the existing windfarm. For properties directly below the ridge and local road users this will have a mitigating effect.	Local residents: VS Local road users: VS	Local residents: SI Local road users: Ne	No No
Viewpoint 3 Royd Moor Hill viewing area E: 421549 N: 404180 Elevation: 335m Distance to nearest turbine: 1.0km approx	LCT: Upland Farmland (Ingbirchworth unit) Landscape Designation: Area of Borough Landscape Value The view extends north-west along the crest of the ridgeline on which Royd Moor windfarm sits. Here the landform takes on a distinct terraced appearance as it dips gently to the right. Landcover comprises walled and improved pastures grazed by sheep, cattle and horses with some areas of rougher grazing. Tree cover is sparse and limited to occasional clumps of wind-sculpted trees. Several poly tunnels associated with a small nursery are visible in the foreground as are Royd Moor turbines aligned as two staggered rows, which dominate views. Other vertical elements visible in panoramic views from the viewing area, but out of shot, include Emley Moor mast to the north, towers and steam plumes from more distant coal-fired power stations in the east, pylons to the south and in the Upper Don valley to the west, and communications masts on the edge of the Pennines further to the west.	Landscape: High Walkers/Hikers: High Local road users: Low	Landscape: A direct effect on the LCT and ABLV. All 5 turbines are visible on the ridgeline at full height, evenly spaced in two staggered rows. Royd Moor turbines are also visible directly in front. The close proximity to the existing windfarm is such that the proposed turbines read as part of a slightly larger group. The height and regimented spacing of the proposed turbines and diameter of the blades is also of sufficient similarity to achieve visual integration with Royd Moor. This has a mitigating effect in reducing the magnitude of change to the character of the site and surrounding area. Visual: Although the proposed turbines will introduce new vertical features on the ridgeline, views from the viewing area and local roads will continue to be dominated by Royd Moor windfarm.	Landscape: S Walkers/Hikers: S Local road users: S	Landscape: SI/Mo Local residents: SI/Mo Local road users: Ne/SI	No No No
Viewpoint 4 A629 Ingbirchworth	LCT: Upland Farmland (Ingbirchworth unit) Landscape Designation: Area of Borough Landscape Value	Landscape: High	Landscape: A direct effect on the LCT and ABLV. All 5 turbines are visible above the ridgeline	Landscape: M	Landscape: Mo	Yes

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
E: 422309 N: 405972 Elevation: 244m Distance to nearest turbine: 1.75km approx	The view extends south-west across an undulating landform that rises up gradually to a low ridgeline in the middle distance on which Royd Moor windfarm sits. Landcover mostly comprises pastoral uses as small, walled enclosures arranged in a strong rectilinear pattern. Tree cover is relatively sparse although in the vicinity of the village and around the reservoir (out of shot) it is quite dense. Royd Moor turbines are visible on the ridgeline mostly from hub height, as a single row of evenly spaced towers with rotating blades.	Local residents: High Local road users: Low	as an evenly spaced row at near full height. Royd Moor windfarm is visible immediately behind but is less conspicuous. However, the proximity to Royd Moor is such that the proposed turbines read as part of a slightly larger group. The regimented spacing of both sets of turbines also ensures a certain visual integration is achieved, albeit the proposed turbines are the more noticeable and extend further along the ridgeline. Visual: The proposed turbines will introduce new vertical elements along the ridgeline. These will read as more noticeable features in certain views from Inbircworth and the A629 where the benefits of screening vegetation are less evident.	Local residents: M Local road users: M	Local residents: Mo Local road users: SI	Yes No
Viewpoint 5 A616 Crow Edge E: 418910 N: 404162 Elevation: 305m Distance to nearest turbine: 1.75 km approx	LCT: Upland Farmland (Ingbrichworth unit) Landscape Designation: Area of Borough Landscape Value The view extends a short distance to the east where it is curtailed by steeply rising landform and the ridgeline on which Royd Moor windfarm sits. Landcover is a mixture of improved pastures, rough grazing and heathland, mostly enclosed by dry stone walls. Quarrying is also a feature of the locality and a small, disused quarry occupies the immediate foreground. On the ridgeline above the quarry all thirteen Royd Moor turbines are visible from hub height, where they appear as two short rows of overlapping towers with rotating blades.	Landscape: High Local residents: High Local road users: Low	Landscape: Direct impact on the LCT and ABLV. The rising nature of the landform is such that, of the 5 proposed turbines, only 4 are visible above the ridgeline and mostly from hub height. Additionally, the proposed turbines are seen in context with Royd Moor windfarm where they appear as part of a single grouping, albeit extending slightly further along the ridgeline towards the viewpoint. Visual: The proposed turbines will introduce new vertical features on the skyline. However, the height and spacing of the towers and diameter of the blades shares sufficient similarities with Royd Moor that they will read as part of a slightly larger group.	Landscape: S Local residents: S Local road users: S	Landscape: SI/Mo Local residents: SI/Mo Local road users: Ne/SI	No No No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
Viewpoint 6 Trans Pennine Trail, Hazlehead-Ecklands E: 421509 N: 402703 Elevation: 247m Distance to nearest turbine: 2.0km approx	LCT: On boundary with Upland Farmland (Ingbirchworth unit) and Upland River Valley (Upland Don unit) Landscape Designation: Area of Borough Landscape Value The view extends north-west across the floor of the Don valley as far as the ridgeline that defines the valley sides. Landcover is mostly walled and improved pastures on the valley bottom and lower slopes, giving way to rough grazing and areas of heathland on the steeper slopes. Tree cover is relatively sparse and mostly confined to the steeper slopes and along the course of the river. Settlement, in the form of isolated properties and farmsteads, generally occupies the lower slopes. On the ridgeline all thirteen Royd Moor turbines are visible as two staggered rows, one row seen at near full height, the other, beyond the ridge, mostly visible from hub height with rotating blades.	Landscape: High Walkers/Hikers: High Local road users: Low	Landscape: A direct effect on the LCT and ABLV. The rising nature of the landform is such that, of the 5 proposed turbines, 2 will be visible at near full height and 3 from hub height. The proposed turbines will also be seen in context with Royd Moor windfarm where they are contained within the spread of existing turbines. The close proximity to Royd Moor is such that the proposed turbines appear as part of the existing windfarm rather than new intrusive features within the landscape. Visual: The proposed turbines will introduce new features on the skyline. However, the height of the towers and diameter of the blades achieves sufficient visual continuity with Royd Moor that they are unlikely to be noticed by the casual observer using the long distance trail.	Landscape: VS Walkers/Hikers: VS Local road users: VS	Landscape: SI Walkers/Hikers: SI Local road users: Ne	No No No
Viewpoint 7 Low Common, Holmfirth E: 417703 N: 407035 Elevation: 367m Distance to nearest turbine: 3.5 km approx	LCT: Upland Farmland (Holmfirth and Meltham unit) Landscape Designation: On boundary with Area of High Landscape Value The view extends south-east along the ridgeline occupied by Royd Moor windfarm. Landcover comprises walled and improved pastures grazed by sheep, cattle and horses. Tree cover is sparse and limited to occasional small clumps of trees. Isolated houses and farmsteads are scattered across the area, which possesses a slight neglected quality. All thirteen Royd Moor turbines are visible above the ridgeline as two parallel rows with rotating blades.	Landscape: Medium-High Local residents: High Local road users: Low	Landscape: A direct effect on the LCT and ABLV. All 5 proposed turbines are visible above the ridgeline as an evenly spaced row at near full height. Royd Moor turbines are also visible immediately behind and slightly to the right. The angle of view does result in a somewhat disjointed relationship between the two such that the proposed turbines appear less well integrated than in other views. Visual: The proposed turbines will introduce new vertical elements along the ridgeline and these will read as more apparent features in views from certain properties and local roads.	Landscape: S Local residents: S Local road users: S	Landscape: SI-SI/Mo Local residents: SI/Mo Local road users: Ne/SI	No No No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
Viewpoint 8 Penistone recreation ground E: 424400 N: 403198 Elevation: 237m Distance to nearest turbine: 4.0 km approx	LCT: On boundary with Upland Farmland (Penistone and Stocksbridge unit) and Upland River Valley (Upland Don unit) Landscape Designation: Area of Borough Landscape Value The view extends north-west across the Upper Don valley floor as far as the ridgeline that defines the valley sides. The recreation ground on the western built-up edge of Penistone occupies the immediate foreground, whilst in the distance enclosed pastures rise up the valley sides. Tree cover is generally quite sparse although it has established well along the dismantled railway to the right of the view where it filters views. Royd Moor turbines are just visible above the ridgeline as two parallel rows with rotating blades.	Landscape: Medium Local residents: High Recreation ground: Medium Local road users: Low	Landscape: A direct effect on the upland farmland LCT and ABLV. Indirect effect on the river valley LCT. All 5 proposed turbines are visible above the ridgeline as an evenly spaced row at near full height. Royd Moor turbines are also visible immediately to the left. The angle of view does result in a somewhat disjointed relationship between the two such that the proposed turbines appear as a more obvious extension than in other views. Visual: The proposed turbines will introduce new vertical elements along the ridgeline and these will read as more apparent features in some views from Penistone. For most of the town, however, the proposed turbines are screened by intervening landform, vegetation and buildings.	Landscape: S Local residents: S Recreation ground: S Local road users: S	Landscape: SI Local residents: SI/Mo Recreation ground: SI Local road users: Ne/SI	No No No
Viewpoint 9 A628/A629 roundabout E: 425852 N: 404292 Elevation: 265m Distance to nearest turbine: 5.0km approx	LCT: On boundary with Settled Wooded Farmland (West Barnsley unit) and Upland River Valley (Upland Don unit) Landscape Designation: Area of Borough Landscape Value The view extends west across the Upper Don valley towards an intermediate ridgeline, at a point where the river has cut a narrow and deeply incised channel, which the A628 follows as it descends into the valley. The elevated Pennine plateau is also visible on the far horizon. Built development on the edge of Penistone occupies much of the valley floor and lower slopes, whilst the steeper sides are also densely wooded. In contrast land cover on the surrounding higher ground is predominately	Landscape: Medium Local road users: Low	Landscape: Indirect effect on the LCT. Direct effect on the ABLV. All 5 turbines are visible above the ridgeline as an evenly spaced row at near full height. Royd Moor turbines are also visible immediately to the left. The angle of view does result in a somewhat disjointed relationship between the two such that the proposed turbines appear less well integrated than in other views. Visual: The proposed turbines will introduce new	Landscape: S Local road users: S	Landscape: SI Local road users: Ne/SI	No No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
	walled and improved pastures, lacking in tree cover and with only a scattering of settlement. Royd Moor turbines are visible on the ridgeline as a compact group with rotating blades.		vertical elements along the ridgeline and these will read as more apparent features in certain views from the A628/A629.			
Viewpoint 10 A628 Fidler's Green E: 415630 N: 400345 Elevation: 461m Distance to nearest turbine: 6.5km approx	LCT: Unenclosed Moorland (Thurleston & Langsett unit) Landscape Designation: Peak District National Park The view extends eastward from the edge of the moorland plateau towards the foothills that adjoin the Pennines. Landcover comprises rough grazing and heathland in the foreground associated with the exposed moorland. This gives way to walled and improved pastures on the lower foothills in the middle distance intermixed with occasional tree belts and a scattering of farmsteads. All thirteen Royd Moor turbines are noticeable in the middle distance, below the horizon, where they appear as a row of evenly spaced towers with blade movement evident. Emley Moor mast is equally noticeable to the left of the view.	Landscape: High Walkers/Hikers: High Local road users: Low	Landscape: Indirect effect on the LCT and National Park. All 5 turbines are visible just above the distant horizon, directly behind and slightly to the left of Royd Moor windfarm. The close proximity to Royd Moor is such that the proposed turbines appear as part of a slightly larger group that occupies a small proportion of the wider view. Visual: The proposed turbines will introduce new vertical elements on the skyline. From this particular viewpoint the increased size of turbine results in a slightly disjointed relationship with Royd Moor. However, to the casual observer, this disparity is less likely to be noticed than if the turbines were seen in isolation or as a distinctly separate group.	Landscape: VS-S Walkers/Hikers: VS-S Local road users: VS-S	Landscape: SI-SI/Mo Walkers/Hikers: SI-SI/Mo Local road users: Ne- Ne/SI	No No No
Viewpoint 11 Pike Lowe, Midhope Moors E: 420910 N: 397380 Elevation: 478m Distance to nearest turbine: 7.5km approx	LCT: Unenclosed Moorland (Midhope & Howden unit) Landscape Designation: Peak District National Park The view extends north from a rocky outcrop on the edge of the moorland plateau across the foothills and valleys that adjoin the Pennines. Landcover comprises rough grazing and heathland in the foreground associated with the exposed moors. This gives way to walled and mostly improved pastures on the foothills. Tree cover is sparse and generally confined to the lower slopes along with a scattering of	Landscape: High	Landscape: Indirect effect on the LCT and National Park. All 5 turbines are visible below the horizon and directly behind Royd Moor windfarm where they are contained within the spread of the existing turbines. The close proximity to Royd Moor is such that the proposed turbines appear as part of the existing windfarm, rather than as new intrusive features in the landscape, where they occupy a small proportion of a much wider panorama.	Landscape: VS	Landscape: SI	No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
	farmsteads and hamlets. Immediately below the plateau coniferous plantations fringe Langsett reservoir. All thirteen Royd Moor turbines are noticeable on an intermediate ridgeline, below the horizon, where they appear as a single row of evenly spaced towers with blade movement evident. Emley Moor mast is equally noticeable on the distant horizon, to the right of the windfarm, whilst pylons are visible features of the valleys.	Walkers/Hikers: High	Visual: The proposed turbines will introduce new vertical elements on the ridgeline. However, the height and spacing of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer, they are unlikely to be distinguishable at this distance.	Walkers/Hikers: VS	Walkers/Hikers: SI	No
Viewpoint 12 Emley Moor Mast E: 422054 N: 412904 Elevation: 274m Distance to nearest turbine: 8.0 km approx	LCT: Settled Wooded Farmland (East Huddersfield unit) Landscape Designation: None The view extends due south across a gently rolling landform towards the edge of the Pennines on the distant horizon. Landcover is a mixture of improved pastures and arable uses, intermixed with scattered farmsteads, hamlets and larger villages. Field patterns are small-scale and enclosed by both walls and hedgerows together with hedgerow trees and small wooded areas. This gives the impression of a well-wooded landscape. Royd Moor turbines are just visible in the middle distance, below the horizon, where they appear as a single row of evenly spaced towers with discernible movement. Emley Moor mast and associated structures is visible to the immediate left, out of shot, where it dominates views	Landscape: Medium Local residents: High Local road users: Low	Landscape: Indirect effect on the LCT. All 5 turbines are visible although only the blade tips break the skyline. Royd Moor turbines appear directly behind and occupy a slightly wider spread. The proposed turbines appear as part of the existing windfarm rather than new intrusive features and together read as a small component within the wider landscape. Visual: The proposed turbines will introduce new vertical elements on the skyline and the increased size and spacing does result in a slight disjointed relationship with Royd Moor. However, this disparity is less likely to be noticeable than if the proposed turbines were seen in isolation or as a separate group.	Landscape: VS Local residents: VS Local road users: VS	Landscape: Ne/SI Local residents: SI Local road users: Ne	No No No
Viewpoint 13 541m trig point Howden Edge E: 417700 N: 396900	LCT: Unenclosed Moorland (Midhope & Howden unit) Landscape Designation: Peak District National Park The view extends north from the open hilltop across an undulating moorland plateau of	Landscape: High	Landscape: Indirect effect on the LCT and National Park. All 5 turbines are visible below the horizon and directly behind Royd Moor windfarm where they are contained within the existing spread of turbines. The close proximity to Royd Moor is such that the proposed turbines	Landscape: VS	Landscape: SI	No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
Elevation: 541m Distance to nearest turbine: 8.5km approx	smooth, rounded hills. Heather moorland, blanket bog and rough grazing dominate landcover, with tree cover mostly absent. Few man-made intrusions exist in this large-scale and open landscape, although Emley Moor mast is noticeable on the distant horizon. Royd Moor turbines are just visible below the horizon as a single row of evenly spaced towers with blade movement evident.	Walkers/Hikers: High	appear as part of the existing windfarm, rather than new intrusive features in the landscape, and occupy a small proportion of a much wider panorama. Visual: The proposed turbines will introduce new vertical elements on the ridgeline. However, the height and spacing of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer, they are unlikely to be distinguishable at this distance.	Walkers/Hikers: VS	Walkers/Hikers: SI	No
Viewpoint 14 A629/B6462 Thurgoland E: 428586 N: 401287 Elevation: 238m Distance to nearest turbine: 8.5km approx	LCT: Boundary of Settled Wooded Farmland (West Barnsley unit) with Upland Rver Valley (Upper Don unit) Landscape Designation: Area of Borough Landscape Value The view extends north-west from the built-up edge of Thurgoland along the Upper Don valley where the valley sides are less pronounced and relate more to the surrounding hills. Landcover is a mixture of improved pastures and arable uses as small, walled enclosures. Woodland survives in places along valley floor and in particular follows the line of a dismantled railway. Much of the valley is also built-up and pylons are detracting features. Royd Moor turbines are just visible on the skyline in the middle distance as two parallel rows with discernible movement.	Landscape: Medium Local residents: High Local road users: Low	Landscape: An indirect effect on the LCT and direct effect on the ABLV. 4 whole blades are just visible on the skyline. Royd Moor turbines are also visible immediately to the left, mostly at full height and aligned on a different orientation. As such the proposed turbines appear as a more obvious extension to the existing windfarm and are less well integrated into the landscape than in other views. Visual: The proposed turbines will introduce new vertical elements on the skyline. The increased size, spacing and general orientation of the turbines, does result in a slight disjointed relationship with Royd Moor. From certain properties and sections of local road the proposed turbines are more likely to be apparent.	Landscape: VS-S Local residents: VS-S Local road users: VS-S	Landscape: Ne/SI-SI Local residents: SI-SI/Mo Local road users: Ne-Ne/SI	No No No
Viewpoint 15 Swains Head, Howden Edge E: 416141	LCT: Unenclosed Moorland (On Boundary with Midhope & Howden unit/Shining Clough & Bleaklow unit/Thurston & Langsett unit) Landscape Designation: Peak District National Park	Landscape: High	Landscape: Indirect effect on the LCT and National Park. All 5 turbines are visible below the horizon and directly behind Royd Moor windfarm where they are mostly contained within the	Landscape: VS	Landscape: SI	No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
N: 398277 Elevation: 510m Distance to nearest turbine: 8.0km approx	The view extends north-east from the open hilltop across an undulating moorland plateau of smooth, rounded hills. Heather moorland, blanket bog and rough grazing dominate landcover, with tree cover mostly absent. Few man-made intrusions exist in this large-scale and open landscape, although Emley Moor mast is noticeable on the distant horizon. Royd Moor turbines are just visible below the horizon as a single row of evenly spaced towers with discernible blade movement.	Walkers/Hikers: High	spread of the existing turbines. The close proximity and relationship to Royd Moor is such that the proposed turbines appear as part of the existing windfarm rather than new intrusive features in the landscape, and occupy a small proportion of a much wider panorama. Visual: The proposed turbines will introduce new vertical elements on the ridgeline. However, the height and spacing of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer, they are unlikely to be distinguishable at this distance.	Walkers/Hikers: VS	Walkers/Hikers: SI	No
Viewpoint 16 High Stones, Howden Edge E: 418700 N: 394300 Elevation: 530m Distance to nearest turbine: 10.5km approx	LCT: Unenclosed Moorland (Midhope & Howden unit) Landscape Designation: Peak District National Park The view extends north across an undulating moorland plateau of smooth, rounded hills. Heather moorland, blanket bog and rough grazing dominate landcover, with tree cover mostly absent. Few man-made intrusions exist in this open and expansive landscape. Royd Moor windfarm is obscured from view by intervening topography (Margery Hill 546m AOD).	Landscape: High Walkers/Hikers: High	Landscape: No change from existing. Visual: No change from existing.	Landscape: N Walkers/Hikers: N	Landscape: Ne Walkers/Hikers: Ne	No No
Viewpoint 17 M1 motorway, Kexbrough E: 430741 N: 409287 Elevation: 60m	LCT: On boundary with Settled Wooded Farmland (West Barnsley unit) and Lowland Valley Floor (Upper Dearne unit) Landscape Designation: None The view extends south-west across the motorway towards the distant ridgeline on which Royd Moor windfarm sits. Landcover is a	Landscape: Medium	Landscape: Indirect effect on the LCT. All 5 turbines are visible on the skyline as an evenly spaced row with no overlapping. Immediately behind and to the left Royd Moor turbines are also visible. The close proximity and relationship to Royd Moor is such that the proposed turbines appear as	Landscape: VS	Landscape: Ne/SI	No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
Distance to nearest turbine: 10.5km approx	mixture of improved pastures and arable uses as small-scale fields enclosed by hedgerows, hedgerow trees and small wooded areas. These combine to give the impression of a well-wooded landscape and filter views within the generally low-lying landform. Royd Moor windfarm is just visible in glimpsed views from a short section of the motorway where it crosses the River Deane on a low embankment. Here the turbines appear on the skyline as a single row of evenly spaced towers with some discernible movement. To the right of the view, out of shot, and behind, are more extensive built-up areas on the outskirts of Barnsley with similar visibility.	Local residents: High Local road users: Low	part of the existing windfarm rather than new intrusive features in the landscape, albeit they extend slightly further along the ridgeline. Visual: The proposed turbines will introduce new vertical elements along the skyline. However, the height and spacing of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer and motorway users in particular, they are unlikely to be distinguishable. The greater incidence of vegetation will also have a limiting effect on views generally from the built-up edges of Barnsley.	Local residents: VS Local road users: VS	Local residents: SI Local road users: Ne	No No
Viewpoint 18 Bretton Country Park and Sculpture Park E: 428736 N: 413076 Elevation: 132m Distance to nearest turbine: 11.0km approx	LCT: On boundary with Coalfield Estate lands (Bretton & Woolley unit) and Settled Wooded Farmland (West Barnsley unit) Landscape Designation: None, but an Historic Parkland setting The view extends south-west from within the wooded grounds of the Sculpture Park across a gently rolling landform. Landcover is predominately arable as medium sized fields enclosed by hedgerows, hedgerow trees and larger wooded areas. These combine to filter and screen views generally. Royd Moor turbines are barely noticeable on the distant skyline where they appear as a single row of towers with some discernible movement.	Landscape: Medium-High Walkers/Hikers: High	Landscape: Indirect effect on the LCT and historic parkland setting. All 5 turbines are visible on the distant skyline as a compact group with minimal overlapping. Immediately behind and to the left Royd Moor turbines are also visible. The close proximity and relationship to Royd Moor is such that the proposed turbines appear as part of the existing windfarm rather than new intrusive features in the landscape, albeit the proposed turbines extend slightly further along the ridgeline. Visual: The proposed turbines will introduce new vertical elements along the skyline. However, the height and spacing of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer, they are unlikely to be distinguishable at this distance. The greater incidence of vegetation will also have a limiting effect on	Landscape: VS Walkers/Hikers: VS	Landscape: Ne/SI-SI Walkers/Hikers: SI	No No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
			views generally.			
Viewpoint 19 Black Hill, Pennine Way E: 408071 N: 404207 Elevation: 580m Distance to nearest turbine: 12.5km approx	LCT: Unenclosed Moorland (On boundary with Heyden unit and Meltham & Wessenden unit) Landscape Designation: Peak District National Park The view extends eastward from the open hilltop across an undulating moorland plateau of smooth, rounded hills. Heather moorland, blanket bog and rough grazing dominate landcover, with tree cover absent. Few man-made intrusions exist in this large-scale and open landscape, although Holme Moor mast is noticeable to the right of the view (out of shot) and Emley Moor mast is also visible on the distant horizon. Royd Moor turbines are just visible on the distant horizon as a compact group with some blade movement evident.	Landscape: High Walkers/Hikers: High	Landscape: Indirect effect on the LCT and National Park. All 5 turbines are just visible on the horizon immediately to the left of Royd Moor windfarm. The close proximity and relationship to Royd Moor is such that the proposed turbines appear as part of a slightly larger windfarm rather than as new intrusive features in the landscape, and occupy a very small proportion of a much wider panorama. Visual: The proposed turbines will introduce new vertical elements on the ridgeline. However, the height and spacing of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer, they are unlikely to be distinguishable at this distance.	Landscape: N-VS Walkers/Hikers: N-VS	Landscape: Ne/SI-SI Walkers/Hikers: Ne/SI-SI	No No
Viewpoint 20 West Nab, Meltham Moor E: 407643 N: 408796 Elevation: 500m Distance to nearest turbine: 13.5km approx	LCT: Unenclosed Moorland (Meltham & Wessenden unit) Landscape Designation: Peak District National Park The view extends due east from a rocky outcrop on the edge of the moorland plateau across the foothills and valleys that adjoin the Pennines. Landcover comprises rough grazing and heathland in the foreground associated with the exposed moors. This gives way to walled and mostly improved pastures on the foothills. Tree cover is relatively sparse and generally confined to the lower slopes along with a scattering of farmsteads and hamlets. Royd Moor windfarm is apparent on the distant skyline as a compact group with some blade movement evident. Emley Moor mast is	Landscape: High Walkers/Hikers: High	Landscape: Indirect effect on the LCT and National Park. All 5 turbines are just visible on the horizon immediately to the left of Royd Moor windfarm. The close proximity and relationship to Royd Moor is such that the proposed turbines appear as part of a slightly larger windfarm rather than as new intrusive features in the landscape, where they occupy a very small proportion of a much wider panorama. Visual: The proposed turbines will introduce new vertical elements on the skyline. However, the height and spacing of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer, they are unlikely	Landscape: N-VS Walkers/Hikers: N-VS	Landscape: Ne/SI-SI Walkers/Hikers: Ne/SI-SI	No No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
	equally noticeable to the left of the view, out of shot, as are the populated Meltham and Holmfirth valleys.		to be distinguishable at this distance.			
Viewpoint 21 B6118 Kirkheaton E: 418963 N: 418066 Elevation: 180m Distance to nearest turbine: 13.0km approx	LCT: Settled Wooded Farmland (East Huddersfield unit) Landscape Designation: None The view extends south across a gently undulating landform. Landcover is predominately arable farmland intermixed with scattered farmsteads, villages and larger urban areas. Field patterns are medium sized and enclosed by hedgerows, fences or not at all. Tree cover is sparse. In the foreground a disused quarry detracts from the rural scene. Royd Moor windfarm is just visible on the distant skyline as a single row of evenly spaced turbines, with some blade movement evident. To the left of the view, out of shot, Emley Moor mast is a dominant feature of views.	Landscape: Medium Local residents: High Local road users: Low	Landscape: Indirect effect on the LCT. All 5 turbines are visible on the skyline, evenly spaced with no overlapping. Directly behind, Royd Moor windfarm is visible where the turbines are similarly orientated, evenly spaced and overlap the proposed turbines. This close proximity and relationship to Royd Moor is such that the proposed turbines appear as part of a slightly larger windfarm rather than as new intrusive features in the landscape. Visual: The proposed turbines will introduce new vertical elements on the skyline. However, the height, spacing and orientation of the turbines shares sufficient similarity with Royd Moor windfarm that, to the casual observer, they are unlikely to be distinguishable at this distance.	Landscape: N-VS Local residents: N-VS Local road users: N-VS	Landscape: Ne-Ne/SI Local residents: Ne/SI-SI Local road users: Ne	No No No
Viewpoint 22 Wain Stones, Pennine Way E: 409333 N: 396272 Elevation: 630m Distance to nearest turbine: 14.0km approx	LCT: Unenclosed Moorland (Shining Clough & Bleaklow unit) Landscape Designation: Peak District National Park The view extends north-east from the Pennine Way National Trail across an undulating moorland plateau of smooth, rounded hills with occasional rocky outcrops. Heather moorland, blanket bog and rough grazing dominate landcover, with tree cover absent. Few man-made intrusions exist in this large-scale, open and semi-wilderness landscape. Emley Moor mast is visible on the distant skyline, whilst Royd Moor windfarm is just visible below the	Landscape: High Walkers/Hikers: High	Landscape: Indirect effect on the LCT and National Park. The proposed turbines are barely visible below the horizon where they appear directly behind Royd Moor windfarm and are mostly contained within the spread of the existing turbines. This close proximity to Royd Moor is such that the proposed turbines appear as part of the existing windfarm rather than as new intrusive features, set within an extensive panorama. Visual: The proposed turbines will introduce new vertical elements on the distant horizon.	Landscape: N Walkers/Hikers: N	Landscape: Ne/SI Walkers/Hikers: Ne/SI	No No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
	horizon as an indistinct group with barely perceptible movement.		However, to the casual observer, they are unlikely to be discernible from Royd Moor windfarm at this distance.			
Viewpoint 23 A6195 Hoyland E: 436983 N: 401734 Elevation: 144m Distance to nearest turbine: 16.5km approx	LCT: Settled Wood Farmland (West Barnsley unit) Landscape Designation: None The view extends north from the bridge crossing of the A6195 across a gently undulating landform. Landcover is predominately arable farmland intermixed with farmsteads, hamlets and larger villages. Field patterns are medium sized and mostly enclosed by hedgerows, hedgerow trees and small wooded areas. This conveys the impression of a well-wooded landscape. Wentworth Castle is a notable feature of the view just below a wooded ridgeline. Royd Moor windfarm is just visible on the distant skyline as an indistinct group with barely perceptible movement. To the left and right of the view, out of shot, are more extensive built-up areas on the outskirts of Barnsley with similar visibility.	Landscape: Medium Local residents: High Local road users: Low	Landscape: Indirect effect on the LCT. All 5 turbines are visible on the distant skyline, evenly spaced with no overlapping. Royd Moor windfarm is visible immediately to the left as a more compact group. However, the close proximity to Royd Moor is such that the proposed turbines appear as part of a slightly larger windfarm rather than as new intrusive features in the landscape. Visual: The proposed turbines will introduce new vertical elements on the skyline. However, to the casual observer, they are unlikely to be discernible from Royd Moor windfarm at this distance.	Landscape: N Local residents: N Local road users: N	Landscape: Ne Local residents: Ne/SI Local road users: Ne	No No No
Viewpoint 24 Brook Hill Lane, Carlecotes E: 417753 N: 403494 Elevation: 333m Distance to nearest turbine: 3.0 km approx	LCT: Upland Farmland (Ingbirchworth unit) Landscape Designation: Area of Borough Landscape Value The view extends north-east where it is contained by the ridgeline that encloses the Upper Don valley. Landcover comprises walled and improved pastures with some areas of rough grazing on the steeper slopes. Tree cover in the form of beech plantations is locally high. Isolated houses and farmsteads are scattered across the area, with many incorporating modern agricultural sheds not in keeping with the local character. All thirteen Royd Moor turbines are visible above the ridgeline as two staggered rows of evenly	Landscape: High Local residents: High Local road users:	Landscape: Direct effect on the LCT and the ABLV The rising nature of the landform is such that whilst all 5 turbines are visible above the ridgeline they are not seen at full height. Additionally, the proposed turbines are seen in close context with Royd Moor windfarm where they appear as part of the same grouping, albeit extending slightly further along the ridgeline towards the viewpoint. Visual: The proposed turbines will introduce new vertical features on the skyline. However, the height and spacing of the towers and diameter of the blades shares sufficient	Landscape: S Local residents: S Local road users: S	Landscape: SI/Mo Local residents: SI/Mo Local road users: Ne/SI	No No No

Viewpoint Ref and Details	Description of Existing View	Receptor Type and Sensitivity	Description of Impact	Magnitude	Significance	Significant
	spaced towers and rotating blades, with minimal overlapping.	Low	similarities with Royd Moor that they will read as part of a slightly larger group.			
Viewpoint 25 A628, Fulshaw E: 420433 N: 401608 Elevation: 286m Distance to nearest turbine: 3.0km approx	LCT: Upland Farmland (Penistone and Stocksbridge unit) Landscape Designation: Area of Borough Landscape Value The view extends north across the floor of the Upper Don valley as far as the ridgeline that defines the southern valley sides. Landcover is predominately walled and improved pastures with areas of rough grazing and heathland on the steeper slopes. Tree cover is sparse and mostly confined to the steeper slopes and along the course of the river. Settlement, in the form of isolated properties and farmsteads, many with modern agricultural sheds, generally occupy the lower slopes. All thirteen Royd Moor turbines are visible above the ridgeline as a single row of evenly spaced towers with rotating blades. Pylons are also a prominent feature of the valley floor.	Landscape: High Local residents: High Local road users: Low	Landscape: A direct effect on the LCT and ABLV. The rising nature of the landform is such that whilst all 5 turbines are visible above the ridgeline they are not seen at full height. Additionally, the proposed turbines are seen directly behind Royd Moor windfarm where they are contained by the spread of the existing turbines. The close proximity and relationship to Royd Moor is such that the proposed turbines appear as part of the existing windfarm rather than as new intrusive features in the landscape. Visual: The proposed turbines will introduce new vertical features on the skyline. However, the height and spacing of the towers and diameter of the blades is such that they achieve an almost seamless integration with Royd Moor windfarm and are unlikely to be differentiated by the casual observer.	Landscape: VS Local residents: VS Local road users: VS	Landscape: SI Local residents: SI Local road users: Ne	No No No

Table 4.10 Cumulative Viewpoint Analysis**KEY**

Sensitivity: VH – Very High H – High M – Medium L – Low VL – Very Low
 Magnitude: VL – Very Large L – Large M – Medium S – Small VS – Very Small N – Negligible
 Significance: Se – Severe Su – Substantial Mo – Moderate SI – Slight Ne – Neutral
 Significant: Yes No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
Viewpoint 3 Royd Moor Hill viewing area E: 421549 N: 404180 Elevation: 335m Distance to Spicer Hill: 1.0km approx Refer Table 4.9 for description of existing view	Royd Moor (500m)	Hazlehead (3.5km)	Blackstone Edge (2.25km) Sheephouse Heights (4.5km)	Landscape: High Walkers/Hikers: High Local road users: Low	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view at close proximity, where they will appear as part of the same group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazelhead: Both will be visible in the same 90° arc of view but as distinctly separate sites. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° arc of view, at close proximity, where they will appear as part of the same group sharing close similarities with turbine height and spacing. Spicer Hill with Sheephouse Heights: Both will be visible in an 180° arc of view as distinctly separate sites. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor, Hazelhead and Blackstone Edge in the same 90° degree arc of view and at close proximity. Additionally, it will also be possible to see Spicer Hill in conjunction with Sheephouse Heights but not at the same time. Spicer Hill in combination with Royd Moor and Blackstone Edge will tend to read as part of a slightly larger, but reasonably compact group. Royd Moor will continue to dominate the view as a result of its close proximity to the viewpoint. The highly regimented layout of Royd Moor does, however, result in a somewhat disjointed and less harmonious relationship with the other two windfarms. The presence of Hazlehead and Sheephouse Heights will have	Landscape: S-M Walkers/Hikers: S-M Local road users: S-M	Landscape: SI/Mo-Mo Local residents: SI/Mo-Mo Local road users: Ne/SI-SI	No No No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
					more of a cumulative effect arising from their remote locations from this main cluster of windfarms. However, all five windfarms will be seen in context of a relatively open and expansive panorama where they occupy a small proportion of available views. This, in combination with the small number of turbines is judged unlikely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.			
Viewpoint 4 A629 Ingbirchworth E: 422309 N: 405972 Elevation: 244m Distance to Spicer Hill: 1.75km approx Refer Table 4.9 for description of existing view	Royd Moor (2.0km)	Hazlehead (4.5km)	Blackstone Edge (2.5km) Sheephouse Heights (5.5km)	Landscape: High Local residents: High	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view at close proximity, where Spicer Hill will appear as part of a slightly larger group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazlehead: The ZTV indicates no cumulative visibility. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° arc of view at close proximity, where they will appear as part of the same group sharing close similarities with turbine height and spacing. Spicer Hill with Sheephouse Heights: Both will be visible in an 180° arc of view where they will appear as distinctly separate sites. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor and Blackstone Edge in the same 90° degree arc of view and at close proximity. Sheephouse Heights will also be visible, but not at the same time, and given the distance and small number of turbines the effects are unlikely to be significant. Spicer Hill in combination with Royd Moor and Blackstone Edge will read as part of a single, but larger group that will occupy a much larger proportion of the available view and dominate the ridgeline. The combined effects are likely to	Landscape: M-L Local residents: M-L	Landscape: Mo-Mo/Su Local residents: Mo-Mo/Su	Yes Yes

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
				Local road users: Low	result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.	Local road users: M-L	Local road users: SI-SI/Mo	No
Viewpoint 5 A616 Crow Edge E: 418910 N: 404162 Elevation: 305m Distance to Spicer Hill: 1.75 km approx Refer Table 4.9 for description of existing view	Royd Moor (1.5km)	Hazlehead (750m)	Blackstone Edge (1.5km) Sheephouse Heights (6.5km)	Landscape: High Local residents: High Local road users: Low	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view at close proximity, where Spicer Hill will appear as part of a slightly larger group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazlehead: Both will be visible as an 180° arc of view, at close proximity and as distinctly separate sites. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° degree arc of view where they will appear as two detached groups on the ridgeline above the viewpoint. Spicer Hill with Sheephouse Heights: The ZTV indicates cumulative visibility, although in reality local landform and distance is likely to limit views of Sheephouse Heights to the hubs and blades. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor and Blackstone Edge in the same 90° degree arc of view at close proximity. Hazlehead will also be visible at close range, but not at the same time. Sheephouse Heights may also be visible but not at the same time and given the distance and small number of turbines, the effects are unlikely to be significant. Spicer Hill in combination with Royd Moor and Blackstone Edge will read as part of a larger group. The presence of Blackstone Edge in particular is such that this enlarged group appears spread out and occupies a greater proportion of the available view. Consequently all three windfarms together tend to dominate the ridgeline. The additional presence of Hazlehead, behind the viewer, and in close	Landscape: M Local residents: M Local road users: M	Landscape: Mo Local residents: Mo Local road users: SI	Yes Yes No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
					proximity to this elongated group is such that the combined effects are likely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.			
Viewpoint 6 Trans Pennine Trail, Hazlehead-Ecklands E: 421509 N: 402703 Elevation: 247m Distance to Spicer Hill: 2.0km approx Refer Table 4.9 for description of existing view	Royd Moor (1.75km)	Hazlehead (3.75km)	Blackstone Edge (3.25km) Sheephouse Heights (3.75km)	Landscape: High Walkers/Hikers: High Local road users: Low	Spicer Hill with Royd Moor: Both windfarms will be visible in the same 90° arc of view at relatively close proximity, however, they will appear as part of the same group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazlehead: Both will be visible as an 180° arc of view where they will appear as two distinct sites. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° degree arc of view where they are likely to read as a single group on the ridgeline, albeit slightly detached from each other. Spicer Hill with Sheephouse Heights: The ZTV indicates no cumulative visibility. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor and Blackstone Edge in the same 90° degree arc of view at relatively close proximity. Hazlehead will also be visible in views, but not at the same time. Spicer Hill in combination with Royd Moor and Blackstone Edge will tend to read as part of a slightly larger, but reasonably compact group on the ridgeline. Blackstone Edge turbines are somewhat detached from the main group and this does cause the group as a whole to extend slightly further along the ridgeline. The presence of Hazlehead will have more of a cumulative effect arising from its remote location from the main cluster of windfarms. However, all four windfarms will be seen in context of a relatively open and expansive panorama where they occupy a small proportion of available views. This, in combination with the	Landscape: S Walkers/Hikers: S Local road users: S	Landscape: SI/Mo Walkers/Hikers: SI/Mo Local road users: Ne/SI	No No No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
					small number of turbines is judged unlikely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.			
Viewpoint 7 Low Common, Holmfirth E: 417703 N: 407035 Elevation: 367m Distance to Spicer Hill: 3.5 km approx Refer Table 4.9 for description of existing view	Royd Moor (3.5km)	Hazlehead (2.5km)	Blackstone Edge (2.25km) Sheephouse Heights (9.25km)	Landscape: Medium-High Local residents: High Local road users: Low	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view at relatively close proximity, where Spicer Hill will appear as part of a slightly larger group. Refer Table 4.9 for detail assessment. Spicer Hill with Hazlehead: The ZTV illustrates fringe cumulative visibility, but in reality local landform is likely to curtail views of Hazlehead on the valley floor from this viewpoint. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° arc of view where they will appear as part of a slightly larger group, sharing close similarities between turbine height and spacing. Blackstone Edge will appear the more noticeable given its closer proximity to the viewpoint. Spicer Hill with Sheephouse Heights: The ZTV illustrates some fringe cumulative visibility with the wireline indicating blade tip visibility only of Sheephouse Heights. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor and Blackstone Edge in the same 90° degree arc of view at relatively close proximity. Views of Sheephouse Heights are likely to be precluded by a combination of local landform, vegetation and distance. Spicer Hill in combination with Royd Moor and Blackstone Edge will tend to read as a slightly larger, but compact group on the ridgeline, with turbines relatively well spaced and with minimal overlapping. Further, they will be seen in context of a relatively open and expansive panorama where they occupy a small proportion of available views. This,	Landscape: S-M Local residents: S-M Local road users: S-M	Landscape: SI/Mo-Mo Local residents: SI/Mo-Mo Local road users: Ne/SI-SI	No No No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx. Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
					combined with the small number of turbines is judged unlikely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.			
Viewpoint 9 A628/A629 roundabout E: 425852 N: 404292 Elevation: 265m Distance to Spicer Hill: 5.0km approx Refer Table 4.9 for description of existing view	Royd Moor (4.5km)	Hazlehead (8.0km)	Blackstone Edge (6.25km) Sheephouse Heights (3.5km)	Landscape: Medium Local road users: Low	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view where Spicer Hill will appear as part of a slightly larger group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazlehead: The ZTV indicates potential fringe cumulative visibility, but in reality local landform is likely to curtail most, if not all, views of Hazlehead from this viewpoint. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° degree arc of view where they are likely to appear as part of the same group, albeit Spicer Hill will be slightly more noticeable as a result of its closer proximity to the viewpoint. Spicer Hill with Sheephouse Heights: Both will be visible in an 180° arc of view where they will appear as distinctly separate sites. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor and Blackstone Edge and in the same 90° arc of view. Additionally, it will also be possible to see Spicer Hill in conjunction with Sheephouse Heights but not at the same time. Spicer Hill in combination with Royd Moor and Blackstone Edge will tend to read as a slightly larger, but compact and balanced group on the skyline. The presence of Sheephouse Heights will have more of a cumulative effect arising from its remote location from this main grouping of windfarms and closer proximity to the viewpoint. However, all four windfarms will be seen in context of a relatively	Landscape: S Local road users: S	Landscape: SI Local road users: Ne/SI	No No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
					open and expansive panorama where they occupy a small proportion of available views. This, in combination with distance and small number of turbines is judged unlikely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.			
Viewpoint 11 Pike Lowe, Midhope Moors E: 420910 N: 397380 Elevation: 478m Distance to Spicer Hill: 7.5km approx Refer Table 4.9 for description of existing view	Royd Moor (7.0km)	Hazlehead (7.5km)	Blackstone Edge (8.0km) Sheephouse Heights (5.0km)	Landscape: High Walkers/Hikers: High	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view where they will appear as part of the same group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazlehead: Both will appear in the same 90° arc of view, but as distinctly separate sites. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° degree arc of view, as two detached groups. Spicer Hill with Sheephouse Heights: Both are likely to be visible as part of an 180° arc of view, where they will read as separate sites. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor, Hazlehead and Blackstone Edge, and in the same 90° arc of view. Sheephouse Heights will also be visible, but not at the same time. Spicer Hill in combination with Royd Moor and Blackstone Edge will read as part of a slightly larger group in the middle distance, albeit with Blackstone Edge somewhat detached from the main group. The additional presence of Hazlehead in the same view will add slightly to the cumulative effect, whilst Sheephouse Heights will be more noticeable given its more remote location from this grouping. However, all five windfarms will be seen in the context of an open and expansive panorama where they will occupy a relatively small proportion of available views. This, combined with distance, similar orientation of view	Landscape: VS-S Walkers/Hikers: VS-S	Landscape: SI-SI/Mo Walkers/Hikers: SI-SI/Mo	No No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
					and small number of turbines, is such that the combined effects are judged unlikely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.			
Viewpoint 15 Swains Head, Howden Edge E: 416141 N: 398277 Elevation: 510m Distance to Spicer Hill: 8.0km approx Refer Table 4.9 for description of existing view	Royd Moor (7.75km)	Hazlehead (6.0km)	Blackstone Edge (7.75km) Sheephouse Heights (9.0km)	Landscape: Hgh Walkers/Hikers: High	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view where they will appear as part of the same group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazlehead: The ZTV indicates some fringe cumulative visibility, however, the wireline suggests local landform will curtail views of Hazlehead. Spicer Hill with Blackstone Edge: The ZTV indicates some fringe cumulative visibility, however, the wireline suggests local landform will curtail views of Blackstone Edge. Spicer Hill with Sheephouse Heights: Both are likely to be visible as part of a wider 180° arc of view and will appear as two distinctly separate windfarms. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will be seen at the same time as Royd Moor and in the same 90° arc of view. Sheephouse Heights is likely to be visible as well, but not at the same time. The addition of Spicer Hill to Royd Moor will not result in significant cumulative effects (Refer Table 6.8 for detail assessment). The presence of Sheephouse Heights in views will have some added cumulative effect. However, all three windfarms will be seen in the context of an open and expansive panorama where they occupy a small proportion of available views. This, combined with distance and small number of turbines, is judged unlikely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.	Landscape: VS Walkers/Hikers: VS	Landscape: SI Walkers/Hikers: SI	No No

Viewpoint Ref and Details	Windfarm Proposals With Overlapping ZTVs Within 15km Radius of Viewpoint (Approx Distance to Nearest Turbine)			Receptor Type and Sensitivity	Description of Predicted Cumulative Impacts	Magnitude	Significance	Significant
	Operational Sites	Consented Sites	Submitted & Scoping Sites					
Viewpoint 20 West Nab, Meltham Moor E: 407643 N: 408796 Elevation: 500m Distance to Spicer Hill: 13.0km approx Refer Table 4.9 for description of existing view	Royd Moor (13.5km)	Hazlehead (11.0km)	Blackstone Edge (12.25km) Sheephouse Heights (18.75km)	Landscape: High Walkers/Hikers: High	Spicer Hill with Royd Moor: Both will be visible in the same 90° arc of view where Spicer Hill will appear as part of a slightly larger group. Refer to Table 4.9 for detail assessment. Spicer Hill with Hazlehead: The ZTV illustrates some fringe cumulative visibility with the wireline indicating blade tip visibility only of Hazlehead. Spicer Hill with Blackstone Edge: Both will be visible in the same 90° arc of view where they will appear as part of the same group. Blackstone Edge is slightly more visible in front of Spicer Hill. Spicer Hill with Sheephouse Heights: The ZTV illustrates some fringe cumulative visibility with the wireline indicating blade tip visibility only of Sheephouse Heights. Spicer Hill with all Windfarms: From this viewpoint Spicer Hill will potentially be seen at the same time and in the same 90° arc of view as all four windfarms. In reality, views of Hazlehead and Sheephouse Heights are likely to be precluded by a combination of local landform, vegetation and distance. Spicer Hill in combination with Royd Moor and Blackstone Edge will read as a compact and largely indistinct group on the distant skyline. Further, they will be seen in the context of an open and expansive panorama where they occupy a small proportion of available views. This, combined with distance and small number of turbines, is judged unlikely to result in the impression of a landscape or view that is defined by the presence of windfarms and characterised primarily by windfarms so that other patterns or components are no longer definitive.	Landscape: VS Walkers/Hikers: VS	Landscape: Sl Walkers/Hikers: Sl	No No

5 ECOLOGY

5.1 INTRODUCTION

This chapter describes the findings of the ecological assessment of the proposed Spicer Hill Wind Farm. Potential ecological effects are considered, including habitats, flora, protected mammals, reptiles and amphibians. Potential effects on bird ecology are considered in Chapter 6: Ornithology. Information pertaining to badgers is contained within a Confidential Annex.

Arcus Renewable Energy Consulting Ltd (Arcus) was commissioned to carry out baseline field surveys and the assessment of potential effects of the proposed development on ecological interests.

This chapter includes the following sections

- Consultation – Summary of consultation undertaken
- Assessment Methodology – a description of the methods used in the baseline surveys and assessment of the significance of effects
- Baseline Description – a description of the ecology of the site based on the results of desk study, consultations and surveys
- Information Gaps – a summary of uncertainties encountered in the assessment;
- Assessment of Potential Effects – a consideration of the ways in which the proposed development may affect the ecology of the site
- Mitigation – a discussion of appropriate mitigation recommended to off-set identified potential effects, this section also identifies any monitoring requirements
- Residual Effects – an assessment of the significance of the effects of the proposed development after mitigation has been implemented
- Statement of Significance – a summary of the findings of the assessment with reference to the obligation to identify any significant effects set out in regulations.

