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Guidance on the Application of Separation Distances from Residential Properties (May 2014) - Full Report

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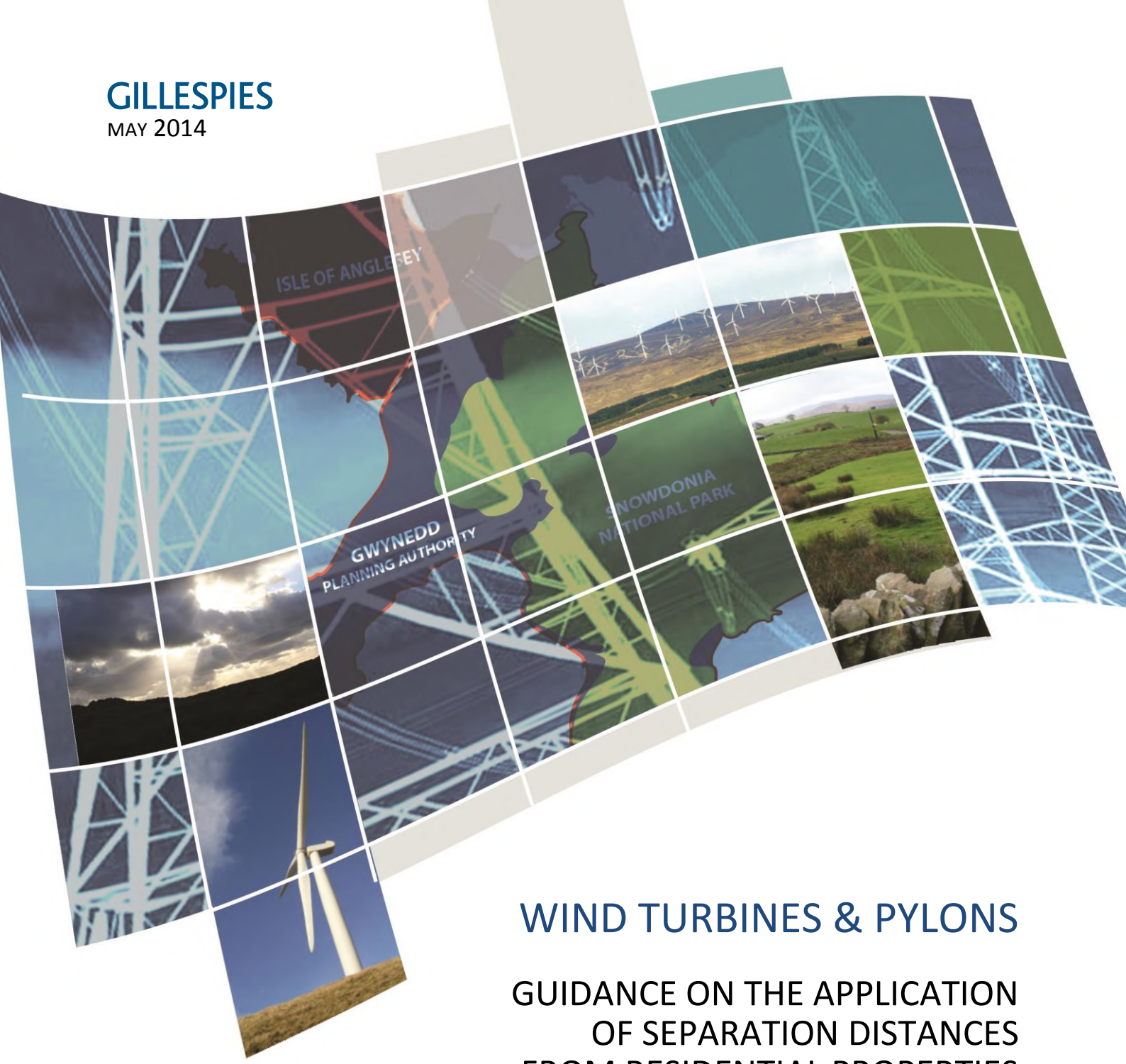

WIND TURBINES & PYLONS

GUIDANCE ON THE APPLICATION OF SEPARATION DISTANCES FROM RESIDENTIAL PROPERTIES

FINAL REPORT

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SECTION 1: INTRODUCTION

Residential visual amenity refers to the visual amenity experienced by residential properties including their gardens. It is a subset of residential amenity which also includes aspects such as noise, light and vibration.[1] In making judgements about residential visual amenity, it is important to note that a potential significant adverse change to an outlook from a property does not in itself result in material harm to living conditions – there needs to be a degree of harm over and above this, for example undue obtrusiveness or overbearing effect, to warrant a refusal[2] or recommendation for refusal of a planning application.

Purpose of the Study

1.1 This study was commissioned by Gwynedd Council, Isle of Anglesey County Council (the Councils) and Snowdonia National Park Authority (the 'Park Authority') to determine the appropriateness of applying minimum separation distances between wind turbines or pylons and residential properties, to protect residential visual amenity.

1.2 The Councils and Park Authority are experiencing a range of pressures relating to wind energy and 400 kV overhead line developments. Local communities and Councillors are concerned about the potential visual impacts of wind turbines or pylons on views from residential properties within the study area, which is illustrated in Figure 1.

[1] The approach taken by inspectors in England confirms that in planning, no individual has a right to a particular view. However there may be a point when, by virtue of the proximity, size and scale of a development, a residential property would be rendered so unattractive a place to live that planning permission should be refused. Whilst the assessment of whether a change in outlook materially harms residential amenity or living conditions is ultimately a planning issue, a judgement on the visual component of residential amenity is often needed from a landscape architect to inform the planning judgement and this is increasingly being undertaken as part of a formal Environmental Impact Assessment (EIA). There is no published guidance that sets out the criteria for establishing whether or not the visual presence of a development impacts unacceptably on living conditions although the issue has been considered at a number of public inquiries, principally in England.

[2] Knight R., '*Residential Visual Amenity Assessment: Its Place in EIA'*, IEMA, published by the Environmentalist Online (July 2012).

Figure 1: Study Area

1.3 The study provides an evidence base to inform policies in the emerging Anglesey and Gwynedd Joint Local Development Plan (JLDP) and any review of policy in the Eryri Local Development Plan (ELDP); it may also be a material planning consideration for considering relevant planning applications in the intervening period.

Study Approach

1.4 There is no nationally recognised method for establishing generic minimum separation distances for wind turbines or pylons from residential properties based on potential visual impacts. As stated in paragraph 2.6, Welsh Government advice is that each case should be judged independently and on its own merits.

1.5 As a starting point to establish whether or not minimum separation distances should be applied, and if so what these should be, the following desk based research and analysis of the issues was initially undertaken:

- National, regional and local planning policy and guidance;
- Other current related guidance;
- Comparative studies; and
- Planning appeal decisions (including liaison with Joint LDP officers and other Local Authorities in Wales to identify relevant planning appeal decisions and any other relevant data which could be used as evidence to back up the study).

1.6 The results of the desktop research were analysed and an appropriate range of distances identified (from which to assess the likely scale of the visual impacts of existing wind turbines and pylons) in order to test and/or back up the research.

1.7 GIS data (provided by the Councils and Park Authority) was used to identify a number of accessible locations within the study area from which existing wind turbines and pylons could be viewed in the landscape. One example from each wind energy height band and two pylons were selected and field work undertaken.

1.8 Following the data gathering and field work a set of draft recommendations were presented to the Steering Group for review and discussion before the final report was drafted.

Report Structure

1.9 The remainder of the report is structured as follows:

SECTION 2: Evidence Base

SECTION 3: Assessment of Visual Impacts

SECTION 4: Testing Distances on Site

SECTION 5: Recommendations

SECTION 2: EVIDENCE BASE

Review of Legislation, Policy and Guidance

2.1 The table set out in Appendix 1 provides a catalogue of research into relevant UK legislation, policy and guidance related to separation distances between wind turbines or pylons and residential properties as of April 2014.