5.2 CONSULTATION

A scoping exercise was undertaken in August 2007. Consultees were provided with specific details of the proposed assessment methodology and data from a variety of sources was collated through a desk study ecological record search. A list of consultees and relevant responses are given in Table 5.1.

Table 5.1: Summary of Ecology Consultee Responses

Consultee	Summary
Natural England	The application should make reference to the latest policy guidance i.e. PPS 9. Recommends that the EIA should consider opportunities for increasing biodiversity both within the site and the surrounding countryside, with particular reference to contributing to repairing the fragmentation of heathland in the area.
Environment Agency (EA)	Consider that the scoping document addresses the issues appropriately
RSPB	Telephone discussion regarding general bird use of area. No records held.
Barnsley Metropolitan Borough Council (BMBC)	Records of locally designated sites requested

Consultee	Summary
West Yorkshire Ecology	A data search was conducted covering the southern part of the site boundary and surrounding area, results of which consisted of: Protected mammals; Known bat roosts; Full details can be found in the Technical Appendix.
South Yorkshire Bat Group	All records from within 5km of the site.
South Yorkshire Badger Group	All records from site boundary and surrounding 500m
County Bird Recorder	Records of statutorily protected and designated breeding and wintering/passage birds.
Local Herpetofauna Recorder	Limited records from surrounding area, noted the only local records are of toads in the local reservoir

5.3 ASSESSMENT METHODOLOGY

5.3.1 Relevant Guidance

The ecological baseline surveys and assessment have been carried out with reference to the following legislation and guidance documents

- Council Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna
- The Conservation (Natural Habitats &c) Regulations 1994
- The Wildlife and Countryside Act 1981
- The Protection of Badgers Act 1992
- Planning Policy Statement 9: Biodiversity and Geological Conservation
- Bat Conservation Trust Bat Surveys Good Practice Guidelines 2007¹
- Wind Turbines and Bats: guidelines for the planning process and impact assessments 2006²
- Guidelines for Ecological Impact Assessment in the United Kingdom 2006³
- Handbook of Biodiversity Methods 2005⁴

5.3.2 Consultation

One of the key best practice measures to emerge from the guidance documents referred to is the need for wide consultation. Consultation is summarised above. Field Survey Methodology

Baseline surveys were carried out by Arcus between May 2007 and March 2008 to collect quantitative data and allow the effects of the potential wind farm development to be assessed.

Full details of the dates, timing and methodology of each survey are provided in ES Volume 3: Ecology Technical Appendix.

¹ Parsons, K., Crompton, R., Graves, R., Markham, S., Matthews, S., Oxford, M., Shepherd, P., Sowler, S. 2007. Bat Surveys: Good Practice Guidelines. BCT, London.

² Rodrigues, L., Bach, L., Biraschi, L., Dubourg-Savage, M., Goodwin J., Harsbuch, C., Hutson, A., Ivanova T., Lutsar, L., Parsons, K. 2006 "Wind Turbines and Bats: guidelines for the planning process and impact assessments" Version 1.0 Doc.EUROBATS.MoP5.12.Rev.3.Annex1 available from www.bats.org.uk

³ IEEM. 2006. Guidelines for Ecological Impact Assessment in the United Kingdom. IEEM, available from www.ieem.org.uk

⁴ Hill, D., Fasham, M., Tucker, G., Shewry, M., Shaw, P. 2005. Handbook of Biodiversity Methods. Cambridge University Press, Cambridge.

5.3.3 Phase 1 Habitat Survey

A Phase 1 Habitat Survey was conducted, using the standard methods outlined in the *Handbook for Phase 1 Habitat Survey* published by the Nature Conservancy Council (1990)⁵, to identify habitat areas of ecological importance. Four visits were made, between August and October 2007 and any significant observations during other ecological surveys undertaken between November 2007 and March 2008 were also included.

5.3.4 Mammals

5.3.4.1 Badger

A survey to determine the presence of badgers was conducted within a 500m buffer of the turbine envelope. Two visits were made on 15th October and 6th November 2007, and the area was examined for any signs of badger activity following standard methodology. The survey also involved checking records of setts received during the desk study. Any evidence of badgers recorded during other ecological survey visits for other features was also included.

5.3.4.2 Water Vole

A survey to determine the presence of water voles was conducted within the turbine envelope. All watercourses were searched for field signs.

5.3.4.3 Otter

A survey to determine the presence of otters was conducted within the turbine envelope. All watercourses were searched for field signs.

5.3.4.4 Bats

A single preliminary visit was made on 12th to 13th September 2007 to determine the scope of survey that would be necessary at this site, based upon the level of bat activity observed. This consisted of consecutive dusk and dawn activity transect surveys, following a predetermined route incorporating 12 listening stops, and was designed with reference to Bat Conservation Trust (BCT) good practice guidelines. Bat echolocation calls were recorded using a frequency division bat detector (Batbox Duet) and digital recorder (EDIROL R-09). Structures and trees were also assessed as to their suitability as bat roosts during daylight.

5.3.5 Reptiles

Habitat within the site boundary was assessed as to its suitability to support reptile populations.

5.3.6 Amphibians

5.3.6.1 Great Crested Newt

Habitat within 500m of the turbine envelope was assessed as to its suitability to support great crested newt populations.

⁵ Joint Nature Conservancy Council. 1990. Handbook for Phase 1 habitat survey: a technique for environmental audit. Joint Nature Conservancy Council

5.3.7 Assessment of Significance

The approach taken to the assessment of ecological impacts follows the guidance produced by the Institute of Ecology and Environmental Management (IEEM 2006). These guidelines set out the process for assessment through the following stages

- Identification of valued ecological receptors (the baseline ecological conditions)
- Predicting and characterising ecological impacts on these resources according to the criteria identified in the guidance (these include for example the magnitude of the effect, duration, nature, and confidence in predictions)
- Assessment of whether impacts are ecologically significant
- Identification of any monitoring requirements

In attributing a value to a receptor, a simple scale of international-national-regional-local is used, as described in Table 5.2. For designated sites this is usually straightforward as most designations imply a level of value, for example SSSIs are designated on a national basis, whereas RAMSAR wetlands are designated at an international level and so imply international value. Guidance for valuing non-designated features and populations is available in publications such as [JNCC 1989 et seq⁶], and these are referenced where appropriate.

TABLE 5.2: Approach to Valuing Ecological Receptors

Value Level	Examples
International	An internationally designated site, candidate site, or an area meeting the criteria for an international designation. Large areas of priority habitat listed under Annex I of the Habitats Directive, and smaller areas of such a habitat that are essential to maintain the viability of that ecological resource. A regularly occurring, nationally significant population of any internationally important species.
National	A nationally designated site or area, meeting criteria for national level designations. Significant extents of a priority habitat identified in the UK BAP, or smaller areas which are essential to maintain the viability of that ecological resource. A regularly occurring, regionally significant population of any nationally important species.
Regional	Viable areas of key semi-natural habitat identified in the Local BAP (LBAP). A regularly occurring, locally significant population of a species listed as being nationally scarce or in the LBAP. Sites which exceed the local authority-level designations but fall short of SSSI selection guidelines, including areas of semi-natural woodland exceeding 0.25ha.
Local	Areas of semi-natural ancient woodland smaller than 0.25ha. Sites of Importance for Nature Conservation or equivalent sites selected on local authority criteria. Local Nature Reserves. Areas of habitat or species considered to appreciably enrich the ecological resource within the local context e.g. species-rich flushes or hedgerows.

Assessment of the magnitude of effects is quantitative where possible.

Effects may be negative, neutral or positive in nature, regarding their effect on VERs and local ecological interests as a whole.

The 2006 IEEM guidelines use only two categories: "significant" or "not significant". In assessing whether an impact is significant, the concept of "ecological integrity" is a guiding principle. This concept can be applied both to designated sites (for example a SSSI) and to

⁶ [JNCC 1989 et seq] Joint Nature Conservation Committee 1989 "Guidelines for the selection of Biological SSSIs" Joint Nature Conservation Committee, Peterborough

defined populations (for example a local red squirrel population). This concept underpins much of the European legislation in relation to nature conservation.

5.4 BASELINE DESCRIPTION

This section describes the flora and fauna at the Spicer Hill development site. Full details can be found in the Ecology Technical Appendix.

5.4.1 Desk Study and Consultations

A summary of consultation is provided in Table 5.1 above.

5.4.2 Designated Sites

Consultation and a search of available digital datasets indicate that there are no statutory designations of European importance (e.g. Special Areas of Conservation (SAC)), national importance (e.g. Sites of Special Scientific Interest (SSSI)) or non-statutory local importance (e.g. Site of Importance for Nature Conservation (SINC) within the turbine envelope). Details of the closest designated sites are provided in Table 5.3, and locations of SSSIs and SINC are shown in Figure 5.1.

Table 5.3: Designated Sites

Designation	Distance	Name	Comments
Special Area of Conservation (SAC)	4.2km SW	South Pennine Moors	Designated for a variety of habitats. Site includes small semi-improved patches of dry heath type habitat but is distantly separated from the SAC by a considerable distance of numerous low value habitats. i.e. improved grassland, arable, conifer plantation etc. No other habitats are shared between the SAC and the site.
Special Protection Area	4.2km SW (same boundary as SAC above)	Peak District Moors (South Pennine Moors Phase 1)	Designated for populations of: golden plover, peregrine, merlin, short-eared owl and dunlin. None of these species were recorded during any surveys and the site provides no significant breeding habitat for any of these species.
Site of Special Scientific Interest (SSSI)	3.9km SE	Spring Meadow, Alderman's Head and Cow Croft Meadows	Designated for its species-rich, unimproved, neutral grassland. This habitat does not occur within the survey area.
Natural Heritage Site	c.700m W	Whitley Edge	Designated primarily for its western gorse heathland and other habitats forming a mosaic with the gorse. Parts of the survey area share these habitats but not within the development footprint.
Natural Heritage Site	c.500m NW	Broadstone Reservoir	The site is designated for its aquatic habitats, its mosaic of grassland/heathland and its passage and breeding bird populations. Parts of the survey area share the constituent habitats within the mosaic but not within the development footprint.

Designation	Distance	Name	Comments
			The survey area has been assessed for its breeding and passage bird populations.
Natural Heritage Site	c.700m E	Ingbirchworth Reservoir	This site is designated for a range of wetland and dry habitats and scarce wetland plants. The site also holds important wintering and passage bird populations. Parts of the survey area share some of the constituent habitats within this NHS but not within the development footprint. The survey area has been assessed for its breeding and passage bird populations.
Natural Heritage Site	c.650m E	Royd Moor Reservoir	The site is designated primarily for its standing water and inundation habitats. Great Crested Newt has also been recorded at this site although its current status is not clear.
Parish Council Designated Nature Reserve	Immediately NE of Spicer House Lane	Ingbirchworth Nature Reserve	Dry heath dominated, isolated, small (c.1ha) site. No negative impact likely.

5.4.3 Habitats

The turbine envelope and surrounding area is greatly dominated by generally poor arable and improved grazing fields. All woodland within the site is plantation and found in restricted pockets. The site includes a number of streams with no high value associated features. The more valuable habitats within the site are dominated by semi-improved grasslands showing characteristics of dry heath shrub and acid grassland. Habitats recorded are shown in Figure 5.2, coded following standard classification. Detailed results of the habitat survey are presented in the Technical Appendix. The main habitats recorded are described below.

5.4.3.1 Improved Grassland

The majority of the development site consists of improved grassland, dominated by agricultural grasses such as perennial rye-grass, crested dog's tail and meadow grasses with frequent clover in the sward. Locally wetter areas have some soft-rush, and nettles and thistles are also occasionally found. This is a common and widespread habitat of limited ecological value. The most improved areas showed evidence of mechanical seeding and are considered to be equivalent to arable fields.

5.4.3.2 Arable

Several fields adjacent to Spicer House Lane held crops or were ploughed and tilled during the survey. This is a common and widespread habitat of limited ecological value.

5.4.3.3 Semi-improved Grassland

Sections of several fields held species-poor neutral swards dominated by perennial rye-grass and crested dog's tail (*Cynosurus cristatus*) with herbs generally limited to thistles, buttercup, dandelions, docks and other common species. Occasional clumps of rush are found throughout damper areas. In a less improved sward, primarily located in the south-east corner of the site, a more diverse flora has been retained including greater amounts of additional species such as sweet-vernal grass, sorrel and self-heal.

5.4.3.4 Semi-improved Acid Grassland

The remainder of the semi-improved fields hold a slightly more diverse sward including species indicating acidic conditions. In addition to the grasses mentioned previously common bent, red and sheep's fescues and mat-grass are all present along with herbs including heath bedstraw, sheep's sorrel, harebell and tormentil. This habitat is frequently found forming a mosaic alongside the dry dwarf shrub heath habitat described below. This habitat is also found in a more species-poor form (common bent and mat-grass dominate with few herbs) beneath the long plantation bordering the stream which cuts through the proposal site near Spicer House.

5.4.3.5 Dry Dwarf Shrub Heath

This habitat within the survey area is almost entirely dominated by western gorse and is located on the steeper slopes of the fields south of Whitely Road and as part of a habitat mosaic with the acid grasslands in the south-east corner of the site. Very few heather plants were also located in the south-east corner and occasional bilberry plants were located adjacent to streams running through the site. The Ingbirchworth Nature Reserve immediately north-east of the survey area was dominated by heather with stands of bilberry and bracken.

5.4.3.6 Marshy Grassland

This habitat occurs in a few small damp areas generally at the bottom of slopes of semi-improved fields where the sward becomes dominated by rush and tufted hair-grass with other species including compact rush, marsh foxtail and forbs including marsh thistle, cuckoo flower and rarely sneezewort.

5.4.3.7 Plantation Woodland

The site includes a few small pockets of broad-leaved plantation dominated by sycamore, oak and beech and a stand of non-native spruce plantation immediately south of Spicer House. These plantations are small, lack connectivity to other woodlands and do not hold any significant understorey or ground flora typical of more valuable woodlands. A small block of coniferous plantation is located adjacent to Spicer House.

5.4.3.8 Running Water

Three streams run through or along the boundaries of the site. These streams were shallow or at least partially dry during the survey and emergent vegetation was limited to rush, willowherb and particularly on the stream along the southernmost boundary of the survey area, covered in a dense carpet of floating sweet-grass. No significant aquatic vegetation was recorded and no signs of protected species were found.

5.4.4 Mammals

5.4.4.1 Badger

All results of the badger survey at the site, and any associated assessment and/or mitigation are included in the Confidential Annex.

5.4.4.2 Water Vole

All the streams and ditches were found to offer some potentially suitable habitat, but no signs of water vole presence were found.

5.4.4.3 Otter

Historical records indicate that otters are active at Ingbirchworth reservoir (750m north-east, 2004). The site is connected to the reservoir by a stream/ditch although the streams within the site are considered to be sub-optimal habitat due to a lack of wooded banks and only shallow and narrow courses. The site does occur between the ponds at the clay quarry to the west of the site and the reservoir and could therefore be used as a commuting route. No evidence of otters was recorded along any of the water courses during the survey.

5.4.4.4 Bats

Roosts

Roost records were provided by the local bat group from the local area. Records included all the species likely to be found in this region including Pipistrelles, Brown long-eared, Daubenton's, Brandt's, Natterer's and Whiskered bats.

Foraging

The majority of foraging activity recorded related to pipistrelle bats, with both the common and soprano pipistrelle species recorded, as well as noctule bats. Activity was also recorded by bats in the *Myotis* group. These species are very difficult to separate using spectrogram software and given the records of at least four of the five british *Myotis* species roosting in the wider region, it was not possible to identify these with confidence. Brandt's, Daubenton's, Natterer's and Whiskered bats are all in the *Myotis* group and have been recorded roosting in the surrounding area. Thus foraging activity may relate to any of these species.

5.4.5 Reptiles

The location and dominant habitat types within the site suggest that the site is unlikely to hold sizeable reptile populations. The nature of the development and the lack of destruction to valuable habitats means that disturbance to any such populations would be minimal. No reptiles were observed on the site during any of the other ecology and ornithology surveys.

5.4.6 Amphibians

5.4.6.1 Great Crested Newt

No ponds are located within the survey area. The ponds in the adjacent clay quarry to the west and in the Ingbirchworth Nature Reserve could offer breeding habitat for this species. They are surrounded by tall rank grassland and dense dwarf shrub respectively, ideal for terrestrial habitat. The majority of the grassland within the site is grazed and very short offering considerably lower value terrestrial habitat. No records of great crested newt were received during the desk study other than historical records from Royd Moor Reservoir NHS, located over 650m from the proposal site.

5.5 VALUED ECOLOGICAL RECEPTORS

Using the baseline information detailed above, Table 5.4 details the identified VERs in the context of the proposed wind farm development at Spicer Hill. Reasoning for inclusion as a VER is also given, and a value assigned based upon the criteria detailed in Table 5.4.

Table 5.4: Valued Ecological Receptors

VER	Value	Reasons - Comments
Ingbirchworth Nature Reserve	LOCAL	Designated at a Parish level for its interest as a semi-natural dry dwarf shrub habitat. Its small size and poor connectivity to other areas of similar habitats restricts its value to local level.
Acid Grassland/Dry dwarf shrub heath Mosaic	LOCAL	The presence of western gorse scrub which is included within the designations of Natural Heritage Sites in the wider area, e.g. Brock Holes NHS near Penistone, and the relative lack of improvement of the sward compared to surrounding areas makes this habitat and particularly the field in the south-east corner of the site of significant value to the local area. This habitat is, however, currently used for livestock grazing and could be vulnerable to a reduction in value should current management become more intensive.
Water Vole	LOCAL	Water voles receive full protection under the Wildlife and Countryside Act, 1981. They are also the subject of a BAP and of a LBAP in BMBC. However, no signs of water vole were found despite suitable habitat. Therefore, any local population or suitable habitat is unlikely to be of national significance, and is considered to be of local value.
Otter	LOCAL	Otters are a European protected species under Annex II of the Habitats Directive. They are also the subject of a UK-wide BAP and of a LBAP in BMBC. The site does hold habitat which could be used as a commuting route. Although otters are protected at international and national levels, there is no evidence of otters were found within the development site. Therefore, if the site is used by otters, it is unlikely to support an internationally or nationally significant population, and so any other population at Spicer Hill is considered to be of local value.
Bats	REGIONAL	All bat species are protected by European law, under Annex II of the Habitats Directive, and pipistrelle bats are the subject of a UK-wide BAP and a LBAP in Barnsley. No roosts were confirmed within the site, however the assemblage of bat species using the site for foraging is considered to be of regional value.
Reptiles	LOCAL	All reptile species are listed on Schedule 5 of the Wildlife and Countryside Act, 1981 (although only smooth snake and sand lizard are afforded full protection) and are the subject of UKBAPs. No reptiles were recorded within the site boundary and habitats are considered to be generally poor for this group. Reptiles are therefore considered to be of local importance.
Great Crested Newt	REGIONAL	Great crested newts are a European protected species under the Habitats Directive. They are also the subject of a UK-wide BAP and a LBAP in Barnsley. Suitable breeding habitat is also protected under the Habitats Directive. Habitat is largely unsuitable at Spicer Hill and no potential breeding ponds occur within the site boundary, and so any population present is unlikely to be of international or national importance. Any population and habitat is therefore considered to be of regional value.

5.6 INFORMATION GAPS

BMBC does not currently have a specific ecological records centre or similar service and therefore it was not possible to undertake a generalised desk study search from such a body. However, other than the habitats mentioned above the site is dominated by species-

poor and heavily managed habitats which are considered unlikely to hold important populations of any protected or otherwise designated or notable floral or faunal populations.

Access into the clay quarry area to the west of the site was not established at the time of the surveys and therefore no Great Crested Newt survey was undertaken. As mentioned previously however these ponds are located within areas of potentially high value terrestrial habitat for any local populations which does not occur in any significant amount within the site boundary. The ponds within the Ingbirchworth Nature Reserve are also surrounded by suitable terrestrial habitat. These ponds are all fairly young and do not form parts of an existing network of ponds likely to hold other populations. The development would involve limited impact upon low value habitats for this species and no records of this species were received from the wider area during the desk study.

The Eurobats guidance recommends very intensive study of bat activity with surveys at height and from the ground repeated more or less on a weekly basis throughout the period when bats are active in the year. The detail of this guidance has not yet been widely implemented in England, and as a result only the broad principles of the guidance have been adopted in this assessment, based on a very much reduced sample of bat activity from the late summer period. There is also an urgent need for research into the potential effects of wind farm developments on bats, as current predictions are based on rather limited data.

5.7 ASSESSMENT OF POTENTIAL EFFECTS

This section provides an assessment of the potential effects of the development with specific reference to how they may affect VERs. For each VER, effects are assessed for the construction, operation and decommissioning phases of the development.

5.7.1 Potential Construction Effects

5.7.1.1 Ingbirchworth Nature Reserve

Ingbirchworth Nature Reserve is not considered likely to face any significant impact from the development as it lies outside of the survey boundary, is surrounded by walls and fences, does not share significant existing habitat links and is separated from the site by the Spicer House Lane.

An increase in traffic on Spicer House Lane adjacent to this site may increase the risk of pollution. The reserve is currently separated from the proposal site by the existing road and is considered unlikely to face any direct impact from increased run-off etc. from the development. The magnitude of these effects is considered to be negligible and therefore not significant. There is therefore no need to consider further the potential effects on this receptor in this assessment.

5.7.1.2 Habitats

There are four ways in which habitat receptors may be affected during the construction phase

- direct loss – this is the most obvious ecological effect, where areas occupied by a particular habitat are reduced in order to accommodate development infrastructure, turbine bases, crane pads, access tracks, control buildings and other elements of the development all have a footprint that results in direct habitat loss at those locations, these losses are permanent in the context of this assessment.
- disturbance – the effects of disturbance are variable in their extent, depending on the nature of the disturbance and sensitivity of the habitat receptor. Some disturbance types (for example, creation of temporary hard standing areas at the contractor's compound) result in long-term disturbance with extended recovery periods. In other cases (for

- example, installation of cables at the sides of access tracks) disturbance is short-term, and certain habitat types are able to recover quickly.
- nutrient enrichment – organic enrichment of habitats is unlikely in the context of wind farm construction, but mineral enrichment can be an issue in some circumstances localised mineral enrichment can result where vegetation is being used to treat water run-off from excavations or roads with high silt content, this is an undesirable effect on sensitive habitat receptors. Often limited direct habitat loss through creation of lagoons as pollution control measures is necessary to prevent mineral enrichment over a wider area.
 - indirect effects – these primarily relate to changes in hydrology, the creation of access tracks and other infrastructure may change the pattern of drainage in an area.

Only one habitat receptor has been identified in this assessment and the potential effects on this receptor are discussed below:

Acid Grassland/Dry dwarf shrub heath mosaic

The turbines, tracks and the site compound would be located outside of this VER habitat and would be situated within areas of arable, improved and poor semi-improved grassland. Some of the tracks and turbines are positioned at the top of slopes which do run down to areas of semi-improved acid grassland. This mosaic may be affected by hydrocarbon pollution and sedimentation through run-off and spillage, which may result in mineral enrichment, indirect habitat loss or a reduction in habitat quality.

Should the mosaic habitat be impacted upon as described above then this would be considered as a significant effect on this receptor in the absence of mitigation. Mitigation measures are proposed below.

5.7.1.3 Water Vole

No potential water vole habitat will be directly affected by construction activities. However, habitat may be indirectly affected by pollution and sedimentation due to run-off and spillage, resulting in deterioration of water quality.

Water voles exist as a number of interacting fragmentary populations, which require empty areas of habitat to move in to. Therefore, although no sign of water voles were recorded it is possible that suitable habitat may become occupied in the future.

Due to this, there is a small chance of a measurable, and so significant, effect on any local population in the absence of mitigation.

5.7.1.4 Otter

The habitat present within the development area is of little or no value to foraging otter, and no marginally suitable habitat will be directly affected during construction. Habitat may be indirectly affected by pollution and sedimentation due to run-off and spillage, resulting in deterioration of water quality.

Otters may cross large areas of open land when hunting for frogs. Historical records indicate otters are present in the general area, and so it is possible that individuals may cross this area rarely.

There is, therefore, a small chance of a measurable, and so significant, effect on the local population in the absence of mitigation.

5.7.1.5 Bats

Bats may be affected by foraging habitat loss and roost loss during construction. No roosts have been identified within the development footprint and so the loss of roosts is not considered likely in this case. The nearest potential roost site, Spicer House, is located over 300m from the nearest turbine.

The construction operation is not considered likely to result in any significant changes to the structure of the existing habitats and so the potential for loss of foraging habitats during construction is considered to be limited.

5.7.1.6 Reptiles

A small area of marginally suitable reptile habitat will be lost during the construction phase. No reptiles were recorded within the site or during the desk study. Habitat of higher potential value to reptiles exists outwith the proposed development area. The low potential of the habitats impacted on by the proposals and the lack of records from the general area suggest that important reptile populations are unlikely to be found within this area. It is considered that there would be no significant impact upon this group.

5.7.1.7 Great Crested Newt

There will be no direct loss of potential great crested newt breeding habitat through construction and only loss of low value potential terrestrial habitat. However, potential breeding ponds located outside of the site may be affected by pollution and sedimentation through run-off and spillage resulting in a deterioration of water quality, and loss of suitable habitat.

Great crested newts exist as a number of interacting fragmentary populations, which require empty areas of suitable habitat for breeding and foraging to move in to. The site does not currently hold any potential breeding habitat and all turbine, track and site compound locations would be in areas of low value as terrestrial habitat. Due to this lack of impact upon important habitats and the lack of any desk study records in the wider area it is considered unlikely that there would be any significant impact on this species.

5.7.2 Potential Operational Effects

5.7.2.1 Ingbirchworth Nature Reserve

An increase in traffic on Spicer House Lane adjacent to this site could increase the risk of pollution, however only very low levels of operational traffic are predicted. The reserve is currently separated from the proposal site by the existing road and is considered unlikely to face any direct impact from increased run-off etc. from the development. The magnitude of these effects is considered to be negligible and so unlikely to be significant.

5.7.2.2 Habitats

Acid Grassland/Dry Dwarf Shrub Heath Mosaic

There is a possibility of increased run-off from tracks and hard standings during the operational phase. This may result in pollution and sedimentation, although to a lesser degree and extent than during the construction phase. Increased usage of the site by machinery may also increase the risk of pollution. The magnitude of these effects is considered to be negligible and so unlikely to be significant in a local context.

No other potential effects on habitat receptors have been identified in the operational phase of the development.

5.7.2.3 *Water Vole and Otter*

There will be an increased level of human activity around the wind farm site during the operational phase, in addition to ongoing farm management. This may potentially result in disturbance to water vole and otter, discouraging these species from foraging in the area. Otters are both crepuscular and nocturnal in their habits, and so this increase in activity is unlikely to result in a measurable impact. Water vole habitat is generally limited to 20m around a watercourse, and so they are also unlikely to be greatly affected. Therefore the magnitude of this effect is predicted to be negligible in the absence of mitigation, and thus not significant.

There is a possibility of increased run-off from tracks and hard standings during the operational phase, which may affect water vole and otter habitat. This may result in pollution and sedimentation, although to a lesser degree and extent than during the construction phase. Increased usage of the site by machinery may also increase the risk of pollution. The magnitude of these effects is considered to be negligible and so unlikely to be significant in a local context.

5.7.2.4 *Bats*

Potential impacts on bats is an area where further research is urgently needed to better inform impact assessments of this type. There are a number of ways in which bats may be affected by the operation of the wind farm, and these are discussed below, however in each case research is required to better inform assessments.

Ultrasound emission has been highlighted as of potential concern in relation to bats, however the EUROBATS guidance indicates this is probably of limited impact⁷. At present there is no evidence that ultrasound from turbines has an effect on bat populations, and whilst further research is required, the existing body of professional opinion on this topic indicates it is unlikely to be significant.

There may be a loss of hunting areas because the area is avoided by bats. At present this impact can not be predicted with certainty as there have not yet been sufficient studies undertaken to allow quantitative prediction of this impact. The scale of the impact will depend on the level of activity in the area prior to construction and the extent to which bats avoid the area. The limited data available indicate that the area is used by an assemblage of foraging bats typical of the wider region. None of the habitat features recorded indicate that this is likely to be a foraging area of particular value in the context of the wider region, being relatively exposed and having few shelterbelts or other woodland features. However it is clearly used by foraging bats on the basis of the field survey evidence. It is currently not clear from the existing research and anecdotal evidence whether bats are discouraged from foraging close to turbines (and so suffer loss of foraging habitat) or are actively attracted to wind farms and so experience collision risk.

There is a collision risk to foraging and migrating bats during the operational phase of the wind farm. At present there is no accepted framework for quantifying collision risk to bats. The significance of this potential impact is likely to be greater for migrating bats⁸. None of the species recorded in and around the development are strongly migratory, although some (such as noctule) are known to make relatively long distance movements flying at heights within the rotor swept area. Noctule bats are known to be migratory in mainland Europe, but this behaviour has not been recorded in the UK population.

There may be a loss of or change in the position of flight corridors. Assessment of the known roosts in the area has not allowed any clear flight corridors to be identified. More

⁷ see note 2

⁸ see note 2

intensive monitoring may allow existing corridors to be identified, however it is not known with certainty the extent to which the positions of flight corridors are likely to change in the presence of wind turbines, and what the likely effect of this change will be at the population level.

The response of the assemblage of foraging bats using the Spicer Hill site is therefore difficult to predict with certainty. To date there is no clear published evidence of direct effects on bat populations as a result of wind farm developments. Collisions have been recorded at other sites, however the greatest concern in relation to collisions focuses on strongly migratory populations, which have not been recorded at Spicer Hill. Bat activity is concentrated along linear features, such as hedgerows and woodland edges, or around woodland and water features. Activity levels generally decrease as distance from these features increases, with some research suggesting a sharp decline beyond 70m from water courses, and little deviation from features during commuting flights⁹. Turbines have been situated out in the open in arable and semi-improved grassland, where bat activity is low due to poor foraging opportunities, with the closest turbine being over 140m from the nearest woodland edge. No turbines interfere with any linear feature which may be used by bats as a commuting route. On this basis a significant effect on the assemblage of bats foraging at this site is considered to be unlikely, however monitoring and further research in this area would improve the confidence in prediction for this impact.

5.7.2.5 Reptiles

No significant operational effects on potential reptile populations have been identified.

5.7.2.6 Great crested newt

There is a low possibility of increased run-off from tracks and hard standings during the operational phase which may affect suitable great crested newt breeding habitat outside the site boundary. This may result in pollution and sedimentation, although to a lesser degree and extent than during the construction phase. Increased usage of the site by machinery may also increase the risk of pollution. The magnitude of these effects is considered to be negligible and so unlikely to be significant in a local context.

5.7.3 Potential Decommissioning Effects

As decommissioning activities are of a similar type and intensity as construction activities they often result in the same potential impacts.

5.7.3.1 Ingbirchworth Nature Reserve

Decommissioning could result in a similar level of impact on Ingbirchworth Nature Reserve as during the construction phase.

5.7.3.2 Habitats

Decommissioning may result in run-off and pollution through spillage on the habitat recetor "acid grassland/dry dwarf shrub heath mosaic". This may have a similar impact on these habitats as during the construction phase. No other potential impacts on habitat receptors have been identified in the decommissioning phase.

⁹ N.C. Downs and Racey, P.A. 2006. The use by bats of habitat features in mixed farm land in Scotland. *Acta Chiropterologica* **8**. 169-186.

5.7.3.3 *Water Vole, Otter Reptiles and Great Crested Newts*

Decommissioning could result in a similar level of impact on these receptors as during construction phase.

5.8 MITIGATION

The principal mitigation measure adopted to minimise the ecological impact of the development has been the use of an iterative design process. Use has been made of ecological constraints feedback from surveyors on the site and ecological issues have been taken into account throughout the design process. This means that most mitigation measures are embedded within the overall design, allowing the opportunity to move turbines away from sensitive habitats or species. This section presents specific measures adopted through the different phases of the development. An ecological clerk of works should be appointed to oversee mitigation measures, and ensure best practise during the construction and decommissioning phases.

5.8.1.1 *Ingbirchworth Nature Reserve and other Habitat Receptors*

A series of mitigation measures are detailed in Chapter 7 to minimise the risk of pollution and sedimentation caused by run-off and spillage which may affect Ingbirchworth Nature Reserve and other habitat receptors.

Embedded mitigation is integral to the design of the development. The site layout has taken habitat constraints into account from the earliest iterations through avoidance of sensitive habitats. All of the proposed development has been located outwith areas of sensitive habitat, and in particular none of the acid grassland/dry dwarf shrub heath mosaic will be lost during the development of the site.

5.8.1.2 *Water Vole and Otter*

Loss of habitat has been avoided through the iterative design process.

The site will be resurveyed prior to construction. This will provide a double-check for any water vole populations or otter evidence that could have been overlooked in the original survey and also for any colonies/individuals that have moved into the area since the previous survey. All turbines have been sited over 20m from any watercourse as part of the iterative design process. If an otter shelter is located prior to construction, appropriate mitigation measures will be agreed with Natural England. This is likely to involve establishing a protected zone around the shelter to minimise the risk of disturbance.

Excavations over 0.5m deep will be covered overnight or escape ramps provided to prevent otters and other mammals from becoming trapped.

A series of mitigation measures are detailed in Chapter 7 to minimise the risk of pollution and sedimentation caused by run-off and spillage which may affect water vole or otter habitat.

Best practice will be employed to reduce risk of disturbance, including avoiding any unnecessary plant movements close to watercourses.

5.8.1.3 *Bats*

The site will be resurveyed during the current season for bat foraging activity and any roosts or potential roosts in order to provide more detailed baseline information to inform post construction monitoring.

Through the design process the guidelines published by Harsbuch and Bach¹⁰ have been adopted, these include minimum separation distances from roosts of 500m and 200m from woodland edge and other important foraging habitats. The 200m buffer was not possible to implement in one instance (woodland to the west of the site, following a water course). Research suggests, however, that bat activity declines sharply beyond 70m from watercourses. The design ensures that the nearest turbine is over 140m from the woodland edge, and stream – over twice the distance at which activity declines – and all turbines are located in open areas of limited foraging value¹¹.

Post construction monitoring would be undertaken for bat activity and bat collisions. Should this monitoring highlight any significant or potentially significant impacts, upon the established baseline, there are a number of experimental mitigation measures that could be adopted, such as the creation of insect rich habitats away from turbines using managed manure piles.

5.8.1.4 Reptiles

A small area of marginally suitable habitat will be lost during construction. This area will be searched by a competent ecologist before construction starts in this area, and the ecologist will supervise the initial phase of construction operations in this area.

5.8.1.5 Great Crested Newt

The ponds within 500m of the site will be surveyed for great crested newt prior to construction, subject to access.

Loss of suitable breeding habitat has been avoided through the iterative design process. The nearest turbine will be located 130m from a potential breeding pond, and the development is in habitat that is not classed as "newt friendly"¹², thus reducing the likelihood of newts occurring the area of the development.

A series of mitigation measures are detailed in Chapter 7 (Hydrology & Hydrogeology) to minimise the risk of pollution and sedimentation caused by run-off and spillage which may affect suitable great crested newt habitat.

5.8.2 Habitat Management Plan

The current value of the acid grassland/dry dwarf shrub heath mosaic habitat is restricted by an apparent lack of specific management to retain or enhance its quality and it could be susceptible to degradation if existing management becomes more intensive with regard to increased grazing and/or improvement. This habitat has the potential to be managed in such a way as to create a more natural acid/heathland area which would compliment and increase the viability of the heather/bilberry habitats present in close proximity at the Ingbirchworth Nature Reserve.

A management plan would be designed to enhance the existing ecological value of this habitat. Such a plan would meet the requests from Natural England, received during the desk study to improve quality, connectivity and quantity of this habitat in the local area.

The management plan will also be designed so as to conserve and improve the broadleaf plantation woodland following the stream to the north-west of the site. This would include the provision of stock-proof fencing, thinning where and when appropriate and replanting of

¹⁰ Harsbuch, C. and Bach, L. 2005 "Environmental Assessment Studies on wind turbines and bat populations – a step towards best practice guidelines" Bat News

¹¹ See note 9.

¹² Oldham, R. S. Keeble, M.J.S., and Jeffcote, M. 2000 "Evaluating the Suitability of Habitat for the Great Created Newt (*Triturus cristatus*) Herpetological Journal 10 143-155

native flora of local provenance where necessary to restore the understory and increase this habitat's biodiversity and ecological value.

5.9 RESIDUAL EFFECTS

Table 5.6 details the predicted effects after mitigation has been considered. As decommissioning activities are of a similar type and intensity as construction activities, they often result in the same potential impacts. In the case of this development, mitigation measures during decommissioning are identical to those employed during construction and so are not repeated. This is likely to be precautionary as in practice many of the decommissioning impacts are likely to be of a smaller scale than the construction impacts.

In the context of the table below, short term means the duration of the construction phase, and long term means the duration of the operational phase (25 years).

Table 5.6 Residual Effects

VER	Value	Potential Effect	Mitigation	Magnitude of Change	Duration	Nature	Significance	Level of Certainty/Comments
Construction Impacts								
Ingbirchworth Nature Reserve	LOCAL	Habitat degradation.	Mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	No change	Short term	Neutral	Not significant	Any indirect impact is considered unlikely with mitigation in place.
Acid Grassland/Dry Dwarf Shrub Heath Mosaic	LOCAL	Habitat degradation.	Avoidance of habitat at design stage, management plan to enhance quality of habitat receptor.	Minor positive	Long term	Positive	Not significant	No potential negative impacts are predicted. Management plan could improve quality of this habitat.
Water Vole	LOCAL	Loss or degradation of suitable habitat,	Avoid potential habitat at design stage, habitat quality protected by hydrology mitigation and protection from plant movement	No change	Short term	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
		Disturbance.	Best practice through avoiding construction operations near watercourses, mammal escape ramps in any excavations	No change	Short term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if water voles are present, but no detectable effect is predicted at the population level after mitigation.
Otter	LOCAL	Loss or degradation of suitable habitat	Layout and design avoids suitable habitat through constraints mapping. Other mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	No change	Short term	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.

VER	Value	Potential Effect	Mitigation	Magnitude of Change	Duration	Nature	Significance	Level of Certainty/Comments
		Disturbance.	Best practice will be implemented, including mammal escape ramps in any excavations.	No change	Short term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if otters are present, but no detectable effect is predicted at the population level after mitigation.
Bats	REGIONAL	Loss of roost and foraging habitat.	Layout and design avoids suitable habitat through constraints mapping.	No change	Permanent	Neutral	Not significant	Potential impact designed out through constraints mapping.
Reptiles	LOCAL	Loss or degradation of suitable habitat	Management plan will enhance quality of habitat.	No change	Permanent	Neutral	Not significant	Potential loss is considered trivial in local context. Management plan will improve the potential value of habitats in the area for this group.
		Disturbance.	Works in marginally suitable habitat supervised by ecologist.	No change	Short term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if reptiles are present, but no detectable effect is predicted at the population level.
Great Crested Newt	REGIONAL	Loss or degradation of suitable habitat,	Layout and design avoids suitable habitat through constraints mapping. Other mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	No change	Permanent	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
		Disturbance.	Design avoids suitable habitat	No change	Short term	Neutral	Not significant	This is considered very unlikely given the terrestrial habitats affected are unlikely to support newts.
OPERATIONAL IMPACTS								
Ingbirchworth Reservoir	LOCAL	Degradation of habitat receptors.	Mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	No change	Permanent	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
Acid Grassland Dry Dwarf Shrub Heath Mosaic	LOCAL	Habitat degradation.	Mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	Minor positive	Long term	Neutral	Not Significant	No potential negative impacts are predicted after mitigation. Management plan could improve quality of this habitat during the operational phase.

VER	Value	Potential Effect	Mitigation	Magnitude of Change	Duration	Nature	Significance	Level of Certainty/Comments
Water Vole	LOCAL	Degradation of suitable habitat,	Mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	No change	Permanent	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
		Disturbance.		No change	Long term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if water voles are present, but no detectable effect is predicted at the population level.
Otter	LOCAL	Degradation of suitable habitat	Mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	No change	Permanent	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
		Disturbance.		No change	Long term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if otters are present, but no detectable effect is predicted at the population level.
Bats	REGIONAL	Collisions, loss of foraging habitat or changes to commuting routes	Monitoring, possibly manure pile diversions or other experimental techniques.	Monitoring required, not expected to result in a large change at the population level	Long term	Negative	Not significant	Habitat is of low quality for foraging, and the nearest potential roost site is >300m from the nearest turbine. Monitoring will help to quantify the effect, but available evidence suggests a detectable effect at the population level is unlikely.
Reptiles	LOCAL	Disturbance		No change	Long term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if reptiles are present, but no detectable effect is predicted at the population level.
Great Crested Newt	REGIONAL	Loss or degradation of suitable habitat	Mitigation measures detailed in Chapter 7 (Hydrology & Hydrogeology).	No change	Permanent	Neutral	Not significant	Any indirect impact on habitat is considered unlikely after mitigation.
		Disturbance		No change	Long term	Neutral	Not significant	Disturbance could lead to an increase in stress for some individuals if great crested newts are present, but no detectable effect is predicted at the population level.

5.10 STATEMENT OF SIGNIFICANCE

Overall, this site is not sensitive with respect to habitats and protected species. Mitigation is recommended to minimise potential effects on VERs identified. After mitigation is considered, the impact on VERs is assessed as not significant.

No important habitat is lost to the development footprint and the inception of a management plan for the acid/grassland/dry dwarf shrub heath mosaic habitat will be implemented that will improve the connectivity, quantity and quality of this habitat in the wider area. Such habitat improvement is likely to benefit the existing populations and possibly encourage new populations of natural flora and fauna. The habitat management plan will also involve improvements beneficial to local flora and fauna, including broadleaf woodland. Monitoring is recommended to improve our understanding of the responses of foraging bats to wind turbine developments.

Climate change is widely accepted as the cause of some adverse ecological events and predictions indicate that declines will occur in many habitat types and ecological taxa. It is also important in the decision making process to consider the positive contribution that the development will have in tackling the issue of climate change.

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6 ORNITHOLOGY

6.1 INTRODUCTION

This chapter describes the findings of the ornithological assessment of the proposed Spicer Hill Wind Farm development. The chapter details the methods used to establish the bird interest within the site and surrounding area and the process used to determine the nature conservation importance of the populations present. It then sets out the potential effects on birds during construction and operation and assesses the significance of potential impacts on populations at an appropriate geographical scale. Means to mitigate any significant impacts are proposed and a summary of residual impacts is provided. An assessment of impacts on non-avian ecology is considered in Chapter 5: Ecology.

The assessment is structured in the following way

- Methodology - a description of the methods used, describing the specific survey methods used to describe the baseline conditions and the approach taken to assess potential impacts
- Baseline Description – a description of the ornithological interest of the site based on the results of surveys, desk information and consultations
- Information Gaps - a summary of the main uncertainties encountered in the assessment;
- Assessment of Effects - this considers in what ways the proposed development may result in changes to the baseline, then describes any appropriate mitigation in relation to each effect and presents an assessment of the significance of the effect taking into account the proposed mitigation measures
- Summary of Effects
- Monitoring - any monitoring requirements are identified
- Statement of Significance - a summary of findings of the assessment with reference to the obligation to identify any significant effects set out in the regulations. Where significant effects are identified, they should be taken into account in the decision making process

The following key issues were identified at the scoping stage for consideration in the assessment

- habitat loss: Nesting or feeding areas may be developed for access tracks or turbine bases and associated structures
- disturbance: Some species may be displaced from an area they would otherwise use for feeding or nesting because of works during construction or decommissioning and the presence of wind turbines and associated maintenance activities during operation
- collision: Birds may fly into and be struck by the turbine blades, with some species, such as raptors and geese considered to be at higher risk than other species, such as passerines
- cumulative impacts: The potential for cumulative impacts with other developments in the local area, either granted or pending planning permission
- opportunities for the enhancement of the local bird community

6.2 METHODOLOGY

The baseline surveys and ornithological assessment have been carried out with reference to the following legislation and guidance:

6.2.1 National Planning Policy

- Planning Policy Statement 22 (PPS22): Renewable Energy
- Planning for Renewable Energy: A Companion Guide to PPS22

- Planning Policy Statement 9 (PPS9): Biodiversity and Geological Conservation
- Circular 11/99 – Environmental Impact Assessment

6.2.2 Regional, Local and Structure Plan Policies

- Regional Spatial Strategy 12 for Yorkshire and the Humber to 2016, Based on Selective Review of RPG 12 (December 2004) (RSS 12)
- Barnsley Unitary Development Plan (UDP), 2000

6.2.3 Other Guidance

Council Directive 79/409/EEC on the conservation of wild birds (the Birds Directive): European legislation which aims to maintain or restore favourable conservation status of all wild birds and to instruct the creation of "Special Protection Areas" in member states for the habitats of rare and vulnerable species listed under Annex 1 of the directive as well as for all regularly occurring migratory species.

The Conservation (Natural Habitats &c.) Regulations 1994 (the "Habitats Regulations"): Legislation which implements the Birds Directive in the UK.

The Wildlife and Countryside Act 1981 and Countryside and Rights of Way (CROW) Act 2000: This Act provides the legislative framework for the protection of British wildlife, including those bird species given extra protection as listed on Schedule 1 of the Wildlife and Countryside Act.

Scottish Natural Heritage guidance on survey methods for onshore wind farm assessments (SNH 2005)¹. This provides detailed guidance and recommendations for survey effort appropriate for the assessment of potential impacts on bird interests at proposed onshore wind farms. The guidance is directed mostly towards upland sites in Scotland, but the principles are generally applicable to lowland sites in England.

The UK and Barnsley Biodiversity Action Plans (BAP) target habitats and species of high ecological interest or of conservation concern and list management actions required to conserve and enhance them within the UK and Barnsley area respectively. Species listed within the Barnsley BAP but not also included on the UKBAP priority list are: barn owl and little ringed plover. Both of these species are also listed under Schedule 1.

The Institute of Ecology and Environmental Management guidelines on ecological impact assessment in the UK (IEEM 2006) have been used as the basis for the assessment of the significance of impacts on birds for the proposed development.

Percival, S.M. (2007). Predicting the effects of wind farms on birds in the UK: the development of an objective assessment method; in *Birds and Wind Power*². Provides suggested guidelines for an approach to valuing receptors and assessing the magnitude and significance of effects of the development on bird populations.

Band, W., Madders, M. and Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk at wind farms. In *Birds and Wind Power*². Provides a methodology for estimating the collision risk to birds that is posed by turbines.

RSPB Birds of Conservation Concern³. Assesses the conservation status of 247 species of bird and categorises them into one of three lists: red, amber and green. The listings

¹ SNH 2005. *Survey methods for use in assessing the impacts of onshore wind farms on bird communities*. Scottish Natural Heritage, Battleby. These guidelines are applicable for projects throughout the UK.

² de Lucas, M., Janss, G. and Ferrer, M. (eds.) (2007) *Birds and Wind Power*. Lynx Edicions, Barcelona.

³ RSPB 2006. *The Population Status of Birds in the UK: Birds of Conservation Concern 2002-2007*.

describe the population status of each species, aiming to help guide conservation action between 2002 and 2007.

6.2.4 Consultation

Account has been taken of the scoping responses set out in Table 6.1.

Table 6.1: Summary of Ornithology Consultee Responses

Consultee	Summary
Natural England (NE)	Asked that cumulative impacts on birds from the development in addition to the existing Royd Moor Wind Farm and other proposed wind farm near Crow Edge be fully assessed.
Royal Society for the Protection of Birds (RSPB)	Stated that they knew of no important bird populations in this area. Mentioned that Golden Plover had historically used the wider area, particularly during spring. Suggested that any management of fields in the area for the benefit of breeding waders could enhance the areas value for this group.
County Bird Recorder	Provided records of Annex 1, Schedule 1, UK and Local BAP, Red List and Amber list species from the site and surrounding 2 miles.

6.2.5 Field Survey Methodology

The following field surveys were carried out between May 2007 and April 2008 to inform the ornithological impact assessment

- breeding bird survey: four survey visits covering the development site were undertaken using the British Trust for Ornithology's Common Birds Census methodology between early May and June 2007, in order to inform an assessment of potential displacement effects
- winter/Passage walkover Survey: monthly walkovers of the development site were undertaken between September 2007 and April 2008 to record wintering/passage birds using the site and hinterland area
- flight activity survey: twenty-four hours of vantage point watches were undertaken from a vantage point on Spicer Hill which overlooks the majority of the development site and all turbine locations and the existing Royd Moor during September 2007 and October 2007, in order to provide information to inform a collision risk assessment. Further vantage point counts specifically undertaken to survey for golden plover were undertaken during April 2008 and will continue into May 2008

Full details of the dates, timing and methodology of each survey are provided in the Ornithology Technical Appendix, which can be found in Environmental Statement Volume 2. The surveys were carried out with reference to SNH's guidance: *Survey methods for use in assessing the impacts of onshore wind farms on bird communities*. Where any deviation from this guidance or from recommendations made by NE or RSPB has been implemented, this has been fully explained in the relevant section of the Technical Appendix.

6.2.6 Assessment Methodology

Ecological Impact Assessment (EcIA) is based on a number of factors, primarily the consideration of the value and sensitivity of a site or the feature being assessed, and the anticipated magnitude and likelihood of a potential effect. The Institute of Ecological and Environmental Management (IEEM) has produced guidelines to assist with ecological

evaluation and impact assessment (see IEEM, 2006) which have been used as a guide in this assessment. These guidelines have no legal standing and are not a substitute for professional judgement and interpretation, particularly where the ecological value of a site and/or impact magnitudes are not clear, or are borderline.

The assessment of the potential impacts of the proposed development on bird interests is a staged process that involves

- determining the nature conservation value of the bird interests present within the zone of influence that may be affected by the development
- identifying and the potential effects based on the nature of the construction, operation and decommissioning of the proposed development
- determining the magnitude of the impacts including consideration of the sensitivity of the receptor and the duration and reversibility of the effect
- determining the significance of the impacts based on the interaction between the effect magnitude/duration, the nature conservation value and sensitivity of the bird interests affected and the likelihood of the effect occurring
- identifying mitigation measures required to address significant adverse effects.
- determining the residual impact significance after the effects of mitigation have been considered, including a description of any legal and policy consequences

6.2.7 Evaluating Features of Ecological Interest

The nature conservation value of the bird interests potentially affected by the development is defined according to Table 6.2 below

Table 6.2: Evaluation of Ornithological Receptors (adapted from Percival 2007).

Level of Value	Determining Factor
Very High	Qualifying feature of an SPA or notified interest of a SSSI. Species present in internationally important numbers (>1% of biogeographic/flyway populations)
High	Species that contribute to the integrity of an SPA or SSSI but which are not cited as species for which the site is designated (SPAs) or notified (SSSIs). Ecologically sensitive species such as rare birds (<300 breeding pairs in the UK) and the following birds of prey: golden eagle, white-tailed eagle, red kite, honey buzzard, osprey, marsh harrier and hen harrier. Species present in nationally important numbers (>1% UK population). Species listed on Annex 1 of the EC Birds Directive or Schedule 1 of the Wildlife and Countryside Act. Regularly-occurring relevant migratory species which are either rare or vulnerable, or warrant special consideration on account of the proximity of migration routes, or breeding, moulting, wintering or staging areas in relation to the proposed wind farm.
Medium	Species present in regionally important numbers (>1% regional population). Species occurring within SPAs and SSSIs but not crucial to the integrity of the site. Priority species in the UK Biodiversity Action Plan.

Level of Value	Determining Factor
Low	Other species of conservation interest, e.g. species listed in Birds of Conservation Concern: (Gregory et al.; RSPB 2002) not covered above, local Biodiversity Action Plan species.
Negligible	All other species, e.g. those on the "green list" that are not present in locally, regionally or nationally important numbers.

6.2.8 Determining the Magnitude of a Potential Effect

In determining the magnitude of effects, behavioural sensitivity and ability to recover from temporary adverse conditions are considered in respect of each potentially affected population. Behavioural sensitivity is determined subjectively based on the species' ecology and behaviour, using the broad criteria set out in Table 6.3. The judgement takes account of information available on the responses of birds to various stimuli (e.g. predators, noise and disturbance by humans). It should be noted that behavioural sensitivity can differ between similar species and between different populations of the same species. Thus the behavioural responses of birds are likely to vary with both the nature and context of the stimulus and the experience of the individual bird. Sensitivity also depends on the activity of the bird, for example, a species is likely to be less tolerant of disturbance whilst breeding than at other times, however, tolerance is likely to increase as breeding progresses.

Table 6.3: Sensitivity

Sensitivity	Definition
High	Species or populations occupying habitats remote from human activities, or that exhibit strong and long-lasting (guide: >20 mins) reactions to disturbance events
Moderate	Species or populations that appear to be warily tolerant of human activities, or exhibit short-term reactions (guide: 5-20 minutes) to disturbance events
Low	Species or populations occupying areas subject to frequent human activity and exhibiting mild and brief reaction (including flushing behaviour) to disturbance events

Effects are judged in terms of magnitude in space and time⁴. There are five levels of spatial effect (Table 6.4) and two main levels of temporal effect (Table 6.5).

Table 6.4: Criteria for Describing Spatial Magnitude (adapted from Percival 2007)

Impact magnitude	Description
Very high	Total loss or very major alteration to key elements/features of the baseline (pre-development) conditions such that the post development character/composition/attributes would be fundamentally changed and may be lost from the site altogether. Guide: <20% of population/habitat remains

⁴ Regini, K. (2000). Guidelines for ecological evaluation and impact assessment. Ecology and Environmental Management. *In Practice*, 29 (September), pp. 1, 3-7. Winchester, Institute of Ecology and Environmental Management.

Impact magnitude	Description
High	Major loss or major alteration to key elements/features of the baseline conditions such that the post development character/composition/attributes would be fundamentally changed. Guide: 20-80% of population/habitat lost
Medium	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes would be partially changed. Guide: 5-20% of population/habitat lost
Low	Minor shift away from baseline conditions. Change arising from the loss/alteration would be discernible but the underlying character/composition/attributes would be similar to pre-development circumstances/patterns. Guide: 1-5% of population/habitat lost
Negligible	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. Guide: < 1% population/habitat lost

In the case of SPAs / SSSIs magnitude is assessed in respect of the area within the designated site boundary. For non-designated sites, magnitude is assessed in respect of an appropriate scale depending on the value of the receptor e.g. County/Local.

Table 6.5: Criteria for Describing Temporal Magnitude

Magnitude	Definition
Permanent	Effects continuing indefinitely beyond the span of one human generation (taken as approximately 25 years), except where there is likely to be substantial improvement after this period (e.g. the replacement of mature trees by young trees which need >25 years to reach maturity, or restoration of ground after removal of a development. Such exceptions can be termed very long term effects)
Temporary	Long term (15 - 25 years or longer - see above) Medium term (5 – 15 years) Short term (up to 5 years)

Knowledge of how rapidly the population or performance of a species is likely to recover following loss or disturbance (e.g. by birds being recruited from other populations elsewhere) is used to assess temporal effects, where such information is available.

6.2.9 Determining the Significance of Potential Impacts

The 2006 IEEM guidelines use only two categories: "significant" or "not significant". In assessing whether an impact is significant, the concept of "ecological integrity" is a guiding principle. This concept can be applied both to designated sites (for example a SSSI) and to

defined populations (for example a local red squirrel population). This concept underpins much of the European legislation in relation to nature conservation.

In determining the significance of a potential impact, all of the above factors are considered: the nature conservation value of the receptor, the sensitivity of the receptor and the magnitude and duration of the potential effect and professional judgement is applied in determining the likelihood of the effect occurring.

In accordance with standard approaches to EIA and in terms of the EIA Regulations, impacts of proposed developments that are assessed as significant would require some form of mitigation or compensation in order to reduce the potential impact. With respect to sites that support protected species, there may also be a legal obligation to provide such mitigation.

6.3 BASELINE DESCRIPTION

The following sections describe the development site's location with respect to surrounding areas designated for their nature conservation interests. The baseline conditions at the development site are described in terms of the breeding bird community, the wintering bird community and the flight activity of target species at the development site. Full details of the results of the surveys are provided in the Technical Appendix.

6.3.1 Statutory Designated Sites

A number of statutory and non-statutory designated sites identified during the desk study are mapped in Figure 5.1 (**Chapter 5: Ecology**) and detailed below.

There are no areas designated as Special Protection Areas (SPA) or Ramsar sites within 4km of the application boundary of the proposed development. The nearest SPA is the South Pennine Moors located c.4.2km south-west of the development site. This area is designated for its upland breeding raptor and wader populations, specifically; peregrine, merlin, short-eared owl, golden plover and dunlin. None of these species were recorded on the site during surveys, however records of all species were received from the county bird recorder within 2 miles of the site boundary, with the exception of short-eared owl. The development site does not hold any habitat suitable for any of these species to breed and desk study records referred to passage/wintering birds.

There are no Sites of Special Scientific Interest designated for bird interests within 4km of the proposed development. The nearest site designated for bird populations is the South Pennine Moors SSSI which lies entirely within the boundary of the South Pennine Moors SPA.

6.3.2 Non-Statutory Designated Sites

There are four local wildlife sites in the area – Whitley Edge, Broadstone Reservoir, Ingbirchworth Reservoir and Royd Moor Reservoir. The main bird interest at these sites are breeding waders and passage birds at the reservoirs.

There are no areas designated as National Nature Reserves within 4km of the application boundary.

6.3.3 Desk Study

6.3.3.1 Very High

Qualifying SPA/SSSI species present in internationally important numbers

Desk study records show that peregrine and merlin are both seen regularly as winter/passage visitors to the wider area. The site does not currently hold any habitat likely

to offer significant breeding potential for either of these species and no significant numbers of prey species were recorded on the site during any of the surveys. Neither species was recorded during any of the surveys.

Golden plover are recorded as using the Whitley Common/Blackstone Edge area as an important local staging post between late March and early May. Discussions with the RSPB suggested that golden plover were less frequent in this area than in the past and were not known to occur in sizeable numbers on the site itself. The development site and surrounding area do not hold habitats likely to hold breeding golden plover with the nearest high value breeding habitats being found in the SPA/SSSI over 4km to the south-west. No golden plover were recorded from the survey area or surrounding fields during any of the surveys, including some specifically targeted survey visits in Spring 2008.

Dunlin is recorded as a regular winter/passage visitor to the nearby reservoirs in the area. No dunlin were recorded from the survey area or surrounding fields during any of the surveys.

No other records were received of species included as qualifying features of any of the nearest internationally or nationally designated sites were recorded as breeding within the site or recorded at any time during the survey.

6.3.3.2 *High*

Ecologically sensitive and rare species; species present in nationally important numbers; species listed on Annex 1 / Schedule 1; regularly occurring migratory species

Dotterel was recorded virtually annually as a passage visitor in low numbers until 1995, after which records became more infrequent and they have not been recorded in the area since 2001.

A single record of barn owl from the Ingbirchworth area was provided dating from 2007. No barn owl was recorded during any surveys.

Little ringed plover is described as being recorded on many dates throughout the summer from all three nearby reservoirs, with breeding confirmed only in 2001. The site does not hold any breeding habitat for this species and it was not recorded during any surveys.

Common quail is described as historically known to breed in the area but with single singing bird from near Broadstones Reservoir in 2006 being the only recent record. No quail were recorded during any of the surveys.

Kingfisher was recorded on several dates in 2001/2 at Ingbirchworth reservoir, but not since.

No other Annex 1 or Schedule 1 species were recorded as breeding within the search area. Although several other species were recorded in low numbers as winter/passage visitors, during which period they are common visitors to this country e.g. brambling, fieldfare and common tern.

6.3.3.3 *Medium*

Species present in regionally important numbers or listed as priority species in the UKBAP

Eight UKBAP priority species are recorded as breeding in the area. All of these species are small passerines except grey partridge and lapwing which are recorded as being resident breeders in the area. Of these species only lapwing, skylark and linnet were recorded during surveys.

6.3.3.4 *Low*

Other species of conservation interest, such as those listed on the red and amber lists of the RSPB's Birds of Conservation Concern and local Biodiversity Action Plan.

Up to four swallows were recorded at Spicer House and three meadow pipits were recorded throughout fields in the survey area. Single oystercatcher, stonechat and willow warbler territories were located around the periphery of the survey area and a single goldcrest was recorded singing in the conifer plantation behind Spicer House.

6.3.3.5 *Other species*

A further six red-listed passerine species and a further forty-two amber list species have been recorded in the wider area.

6.3.4 **Breeding Birds Survey**

Twenty-one species were recorded holding territory or displaying signs of breeding within the development site. Territories are shown on Figures 6.1a-6.1c. More detailed information of the birds recorded during breeding bird surveys is provided in the Technical Appendix. These are grouped according to their nature conservation value defined in Table 6.2.

6.3.4.1 *Very High*

Qualifying SPA/SSSI species present in internationally important numbers

No species included as qualifying features of any of the nearest internationally or nationally designated sites were recorded as breeding within the site or recorded at any time during the survey. No species were present within the survey area in internationally important numbers.

6.3.4.2 *High*

Ecologically sensitive and rare species; species present in nationally important numbers; species listed on Annex 1 / Schedule 1; regularly occurring migratory species

No Annex 1 or Schedule 1 species were recorded within the survey area during the survey.

6.3.4.3 *Medium*

Species present in regionally important numbers or listed as priority species in the UKBAP

A single displaying lapwing was recorded within the south-east corner of the survey area. Two further displaying birds were recorded in fields to the north-east of the survey area c. 150m from the site. Up to eight birds were recorded feeding in fields immediately north of Spicer Hill during the survey but these were never recorded undertaking breeding behaviour and were considered to be non-breeders or failed breeders. No juvenile birds were recorded from any of the displaying birds during the survey.

A single curlew was recorded undertaking breeding behaviour in fields immediately west of the survey area and a single bird (presumed to be from this pair) was seen in a field in the north-west of the site. This pair is located c.400m from the nearest turbine location.

A total of seven skylarks were widely distributed throughout the survey area and in immediately adjacent fields. No juveniles were recorded and due to the location of the majority of the territories in fields with high grazing or arable management it is considered that breeding success would have been generally poor. One territory was located within 100m of the existing wind farm.

A single dunnock territory was located in plantation woodland c.200m north of proposed turbine 4.

Up to three starling nests were considered to be present within the Spicer House buildings, c.300m from the nearest proposed turbine.

A total of five linnet territories was recorded with four of these being located outside of the site. The only territory within the site was located mid way between the proposed locations of turbines 2 and 3. One territory was located within the Ingbirchworth Nature Reserve and the remaining three were located in close proximity to each other on Small Shaw Bank, c.400m from the nearest turbine location (but within 200m of existing turbines).

A single yellowhammer territory was recorded on the southern boundary of the survey area, over 400m from the nearest proposed turbine location and c.250m from the nearest existing turbine.

6.3.4.4 *Low: other species of conservation interest, such as those listed on the red and amber lists of the RSPB's Birds of Conservation Concern and local Biodiversity Action Plan*

Up to four swallows were recorded at Spicer House and three meadow pipits were recorded throughout fields in the survey area. Single oystercatcher, stonechat and willow warbler territories were located around the periphery of the survey area and a single goldcrest was recorded singing in the conifer plantation behind Spicer House.

6.3.4.5 *Other species*

Other species breeding at or near the development site included small numbers of common and widespread birds such as: jackdaw, pied wagtail, wren, robin, blackbird, blue tit, carrion crow, and chaffinch.

6.3.5 *Wintering Birds*

A total of twenty-seven species of bird were recorded during the winter/passage walkover survey visits between September 2007 and March 2008. There were few species of conservation interest recorded at the development site. Those records of species of conservation interest (wildfowl, waders and Annex 1/Schedule 1 raptors and flocks of other passerine species) are summarised below.

Up to 32 lapwing were recorded in fields between the development site and Ingbirchworth Reservoir on all visits. Lapwing was only recorded on the site when two birds were seen in arable fields during the March visit. No other waders were recorded within or in close proximity to the development site during the survey.

A flock of up to five hundred Canada geese was recorded distantly west and south-west of the site on occasions throughout the survey. These geese were seen to be commuting between Ingbirchworth, Royd Moor and Scout Dyke Reservoirs and surrounding fields. The geese were never recorded within 800m of the site boundary.

A single kestrel was regularly seen hunting along Spicer House Lane, usually close to the Ingbirchworth Nature Reserve.

Up to twenty-one redwing and thirty-five fieldfare were recorded around Spicer House during the November and December visits.

Up to one hundred and twenty starlings were recorded in recently ploughed arable fields within the site boundary on site visits in February and March.

Low numbers of common and black-headed gulls were recorded in fields between the development site and Ingbirchworth Reservoir throughout the winter. Once the arable fields within the site had been ploughed up to two hundred black-headed and thirty common gulls were seen in the area. Single herring and lesser black-backed gulls were also occasionally seen.

Groups of up to fifty crows, jackdaws and less commonly rooks were regularly seen flying around the site and in fields south of Whitley Road.

6.3.6 Flight Activity

Full details of the flight activity of target species is provided in the Technical Appendix.

Focal species records were limited to single sightings of two teal flying into ponds at the adjacent clay quarry during one evening survey. The only other wildfowl recorded were a pair of mallard following the same route as the teal. No other wildfowl were recorded within 800m of the vantage point.

No raptors other than the occasional kestrel hunting within the site were recorded.

No golden plover were recorded during any survey visit, including specifically targeted surveys during April 2008.

No waders were seen flying over the site during the survey with small numbers of lapwing and a single curlew (twice) outside the site boundary being the only records.

Recorded movements were greatly dominated by crows and gulls crossing the site (all in single figure flocks) and low numbers of passerines moving within the site.

During a few visits several swallows and house martins were recorded crossing the site at low heights i.e. less than ten metres, and probably migrating along the line of Whitley Road (past the existing turbines).

A single heron was recorded flying over the site at well over one hundred metres height.

6.4 INFORMATION GAPS

The flight activity was designed to act as a scoping tool for the need to undertake more extensive surveys. Based on the findings of this survey and desk study responses from the county bird recorder and RSPB it was considered that the area did not hold any significant populations of species likely to be vulnerable to collision or other disturbance and further activity surveys were deemed unnecessary.

No information has been gathered regarding nocturnal flight activity by birds such as owls, although no owls were recorded during early morning and evening breeding bird and flight activity surveys. No droppings or pellets were found within the survey area and there are no records of barn owl from the only building within the survey area, Spicer House.

6.5 ASSESSMENT OF POTENTIAL EFFECTS

6.5.1 Evaluating Nature Conservation Importance

The nature conservation importance of species potentially affected by development at Spicer Hill was determined using criteria defined in Table 6.2. These are set out in Table 6.6.

Table 6.6 Nature conservation value of ornithological receptors at Spicer Hill.

Value	Species
Very high	Breeding raptors and waders from South Pennine Moors SPA/SSSI i.e. Peregrine, Merlin, Golden Plover and Dunlin (desk study records only).
High	Dotterel, Barn Owl, Little Ringed Plover, Common Quail and Kingfisher (desk study records only).
Medium	Grey Partridge, Bullfinch, Spotted Flycatcher, Song Thrush, Reed Bunting, Tree Sparrow, Twite (desk study only) Lapwing, Curlew, Skylark, Dunnock, Starling, Linnet, Yellowhammer
Low	Swallow, Meadow Pipit, Oystercatcher, Stonechat, Willow Warbler, Goldcrest

6.5.2 Behavioural Sensitivity

The behavioural sensitivity of the above listed bird species potentially affected by the development was determined using criteria set out in Table 6.3. These are set out in Table 6.7.

Table 6.7 Behavioural sensitivity of species of high and moderate Nature Conservation Importance recorded at Spicer Hill

Sensitivity	Species	Reason
High/Moderate	None	No species likely to fall within this category were recorded from the site during the surveys or as desk study records.
Moderate	Curlew	Birds sensitive to visual disturbance and sudden noise events over relatively large distances (e.g. up to c. 500m)
Moderate/Low	Non-breeding: Peregrine, Golden Plover, Merlin, Breeding: Lapwing	Breeding birds sensitive to visual disturbance and sudden noise events over relatively large distances (e.g. up to c.500m). However, individuals tolerate quite high levels of disturbance in some situations. Non-breeding birds less sensitive to disturbance.
Low	Skylark, Swallow, Stonechat, Starling, Dunnock, Linnet, Yellowhammer	Birds sensitive to visual disturbance and sudden noise events, but effects likely to extend only a short distance (e.g. up to c.100m). Individuals appear capable of a high degree of habituation

The breeding raptors and waders using the South Pennine Moors SPA/SSSI are sufficiently distant from the proposed development that they are highly unlikely to be disturbed by any phase of the wind farm development. Given this, it is considered that there is no requirement to consider impacts on these receptors further in this assessment.

Whilst no birds were recorded from the survey area the desk study history of peregrine, merlin and golden plover means that they are taken in to account during this assessment.

Small numbers of curlew and lapwing breed in the survey area and immediate surroundings.

The survey area supports a small breeding skylark population.

The numbers of other species of passerine of low or medium importance using the survey area were relatively low. Of those species, only one linnet territory would be within 100m of a proposed turbine location. Those species would be highly unlikely to be negatively affected by the presence of the adjacent proposed development. There may be additional disturbance impacts during the construction phase, but the short, temporary nature of the construction phase and the low number of birds breeding within the footprint of the proposed development means that significant effects on their local, regional or national populations would not occur.

Taking the above information into account, the ornithological receptors to be considered further in the assessment are

- winter/Passage peregrine, merlin and golden plover
- breeding waders (curlew and lapwing) in the survey area
- skylark breeding within the survey area

6.5.3 Nature and Magnitude of Potential Effects

The potential effects of each of the three main phases of the development of the wind farm are described below. Different species vary in their behavioural sensitivity to the disturbance effects of the construction, operation and decommissioning phases of the wind farm. There is little published information on the distances at which birds may be adversely affected, therefore the sensitivities defined in Table 6.3 are considered in assessing the potential effect.

6.5.3.1 Construction effects

Direct land-take by the development structures (turbine bases, control building, access tracks etc.) would result in the loss of a very small proportion of the available habitat within the site (see Chapter 5: Ecology). This is highly unlikely to affect 1% of any species population at a regional or local scale, therefore the potential effect of land take on all bird species is considered to be negligible.

During the construction phase of the development, the potential impacts of associated noise and visual disturbance could lead to the temporary displacement or disruption of breeding and foraging birds. Potential effects are likely to be greatest during the breeding season (mainly between March and September depending on species) and behavioural sensitivity to the effects will vary between species. Disturbance of birds due to construction activities of this type has not been sufficiently quantified and the available information is often contradictory. However, larger bird species, those higher up the food chain, or those that feed in flocks in the open tend to be more vulnerable to disturbance than small birds living in structurally complex or closed habitats such as woodland⁵. The potential effects associated with construction activities are only likely to occur for as long as the construction phase continues. The exception to this would be if an adverse impact on the breeding success of a receptor were such that the local population becomes extinct and replacement does not occur.

⁵ Hill, D.A., D. Hockin, D. Price, G. Tucker, R. Morris, and J. Treweek. 1997. Bird disturbance: improving the quality of disturbance research. *Journal of Applied Ecology* 34:275-288.

6.5.3.2 Operational effects - Disturbance

The operation of turbines and associated human activities for maintenance purposes has the potential to cause disturbance and displace birds from the wind farm area. It is considered likely that disturbance effects during the operational phase will be less than during the construction phase. Studies have shown that in general, species are not disturbed beyond 600-800m from turbines and in some cases, birds have not been disturbed at all⁶. However, individual turbines, or the wind farm as a whole, may present a barrier to the movement of birds, restricting or displacing birds from much larger areas. The effect this would have on a population is subtle, and difficult to predict with any great certainty. If birds regularly have to fly over or around obstacles or are forced into suboptimal habitats, this may result in reduced feeding efficiency and greater energy expenditure. By implication, this will reduce the efficiency with which they accumulate reserves, potentially affecting breeding success. During the lifetime of the wind farm, however, birds may habituate to the presence of turbines, thus the effect is likely to be greatest in the short-term.

6.5.3.3 Operational effects - Collision

Collision of a bird with the turbine rotors is almost certain to result in the death of the bird. In low-density populations, such as raptors, this could have a more adverse impact on the local population than in higher density populations (*e.g.* skylark). The frequency and likelihood of a collision occurring depend on a number of factors. These include aspects of the structure and behaviour of the bird, the nature of the surrounding environment and the structure and layout of the turbines.

Collision risk is perceived to be higher in birds that spend much of the time in the air, such as foraging raptors, and those that have regular flight paths between feeding and breeding/roosting grounds (*e.g.* divers and geese). The majority of bird fatalities at wind farms have occurred on major migration flyways, in reduced visibility or at night^{7,8}. Birds are also more susceptible if the wind farm is located in an area of unusually high prey density. A close array of turbines across a natural wind funnel (a "wind wall") has also been known to cause increased bird mortality. For diurnal foraging raptors, the proximity of structures on which to perch can increase the likelihood of collision with turbines⁹. The proposed site at Spicer Hill presents none of these factors that are likely to increase the risk of bird collision.

It should be noted that operational disturbance and collision risk effects are mutually exclusive in a spatial sense *i.e.* a bird that avoids the wind farm area cannot be at risk of collision with the turbine rotors at the same time. However, they are not mutually exclusive in a temporal sense; a bird may initially avoid the wind farm, but habituate to it, and would then be at risk of collision. In this case there has not been sufficient bird activity to justify running a collision risk model¹⁰.

6.5.3.4 Decommissioning effects

Potential disturbance effects associated with decommissioning are assumed to be the same as those identified for construction. This assumes that there is no permanent displacement

6 Quoted in guidance notes supplied by SNH/BWEA "Methodology for assessing the effects of wind farms on ornithological interests".

7 Crockford, N.J. (1992) A review of the possible impacts of wind farms on birds and other wildlife. JNCC Report No. 27. JNCC, Peterborough.

8 Gill, J.P., Townsley, M. & Mudge, G.P. (1996) Review of the impacts of wind farms and other aerial structures upon birds. SNH Review 21 68

9 Orloff, S. & Flannery, A. (1996) Avian mortality in Altamont Pass WRA – final report. California Energy Commission, Sacramento.

¹⁰ Band W., Madders M. & Whitfield D.P. (2007) Developing field and analytical methods to assess avian collision risk at wind farms. In de Lucas M., Janss G. & Ferrer M. (eds.) *Birds and Wind Power*. Lynx Edicions, Barcelona.

of birds from the wind farm due to disturbance effects. Decommissioning effects are not considered separately for each receptor.

6.5.4 Potential Construction Effects

6.5.4.1 Peregrine and Merlin

Due to the low densities of these species in the area, the low numbers of potential prey species within the survey area and the lack of records during the surveys it is considered unlikely that disturbance during the construction phase of the development would have a significant impact on these species and therefore the magnitude of potential effects on these species is considered to be **negligible**.

6.5.4.2 Golden Plover

This species does not breed within the survey area and therefore any disturbance would be to passage populations. The wider area holds considerable amounts of alternative habitat for feeding passage birds and it is difficult to establish the threshold distances at which golden plover might be disturbed by construction activities at the wind farm. In this case, a precautionary approach is taken in assuming that birds would be displaced from areas within 500m of the turbine bases and access tracks. No golden plover were recorded from within 500m of any turbine locations during any survey visit up to end April 2008 and therefore the magnitude of potential effects on any passage populations are considered most likely to be **negligible**. Further surveys are ongoing to cover the spring period in more detail, however to date there has been no recorded activity by this species in or near the site.

6.5.4.3 Breeding curlew and lapwing

It is difficult to establish the threshold distances at which curlew and lapwing might be disturbed by construction activities at the wind farm. In this case, a precautionary approach is taken in assuming that birds would be displaced from areas within 500m of the turbine bases and access tracks (note however, that an existing lapwing territory is located within c.400m of the existing Royd Moor turbines).

Both curlew and lapwing breed at low density within the survey area, but neither species breeds or has been recorded within the application boundary. The distance between the breeding site and the nearest part of the proposed development was c.400m for curlew and c.70m for lapwing. Under the assumption that breeding curlew and lapwing would be disrupted by construction activities within 500m, the single pair of curlews and three pairs of lapwing would be disrupted or displaced. Therefore the magnitude of potential effects of construction disturbance on breeding waders in the absence of any mitigation is considered to be **medium** in the short-term and **negligible** in the long-term. Due to the small population sizes within 500m of the turbines and the presence of greater populations in the wider area this disturbance is considered to be **negligible** on local populations of these species.

6.5.4.4 Skylark

For the purposes of this assessment it is assumed that skylark would only be displaced from areas immediately adjacent to construction activities (e.g. within 100m). It is predicted that the majority of breeding skylark within the survey area would be affected by construction activity (i.e. five of the seven recorded territories are located within 100m of turbine or track locations). The duration of any displacement effects would be short-term, lasting only one breeding season while construction of the wind farm occurs. Therefore the magnitude of potential construction disturbance effects on skylark is considered to be **low** in the short-term and **negligible** in the long-term. There is unlikely to be any long-lasting effect of the temporary displacement of breeding skylarks on the regional population.

6.5.5 Potential Operational Effects - Disturbance

6.5.5.1 Peregrine and Merlin

Due to the low densities of these species in the area, the low numbers of potential prey species within the survey area and the lack of records during the surveys it is considered unlikely that disturbance during the operational phase of the development would have a significant impact on these species and therefore the magnitude of potential effects on these species is considered to be **negligible**.

6.5.5.2 Golden Plover

This species does not breed within the survey area and therefore any disturbance would be to passage populations. The wider area holds considerable amounts of alternative habitat for feeding passage birds and it is difficult to establish the threshold distances at which golden plover might be disturbed by construction activities at the wind farm. In this case, a precautionary approach is taken in assuming that birds would be displaced from areas within 500m of the turbine bases and access tracks. No golden plover have been recorded from within 500m of any turbine locations during the survey and therefore the magnitude of potential effects on any passage populations are considered most likely to be **negligible**.

6.5.5.3 Breeding curlew and lapwing

Operation of the turbines may result in disturbance or displacement of breeding birds. It is difficult to establish the threshold distances at which curlew and lapwing might be disturbed by the operation of the wind farm and associated maintenance activities. In this case, however, the existing wind farm provides a baseline with which to compare the distance between the existing turbines and territory locations with the distance between the proposed turbine locations and the breeding territories.

The closest curlew territory in 2007 was c.800m away from the nearest existing turbine position. In relation to the proposed development, the nearest curlew territory would be c.450m away. It is therefore reasonably concluded that the single curlew territory could be affected by disturbance during the operational phase of the development.

The closest lapwing territory in 2007 was c.380m away from the nearest existing turbine position. In relation to the proposed development, the nearest lapwing territory would be c.70m away. It is therefore reasonably concluded that lapwing would be affected by disturbance during the operational phase of the development.

Therefore it is considered that any operational disturbance would have a potential effect of **medium** magnitude on the breeding waders.

6.5.5.4 Skylark

Skylarks nest at the site and in the surrounding area. Recent guidance (SNH, 2005¹) indicates that this species and other red listed passerines are unlikely to be negatively affected by upland wind farm developments. Five territory locations would be within 100m of proposed turbine positions. One existing territory is located within 100m of the existing turbines at Royd Moor Wind Farm and a further two are located within 150m. Therefore it is considered that any operational disturbance would have a potential effect of **low** magnitude on breeding skylarks.

6.5.6 Potential Operational Effects - Collision

6.5.6.1 Peregrine and Merlin

Peregrine and Merlin were not observed within the proposed wind farm development area. The collision risk to these species is predicted to be **negligible**.

6.5.6.2 Golden Plover

Golden Plover were not observed within the proposed wind farm development area during surveys undertaken to date. Based on this the collision risk to these species is predicted to be **negligible**. Additional ongoing surveys undertaken between April and May 2008 have not identified any golden plover from within the survey area at the time of printing. Final visits in May will further clarify this assessment.

6.5.6.3 Breeding curlew and lapwing

Breeding curlew and lapwing were recorded in low numbers within the proposed wind farm development area along with a maximum of nine non-breeding birds. The collision risk to these species is predicted to be **low**.

6.5.6.4 Skylark and other species

Recent guidance (SNH, 2005¹) indicates that this species is unlikely to be negatively affected by upland wind farm developments. Low numbers of breeding skylark were present within the survey area in the context of local and national populations of this common species. The flight patterns of this species make it a limited collision risk (i.e. relatively slow and manoeuvrable). Therefore it is considered any potential adverse effects as a result of collision would be of **negligible**.

Collision risks to most other species recorded during surveys is considered to be very low due to limited populations or records in the wind farm area. The highest risk species groups, based on surveys, would be corvids and gulls passing over the site or feeding in arable fields around the turbines. These groups consist of extremely common and widespread species with breeding birds limited to a few jackdaws and a single crow at or near Spicer House and as a result, the potential adverse effects on other species due to collision are predicted to be of **negligible**.

6.5.7 Potential Decommissioning Effects

These are likely to be the same as for the construction phase, hence the potential disturbance effects as a result of decommissioning activities are considered to be the same as for the construction phase.

6.6 MITIGATION

Construction (and decommissioning) would be timed where possible to commence outside the breeding season and to only affect a single breeding season. This is to minimise disturbance to breeding birds during the construction phase. By commencing construction activities outside the breeding season, birds returning to the area to breed would have the opportunity to select breeding sites further away from potentially disturbing activities, if suitable available habitat exists.

An Ecological Clerk of Works (ECoW) would be appointed to oversee the construction and decommissioning phases of the development. In addition to responsibility for ensuring that protected species are not disturbed and that pollution prevention measures are

implemented, the ECoW would be responsible for ensuring that breeding birds are not recklessly disturbed by construction or decommissioning activities.

Potential effects on breeding waders could be off-set by management of grazing in parts of the site distant from proposed turbines. A Habitat Management Plan will be prepared in respect of the improved and semi-improved grassland on site. Where practicable measures will be incorporated to facilitate management of the current grazing regime.

6.7 RESIDUAL EFFECTS

6.7.1 Construction Effects

Short-term disturbance effects on breeding and passage waders would be reduced to a **low/negligible** magnitude depending on the availability of other suitable areas more than 500m away in which to breed and the actual reaction (in terms of disturbance distance) to construction activities. This potential effect is assessed as **not significant**. All other potential construction effects are assessed to be of negligible or low magnitude and are considered to be **not significant**.

6.7.2 Operational Effects

All potential operational effects are assessed to be of negligible or low magnitude other than medium effects of breeding waders. Due to the low numbers of breeding waders on the site and the large amount of alternative breeding habitat in the wider area these impacts are considered to be **not significant** on local population levels of these species.

6.7.3 Decommissioning Effects

These would be the same as for construction effects, therefore short-term disturbance effects on breeding waders would be reduced to a **low/negligible** magnitude.

All other potential decommissioning effects are assessed to be of negligible or low magnitude and are considered to be **not significant**.

6.8 CUMULATIVE IMPACTS AND EFFECTS

The potential effects of the proposed Spicer Hill development have been considered in combination with the existing Royd Moor Wind Farm.

The only species at Spicer Hill that may be prone to cumulative impacts are golden plover and other breeding waders, as a result of potential cumulative collision risk. The cumulative collision risk to golden plover is likely to remain low in the context of background mortality and the size of the national population, and is considered to be **not significant**.

6.9 SUMMARY OF EFFECTS

Table 6.8 Summary of Effects Table

Potential Effect	Description of Effect and any Mitigation	Significance & Comments
Construction Effects – Disturbance		
Peregrine/Merlin	Short term effect (1 year approx) of negligible spatial magnitude on a very high value receptor with moderate-low behavioural sensitivity (non-breeding)	NOT SIGNIFICANT
Golden Plover	Short term effect (1 year approx) of negligible spatial magnitude on a very high value receptor with moderate-low behavioural sensitivity (non-breeding)	NOT SIGNIFICANT
Curlew	Short term effect (1 year approx) on a medium value receptor with moderate behavioural sensitivity. The spatial magnitude is very high in the context of the population within the area surveyed (only one pair), but it is of low magnitude in the context of the regional population. Timing of the start of construction may reduce the spatial magnitude.	NOT SIGNIFICANT – displacement or disruption to one breeding attempt in one year.
Lapwing	Short term effect (1 year approx) on a medium value receptor with moderate-low behavioural sensitivity. Spatial magnitude very high in the context of the population within the area surveyed, but negligible within the context of the regional population. Timing of the start of construction may reduce the spatial magnitude.	NOT SIGNIFICANT – displacement or disruption of up to three breeding attempts in one year.
Skylark	Short term effect (1 year approx) of low spatial magnitude on a medium value receptor with low behavioural sensitivity. Timing of the start of construction may reduce the spatial magnitude.	NOT SIGNIFICANT – disruption or displacement of five breeding attempts in one year
Peregrine/Merlin	An effect of negligible spatial magnitude on a very high value receptor of moderate-low behavioural sensitivity over 25 years.	NOT SIGNIFICANT – these species are likely to make only trivial use of the site if at all.
Golden Plover	An effect of negligible spatial magnitude on a very high value receptor of moderate-low behavioural sensitivity over 25 years.	NOT SIGNIFICANT – this species has not been recorded on the site during any surveys undertaken to date including specific surveys undertaken throughout April 2008. These surveys are ongoing and if any significant results are gathered in the remaining survey visits then this significance

Potential Effect	Description of Effect and any Mitigation	Significance & Comments
		may require revision.
Curlew	An effect of medium magnitude on a medium value receptor of moderate behavioural sensitivity over the long term (25 years). At the local level, displacement or disruption to the breeding activity of one pair is unlikely to be detectable at the population level.	NOT SIGNIFICANT
Lapwing	An effect of medium spatial magnitude on a medium value receptor with moderate to low behavioural sensitivity over the long term (25 years). At the local level, displacement or disruption to the breeding activity of three pairs is unlikely to be detectable at the population level.	NOT SIGNIFICANT
Skylark	An effect of low magnitude on a medium value receptor with low behavioural sensitivity for 25 years. At the local level, displacement or disruption to the breeding activity of five pairs is unlikely to be detectable at the population level.	NOT SIGNIFICANT
Operational Effects – Collision		
Peregrine/Merlin	An effect of negligible spatial magnitude on a very high value receptor over 25 years.	NOT SIGNIFICANT – have not been observed within the site
Golden Plover	An effect of negligible spatial magnitude on a very high value receptor over 25 years.	NOT SIGNIFICANT – has not been recorded on the site during any surveys undertaken to date including specific surveys undertaken throughout April 2008. These surveys are ongoing and if any significant results are gathered in the remaining survey visits then this significance may require revision.
Curlew	An effect of low spatial magnitude on a medium value receptor over 25 years	NOT SIGNIFICANT
Lapwing	An effect of low spatial magnitude on a medium value receptor over 25 years	NOT SIGNIFICANT
Skylark	An effect of low spatial magnitude on a medium value receptor over 25 years	NOT SIGNIFICANT

6.10 STATEMENT OF SIGNIFICANCE

Effects have been evaluated in accordance with Sections 6.2.6 to 6.2.9. For each potential effect identified, significance was determined by taking account of the magnitude and duration of the predicted effects on the population at the site, together with the nature conservation value and behavioural sensitivity of the affected species. In making the assessment, the importance of the potentially affected population within a regional and national context has been considered, together with any appropriate information on trends in the species' population.

The receptors of nature conservation value considered potentially at risk from the effects of the development and considered in detail in the assessment included

- passage/wintering peregrine, merlin and golden plover
- breeding waders (curlew and lapwing) in the survey area.
- skylark breeding within the survey area.

Most of the potential effects have been assessed as of negligible magnitude and are therefore not significant.

Effects considered of low to medium magnitude include construction disturbance to, breeding waders and skylark. However, these effects are not considered to be significant with respect to the potential effects on the regional or national populations.

It should also be noted that climate change is widely accepted as the cause of some adverse ecological events and predictions indicate that declines will occur in many ecological taxa, including bird populations¹¹. It is therefore also important in the decision making process to consider the positive contribution that the development will have in tackling the issue of climate change.

¹¹ Parmesan, C & Yohe, G 2003. A globally coherent fingerprint of climate change impacts across natural systems. *Nature*, 421, pp 37-42; Berry, P, Dawson, T, Harrison, P, Pearson, R & Butt, N 2003 The sensitivity and vulnerability of terrestrial habitats and species in Britain and Ireland to climate change. *Journal for Nature Conservation*, 11, pp 15-23; Root, T.L., Price, J.T., Hall, K.R., Schneider, S.H., Rosenzweig, C. & Pounds, J.A. 2003. Fingerprints of global warming on wild animals and plants. *Nature*, 421: 57-60; Thomas, C.D., Cameron, A., Green, R.E., Bakkenes, M., Beaumont, L.J., Collingham, Y.C., Erasmus, B.F.N., Ferreira de Siqueira, M., Grainger, A., Hannah, L., Hughes, L., Huntley, B., van Jaarsveld, A.S., Midgley, G.F., Miles, L., Ortega-Huerta, M.A., Peterson, A.T., Phillips, O.L. & Williams, S.E. 2004. Extinction risk from climate change. *Nature* 427: 145 – 148.

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7 HYDROLOGY & HYDROGEOLOGY

7.1 INTRODUCTION

This chapter assesses the hydrological and hydrogeological effects of the proposed Spicer Hill Wind Farm during the construction, operation and decommissioning phases of the project. Elements of the proposal assessed include turbines, access tracks, control building, construction compound and the associated buildings or hard standing areas. Reference is also made to Chapter 5 Ecology where appropriate.

This chapter contains the following sections

- Consultations - a summary of consultation undertaken in relation to this assessment
- Methodology - describing both the methods used in baseline surveys and in the assessment of the significance of effects
- Baseline Description - a description of the hydrology and hydrogeology of the site based on the results of surveys, desk information and consultations
- Information Gaps - a summary of the main uncertainties encountered in the assessment
- Potential Effects - identifying the ways in which the site could be affected by the proposed wind farm
- Mitigation - a description of measures recommended to off-set potential effects
- Residual Effects - an assessment of the significance of the effects of the development, after mitigation measures have been implemented
- Summary of Effects
- Statement of Significance

The predominant effects on local hydrology and hydrogeology in wind farm developments are typically associated with borrow pit construction. In order to eliminate this risk, the Developer has elected not to excavate borrow pits at the site, and instead, to import stone from local quarries for foundation material.

All remaining potentially polluting construction activities will be controlled through a Pollution Prevention Plan (PPP).

7.2 CONSULTATION

Information has been provided by a range of organisations during this assessment, and this is summarised in Table 7.1 below.

Table 7.1 Consultation Communications

Consultee	Key Points in Response
The Meteorological Office	Information provided on meteorological conditions at Spicer Hill and regional climatic averages.
Environment Agency	Information provided on flood risk, watercourse designations and local fisheries.
Barnsley Metropolitan Borough Council	Information provided on private water supplies. Listed planning requirements, and consultees who would and wouldn't respond to scoping
Natural England	Information provided on local Watercourse Designations.
The British Geological Survey	Details provided on solid and drift geology, and groundwater.

7.3 METHODOLOGY

7.3.1 Desk Study

The desk study included

- Identification of catchments, watercourses, springs and water features
- Collation of data provided through consultations
- Collation of flood plain information and water quality data
- Compilation of soils, geological and hydrogeological information

Reference was made to the following sources of information

- The British Geological Survey 1:50,000 Series Solid and Drift Edition (sheet 86)
- Hydrogeological Map of England and Wales 1:625,000, 1977
- The Ordnance Survey 1:50,000 Landranger Map (Sheet 110)
- Water Framework Directive (2000/60/EC). The Water Framework Directive (WFD) establishes a framework for the protection, improvement and sustainable use of all water environments
- The Construction Industry Research and Information Association (CIRIA) Environmental Good Practice on Site (C502) (1999). C502 provides guidance on how to avoid causing environmental damage when on a construction site
- CIRIA Control of Water Pollution from Construction Sites (C532) (2001). C532 provides guidance on how to plan and manage construction projects to control water pollution

7.3.2 Site Walkover

A site walkover was carried out on 13th December 2007 to visually inspect surface water features and to obtain an understanding of the local topography and hydrological regime.

7.3.3 Assessment of Significance

The significance of potential effects of the proposed wind farm has been defined by taking into account sensitivity and magnitude, and combining these with the likelihood of an event occurring.

The **sensitivity** of the receiving environment can be defined as its ability to absorb an effect without perceptible change and can be classified as either low, moderate or high. These are dependent on factors such as the quality of local receiving waters, their purpose (e.g. whether used for drinking, fisheries, etc), and existing influences, etc.

The **magnitude** includes the timing, scale, size and duration of the potential effect resulting from the proposed wind farm. The magnitude of potential effects can be classified as negligible, minor, moderate or major.

The significance of the unmitigated effect is therefore defined as follows:

Table 7.2 Unmitigated Significance Criteria

Magnitude	Sensitivity		
	Low	Moderate	High
Negligible	Negligible	Negligible	Negligible
Minor	Negligible	Minor	Medium
Moderate	Minor	Medium	Medium
Major	Minor	Medium	Major

The **likelihood** of an event occurring is then included, and classified as unlikely, possible or likely.

Finally, the residual (or overall) significance after mitigation is a function of the unmitigated significance combined with the likelihood of an event occurring (with mitigation taking place); as shown below:

Table 7.3 Residual Significance Criteria after Mitigation

Unmitigated Significance	Likelihood		
	Unlikely	Possible	Likely
Negligible	Negligible	Negligible	Negligible
Minor	Negligible	Negligible	Minor
Medium	Negligible	Minor	Medium
Major	Minor	Medium	Major

Conclusions will therefore state whether residual significance will be major, medium, minor or negligible, once appropriate mitigation has been implemented. This assessment relies on professional judgment to ensure that the impacts are appropriately assessed. Impacts of medium significance or greater are considered significant in terms of the EIA Regulations.

7.4 BASELINE DESCRIPTION

7.4.1 Topography and Land Use

The closest settlements are Penistone, located approximately 3.2km to the south east of the application boundary and Stocksbridge, approximately 9km to the south east of the application boundary.

The proposed turbine locations, access tracks and associated infrastructure are illustrated in Figure 1.2.

The 1:50,000 Ordnance Survey Landranger Map (Sheet 89) shows the turbine envelope to lie in an elevated plateau rising from elevations of approximately 310m AOD to 362m AOD. Topography is broadly defined by a ridge sloping from north to south towards Small Shaw Dyke. The majority of the land is used for livestock grazing and land to the east for arable farming. Habitats are described in detail in Chapter 5, Ecology.

Surface water courses and catchments are illustrated on Figure 7.1.

7.4.2 Solid Geology

The British Geological Survey Digital Mapping shows the main part of the study area is underlain by sandstone, siltstone and mudstone rocks from the Westphalian period, identified as Pennine Lower Coal Measures. Rhythmic bands of Grenoside sandstone, Greenmore Rock and 80 Yard Rock also lie in the southern section of the site. Solid geologies are shown on Figure 7.2.

7.4.3 Superficial Geology

The British Geological Survey 1:50,000 Series Solid and Drift Edition (sheet 86) shows the dominant superficial geology to comprise of undifferentiated mudstones, silt, weathered clay and Alluvium from the Quaternary period. Trial pit investigations, undertaken by Donaldson Associates, revealed sandy gravel and cobbles to overlay sandstone to a depth of 0.7m at the proposed location of Turbine 1. Stiff slightly sandy clay to depths of approximately 2m was encountered at Turbines 2 and 3. The trial pit at Turbine 4 contained stiff slightly sandy clay with occasional sandstone and shale gravel to a depth of 1.75m. Very weak weathered shale was encountered underlying the clay. Similar results were obtained from trial pits at Turbine

5 but sandstone was encountered at a depth of 1.3m. Surface geologies are shown on Figure 7.3.

7.4.4 Hydrogeology

The Hydrogeological Map of England and Wales 1:625,000 (1977), shows the site to be underlain by the Yordale Series and Coal Measures consisting of rhythmic sequences of shales, sandstones, coals and limestones. Mine waters from coal measures tend to be ferruginous and acidic.

7.4.5 Climate

The Hydrogeological Map of England and Wales 1:625,000 (1977), shows the Average Annual Rainfall to be 635mm to 716mm per annum. The Meteorological Office report regional Average Annual precipitation for Sheffield to be 824.7mm per annum (1971 to 2000).

7.4.6 Hydrology

Figure 7.1 shows the main surface water courses and their associated catchments.

One unnamed watercourse dissects the northeast section of the study area and drains north towards Ingbirchworth Reservoir. Annat Royd Beck issues in the northeast of the site and drains north towards Royd Moor Reservoir, whilst Small Shaw Dyke issues in the south of the site and drains in accordance with topography towards Lee Lane Dyke before convening with the River Don, approximately 2.5km to the southeast of the study area boundary.

7.4.6.1 Hydrological Regime

In terms of hydrological regime, steeper sections of watercourses will naturally respond more quickly to rainfall. Watercourses, on the Spicer Hill Wind Farm site, on a moderate incline or are relatively flat and slow flowing and the steeper sections tend to be outwith the turbine envelope. Watercourses on-site are therefore likely to have more capacity to absorb rainfall, with corresponding slower response rates.

7.4.6.2 Surface Water Continuity

Surface water courses appear to be relatively continuous, with no obvious blockages evident during the site visit.

7.4.6.3 Surface Water Morphology

From what was observed on-site, morphology is relatively typical of parallel drainage network water courses, which are flatter in their upper reaches and become increasingly steep and faster flowing as they progress downslope.

7.4.7 Designations

No statutory designations pertaining to watercourses exist within a 5km radius of the site. However, two tributaries of neighbouring reservoirs dissect the site. Emphasis would need to be given to protecting the integrity of watercourses in proximity to the development, particularly by mitigating against impacts during construction.

7.4.8 Fisheries

Consultation responses have highlighted the importance of local fisheries as salmonid feeder rivers, particularly the River Don. Construction of wind farms, if poorly controlled, can lead to increased run-off, sedimentation, compaction, and changes to soil flow patterns. In this

instance, run-off would drain in accordance with the existing surface run-off regimes on site, predominantly towards Annat Royd Beck and Small Shaw Dyke. In light of this, appropriate mitigation measures would be taken to reduce the possibility of sediment directly entering watercourses.