2.2 The review of the legislation, policy and guidance for wind turbines quickly revealed that the establishment of separation distances between turbines and residential properties in respect to residential visual amenity is not a straightforward matter. This is reflected in the wide variety of separation distances recommended by both national and local planning guidance. The only current national guidance on separation distance for visual amenity is the 2 km community separation distance[3] applied in Scotland. Local planning guidance varies greatly; for instance guidance on separation distances between turbines of around 20 m - 25 m to blade tip and residential properties ranges from 350 m (Milton Keynes Local Plan) to 1 km (Wiltshire Core Strategy). It is important to note that the height bands/descriptions of turbines often varies in national and local guidance and the establishment of minimum separation distances sometimes takes into consideration other factors such as noise and shadow flicker. Some local authorities apply relatively rigid separation distances from residential properties whereas others provide more general guidance and acknowledge that factors such as topography and vegetation may reduce impacts on residential visual amenity.

2.3 National policy and guidance is summarised in the following paragraphs.

National Policy and Guidance Context – Wind Turbines

2.4 In **Wales** there are currently no nationally prescribed minimum separation distances between proposed wind turbines and existing residential properties based on potential adverse visual impacts. National planning policy requires that local planning policy and guidance be based on robust evidence.

2.5 Annex D of Technical Advice Note (TAN) 8: Planning for Renewable Energy, provides a potential methodology for local planning authorities with Strategic Search Areas which suggests minimum separation distances between wind turbines and residential properties, specifically in relation to **noise impacts**, as follows:

[3] Separation distance between communities and wind farms

"500 metres is currently considered a typical separation distance between a wind turbine and residential property to avoid unacceptable noise impacts. However, when applied in a rigid manner it can lead to conservative results and so some flexibility is advised." [4]

2.6 The Welsh Government response to the Petitions Committee (June 2012) confirmed *'Welsh Government guidance in respect of separation distances contained in TAN 8 relates to methodological guidance for local planning authorities in refining the boundaries of Strategic Search Areas and remains unchanged.'* and stated *'we would therefore expect separation distances to be determined locally based upon the rigorous assessment of local impacts. The Welsh Government believes that a rigid minimum separation distance could unnecessarily hinder the development of renewable energy projects in Wales. We have taken the consistent view that the issue of separation distances between residential premises and wind turbines is best determined locally on a case-by-case basis, taking on board locally sensitive issues such as topography, local wind speeds and directions as well as the important considerations of visual and cumulative impacts.'*

2.7 In response to a written question to the National Assembly for Wales[5], Jane Davidson (Environment Sustainability and Housing Minister) confirmed that:

"The issue is less to do with distance than the need to limit noise from wind farms to 5 decibels above background noise for both day and night time. The separation distances between wind turbines and residential properties can be examined as part of the refinement work by local planning authorities and on a case by case basis, taking into account topography and orientation, when decisions on planning applications are taken".

2.8 In **Scotland**, Scottish Planning Policy (SPP)[6] provides the following guidance relating to separation distances for wind farms in relation to visual impacts:

"Separation distance of up to 2km between areas of search and the edge of cities, towns and villages is recommended to guide developments to the most appropriate sites and to reduce visual impact, but decisions on individual developments should take into account specific local circumstances and geography. Development plans should recognise that the existence of these constraints on wind farm development does not impose a blanket restriction on development, and should be clear on the extent of constraints and the factors that should be satisfactorily addressed to enable development to take place. Planning authorities should not impose additional zones of protection around areas designated for their landscape or natural heritage value."

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[4] Paragraph 3.4, Proximity to Residential Dwellings, Annex D of TAN 8 (wales.gov.uk/topics/planning/policy/tans/tan8/?lang=en)
[5] National Assembly for Wales, Answers issued to Members on 21 January 2008, WAQ50841
[6] Scottish Planning Policy, (February 2010) scotland.gov.uk/Resource/Doc/300760/0093908.pdf supplemented by online renewables planning advice, Onshore Turbines (Dec 2013) scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables/Onshore

2.9 The Scottish Government recently consulted on a proposal to increase the community separation distance guide for wind farms from *"...up to 2km"* (SPP February 2010, para 190[7]) to *"...up to 2.5km"* (Draft SPP for Consultation April 2013, paragraph 218[8]). Following consultation responses, Scottish Government commissioned research on community separation distance to inform the final SPP[9]. The research[10] concluded that there was an absence of robust evidence behind the 2 km separation distance but taking into account public acceptance of this there was an argument for retaining the existing 2 km separation distance (with clearer definitions of relevant terms). It also stated that another option was to remove the 2 km distance from SPP altogether although retaining reference to visual impact as a criterion. The revised SPP is due to be published in June 2014.

2.10 SNH published guidance Visual Assessment of Windfarms: Best Practice[11] states that *"Distance should not be used mechanistically to predict magnitude[12] at a particular viewpoint because of the potential effects of other modifying factors".* However, a number of Local Authorities do provide guidance on separation distances for wind turbines as part of Supplementary Planning Guidance documents.

2.11 In **England** there are currently no separation distance guidelines for wind turbines.

National Policy and Guidance Context – Pylons

2.12 There is currently no published planning guidance within the UK relating to separation distances between pylons and residential properties. However the Holford Rules[13] with NGC (1992) and SHETL (2003) notes refer to minimising impacts on people, residential areas etc. as follows:

'a. Avoid routeing close to residential areas as far as possible on grounds of general amenity.

b. In rural areas avoid as far as possible dominating isolated houses, farms or other small-scale settlements'[14]

The Holford Rules are the current guidelines referenced in the National Planning Statements for Nationally significant Infrastructure Projects.

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[7] Scottish Planning Policy, (February 2010) scotland.gov.uk/Resource/Doc/300760/0093908.pdf
[8] Draft Scottish Planning Policy for Consultation (April 2013) - scotland.gov.uk/Publications/2013/04/1027/downloads
[9] scotland.gov.uk/Resource/0044/00441852.pdf
[10] Research carried out by ClimateXChange and the University of Dundee, Sept 2013 climatexchange.org.uk/files/5313/8496/4510/CXC_Report_-_Separation_distances_for_Wind_Farms.pdf
[11] University of Newcastle (2002) Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A
[12] The magnitude of the visual effects refers to not only the scale of the change of view (including the nature of the view, the degree of visible contrast or changes in the landscape and the nature of the view) but also the geographical extent of the view (including angle of view, distance from receptor and extent of the area over which changes would be visible) and the duration and reversibility of visual effects.
[13] Guidelines used by National Grid for the routeing of new overhead lines, the Holford Rules were originally set out in 1959 by Lord Holford, which have been reviewed and supplemented and form the basis for the approach to routeing new overhead lines.
[14] Further notes on clarification to Holford Rule 7

Review of Planning Appeals and Applications

2.13 A summary of research into recent UK planning appeals and applications, in connection with wind energy and 400 kV overhead line developments, is included in the following paragraphs.

Review of Planning Appeals – Wind Turbines

2.14 The table set out in Appendix 2 summarises the reviews of a number of planning appeals for proposed wind energy developments (most cases dating from 2009). Each written appeal decision was analysed; particularly key text relating to observations on residential visual amenity and the distances of proposed turbines from residential properties. Details of the heights of turbines and their distances from properties are included in the table together with resultant conclusions/comments on whether or not the overall effect on residential visual amenity was deemed to be unacceptable i.e. **so unpleasantly overwhelming and unavoidable that it may result in a material harm to living conditions to warrant a refusal of planning permission in the public interest**.