7.4.9 Water Supplies Public and Private

Consultation responses have indicated that there are no private or potable water supplies or abstractions within a 2km radius of the study area.

7.4.10 Flooding

The Environment Agency has no records of flooding in the study area, however, it has suggested that marginal flooding in low lying areas located beyond the north of the study area (in proximity to Ingbirchworth Reservoir) is possible during heavy and prolonged precipitation events. Areas at risk from marginal flooding are shown on Figure 7.1.

7.5 INFORMATION GAPS

At this stage, a Pollution Prevention Plan (PPP) is not required to complete this assessment, however it is likely to be necessary prior to construction.

7.6 ASSESSMENT OF POTENTIAL EFFECTS

These are considered for construction, operation and decommissioning.

As highlighted in section 7.1 the predominant effects on local hydrology and hydrogeology in wind farm developments are typically associated with borrow pit construction, none of which are proposed at Spicer Hill Wind Farm.

7.6.1 Potential Construction Effects

7.6.1.1 Access Tracks and Cabling

Approximately 1.7km of new access track will be constructed, of approximately 5m wide running width during construction, reduced to 3m during operation. There may also be temporary passing places to facilitate vehicle movement on site. The access tracks would not cross any of the watercourses onsite and would not be constructed within 50m of watercourses.

Access tracks can lead to increased run-off, sedimentation, compaction, and changes to soil flow patterns. Run-off would drain in accordance with the existing surface run-off regimes in the study area, predominantly towards tributaries of Ingbirchworth Reservoir, Small Shaw Dyke and Annat Royd Beck. Culverting across water courses can, in addition to the above, impede flows and passage of wildlife.

Such potential impacts can be mitigated and measures are discussed in section 7.6. However, it is possible that under certain circumstances, such as during heavy rainfall, these effects may still occur. In order to ensure that the worst-case has been considered, therefore, these potential impacts are classed as "Possible".

Figures 2.8a and 2.8b provide details of access tracks.

7.6.1.2 Construction Compound and Control Building

The proposed construction compound would have a site area of (0.4ha, as shown on Figure 2.11. It would be located in the south east part of the study area, within the catchment of

Annat Royd Beck. This area would be used in part for fuel storage and re-fuelling, and would be equipped with the necessary bunding. It would also incorporate car parking, offices, and welfare facilities.

The control building would be located adjacent to the main access track at grid reference 420600, 405100, within the catchment of the unnamed tributary draining towards Ingbirchworth Reservoir.

Both construction compound and control building would be located a minimum of 50m from surface water courses.

Potential impacts would be similar as for access tracks above, and these can be mitigated against. Again, however, it is possible that under certain circumstances, they may still occur, and so to ensure a worst-case has been considered, they are classed as "Possible".

7.6.1.3 Chemical Pollution

Potential risks include the spillage or leakage of chemicals, unset cement, foul water, fuel or oil, during use or storage on site. These pollutants have the potential to adversely affect soils, water quality, and groundwater, and hence impact on the biodiversity of receiving watercourses.

The unnamed tributary of Ingbirchworth has turbine 3 and associated access tracks within its catchment. Annat Royd Beck has turbines 1, 2 and associated access tracks within its catchment, whilst turbines 4 and 5 lie within the catchment of Small Shaw Dyke. The construction compound and control building are also to be located within the catchment of Annat Royd Beck. They could therefore be at risk from a pollution incident during construction, if managed improperly. All surface water courses and surface water bodies are considered to be of high sensitivity.

Again, potential impacts can be mitigated against; however, accidental spillages cannot be absolutely ruled out and, in order to ensure the worst-case has been considered, are classed as "Possible".

7.6.1.4 Erosion and Sedimentation

Erosion and sedimentation can occur from excavations, ground disturbance and poor design of drainage ditches. Sediment entering watercourses has the potential to affect flood storage capacity, water quality, and ecology. Clearly therefore, if unmitigated, increased sedimentation could have an indirect impact on local brooks, and ultimately the receiving river systems such as the River Don.

The magnitude of such impacts is considered to be moderate, but potential impacts can be mitigated against, particularly through best practice in the design and construction of the site. Despite this, and in order to ensure that the worst-case is assessed, they are still classed as "Possible".

7.6.1.5 Felling Proposals

Land at Spicer Hill is predominantly used for sheep grazing. There is limited woodland in the vicinity of the unnamed tributary of Ingbirchworth Reservoir and there are no proposals to fell this woodland.

7.6.1.6 Change to Soil Interflow Patterns

Some turbine base excavations may need temporary sub-surface water controls such as physical cut-offs or de-watering. These divert flows away from the excavation, and de-

watering temporarily lowers the local water table. Localised temporary changes to soil interflow patterns may therefore arise.

Given the low sensitivity of groundwater in this area and the temporary nature of this impact, the risk is not considered to be significant (with appropriate management and mitigation).

7.6.1.7 Impediments to Flow

The access track will not entail any crossing of onsite watercourses. Felling of woodland can increase in surface water run-off and cause impediments to river flow. There are no proposals to fell woodland at Spicer Hill.

7.6.1.8 Compaction of Soils

Construction of access tracks and movement of construction traffic can lead to compaction of the soil. This can reduce soil permeability, potentially leading to increased run-off and increased erosion. The study area geology is generally of low permeability and has relatively flat topography, so the effects of compaction would not result in a significant increase in runoff. Furthermore, the proportion of affected area is relatively small in relation to the unaffected area. For these reasons, the magnitude of this impact would be minor.

7.6.1.9 Migration of Pollutants from Contaminated Land

There are no known areas of contaminated land in the study area. Should potentially contaminated land be encountered during excavations, however, this would be tested and disposed of in line with appropriate guidelines and legislation.

7.6.1.10 Increase in Runoff

Increased run-off has the potential to influence a range of factors discussed in this section (sedimentation, chemical pollution, soil flow changes, etc), particularly in relation to surface water courses (see below).

The increase in hard standing could increase the volume and rate of localised surface run-off. The impermeable nature of the underlying geology, however, means there would be limited infiltration and relatively high run-off rates, which suggests that the increase in hard standing would be unlikely to have a significant effect.

There are also no active floodplains, either on or nearby the study area, and the Environment Agency has no records of flooding within the study area. Additional drainage is not proposed outside the study area but the principles of Sustainable Urban Drainage for the development site will be implemented in order to circumvent any additional drainage affecting any existing risk areas.

7.6.1.11 Surface Water Courses

Surface water run-off has the potential to directly enter on-site surface water courses and water bodies (detailed previously), and to indirectly reach off-site surface water courses such as the River Don.

A buffer zone of 50m would be established between all tracks, turbine bases and watercourses.

The use of interceptor drains, silt traps and balancing ponds would ensure that there is no pathway for pollutants or additional sediment to enter watercourses on site. This mitigation would therefore ensure that no surface run-off from the worked areas of the study area would flow directly into a watercourse during normal operations. Despite this, it is possible

that under certain circumstances, such as during heavy rainfall, surface water impacts may still occur. In order to ensure that the worst-case has been considered, these potential impacts are classed as "Possible".

7.6.2 Potential Operational Effects

Potential medium and long term effects associated with site infrastructure such as access tracks, turbine bases and hard standing could potentially include

- Increased run-off rates and volume
- Further erosion and sedimentation
- Alterations to natural flow pathways and
- Increased pollution risk

These effects have been discussed in relation to the construction phase, and as there would be significantly less activity during operation, the magnitude and likelihood of these is thus reduced. This will be further ensured through best practice design and construction, such as cross drainage, use of shallow drainage ditches, prevention of blockages, and adherence to a PPP.

7.6.3 Potential Decommissioning Effects

The potential effects of the de-commissioning phase are also similar and generally less than those outlined above, and are not repeated here.

7.7 MITIGATION

Mitigation measures referred to above are broadly divided into those which are "embedded" into the design of the site and those which would be implemented through best practice (and a PPP).

7.7.1 "Embedded" Mitigation Measures

A fundamental "embedded" mitigation measure is the use of interceptor drains, silt traps and balancing ponds in proximity to access tracks to avoid introducing silt to site watercourses

Secondly, the predominant effects on local geology and hydrology in wind farm developments are typically associated with borrow pit construction and borrow pits will not be excavated at Spicer Hill. Stone for use in foundation, track and construction compound construction will be imported.

Thirdly, there will be a 50m buffer zone for all turbine bases around the watercourses on the site. This 50m buffer zone, in conjunction with a suitable PPP (see below) should avoid potential impacts on surface water courses.

Sustainable Urban Drainage (SUDS) relates to the management of run-off in urban areas. However, the principles of sustainable drainage and site management would be implemented on site in order to minimise the risk to surface watercourses and groundwater.

7.7.2 Best Practice

Best Practice would be followed in all aspects of construction and operation, specifically through a PPP.

The PPP would set out measures to be employed to avoid or mitigate against potential impacts for all phases of the development, and would also include an Incident Plan to be

followed, should pollution occur. A nominated person would have specific responsibility for implementation of the PPP.

Method statements would also be applied, which would follow the principles laid out in relevant Pollution Prevention Guidelines.

There are no watercourse crossings on site and a 50m buffer between all workings and watercourses would be maintained. Written consent would also be sought from the Environment Agency, prior to working in the vicinity of watercourses.

Access tracks would have adequate crown or cross-slope to allow rainwater to be shed and where gradients are present lateral drainage would intercept flow. A drainage ditch would be formed on the upslope side of the track and conveyed under the road at regular intervals and disbursed back in into the ground by surface soakaways which will dissipate the flows back into the ground surface and vegetation.

Drainage cross pipes would be laid, as required, in areas where the position of the access track could lead to ponding on one side. It is anticipated that crosspipes will be laid in the vicinity of the site entrance which is currently a marshy area of ground.

Figures 2.8a and 2.8b provide road drainage details.

In order to further reduce surface water pollution potential, concrete batching during construction will be carried out off-site, with the final material being imported onto site for immediate use.

Mitigation measures for construction, operation and decommissioning are listed in the following tables. The tables also provide an overall analysis of the significance of the effects, both pre and post mitigation. This is based on the preceding discussion, and demonstrates that with the appropriate mitigation. The residual significance of all effects will be minor (or lower).

Table 7.4 Mitigation Measures Construction (And Decommissioning)

Activity	Impact	Receptor	Sensitivity	Mitigation	Before Mitigation		After Mitigation	
					Magnitude	Significance	Likelihood	Residual Significance
1) Access tracks (including cabling)	Increased run-off	Water courses (and fisheries)	High	1a) No borrow pits on-site 1b) Pollution Prevention Plan 1c) Method Statements (including on-site effluent disposal) and consent from Environment Agency 1d) Interceptor drains 1e) Silt traps 1f) Balancing ponds 1g) 50m buffer around all water courses 1h) Sustainable Urban Drainage (SUDS)	Moderate	Medium	Possible	Minor
	Erosion and sedimentation	Water courses (and fisheries)	High	As 1a to 1h	Moderate	Medium	Possible	Minor
	Brook flow impediments	Water courses (and fisheries)	High	1i) Construction best practice	Moderate	Medium	Possible	Minor
	Soil flow changes	Soils	High	As 1a to 1h 1i) Drainage cross pipes and disbursement channels	Moderate	Medium	Possible	Minor
	Soil loss and compaction	Soils	High	As 1a to 1i	Moderate	Medium	Possible	Minor
2) Compound (and control building)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)
3) Turbine erection areas, turbine bases,	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)

Activity	Impact	Receptor	Sensitivity	Mitigation	Before Mitigation		After Mitigation	
					Magnitude	Significance	Likelihood	Residual Significance
and other hard standing								
4) Activities involving chemical handling and storage (includes turbine erection, vehicle operations, etc)	Pollution	Water courses and fisheries	High	As 1a to 1i 4a) Storage in bunded compound 4b) Disposal via registered waste carriers 4c) Off-site concrete batching	Moderate	Medium	Possible	Minor
	Pollution	Groundwater	High	As 1a to 1i As 4a to 4c	Moderate	Medium	Possible	Minor
	Pollution	Soils	High	As 1a to 1i As 4a to 4c	Moderate	Medium	Possible	Minor

Table 7.5 Mitigation Measures Operation

Activity	Impact	Receptor(s)	Sensitivity	Mitigation	Before Mitigation		After Mitigation	
					Magnitude	Significance	Likelihood	Residual Significance
1) Access tracks (including cabling & water crossings)	Drainage modifications, including increased run-off	Water courses and fisheries	High	1a) Pollution Prevention Plan 1b) Interceptor drains 1c) Silt traps 1d) Balancing ponds 1e) 50m buffer around all water courses 1f) Regular inspections (part of PPP) 1g) Sustainable Urban Drainage (SUDS)	Minor	Medium	Possible	Minor
	Erosion and sedimentation	Water courses and fisheries	High	As 1a to 1g	Minor	Medium	Unlikely	Negligible
	Soil flow changes	Soils	High	As 1a to 1g	Minor	Medium	Unlikely	Negligible
2) Compound (and control building)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)
3) Turbine erection areas, and other hard standing	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)	As 1)
4) Activities involving chemical handling and storage	Pollution	Water courses and fisheries	High	As 1)	Medium	Medium	Unlikely	Negligible
	Pollution	Groundwater	High	As 1)	Medium	Medium	Unlikely	Negligible
	Pollution	Soils	High	As 1)	Medium	Medium	Unlikely	Negligible

7.8 RESIDUAL EFFECTS

As indicated above, the residual significance of all effects will be minor (or lower).

7.9 SUMMARY OF EFFECTS

The effects are summarised in the previous tables, with residual significance for all issues being assessed as minor (or lower) for construction, operation and decommissioning.

7.10 STATEMENT OF SIGNIFICANCE

This chapter has assessed the likely significance of effects of the development on hydrology and hydrogeology. Following adoption of the proposed mitigation measures (particularly through the implementation of "embedded" measures, a Pollution Prevention Plan and Private Water Risk Assessment), Spicer Hill Wind Farm has been assessed as having the potential to result in effects of a minor significance or lower.

Given that impacts of medium significance or greater are considered significant in terms of the EIA Regulations, the potential effects on hydrology and hydrogeology are not considered to be significant.

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8 CULTURAL HERITAGE

8.1 INTRODUCTION

The purpose of this chapter is to identify potential significant effects upon the Cultural Heritage resource of the development site and surrounding area. Cultural heritage resources include Scheduled Ancient Monuments (SAM), other non-designated archaeological sites recorded in the South Yorkshire Historic Environment Record, Listed Buildings, Registered Historic Parks and Gardens, and Registered Battlefields.

The assessment is intended to identify cultural heritage sites which may be affected, either directly (e.g. through physical disturbance during construction) or indirectly (e.g. through changes to visual and archaeological setting) during construction, throughout operation or from de-commissioning of the proposed wind farm. The potential for significant effects is then assessed.

This chapter contains the following sections

- Consultations - a summary of consultation undertaken in relation to this assessment
- Guidance – a summary of guidance referred to as part of the assessment
- Methodology - describing the methods used in baseline surveys and in the assessment of the significance of effects
- Baseline Description - a description of the site based on the results of surveys, desk information and consultations
- Information Gaps - a summary of the main uncertainties encountered in the assessment;
- Potential Effects – identification and assessment of the ways in which the site could be affected by the proposed wind farm
- Mitigation - a description of measures recommended to off-set the identified potential effects
- Residual Effects - an assessment of the significance of the effects of the development, after mitigation measures have been implemented
- Cumulative Effects – an assessment of the cumulative effects of the development in conjunction with existing, consented and proposed wind farms within the assessment area
- Summary of Effects
- Statement of Significance

8.2 CONSULTATION

Consultation was undertaken with both statutory and non-statutory consultees, both at the Scoping stage, as described in Chapter 1, and as part of the assessment process. The responses are summarised in Table 8.1 below.

Table 8.1 Consultation Responses

Consultee	Response
South Yorkshire Archaeology Advisory Service	Stated that the potential for unknown archaeological remains to be affected within the site should be assessed. Required that the impact assessment consider the potential impact upon the settings of features beyond the site boundary. Supplied data from County Historic Environment Record.
English Heritage	English Heritage supplied data on nationally designated cultural heritage features held by the National Monuments Record. English Heritage strongly advised that the conservation and archaeological staff from the Local Authority should be closely involved in preparation of an EIA. Proposal should cover a zone of influence of 10km to study the impact

Consultee	Response
	of the setting and visual amenity of historic places. Proposal should assess impact as laid out in PPG 15 and 16 and PPS 22. Photomontages may be appropriate.

8.3 RELEVANT GUIDANCE

The assessment has taken into account the following guidance and legislation:

- *PPG15 Planning and the Historic Environment* (1994) and *PPG16 Archaeology and Planning* (1990) provide guidance on development and historic interests such as Listed Buildings and Conservation Areas, and on dealing with known and unknown archaeological remains through the planning system
- Statutory protection for archaeology is principally outlined in the Ancient Monuments and Archaeological Areas Act (1979) as amended by the National Heritage Act (1983) and nationally important sites are listed in a Schedule of Monuments. Scheduled Monument Consent (SMC) is required before any work affecting the fabric of a Scheduled Monument can be carried out
- Listed Buildings and Conservation Areas receive protection under the Planning (Listed Buildings and Conservation Areas) Act 1990. Works that affect the character and appearance of such structures may require an approval from the Local Planning Authority via a procedure set out in the act

The following guidance and advice was also considered, although not all is specific to England:

- *Standards and Guidance for Archaeological Desk Based Assessments* (Institute of Field Archaeologists, 1999). This advises that the aim of a desk-based assessment is to gain information about the known and potential archaeological resource within the proposed development site boundary and that from this an appraisal can be made on the presence or absence of archaeology
- *Planning Advice Note Archaeology - Planning Process and Scheduled Monument Procedures* (PAN 42, Scottish Executive) provides advice on the handling of archaeological matters within the planning process and on the separate control over *Scheduled Monuments under the Ancient Monuments and Archaeological Areas Act* (1979)
- *Planning Advice Note - Renewable Energy Technologies* (PAN 45, Revised 2002, Scottish Executive) provides useful advice and information for on-shore wind power, and contains guidance on the visual effects from wind turbines
- *Landscape Appraisal for Onshore Wind Development*, University of Newcastle 2003.
- *Guidelines on the Environmental Impacts of Wind Farms and Small Scale Hydroelectric Schemes*, Scottish Natural Heritage, 2001
- *Visual Assessment of Wind Farms – Best Practice*, University of Newcastle (for Scottish Natural Heritage), 2002
- *Wind Energy and the Historic Environment*, English Heritage, 2005. This emphasises that potential effects on the historic environment be addressed at all levels of an EIA, and that the implications of development upon the resource be reflected at all levels of planning (regional, local etc.). Indirect effects upon settings are to be assessed, and physical damage to historic sites avoided. Consideration of the reversibility of schemes should be considered

8.4 METHODOLOGY

This assessment has involved

- consultation with the statutory and non-statutory bodies to gain data establishing the baseline conditions for the development site and its surrounding area

- desk-based studies and site visits to contribute to and validate data relevant to establishing the baseline conditions
- assessment of the effects expected from the proposed development and their potential effect upon the existing conditions
- assessment of the significance of the effects taking into account the sensitivity of the development site (and selected features beyond the development site), the magnitude of potential effects (both direct and indirect) and the likelihood of such effects occurring
- identification of means to mitigate and avoid, where possible, any potential effects, as well as the assessment of the residual effects which may exist after application of any mitigation

A detailed method statement for the assessment of effects and their significance is presented in Section 8.4.4 below.

8.4.1 Assessment Methodology

The assessment of effects on the cultural heritage is concerned with direct (physical) and indirect (largely visual) effects.

8.4.1.1 Direct (physical)

Assessment of physical effects considers direct effects to the cultural heritage, where sites or potential (buried) sites are in danger of being disturbed or destroyed. Physical effects are likely to occur during construction and decommissioning, and are permanent and irreversible. They are discussed in 8.7.1 Potential Construction Effects.

8.4.1.2 Indirect (visual, noise etc.)

This assessment will take account of the potential visual intrusion on the settings of Scheduled Monuments, monuments registered as nationally important and Listed Buildings that exist within the proposed wind farm development site and a 15km Zone of Theoretical Visibility. The setting of a national monument or Listed Building can be loosely interpreted as *features that form an integral part of their significance. Setting can be tangible, such as a defined boundary or intangible, such as atmosphere or ambience.* The main concern for visual effects is the potential for the proposed development to fragment the historic landscape, separate connectivity between historic sites and impinge on views to and from sites with important landscape settings. Visual effects can occur during construction, operation and decommissioning. Wind farms can have a lifespan of up to 25 years, but the visual effects from this sort of development are considered temporary and largely reversible.

In the absence of other guidance, Scotland's *Planning Advice Note - Renewable Energy Technologies* (PAN 45, Revised 2002) has been used in determining visual effects. It notes that: *'visual effects will be dependent on the distance over which a wind farm may be viewed, whether the turbines can be viewed adjacent to other features, different weather conditions, the character of the development and the landscape and nature of the visibility'*. It further clarifies the relationship between distance and prominence of a wind farm in an open landscape

- within an area of 2km from a wind farm it will be a prominent feature
- within an area between 2-5km from a wind farm it will be relatively prominent
- between 5-15km, a wind farm will only be prominent in clear visibility and as part of the wider landscape and
- between 15-30km turbines will only be seen in very clear visibility and then as a minor element in the landscape.

It is therefore considered, for purposes of this assessment, that an indirect visual effect on the setting of a nationally important monument beyond 15km from the proposed wind farm is not significant. Beyond 5km an historic site of regional importance does not suffer significant effects on setting.

It is also important to consider existing screening of the cultural heritage from natural topography of the landscape. Forest and woodlands can also provide suitable visual screening to the cultural heritage. However, it is noted that in managed forests the level of screening will alter and views may be opened up over time, which once were non-existent.

No detailed consideration of potential effects from noise or shadow flicker has been undertaken for Cultural Heritage features, since no significant above ground or built heritage features exist within or immediately adjacent to the development site to receive any such effects. The assessment of indirect (visual) effects is based on the final form of the proposed development and is discussed in Section 8.7.2 on Potential Operational Effects.

8.4.2 Assessment of Significance

This assessment proceeds from a consideration of the *Sensitivity* of a cultural heritage feature against the *Severity* of any potential effects, to arrive at the *Significance* of the effect.

Sensitivity for the purposes of this assessment has been equated with designation status, as shown in Table 8.2 below.

Table 8.2 Sensitivity

Level of Sensitivity	Designation Status
Very High	World Heritage Sites.
High	Scheduled Monuments (whether or not in State Care), Grade I Listed Buildings, Registered Battlefields, Registered Historic Gardens etc.
Medium	Grade II* Listed Buildings, regionally important archaeological features and areas (as defined in the Sites and Monuments Record). Conservation Areas.
Low	Grade II Listed Buildings, sites and features noted as Locally important in the Sites and Monuments Record.
Negligible	Badly preserved/damaged or very common archaeological features/buildings of little or no value at local or other scale.

Listed Buildings are nationally designated and are subject to a grading process (Grade I, II*, II). This grading is taken as indicative of a presumed level of importance, based on rarity, period, architectural style, completeness, degree of subsequent alterations and so on. This assessment has assigned the Grades to different levels of sensitivity as shown above in Table 8.2.

Severity is a measure of the nature of the expected effects. It has been broken down, for direct and indirect effects, as shown in Table 8.3 below. For the purposes of visual assessment, proximity to the proposed wind farm (within the Zone of Theoretical Visibility (ZTV)) has been taken to be the determining attribute (so as to allow for concordance with the statements of visual prominence presented in PAN 45). A site centre at approximate grid reference (420444,405019) (Turbine 4) has been used for purposes of calculating distance to the various features, or the distance of those features to the nearest turbine, or the distance of the feature from the nearest point in the proposed development site boundary is stated.

Table 8.3 Severity

Level of Magnitude	Definition
Very High	Total loss of or major alteration to a site, building or other feature. Presence within or immediately adjacent to wind farm site.

Level of Magnitude	Definition
High	Major damage to or significant alteration to a site, building or other feature. Loss of one or more key attributes. Extensive change to the setting of a Scheduled Monument, Historic Park Grade I, Grade I or II* Listed Building feature (i.e. proximity within 2km of the wind farm site). Other features may receive a high magnitude of effect upon their setting if within or immediately adjacent to the site.
Medium	Damage or alteration to a site, building or other feature. Encroachment on an Area considered to have high archaeological potential. Change in setting to Monuments/buildings and other features within 5km of development site, (i.e. proximity within approximately 2-5km of the wind farm site).
Low	Minor damage or alteration to a site, building or other feature. Encroachment on an area where it is considered that low archaeological potential exists. Minor change in setting of Monuments, site and other features (i.e. proximity within 5-15km of the wind farm site).
Negligible	No Physical effects. Proximity within 15-30km of the wind farm site.

The *Significance* of any potential effect can be arrived at by matching *Sensitivity* against *Severity* as shown in Table 8.4 below.

Table 8.4 Significance

Sensitivity	Very High	High	Medium	Low	Negligible
Severity					
Very High	Major	Major	Moderate	Minor	Minor
High	Major	Major	Moderate	Minor	Not Significant
Medium	Moderate	Moderate	Moderate	Minor	Not Significant
Low	Minor	Minor	Minor	Not Significant	Not Significant
Negligible	Minor	Not Significant	Not Significant	Not Significant	Not Significant

A significant effect is considered to occur where the combination of sensitivity and severity results in a major or moderate effect. The assessment text considers in detail only those features for which a potential effect of "moderate" or higher significance is initially predicted based on the distance of the feature from the development site and the feature's designation status (in accordance with the matrix presented above). The Summary Table and Statement of Significance use the final assessed significance levels derived from the consideration in the main assessment text.

8.4.3 Zone of Theoretical Visibility (ZTV)

The Zone of Theoretical Visibility has been calculated to ground contours, and takes no account of ground cover (tree plantations, buildings and settlements).

In considering effects using this methodology, the following points need to be borne in mind. Firstly, the ZTV is a theoretical construct, based upon fairly crude base terrain modelling. It does not take into account the presence of structures and vegetation that may add a screening effect in the landscape. Within each "band", based on numbers of turbines

theoretically visible, no distinction is made in how much of each turbine is visible. The ZTV therefore represents an absolute "worst case scenario" and in reality visual effects are likely to be substantially less than suggested. Secondly, mechanical application of the methodology will generate major and medium effects (simply based on distance and designation status), for which (in case of visual effects upon settings) no mitigation is proposed. Where this is the case, predicted medium or major effects are discussed in detail within the assessment text (in Section 8.7.2 Potential Operational Effects) and ameliorating conditions highlighted.

8.5 BASELINE DESCRIPTION

8.5.1 Development Site Condition

The site and its current land use are more fully described in Chapter 2. It is noted here that the site is principally used for agriculture (pasture). The regular rectangular fields that occupy the site are divided from each other principally by drystone walls in various states of repair. This regular pattern is interrupted by a narrow curved corridor running south-west/north-east. This is walled to north and south, and contains a former minor watercourse. It may have originally provided access to the quarry adjacent to the site from Spicer House Lane. The site slopes down to the north east, away from Whitely Road and Spicer Hill. The underlying geology of the site is sandstones and mudstones, overlain with silts and weathered clays.

8.5.2 Features within the site

No archaeological features recorded on the South Yorkshire Sites and Monuments Record lie within the site boundary. The narrow corridor noted above is visible on the 1851 1st Edition OS mapping, and the general boundary pattern has remained the same since that period. A sandstone quarry is shown within the site on the first edition OS, although this is no longer readily apparent on the ground.

8.5.3 Features beyond the development site

Following consultation with South Yorkshire Archaeology Advisory Service, and bearing in mind that (following the guidance in the Scottish PAN 45 as noted in 8.4.1 above) no significant visual effects would be anticipated at a greater range than 15km, 15km has been used as the maximum assessment range.

8.5.3.1 Scheduled Ancient Monuments

There are 51 Scheduled Monuments within 15 km of the site boundary. Where these lie within the ZTV (Figures 4.5-4.6), assessment using the matrix on Table 8.4 would predict that they would be expected to receive potential visual effects on their setting of "minor" or greater significance. Of these, 3 lie within 5km of the site boundary. These are listed below and potential impacts upon their settings are assessed in section 8.7.2.

Monument ID 23393 Catshaw Cross wayside cross

Monument ID 27213 Hartcliff Road wayside cross

Monument ID 31503 Castle Hill prehistoric enclosed settlement

8.5.3.2 Registered Parks and Gardens

There are 7 Registered Parks and Gardens within 15km of the site boundary, of which 5 lie within the ZTV. In no case does the whole of the registered area lie within the ZTV (Figures 4.5-4.6). These are listed below:

Park ID 1384	Wentworth Castle (Gd I)
Park ID 1384	Wortley Hall (Gd II)
Park ID 2163	Cannon Hall (Gd II)
Park ID 2224	Bretton Hall (Gd II)
Park ID 4772	Locke Park (Gd II)

None lie within 5km of the site boundary. The nearest park is Cannon Hall Park and its lies approximately 6.9km to the east of the nearest turbine (1) at its closest point. Although these features are considered to be highly sensitive, they are sufficiently distant from the site that they would be predicted to receive potential impacts upon their settings of only "minor" significance at worst. Locke Park is not considered to receive any significant impact by reason of its location to the east of the M1 within the urban area of Barnsley. These features are not further considered.

8.5.3.3 Listed Buildings

There are approximately 2790 Listed Buildings of all grades within 15km of the site boundary, the majority of which lie within the urban environments of Barnsley, Huddersfield and Sheffield, as well as Penistone, and the smaller villages, and many of these do not fall within the predicted Zone of Theoretical Visibility. Of the 235 Listed Buildings that lie within 5km of the site boundary, 6 are listed at Grade II*, and 1 at Grade I and might be predicted to receive potential impacts upon their setting of "Moderate" or higher significance. These are listed below, and assessed in section 8.7.2. Of these, 35 Listed buildings lie within 2km of the site boundary (of which 34 lie within the ZTV), and two of these are listed at Grade II*.

LB ID 334066	Summer house, 1 Bullhouse, nr Millhouse Green (Gd II*)
LB ID 334039	Cat Hill Farmhouse, Cat Hill Lane (Gd II*)
LB ID 341276	Cruck barn, Nether End Farmhouse, Nether End (Gd II*)
LB ID 333814	Gunthwaite Hall Barn, Gunthwaite Hall (Gd I)
LB ID 333815	Stable range, Gunthwaite Hall (GdII*)
LB ID 334061	Bullhouse Hall (Gd II*)
LB ID 333817	Barn at Ingfield Farm, Nr Ingbirchworth (Gd II*)

8.5.3.4 Conservations Areas

There are 7 conservation areas within 5km of the proposed development. Using the matrix presented at Table 8.4, they would be predicted to receive impacts of "minor" significance upon their settings, where intervisible with the windfarm. The majority are located within local settlements, and their immediate settings depend on the village or urban environments of which they form a part. The proposed windfarm will not in these cases significantly affect their settings, particularly given the fact that the existing Royd Moor windfarm has formed a part of the wider landscape setting for the local settlements for the last decade. The closest of these areas is at Ingbirchworth, approximately 1.7km to the north-east of the proposed development at its nearest point. It is considered further in 8.7.2 below.

8.5.3.5 Other

There are 7 records on the South Yorkshire Sites and Monuments record within 1km of the site. One of these relates to the Grade II listed Annat Royd Farm, and 2 records relate to the unlisted Bents Farm at Crow Edge. One record relates to the Scheduled Catshaw Cross. Of the remaining records 1 relates to a former WWII decoy site at Blackstone Edge and 3 records relating to findspots of Mesolithic flint. None of the latter 4 records refer to features with any extant above ground remains. The listed and Scheduled Features are dealt with elsewhere in this assessment. Bents farm and the other records are assessed below (section 8.7.2).

It is noted that the local field boundary pattern is recorded on the 1851 1st edition OS maps, and remains fundamentally unchanged since its creation.

8.5.4 Archaeological Potential

There are no recorded archaeological features within the site, and only limited evidence in the form of findspots of lithic material on Upper Whitley Edge as well as a WWII decoy site beyond the site boundary. However, the lack of archaeological evidence for former activity may be a result of the lack of development in the area, and the potential for unknown, buried remains to exist within the site cannot be discounted. However, it is likely that any such remains will relate to former agricultural use of the site from the prehistoric period onwards, and are likely to be of local or regional importance only. It is considered unlikely that significant remains of regional or national importance would be encountered. The development footprint itself is relatively limited, and further reduces the potential for damage or destruction of buried remains. An appropriate scheme of mitigation is suggested below (section 8.8), to ensure that a record of any such remains can be created.

8.6 INFORMATION GAPS

Although the aerial photographs available in the collection held by the South Yorkshire Archaeology Advisory Service have been reviewed, no additional coverage has been requested from the collection held at the National Monument Record.

8.7 ASSESSMENT OF POTENTIAL EFFECTS

8.7.1 Potential Construction Effects

This section considers direct (physical) effects from construction of the proposed development. Indirect, that is visual, effects are discussed in the following Section (8.7.2), based on the final form of the wind farm.

The proposed development including its construction is described in Chapter 2. No known archaeological site or features will be directly affected by the construction of the proposed wind farm. However, any excavation or soil stripping may impact upon unknown buried archaeological remains, though this is considered to be unlikely. Any remains encountered are likely to be of local importance, but depending on type, survival, period etc, may exceptionally be of regional or higher importance. Should such remains survive beneath the proposed development's footprint, they are likely to suffer damage or destruction during construction. Although the significance of the effect may be higher or lower (dependent on the type of remains present), the effect can be mitigated by implementing a scheme of archaeological work leading to preservation by record (see 8.8.1 below). Once such a programme is in place, the effect is not considered significant.

Existing entrances within boundary walls will be used where possible, and temporary widening of entrances or creation of new entrances (for example to allow access for abnormal loads) will be restored after construction, other than where permanent new access are required to allow access for maintenance purposes.

There may be indirect effects upon the settings of some cultural heritage features arising from construction of the wind farm. These are considered temporary. The indirect, visual impact of the development upon the settings of cultural heritage features is considered below, based on the full operational wind farm.

8.7.2 Potential Operational Effects

There are no direct effects anticipated from the operation of the wind farm upon any known cultural heritage features.

Indirect (visual) effects upon the settings of a number of cultural heritage features may be experienced at those sites. These are discussed below.

8.7.2.1 Scheduled Ancient Monuments

There are three monuments within 5km of the monument, 2 of which lie within 2km.

The boundary and wayside cross known as Catshaw Cross, SAM 23393 lies 1.3km south of the nearest turbine. Its immediate setting is the boundary of B6106 to its north and the nearby buildings along the minor road to its east. It already is overlooked to the north by the existing turbines at Royd Moor, approximately 1km away, and which would be in front of the proposed turbines when view from the monument. The intervening presence of Flash House Farm will tend to further reduce the prominence of the wind farm from the monument. The feature is regarded as of "high" sensitivity by virtue of its designation, and given its location within 2km of the proposed turbines, it would be predicted to receive an effect of "major" significance (based on the matrix presented in Table 8.4). However, the presence of the existing Royd Moor scheme means that the proposed turbines will not introduce a new element into the landscape, and so not cause an extensive change in the setting of the monument. The change in setting is therefore considered to be minor, despite its proximity, and the magnitude of the impact is therefore considered to be "low". The significance of the effect is assessed as being "minor".

The wayside cross, south of Hartcliff Road (SAM 277213) is not predicted to lie with the ZTV, and is not expected to receive any impact upon its setting from the proposed development.

The Castle Hill earthwork (SAM 31503) constitutes the remains of a late prehistoric enclosed settlement. It is in part known from cropmark evidence and has a limited above ground presence (this being most marked on its south-western part). It lies approximately 1.6km north of the nearest turbine (1) in open fields. In views from the monument, the proposed turbines would be in front of and larger than the existing Royd Moor Wind Farm. Although of "high" sensitivity by virtue of its designation, the monument itself is capable of receiving only a limited impact upon its setting, given its limited presence in the landscape. The purpose of designation here is largely to protect its physical integrity, which the proposed development does not threaten. The monument is not presented nor is access facilitated. The potential impact upon the setting of the monument is therefore assessed as being "minor".

8.7.2.2 Listed Buildings

Of the 235 Listed Buildings within 5km of the site boundary, all are listed at Grade II, with the exception of 6 listed at Grade II* and 1 at Grade I (all of which lie within the Zone of Theoretical Visibility). Of these there are 2 Grade II* Listed Buildings within 2km. These are given further consideration below.

Given that the proposed wind farm will not introduce an entirely new feature the local landscape, given the existing presence of turbines at Royd Moor, the extent of the potential for change in setting is assessed as being "low". Using the matrix presented on Table 8.4, Grade II Listed Buildings would be considered to receive no significant impact at between 5-

15km from the site, and those within 2km (of which 32 structures lie within the ZTV) would receive an impact of only "minor" significance.

The Grade I listed Gunthwaite Hall Barn (LB ID 333814) lies approximately 3.5km to the north-east of the nearest turbine (3). It is a well preserved timber framed barn dating to the 16th century. It is part of a working farm. Its setting is defined as the farm, with its more modern outbuilding and adjacent hall. It is screened to the south-west by woodland. There are only limited views of the structure, amongst the surrounding buildings. The building is of "high" sensitivity, but the magnitude of the impact is assessed as "negligible", and the potential effect upon the settings is assessed as "not significant". The same assessment applies to the early 18th century Stable Range, part of the same farm (LB ID 333815), listed at Grade II*.

The Grade II* Listed Hall and Summerhouse at Bullhouse, near Millhouse Green (LB IDs 334061 and 334066 respectively), lie approximately 2.2km south of the nearest turbine (5). The setting of the summer house can be defined as its immediate relationship to the garden within which it stands, with a wall to the north, and to the buildings to the south of the garden. The hall lies further to the west, but its setting is defined by its close relationship to the complex of buildings to its south and east. Part of the immediate setting to the south includes the non-operational turbine south of the disused railway within approximately 200m of the listed structures. Given this turbine, and the existing Royd Moor turbines to the north, the proposed development is not considered to cause more than a limited change in the wider setting of the buildings, in views towards the north (where there are possible taking into account tree cover to the north of the building complex). Although the features are of "medium" sensitivity, the impact is considered "negligible" (due to the reasons stated above), and the final potential effect is assessed as "not significant".

The Grade II* listed barn at Ingfield Farm (LB ID 333817), near Ingbirchworth, lies approximately 1.7km north-east of the nearest proposed turbine. The barn is part of the working Ingfield Farm, which together with the surrounding outbuildings and other houses and structures locally is considered to constitute its setting. Although the turbines are likely to be visible in some view from the barn, there are no long views of the barn itself in which the turbines would be dominant or in the foreground. Given the presence of the existing Royd Moor Wind Farm, the extent of the change to the wider setting is considered to be minor, and negligible in terms of the barn's immediate setting. The final potential effect upon setting is therefore assessed as "not significant".

The Grade II* listed Cruck barn at Nether End Farm, Nether End (LB ID 341276) lies approximately 4.9km to the North-east of the site. Its setting is defined as its relationship to the adjacent farm, as well as the road and modern farm building to its west (which effectively screen the building from the proposed wind farm). The potential effect upon the setting of this feature is assessed as "not significant".

Cat Hill Farmhouse, Cat Hill (LB ID 334039) lies approximately 3.9km to the east of the nearest turbine. The Farmhouse lies amongst a number of related buildings (which form its immediate setting and most of which are used as private residences) with some localised screening from trees, situated on the flank of low hill between Scout Dyke and Hoylandswaine. There are relatively open views across to Spicer Hill, in which the turbines would be visible to the north of the existing Royd Moor turbines. There are only limited long views on which the listed building is visible, and in none of these will the turbines be in the foreground, or prominent as part of the background. The impact upon the setting is considered to be of "minor" significance only, and takes into account that all of the proposed turbines are likely to be visible to the west.

The three nearest Grade II listed buildings are Annat Royd Farm (LB ID 338828), Carr House (334090) and Royd Moor Farm (LB ID 334092). Although predicted to receive impacts upon

their settings on only "minor" significance by virtue of their designation, they are given further detailed consideration below.

Annat Royd farmhouse lies to the east of the proposal, within 1km from the nearest turbine. The farm house and an adjoining L-shaped barn on its western side are both listed at Grade II. They are somewhat screened by a modern barn to the immediate west, and modern buildings lie across the yard to the south. The integrity of the listed building around the northern and western side of the yard is not threatened by the proposed development, which will not interrupt views of this building range (although turbines may be visible above and behind them in some views). The historic character of the buildings and their association within the working farm will not be affected. The immediate western landscape already contains Royd Moor windfarm. The new proposal will cause a potential impact of only "minor" significance to the farm's wider setting, in that it will mean that turbines will be closer and visible in a greater arc in views to the west from the farm (where these are not already blocked by existing farm buildings).

Royd Moor Farmhouse lies to the south-east of the proposal approximately 1.5km from the nearest turbine. It has an associated L-shaped barn range (also listed at Grade II) adjoining to its north. The setting is defined as its relationship to the surrounding modern barns to north and east. It has some additional screening from trees to its west. It is not considered that the development will significantly impact upon the setting of these buildings in their immediate farm environment. Additional turbines may be visible where there are views to the north, beyond the existing Royd Moor wind farm.

Carr House lies downslope to the south of the proposed scheme, at approximately 1.2km from the nearest proposed turbine. The property has open view to the south and west, but is screened by a plantation to its north and east. The existing Royd Moor wind farm will lie between it and the proposed turbines. The impact upon the property's setting is assessed as being only "minor".

8.7.2.3 Ingbirchworth Conservation Area

The western edge of the conservation area lies approximately 1.7km to the north-east of the nearest proposed turbine. The conservation area incorporates the southern part of the village and straddles the A629. Assessment against the matrix presented in Table 8.4 would indicate a potential effect upon setting of "moderate" significance. The setting of the eastern half of the conservation area relates to its association with the A road between Sheffield and Huddersfield, whilst the western half (lying below the road level) is more related to the field and stream around which many of the buildings lie. The turbines would be prominent in views to the south and west from the conservation area perimeter. The turbines would be visible behind and above the village in view from the east, or from the eastern side of the conservation area. When approached from the south, the turbines would be visible in the left side (west) of views, again above and to the side of the village. However, these views would already incorporate the existing Royd Moor turbines, and it is considered that the proposal would not be introducing an unknown or new element into those views. The potential impact upon its setting is considered to be "minor" for this reason.

8.7.2.4 Other

Bents Farm is of local importance, but its local setting is defined in part by its relation to the Hepworths industrial site to its west, as well as other buildings to north and south. It lies 1.6km from the nearest turbine. Given its level of designation as well as its immediate setting, it is not considered to receive any significant effect upon its setting.

8.7.3 Potential Decommissioning Effects

No effects are anticipated as a result of decommissioning. In the event that new access tracks are required, or any previously undisturbed ground will be subject to excavation, then a watching brief or other archaeological mitigation may be required.

Decommissioning would have the effect of removing all the visual effects, and of (all other circumstances remaining the same) restoring the predevelopment visual condition.

8.8 MITIGATION

8.8.1 Construction Mitigation Measures

Although no known cultural heritage features will be directly affected by construction, there is a (low) potential that unknown, buried, archaeological remains may exist within the site that could be disturbed by excavation activities.

It is proposed that an archaeological watching brief be carried out on all earth-moving and excavation activities during construction. It is anticipated that the scope and extent of any watching brief will be agreed with South Yorkshire Archaeological Advisory Service in advance, and that this could be addressed by means of a suitably worded condition, should the development be granted consent. The work will be carried out by a suitably qualified and experienced archaeologist, or organisation. The scope will allow for the appropriate investigation and recording of any remains should they be encountered, so as to achieve preservation by record. This is understood to include any appropriate post-excavation assessment, analysis and publication of archaeological records and materials generated by a watching brief.

8.8.2 Operational Mitigation Measures

No specific mitigation (beyond that incorporated into the design of the proposed development) is considered necessary or practical for any indirect visual effects upon the settings of any cultural heritage features.

8.8.3 Decommissioning Mitigation Measures

No mitigation requirement is anticipated. In the event that new access tracks are required, or any previously undisturbed ground will be subject to excavation, then a watching brief or other archaeological mitigation may be required.

8.9 RESIDUAL EFFECTS

8.9.1 Construction Effects

There would be no significant residual effects after the implementation of an appropriate scheme of archaeological work by way of mitigation prior to and during construction (including excavation and publication of any finds that may be made during the watching brief).

8.9.2 Operational Effects

There will be some visual effects upon the settings of some cultural heritage features (as noted in Section 8.7.2 above), none of which are considered of worse than "minor" significance, and for which no mitigation is proposed or considered practical. These effects will be temporary, lasting only for the 25-year life of the wind farm, and reversible upon decommissioning.

8.9.3 Decommissioning Effects

No residual effects are expected, unless alternative access routes are required on previously undisturbed ground. In this case, a watching brief or other archaeological mitigation may be required on any new track sections, given that the development site as a whole is considered to have (low) potential for unknown buried archaeological remains to be encountered.

8.10 CUMULATIVE EFFECTS

This assessment has taken into account the existing Royd Moor Wind Farm, the consented Hazelhead scheme as well as the proposed Blackstone Edge scheme. Figure 4.36 shows the cumulative ZTV from these sites along with Spicer Hill Wind Farm. Hazelhead lies downhill approximately 2.5km to the west of the proposed development, and Blackstone Edge would be located immediately to the north of the proposed Spicer Hill scheme. The presence of the existing Royd Moor scheme (as well as the non-operational turbine near Millhouse Green) means that the Spicer Hill turbines would not be an entirely new type of feature in the landscape.

Although more turbines may be seen from many of them, the majority of the scheduled monuments subject to this assessment are not likely to receive any significant additional cumulative impact upon their settings. This is in part due to the nature of the monument types (many having only a limited above ground presence, or highly defined localised settings). The same is considered to be the case for the Listed Buildings, as well as for the Registered Parks. In particular the effect of Royd Moor, Spicer Hill and Blackstone Edge would be to increase the number of turbines visible, as well as the length of the ridge occupied by them, with turbines increasing in height from south to north. In views from west and east the arc of view occupied by turbines would be greater (depending on how close the observer is), however the change is one of scale rather than the introduction of an entirely new element in those views. At distance the separate schemes are likely to be perceived as one (albeit with turbines of different heights). The positioning of Hazelhead to the west and downhill will tend to screen it in view from the east, and not lead to any significant additional effects on cultural heritage features to the east of Spicer Hill.

8.11 SUMMARY OF EFFECTS

There is limited potential for unknown, buried archaeological remains to be affected during construction, resulting in damage or destruction to such features. This effect can be mitigated by the application of a programme of archaeological work (as part of a watching brief) to enable the recording of such remains, leading to preservation by record.

No effects of "moderate" and "major significance are anticipated upon the settings of cultural heritage features, based on distance and designation level. Of the three Scheduled Monuments within 5km, 1 is not intervisible with the scheme (the wayside cross at Hartcliff Road) and 2 (Catshaw Cross and the earthwork at Castle Hill) are assessed as receiving only an impact of only "minor" significance.

No Registered Parks are anticipated to receive an impact upon their setting of more than "minor" significance, largely due to their distance from the site (more than 6.6km from the nearest turbine) and the fact that the wind farm will not be visible from the majority of each designated area (except for Cannon Hall, but even here the presence of trees across much of the area reduces the visual presence of the scheme further).

Of the listed buildings that are intervisible with scheme, those with the highest levels of designation (Grade I or II*) are sufficiently far from the proposed scheme that the potential impact is considered of "minor" significance (as with Cat Hill, taking into account the existing Royd Moor scheme). The others are not considered to receive any significant effect due to their specific localised settings; often as part of working farms and surrounded by modern barn and other ancillary structures. The majority of the Grade II listed buildings are not

assessed as receiving any significant impact due to distance, low level of importance (by virtue of their low grading) and/or urban locations.

Table 10.5 Summary of Effects Table

Potential Effect	Mitigation	Residual Effect
Construction Effects		
Potential (low) to damage unknown buried archaeological remains.	Watching Brief	None - Preservation of any remains by record.
Operational Effects		
Some "minor" effects upon the settings of cultural heritage features, considered temporary and reversible.	None	"Minor" effects upon settings of some cultural heritage features.
Decommissioning Effects		
No direct effects anticipated.	None	None
Reversal of "minor" impacts upon settings of some Cultural Heritage Features	None	None

8.12 STATEMENT OF SIGNIFICANCE

There will be no direct impacts upon any known cultural heritage features. There is a low potential that unknown, buried archaeological remains could be encountered during construction works. However, after the application of appropriate mitigation (a watching brief incorporating appropriate investigation and recording is proposed, see 8.8.1 above) any residual effect is assessed as being not significant, given that preservation by record will have been achieved.

Although a number of potential impacts upon the settings of some Scheduled Monuments and Listed Buildings are predicted, these are assessed as being of no worse than of "minor" significance. Any effect is considered temporary and reversible.

No cumulative effects are predicted as a result of the consented Hazlehead Wind Farm and proposed Blackstone Edge Wind Farm.

An effect of "minor" significance is not considered "significant" in terms of the EIA Regulations.

9 NOISE

9.1 INTRODUCTION

This chapter addresses the potential noise effects of the proposed Spicer Hill Wind Farm on nearby noise sensitive receptors during construction, operation and decommissioning.

The aim of the assessment is to predict the effects of noise at the nearest noise sensitive receptors (residential properties) and assess this against relevant standards and guidelines.

A glossary of acoustic terminology is contained in Appendix 9.1 which can be found at the end of this chapter.

The Noise Technical Appendix, contained in ES Volume 3 presents descriptions of methodologies and data used in this assessment.

This chapter contains the following sections

- Consultations – summary of consultation undertaken in relation to the noise assessment
- Legislation and Guidance – documents used to inform scope and assessment
- Methodology – details of survey and assessment methodology including significance criteria (details of when an effect is and is not significant)
- Baseline – identification of receptors, relevant desktop information and field result surveys
- Assessment – identification of potential impacts, assessment of impacts
- Mitigation – details of any mitigation proposed and mitigation already incorporated into the project design
- Residual Effects – identification of any effects remaining after mitigation is applied
- Summary of Effects – summary table identifying receptor, mitigation and residual effect for construction, operation and decommissioning
- Statement of Significance – details of any significant effects predicted as part of the assessment

9.2 CONSULTATION

A Scoping exercise was undertaken in August 2007 to gather the views of key stakeholders regarding the form and content of this ES. The only respondent to comment on the issue of noise was the Highways Agency highlighting the potential for noise to result in driver distraction. As recommended by the Highways Agency, the site has good approach visibility which would mitigate this potential effect.

Consultation was carried out with BMBC's Regulatory Services in order to agree certain aspects of the noise assessment methodology and locations for the baseline noise survey. Copies of consultation correspondence are included in the Noise Technical Appendix, and summarised as follows

- four baseline noise monitoring locations were agreed, as detailed in section 9.5.3.
- noise from the turbines at the existing Royd Moor wind farm were to be considered as a part of the existing background noise due to their being a long-established land use.

BMBC confirmed that over the operational lifespan of the existing Royd Moor Wind Farm two complaints have been received. The first dates from commissioning in 1994 and was satisfactorily resolved and the second was recorded in March 2008. This recent complaint

related to mechanical noise emanating from one turbine and following maintenance, no further complaints have been received¹.

9.3 LEGISLATION AND GUIDANCE

The following guidance and information sources have been considered in carrying out this assessment

- Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended) (EIA Regulations)
- PPS22 Renewable Energy (2004)²
- PPG24 Planning and Noise (1994)
- ETSU-R-97 The Assessment and Rating of Noise from Wind Farms
- The measurement of low frequency noise at three UK wind farms, Hayes McKenzie, The Department for Trade and Industry, URN 06/1412, 2006
- Research into aerodynamic modulation of wind turbine noise. Report by University of Salford, Department for Business, Enterprise and Regulatory Reform, URN 07/1235, July 2007.
- ETSU W/13/00385/REP: A Critical Appraisal of Wind Farm Noise Propagation³.

9.3.1 Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 (as amended)

The relevant provisions of this document are set out in Chapter 1 of this ES.

9.3.2 PPS 22 Renewable Energy

PPS22 provides guidance to local authorities on policy matters relating to renewable energy developments. In terms of noise, it states:

"Renewable technologies may generate small increases in noise levels (whether from machinery such as aerodynamic noise from wind turbines, or from associated sources – for example, traffic). Local planning authorities should ensure that renewable energy developments have been located and designed in such a way to minimise increases in ambient noise levels. Plans may include criteria that set out the minimum separation distances between different types of renewable energy projects and existing developments. The 1997 report by ETSU for the Department of Trade and Industry should be used to assess and rate noise from wind energy development"

The Companion Guide to PPS22⁴ provides further details of technical aspects of renewable energy technologies. In terms of noise from wind turbines, it describes its character and sources, and restates that ETSU-R-97 should be used in the assessment process. It also states that there is no evidence that ground transmitted low frequency noise from wind turbines is at a sufficient level to be harmful to human health.

9.3.3 PPG24: Planning and Noise

PPG 24 provides guidance to local authorities in England on the use of their planning powers to minimise the adverse effects of noise. It

- outlines considerations to be taken into account in determining planning applications both for noise-sensitive developments and for those activities which will generate noise

¹ J. Scott, pers. com.

² Planning Policy Statement 22: Renewable Energy, Office of the Deputy Prime Minister, 2004

³ ETSU W/13/00385/REP: A Critical Appraisal of Wind Farm Noise Propagation, ETSU for the DTI 2000

⁴ Planning for Renewable Energy, A Companion Guide to PPS22, Office of the Deputy Prime Minister 2004

- recommends appropriate levels for exposure to different sources of noise
- advises on the use of conditions to minimise the effects of noise

It gives no specific guidance on the assessment of noise from wind farms.

9.3.4 ETSU-R-97

ETSU-R-97 provides a framework for the assessment and rating of noise from wind turbines. It has become the accepted standard for wind farm developments in the UK, and the methodology has therefore been adopted for the present assessment.

ETSU-R-97 recommends the application of noise limits at the nearest noise-sensitive properties, to protect outside amenity and prevent sleep disturbance inside dwellings. It proposes that site-specific noise criteria are adopted based on the background noise. Noise from wind turbines and background noise both typically vary with wind speed. According to ETSU-R-97, wind farm noise assessments should therefore consider the site-specific relationship between wind speed and background noise, along with the particular noise emission characteristics of the proposed wind turbines.

ETSU-R-97 states that the noise limits should apply to the cumulative effect of all wind turbines in the area contributing to the noise received at the properties in question, and that an existing wind farm should not be considered as part of the prevailing background noise.

9.3.5 The measurement of low frequency noise at three UK wind farms

A recent study⁵, published in 2006, by Hayes McKenzie on the behalf of the DTI investigated low frequency noise from wind farms. This study concluded that there is no evidence of health effects arising from infrasound or low frequency noise generated by wind turbines. It also noted, however, that a phenomenon known as Aerodynamic Modulation was in some isolated circumstances (5 out of 126 operating wind farms in the UK) occurring in ways not anticipated by ETSU-R-97.

9.3.6 Research into aerodynamic modulation of wind turbine noise

A further study⁶ was carried out on behalf of the Department for Business, Enterprise and Regulatory Reform by the University of Salford, which investigated the incidence of noise complaints associated with wind farms and whether these were associated with Amplitude Modulation. This report defined Amplitude Modulation (AM) as aerodynamic noise from wind turbines with a greater degree of fluctuation than normal at blade passing frequency. Its aims were to ascertain the prevalence of AM on UK wind farm sites, to try to gain a better understanding of the likely causes, and to establish whether further research into AM is required.

The study concluded that AM has occurred at only a small number (4 of 133) of wind farms in the UK, and only for between 7% and 15% of the time. It also states that the causes of AM are not well understood as yet, and that prediction of the effect is not currently possible. The study recommends against further research into the phenomenon at this stage, and no revision to the current guidelines (ETSU-R-97) on wind farm noise assessment is recommended.

9.3.7 ETSU W/13/00385/REP: A Critical Appraisal of Wind Farm Noise Propagation

This document is discussed in Section 9.4 under *Prediction of Noise Levels*.

⁵ 'The measurement of low frequency noise at three UK wind farms', Hayes Mckenzie, The Department for Trade and Industry, URN 06/1412, 2006

⁶ 'Research into aerodynamic modulation of wind turbine noise'. Report by University of Salford, The Department for Business, Enterprise and Regulatory Reform, URN 07/1235; July 2007.

9.4 METHODOLOGY

The assessment of the effect of noise from the operation of the proposed wind farm has been conducted in accordance with ETSU-R-97. ETSU-R-97 specifies the use of the $LA_{90,10min}$ descriptor for both background noise and turbine noise and assumes free-field conditions. (see Appendix 9.1) All references to noise levels in this chapter therefore refer to this descriptor unless otherwise stated. Similarly, unless otherwise stated all wind speeds refer to a height of 10m above ground level.

9.4.1 Baseline Noise Survey

ETSU-R-97 provides a method for determining existing background noise. Typically, the baseline assessment requires the measurement of background noise at sensitive receptors, along with wind speed at the location of proposed turbines, 10 m above ground level. Predicted noise levels from the proposed wind farm are then compared with criteria based on noise limits specified in ETSU-R-97.

ETSU-R-97 states that the noise limits should apply to the cumulative effect of all wind turbines in the area contributing to the noise received at the properties in question, and that an existing wind farm should not be considered as part of the prevailing background noise.

There can be practical difficulties inherent in trying to fulfil this requirement: it can be difficult to obtain the agreement of the operator of an existing wind farm to shut down their turbines so that a survey can be carried out for another project; alternatively correcting measured background noise levels by subtracting a calculated level for the existing wind turbines may be inaccurate.

During consultation with the Council it was agreed that the existing turbines are to be considered a component of the prevailing background noise for the purposes of the current assessment. Notwithstanding this, the assessment carried out includes the contribution of noise from Royd Moor *within the predicted noise levels and measures were taken during the baseline noise survey to minimise the effects of noise from the existing turbines in order that the above requirement of ETSU-R-97 is fulfilled as far as reasonably practicable.*

9.4.2 Prediction of Noise Levels

ETSU-R-97 does not provide guidance on appropriate prediction techniques. However, a review of wind farm noise propagation was carried out on behalf of ETSU in 2000⁷. This review examined a number of alternative prediction techniques and provided recommendations on appropriate methods. Based on these, the prediction method used for this assessment was that detailed in ISO 9613⁸ with the exception that barrier attenuation has been omitted.

A computer model (SoundPLAN) has been used to predict noise levels resulting from the operation of the proposed wind farm, based on the methodology specified in ISO 9613. The use of this technique is considered to be appropriate for predicting the noise from the proposed wind turbines. Full details of the modelling procedure are given in the Noise Technical Appendix. The ISO 9613 method predicts noise levels likely to occur under conditions favourable to noise propagation, i.e. downwind or under a moderate ground-based temperature inversion (such as may occur at night). The accuracy of the method is estimated in the standard as $\pm 3dB(A)$, however, conservative assumptions have been made in the modelling process and it is therefore more likely that the model will over-predict than under-predict noise levels.

⁷ ETSU W/13/00385/REP: A Critical Appraisal of Wind Farm Noise Propagation, ETSU for the DTI 2000

⁸ ISO 9613-2: 1996 Acoustics – Attenuation of sound During Propagation Outdoors – part 2: General Method of Calculation.

9.4.3 Noise Sources

The candidate wind turbine model for the purposes of the noise assessment is the WinWinD 1MW (WWD1), with a hub height of 56m and rotor diameter of 56m. Noise emission data for the WWD1 was provided by the manufacturer. They were unable to provide appropriate data for the 56m rotor diameter model, but provided that for the same turbine with a 60m rotor diameter. This is likely to have slightly higher noise emissions than a turbine with a 56m rotor diameter. The manufacturer's data is reproduced in full in the Noise Technical Appendix, and the variation in noise output (sound power level) with wind speed summarised in Table 9.1. A safety margin of +1 dB(A) has been applied to the manufacturer's measured data⁹. It has also been assumed for the purposes of assessment that the sound power level remains constant at wind speeds above its maximum measured value (at 8 ms⁻¹) rather than declining slightly, as stated in the report, and a value for a wind speed of 4 ms⁻¹ has been assumed, by projecting from 6 and 5 ms⁻¹.

Table 9.1: Noise Emissions - WinWinD 1MW Wind Turbine

Wind Speed at 10m AGL, ms ⁻¹	4	5	6	7	8	9 and above
Manufacturer's Measured Sound Power Level, L _{WA} , dB(A)	n/a	93.1	97.9	101.9	104.0	103.4
Sound Power Level Assumed for Assessment, L _{AW} , dB(A)	89.3	94.1	98.9	102.9	105.0	105.0

The candidate turbine's noise emissions are stated in the manufacturer's data to be free of tonal elements such that would require a penalty to be added under the terms of ETSU-R-97.

Turbine selection is likely to be subject to a competitive procurement process. A warranty will be sought from the manufacturer of the model selected that noise emissions will not exceed those assessed, i.e. those detailed in Table 9.1, and that the turbine selected will be free of tonal elements such that would require a penalty to be added under the terms of ETSU-R-97.

Noise Levels have also been calculated for the Royd Moor wind turbines, based on a sound power level of 98 dB(A) at all wind speeds, based on information provided in the Environmental Statement for Royd Moor. It has been assumed that the spectrum of the WinWinD turbines, corrected to the appropriate broadband sound power level provides a fair representation of the noise from the existing turbines. These have been 'added'¹⁰ to those calculated for Spicer Hill and the total assessed.

9.4.4 Noise Limits

Separate noise limits apply for quiet day-time and night time, as outlined below.

Quiet daytime is defined in ETSU-R-97 as 18:00 – 23:00 every day, as well as 13:00 – 18:00 on Saturday and 07:00 – 18:00 on Sundays. During these periods, the guidance prioritises the protection of outdoor amenity for residents, by applying noise limits that would not significantly affect the enjoyment of areas such as gardens.

ETSU-R-97 proposes the adoption of a site standard of 5 dB(A) above the prevailing wind varying background noise level. This is based on wide experience in environmental acoustics that noise from a new source is unlikely to cause annoyance where the predicted increase is less than 5 dB (A) above the existing background.

In addition to the limit of 5 dB(A) above background, an allowance is included for a fixed lower limit to be applied at wind speeds or locations where background noise levels are low.

⁹ The uncertainty in the measured values is stated to be 0.6 dB(A)

¹⁰ Sound levels are summed logarithmically, rather than arithmetically, see Appendix 9.1

Where the quiet daytime background noise level is less than 30-35 dB(A), the limit is defined as 35-40 dB(A). The value selected for the fixed lower limit depends on the following: The number of affected dwellings, the effect of noise limits on the output of the proposed wind farm, and the duration and level of exposure. In this instance, the 40 dB(A) limit has been applied to properties where the existing Royd Moor turbines provide a greater contribution to the overall noise level than the proposed Spicer Hill turbines. The Royd Moor turbines were erected prior to the adoption of ETSU-R-97 and noise levels relating to the development are not controlled by planning condition. Therefore, where Royd Moor has the greater effect on a particular property it is considered reasonable to apply the higher limit to take account of this.

The quiet daytime limit also applies to all other daytime periods, with the limits based on the quiet daytime background noise level.

Different standards apply at night, where sleep disturbance is the primary concern rather than the requirement to protect outdoor amenity. Night-time is considered to be all periods between 23:00 and 07:00. A limit of 43 dB(A) is recommended for night-time at wind speeds or locations where the background noise level is less than 38 dB(A). Where background noise levels exceed 38 dB(A) the limit is set to 5 dB(A) above the background noise level.

The noise limits derived from ETSU-R-97 for this assessment are therefore

- daytime: the higher of 35/40 dB(A) or 5 dB(A) above the derived quiet daytime background noise level. The 40 dB(A) limit has been applied to properties where the existing Royd Moor turbines provide a greater contribution to the overall noise level than the proposed Spicer Hill turbines.
- night-time: the higher of 43 dB(A) or 5 dB(A) above the derived night-time background noise level

There is also provision for an increase in the fixed lower limit value where the occupier of the property has a financial interest in the proposed wind farm. In this situation, the limit for both daytime and night-time becomes the higher of 45 dB(A) or 5 dB(A) above the derived background noise level for the relevant period.

9.4.5 Significance Criteria

Predicted wind turbine noise levels in excess of the ETSU-R-97 limits are considered **significant** in terms of EIA Regulations. Noise levels lower than these limits are considered **not significant**.

9.5 BASELINE DESCRIPTION

9.5.1 Description of Local Noise Environment

The site is situated in a predominantly rural area, with the nearest settlement being Ingbirchworth, approximately 1km from the site. Existing noise sources in the area include road traffic noise, agricultural machinery and activities, and the existing Royd Moor Wind Farm. The latter has been in operation since 1993 and as such, BMBC has indicated that in their view it would be acceptable to consider this to be a part of the existing background noise in the area.

9.5.2 Identification of Potential Noise Receptors

Potential receptors were identified through examination of Ordnance Survey Digital Mapping at 1:10,000 scale, aerial photographs showing the development site and site visits.

The extents of the noise assessment and baseline noise survey were defined by producing a noise contour plot for the area around the development site (see Figure 9.1). This presents

predicted noise levels for the highest noise emission level of the candidate turbine as contours. These were calculated using the same procedure as discussed in Section 9.4, and include the calculated contribution from the existing Royd Moor turbines. Properties with the potential to be significantly adversely affected were identified using the noise contour plot thus allowing further assessment to be directed at appropriate receptors.

The lowest noise limit specified in ETSU-R-97 is 35 dB(A), therefore only properties located within the 35 dB(A) contour have been included within the assessment. All other properties will experience levels lower than 35 dB(A), and would therefore be in compliance with ETSU-R-97 were Spicer Hill Wind Farm to be constructed.

Twelve properties have been identified as potentially receiving levels of wind turbine noise in excess of 35 dB(A), as detailed in Table 9.2 and shown in Figure 9.1.

Table 9.2: Properties within 35 dB(A) Contour

Name	X	Y	Nearest Turbine	Separation, m
Annat Royd	421319	404955	3	487
Brown's Edge	420431	405746	1	506
Carr House	421318	403988	3	975
Eagle Nest	420948	404239	3	611
Far Royd Moor	421786	404783	3	942
Flash House Farm 1	420517	403855	5	963
Flash House Farm 2	420366	403847	5	986
Green Gate	420742	406043	1	782
Illian's Cottage	420170	403920	5	968
Small Shaw	420679	404074	5	760
Spicer House	420481	405587	1	340
The Lanes	419980	404049	5	946
Whitley House	421332	404172	3	827

9.5.3 Measurement of Baseline Noise Levels

The baseline survey was carried out between the 12th of February and the 5th of March 2008, and in accordance with ETSU-R-97 as follows

- type 1 measuring equipment, equipped with suitable windshields, was used. the equipment was calibrated at the start of the survey, and calibration checked after one week and at the end of the survey. no significant calibration drift occurred
- measurements were performed at a height of 1.2m AGL, in free-field conditions, i.e. a minimum of 3.5 m, and where possible at least 10 m from any reflective surface other than the ground
- background noise levels were recorded at continuous 10-minute intervals, as LA90, 10min
- wind speeds were measured simultaneously at a height of 10m AGL at a location representative of the proposed turbine locations (420720, 405058). the location of the wind speed measuring mast is shown in figure 9.1
- a rain gauge was installed on the wind mast to record levels of precipitation. measurements obtained from any one-hour periods when rainfall was recorded were excluded from further analysis
- periods where the sound level meters recorded an over-range reading were also excluded
- an equivalent of a minimum of one week of data was obtained for each monitoring location, after exclusions are taken into account

In order to minimise the effects of noise from the existing Royd Moor Wind Farm, the monitoring equipment was positioned, where possible, so that there was not a direct line of

sight between the microphone and the wind turbines, due to screening by buildings or topography. The one exception to this was Whitley House where 2-3 turbines were visible.

Table 9.3 provides a summary of the background noise monitoring locations employed. Copies of survey records are included in the Noise Technical Appendix.

Table 9.3: Baseline Noise Survey Locations

Location	Description of Monitoring Location	Grid Reference of Monitoring Location	Noise Sources Present
Annat Royd	Edge of field NE of house	421349,404973	Distant traffic, farm activities, dairy.
Brown's Edge	Corner of garden NE of house	420465,405769	Distant traffic, farm machinery.
Whitley House	Garden E of house	421351,404169	Dogs, traffic, wind.
Eagle Nest	Corner of garden east of house	420979,404214	Farm traffic, wind, dogs.

The measured background noise levels and wind speeds have been correlated and sorted into quiet daytime and night-time periods, as defined in ETSU-R-97 (see Section 9.4.4). Plots of background noise level against wind speed have been prepared (Charts 9.1 to 9.8) for each monitoring location for quiet daytime and night-time. A regression analysis was carried out, and lines of best fit added to each chart to represent the 'derived background noise level'.

The resident of Annat Royd stated that noise from their dairy was likely to be audible at times when milking was carried out (approximately 0530 to 0830 and 1630 to 1930). Measurements from this location were examined and results from these times that appeared elevated (i.e. where there was a clearly discernible and sudden increase in the background noise levels to approximately 40-43 dB(A)) were excluded. This resulted in a reduction in the derived background noise levels of less than 2 dB(A), and is considered to be a conservative approach, as the noise from the milking activities could reasonably be considered as a normal part of the background noise in this location.

The results from each monitoring location were also examined to ascertain whether noise from the existing Royd Moor Wind Farm was contributing significantly to the prevailing background noise levels. This was achieved by excluding measurements from periods when the wind direction was such that the monitoring locations were downwind of Royd Moor (based on a range of 90 degrees either side of the direction from the centre of the wind farm to the monitoring location). This was found to have a minimal effect on the derived background noise levels (typically +/- < 0.5 dB(A)), and resulted in a reduction in the number of usable measurements for each location to below the minimum required by ETSU-R-97. Results from the full range of wind directions have therefore been included.

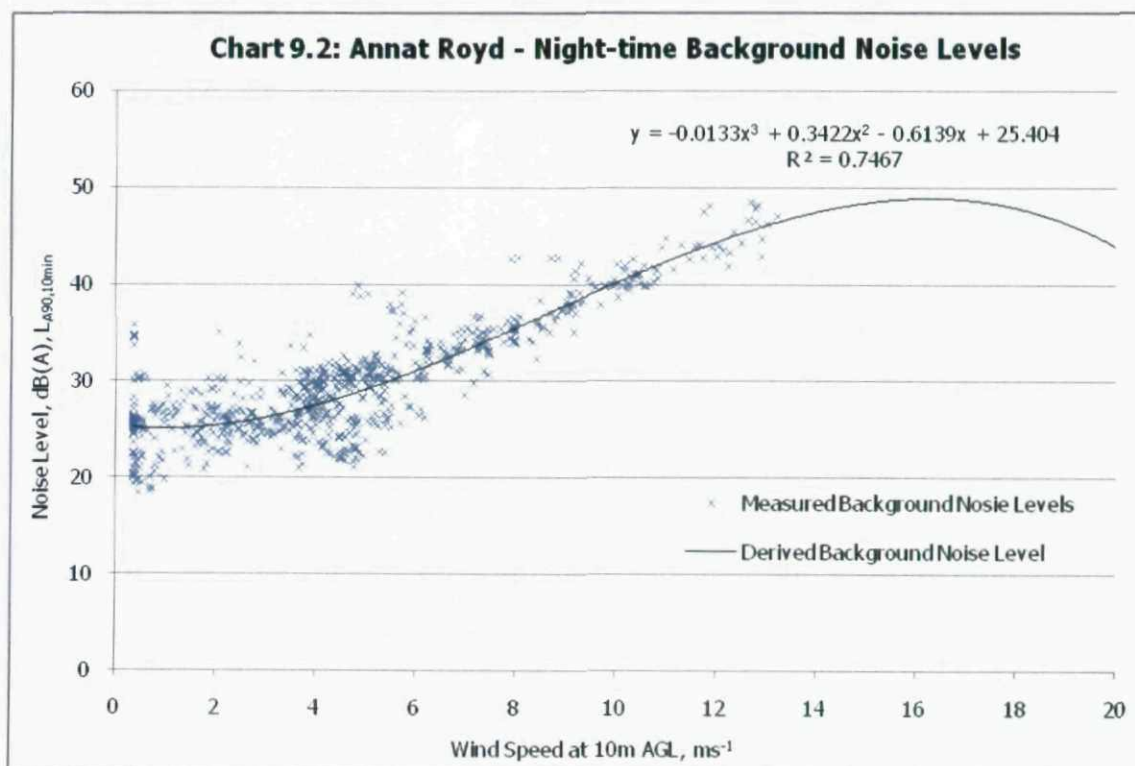
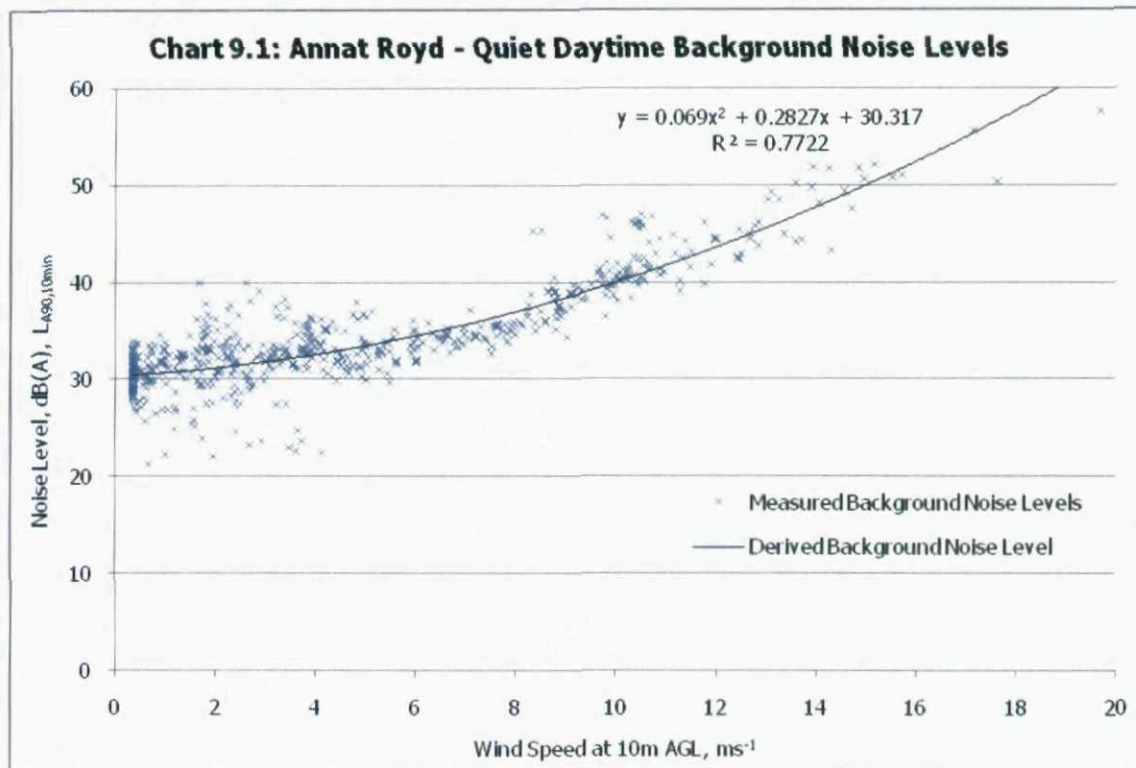
Table 9.4 details the derived background noise level for quiet daytime and night-time for each monitoring location for the assessment range of 4 ms⁻¹ (cut-in) to 12 ms⁻¹

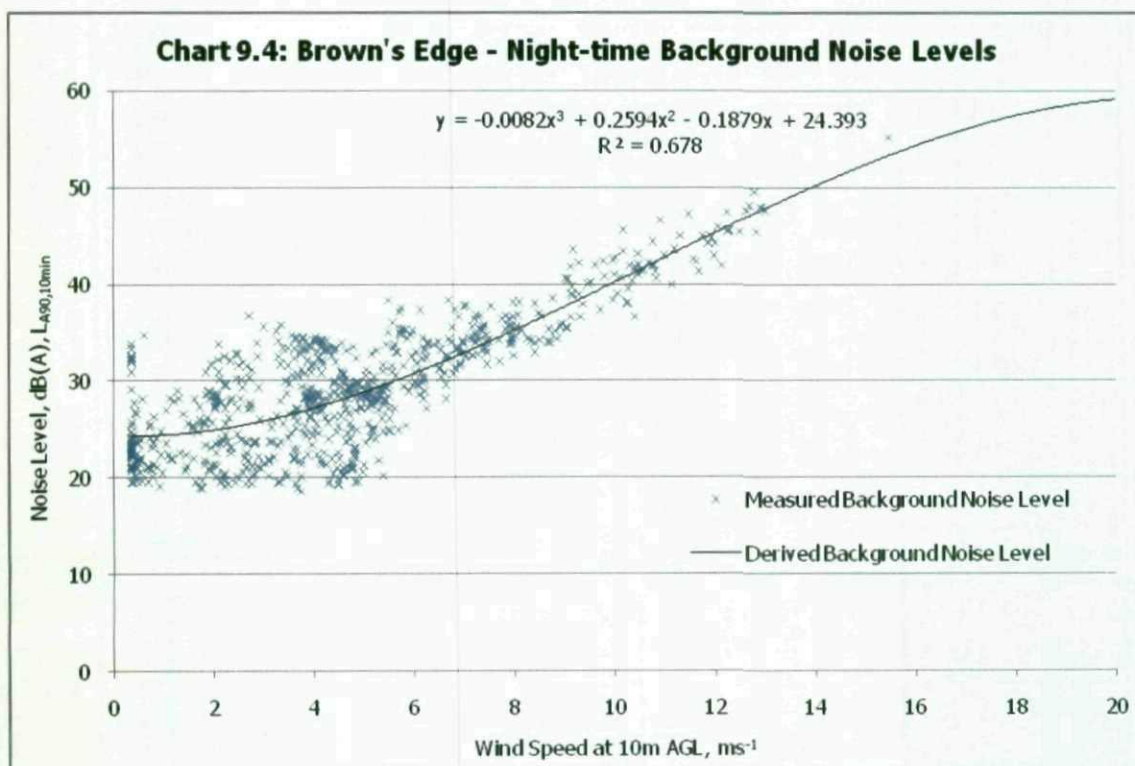
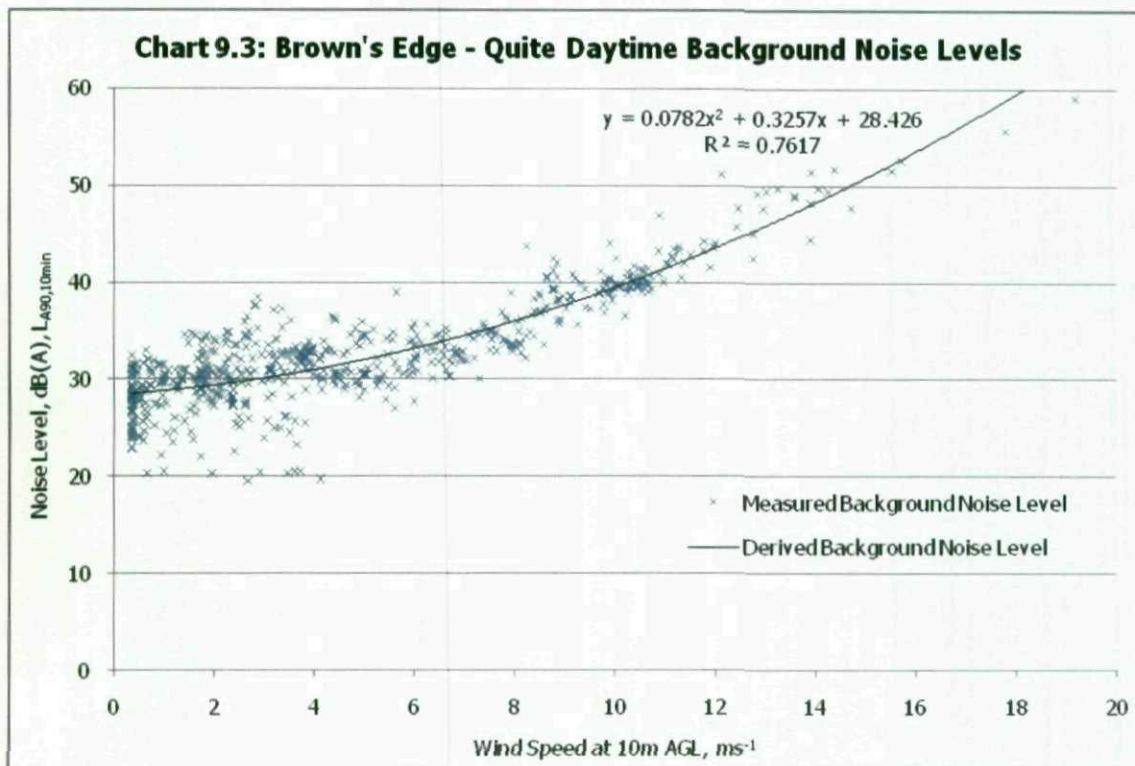
Table 9.4: Derived Background Noise Levels

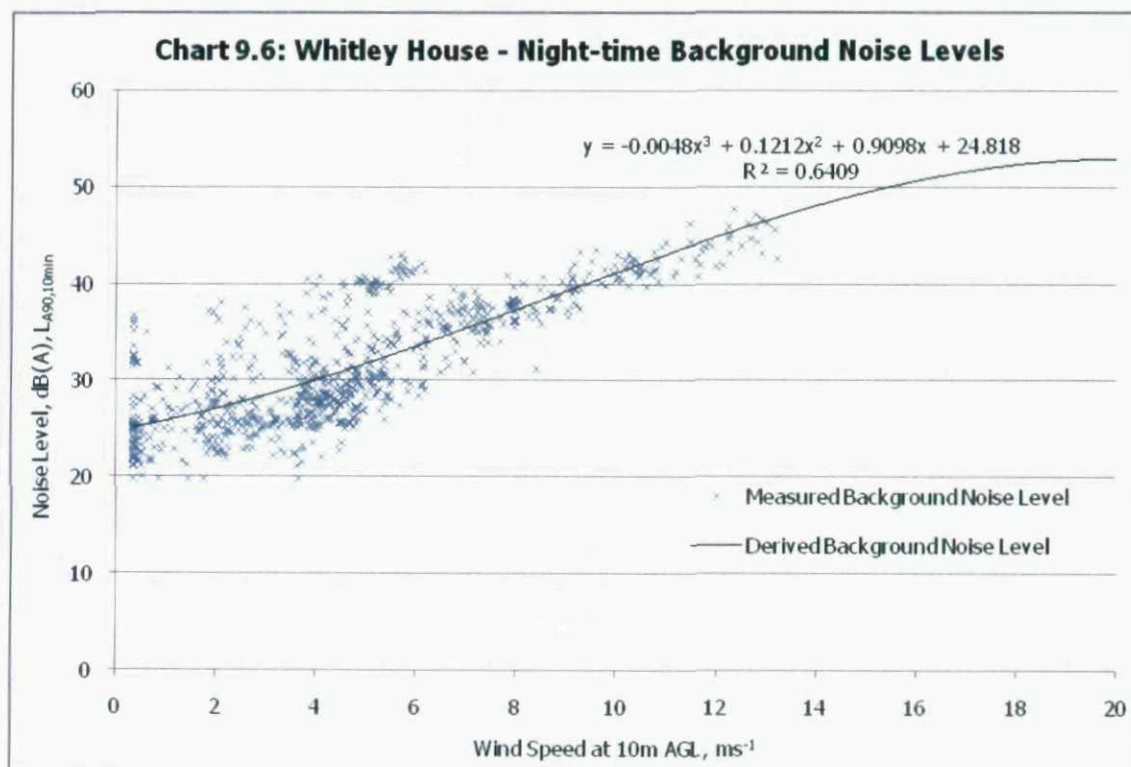
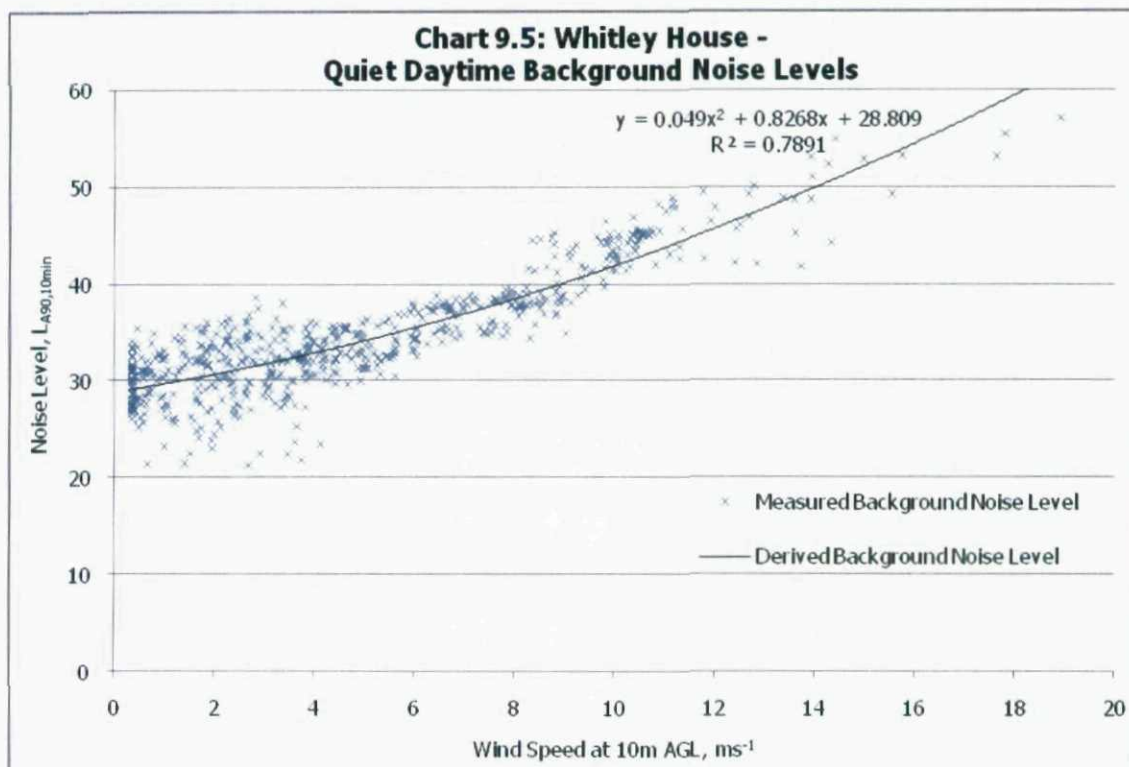
Location	Period	Wind Speed, 10m, ms ⁻¹									
		4	5	6	7	8	9	10	11	12	
		Background Noise Level, LA _{90,10min} dB(A)									
Annat Royd	Quiet Daytime	32.6	33.5	34.5	35.7	37.0	38.5	40.0	41.8	43.6	
	Night-time	27.6	29.2	31.2	33.3	35.6	37.9	40.2	42.4	44.3	
Brown's Edge	Quiet Daytime	31.0	32.0	33.2	34.5	36.0	37.7	39.5	41.5	43.6	
	Night-time	27.3	28.9	30.8	33.0	35.3	37.7	40.3	42.8	45.3	
Whitley House	Quiet Daytime	32.9	34.2	35.5	37.0	38.6	40.2	42.0	43.8	45.8	
	Night-time	30.1	31.8	33.6	35.5	37.4	39.3	41.2	43.1	44.9	
Eagle Nest	Quiet Daytime	36.9	38.4	39.9	41.2	42.3	43.3	44.2	45.0	45.5	
	Night-time	35.8	37.4	38.8	40.2	41.3	42.4	43.3	44.1	44.7	

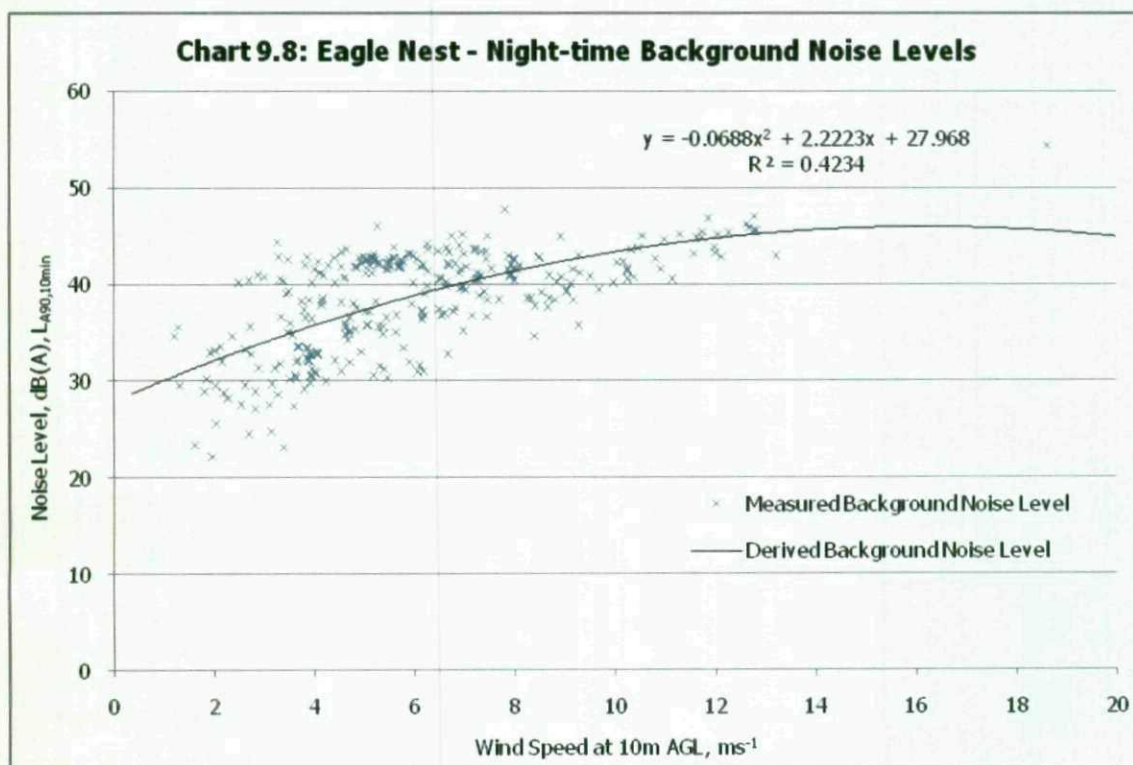
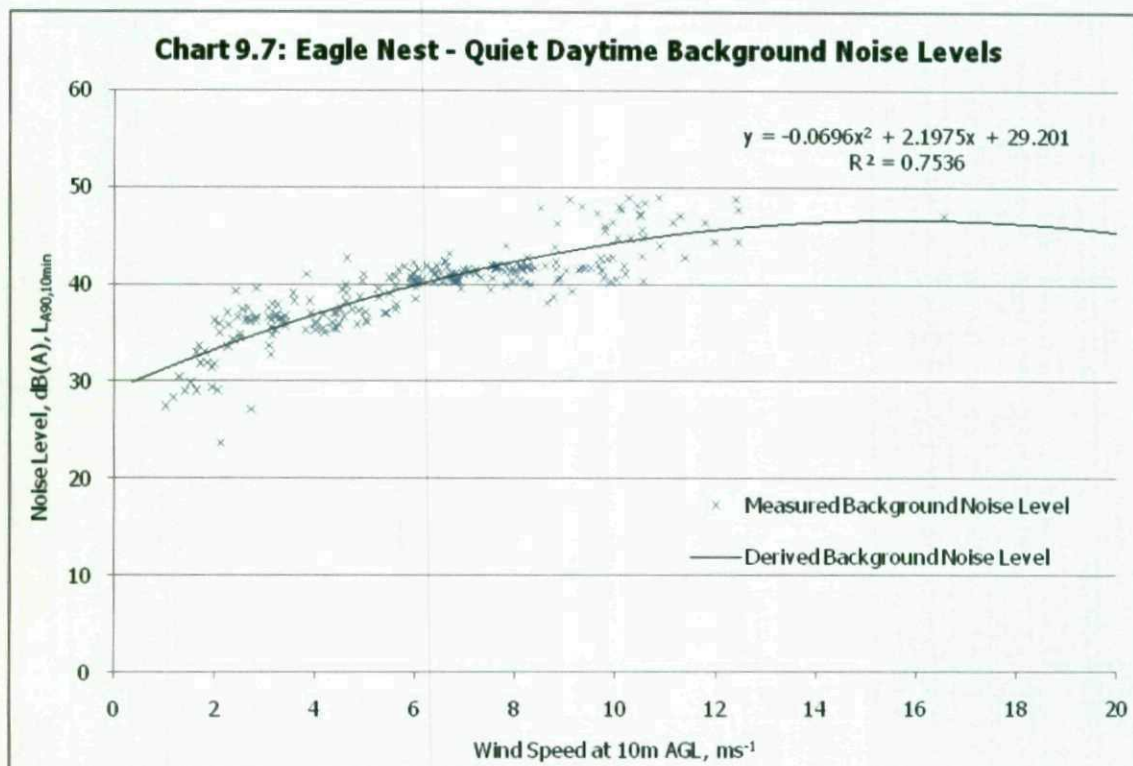
The background noise levels obtained at Brown's Edge have been applied to the receptors where monitoring was not carried out. The results from this location were selected for the following reasons:

- the derived background noise levels from this location were generally the lowest of those obtained.
- this location is farthest of the monitoring locations from the existing Royd Moor wind turbines and is therefore likely to be the least affected by noise from this source.
- for the above two reasons, this approach is considered to be conservative.









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9.6 ASSESSMENT OF EFFECTS

9.6.1 *Potential Construction and Decommissioning Effects*

It is anticipated that construction of the proposed wind farm development will take approximately 10 months (see Chapter 2). The construction programme will be phased, and it is therefore unlikely that construction activities would occur predominantly at any particular location. Consequently, it is unlikely that construction noise would affect any particular property for more than a short period of time, throughout the entire period.

The principal UK guidance on noise from construction activities is contained in BS 5228¹¹. This standard provides information on

- legislation affecting noise from construction sites
- methods of controlling construction noise
- a method for calculating the likely levels of noise resulting from construction activities

The disturbance or annoyance caused by construction noise is dependent on a number of factors, including

- the time of day that the noise occurs
- its duration, in terms of both the number of hours per day and the overall duration
- the level of noise produced
- the level of existing background noise in the area
- the character of the noise (particularly if it contains strong impulsive or tonal elements)
- the attitude of the affected persons to the source of the noise

Rather than specifying limits on acceptable levels of construction noise, BS 5228 advocates an approach based on the use of best practice working measures to minimise, as far as is reasonably practicable, the adverse effects of construction noise. Therefore, rather than assessing the effects of construction noise in terms of noise level, it is proposed to adopt the mitigation measures detailed in Section 9.6.1, which are considered to be best practice, as advocated in BS 5228, in order to minimise the adverse effects of any noise that does occur during construction as far as is reasonably practicable.

The effects of construction traffic are assessed in Chapter 10. Where significant increases in traffic are identified, it can reasonably be assumed that significant noise effects would occur at properties situated adjacent to the transport routes.

Noise during decommissioning will be similar in nature to that during construction, and will be managed through best practice to ensure compliance with standards and guidelines appropriate at the time.

¹¹ BS 5228:1997: Noise and vibration control on construction and open sites.

9.6.2 Potential Operational Effects

The potential effects of noise from operation of the proposed wind farm on each of the receptors identified in Table 9.2 are assessed below.

9.6.2.1 Annat Royd

Table 9.5 details the background noise levels, noise limits and predicted overall noise levels (inclusive of Royd Moor) at Annat Royd. In the final two rows, the predicted noise level is compared with the noise limits. A negative value indicates that the predicted noise levels are below the limits.