2.15 Although there is currently no published guidance on how impacts on residential visual amenity should be assessed, unacceptable impacts on residential visual amenity have been defined by Planning Inspectors, as follows:

'…there is no right to a view per se, and any assessment of visual intrusion leading to a finding of material harm must therefore involve extra factors such as undue obtrusiveness, or an overbearing impact leading to a diminution of conditions at the relevant property to an unacceptable degree' (paragraph 32 of the Sixpenny Wood decision notice; Appeal ref: APP/E2001/A/09/2101851; Decision 8 December 2009)

"...when turbines are present in such number, size and proximity that they represent an unpleasantly overwhelming and unavoidable presence in main views from a house or garden, there is every likelihood that the property concerned would become widely regarded as an unattractive and thus unsatisfactory (but not necessarily uninhabitable) place in which to live. It is not in the public interest to create such living conditions where they did not exist before." (paragraph 66 of the Enifer Downs decision notice; Appeal ref: APP/X22201/A/08/2071880; Decision 16 March 2009)

2.16 In the case of the Burnthouse Farm appeal case (APP/D0515/A/10/2123739) the decision letter on behalf of the Secretary of State, provided the following clarification on the Inspector's Report, reinforcing the fact that a judgement of a significant adverse visual impact is not enough to merit refusal (IR):

'For the reasons given at IR229-232, the Secretary of State agrees with the Inspector that serious harm to living conditions which might lead to a recommendation for planning permission to be refused, in the public interest, is a more stringent requirement than the identification of a significant adverse impact. He further agrees that when assessing the effect on visual outlook, it

is helpful to pose the question 'would the proposal affect the outlook of these residents to such an extent, i.e. be so unpleasant, overwhelming and oppressive that this would become an unattractive place to live?'[15]

Review of Planning Applications – Pylons

2.17 There have been no recent planning appeals in connection with 400 kV overhead line developments. However, one of the more recent 400 kV overhead line developments to receive planning permission in the UK is the upgraded Beauly to Denny line in Scotland, which was granted in 2010. Chapter 24 (Visual Effects) of the Beauly to Denny Environmental Statement (ES) stated the following:

'every effort has been made to maintain a minimum distance of 100 m between any residential property and the proposed line' (paragraph 24.5.1.3)

'The 100 m distance has been established as a general guide in order to address concerns relating to visual amenity. The 100 m distance has been proposed as, at this distance, for a property located on level ground and with a garden extending to 15 m from the house, a 10 m tall tree at the end of the garden will screen views of a 55 m tall tower located at 100 m from the property. However, not all properties will be on level ground or with gardens 15 m in length. The situation at each property close to the line has been assessed and the information relating to properties where a major adverse effect is anticipated, is included in Technical Annex 24.2.' (paragraph 24.5.1.4)

2.18 Of the properties assessed within Technical Annex 24.2 (Proximity Survey) of the ES, all of the properties where a major (very large) adverse impact was anticipated were within 400 m of the proposed line and most were within 200 m. No specific residential visual amenity assessment was carried out in support of the application.

[15] 11-07-06 3-in-1 Burnthouse Farm Fenland 2123739 (pcs.planningportal.gov.uk/pcsportal/ShowDocuments.asp)

SECTION 3 : ASSESSMENT OF VISUAL IMPACTS

Scale of visual impact refers to the following:

- 'The scale of change in the view with respect to the loss or addition of features in the view and changes in its composition, including the proportion of the view occupied by the proposed development;
- The degree of contrast or integration of any new features or changes in the landscape with the existing or remaining landscape elements and characteristics in terms of form, scale and mass, line, height, colour and texture; and
- The nature of the view of the proposed development, in terms of the relative amount of time over which it will be experienced and whether views will be full, partial or glimpses.'[16] (GLVIA3, paragraph 6.39)

A very large scale of visual impact can be defined as a very large scale change in a view that introduces new, non-characteristic or discordant or intrusive elements into the view which may form the principal element of/or dominate the view and may overpower the viewer. This may occur where a proposed development would be in close proximity to the viewer, in a direct line of vision, or affecting a substantial part of the view and where it would be prominent within, or contrasts with, the visual context, and detracts from its visual amenity.

3.1 Although there is currently no published guidance on how impacts on residential visual amenity should be assessed there are common threshold criteria which have been applied by Inspectors when considering the acceptability of impacts on residential visual amenity (whether or not a development may be likely to cause a change in outlook which would materially harm residential amenity or living conditions).

3.2 Following the review of recent planning appeals, and from experience in carrying out Landscape and Visual Impact Assessments (LVIA) and residential visual amenity assessments, it is recognised that **the threshold for unacceptable visual impacts may often be higher than the point at which the scale of visual impact is assessed to be very large.** However, for the purposes of the consideration of separation distances between residential properties and wind turbines or pylons, it is recommended that the threshold for considering whether there would be an unacceptable impact on residential visual amenity would be from any property where the visual impact is predicted to be very high.

[16] Landscape Institute and Institute for Environmental Management and Assessment (2013) Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Routledge

The Assessment of Visual Impacts of Wind Turbines or Pylons on Residential Properties

3.3 Principles regarding the assessment of the potential visual impacts of wind turbines or pylons are set out in the following guidance documents:

- Landscape Institute (LI) and Institute of Environmental Management Assessment (IEMA) (Third Edition 2013) Guidelines for Landscape and Visual Assessment (GLVIA3);
- LANDMAP Guidance Note 3: Guidance for Wales, Using LANDMAP for Landscape and Visual Impact Assessment of Onshore Wind Turbines (May 2013);
- University of Newcastle (2002) Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A; and
- Holford Rules - with National Grid Company (NGC) 1992 and Scottish Hydro Electric Transmission Limited (SHETL) 2003 notes.

3.4 When assessing the significance of visual impacts of a wind turbine or pylon on a residential receptor the potential **scale of impact or change in a view** is considered together with the **sensitivity** of the receptor. As noted in GLVIA3, it is generally accepted in the landscape profession that **residential receptors are considered high sensitivity visual receptors so the only variable then becomes the scale of impact**.

3.5 **Scale of impact** is often described as high, medium, low or negligible (positive, negative or neutral) but terminology such as very large, large, medium, small, very small and negligible (positive, negative or neutral) can also be used.

3.6 The assessment of the likely scale of impact will depend on the extent of changes in the composition of a view brought about by the introduction of a wind turbine or pylon; taking into account proximity and the proportion of the view occupied by the development and also their apparent prominence as determined by a number of modifying factors (discussed further in paragraph 4.14 and Table 4.4).

3.7 **The most significant adverse visual impacts are predicted where residential receptors (residential properties) may experience a very large scale of impact (or change in their view).** Because this study is primarily concerned with establishing whether or not a minimum separation distance should be applied to prevent unacceptable impacts on residential visual amenity it is important to reiterate the fact that a significant adverse impact on a view from a residential property does not in itself result in material harm to living conditions *'there needs to be a degree of harm over and above this to warrant a refusal in the public interest'*[17]

[17] Knight R., '*Residential Visual Amenity Assessment: Its Place in EIA*', IEMA, published by the Environmentalist Online (July 2012).

Wind Energy Development Height Bands

3.8 In order to assess the distances at which wind turbines of different heights may give rise to very large scales of visual impact, the following five height bands[18] are considered:

- Up to 25 m
- 25.01 – 50 m
- 50.01 – 75 m
- 75.01 – 100 m
- Over 100.01 m

3.9 These bands are broadly based on the heights set out in the wind energy development typologies identified within the Isle of Anglesey, Gwynedd & Snowdonia National Park, Landscape Sensitivity and Capacity Assessment[19].

3.10 It is important to note that applications and enquiries for large scale wind energy developments (typically turbines over 80 m high) are most commonly associated with TAN 8 SSAs. There are no SSAs within Gwynedd, the Isle of Anglesey or Snowdonia National Park; however, there are several large developments to the north of Anglesey (including three operational wind farms). There are also three SSA's within relatively close proximity to the National Park (SSA A, B and D). There are currently no wind turbines over 100.01 m in the study area, therefore it was not possible to make on site assessments of turbines over this height.

3.11 The Landscape Sensitivity and Capacity Assessment[20] study recommends that there is no further capacity for wind energy developments comprising turbines above 50 m within the study area. However, turbines above 50 m are included in this study for reference as these relate to some operational/consented wind energy developments within the Isle of Anglesey and also within neighbouring Authorities to Gwynedd and Snowdonia National Park.