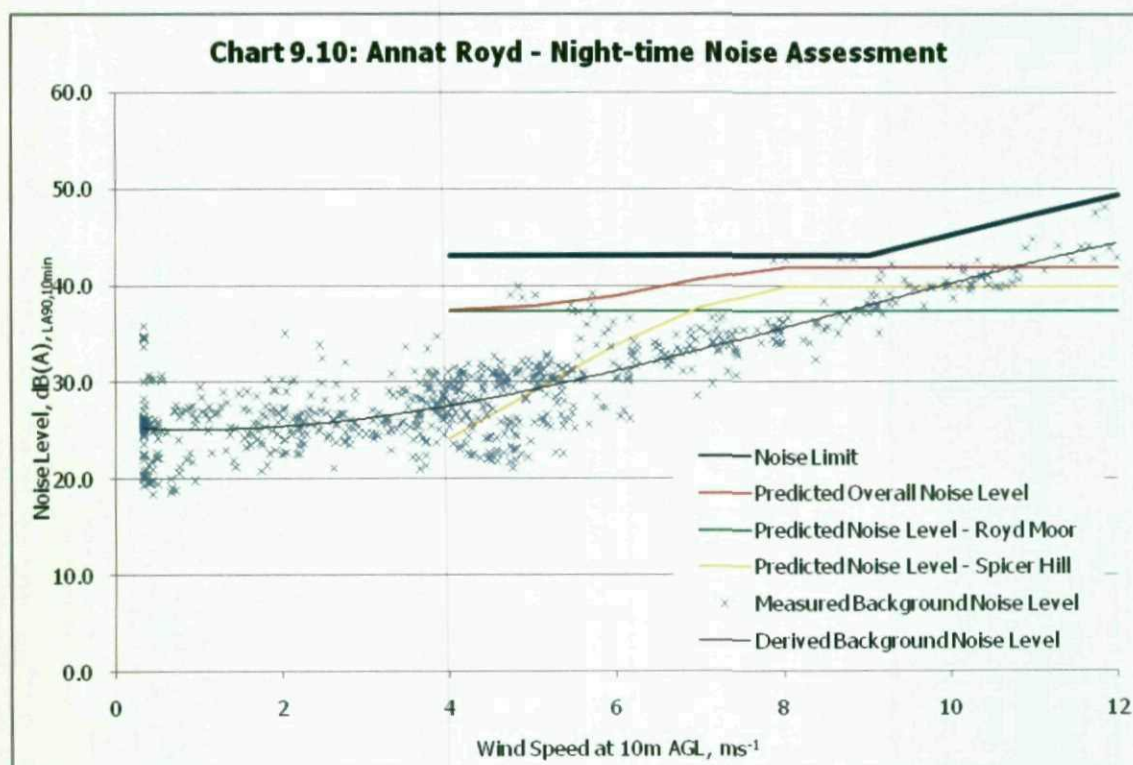
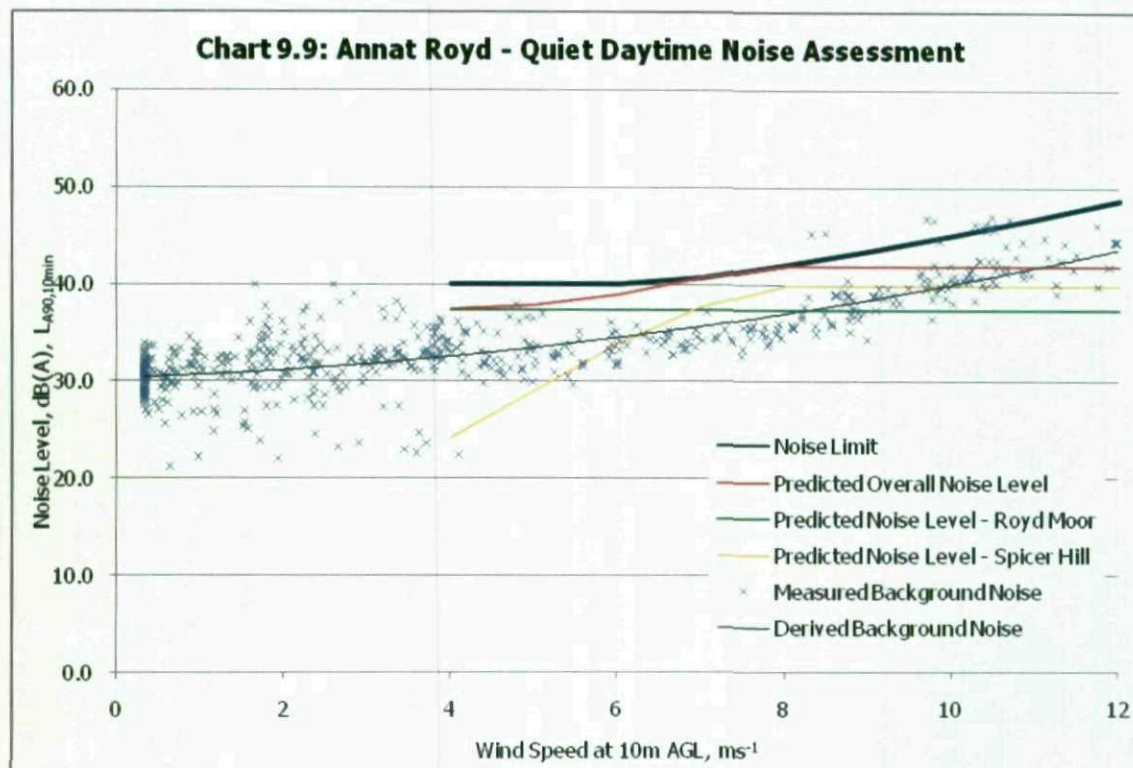
A daytime fixed lower limit of 40 dB(A) has been applied at this property, as at low wind speeds, the overall noise level results mainly from noise from Royd Moor (see Chart 9.9), for which there is no existing planning condition controlling noise.

Table 9.5 Noise Assessment for Annat Royd

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90, 10min}								
Background Noise Level	Day	32.6	33.5	34.5	35.7	37.0	38.5	40.0	41.8	43.6
	Night	27.6	29.2	31.2	33.3	35.6	37.9	40.2	42.4	44.3
Noise Limits	Day	40.0	40.0	40.0	40.7	42.0	43.5	45.0	46.8	48.6
	Night	43.0	43.0	43.0	43.0	43.0	43.0	45.2	47.4	49.3
Predicted Noise Level		37.5	37.9	38.9	40.6	41.8	41.8	41.8	41.8	41.8
Assessment	Day	-2.5	-2.1	-1.1	-0.1	-0.2	-1.7	-3.2	-5.0	-6.8
	Night	-5.5	-5.1	-4.1	-2.4	-1.2	-1.2	-3.4	-5.6	-7.5

Charts 9.9 and 9.10 show the assessment details in Table 9.5 in a graphical format. They also detail the individual contributions that the existing Royd Moor and proposed Spicer Hill wind turbines make to the overall predicted noise levels.

As demonstrated by Table 9.5 and Charts 9.9 and 9.10, the overall predicted noise levels at Annat Royd are lower than the limits specified by ETSU-R-97, and are therefore considered to be **not significant**.



9.6.2.2 Brown's Edge

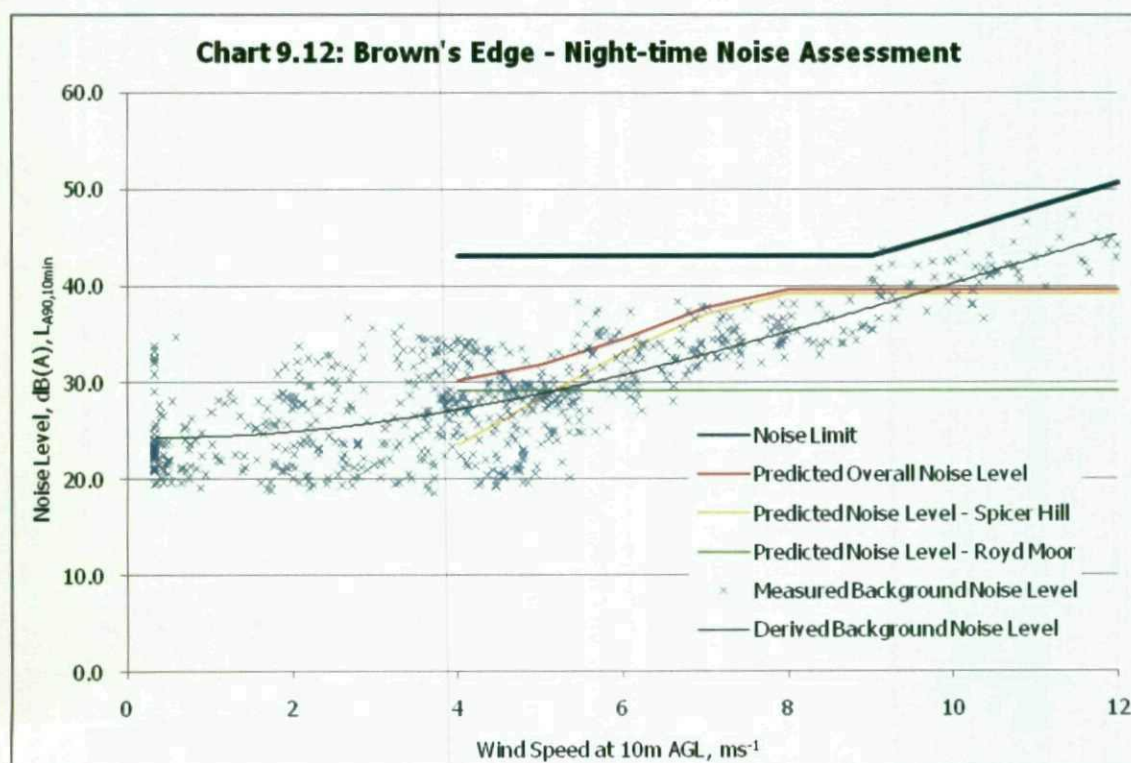
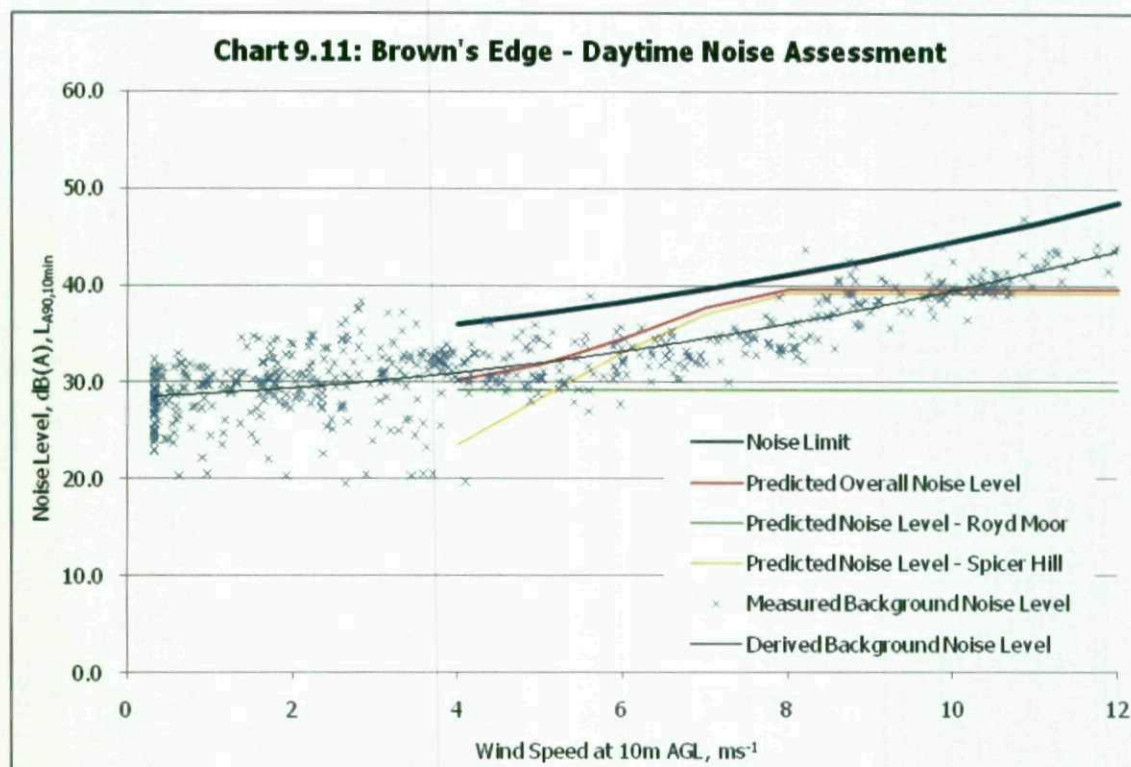
Table 9.6 details the background noise levels, noise limits and predicted overall noise levels (inclusive of Royd Moor) at Brown's Edge. In the final two rows, the predicted noise level is compared with the noise limits. A negative value indicates that the predicted noise levels are below the limits.

Table 9.6: Noise Assessment for Brown's Edge

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90, 10min}								
Background Noise Level	Day	31.0	32.0	33.2	34.5	36.0	37.7	39.5	41.5	43.6
	Night	27.3	28.9	30.8	33.0	35.3	37.7	40.3	42.8	45.3
Noise Limits	Day	36.0	37.0	38.2	39.5	41.0	42.7	44.5	46.5	48.6
	Night	43.0	43.0	43.0	43.0	43.0	43.0	45.3	47.8	50.3
Predicted Noise Level		30.2	31.8	34.6	37.8	39.6	39.6	39.6	39.6	39.6
Assessment	Day	-5.8	-5.2	-3.6	-1.7	-1.4	-3.1	-4.9	-6.9	-9.0
	Night	-12.8	-11.2	-8.4	-5.2	-3.4	-3.4	-5.7	-8.2	-10.7

Charts 9.11 and 9.12 show the assessment details in Table 9.6 in a graphical format. They also detail the individual contributions that the existing Royd Moor and proposed Spicer Hill wind turbines make to the overall predicted noise levels.

As demonstrated by Table 9.6 and Charts 9.11 and 9.12, the overall predicted noise levels at Brown's Edge are lower than the limits specified by ETSU-R-97, and are therefore considered to be **not significant**.



9.6.2.3 Whitley House

Table 9.7 details the background noise levels, noise limits and predicted overall noise levels (inclusive of Royd Moor) at Whitley House. In the final two rows, the predicted noise level is compared with the noise limits. A negative value indicates that the predicted noise levels are below the limits.

A daytime fixed lower limit of 40 dB(A) has been applied at this property, as at low wind speeds, the overall noise level results mainly from noise from Royd Moor, for which there is no existing planning condition controlling noise.

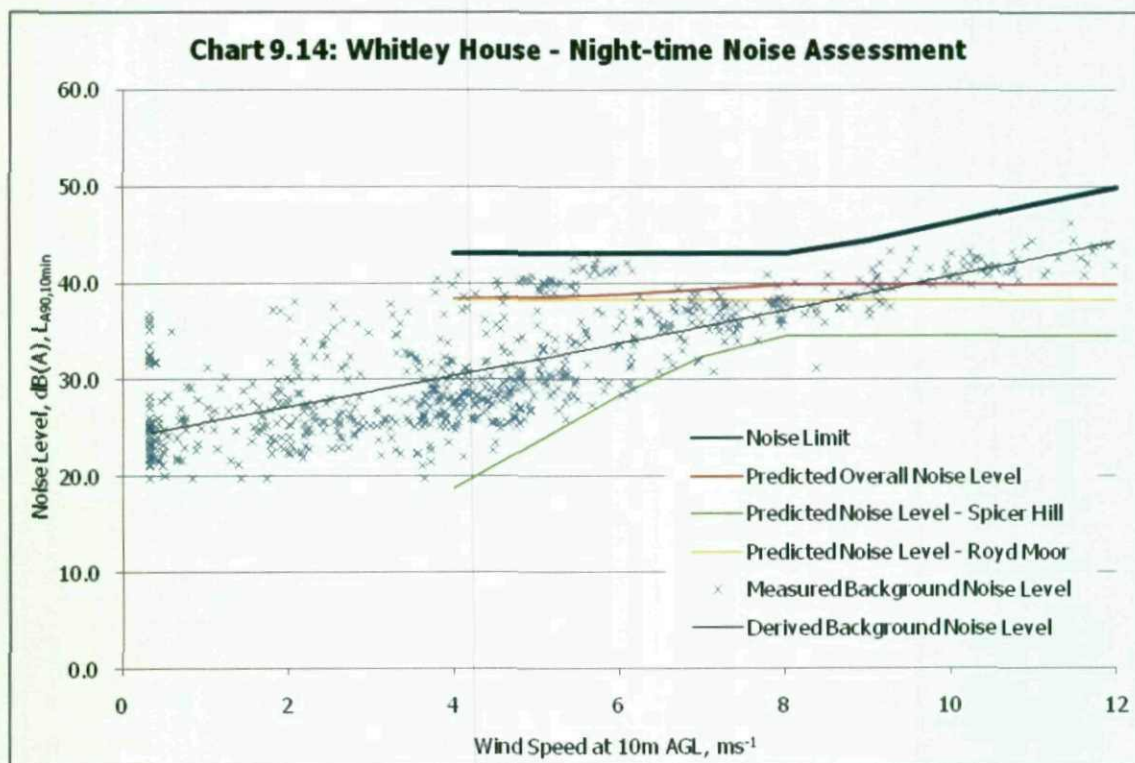
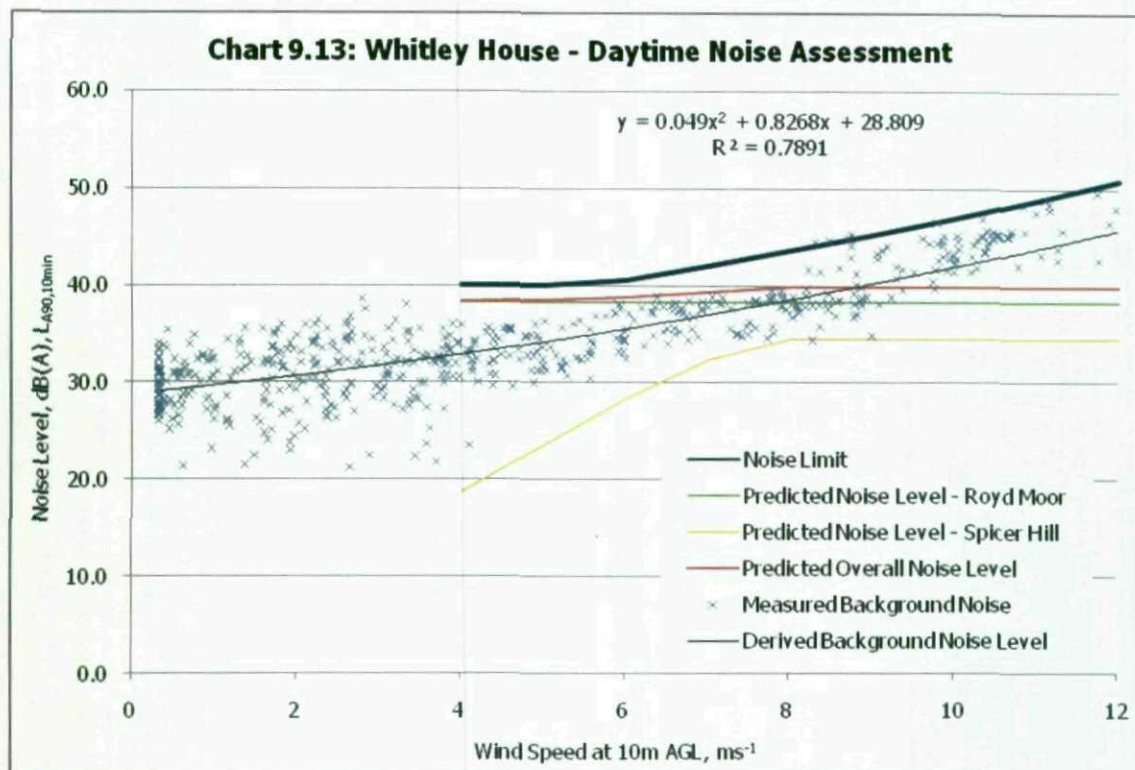
Table 9.7: Noise Assessment for Whitley House

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90, 10min}								
Background Noise Level	Day	32.9	34.2	35.5	37.0	38.6	40.2	42.0	43.8	45.8
	Night	30.1	31.8	33.6	35.5	37.4	39.3	41.2	43.1	44.9
Noise Limits	Day	40.0	40.0	40.5	42.0	43.6	45.2	47.0	48.8	50.8
	Night	43.0	43.0	43.0	43.0	43.0	44.3	46.2	48.1	49.9
Predicted Noise Level		38.3	38.4	38.7	39.3	39.8	39.8	39.8	39.8	39.8
Assessment	Day	-1.7	-1.6	-1.8	-2.7	-3.8	-5.4	-7.2	-9.0	-11.0
	Night	-4.7	-4.6	-4.3	-3.7	-3.2	-4.5	-6.4	-8.3	-10.1

Charts 9.13 and 9.14 show the assessment details in Table 9.7 in a graphical format. They also detail the individual contributions that the existing Royd Moor and proposed Spicer Hill wind turbines make to the overall predicted noise levels.

It can be seen from Charts 9.13 and 9.14 that Royd Moor would contribute the majority of the overall predicted noise level at Whitley House.

As demonstrated by Table 9.7 and Charts 9.13 and 9.14, the overall predicted noise levels at Whitley House are lower than the limits specified by ETSU-R-97, and are therefore considered to be **not significant**.



9.6.2.4 Eagle Nest

Table 9.8 details the background noise levels, noise limits and predicted overall noise levels (inclusive of Royd Moor) at Eagle Nest. In the final two rows, the predicted noise level is compared with the noise limits. A negative value indicates that the predicted noise levels are below the limits.

Table 9.8: Noise Assessment for Eagle Nest

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90, 10min}								
Background Noise Level	Day	36.9	38.4	39.9	41.2	42.3	43.3	44.2	45.0	45.5
	Night	35.8	37.4	38.8	40.2	41.3	42.4	43.3	44.1	44.7
Noise Limits	Day	41.9	43.4	44.9	46.2	47.3	48.3	49.2	50.0	50.5
	Night	43.0	43.0	43.8	45.2	46.3	47.4	48.3	49.1	49.7
Predicted Noise Level		41.9	42.0	42.3	42.8	43.3	43.3	43.3	43.3	43.3
Assessment	Day	0.0	-1.4	-2.6	-3.4	-4.0	-5.0	-5.9	-6.7	-7.2
	Night	-1.1	-1.0	-1.5	-2.4	-3.0	-4.1	-5.0	-5.8	-6.4

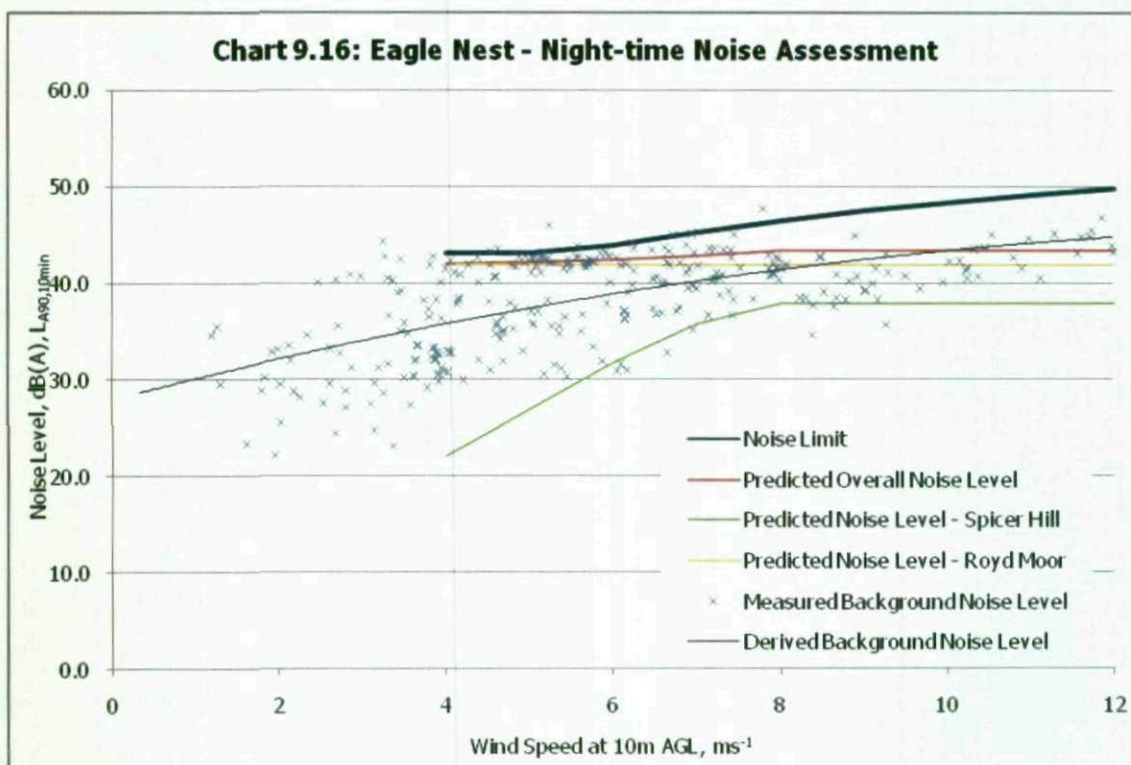
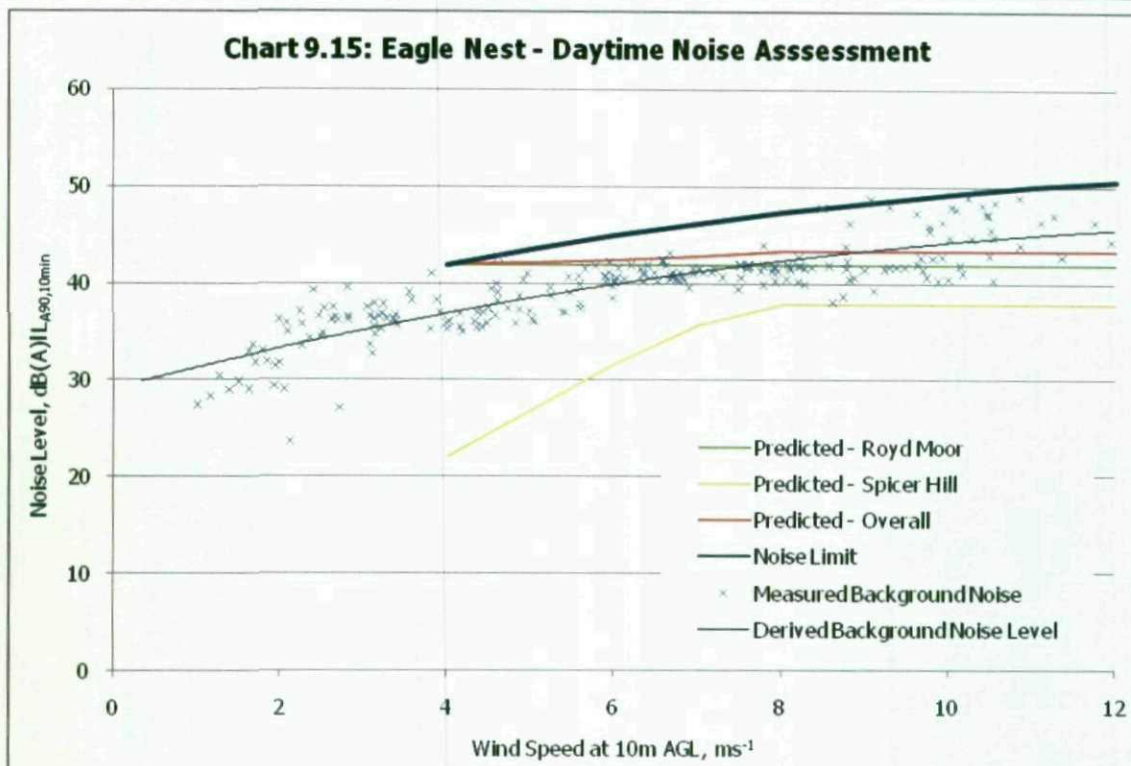
Charts 9.15 and 9.16 show the assessment details in Table 9.8 in a graphical format. They also detail the individual contributions that the existing Royd Moor and proposed Spicer Hill wind turbines make to the overall predicted noise levels.

It can be seen from Charts 9.15 and 9.16 that Royd Moor would contribute the majority of the overall predicted noise level at Eagle Nest.

As demonstrated by Table 9.8 and Charts 9.15 and 9.16, the overall predicted noise levels at Eagle Nest are lower than the limits specified by ETSU-R-97, with the exception of daytime periods where the wind speed is 4 ms⁻¹.

At this speed, the predicted noise level is equal to the limit. However, as demonstrated by Chart 9.15, the overall noise level at this wind speed is due entirely to noise from Royd Moor. The predicted noise level for Spicer Hill is more than 10 dB(A) lower than that for Royd Moor, and therefore does not make a contribution to the total. This therefore represents no change to the current conditions, and cannot therefore be considered to be a significant effect of the proposed Spicer Hill Wind Farm.

Operational noise levels at Eagle Nest are therefore considered to be **not significant**.



9.6.2.5 Spicer House

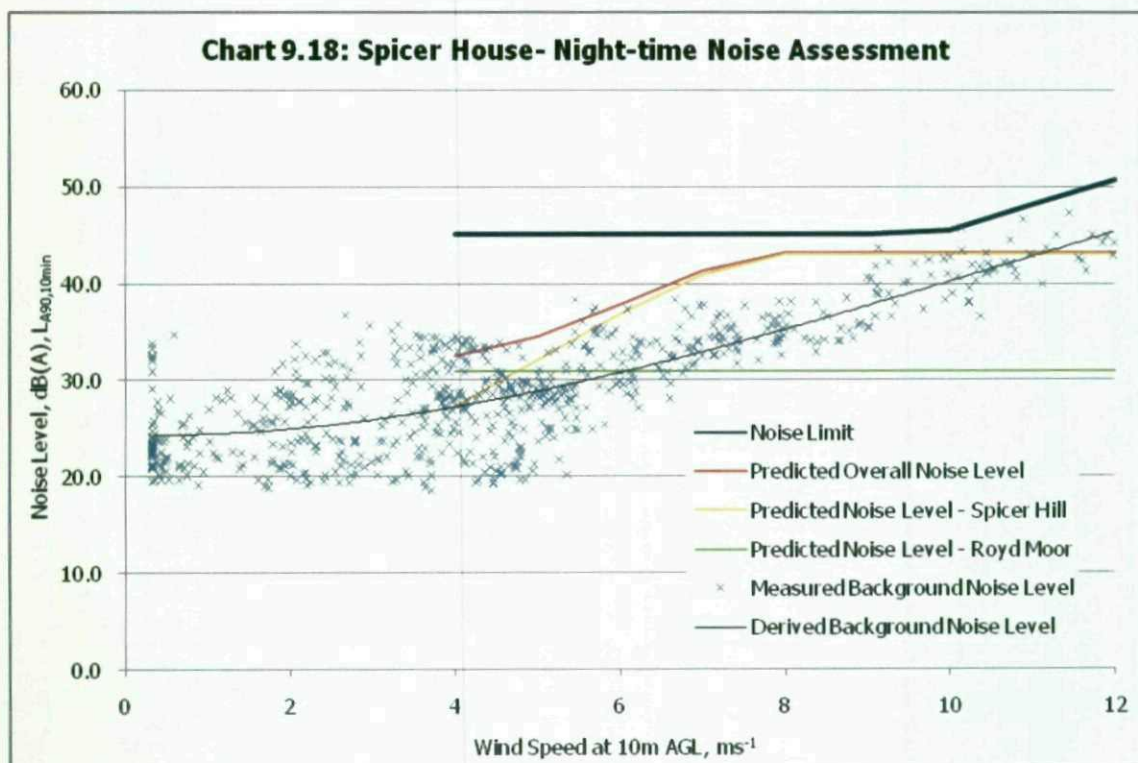
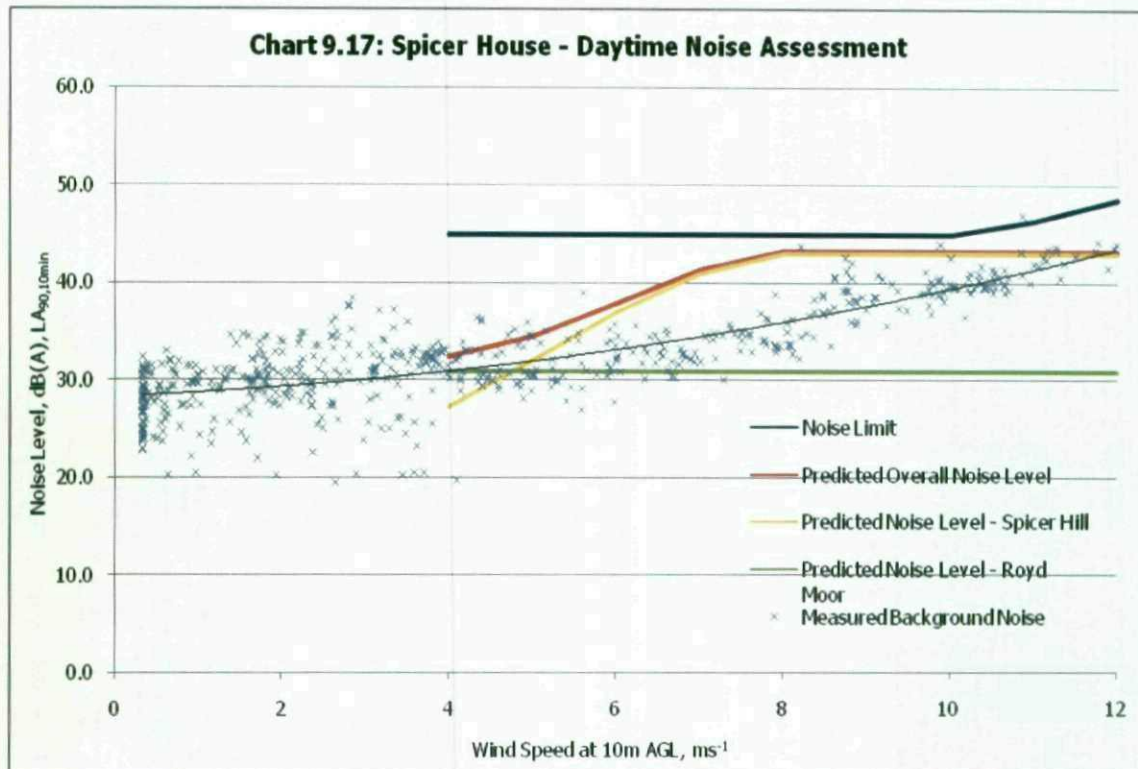
Table 9.9 details the background noise levels, noise limits and predicted overall noise levels (inclusive of Royd Moor) at Spicer House. It has been assumed that background noise levels at this property are similar to those at the nearby Brown's Edge monitoring location. A fixed lower limit of 45 dB(A) (for financial involvement) has been applied at this property for both daytime and night-time. The property is owned by the developer and is unoccupied at the time of writing. In the final two rows, the predicted noise level is compared with the noise limits. A negative value indicates that the predicted noise levels are below the limits.

Table 9.9: Noise Assessment for Spicer House

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90, 10min}								
Background Noise Level	Day	31.0	32.0	33.2	34.5	36.0	37.7	39.5	41.5	43.6
	Night	27.3	28.9	30.9	33.0	35.4	37.9	40.4	43.0	45.6
Noise Limits	Day	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.5	48.6
	Night	45.0	45.0	45.0	45.0	45.0	45.0	45.4	48.0	50.6
Predicted Noise Level		32.5	34.6	37.9	41.3	43.3	43.3	43.3	43.3	43.3
Assessment	Day	-12.5	-10.4	-7.1	-3.7	-1.7	-1.7	-1.7	-3.2	-5.3
	Night	-12.5	-10.4	-7.1	-3.7	-1.7	-1.7	-2.1	-4.7	-7.3

Charts 9.17 and 9.18 show the assessment details in Table 9.9 in a graphical format. They also detail the individual contributions that the existing Royd Moor and proposed Spicer Hill wind turbines make to the overall predicted noise levels.

As demonstrated by Table 9.9 and Charts 9.17 and 9.18, the overall predicted noise levels at Spicer House are lower than the limits specified by ETSU-R-97, and are therefore considered to be **not significant**.



9.6.2.6 Other Properties

Table 9.10 details the assumed background noise levels (from Brown's Edge), noise limits, predicted noise levels and assessment of noise for the remaining properties identified in Table 9.2.

Table 9.10: Noise Assessment for Other Properties

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Background Noise Level	Day	31.0	32.0	33.2	34.5	36.0	37.7	39.5	41.5	43.6
(Brown's Edge)	Night	27.3	28.9	30.9	33.0	35.4	37.9	40.4	43.0	45.6
Noise Limits ¹²	Day	36.0 (40)	37.0 (40)	38.2 (40)	39.5 (40)	41.0	42.7	44.5	46.5	48.6
	Night	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.0	50.6
Predicted Noise Level										
Carr House		34.5	34.6	35.0	35.8	36.5	36.5	36.5	36.5	36.5
Far Royd Moor		32.3	32.6	33.3	34.7	35.7	35.7	35.7	35.7	35.7
Flash House Farm 1		34.2	34.4	34.9	35.9	36.7	36.7	36.7	36.7	36.7
Green Gate		27.7	28.8	31.0	33.8	35.6	35.6	35.6	35.6	35.6
Illian's Cottage		33.0	33.2	33.9	35.0	36.0	36.0	36.0	36.0	36.0
Small Shaw		38.2	38.3	38.7	39.5	40.2	40.2	40.2	40.2	40.2
The Lanes		32.6	32.9	33.6	34.9	35.9	35.9	35.9	35.9	35.9
Assessment	Day									
Carr House		-1.5	-2.4	-3.2	-3.7	-4.5	-6.2	-8.0	-10	-12.1
Far Royd Moor		-3.7	-4.4	-4.9	-4.8	-5.3	-7.0	-8.8	-10.8	-12.9
Flash House Farm 1 ¹³		-1.8	-2.6	-3.3	-3.6	-4.3	-6.0	-7.8	-9.8	-11.9
Green Gate		-8.3	-8.2	-7.2	-5.7	-5.4	-7.1	-8.9	-10.9	-13.0
Illian's Cottage		-3.0	-3.8	-4.3	-4.5	-5.0	-6.7	-8.5	-10.5	-12.6
Small Shaw		-1.8	-1.7	-1.3	-0.5	-0.8	-2.5	-4.3	-6.3	-8.4
The Lanes		-3.4	-4.1	-4.6	-4.6	-5.1	-6.8	-8.6	-10.6	-12.7
Assessment	Night									
Carr House		-8.5	-8.4	-8.0	-7.2	-6.5	-6.5	-8.9	-11.5	-14.1
Far Royd Moor		-10.7	-10.4	-9.7	-8.3	-7.3	-7.3	-9.7	-12.3	-14.9
Flash House Farm 1		-8.8	-8.6	-8.1	-7.1	-6.3	-6.3	-8.7	-11.3	-13.9
Green Gate		-15.3	-14.2	-12.0	-9.2	-7.4	-7.4	-9.8	-12.5	-15.0
Illian's Cottage		-10.0	-9.8	-9.1	-8.0	-7.0	-7.0	-9.5	-12.0	-14.6
Small Shaw		-4.8	-4.7	-4.3	-3.5	-2.8	-2.8	-5.2	-7.8	-10.4
The Lanes		-10.4	-10.1	-9.4	-8.1	-7.1	-7.1	-9.5	-12.1	-14.7

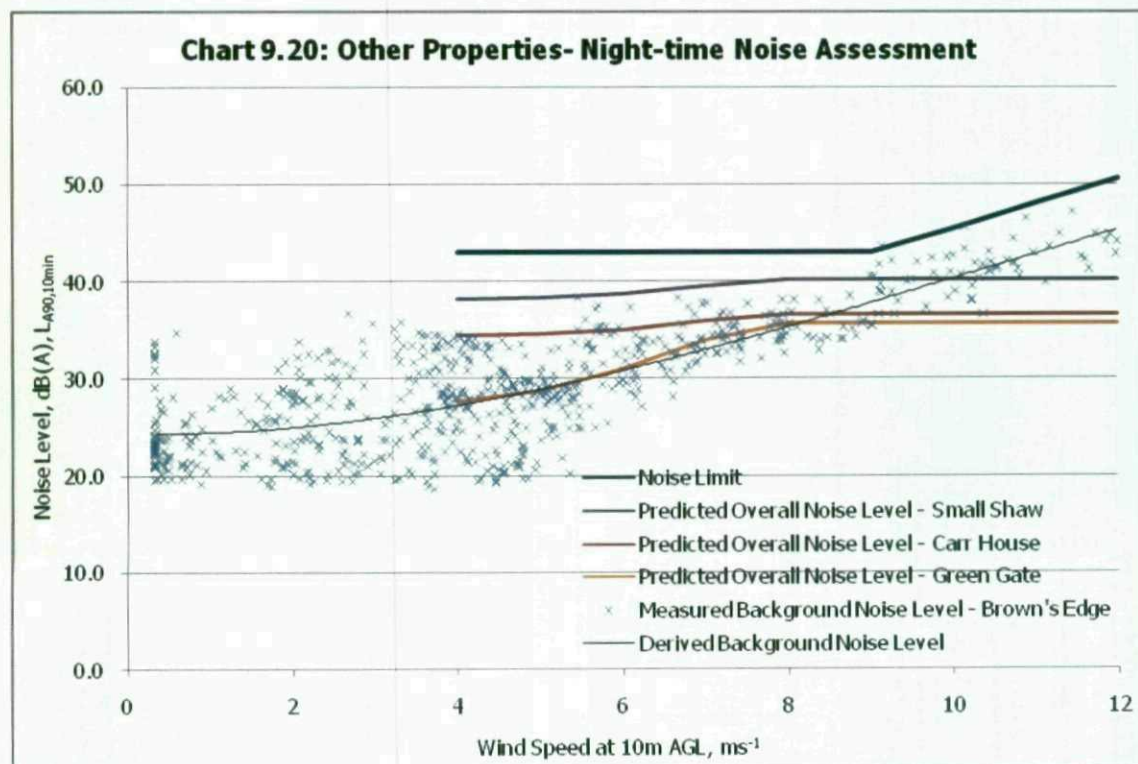
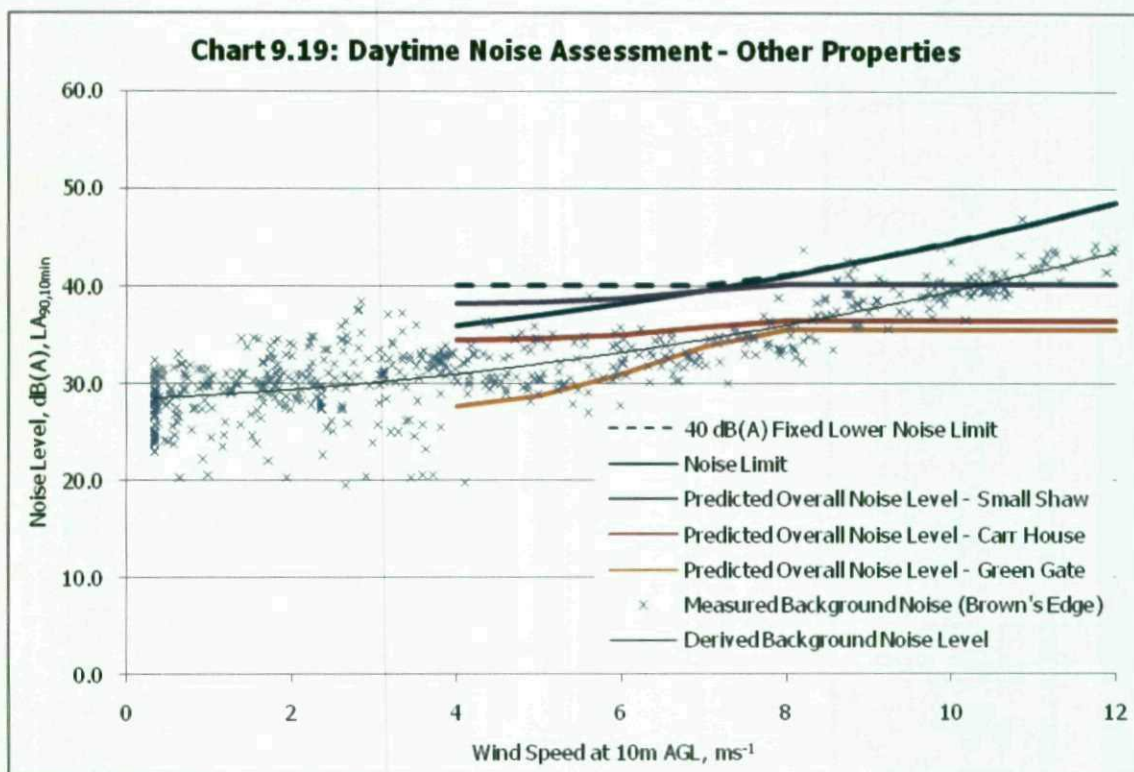
Charts 9.19 and 9.20 show the assessment details in Table 9.10 in a graphical format. For clarity, only overall predicted noise levels for Small Shaw, Carr House and Green Gate are

¹² A 40 dB(A) fixed lower limit has been applied in the case of Small Shaw, as at low wind speeds, the overall noise level results mainly from noise from Royd Moor, for which there is no existing planning condition limiting noise.

¹³ Flash House Farm 2 would receive noise levels between 0.5 and 0.7 dB(A) lower than Flash House Farm 1

shown in the Charts. Noise levels at the remaining properties fall between those for Carr House and Green gate.

As demonstrated by Table 9.10 and Charts 9.19 and 9.20, the predicted overall noise levels are lower than the limits specified by ETSU-R-97, and are therefore considered to be **not significant**.



9.7 MITIGATION

9.7.1 *Construction and Decommissioning Mitigation Measures*

The following good practice measures would be required of all contractors during construction

- operations shall be limited to times agreed with BMBC Regulatory Services.
- The site contractors shall publicise the programme for the commencement and duration of operations, provide details of the project programme; and provide named contacts for daytime and out of hours.
- a community liaison group, comprising representatives from the nearest communities and the developer, shall meet regularly prior to and during the construction period to facilitate communication between the parties and ensure that opportunities are taken to minimise noise nuisance through effective project management.
- the site contractors shall prepare detailed method statements for each construction activity, which will include identification of potentially noisy operations and details of noise control measures to be adopted, to be available for inspection by BMBC.
- the contractors shall be required to select the quietest item of suitable plant available for all site operations where practicable. The work programme on site will also be phased to reduce the combined effects arising from several noisy operations. Where necessary and practicable, noise from fixed plant and equipment shall be contained within suitable acoustic enclosures or behind acoustic screens.
- all sub-contractors appointed by the main contractor shall be formally and legally obliged, through contract, to comply with all environmental noise conditions.
- where practicable, night time working will not be carried out however, any plant and equipment required for operation at night (23:00 - 07:00) shall be mains electric powered where practicable. Any night-time lighting rigs, pumps or other equipment shall be powered using mains electricity or silenced and suitably shielded to ensure compliance with WHO night-time noise criteria at the nearest residential properties, assuming open windows.

The effect of construction traffic is assessed in Chapter 10. Where significant increases in traffic are identified, it can reasonably be assumed that significant noise effects would occur at properties situated adjacent to the transport routes. These would be temporary in nature, limited to times agreed with BMBC and would be minimised as far as is reasonable practicable.

In a similar way to construction, noise during decommissioning will be managed to ensure with best practice and guidelines current at the time.

9.7.2 *Operational Mitigation Measures*

The design of the proposed wind farm incorporates a number of embedded mitigation measures, designed to ensure that noise from operation of the wind farm would comply with the requirements of the relevant guidance on acceptable levels of wind farm noise, including

- layout design to ensure adequate separation from nearby properties
- selection of turbine model with low noise emissions

The Developer will undertake to ensure that the turbine model procured for use on the site will have noise emissions no greater than those assessed here, as detailed in Table 9.1.

9.8 RESIDUAL EFFECTS

9.8.1 Construction Effects

The proposed mitigation measures will ensure that noise during construction is managed as far as is reasonable practicable.

9.8.2 Operational Effects

As there are no additional operational mitigation measures required or proposed, residual effects during operation would be unchanged from those assessed, i.e. **not significant**.

9.8.3 Decommissioning Effects

The proposed mitigation measures will ensure that noise during construction is decommissioning as far as is reasonable practicable.

9.9 CUMULATIVE EFFECTS

The following existing, consented and proposed wind farms have been identified (see Chapter 4) for cumulative assessment within this ES (closest first)

- Royd Moor, existing
- Blackstone Edge, planning application
- Hazelhead, consented

The potential effects of Royd Moor have been included in the above assessment so do not require further consideration.

9.9.1 Cumulative Assessment: Spicer Hill, Royd Moor and Hazelhead

As Hazelhead Wind Farm has been consented, this site has been addressed first. Noise levels for the proposed turbines have been calculated, assuming the Sound Power Levels detailed in Table 9.11 under 'Assessment Envelope', which take into account the characteristics of the most common turbines within the size range consented (80m rotor diameter, 60m hub height). The Vestas V80 1/3-octave spectrum was assumed.

Table 9.11: Noise Emissions, 80m Rotor Turbines

Turbine Model	Wind Speed at 10m AGL, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB(A)								
Vestas V80	n/a	n/a	103.9	104.8	105.3	105.3	105.3	n/a	n/a
Nordex N80	98.0	100.5	102.5	103.0	103.5	104.0	104.0	104.5	105.0
Assessment Envelope	98.0	100.5	103.9	104.8	105.3	105.3	105.3	105.3	105.4

Table 9.12 details the predicted cumulative noise levels for Hazelhead in conjunction with Spicer Hill and Royd Moor.

Table 9.12: Cumulative Noise Levels, Hazelhead, Spicer Hill and Royd Moor

Location	Wind Speed at 10m AGL, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Predicted Noise Level, dB(A)								
Annat Royd	37.5	37.9	38.9	40.6	41.8	41.8	41.8	41.8	41.8
Brown's Edge	30.3	31.9	34.7	37.8	39.7	39.7	39.7	39.7	39.7
Carr House	34.5	34.7	35.1	35.9	36.6	36.6	36.6	36.6	36.6
Eagle Nest	42.0	42.0	42.3	42.9	43.3	43.3	43.3	43.3	43.3
Far Royd Moor	32.4	32.6	33.4	34.7	35.7	35.7	35.7	35.7	35.7
Flash House Farm 1	34.2	34.5	35.0	36.0	36.8	36.8	36.8	36.8	36.8
Flash House Farm 2	33.6	33.8	34.5	35.5	36.4	36.4	36.4	36.4	36.4
Green Gate	27.8	28.9	31.2	33.9	35.6	35.6	35.6	35.6	35.6
Illian's Cottage	33.1	33.4	34.2	35.3	36.2	36.2	36.2	36.2	36.2
Small Shaw	38.2	38.3	38.8	39.6	40.2	40.2	40.2	40.2	40.2
Spicer House	32.5	34.6	37.9	41.3	43.3	43.3	43.3	43.3	43.3
The Lanes	32.8	33.1	34.1	35.3	36.2	36.2	36.2	36.2	36.3
Whitley House	38.4	38.5	38.8	39.3	39.8	39.8	39.8	39.8	39.8

Table 9.13 details the increase in noise relative to Spicer Hill and Royd Moor only when Hazelhead is taken into consideration.