[18] All references to heights of wind turbines in this report refer to height to blade tip.
[19] Gillespies (2014), Isle of Anglesey, Gwynedd & Snowdonia National Park, Landscape Sensitivity and Capacity Assessment
[20] Gillespies (2014), Isle of Anglesey, Gwynedd & Snowdonia National Park, Landscape Sensitivity and Capacity Assessment

Pylons

3.12 Although pylons for 400 kV overhead line developments can vary in height from around 35 to 60 m, this study focusses on pylons ranging from 40 – 60 m as this is the height range most typically found within the study area. It also only considers pylons of the traditional steel lattice tower design.

SECTION 4 : TESTING DISTANCES ON SITE

Field Based Review

4.1 Following the desk top research, a field based review was undertaken to establish the range of distances within which wind turbines or pylons may give rise to a very large scale of visual impact (and therefore may give rise to unacceptable impacts in terms of residential visual amenity).

4.2 The results of the desktop research were compiled to identify an appropriate range of distances to be tested on site (for various heights of wind turbines or pylons). The maximum distances established for assessment purposes varied from around 2 km for turbines up to 100 m in height down to 500 m for turbines up to 25 m in height. The 2 km distance was included as a conservative distance as most of the desk based research revealed that a turbine of 100 m would be highly unlikely to give rise to unacceptable harm on residential visual amenity from beyond 1 km.

4.3 It is important to note that the scope of this study is limited. One operational turbine example, from within each of the height bands listed in paragraph 3.821, and two examples of pylons were chosen within the study area in collaboration with the Steering Group (based on existing operational wind turbine GIS data and OS data). In addition to height, the criteria for choosing the turbines and pylons included accessibility in terms of the openness of views and public accessibility for site assessment and photography. The two pylon examples were chosen to illustrate the differences in scale of visual impacts and demonstrate the effects of modifying factors such as whether the structure was seen against a solid background such as landform or vegetation or skylined.

4.4 The height and co-ordinates of the wind turbines were provided by the Steering Group. The locations of the pylons were based on 1:25,000 OS data and the heights of pylons provided by National Grid.

4.5 Details of the turbines and pylons chosen and assessed on site are presented in Table 4.1 together with their corresponding Figures which are included in Appendix 3. The figures in Appendix 3 illustrate the photographs taken on site, together with the viewpoint locations in relation to the turbine(s) or pylon(s) being assessed.

[21] Note: This is excludes turbines over 100.1 m as there are currently no operational turbines over this height in the study area.

Table 4.1: Details of Wind Turbines and Pylons Assessed on Site

	Height*	Corresponding Figures (Appendix 3)
Wind Turbines	17.8 m	Figure A3-1.1 : Viewpoint Locations for Wind Turbine - 17.8 m High Figure A3-1.2: Views to Wind Turbine - 17.8 m High
	34.2 m	Figure A3-2.1: Viewpoint Locations for Wind Turbine – 34.2 m High Figure A3-2.2: Views to Wind Turbine – 34.2 m High
	53 m	Figure A3-3.1: Viewpoint Locations for Wind Turbine - 53 High Figure A3-3.2: Views to Wind Turbine - 53 m High
	93 m	Figure A3-4.1: Viewpoint Locations for Wind Turbine - 93 m High Figure A3-4.2: Views to Wind Turbine - 93 m High
Pylons	50–59 m	Figure A3-5.1: Viewpoint Locations for Pylons 50-59 m High Figure A3-5.2: Views to Pylons 50-59 m High
	55-59 m	Figure A3-6.1: Viewpoint Locations for Pylons 55-59 m High Figure A3-6.2: Views to Pylons 55-59 m High

*Height of wind turbine measured to blade tip

4.7 The viewpoint photographs were taken using the same camera and lens setting to obtain a like for like comparison for illustration purposes (based on current guidance - The Landscape Institute, Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment, March 2011); however, it is important to note that although photographs are useful they are no substitute for the true experience of the receptor on site.

4.8 Supplementary photographs of the Pylons in the range of 55-59 m high are included in Appendix 4 for illustrations purposes. These photographs were re-taken by Gwynedd Council to illustrate the effects of the pylons under different weather conditions; however, they have not replaced the original study photographs as they were taken using a different camera/lens setting, and from slightly different viewpoints. This is an interesting example which not only illustrates how the pylons can appear differently under different weather conditions but also reinforces the point that photographs can be deceptive and as stated above should not replace site based assessment.

4.9 The site based assessments of each of these examples established an indicative range of distances from which such structures may start to give rise to a very large scale of visual impact. Table 4.2 summarises the findings of the site based review.

Table 4.2: Results of Site Based Assessments

	Height*	Indicative distances within which the structure may give rise to a very large scale of visual impact
Wind Turbines	**17.8 m**	c. **130 m**
	34.2 m	c. **280 m**
	53 m	c. **400 m**
	93 m	c. **750 m**
Pylons	**50-59 m**	c. **400 m**
	55-59 m	c. **400 m**

*Height of wind turbine measured to blade tip

Theoretical Apparent Height Model in Support of Field Based Review

4.10 It can often be difficult to perceive the height of a wind turbine or pylon during a site assessment; in particular when assessing the potential visual impacts of a proposed development. This is due to a combination of a lack of reference e.g. mature trees or buildings close to potential sites, and assessing viewpoints at some distance.

4.11 In support of the site based assessment a mathematical model was used to calculate the apparent height of a turbine or pylon when its true height and distance from a viewer are known. **The apparent height of a turbine or pylon is defined as the height that the structure would appear at arm's length (61 cm) from the viewer** (i.e. the structure would appear to be the same height as an X cm high object held at arm's length (61 cm) from the viewer).

4.12 The formulae presented in Appendix 5 are used to work out the apparent height of a structure at arm's length (61 m), when the true height and distance from the viewer are known.

4.13 The apparent heights of the wind turbines and pylons assessed on site have been worked out (based on this model) and are shown alongside the viewpoints in Appendix 3 (for a comparison of known distances and apparent height). Table 4.3 demonstrates that there is a correlation between the apparent height of the structure and the indicative distances within which the structures may give rise to very large scales of visual impacts.

Table 4.3: Results of Site Based Assessments

	Height*	Indicative distances within which the structure may give rise to a very large scale of visual effect	Apparent Height of Structure (at arm's length – 61 cm)
Wind Turbines	**17.8 m**	c. **130 m**	8.35 cm
	34.2 m	c. **280 m**	7.45 cm
	53 m	c. **400 m**	8.08 cm
	93 m	c. **750 m**	7.56 cm
Pylons	**50-59 m**	c. **400 m**	7.63 - 9.00 cm
	55-59 m	c. **400 m**	8.39 – 9.00 cm

*Height of wind turbine measured to blade tip

4.14 When comparing the apparent height values in Table 4.3 it was observed that when a turbine or pylon roughly appeared the same height (or more) as a 7.5 cm object held at arm's length (61 cm) from the viewer then there was potential that such a structure may give rise to a very large scale of visual effect due to its prominence in the view.

4.15 As discussed above and previously in paragraphs 2.10 and 3.6, in addition to the height of a structure and its distance from a receptor there are a number of modifying factors which may affect the assessment of the scale of visual impact by reducing or increasing it. These factors are outlined Table 4.4[22]:

[22]Based on Figure 2: Conceptual Model for Visual Impact Assessment, University of Newcastle (2002) Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A

Table 4.4: Modifying Factors

	Factors that may contribute to a <u>reduction</u> in the assessed scale of visual impacts	Factors that may contribute to an <u>increase</u> in the assessed scale of visual impacts
Relevant to Wind Turbines and Pylons	Occupies a small proportion of the view Well screened by vegetation/landform/other Partial or glimpsed view Oblique angle of view Viewer looks down onto structure from an elevated position Absence of visual clues/visual reference e.g. mature trees, buildings etc. Urban situation Scale of structure fits with scale of landscape (typically large) Backclothed Well accommodated within the view Complex scene Low contrast Time of day Season Weather Size and design of the wind turbine or pylon	Occupies a large proportion of the view Lack of screening In full view Direct angle of view Viewer looks up to structure from a low lying position Visual clues/visual reference e.g. mature trees, buildings etc. Rural situation Scale of structure conflicts with scale of landscape (typically small) Skylined Poorly accommodated within the view Simple scene High contrast Time of day Season Weather Size and design of the wind turbine or pylon
Specific to Wind Turbines	Existing movement within the view Speed of blade movement Design of turbine (ratio of blades to tower height/width) Few turbines visible Turbines are skylined Turbine layout relates well to landscape pattern Small geographical spread Poor weather/visibility	Lack of existing movement Speed of blade movement More than one turbine visible Layout of turbines Turbine layout relates poorly to existing landscape Wide geographical spread Good weather/visibility
Specific to Pylons	Pylon is seen backclothed against a solid background Few pylons visible Orientation of pylon(s)	Pylon is seen skylined Other pylons or vertical structures and creation of ‘wirescape’ More than one pylon visible, particularly if seen ‘stacked’ or ‘fenced’ against one another Orientation of pylon(s)

4.16 These modifying factors may rule out the potential of a wind turbine or pylon giving rise to unacceptable impacts on residential visual amenity, even if a residential property falls within the indicative distances shown in Table 4.3.

4.17 One example of how modifying factors can influence the scale of visual impact is illustrated in the photographs below. The true heights, distances from the viewer and the apparent heights of each of these pylons doesn't vary dramatically, however the resultant scale of visual impacts does. The photograph on the left illustrates how the scale of visual impacts of a pylon are reduced when it is viewed against the backdrop of a mountain from a slightly more elevated position; the bottom part of the structure is largely obscured by a stone wall field boundary and topography which further reduces the impact. The scale of visual impacts of the pylon in the photograph to the right are increased by the fact that it is viewed from a less elevated position and is much more visible, because it is on the skyline (even though vegetation screens the very bottom part of the structure).

Photograph 1: 50m high pylon
345 m from viewer
(apparent height 8.84 cm)

Photograph 2: 56m high Pylon
400 m from viewer
(apparent height 8.54 cm)

SECTION 5 : RECOMMENDATIONS

5.1 Analysis of current guidance and case law indicates that there are a variety of distances within which unacceptable impacts on residential visual amenity can occur and that this is by no means entirely dependent on the relationship between the height and proximity of a turbine or pylon from a residential property.

5.2 There is therefore no conclusive evidence to support the strict application of minimum separation distances between residential properties and wind turbines or pylons in terms of visual residential amenity. For this reason it is recommended that each proposed development should be considered on its own merits, on a case by case basis.

5.3 Although rigid separation distances are not recommended, the use of indicative residential visual amenity assessment trigger distances (within which there is potential for very large scale of visual impacts) is considered a valuable tool to identify any locations where a visual residential amenity assessment should be carried out to identify any potentially unacceptable impacts in terms of residential visual amenity.

5.4 The proposed guide to 'residential visual amenity assessment trigger distances' for broad height bands of wind turbines and/or pylons are presented in Table 5.1 below:

Table 5.1: Rough Guide to Residential Visual Amenity Assessment Trigger Distances for Wind Turbines and Pylons

	Height*	Residential Visual Amenity Assessment Trigger Distance (Potential '*Very Large*' Scale of Visual Impact)
Wind Turbine	Up to 25 m	Within 200 m
	25.01 - 50 m	Within 400 m
	50.01 – 75 m	Within 600 m
	75.01 – 100 m	Within 800 m
	Over 100.01 m	Within 800 m
Pylon	Up to 40 m	Within 350 m
	40.01 – 60 m	Within 500 m

*Height of wind turbine measured to blade tip

5.5 These distances are based on the findings of Table 4.3 and paragraph 4.14 which conclude that when a wind turbine or pylon would have an apparent height of around 7.5 cm (or more) it may give rise to a very large scale of visual impact.

5.6 Using the mathematical formula in Appendix 5 it is possible to refine the above guidelines further for each individual case to work out a more precise trigger distance for any height of wind turbine or pylon (including structures higher than 100 m). When the proposed height of a wind turbine or pylon is known, the distance at which its apparent height would be around 7.5 cm can be worked out as illustrated in Appendix 6. This formula can be used to work out and agree trigger distances for each individual scheme.

5.7 It is important to reinforce the fact that in addition to the above there are a number of modifying factors which may affect the assessment of the scale of visual impact by reducing or increasing it (refer Table 4.4). These will all need to be taken into consideration in the establishment of an agreed offset distance for carrying out a residential visual amenity assessment.

GLOSSARY AND ABBREVIATIONS

Backclothing	When a structure such as a wind turbine or pylon is seen against a solid backdrop such as vegetation or landform
Background	The background or backdrop against which a structure such as a wind turbine or pylon is viewed
EIA	Environmental Impact Assessment
ES	Environmental Statement
GIS	Geographical Information System
GLVIA3	Guidelines for Landscape and Visual Impact Assessment, Third Edition, published jointly by the Landscape Institute and Institute of Environmental Management and Assessment, 2013.
LVIA	Landscape and Visual Impact Assessment.
Magnitude*	A term that combines judgements about the size and scale of the effect. The extent of the area over which is occurs, whether it is reversible or irreversible and whether it is short or long term in duration.
Receptor	Physical or perceptual landscape resource, special interest, viewer group or individuals that may be affected by a proposal.
Residential Receptor	People living in a private residential property
Residential Visual Amenity*	A collective term describing the views and general amenity of a residential property, relating to the garden area and main drive, views to and from the house and the relationship of the outdoor garden space to the house.
Scale Indicators*	Landscape elements and features of a known or recognisable scale such as houses, trees and vehicles that may be compared to other objects where the scale of height is less familiar, to indicate their true scale.
Scale of Visual Impact	The size of an impact
Skylined / Skylining	When a structure such as a wind turbine or pylon is seen against the sky
Sensitivity*	A term applied to specific receptors, combining judgements of the susceptibility of the receptor to the specific type of change or development proposed and the value related to that receptor.
SSA	Strategic Search Area
Susceptibility	The ability of a defined landscape or visual receptor to accommodate the specific proposed development without undue negative consequences.
TAN 8	Technical Advice Note 8
Type or Nature of Effect	Whether an effect is direct or indirect, temporary or permanent, positive (beneficial), neutral or negative (adverse) or cumulative.
Visual Amenity*	The overall pleasantness of the views people enjoy of their surroundings which provide an attractive visual setting or backdrop for the enjoyment of activities of the people living, working and recreating, visiting or travelling through an area.
Visual Impact	Impacts on specific views and on the general visual amenity experienced by people (these can be adverse, neutral or beneficial)

Note: Descriptions marked with an asterisk are identical to those provided in the Third Edition Guidelines for Landscape and Visual Impact Assessment glossary or text.

REFERENCES

- ClimateXChange and the University of Dundee (Sept 2013) *Review of the 2Km separation distance between areas of search for onshore wind farms and the edge of cities, towns and villages. Scottish Government Commissioned Report*
- Gillespies (2014) *Isle of Anglesey, Gwynedd & Snowdonia National Park, Landscape Sensitivity and Capacity Assessment*
- Holford Rules *with National Grid Company (NGC) 1992 and Scottish Hydro Electric Transmission Limited (SHETL) 2003 notes*
- Knight R. (July 2012*) 'Residential Visual Amenity Assessment: Its Place in EIA', IEMA, published by the Environmentalist Online*
- Landscape Institute and Institute for Environmental Management and Assessment (2013) *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition, Routledge*
- Landscape Institute (March 2011) *Advice Note 01/11: Photography and photomontage in landscape and visual impact assessment*
- National Assembly for Wales (2008) *Answers issued to Members on 21 January 2008, WAQ50841* http://www.assemblywales.org/bus-home/bus-chamber/bus-chamber-third-assembly-written.htm?act=dis&id=71535&ds=1/2008
- Scottish Government (February 2010) *Scottish Planning Policy*
- Scottish Government (April 2013) *Draft Scottish Planning Policy for Consultation*
- University of Newcastle (2002) *Visual Assessment of Windfarms Best Practice. Scottish Natural Heritage Commissioned Report F01AA303A*
- Welsh Assembly Government (2005) *Technical Advice Note (TAN) 8: Planning for Renewable Energy*
- Welsh Assembly Government (June 2012) *Response to Petitions Committee*
- Scottish and Southern Energy (November 2009) *Proposed Beauly to Denny 400kV Overhead Transmission Line Environmental Statement (ES)* http://www.scotland.gov.uk/Topics/Business-Industry/Energy/Infrastructure/Energy-Consents/Beauly-Denny-Index/Environmental-Statement

Note: Other reference sources are included within Appendix 1 and Appendix 2.