Table 9.13: Cumulative Noise Increase, Hazelhead, Spicer Hill and Royd Moor

Location	Wind Speed at 10m AGL, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Increase, dB(A)								
Annat Royd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Brown's Edge	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Carr House	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Eagle Nest	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Far Royd Moor	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0
Flash House Farm 1	0.0	0.1	0.2	0.2	0.1	0.1	0.1	0.1	0.1
Flash House Farm 2	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Green Gate	0.1	0.1	0.2	0.1	0.1	0.1	0.1	0.1	0.1
Illian's Cottage	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Small Shaw	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Spicer House	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0
The Lanes	0.2	0.2	0.5	0.4	0.4	0.4	0.4	0.4	0.4
Whitley House	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

In the cases of Annat Royd, Eagle Nest, and Whitley House, there no increase relative to the levels predicted for Spicer Hill and Royd Moor only is predicted.

The greatest predicted increase would occur at The Lanes where the increase would be up to 5 dB(A) (for 6 ms⁻¹). Table 9.10 illustrates that this is considerably less than the margin between the predicted noise levels for Spicer Hill and Royd Moor only and the noise limits (minimum 3.3 dB(A)).

Similarly, cumulative noise levels at Illian's Cottage would be up to 0.3 dB(A) higher than those for Spicer Hill and Royd Moor only. The minimum margin at Illian's Cottage (Table 9.10) was 3.0 dB(A).

For the remaining properties, the relative increase is 0.2 dB(A) or less, compared to margins greater than 1.0 dB(A).

Therefore, cumulative noise levels due to the operation of Hazelhead in conjunction with Spicer Hill and Royd Moor would be within the ETSU limits and therefore are considered to be **not significant**.

9.9.2 Cumulative Assessment: Blackstone Edge, Hazelhead, Spicer Hill and Royd Moor

Noise Levels for the proposed Blackstone Edge Wind Farm have been calculated using noise emission data detailed in the Blackstone Edge Wind Farm Environmental Statement¹⁴. These have been added (logarithmically) to those in Table 9.12 to obtain the cumulative noise levels for Blackstone Edge, Hazelhead, Spicer Hill and Royd Moor Detailed in Table 9.14.

Table 9.14: Cumulative Noise Levels, Hazelhead, Spicer Hill and Royd Moor

Location	Wind Speed at 10m AGL, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Predicted Noise Level, dB(A)								
Annat Royd	37.6	38.1	39.1	40.8	42.0	42.0	42.1	42.1	42.1
Brown's Edge	31.3	34.5	37.0	39.3	41.0	41.3	41.5	41.5	41.5
Carr House	34.5	34.8	35.4	36.2	36.9	37.0	37.0	37.0	37.0
Eagle Nest	42.0	42.1	42.4	43.0	43.5	43.5	43.5	43.5	43.5
Far Royd Moor	32.4	32.9	33.8	35.0	36.1	36.2	36.2	36.2	36.2
Flash House Farm 1	34.3	34.8	35.5	36.5	37.3	37.5	37.6	37.6	37.6
Flash House Farm 2	33.7	34.3	35.1	36.1	37.0	37.1	37.3	37.3	37.3
Green Gate	28.5	30.9	33.1	35.3	36.9	37.2	37.4	37.4	37.4
Illian's Cottage	33.3	34.0	35.0	36.1	37.0	37.2	37.4	37.4	37.4
Small Shaw	38.2	38.5	39.0	39.8	40.5	40.6	40.7	40.7	40.7
Spicer House	33.2	36.3	39.3	42.1	44.0	44.1	44.3	44.3	44.3
The Lanes	33.0	34.0	35.2	36.3	37.3	37.6	37.8	37.8	37.8
Whitley House	38.4	38.6	38.9	39.5	40.0	40.1	40.1	40.1	40.1

A detailed assessment of the potential cumulative effects of Blackstone Edge in combination with Hazelhead, Spicer Hill and Royd Moor on each of the properties detailed in Table 9.14 is presented below. The level of detail provided for this cumulative assessment is greater than that of the existing and consented schemes due to the greater increases that may occur when the effects of Blackstone Edge are added to the others.

¹⁴ Proposed Blackstone Edge Wind Farm, Barnsley, South Yorkshire, Environmental Statement, January 2008, Entec UK Limited

9.9.2.1 Annat Royd

The predicted cumulative noise levels would exceed the limits detailed in Table 9.5 by 0.1 dB(A) at a wind speed of 7 ms⁻¹ and equal the limit at 8 ms⁻¹. However, the residents of this property are understood to have a financial interest in Blackstone Edge¹⁵, and therefore a lower limit of 45 dB(A) may be applied as detailed in Table 9.15.

Table 9.15 Cumulative Noise Assessment for Annat Royd

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Noise Limits	Day	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.8	48.6
	Night	45.0	45.0	45.0	45.0	45.0	45.0	45.2	47.4	49.3
Predicted Noise Level		37.6	38.1	39.1	40.8	42.0	42.0	42.1	42.1	42.1
Assessment	Day	-7.4	-6.9	-5.9	-4.2	-3.0	-3.0	-2.9	-4.7	-6.5
	Night	-7.4	-6.9	-5.9	-4.2	-3.0	-3.0	-3.1	-5.3	-7.2

On this basis, the cumulative effects would be **not significant** at Annat Royd.

9.9.2.2 Brown's Edge

Table 9.16 details the assessment of cumulative noise at Brown's Edge.

Table 9.16: Cumulative Noise Assessment for Brown's Edge

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Noise Limits	Day	36.0	37.0	38.2	39.5	41.0	42.7	44.5	46.5	48.6
	Night	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.0	50.6
Predicted Noise Level		31.3	34.5	37.0	39.3	41.0	41.3	41.5	41.5	41.5
Assessment	Day	-4.7	-2.5	-1.2	-0.2	0.0	-1.4	-3.0	-5.0	-7.1
	Night	-11.7	-8.5	-6.0	-3.7	-2.0	-1.7	-3.9	-6.5	-9.1

As can be seen, the cumulative noise levels would equal the daytime limit at a wind speed of 8 ms⁻¹ and would comply with the limits in all other cases. It should be borne in mind that the stated noise levels are for a downwind situation and it is unlikely that all turbines would be truly downwind at any time. Therefore, the cumulative effects at Brown's Edge are considered to be **not significant**.

9.9.2.3 Carr House

The noise levels detailed in Table 9.14 are no more than 0.5 dB(A) higher than those in Table 9.10. The margins at this location were at least 1.5 dB(A) so the cumulative effects are considered to be **not significant**.

¹⁵ Blackstone Edge resident, Pers Com

9.9.2.4 Eagle Nest

Table 9.17 details the assessment of cumulative noise at Eagle Nest.

Table 9.17: Cumulative Noise Assessment for Eagle Nest

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Noise Limits	Day	41.9	43.4	44.9	46.2	47.3	48.3	49.2	50.0	50.5
	Night	43.0	43.0	43.8	45.2	46.3	47.4	48.3	49.1	49.7
Predicted Noise Level		42.0	42.1	42.4	43.0	43.5	43.5	43.5	43.5	43.5
Assessment	Day	0.1	-1.3	-2.5	-3.2	-3.8	-4.8	-5.7	-6.5	-7.0
	Night	-1.0	-0.9	-1.4	-2.2	-2.8	-3.9	-4.8	-5.4	-6.2

As before the cumulative noise levels at Eagle Nest are lower than the limits specified by ETSU-R-97, with the exception of daytime periods where the wind speed is 4 ms⁻¹.

At this speed, the limit is exceeded by a very small margin, 0.1 dB(A). However, the overall noise level at this wind speed is due entirely to noise from Royd Moor. This therefore represents no change to the current conditions, and cannot therefore be considered as a significant effect.

Therefore, the cumulative effects at Eagle Nest are considered to be **not significant**.

9.9.2.5 Far Royd Moor

The noise levels detailed in Table 9.14 are no more than 0.5 dB(A) higher than those in Table 9.10. The margins at this location were at least 3.6 dB(A), so the cumulative effects are considered to be **not significant**.

9.9.2.6 Flash House Farm

Table 9.18 details the assessment of cumulative noise at Flash House Farm showing the predicted levels for Flash House Farm 2, the worst case.

Table 9.18: Cumulative Noise Assessment for Flash House Farm

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Noise Limits	Day	36.0	37.0	38.2	39.5	41.0	42.7	44.5	46.5	48.6
	Night	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.0	50.6
Predicted Noise Level		34.3	34.8	35.5	36.5	37.3	37.5	37.6	37.6	37.6
Assessment	Day	-1.7	-2.2	-2.7	-3.0	-3.7	-5.2	-6.9	-8.9	-11.0
	Night	-8.7	-8.2	-7.5	-6.5	-5.7	-5.5	-7.8	-10.4	-13.0

As can be seen the predicted cumulative levels for Flash House Farm are lower than the limits, and are therefore considered to be **not significant**.

Green Gate: the noise levels detailed in Table 9.14 are no more than 2.2 dB(A) higher than those in Table 9.10. The margins at this location were at least 5.5 dB(A), so the cumulative effects are considered to be **not significant**.

9.9.2.7 Illian's Cottage

The noise levels detailed in Table 9.14 are no more than 1.4 dB(A) higher than those in Table 9.10. The margins at this location were at least 3.0 dB(A) so the cumulative effects are considered to be **not significant**.

9.9.2.8 Small Shaw

Table 9.19 details the assessment of cumulative noise at Small Shaw showing the predicted levels for Flash House Farm 2, the worst case.

Table 9.19: Cumulative Noise Assessment for Small Shaw

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Noise Limits	Day	40.0	40.0	40.0	40.0	41.0	42.7	44.5	46.5	48.6
	Night	43.0	43.0	43.0	43.0	43.0	43.0	45.4	48.0	50.6
Predicted Noise Level		38.2	38.5	39.0	39.8	40.5	40.6	40.7	40.7	40.7
Assessment	Day	-1.8	-1.5	-1.0	-0.2	-0.5	-2.1	-3.8	-5.8	-7.9
	Night	-4.8	-4.5	-4.0	-4.2	-2.5	-2.4	-4.7	-7.3	-9.9

As can be seen the predicted cumulative levels for Small Shaw are lower than the limits, and are therefore considered to be **not significant**.

9.9.2.9 Spicer House

Table 9.20 details the cumulative noise assessment for Spicer House

Table 9.20: Cumulative Noise Assessment for Spicer House

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Noise Limits	Day	45.0	45.0	45.0	45.0	45.0	45.0	45.0	46.5	48.6
	Night	45.0	45.0	45.0	45.0	45.0	45.0	45.4	48.0	50.6
Predicted Noise Level		33.2	36.3	39.3	42.1	44.0	44.1	44.3	44.3	44.3
Assessment	Day	-11.8	-8.7	-5.7	-2.9	-1.0	-0.9	-0.7	-2.2	-4.3
	Night	-11.8	-8.7	-5.7	-2.9	-1.0	-0.9	-1.1	-3.7	-6.3

As can be seen the predicted cumulative levels for Spicer House are lower than the limits, and are therefore considered to be **not significant**.

9.9.2.10 The Lanes

The noise levels detailed in Table 9.14 are no more than 1.9 dB(A) higher than those in Table 9.10. The margins at this location were at least 3.3 dB(A) so the cumulative effects are considered to be **not significant**.

9.9.2.11 Whitley House

Table 9.21 details the cumulative noise assessment for Whitley House

Table 9.21: Noise Assessment for Whitley House

		Wind Speed at 10m AGL, ms ⁻¹								
		4	5	6	7	8	9	10	11	12
		dB(A), L _{A90} , 10min								
Noise Limits	Day	40.0	40.0	40.5	42.0	43.6	45.2	47.0	48.8	50.8
	Night	43.0	43.0	43.0	43.0	43.0	44.3	46.2	48.1	49.9
Predicted Noise Level		38.4	38.6	38.9	39.5	40.0	40.1	40.1	40.1	40.1
Assessment	Day	-1.6	-1.4	-1.6	-2.5	-3.6	-5.1	-6.9	-8.7	-10.7
	Night	-4.6	-4.4	-4.1	-3.5	-3.0	-4.2	-6.1	-8.0	-9.8

As can be seen the predicted cumulative levels for Whitley House are lower than the limits, and are therefore considered to be **not significant**.

9.9.3 Summary of Cumulative Assessment

In summary, no cumulative effects are predicted at any of the properties identified in Table 9.2 due to combined operation of Royd Moor, Spicer Hill, Hazelhead, Blackstone Edge and Sheephouse Heights wind farms. Assuming that similar margins exist at the other proposed or consented wind farms, it is considered unlikely that cumulative effects would occur at any other properties not assessed here.

9.10 SUMMARY OF EFFECTS

Table 9.22 Summary of Effects Table

Potential Effect	Mitigation	Residual Effect
Construction Effects		
Noise during construction	Best practice measures	Minimised as far as is reasonably practicable.
Operational Effects		
Noise during operation not significant at all locations	Embedded mitigation: layout design and turbine selection.	Not significant.
Decommissioning Effects		
Noise during decommissioning	Best practice measures to comply with guidance and standards relevant at the time.	Minimised as far as is reasonably practicable.
Cumulative Effects		
No significant cumulative effects predicted.	None required	Not significant.

9.11 STATEMENT OF SIGNIFICANCE

An assessment of noise during construction, operation and decommissioning has been carried out.

Noise during construction and decommissioning will be managed through the use of best practice to ensure that effects are minimised as far as is reasonably practicable.

Operational noise has been assessed in accordance with relevant guidelines and in consultation with BMBC. A baseline noise survey has been carried out and noise limits established. The noise levels likely to occur at nearby properties under worst-case conditions and inclusive of current wind turbine noise have been predicted and assessed against these

limits. All predicted noise levels are lower than the limits, are therefore considered to be **not significant**.

Cumulative effects resulting from the combined operation of Royd Moor, Spicer Hill, Hazelhead, Blackstone Edge and Sheephouse Heights wind farms have been assessed and found to be comply with relevant limits and are therefore considered to be **not significant**.

APPENDIX 9.1 GLOSSARY OF ACOUSTIC TERMINOLOGY

The following items of acoustic terminology have been referred to in the preceding chapter. Terms in *italics> are defined elsewhere in the glossary.*

Background Noise: The background noise level is the under lying level of noise present at a particular location for the majority (usually 90%) of a period of time. As such it excludes any short-duration noises, such as individual passing cars (but not continuous traffic), dogs barking or passers-by. Sources of background noise typically include such things as wind noise, traffic and continuously operating machinery (e.g. air conditioning or generators).

Decibel (dB): The decibel is the basic unit of noise measurement. It relates to the pressure created by the sound (Sound Pressure Level) and operates on a logarithmic scale, ranging upwards from 0 dB. 0dB is equivalent to the normal threshold of hearing at a *frequency* of 1000Hz. Each increase of 3 dB on the scale represents a doubling in the Sound Pressure Level, and is typically the minimum noticeable change in sound level under normal listening conditions. For example, while an increase in noise level from 32 dB to 35 dB represents a doubling in sound pressure level, this change would only just be noticeable to the majority of listeners.

dB(A): Environmental noise levels are usually discussed in terms of dB(A). This is known as the A-weighted sound pressure level, and indicates that a correction factor has been applied, which corresponds to the human ear's response to sound across the range of audible *frequencies*. The ear is most sensitive in the middle range of frequencies (around 1000-3000Hz), and less sensitive at lower and higher frequencies. The A-weighted noise level is derived by analysing the level of a sound at a range of frequencies and applying a specific correction factor for each frequency before calculating the overall level. In practice this is carried out automatically within noise measuring equipment by the use of electronic filters, which adjust the frequency response of the instrument to mimic that of the ear.

Façade: A façade noise level is one measured at, or very close to, the façade of a building. These are typically 3 dB higher than free-field levels, due to reflection.

Free Field: This term refers to a location where the propagation (movement) of sound is not affected by the presence of obstacles or surfaces which would cause reflections (echoes).

Frequency: The frequency of a sound is equivalent to its pitch in musical terms. The units of frequency are Hertz (Hz), which represents the *number of cycles* (vibrations) per second.

LA_{90,t}: This term is used to represent the *A-weighted* sound pressure level that is exceed for 90% of a period of time, t. This is used as a measure of the *background noise* level.

LA_{eq,t}: This term is known as the *A-weighted* equivalent, continuous sound pressure level for a period of time, t. It is similar to an average, and represents the sound pressure level of a sound of continuous intensity that would result in an equal quantity of sound energy as a sound which varies in intensity.

Low frequency noise: Noise at the lower end of the range of audible frequencies (20Hz – 20kHz). Usually refers to noise below 250Hz. Should not be confused with infrasound, which is sound below the lowest audible frequency, 20Hz.

Noise: Unwanted sound. May refer to both natural (e.g. wind, birdsong etc) and artificial sounds (e.g. traffic, noise from wind turbines, etc)

Noise contour plot: A diagram showing lines of equal sound levels (Isobels) in a similar manner to height contours on an Ordnance Survey map or isobars (lines of equal pressure) on a weather map.

Noise sensitive receptors: Locations that may potentially be adversely affected by the addition of a new source of noise. Can include residential properties, outdoor areas and sensitive species.

Sound power (W): The sound energy radiated per unit time by a sound source, measured in watts (W).

Sound power level (L_w): Sound power measured on the decibel scale, relative to a reference value (W_0) of $10^{-12}W$.

Sound pressure (P): The fluctuations in atmospheric pressure relative to atmospheric pressure, measured in Pascals (Pa).

Sound pressure level (L_p): Sound pressure measured on the decibel scale, relative to a sound pressure of $2 \times 10^{-5} Pa$.

Tonal element: A characteristic of a sound where the sound pressure level in a particular frequency range is greater than in those frequency ranges immediately above higher or lower. This would be perceived as a humming or whining sound.

Vibration: In this context, refers to vibration carried in structures such as the ground or buildings, rather than airborne noise.

10 TRAFFIC AND TRANSPORTATION

10.1 INTRODUCTION

This chapter identifies and assesses the potential effects of increased road traffic expected as a result of the construction, operation and decommissioning of the proposed Spicer Hill Wind Farm. The chapter also considers the significance of any effects and the required mitigation measures are considered.

10.2 METHODOLOGY

10.2.1 Assessment Methodology

The assessment of potential traffic impacts of the wind farm is based on the following

- consultation with the local highway authority, Barnsley Metropolitan Borough Council (BMBC)
- delivery route assessment and vehicle swept path analysis for turbine delivery vehicles (TDVs)
- acquisition and review of traffic flow and accident data
- development of an outline construction programme and activity schedule
- analysis of data and impact significance in line with recognised assessment guidelines
- preparation of a relevant mitigation strategy
- review of operational and decommissioning effects

10.2.2 Relevant Guidance

To enable the assessment of the potential transport and traffic effects on the local road network, the following guidance documents have been taken into account

- Guidelines for the Environmental Assessment of Road Traffic, Institute of Environmental Management and Assessment (IEMA), 1993
- Guidelines for Traffic Impact Assessment, The Institution of Highways and Transportation, September 1994

Normally, a formal Transport Assessment would not be required for the proposed wind farm as these principally relate to developments that generate significant long-term increases in traffic and travel patterns as a result of their function such as retail parks, employment and residential developments. Information normally included within a Transport Assessment is provided within this Chapter. It is considered that the information provided within this chapter is sufficient in addressing the local transport impacts of the wind farm during construction, operation and decommissioning.

10.2.3 Consultation

The local highway authority, (BMBC), was consulted regarding the access and routing strategy for the wind farm. Discussions identified that although there were no major issues with general access, there was a preference to route construction traffic so that it avoids major settlement areas such as Thurlstone and Penistone as outlined further in this chapter.

The local abnormal loads authorities i.e. The Highways Agency (Area 12), Network Rail and BMBC Highways and Engineering were contacted regarding the structural suitability of

delivery routes to the wind farm. All authorities have responded that they no structural issues with the movement of the wind turbine sections¹.

10.2.3.1 Route Review Methodology

To define conditions for the proposed wind farm development in terms of access and transportation, a baseline study comprising of a strategic route review and local delivery route assessment has been carried out for potential routes to the wind farm development site from the M1 motorway. Turbine components will be delivered by sea to a suitable port such as Immingham, Hull or Goole and transported via the regional motorway network to Junction 36 or 37 of the M1.

The route for access to the development site from the motorway is illustrated in Figure 10.1 and is detailed below. It provided for a site entrance on either Spicer House Lane (Access A) or Whitley Road (Access B). Following further study, Access B, Whitley Road was considered the most appropriate access point

- From Junction 36 of M1 proceed south along A61
- Turn right (west) onto A616
- Turn right (east) onto A628
- Turn left (north) onto Royd Lane
- Proceed to site or
- Turn right (north) onto Royd Moor Hill
- Turn left (north) onto Spicer House Lane
- Proceed to site

Abnormal loads and overall general construction vehicles would use these routes thereby avoiding Penistone and Thurlstone.

The strategic route review involved a detailed site visit along the proposed delivery routes in order to identify potential geometric constraints that would affect the manoeuvring of general heavy goods vehicles (HGVs) and the TDVs accessing the wind farm, in particular the blade and tower section TDVs. Vehicle swept path analysis (SPA) was provided at the identified constraints.

10.2.3.2 Significant Effects Methodology

The Guidelines for the Environmental Assessment of Road Traffic suggest that two broad principles be used as a screening process to delimit the scale and extent of the assessment. These are

- The inclusion of highway links where traffic flows would increase by more than 30% (or the number of heavy goods vehicles would increase by more than 30%)
- The inclusion of any other specifically sensitive areas where traffic flows would increase by 10% or more

In addition to the above guidance, Paragraph 3.1.5 of Guidelines for Traffic Impact Assessment states that

"In the absence of alternative guidance from the highway authority in the form of approved or adopted policy, the Guidelines therefore recommends that a TIA should normally be produced where one or other of the following thresholds are exceeded:

¹ Vehicles transporting the wind turbine blades, nacelles, tower sections and foundation plates would be considered abnormal loads due to their lengths, widths and weights.

- *Traffic to and from the development exceeds 10% of the existing two-way flow on the adjoining highway;*
- *Traffic to and from the development exceeds 5% of the existing two-way traffic flow on the adjoining highway, where traffic congestion exists or will exist within the assessment period or in other sensitive locations".*

Where the predicted increase in traffic flow is lower than these thresholds then the effect is considered to be low or insignificant.

These guidelines for TIAs are mainly directed at developments that, when in operation will generate significant traffic movements that will affect the existing road network. Therefore under the TIA guidelines a formal transport assessment is not required for the wind farm as traffic generated during operation and maintenance will not exceed these thresholds as detailed further in this chapter:

To provide a more robust assessment, the threshold outlined by the TIA guidelines is used within this transport and traffic assessment.

10.3 BASELINE DESCRIPTION

10.3.1 Route and Site Access

The routes to the site were assessed for suitability as detailed in section 10.2.3 above. It was established that the M1 would be suitable for the TDVs and general construction vehicles without the need of road works. The delivery route assessment identified that minor widening works would be required along the unclassified roads leading to the site. The removal of a central island and street furniture would also be required along the junction of the A628 with Royd Lane at Millhouse Green.

Construction materials would be sourced from local quarries and transported by 20T heavy goods vehicles (HGVs) to the site. Routes from these quarries will converge on the A616 and A628. Where possible, local contractors will be employed during the construction of the wind farm and will approach the site from a variety of routes, depending on their origin. The existing population statistics maps for Yorkshire highlight Penistone and Stocksbridge as the nearest high density centres. In addition, Hollingworth and Glossop have been identified to the west. It is therefore likely that the majority of site personnel would travel to the site via the A616 and A628. To assess a worse case scenario it is assumed that 100% of the (site personnel and construction traffic) vehicles would approach the site via the A616 and A628.

The proposed access to the site during construction will be via Whitley Road.

10.3.2 Sensitive Receptors

A desktop assessment to identify potential sensitive receptors along the selected access route was undertaken by reviewing 1:25,000 Ordnance Survey mapping. No physical sensitive receptors were identified. The strategic route review identified high pedestrian flows within Penistone and Thurlstone; the access strategy therefore promotes the use of routes avoiding these areas.

Personal Injury Accident data was also requested from the Highways Agency. This identified that there are no existing accident black spots along the delivery routes.

10.3.3 Traffic Flows

Base traffic flow data was obtained from the Highways Agency at three locations along the access routes to the wind farm. The traffic data was provided in for the month of March 2008 and summarised in Table 10.1.

Projected baseline traffic flows for the expected year of construction have been calculated from the obtained data by using Department for Transport's National Road Traffic Flows (NRTF) low-growth (all vehicle) factors. A factor of 1.024 was applied for the year 2008 to 2010. Table 10.2 shows the projected base traffic flows, which have been used for assessing the significance of the effect of increased traffic along the routes.

Table 10.1 – Average 2008 24-hour Weekday Base Traffic Flows

Classification No.	Location	Traffic Volume	
		Total Vehicles	HGVs
A616	Wortley	23534	4777
A616	Stocksbridge	15100	3458
A628	West of Flouch Inn	3772	13593

Table 10.2 - Projected Traffic Flows

Classification No.	Location	Traffic Volume	
		Total Vehicles	HGVs
A616	Wortley	24099	4892
A616	Stocksbridge	15462	3541
A628	West of Flouch Inn	3863	13919

10.4 INFORMATION GAPS

Enough traffic flow information for the highway network surrounding the site has been obtained to allow an appropriate assessment to be made of the potential traffic impacts as a result of the wind farm.

10.5 ASSESSMENT OF POTENTIAL EFFECTS

10.5.1 Potential Construction Effects

10.5.1.1 Public Highway Improvements

Following the detailed route assessment, it was identified that a number of improvement works would be required in order to accommodate access by the TDVs. The following general measures would be required

- temporary removal of central island and road signs at the junction of the A628 and Royd Lane

- minor road widening and tree trimming at the junction of Whitley Road and Royd Moor Hill
- widening at the site access

These road works would be consented separately under The Roads Act 1984 and agreed with BMBC to ensure that road safety is not compromised. No other offsite highway works were identified by the route assessment.

The main erection crane would be in the region of 400 tonnes lifting capacity, however, whilst travelling to site on public highways, the crane would be de-rigged and its axle weights would be within that permissible by current legislation. The width of the crane would be approximately 3m and the length of the crane de-rigged would be approximately 18m long. One smaller assisting crane (of 150 – 300 tonnes) will also be required for the blade erection, and assembling of the main lifting crane. At approximately 24 tonnes, the nacelle would be the heaviest single component; the overall weight of this TDV being in the region of 40-50 tonnes. The longest vehicle that would access the site will be the blade TDV. This vehicle would be approximately 33 metres in length.

The site access will be designed to the standards outlined within the DfT Design Manual for Roads and Bridges (DMRB) TD42/95 and would achieve the required visibility splays along Whitley Road. This access will have an over-run area to aid the TDVs manoeuvring and allow them to leave the public highway as quickly and safely as possible.

10.5.1.2 Construction Traffic Numbers

During the 10-month construction period, the following will access the site

- low loaders and other HGVs to deliver equipment and plant
- 20-tonne lorries, to deliver/move material and stone for access tracks
- flat-bed lorries to deliver control building components
- extendable semi-low and platform trailers to deliver turbine components (requiring private or police escort)
- cranes delivered as mobile units and on low-loaders
- deliveries of fuel and water by tanker and
- construction personnel, by private car, light vehicles or minibus

The TDVs will constitute abnormal loads during delivery to the site. Once the component has been unloaded, the TDV will be retracted to the size of a standard articulated lorry (approximately 16.5 metres in length).

The total number of off-site vehicle movements² generated during the construction of the wind farm is estimated as 7,782 over a 10 month period as shown in Table 10.3 This figure takes account of all construction vehicles generated by the above works during the construction period and assumes an average of 1 construction personnel per vehicle.

Of the 7,782 movements generated, 3,782 are as a result of deliveries of equipment and materials to site (HGVs), the remaining 4000 trips are generated from the movements of site staff (cars and light vehicles).

As illustrated in Table 10.3, HGV vehicle movements are not uniform throughout the construction period with the peak number of HGVs occurring during month 3 with 920 HGV movements generated. This equates to approximately 46 HGV movements a day.

² One movement equals one arrival or one departure

Table 10.3 - Vehicle Movements During Construction Phase

Activity (Total Arrivals & Departures)	Month/Movements										Total
	1	2	3	4	5	6	7	8	9	10	
Access tracks, hard standings and compound	740	740	738	738							2956
Turbine foundations & erection			170	168	168	168					674
Cable, miscellaneous mechanical and electrical supplies			10	10	10	10	10	10	10	10	80
Control building					26	26					52
Fuel & drinking water delivery	2	2	2	2	2	2	2	2	2	2	20
Total HGVs per month	742	742	920	918	206	206	12	12	12	12	3782
Site personnel	400	400	400	400	400	400	400	400	400	400	4000
Total vehicle movements per month	1142	1142	1320	1318	606	606	412	412	412	412	7782
Average HGVs per day	37	37	46	46	10	10	1	1	1	1	
Average Site personnel per day	20	20	20	20	20	20	20	20	20	20	
Average Total Movements per day	57	57	66	66	30	30	21	21	21	21	

Note: 1 movement = 1 arrival or 1 departure

The peak overall monthly traffic movements also occur during month 3 with 1,320 traffic movements generated, around 66 vehicle movements per day (including site personnel in cars and light vans). It is unlikely that there will be significant increases in traffic during the AM and PM peak periods as routing agreements would seek to reduce the movement of construction vehicles at this time.

These increases in traffic are summarised in Table 10.4.

Table 10.4 - Summary of Traffic Impact

Road	Location	Percentage Increase		10% threshold, applied to non sensitive areas	5% threshold, within sensitive areas
		Totals	HGVs		
A616	Wortley	0.3%	0.9%	Below Threshold	Below Threshold
A616	Stocksbridge	0.4%	1.3%	Below Threshold	Below Threshold
A628	West of Flouch Inn	1.7%	0.3%	Below Threshold	Below Threshold

The increase in overall volume is not considered to be significant in either sensitive or non-sensitive locations. However, it is expected that the traffic along Royd Lane would be considered to be significant due to the existing low levels of traffic. Mitigation measures outlined to the end of this chapter would reduce the impact of these movements.

10.5.2 Potential Operational Effects

The predicted levels of traffic associated with the operation and maintenance of the wind farm are summarised in Table 10.5 below.

Table 10.5 - Summary of Vehicle Movements During Operation

Activity	Annual Vehicle Movements	Duration
Standard Turbine Servicing	10 visits (20 vehicle movements per annum)	1 visit per turbine, lasting 5 days
Unscheduled Servicing	5 visits (10 vehicle movements per annum)	1 visit per turbine, lasting 1 day every 18 months
Repairs to turbines	30 visits (60 vehicle movements per annum)	1 visit per turbine approximately every 2 months
Access Track Maintenance	4 visits (8 vehicle movements per annum)	2 vehicles per day for a period of 2 days once a year
Substation maintenance	1 visits (2 vehicle movements per annum)	1 visit per year

In addition routine site inspections would be undertaken once a month in a four-wheel drive vehicle to ensure that the turbines are operating at their maximum efficiency.

As can be seen from the Table 10.5, vehicle movements would not be expected to exceed 4 movements per day. The effect of the operational traffic falls substantially below the guidance thresholds and is considered to be insignificant.

10.5.3 Potential Decommissioning Effects

Prior to decommissioning of the wind farm a further traffic assessment will be undertaken and traffic management procedures agreed with BMBC. The levels of traffic associated with the decommissioning will be lower than those during construction since the concrete turbine bases will be left in situ and access tracks left to be naturally overgrown. It is therefore

expected that the traffic impacts are likely to be insignificant based on the current baseline data.

10.6 MITIGATION

10.6.1 Construction Mitigation Measures

In order to reduce traffic impacts from construction of the proposed wind farm, construction personnel would be encouraged to car-share or utilise company shuttles where practicable. This would be estimated to increase the occupancy rate for construction personnel to an average of around 2.5³ persons per vehicle, equivalent to reducing the number of vehicle movements associated with personnel by approximately 60%.

A traffic management plan will be drawn up by the developer and the relevant contractor, and agreed with BMBC. Potential management measures to mitigate the impacts could include

- restrictions and approved access routes for construction vehicles only along the A616 and A628 to avoid Penistone and Thurlstone
- removal and replacement of street furniture such as road signs as identified by the route assessment, appropriate temporary measures would be undertaken to ensure that road safety is not compromised
- temporary or permanent road signage along the Whitley Road and Spicer House Lane in the vicinity of the site, these signs would warn road users of HGV traffic
- arrangements with police for escort of turbine loads to the site
- advanced notification to the general public warning of turbine component transport movements
- informative road signage warning other users of turbine components transport movements and construction traffic
- improvements involving road widening and junction visibility improvements at the site access
- arrangements for continual road maintenance and cleaning e.g. resurfacing following completion of construction and road sweeping along the unclassified road in the vicinity of the site access
- specific timing of deliveries outside of peak hours
- wheel cleaning / dirt control arrangements at key stages of construction
- provision of temporary signs and traffic control where necessary

An appropriate police or contractor escort would accompany movement of turbine components from the port of entry, with timings agreed with the local police and BMBC.

The route used to transport turbine components to the site would utilise the nearest appropriate port as directed by the DfT and the selected turbine manufacturer.

10.6.2 Operational Mitigation Measures

As previously identified, the traffic generated during operation and maintenance of the wind farm will not have a significant effect on the existing road network.

Suitable signage will be erected along the unclassified road advising of the access to the wind farm. No other specific mitigation measures would be required during operation of the wind farm, due to the low numbers of operational vehicle movements.

Vehicular access within the site will be controlled and adhere to appropriate strategies for public safety. The condition of the access tracks, culverts and other elements will be

³ National Travel Survey 2006

inspected regularly to reduce the risk of failure that may result in damage to the local environment.

10.6.3 Decommissioning Mitigation Measures

Decommissioning of the wind farm would comprise of either complete removal of the facility or replacement of turbines to extend the operational life of the facility.

Where complete decommissioning is proposed the turbines and all associated above ground equipment will be completely removed. Turbine towers and blades are likely to be dismantled or cut up into smaller sections prior to their removal to ease transport requirements.

Replacement of existing turbine and plant will involve processes similar to the initial commissioning.

A traffic management plan would be prepared for the decommissioning process to ensure that traffic impacts at this time are minimised.

10.7 RESIDUAL EFFECTS

10.7.1 Construction Effects

The mitigation measures described above, given the nature of the increase in traffic being short-term, will ensure that there would be minimal residual effects. A summary justification is as follows

- a traffic management plan will minimise the effects during construction;
- the A616 and A628 having sufficient capacity to cater for the predicted traffic levels during construction; and
- the increase in traffic during construction would be temporary with the highest levels occurring during the first five of months of the construction period.

The environmental effects identified would be managed through the mitigation measures discussed, so ensuring that all effects are not significant.

10.7.2 Operational Effects

There will be residual effects on the existing road network from the operation of the wind farm but they will be negligible and not significant.

10.7.3 Decommissioning Effects

The decommissioning effects should be similar in nature to the construction effects but their intensity will be greatly reduced as the majority of the construction traffic is created by the construction of the access track, which will mostly remain intact irrespective of decommissioning options and long loads would be cut up and dismantled on site prior to transportation.

10.8 SUMMARY OF EFFECTS

A summary of the potential effects, mitigation and residual effects defined within this chapter are summarised in Table 10.6 below.

Table 10.6 - Summary of Effects

Potential Effect	Mitigation	Residual Effect
Construction Effects		
Short-term increase in number of HGVs on Royd Lane.	Traffic management plan to be agreed. The limited use of vehicle convoys to reduce the effect of pedestrian intimidation/severance. Possible road signage to be agreed with BMBC.	Minor short-term effect.
Short-term increase in overall traffic on A616 and A628	Timings to be scheduled outside of peak traffic hours. Traffic management to be agreed.	No significant effect.
Traffic delays due to abnormal load movement.	Traffic management and timings of deliveries to be agreed with BMBC and local police. Deliveries to be scheduled outside peak traffic hours.	No significant effect.
Operational Effects		
Increase in traffic along A616, A628 and Royd Lane	Appropriate access signage to be agreed with BMBC.	No significant effect.
Decommissioning Effects		
Increase in traffic along A616, A628 and Royd Lane	Management plan to be carried out prior to works being carried out.	As per construction effects.

10.9 STATEMENT OF SIGNIFICANCE

This traffic assessment concludes that there would be a short term, not significant increase in traffic levels on the delivery route to the wind farm. In accordance with the IEMA significance criteria these increases are judged to be temporary minor, due to the current low levels of traffic on these roads. The busiest period of construction would be during months 3-4 and although there will be an increase in HGV movements; the overall effects of other traffic movements is not significant.

Abnormal loads would be normally timed during off-peak periods in order to avoid delays to other road users at times to be agreed with the police and BMBC.

Traffic generated during the operation and maintenance of the wind farm would be minimal and would not result in any significant effects.

Traffic generated during decommissioning of the wind farm is likely to be lower than the levels associated with construction and will be the subject of a further traffic management plan. Decommissioning traffic would therefore be not significant. An appropriate traffic assessment would be undertaken prior to the decommissioning of the wind farm.

11 SOCIO-ECONOMICS, TOURISM, RECREATION & LAND USE

11.1 INTRODUCTION

This chapter provides an assessment of the socio-economic, tourism, recreational and land use issues likely to be affected by the proposed development. The chapter firstly examines the effect of the proposed development on the local economy of Barnsley, secondly it considers the effects on local tourist attractions and recreation facilities (excluding landscape and visual effects which are considered in Chapter 4), and lastly examines the land use within and surrounding the development site.

This chapter contains the following sections

- Legislation and guidance
- Methodology - describing the methods used in baseline surveys and in the assessment of the significance of effects
- Baseline References - a description of the development site and the surrounding area based on the result of desk information
- Potential Effects - identifying the ways in which socio-economics, recreation and land use could be affected by the proposed wind farm
- Summary of Effects
- Statement of Significance

11.2 LEGISLATION AND GUIDANCE

The following documents have been considered for the assessment of the potential impacts of the proposed development on tourism, recreation and socioeconomics

- Guidelines for Environmental Impact Assessment (2004) Institute of Environmental Management and Assessment
- A Handbook for Environmental Impact Assessment (2005) Scottish Natural Heritage

11.3 METHODOLOGY

The assessment of socio-economic, recreation and land-use effects identifies existing conditions of the area surrounding the proposed wind farm and predicts the likely impacts (both positive and adverse) arising from the proposed development.

In terms of socio-economic factors, effects would be significant if the proposed development resulted in any fundamental or material changes in population, structure of the local community, and local economic activity during the different construction, operation or decommissioning phases.

In respect to tourism and recreation, consultations with the local authority and relevant tourist bodies provide baseline information regarding tourist & recreation sites around the area. Site visits supplemented this information and the assessment of effects was undertaken broadly following SNH's Guide to Outdoor Access Assessment¹ in the absence of more local guidance. Significant effects are those where the proposed development would lead to permanent effects on facilities or public access to recreational resources that have more than local use or importance. The potential impact of the proposal on tourism and recreation is closely related to public attitudes towards wind turbines in the landscape and a number of studies have been conducted on the subject. The relevant conclusions from the most recent studies are discussed later in this chapter.

¹ A Handbook for Environmental Impact Assessment (2005) Scottish Natural Heritage

The physical effects of the proposed development on existing land use are assessed by considering the effect of the wind farm and associated infrastructure on the current land use of the site. Significant effects would be those which resulted in a fundamental change in the predominant land use of the site.

11.3.1 Baseline References

The baseline description has been prepared after referencing a number of different sources and materials, including the following:

- National Statistics online (www.statistics.gov.uk)
- NOMIS Official Labour Market Statistics (www.nomisweb.co.uk)
- Barnsley Metropolitan Borough Council (www.barnsley.gov.uk)
- Penistone Community Website (www.penistone.uk.com)
- Peak District National Park (www.peakdistrict.org)
- The Trans-Pennine Trail (www.transpenninetrail.org.uk)
- Visit Penistone (<http://www.visitpenistone.co.uk/>)

Baseline conditions have been established through desktop studies, consultation and a review of information on local attractions.

Information concerning the public's perception of wind farms has been gathered from all parts of the United Kingdom

11.3.2 Consultation

As part of the Scoping process relevant organisations were contacted with regard to the proposal. Table 11.1 outlines the responses received

Table 11.1 Consultation response

Consultation	Response
British Horse Society	There is a public bridleway is situated at approximately 700m from the closest wind turbine from Whitley Road to Middle Cliff. It was recommended that a 200m buffer should be mentioned from the bridleway according to the Companion Guidance PPS22.
Natural England	The EIA should discuss any possible impacts on the rights of way. It should also consider opportunities for increasing access linkages both within the site and with the surrounding countryside.
English Heritage	The assessment of the setting of these sites of historic interest is further discussed based on the guidance provided in PPS22 in the Chapter 8 Cultural Heritage.
National Trust	The National Trust was consulted and due to proximity of the wind farm from the Peak District National Park, and recommended a few view points from the popular routes in the National Park. These view points are further considered in the Landscape and Visual Assessment (Chapter 4).

11.4 BASELINE DESCRIPTION

11.4.1 Socio Economics

The population of the Borough of Barnsley increased from 218,100 in 2001 to 222,100 in 2005. This was an increase of 1.8% over the 5 year period, compared to an increase of 1.9% for England as a whole. According to the 2001-2005 mid-year estimate, there has been a decrease in 0-9 year olds (-5%) and 25-34 year olds (-14%), but all other age groups have seen an increase in numbers.

The development site is situated in the Penistone West Ward which is more rural in character than other parts of the borough. According to 2005 mid-year estimates, Penistone West Ward had a population of 10,525 in 2005, and its population density was 1.31 persons per hectare compared to 6.63 across the Borough of Barnsley and 3.4 in England and Wales as a whole.

There is a high percentage of working age population in Barnsley (approximately 76%). The Nomis official labour market statistics from the period April 2006 to March 2007 states that there were 103,400 economically active people in Barnsley and of these 97,600 were in employment. The unemployment rate for Barnsley stood at 5.6% for the same period, slightly above the British average of 5.3%.

According to the 2005 mid-year estimate, the average gross weekly wage in Barnsley in 2007 was £408.50, which is lower than the national average of £458.60.

11.4.2 Recreation and Tourism

The Spicer Hill site lies within a predominantly agricultural area that is 1.5km from the Peak District National Park. Tourism and recreation resources are highlighted on Figure 11.1.

There are two particularly well-known tourist attractions within the vicinity of the site, the Peak District National Park and the Trans-Pennine Trail.

The Peak District National Park attracts over 19 million day visits per year² and generates in the region of £75 million for the local economy, based on the most up to date publicly available information³. According to the Peak District National Park Visitor Survey, Heart of England Tourist Board (1998), 51% of visitors said they visited the National Park for the scenery and landscape. The National Park also attracts large numbers of visitors for the range of activities available which includes climbing, caving, walking and cycling.

The Trans-Pennine Trail was first opened in 1989 and is a long distance route for walkers cyclists and horse riders that runs for 555km from the coast at the Irish Sea through Lancashire and Yorkshire to the coast of the North Sea. The section running through the borough of Barnsley is also National Cycle Route No. 62 and attracted 1 million people in 2007⁴. One of the sections of the trail that runs through from the Peak District National Park to Penistone is 1.5km to the south of the site.

There are a few local trails around the site. Barnsley Boundary walk is a long distance walk that passes close to the proposed wind farm. It is a 117km route and the section from Langsett to Ingbirchworth comes within 50m of the northern edge of the development site. The other walk is the Penistone Boundary Walk. It is a circular trail that runs for 25km around the boundary of Penistone. It is approximately 300m from closest turbine.

There are several well-known local historic attractions around the area, some of these are listed below

- Cannon Hall, built in 1760's is now converted to a museum and has 70 acres of parkland and historic walled garden that attracts large numbers of visitors all around the year. It is 7km from the site boundary.
- the award winning Elsecar Heritage Centre is a History and Craft centre that is located within the conservation village of Elsecar. The visitors can explore the former ironworks and colliery workshops of Earls Fitzwilliam and attractive restored buildings and

² Peak District National Park Profile, Best Value Performance Plan 2007-08, Annex 1, p46

³ <http://www.peakdistrict-nationalpark.info/studyArea/factsheets/02.html>

⁴ http://www.bbc.co.uk/southyorkshire/content/articles/2005/06/09/trans_pennine_trail_feature.shtml

monuments. The Heritage Centre is part of the Trans-Pennine Trail. It is approximately 18km from the site boundary

- Wentworth Castle Gardens and Parkland feature 26 listed buildings and monuments that are popular with the visitors because of its scenic views. It is considered as one of the most important historic gardens in the North of England.⁵ It also has been featured in the BBC TV series 'Restoration' in 2003 and is 11km from the site boundary.

Horse riding is a popular recreational activity in the area, with a number of private stables close to the site. There are two public bridleways (see figure 11.1) approximately 0.7km and 1.5km from the closest turbine respectively. The British Horse Society has confirmed that a number of minor roads around the site are also utilised by riders. In addition, the Trans-Pennine Trail is also used as a National Long Distance Bridleway.

There are three reservoirs; Scout Dike, Ingbirchworth and Royd Moor that are within 1.5km of the development site. Bird watching and fishing are popular recreational activities at these reservoirs. There are also two designated circular routes constructed by Yorkshire Water⁶ for walking; cycling and horse riding around Ingbirchworth Reservoir (2km in length) and Royd Moor (6km in length).

The operational Royd Moor Wind Farm is considered to be an attraction for walkers on the Royd Moor reservoir walking route. "The windy tops of the moor present the ideal setting for a wind farm which can be observed from Spicer House Lane."⁷ Regular users of the public bridleways and minor roads are familiar with turbines due to the existing wind farm.

11.4.3 Public attitudes towards Wind Farms

In the United Kingdom there have been numerous surveys to assess the public's attitudes to wind farms. This section examines a number of these studies in chronological order, as a means of predicting the public's response to the proposed development.

A survey conducted by the Royal Society for the Protection of Birds (RSPB) in September and October 2001, in which 1000 adults were canvassed, revealed that only 3% of the respondents are opposed to building onshore wind farms in the UK over the next ten years⁸. This poll revealed that 68% of the respondents are opposed to building new nuclear power stations and 82% opposed their construction within three miles of their homes.

A MORI poll was commissioned by the Scottish Renewables Forum and the British Wind Energy Association in 2002 to determine public attitudes towards wind farms in Argyll, which has the highest concentration of such developments in Scotland. The survey, which was based on detailed interviews with some 300 visitors over two September weekends, found that over 90% of visitors would return to Scotland for a holiday whether or not there were wind farms in the area. Of those that had actually seen wind farms whilst on holiday only 8% had come away with a negative impression. Eight out of ten said that they would go to a wind farm visitor or information centre during their stay⁹. The conclusions that may be drawn from the research are that there is no evidence that wind farms detract from the tourist experience of an area.

⁵ <http://www.wentworthcastle.org/view.asp?id=145>

⁶ <http://www.yorkshirewater.com/?OBH=522&ID=3544>

⁷ Yorkshire Water website, www.yorkshirewater.com/recreation/?OBH=3750&ID=147

⁸ BRMB for RSPB Market Research (2001) RSPB Market Research Project 0136: the Public's views on energy issues

⁹ MORI Scotland, "Tourist Attitudes towards Wind Farms", 2002. Sample: 307 Tourists.

A MORI survey commissioned in 2003 by the Scottish Executive which examined the views of locals living within 20km of Scotland's ten largest wind farms¹⁰ revealed that

- 20% of the residents felt that their local wind farm has a broadly positive effect on the area, compared to just 7% who said it was negative, while 73% felt it had neither a positive or negative effect or expressed no opinion
- when asked what the shortcomings of the area in which they lived most commonly mentioned lack of amenities (20%) and poor public transport (18%), whilst only 0.3% of people specifically mentioned wind farms as a negative aspect of their area.

The 2003 study also found that people living closest to wind farms tend to be more positive about them (44% of those living 5km say that a wind farm has had a positive effect compared to 16% of those living 10-20km away). People living closest to wind farms are also more supportive of expansion of the sites (65% of those within the 5km zone support 50% expansion compared with 53% of those in the 10-20km zone). The same study also found that before construction 27% of people surveyed thought that adverse landscape impacts might occur as a result of wind farm development. Following construction only 12% indicated that the landscape had been spoiled.

In July 2003 a poll of 2,500 participants found that 74% were in favour of the Government's ambition to generate 20% of the UK's electricity from renewable power sources by 2020 and of increasing the use of wind power throughout the UK¹¹.