APPENDICES

Appendix 1 : Summary Review of Legislation, Policy and Guidance

<table>
<tr><th>Authority/Document/ Year/Reference</th><th>Development type</th><th>Recommended Separation Distances – Summary</th><th>Recommended Separation Distances – Detailed Guidance</th></tr>
<tr><td colspan="4">Review of National Planning Policy and Guidance</td></tr>
<tr><td>Wales: Technical Advice Note 8(iii)</td><td>Wind Turbines</td><td>500m on the grounds of noise</td><td>‘500 metres is currently considered a typical separation distance between a wind turbine and residential property to avoid unacceptable noise impacts. However, when applied in a rigid manner it can lead to conservative results and so some flexibility is advised.’</td></tr>
<tr><td>Welsh Government Response to Petitions Committee June 2012</td><td>Wind Turbines</td><td>500m maintained as guidance distance but reiterated should not be applied rigidly</td><td>‘Welsh Government guidance in respect of separation distances contained in TAN 8 relates to methodological guidance for local planning authorities in refining the boundaries of Strategic Search Areas and remains unchanged. In this context TAN 8 states that "500m is currently considered a typical separation distance between a wind turbine and residential property to avoid unacceptable noise impacts, however when applied in a rigid manner it can lead to conservative results and so some flexibility is advised", we would therefore expect separation distances to be determined locally based upon the rigorous assessment of local impacts. The Welsh Government expects decisions on planning applications to respect Welsh planning policy as set out in Planning Policy Wales (PPW) and TAN 8: Renewable Energy.

The Welsh Government believes that a rigid minimum separation distance could unnecessarily hinder the development of renewable energy projects in Wales. We have taken the consistent view that the issue of separation distances between residential premises and wind turbines is best determined locally on a case-by-case basis, taking on board locally sensitive issues such as topography, local wind speeds and directions as well as the important considerations of visual and cumulative impacts.’</td></tr>
<tr><td>Scottish Planning Policy
PAN 45, 2002 (Planning Advice Note)

Subsequently revoked. See below</td><td>Wind Turbines</td><td>2km</td><td>‘Separation distance of up to 2km between areas of search and the edge of cities, towns and villages is recommended to guide developments to the most appropriate sites and to reduce visual impact, but decisions on individual developments should take into account specific local circumstances and geography. Development plans should recognise that the existence of these constraints on wind farm development does not impose a blanket restriction on development, and should be clear on the extent of constraints and the factors that should be satisfactorily addressed to enable development to take place. Planning authorities should not impose additional zones of protection around areas designated for their landscape or natural heritage value.’(Para 190)

Effect of turbines
<table>
<tr><th>Distance</th><th>Effect</th></tr>
<tr><td>Up to 2km</td><td>Likely to be a prominent feature</td></tr>
<tr><td>2-5km</td><td>Relatively prominent</td></tr>
<tr><td>5-15km</td><td>Only prominent in clear visibility – seen as part of the wider landscape</td></tr>
<tr><td>15-30km</td><td>Only seen in very clear visibility – a minor element in the landscape</td></tr>
</table></td></tr>
<tr><td>Scottish Government Online Renewables advice: Onshore Wind Turbines (2013)

http://www.scotland.gov.uk/Topics/Built-Environment/planning/National-Planning-Policy/themes/renewables/Onshore</td><td>Wind Turbines</td><td>2km</td><td>Separation Distances:
‘Paragraph 190 of the SPP refers to a guideline separation distance of up to 2km between areas of search for groups of wind turbines and the edge of towns, cities and villages, to reduce visual impact. However, this 2km separation distance is a guide not a rule and decisions on individual developments should take into account specific local circumstances and geography.’ (page 7)</td></tr>
<tr><td>Scottish Planning Policy – Consultation Draft (2013)</td><td>Wind Turbines</td><td>2.5km</td><td>Consultation draft proposed increasing separation distance from 2km to 2.5km:

‘Community separation: a separation distance of up to 2.5 km is recommended between wind farms and cities, towns and villages identified in the local development plan. This is to</td></tr>
</table>

Authority/Document/ Year/Reference	Development type	Recommended Separation Distances – Summary	Recommended Separation Distances – Detailed Guidance
Review of National Planning Policy and Guidance			
			reduce visual impact but decisions on individual developments should take into account specific local circumstances and geography. The guidelines should not be used to mitigate against noise and shadow flicker that will normally be subject to separate development management considerations.' (para 218) Following responses to the consultation, further research was commissioned (see University of Dundee report below) The revised SPP is due to be published in June 2014 which will set out the revised (if any) planning guidance in relation to separation distances.
Review of the 2 km Separation Distance Between Areas of Search for Onshore Wind Farms and the Edge of Cities, Towns and Villages **Prepared for Scottish Government by University of Dundee (2013)**	Wind Turbines	Two options proposed – the first to retain the existing 2km separation distance or secondly to remove reference to it from Scottish Planning Policy Revised Planning Policy containing the outcome of this decision due 2014	'While some conjectural allusion is made to the provenance of the 2km criterion in the SPP (Scottish Government, 2010), we nevertheless conclude that no definitive evidence was found to establish the provenance of the criterion; neither was a justification or rationale found for it being 2km; nor the precise size of wind turbines upon which the criterion was based. While a seemingly logical approach for increasing the separation distance to 2.5km exists… it is questionable to suggest that subjective aspects of visual impacts are directly proportional to physical distance.' It is generally acknowledged that the existence of clear planning policies and guidelines is correlated to the successful deployment of wind turbines. There is thus an argument for either 1) given existing public acceptance, retaining the existing 2km separation distance as a criterion in identifying spatial frameworks for wind energy in Scotland but with clear definitions of relevant terms or; 2) removing the 2km distance from SPP altogether although retaining reference to visual impact as a criterion.' (section 7)
Companion Guide to PPS22: Renewable Energy	Wind Turbines	Height of turbine plus 10%	'The minimum desirable distance between wind turbines and occupied buildings calculated on the basis of expected noise levels and visual impact will often be greater than that necessary to meet safety requirements. Fall over distance (i.e. the height of the turbine to the tip of the blade) plus 10% is often used as a safe separation distance.' (paragraph 51).
Northern Ireland: Planning Policy Statement: Related to wind farm development proximity to occupied dwellings. **Wind Turbines: Planning and Separation Distances (2013)**		10 times rotor diameter, but not less than 500m	In Northern Ireland, there is no statutory separation distances stipulated in legislation. Recommendations or suggestions for separation are made through planning policy and guidance. Planning policy and guidance influence and inform decisions made on applications, therefore it is good practice for a developer to adhere to the recommendations made, however, they are not obligated. Planning Policy Statement 18 (PPS18) suggests that turbines are a safe technology and that even in the rare event of structural damage occurring incidents of blade throw are most unlikely. Distances are calculated on the basis of noise levels so as to reduce nuisance: NIAR 767-13 Research Paper Northern Ireland Assembly, Research and Information Service. The minimum desirable distance between wind turbines and occupied buildings calculated on the basis of expected noise levels and visual impact will usually be greater than that necessary to meet safety requirements. Fall over distance (i.e. the height of the turbine to the tip of the blade) plus 10% is often used as a safe separation distance. The Department of the Environment's best practice guidance on PPS18 goes on to state that: As a matter of best practice for wind farm development, the Department will generally apply a separation distance of 10 times rotor diameter to occupied property (with a minimum distance of not less than 500m). (Section 2.1 - Wind Turbines: Planning and Separation Distances (2013))