In July 2006 the Wind Tracker survey of public opinion to wind energy in Great Britain¹² showed that

- 76% of people agreed wind farms are necessary to help us meet current and future energy needs
- 52% disagreed that wind farms are ugly or would be a blot on the landscape with 21% having no strong view
- 60% of people think what they look like is unimportant because wind farms are necessary
- 56% said they would be happy to have a wind farm in their local area with 21% having no strong view

In March 2007 Allegra Strategies undertook a comprehensive study into UK consumer views on Energy Efficiency and Alternative Energy Sources. Key findings in relation to wind energy were as follows

- renewable energy sources featured highly when consumers were asked which source of energy would be best for society. Most popular was wind power cited by 19.9% of consumers, second was solar at 17.9%, third most popular was nuclear at 10.5%
- wind power was believed to be the best energy source for society because there is plenty of wind in the UK, wind is considered to be a clean and natural source of energy, better for the environment, will not run out like fossil fuels and is cost efficient in the long-term
- consumers perceived wind farms as a good solution to benefit the environment. 18% thought wind farms were aesthetically pleasing versus 6.4% who viewed wind farms as an eyesore. For a number of respondents the benefits of wind energy outweighed the visual impact and respondents were unsympathetic about other consumers complaints regarding the visual impact of wind farms;
- many consumers believed wind turbines should be used more widely to produce clean energy and they generally responded positively to wind turbines in their local area

¹⁰ Scottish Executive, MORI, "Public Attitudes to Wind Farms: A survey of Local Residents in Scotland", 2003. Sample: 1, 800 residents.

¹¹ Conducted by leading independent research company GfK NOP and governed by MRS Codes of Conduct. BWEA Press Release July 2003 <http://www.bwea.com/media/news/round2.html>

¹² BWEA Press Release 22nd August 2006 <http://www.bwea.com/media/news/060822.html>

- 70.1% of respondents stated that they would be happy to have a wind farm located close by, compared with 17.3% who would not
- 85.9% of respondents who had wind turbines in their local area expressed positive feedback. Only 5.3% were opposed
- many of the respondents in Northern England (46.1%) would prefer their electricity to be derived from large scale renewables
- most consumers in UK (47.8%) favoured large -scale renewable such as wind energy as their most preferred source

Overall, sixty separate surveys have been conducted over a 15 year period and results have shown

- consistently high levels of support for the development of wind farms...both in principle, and also in practice, amongst residents living near a wind farm
- direct experience provokes a more positive attitude
- closer proximity results in a higher level of support
- results of 'before and after' surveys have shown a shift in attitudes towards positive and the fears of potential adverse effects are unfounded ¹³

11.4.4 Land Use

The development site is in agricultural use as rough grassland and improved pasture, used predominantly for sheep grazing. The Penistone Ward and neighbouring areas is a mixed urban and agricultural area with the site situated in a poor agricultural quality land - Grade 4 or 5¹⁴.

The closest settlements around the site are Crow Edge, located approximately 1km to the east of the development site, Ingbirchworth, located 1.5km south west of the development site, and Penistone, approximately 2.5km south west of the development site.

The Barnsley Boundary Walk footpath and the permitted routes around the Ingbirchworth and Royd Moor reservoirs (part of Yorkshire Water walks) are in close proximity to the site boundary; both are to the north east of the site at approximately 300m from the closest turbine.

The Whitley Road runs along the south-western part of the application boundary which will form the vehicular access point to the site and Spicer House Lane that runs along the eastern part of the application boundary.

11.5 ASSESSMENT OF POTENTIAL EFFECTS

11.5.1 Socio-economic Effects

The development of Spicer Hill Wind farm will result in contract opportunities for local and regional contractors both for construction activities themselves and throughout the supply chain. The investment in this project has the potential to generate a range of economic and social effects and opportunities for local businesses, most notably employment opportunities and local spending.

Social and economic effects can be divided into

- direct effects: for example employment opportunities in the construction, operation and maintenance and decommissioning of the wind farm

¹³ BWEA Briefing Sheet: Public Attitudes to Wind Energy in the UK, November 2004.

¹⁴ www.magic.gov.uk

- indirect effects: such as employment opportunities created down the supply chain by those companies providing services to the proposed development during construction, operation and de-commissioning
- induced effects: for instance employment created by the additional spend of wages into the local economy and the purchasing of basic materials, equipment and office space for staff

11.5.1.1 Construction

The wind farm will place significant contracts for services and materials during construction and local sourcing will be preferred where possible. In the region of 10 full time equivalent short-term construction jobs would be created during the 10 month construction period.

Manufacture of the bulk of the turbines will be by an established turbine manufacturer. Local sourcing of equipment and the turbines themselves in preferred whenever possible but it is constrained to some extent by the specialist nature of the equipment.

Examples of direct opportunities for local contractors would include

- haulage
- turbine base and access track construction
- the supply of building materials (e.g. fencing, concrete, cement, stone, etc.)
- mechanical, electrical and supervisory services

All stone and ready mixed cement used for the construction of the project would be sourced from local quarries providing an additional, indirect economic benefit to the area.

Construction workers not living locally would stay in local accommodation during the construction period providing an economic opportunity for local accommodation and other local services.

Overall, construction of the wind farm would not result in any fundamental or long term changes in population, structure of the local community, local services or employment, but would bring about a moderate, short term, temporary beneficial effect through increases in employment and business opportunities.

11.5.1.2 Operation

Once operational one to two full-time equivalent maintenance jobs would be created. This would be a skilled engineering position, living with a call out distance of the site. Also, a periodic maintenance would be required from a specialist maintenance team. The developer is also committed to maximising opportunities for local companies during the operation of the wind farm.

A community fund to support sustainable/environmental projects will be set up throughout the operational life of the wind farm. The vehicle for administering this community fund will be established and agreed with BMBC and relevant Parish and/or Town Councils. This vehicle will help to determine the scope of projects to be funded and a mechanism for granting awards.

11.5.1.3 Decommissioning

Employment opportunities would also arise during the de-commissioning process. De-commissioning effects are anticipated to be of a similar nature and scale as construction effects, with employment opportunities arising during this process.

11.5.2 Recreational and Tourism Effects

11.5.2.1 Construction

There are a number of public rights of way (as shown on Figure 11.1) in the vicinity of the site. The Public Rights of Way Officer for Barnsley Metropolitan Borough Council has stated that wind farm would not be a cause for concern, and that disruption to walking, cycling and horse riding in the area would be minimal.

This is borne out by experience elsewhere in the UK and indeed at the existing Royd Moor Wind Farm where public access around the site continues as it had before.

There will be no direct effects on recreational routes around the site. During construction there may be indirect intermittent effects on noise levels and air quality. There will be minimised through best practice guidance.

11.5.2.2 Operation

Surveys of public attitudes to wind farms provide no clear evidence that the presence of wind farms in an area has any adverse impact on local tourism. In fact, the Royd Moor wind farm (situated directly adjacent to the proposed site) is a tourist attraction for walkers, cyclists and horse riders that use the public bridleways, minor roads and designated walking routes in the area.

Renewable Energy now forms part of the National Curriculum in England and the wind farm could be accessible for organised educational visits with local school, colleges and other organisations who wish to arrange visits through the Developer.

With reference to the assessment outlined above, the wind farm would not lead to any long-term significant direct adverse effects on any recreational or tourist resource.

11.5.2.3 De-commissioning

Decommissioning effects will be similar to construction effects as described above. The wind farm is a temporary feature which after its 25 year operational life would be removed and the development site restored. No significant effects are predicted.

11.5.3 Land Use

11.5.3.1 Construction

The total area within the planning application boundary is 28.1ha. It is estimated that the total land take of the wind farm made up of the wind turbine foundations, access tracks, compound, borrow pits, extension to control building and hard-standings would be approximately 1.76ha or approximately 6.27% of the total planning application area, and less than the total study area. However some of these areas such as the construction compound will be reinstated following construction whilst turbine foundations and crane pads would be covered with subsoil and topsoil and allowed to naturally re-vegetate.

The majority of the development site consists of poor arable and improved grazing fields which have little ecological value. Small areas of acid grassland/dry dwarf shrub heath mosaic have been identified on site, and impacts have been avoided through iterative design. The proposed wind farm offers opportunities for habitat management that would otherwise be unlikely to occur.

Chapter 5 confirms that a habitat management plan will be developed which will include measures to enhance the habitat quality and biodiversity value of the site. In particular,

whilst aiming to improve the quality of the existing grassland habitat through appropriate management techniques, the management plan will aim to conserve and improve the broadleaf plantation woodland following the stream to the north-west of the site. Further details are provided in Chapter 5.

The land is currently used for grazing and it will be necessary to ensure the safety of livestock during construction either through restricting part of all of the site parts of the 10 month construction period.

This would be a minor negative effect and would be considered as a limited loss to the grazing/agricultural land.

11.5.3.2 Operation

The only land that will be directly affected by the wind farm development would be the land used for the wind turbines, access tracks, control building and compound and hard standings. No other land within the development site would be affected during operation.

One of the benefits of the wind farms is that they enable diversification in farming by allowing the existing land use to continue unaffected whilst adding extra value by the addition of a wind farm.

11.5.3.3 De-commissioning

The proposal is a temporary feature which after its 25 year operational life would be removed and the development site restored, or the life of the project extended subject to the approval of further planning permission and related consents. The access tracks would be retained for use in land management following de-commissioning.

11.5.4 Cumulative Effects

Cumulative visual effects on outdoor recreational facilities such as rights of way are assessed in Chapter 4.

11.5.5 Summary of effects

Table 11.2 Summary of Effects

	Socio-economic effects	Tourism and Recreation Effects	Land Use Effects
Construction	1) Opportunities for local contractors. 2) Stone and cement sourced locally. 3) Approx 10 Full Time Employment construction jobs.	1) Minor impact during the construction months to the existing bridle ways and public rights of way near to the site.	1) Limited loss of improved and semi-improved grassland 2) Improved condition of broadleaf woodland and other habitat enhancement opportunities.
Operation	1) One to two full time maintenance jobs. 2) Community fund	1) Wind farm can be utilised for pre-arranged educational visits. 2) No direct effect on tourism and recreation facilities.	1) Grazing activities unaffected.
Decommissioning	1) Employment and Contracting opportunities.	1) Minor impact on the recreation facilities during decommissioning of the wind farm.	1) Turbines removed and infrastructural areas of site restored to use as farm land.

11.5.6 Statement of Significance

The development of Spicer Hill Wind Farm would not result in any fundamental, long-term or material changes in the population, structure of the local services or long term employment. However, there would be a minor, short term economic benefit due to the creation of jobs and through tendering opportunities for local and regional companies directly for construction and through the supply chain. Socio-economic effects would occur at a local and regional level and are deemed to be minor short term and not significant in terms of the EIA regulations.

Effects on tourism and recreation are dependent upon the attitude of the viewer. Studies undertaken by a range of professional bodies have shown that the majority of the public are in favour of generating energy from renewable sources and although local people can be concerned about wind farm proposals in their area, these fears are generally allayed when the wind farm becomes operational.

The loss of improved and semi-improved grassland and arable land is assessed as negligible and not significant in the context of the similar available land locally. The habitat management plan will improve biodiversity in the area.

12 EXISTING INFRASTRUCTURE

12.1 INTRODUCTION

This chapter describes and assesses the potential effects on existing infrastructure including

- television and telecommunication
- aviation
- utilities

12.2 CONSULTATION

Consultation has been carried out with the main communications and utilities providers in the area, as shown in Table 12.1.

Table 12.1 Summary of Consultations

Consultee	Summary of Response
Ofcom	Identified one fixed civil microwave link, operated by BT, which may be affected by the proposed wind farm
Joint Radio Company	The proposed wind farm is unlikely to affect civil microwave or scanning telemetry links managed by JRC
CSS Spectrum Management	The proposed wind farm will not have an impact on UHF radio scanning telemetry links in the region
Arqiva	Within an Arqiva area, although the proposal will not affect operations in the area
National Grid Wireless	In an area for which Arqiva has a watching brief, therefore no comment on the proposal
British Telecommunication	Proposal is unlikely to affect existing links, therefore BT have no objection
Orange PCS	Proposal will not affect communications links
Vodafone	Proposal will not affect communications links
Cable and Wireless Network Planning	Proposal will not affect communications links
T-Mobile	Proposal will not affect communications links
Hutchison 3G	Proposal will not affect communications links
BBC Online Reception Tool	The proposed wind farm would be likely to affect up to 215 homes for whom there is no alternative off-air service ¹
National Grid UK Transmission	Negligible risk to operational electricity and gas transmission networks
National Grid Regional Gas Transmission	Identified high pressure regional gas plant within the site boundary and requested appropriate way leave

¹ An alternative off-air service refers to an available source of transmission from an alternative transmitter. BBC Windfarms online assessment tool - <http://windfarms.kw.bbc.co.uk/rd/projects/windfarms/index.shtml>

Consultee	Summary of Response
Northern Gas Networks (NGN)	Identified high pressure regional gas pipeline within the site boundary and requested appropriate way leave
Yorkshire Water	No infrastructure within the site boundary
Robin Hood and Sheffield City Airport	No objection to the proposal
National Air Traffic Service En Route Plc (NERL)²	Site is within the area where the turbines could have an impact on operational infrastructure

12.3 LEGISLATION AND GUIDANCE

There are a number of documents which give guidance on aviation and telecommunications considerations for wind farm developments. The most important of these are

- Wind Energy and Aviation Interests – Interim Guidelines. Wind Energy, Defence and Civil Aviation Interests Working Group
- Best Practice Guidelines for Wind Energy Development, British Wind Energy Association (BWEA)
- Planning Policy Guidance 8 (PPG8): Telecommunications
- BBC, Ofcom (2001), The impact of Large Buildings and Structures (including wind farms) on Terrestrial Television Reception
- Ofcom (2002), Guidelines for Improving Digital Television and Radio Reception

12.4 METHODOLOGY

Baseline conditions for microwave links and utilities have been identified through consultation. Potential effects have been assessed through further consultation and desk based assessment. Where feasible, the baseline information has been used to design the layout in such a way as to avoid impacts on existing infrastructure.

12.5 BASELINE CONDITIONS

The following installations and systems have been identified through consultation and desk top study.

12.5.1 Television and Telecommunication

Consultation with the BBC via the online assessment tool identified two transmitters that could potentially be affected by the wind turbines, details of which are provided in Table 12.2.

Table 12.2 Local Television Transmitters

Name	NGR	Power	Distance (km)
Emley Moor	SE222128	870kV	7.5
Emley Moor CH5	SE222128	870kV	7.5

One microwave link was identified by Ofcom as being in the vicinity of the proposed wind farm. Details of the link were collected through consultation with the link operator.

² NERL pre-planning consultation tool <http://www.bwea.com/aviation/nats.html>

The Joint Radio Company (JRC) initially identified no links that could potentially be affected by the proposed wind farm, although further consultation identified one scanning telemetry link that may potentially be affected.

Through consultation with their individual clients CSS Spectrum Management (CSS) identified no VHF radio telemetry links that were likely to be affected by the proposal.

12.5.2 Utilities

National Grid UK Transmission has identified no plant in the vicinity of the site, and has stated that the risk to their operational electricity transmission network and operational national gas transmission network as a result of the proposed turbines is negligible.

Northern Gas Networks (NGN) have identified regional high pressure gas plant running in a north to south direction in the eastern part of the site boundary. National Grid Gas Distribution identified the same regional plant in the south of the site, between turbine three and turbine five shown on Figure 1.2. The plant also passes between the turbines at the existing Royd Moor Wind Farm.

Yorkshire Water has identified no plant within the site boundary associated with water or sewage transmission or treatment.

12.6 ASSESSMENT OF EFFECTS

12.6.1 Potential Construction Effects

12.6.1.1 Television and Telecommunication

The British Wind Energy Association and Ofcom Guidance advise that the effects of construction and decommissioning should not be assessed, and it is not standard practice to do so.

The only possible effects are likely to be as a result of tall cranes. These cranes are likely to be in the vicinity of the proposed turbines, and as such are likely to have similar effects. As the turbines have been sited in accordance with clearance requirements of the link operators, they are unlikely to affect the identified links. In addition, the cranes are temporary structures which will not be erected for long periods of time.

As a result, any effects during construction are likely to be similar in nature but of a smaller magnitude than operational effects.

12.6.1.2 Aviation

The Ministry of Defence would be advised before construction commences, in order that military air crew can be advised of the potential obstruction.

12.6.1.3 Utilities

Effects on existing utilities during construction can include disturbance to infrastructure and associated services where infrastructure is in close proximity to construction areas. No effects on existing utilities are predicted during construction. The wind turbines have been located to avoid the gas plant, and detailed consultation will be undertaken with NGN prior to commencing construction. There will be a requirement for the access tracks to cross the high pressure gas main on the site, although a suitable crossing shown on Figure 2.8b will be constructed to ensure that vehicle movements not affect the pipeline. Pipeline crossings will be agreed and constructed in consultation with NGN.

There is no other infrastructure on the site that is likely to be affected by the construction of the proposed wind farm

12.6.2 Potential Operational Effects

12.6.2.1 Television and Telecommunication

Wind turbines and other structures have the potential to create interference with television and telecommunication transmissions. Interference to television reception can occur in any direction within 500m of a turbine (reflection zone), or within 5km of a turbine in the line of sight between transmitter and receiver (shadow zone).³ These potential zones of effect are shown in Figure 12.1.

It is important to recognise that if properly mitigated, effects on telecommunications, television and radio broadcasting links or scanning telemetry are not a significant constraint to wind farm development. Terrestrial television transmissions for domestic reception within the UK are the joint responsibility of the BBC and Ofcom. Distribution links and other communication links are provided and operated on behalf of the broadcasters by National Grid Wireless and Arqiva.

The proposed wind farm lies within an area under the BBC's jurisdiction with responsibility for ensuring the integrity of Re-Broadcast Links with Arqiva. At the moment, digital and analogue signals are broadcast simultaneously. Starting this year the UK analogue television broadcasts will be phased out, region by region, to be replaced by digital transmissions. The process of switchover will be complete by 2012. In 2012 the analogue signal in the Yorkshire region will be switched off and viewers without digital receivers will be faced with a blank screen. As digital TV greatly compresses sound and pictures in order to be transmitted on the digital signal, several television channels can be transmitted using the same amount of space of just one analogue channel. This results in a considerably more effective method of transmitting television signals. Digital television transmission reception does not generally suffer from ghosting caused by minor reflections of the signal, but sudden picture degradation may occur in extreme circumstances due to signal reflections.

Arqiva states that the wind farm is unlikely to affect any UHF Re-Broadcast feeds and hence do not object. The BBC wind farm planning tool advised that reception at up to 215 homes may be adversely affected by the proposed wind farm, with effects likely to be on signals from the Emley Moor transmitter.

Ofcom manages fixed microwave links across the UK on behalf of individual telecommunication organisations. Ofcom identified one fixed link in the vicinity of the proposed wind farm, belonging to British Telecommunications (BT). Consultation with BT has indicated that the link identified by Ofcom is more than 1km from the proposed wind farm, and as such will not be affected by the turbines.

The JRC and CSS Spectrum Management Services manage scanning telemetry links throughout the UK on behalf of individual operators. Both JRC and CSS have indicated that the proposal is unlikely to affect their operations in the area, and as such have no objection to the wind farm.

12.6.2.2 Aviation

NATS En Route Plc ("NERL") has replaced its pre-planning consultation process with an online assessment tool for developers.⁴ The online maps provide developers with information about areas where wind turbines may be of concern to NERL. Maps are displayed for a range of tip

³ The Impact of Large Buildings and Structure (Including Wind Farms) on Terrestrial Television Reception.

⁴ <http://www.bwea.com/aviation/nats.html>

heights from 20-140m. The 84m tip height map was analysed for the proposed wind farm. The assessment shows the turbines to be within an area where there are likely to be some effects on the operational infrastructure of NERL. However, these maps are indicative and for guidance only and NERL would also assess the application at the planning stage.

The only airport within the 30km consultation zone⁵ is Sheffield City Airport, which is approximately 25km south east of the proposed wind farm. Both Robin Hood and Sheffield City Airports were consulted and neither have identified an objection to the proposed wind farm. It is considered unlikely therefore, that the wind turbines will affect operational procedures or safety at either airport.

Consultation has been undertaken with the MOD, which has indicated that the proposed wind farm is unlikely to affect current MOD and defence estates interests and operations.

12.6.2.3 Utilities

The wind farm is considered unlikely to affect existing utilities once it becomes operational. Current UK guidance on the siting of wind farms close to pipelines containing hazardous fluids recommends that the distance between turbines and such pipelines should be one and a half times the hub height of the turbine⁶. The closest proposed turbine to the pipeline at Spicer Hill is approximately 40m however through further dialogue with NGN and micro-siting the Developer is confident that the wind farm will not have a detrimental effect on the pipeline. The likelihood of either blade or tower failure is so low that in reality, the operational turbines will not affect the on-site utilities.

12.6.3 Potential Decommissioning Effects

Potential decommissioning effects are likely to be similar in nature to those encountered during construction, only of less significance. It is therefore considered that there will be no foreseeable additional effects beyond those discussed in section 12.6.1 which arise as a result of decommissioning.

12.7 MITIGATION

12.7.1 Television and Telecommunication

Any adverse impacts with regard to television interference can be resolved through technical solutions that will be agreed between JG Pears Ltd and the local planning authority. Mitigation measures can include

- change in receiving aerial height
- replacement of receiving aerials
- retuning of television receivers
- provision of satellite or cable services to affected households

Embedded mitigation in the form of site design will result in no effects on telecommunications as a result of the proposed wind farm.

12.7.2 Aviation

Given that the wind farm is unlikely to affect either MOD installations and activities, or operations at nearby airports, mitigation is not required.

⁵ Wind Energy and Aviation Interests – Interim Guidelines. Wind Energy, Defence and Civil Aviation Interests Working Group Available On-line <http://www.berr.gov.uk/files/file17828.pdf>

⁶ Requirements for the siting of wind turbines close to pipelines containing hazardous fluids. United Kingdom Onshore Pipeline Operators Association (UKOPA)

Should NATS identify a potential effect on their infrastructure or operations in their role as a statutory consultee in the planning process, there are a range of potential technical mitigation solutions available. JG Pears will seek to find the technical solution that best addresses the potential impacts identified during further technical assessments and consultation.

12.7.3 Utilities

Mitigation to avoid effects on existing utilities plant is embedded in the wind farm design. Chapter 2 and Figure 2.8b provide further information on the proposed crossing of the high pressure gas infrastructure.

12.8 RESIDUAL EFFECTS

No significant effects are predicted after mitigation.

12.9 SUMMARY OF EFFECTS

Table 12.3 Summary of Effects

Receptor	Mitigation	Residual Effects
Construction		
Utilities	Location and nature of utilities taken into account during site design. Appropriate construction methods and on-site safety procedures to be agreed with NGN and followed during construction.	No significant effect
Telecommunications links	Erection of cranes unlikely to be in the vicinity of communications links therefore none required.	No significant effect
Operation		
Utilities	Wind farm can achieve recommended safe distance between gas pipeline and turbines through micro-siting.	No significant effect
Telecommunications links	Wind farm designed to avoid impacts upon links.	No significant effect
Television reception	Any effects can be resolved through technical solutions including a change in aerial height, or realignment of aerial.	No significant effect
Decommissioning		
All receptors	None identified.	No effect

12.10 STATEMENT OF SIGNIFICANCE

The proposed Spicer Hill Wind Farm will have no significant effects on existing telecommunications, television reception, existing infrastructure, MOD operations, or operations at either Sheffield City or Robin Hood Airports. Detailed assessment of the proposal by NATS after the application is submitted will identify whether there are likely to be potential effects on civil aviation radar operations.

13 SHADOW FLICKER

13.1 Introduction

Shadow flicker is an effect that can occur when the shadow of a moving wind turbine blade passes over a small opening (window), briefly reducing the intensity of light within the room, and causing a flickering to be perceived.

It occurs only under certain combinations of relative sun, turbine and window locations, turbine orientation, times of day, days of the year and weather conditions.

The flickering may have the potential to cause disturbance and annoyance to residents if it affects occupied rooms of a house. Persons with photosensitive epilepsy are usually sensitive to flickering light that is usually between 3 - 50 Hz¹. The frequencies of flicker caused by modern wind turbines (less than 1.5 Hertz) are well below the frequencies known to trigger effects in these individuals.

13.2 Guidance and Assessment Methodology

13.2.1 Relevant Guidance

Planning for Renewable Energy, A Companion Guide to PPS22² has been considered in carrying out this assessment. The Companion Guide document was published by the Office for the Deputy Prime Minister in 2004 to provide additional information to assist in the implementation of Planning Policy Statement 22: Renewable Energy (PPS22). The Guide provides additional technical information on a range of renewable energy technologies, including onshore wind power, which is universally applicable.

The companion guide describes the conditions under which flicker may occur and states that the effect diminishes with distance, and that *"flicker effects have been proven to occur only within ten rotor diameters of a turbine."* It also confirms that effects only occur within 130 degrees either side of north relative to the turbines.

13.2.2 Assessment Methodology

Properties with the potential to be affected by shadow flicker have been identified by mapping the area around each proposed turbine location within a distance of ten rotor diameters and 130 degrees either side of north (the 'shadow flicker study area') using GIS (Geographical Information System). The resulting map showing this (Figure 13.1) was then used to identify properties (as shown on Ordnance Survey 1:25,000 scale digital mapping) within the shadow flicker study area. These were then confirmed during a site visit. Three properties were identified in this way.

A recognised computer software package³ was then used to calculate theoretical specific times and durations of flicker effects for each property. Details of assumptions made about the properties are given section 13.3 Baseline Description.

This software creates a mathematical model of the proposed wind farm development site and its surroundings, based on

- turbine locations, hub height and rotor diameter
- topography (obtained from OS elevation data on 50m horizontal grid)

¹ Epilepsy Action, http://www.epilepsy.org.uk/info/photo_other.html

² <http://www.communities.gov.uk/publications/planningandbuilding/planningrenewable>

³ WindFarm by ReSoft, Release 4.1.1.1

- latitude and Longitude of the development site (used in calculating the position of the sun in relation to time of day and year)

A cut-off distance of 560m (10 rotor diameters) from each turbine was employed during this calculation

Certain worst-case assumptions are made in the calculation, including

- weather conditions are such that shadows are always cast during each of 365 days of the year, i.e. bright sunshine every day
- the turbine rotor will always be facing directly towards a given window, maximising the size of the shadow and duration of the effect
- the turbines will always be rotating and
- there will not be intervening structures or vegetation (other than topography) that may restrict the visibility of a turbine, preventing or reducing the effect

The above calculations are intended to indicate a theoretical maximum in potential duration of effects and to provide an approximation of the times of day and year rather than an accurate prediction. This is sufficient for the purposes of this assessment. If deemed to be necessary, calculations that are more detailed will be carried out for the purposes of developing detailed mitigation measures.

In practice, for much of a given year weather conditions will be such that shadows would not be cast, or would be weak and thus would not give rise to flicker effects. In the UK, bright sunshine typically occurs for around 30% of daylight hours per annum. This means that the computer model calculation most likely overestimates the duration of effects by as much as three times. Other factors such as the potential for screening by vegetation or intervening structures and the varying orientation of the turbines due to varying wind direction will also reduce or prevent flicker incidence in practice as compared to the theoretical maximum suggested by the calculation.

No guidance is available regarding what levels of shadow flicker may be considered acceptable in the UK. Therefore, in this assessment it has been assumed that any shadow flicker effects that are predicted to occur will be significant.

13.3 Baseline Description

Table 13.1 details the three properties identified within 560m and 130 degrees either side of north of the proposed turbine locations. These are also shown in Figure 13.1.

Table 13.1: Potential Shadow Flicker Receptors

Reference	Name	Eastings	Northings	Closest to Turbine No.	Distance (m) from the Turbine
1	Annat Royd	421319	404955	3	480
2	Spicer House	420481	405587	1	340
3	Brown's Edge	420431	405746	1	500

The following assumptions have been made for all potential receptors

- All windows have been assumed to measure 1m by 1m, to be situated at a height of 3.0m above ground level, to the window's centre (representing an average of ground and first floor levels) and to be located at the grid references given in Table 13.1

- Each property is assumed to have one window on each façade that faces towards a proposed turbine location. The orientations assumed are detailed in Table 13.2
- The orientation of the properties' facades has been estimated from OS 1:25,000 scale digital mapping, to the nearest 15 degrees

The above assumptions provide a level of accuracy consistent with the assumptions discussed in Section 13.2.2 Assessment Methodology.

13.4 Potential Effects

Details the results of the calculation carried out of the theoretical maximum shadow flicker effects at the identified receptors, and the likely duration (assuming 30% per annum bright sunshine).

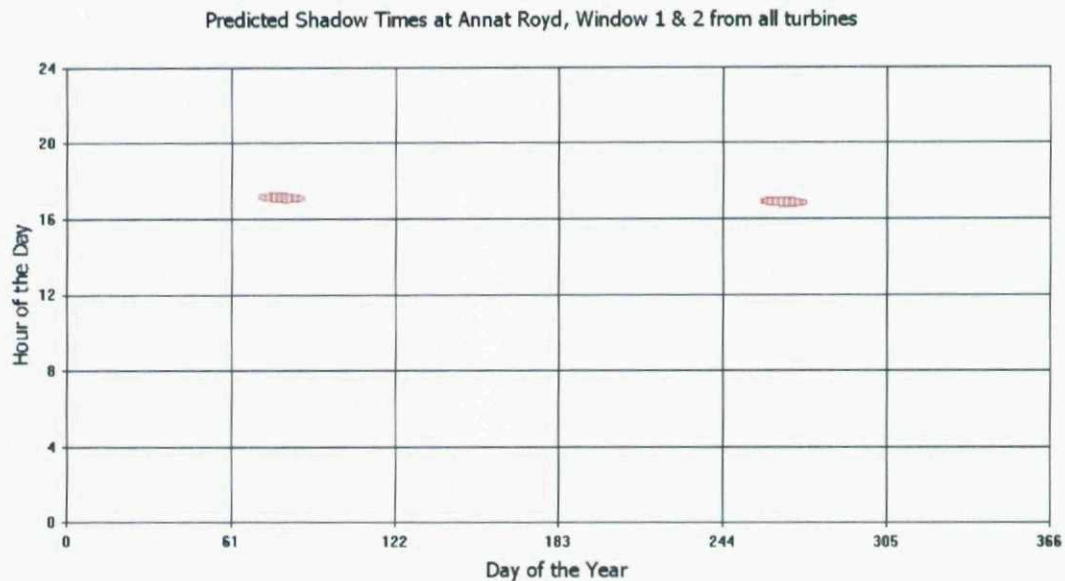
Table 13.2 Potential Shadow Flicker Effects

Ref	Name	Window	Orientation (Degrees)	Days per year	Max hours per day	Mean hours per day	Theoretical hours per annum	Likely hours per annum
1	Annat Royd	1	335	36	0.47	0.38	13.68	4.1
		2	245	36	0.47	0.38	13.68	4.1
2	Spicer House	1	135	84	0.68	0.60	50.40	15.1
		2	225	84	0.68	0.59	49.56	14.8
3	Brown's Edge	1	135	38	0.40	0.33	12.54	3.7
		2	225	38	0.40	0.33	12.54	3.7

Charts showing the times of day and year that effects are predicted to occur (for the worst-affected window in each case) and a discussion of the results for each property are presented below.

Property 1: Annat Royd

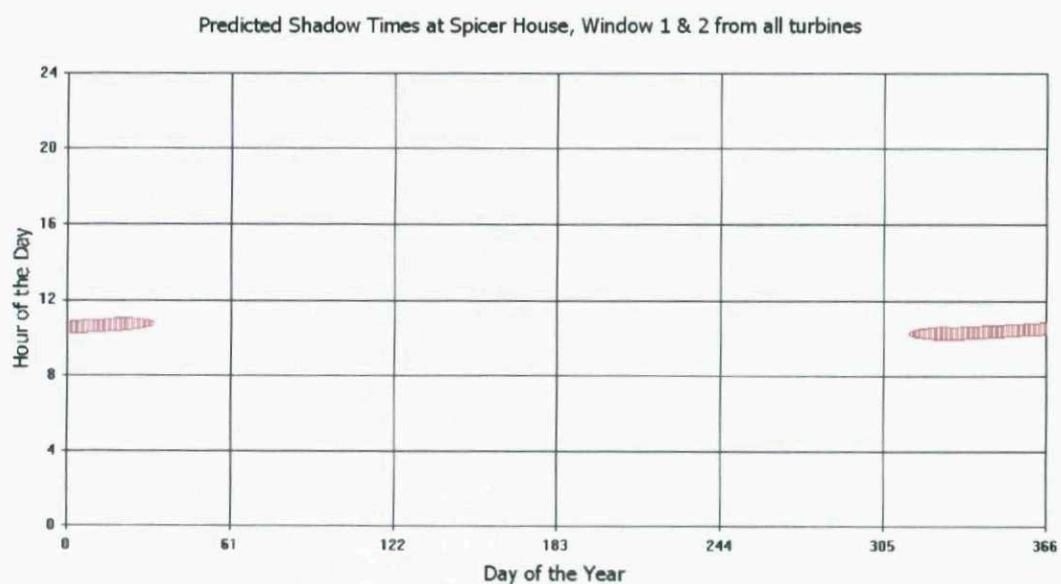
Chart 13.1 shows the times that shadow flicker have been predicted to occur at Annat Royd on window 1, which faces north-west. As shown on the graph, effects could occur for short periods during spring and late-summer evenings.

Chart 13.1: Shadow Times at Annat Royd

Day 0 - 366 indicates Jan 1st to December 31st (taking into account any leap years)

Property 2: Spicer House

Chart 13.2 shows the times that shadow flicker have been predicted to occur at Spicer Hill on window 1, which faces south-east. As shown on the graph, effects could occur on winter mornings.

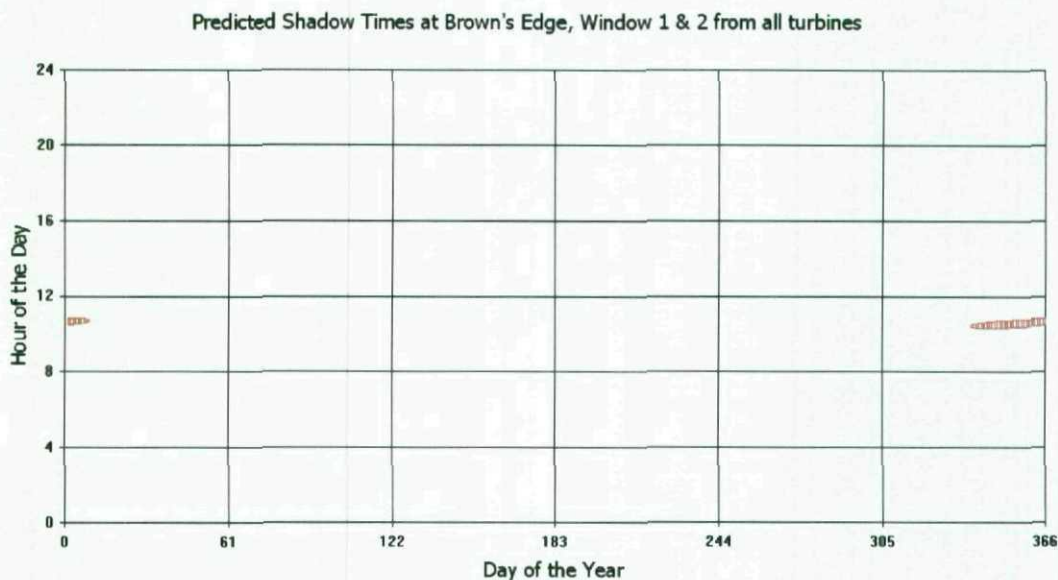
Chart 13.2: Shadow times at Spicer House

Day 0 - 366 indicates Jan 1st to December 31st (taking into account any leap years)

Property 3: Brown's Edge

Chart 13.3 shows the times that shadow flicker have been predicted to occur at Brown's Edge on window 1, which faces approximately south-east. As can be seen, effects could occur on for short periods on winter mornings.

Chart 13.3: Shadow times at Brown's Edge



Day 0 - 366 indicates Jan 1st to December 31st (taking into account any leap years)

It should be noted that in practice the effects are likely to be less than those here predicted due to the factors previously discussed.

The assessment carried out only addresses the effects of shadows within buildings. Moving shadows will also be apparent out of doors. These do not result in flicker in the same way or to the same extent, as the intensity of effects is amplified indoors due to the periodic interruption of light entering windows.

Any effects that occur in practice would only do so during the operational phase of the wind farm. No effects will occur during construction or decommissioning.

13.5 Mitigation

A control system would be employed⁴ as part of the wider turbine control systems to calculate, in real time, whether shadow flicker may affect a property, based on pre-programmed co-ordinates for the properties and wind turbines, and the intensity of sunlight, as measured by a device attached to a turbine tower. When the control system calculates that the sunlight is bright enough to cast a shadow, and that a turbine shadow falls on a property, it automatically shuts the turbine down, re-starting it when the shadow has moved away from the property.

In the highly unlikely event that shadow flicker is experienced at properties other than those identified in this assessment, these would be investigated by J. G. Pears Ltd. or an

⁴ An example can be found at:
http://www.windtest.de/WTk/WTk-Englisch/Akustik/x_akustik_swm_engl.htm

independent third party, and if a complaint is found to be justified additional control measures of the types identified above will be implemented.

13.6 Residual Effects

Implementation of the identified mitigation will ensure that properties will not be affected by shadow flicker from the proposed turbines.

14 MISCELLANEOUS ISSUES

14.1 INTRODUCTION

This chapter describes and assesses the potential effects on

- air quality and climate
- health and Safety
- weather conditions

14.2 LEGISLATION AND GUIDANCE

Relevant legislation and guidance that has been consulted in respect of this Chapter is listed in each of the relevant sections below, as appropriate.

14.3 METHODOLOGY

Baseline conditions have been established through desk based assessment and consultation for the above issues where appropriate. The methods of assessment for the various subjects considered within this chapter are described in greater details in the relevant sections below.

14.3.1 Consultation

A Scoping exercise was undertaken and is described in detail in Chapter 2. The following relevant consultation response has been received.

Highways Agency in their Spatial Planning Advice Note: SP 02/06 advises that as a good practice wind farms should be sited such that oncoming vehicles have a clear and continuous view along the length of the carriageway. This good approach visibility will help in avoiding any visual and noise distractions for the drivers and prevent any accidents.

14.4 AIR QUALITY AND CLIMATE

14.4.1 Construction

The movement of vehicles and plant on site would create exhaust emissions. Details of the number of vehicles predicted during the construction phase of the project can be found in Chapter 10.

In addition, certain construction activities could create dust in dry, windy conditions. Mitigation measures to limit the occurrence of dust are would be incorporated in the Pollution Prevention Plan.

Given the short term nature of the construction period, and the distance from construction activities to the nearest residential properties, effects of construction on local air quality are likely to be negligible.

14.4.2 Operation

Climate change is recognised as a global problem caused largely by an anthropogenic increase in carbon dioxide (CO₂) and other greenhouse gas levels. Currently the CO₂ concentration in the Earth's atmosphere is at its highest concentration in 55 million years and is continuing to increase at a progressively higher rate.

Electricity in the UK is currently generated from a range of sources including fossil fuels, nuclear fuel and renewable energy. The use of fossil fuel in the generation of electricity releases greenhouse gases, predominantly CO₂, as described above.

Wind turbines create no atmospheric pollution during operation. Spicer Hill Wind Farm has the potential to displace electricity generated from fossil fuels and consequently prevent CO₂ from being released. The actual amount of CO₂ released through electricity generation in the UK relates directly to the generating plant in use at any given time. This mix changes on a daily basis and will change in the future as UK generating plant is replaced and as a consequence it is not possible to predict exactly how much CO₂ release the wind farm will prevent over its lifetime.

The Digest of United Kingdom Energy Statistics (DUKE Stats) 2007: Carbon Dioxide Emissions from Power Stations in 2006 assumes that when generating electricity from gas 370g of CO₂ are released each kilowatt hour (kWh); this is increased to 875g per kWh when generation is from coal. A typical UK electricity generation mix¹ releases 430g of CO₂ per kilowatt-hour of electricity generated.

Theoretically, every kilowatt-hour of wind energy displaces the emissions of the current generation mix. A range of tonnes of CO₂ could be displaced by the proposed Spicer Hill Wind Farm annually, with the minimum resulting from gas CO₂ emissions displaced, and the maximum from coal CO₂ emissions displaced.

Based on the estimates from the different types of fossil fuel sources of energy, Spicer Hill Wind Farm, with an installed capacity of 5 MW, would displace between approximately 4435 and 10497 tonnes of CO₂ emissions each year from entering the atmosphere, with 5160 tonnes being displaced based on the typical generation mix. In addition the operation of the wind farm could, based on the same assumptions, also displace other gases related to coal-fired electricity generation including those associated with acid rain such as sulphur dioxide (SO₂) and oxides of nitrogen (NO_x).

The mix of generation sources is likely to change in the long term, which will affect the calculations presented here. It is difficult to quantify therefore the lifetime effects of the wind farm on emissions. The cumulative generation of power from wind farms and other forms of renewable energy generation may allow more dated fossil fuel power stations to be decommissioned at the end of their design lives, reducing the national emissions of pollutants from electricity generation.

14.5 HEALTH AND SAFETY

The selected construction contractor will, in accordance with the UK industry regulations carry out a comprehensive health and safety assessment prior to the construction of the Spicer Hill Wind Farm. The information presented within this ES provides an outline of the issues to be addressed.

The implementation of the construction design and management principles (CDM) will result in a wind farm development designed, built, operated and maintained to the highest safety standards.

14.5.1 Design and Construction

The layout and design of the proposed wind farm takes into account the following considerations

- location of existing services

¹ Figure published by DEFRA (<http://www.defra.gov.uk/environment/business/envrpf/>)

- public safety
- existing structures on site
- access
- construction
- maintenance/Inspection
- emergencies

Safe access to the wind farm has been assessed. The following issues have been addressed and are incorporated within the design of the proposed wind farm

- vehicle size, weight and clearance distances
- maintenance of public access requirements
- stability of ground conditions
- prevention of conflict with underground or overhead services
- traffic control
- construction requirements

The construction of the development site would be managed in accordance with the Health and Safety at Work etc. Act 1974 and comply with the relevant Health and Safety Regulations including

- The Management of Health and Safety at Work Regulations 1999
- The Construction (Health, Safety and Welfare) Regulations 1996, by Statutory Instruments 1996/1592, 1998/494, 1999/3242 and 2000/2380
- Construction (Design and Management) Regulations 1994 (as amended)
- Electricity Safety, Quality and Continuity Regulations 2002
- Electricity at Work Regulations 1989
- The Control of Noise at Work Regulations 2005
- Personal Protective Equipment at Work Regulations 1992
- Manual Handling Operations 1992
- The Lifting Operations and Lifting Equipment Regulations 1998
- Construction (Head Protection) Regulations 1989
- The Health and Safety (Safety Signs and Signals) Regulations 1996
- The provision and use of work equipment regulations (PUWER)
- Pressure Equipment (Amendment) Regulations 2002
- Work at Height Regulations 2005
- Personal Protective Equipment Regulations 2002
- Control of substances hazardous to health (COSHH)
- The manual handling regulations

The site would operate to the BWEA (British Wind Energy Association) Guidelines for Health and Safety in the Wind Energy Industry. Potentially hazardous areas such as foundation excavations would be fenced and signed as appropriate.

14.5.2 Operation

A Supervisory Control and Data Acquisition (SCADA) system monitors the performance of the wind farm and should a fault occur a message is automatically sent to the wind farm engineer preventing emergency situations from arising.

Warning signs and security infrastructure would be in place around the control building to ensure public safety.

The BWEA Wind Turbine Safety Rules have been developed by wind farm owners and operators to develop a safe system of work for operational onshore and offshore turbines in the UK. These would be implemented at the site.

14.5.3 Driver Distraction

There is no documented evidence from Highways Agency's own records of existing wind farms located near roads being linked to driver distraction or effects on road safety. The proposed Spicer Hill Wind Farm is adjacent to the A628 and A629. Royd Moor Wind Farm has been operational since 1993 and no incidents of road traffic accidents resulting from driver distraction as a consequence of the wind farm have been recorded.

Beyond the vicinity of the site, there are numerous examples of wind farms in close proximity to major roads. The A68 passes straight through Dun Law Wind Farm. Lambrigg Fell Wind Farm is located immediately adjacent to and to the west of the M6 in the Lake District. The Green Park turbine in Reading is within 300m of the M4 and seen by over 10,000 car drivers every year.

There is no documented evidence of existing wind farms located near roads being linked to driver distraction or effects on road safety. Drivers are faced with a number of varied and competing distractions during any normal journey, including advertising hoardings deliberately designed to attract attention. Turbines pose no greater distraction than other features of interest within the landscape. The situation of Spicer Hill Wind Farm on a ridge is such that the turbines will be visible to drivers on approach and will not suddenly appear in the view.

There is no evidence to suggest that Spicer Hill Wind Farm would result in any decrease in highway safety due to driver distraction.

14.6 EFFECTS OF WEATHER

Due to the exposed nature of wind farm sites, wind turbines are designed to withstand extreme weather conditions.

14.6.1 Extreme Winds

The turbines would be fitted with sensors which would automatically shut down and brake (or "park") the turbines should very high wind speeds occur which exceed safe operating limits. This prevents excessive wear on the gear box and damage to the turbines.

14.6.2 Lightning Strike

The turbines would also be equipped with lightning protection equipment. In the event of a lightning strike, the equipment will effectively and safely conduct the lightning strike into the earth.

14.6.3 Icing

In certain meteorological conditions, such as still, cold weather, it is possible for ice to form on the rotor blades. If this occurs, two types of risk may result

- ice fragments thrown from the rotor and
- ice fall from the turbines while shut down.

Ice throw has been noted as a higher risk in very cold climatic conditions for example in the high latitudes of Scandinavia or the very high altitudes in Europe. The most severe icing is due to in-cloud icing which is typical in mountainous regions. This occurs when a super cooled cloud collides with a cold surface causing ice to accumulate. Ice fall may occur when ice accumulates on a turbine and then falls to the ground after temperatures begin to rise and the ice melts. This phenomenon is observed during times when the temperature warms following a period of extreme cold weather conditions.

Due to the more temperate climate of the United Kingdom, it is considered that suitable weather conditions for icing occur for less than seven days per year² within this area.

Despite the low risk, the turbines would be fitted with vibration sensors which detect any imbalance such as that caused by icing, in which case the affected turbines would be shut down. Inherent in the design of the layout is a further mitigation provided by the spacing between turbines and public rights of way, where a buffer of at least 84m, equivalent to the maximum tip height has been applied. In wind farms in the particular locations and circumstances where ice fall has actually been observed the statistical maximum of occurrence is within 50m of a turbine base. The most frequent observation is ice simply falling straight down and not being thrown laterally. Beyond a 50m radius of the base the statistical risk decreases rapidly to negligible.

Operational procedures would also be put in place to ensure the safety of both workers, the landowners and the public in relation to ice throw and ice fall. Procedures would include turbine shutdown and warning signage.

14.7 SUMMARY OF EFFECTS

A summary of the potential and residual effects and mitigation discussed in this chapter is included in Table 14.2

Table 14.2 Summary of Effects Table

Potential Effect	Mitigation	Residual Effect
Construction Effects		
Dust Nuisance	Use of water sprays and good construction practices	No significant effect
Site Health & Safety	Relevant health & safety regulations and guidelines will be followed to ensure safe design and construction of the wind farm site.	No significant effect
Operational Effects		
Emissions savings	None necessary	Positive effect from emission savings of CO ₂ , during wind farm's 25 year operational lifetime.
Site Health & Safety	Relevant health & safety regulations and guidelines will be followed to ensure safe operation of the wind farm site.	No significant effect
Driver Distraction	None necessary	No significant effect
Effects of Weather	Sensors and protection equipment fitted to turbines and operational procedures to mitigate any risks.	No significant effect
Potential for shadow flicker effect at 3 properties.	Monitoring of effects, identified control measures at receptor or source as required.	No properties affected by shadow flicker – no significant effect
Decommissioning Effects		
Site Health & Safety	Relevant health & safety regulations and guidelines will be followed to ensure safe decommissioning of the wind farm site.	No significant effect

14.8 STATEMENT OF SIGNIFICANCE

Spicer Hill Wind Farm will have a positive effect through the saving of greenhouse gas and other polluting emissions. During the course of every year of its 25 year operational life, the

² Wind Energy Production in Cold Climate (WECO), 1999, Garrad Hassan & Partners Ltd (W/11/00452/REP)

electricity generated by the wind farm could displace between 4435 and 10497 tonnes of CO₂ from entering the atmosphere.

Any health and safety risks will be addressed through mitigation measures and normal construction and operational procedures. All relevant legislation will be adhered to during all stages of development. The implementation of current best practice and technology will be used so as to minimise any health and safety risks that might be associated with this project. The implementation of the construction design and management principles will result in a quality wind farm development, built, operated and maintained to the highest standards of safety. Sensors and protection equipment will be fitted to turbines and operational procedures followed to mitigate any safety risks associated with extreme weather. As such there will be no significant effects in relation to health and safety.