Authority/Document/ Year/Reference	Development type	Recommended Separation Distances – Summary		Recommended Separation Distances – Detailed Guidance
Review of National Planning Policy and Guidance				
Wind Turbines (Minimum Distances from Residential Premises) Bill [House of Lords] 2010-12	Wind Turbines	Turbine height 25-50m 50-100m 100-150m >150m	Separation distance 1000m 1500m 2000m 3000m	Reached a Second Reading in June 2011 the Bill was discontinued and will make no further progress. Made provision for a minimum distance between wind turbines and residential premises according to the size of the wind turbine.
Onshore Wind Turbines (Proximity of Habitation) Bill [House of Commons] 2010-12	Wind Turbines	Ten turbine rotor diameters		The Bill had its first reading in November 2010 but subsequently failed to complete its passage through Parliament before the end of the session and therefore will make no further progress. It sought to give powers to local authorities to specify in their neighbourhood development plans a 'recommended best practice set-back distance' between onshore wind turbines and habitations.
Wind Turbines (Minimum Distance from Residential Premises) Bill [House of Lords] 2012-13	Wind Turbines	Re-introduction of the earlier Bill was given its first reading in May 2012.		'It has been mooted that a private members bill may result in mandatory minimum distances between turbines and dwellings. However at the present time this does not form part of Government policy and whether such measures would be enshrined in legislation is not known. The matter cannot therefore carry weight […..]' APP/U2615/A/10/2131105 (November 2010)
The Local Government Association (LGA) Feb 2011	Wind Turbines	600-800m for large wind turbines		'a setback distance of at least 600 – 800 metres from residential properties for large wind turbines. This may be reduced for smaller projects. Other land uses, including non-residential buildings and agriculture, can still be accommodated in this zone'. Section titled: designated areas and approximate setback distances.
Planning For Renewable Energy – A Companion Guide to PPS22, 2004	Wind Turbines	350m on grounds of Noise		Suggests separation distance of 350m

Authority/Document/ Year/Reference	Development type	Recommended Separation Distances – Summary	Recommended Separation Distances – Detailed Guidance
Review of Local Planning Guidance			
Aberdeenshire Local Plan (2012) http://www.aberdeenshire.gov.uk/planning/finalised/	Wind Turbines	Minimum of 400m on grounds of ice throw, shadow flicker, shadow throw and visual intrusion	Policy inf/7 (g): g) the proposal is sited to minimize adverse impact on the safety or amenity of any regularly occupied buildings and the grounds which they occupy - with regard to: ice throw in winter conditions, shadow flicker and shadow throw, visual intrusion, and the likely effect of noise generation. It is not anticipated that, taking into account all these factors, development would be less than 400m from the nearest dwelling and it is possible that a greater separation distance will be required;
Allerdale Wind Turbine Separation Distance Topic Paper	Wind Turbines	800m for turbines over 25m	'…the policy sets out a minimum separation distance of 800m between wind turbines (over 25m) and residential properties.
Camarthenshire Local Development Plan 2006-2021 (2011) http://www.carmarthenshire.gov.uk/english/environment/planning/planning%20policy%20and%20development%20plans/local%20development%20plan/pages/localdevelopmentplanhome.aspx	Wind Turbines	1500m (for large scale wind farms of 25 MW and over)	j) proposals will not cause an unreasonable risk or nuisance to, and impact upon the amenities of, nearby residents or other members of the public and should be located a minimum of 1500metres away from the nearest residential property (Policy RE1 Large Scale wind Power) Turbines are required to be sited a minimum of 1500 metres from the nearest residential property and shall pay due regard to the amenities of the residents and occupants of nearby properties. This requirement should reduce the potential nuisance arising from wind turbine operation, noise, shadow flicker, safety risk, radio or telecommunications interference. No turbine should cause demonstrable harm to the amenity of any resident. Proposals that would result in unacceptable nuisance arising from wind turbine operation, noise, shadow flicker, safety risk, radio, telecommunications or aviation interference will not be permitted. (para 6.7.12)
Cherwell: Planning Guidance on the Residential Amenity Impacts of Wind urbine Development (2011) http://modgov.cherwell.gov.uk/mgConvert2PDF.aspx?ID=8812	Wind Turbines	800m or no less than 3 times turbine height (to tip).	'Normally a minimum of 800m from dwellings. No less than 3 times turbine height (ground to blade tip). Settlements of more than 10 dwellings should not normally have turbines in more than 90 degrees of their field of view for a distance of 5km Individual dwellings should not normally have turbines in more than 180 degrees of their field of view for a distance of 10km
Fenland District Council Wind Turbine Development Policy Guidance Incorporating Revisions following Public Consultation (2009)	Wind Turbines	400m	'Proposals within 400m of settlement are highly unlikely to be considered acceptable in visual terms, unless existing features can be proven to fully screen views of the turbines, which otherwise would be dominant features and overpower sensitive receptors including residential locations. Proposals within 2km of settlement will need to be carefully considered as turbines are highly likely to be prominent features and command/control views for sensitive viewers, including residential properties, within this range. Existing features including built form and vegetation may be able to locally reduce visual impacts of turbines within this range.' (para 6.2)
Highland Renewable Energy Strategy (2006) http://www.highland.gov.uk/yourenvironment/planning/energyplanning/renewbleenergy/highlandrenewableenergystrategy.htm	Wind Turbines	1km	S.1 Devices should be positioned far enough away from residential areas and working places to avoid direct nuisance and disturbance. S. 2 Devices should be positioned so as to maintain at least a one km separation zone between dwellings and wind turbines S.3 The positioning of devices should also reflect the aesthetics of particular views. Developments should not take place in widely acknowledged and particularly important views, i.e. those generally valued by residents for their lack of other development influences such as wires, poles, signs, buildings, vehicles, or commercial forestry.

<table>
<tr><th>Authority/Document/ Year/Reference</th><th>Development type</th><th>Recommended Separation Distances – Summary</th><th>Recommended Separation Distances – Detailed Guidance</th></tr>
<tr><td colspan="4">Review of Local Planning Guidance</td></tr>
<tr><td>Huntingdonshire District Council Cumulative Landscape and Visual Impact of Wind Turbines in Huntingdonshire (2013)</td><td>Wind Turbines</td><td>Guidance provided in relation to dominant, prominent, conspicuous, apparent, inconspicuous and negligible zones. First three categories reproduced over. (Para 4.25)</td><td>
<table>
<tr><td>Magnitude of Impact/Height of Turbine</td><td><30m</td><td>30-69m</td><td>70-99m</td><td>100-129m</td><td>130-c.150m</td></tr>
<tr><td>Dominant</td><td><400m</td><td><600m</td><td><800m</td><td><1km</td><td><1.2km</td></tr>
<tr><td>Prominent</td><td><750m</td><td><1.5km</td><td><1.75km</td><td>< 2km</td><td><2.5km</td></tr>
<tr><td>Conspicuous</td><td>750m-1.5km</td><td>1-5-3km</td><td>1.75 -4km</td><td>2-5km</td><td>2.5- 6km</td></tr>
</table>
</td></tr>
<tr><td>Lincolnshire County Council
Wind Energy Position Statement (2012)

http://www.stopwestpinchbeckwindfarm.org.uk/wp-content/uploads/2012/06/Lincs-Wind-Farm-Position-Statement1.pdf</td><td>Wind Turbines</td><td>700m
2km if there are noise issues</td><td>‘No wind turbine developments shall be constructed in close proximity of a residential property (the accepted distance for separation is 700 metres) however, noise and amplitude modulation issues can be present up to 2km away. Therefore, unless through assessment, it can be demonstrated that there would be acceptable noise levels within the 2km radius of a residential property, the minimum distance should be 2km:

No wind turbines shall be constructed within a distance of a factor of ten times the diameter of the blades of a residential property to mitigate against flicker, unless intervening topography/structures negates the impact.’</td></tr>
<tr><td>Milton Keynes Local Plan (2002)</td><td>Wind Turbines</td><td>Local Plan: Turbines over 25m required separation distance of 350m, increasing to 1km if turbines over 100m. Revised to a sliding scale of approximately 10 times height within SPD</td><td></td></tr>
<tr><td>Rutland County Council
Wind Turbine Developments Supplementary Planning Document (2012)

Supported by

Rutland Landscape Sensitivity and Capacity Study – Wind Turbines (The Landscape Partnership 2012)</td><td>Wind Turbines</td><td>Turbines within ‘dominant’ zone of a property or ‘prominent’ zone of a settlement unlikely to be acceptable/require careful consideration respectively.

Dependant on height of turbine, dominant zone ranges from within 320m to 920m and prominent zone ranges from 920m to 2.3km</td><td>WT2 – Visual impact:

‘Wind turbine proposals within the dominant zone of any property (see Appendix 2 of this document) are unlikely to be considered acceptable in visual terms, unless existing features can be proven to fully screen views of the turbines. Wind turbine proposals within the prominent zone of a settlement (see Appendix 2 of this document) will need to be carefully considered as turbines are highly likely to be prominent features and command/control views for sensitive viewers, including residential properties, within this range. Existing features including built form and vegetation may be able to locally reduce visual impacts of turbines within this range.’

Appendix 2 : Visual Impacts of Wind Turbines Extrapolated for Different Turbine Heights:
<table>
<tr><td>Mag-nitude of impact</td><td colspan="6">Distance from Turbines</td></tr>
<tr><td>Height of turbine</td><td>Up to 50m</td><td>50-70m</td><td>71-85m</td><td>86-99m</td><td>100-130m</td><td>131-c.150m</td></tr>
<tr><td>Domin-ant</td><td>Within 320m</td><td>Within 180m</td><td>Within 575m</td><td>Within 680m</td><td>Within 800m</td><td>Within 920m</td></tr>
<tr><td>Prom-inant</td><td>320-800m</td><td>480m-1.2km</td><td>575m-1.4km</td><td>680m-1.7km</td><td>800m-2km</td><td>920m-2.3km</td></tr>
</table>
</td></tr>
<tr><td>Torridge District Council Wind Energy Policy (2010)</td><td>Wind Turbines</td><td>600m from residential settlements/dwellings, general settlements, villages, tourist development, campsites/caravan parks and isolated dwellings</td><td>‘Torridge District Council is aware of the restrictions placed by PPS22 with regards to separation distances from wind turbines but nevertheless it would like developers to consider the application of Torridge District Council's distance recommendations. These distance proposals should be seen as a starting point for discussions. The Council seeks to safeguard the amenity of residents and the minimisation of visual impact on the landscape. It recognises that noise and visual impact assessment might allow for wind turbine locations at distances of less than 500 [stipulated for designated landscapes] and 600m [stipulated for residential dwellings and tourist developments], as in some cases, lesser separation distances might be sufficient or not required for safeguarding purposes. Site-specific measurements will therefore determine separation distances from noise sensitive properties and distance to designated landscapes will be determined by landscape and visual impact assessment.’ (para 3.4)</td></tr>
</table>

<table>
<tr><th>Authority/Document/ Year/Reference</th><th>Development type</th><th colspan="2">Recommended Separation Distances – Summary</th><th>Recommended Separation Distances – Detailed Guidance</th></tr>
<tr><td colspan="5">Review of Local Planning Guidance</td></tr>
<tr><td rowspan="5">Wiltshire Core Strategy core policy 42 proposed change (2012)

http://www.wiltshire.gov.uk/planninganddevelopment/planningpolicy/wiltshirecorestrategy/wiltshirecorestrategyfocussedconsultation.htm</td><td rowspan="5">Wind Turbines</td><td>Turbine Height</td><td>Separation Distance</td><td rowspan="5">‘(vii) residential amenity, including noise, odour, visual amenity and safety.

Add new paragraph after paragraph 6.38 to read: Additional guidance will be prepared to support the implementation of Core Policy 42 to identify appropriate separation distances between wind turbines and residential premises in the interests of residential amenity, including safety. In the interim period, prior to the adoption of the guidance, the following minimum separation distances [1] will be applied

Shorter distances may be appropriate where there is clear support from the local community. ‘

Source: Wind Turbines (Minimum Distances from Residential Premises) Bill [HL] 2010-12’</td></tr>
<tr><td>25-50m</td><td>1000m</td></tr>
<tr><td>50-100m</td><td>1500m</td></tr>
<tr><td>100-150m</td><td>2000m</td></tr>
<tr><td>>150m</td><td>3000m</td></tr>
<tr><td>Ynys Mon Onshore Wind Energy SPG (2013)</td><td>Wind Turbines</td><td colspan="2">500m or 20 times tip height (metres) – whichever is greatest</td><td>‘In the absence of guidance, this document presents the local approach to be taken towards wind turbine development in Anglesey. To ensure that local residents or tourists onto the Island do not suffer from close proximity to Medium or Large Turbines (i.e. turbines higher than 20m to tip height) the Council has introduced Minimum Separation distances for residential and tourist receptors. Table 4 below set out the separation distances that will be applied to wind turbine developments: (para 7.9.8)

Table 4
<table>
<tr><th>Typology of turbine</th><th>Minimum Separation distance from residential or tourism properties</th></tr>
<tr><td>Medium (i.e. between 20.1m – 65m tip height)</td><td rowspan="2">500m or 20 times tip height (in metres) (whichever is the greatest)</td></tr>
<tr><td>Large (i.e. between 65.1m – 135m + tip height)</td></tr>
</table></td></tr>
</table>

Appendix 2 : Summary Review of Appeal Decisions

Summary Review of Appeal Decisions (Separation Distances between Wind Turbines/Pylons and Residential Dwellings)

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
Case: Mynydd y Gelli **Ref:** APP/Y6930/A/12/2181883 **Date:** 2013 **Decision:** Planning permission granted	9 no turbines 118m to tip	Distances not known. Number of settlements with views to development	Not overbearing	'… any impact on visual amenity would not be so detrimental that the settlements and residential properties within them would be widely regarded by the public as being an unattractive place in which to live.' (para 57)	Some clear views, others confined by valley sides Scale and distance
Case: Tre Ifan, Brynsiencyn **Ref:** APP/L6805/A/12/2190208 **Date:** 2013 **Decision:** Planning permission refused (effects on residential amenity not a factor)	1 no turbine 46.1m to tip	'A number' of properties look towards the site at a distance of 450m or greater.	Not overbearing	'I do not consider that the proposed turbine, even in the case of Ty Mawr whose sitting room window faces towards the site at a distance of about 470m would have such a dominant presence as to reduce living conditions to an unacceptable level.' (para 26)	
Case: Burnthouse Farm **Ref:** APP/D0515/A/10/2123739 **Date:** 2011 **Decision:** Planning permission granted and this permission subsequently upheld by Secretary of State (2011)	3 no turbines 100m to tip	430-470m	Not overbearing	'I consider that they would not be so dominant as to render the property an unpleasant place to live.' (para 241)	Turbines appear to the side rather than in the middle of the view from the garden/living room Vegetative screening Trees in foreground would appear larger than the turbines
		900m	Not overbearing	'The wide and open views of fenland…are narrowed at ground level…by trees. These would frame views of the turbines but because of their distance from the appeal site, I consider that they would not look overwhelming. Whilst there would be a significant impact, this would not amount to it becoming an unattractive place to live.' (para 246)	Distance
		930m	Not overbearing	'With open, south-facing views from living rooms and a front entrance, the turbines would change the visual outlook for occupiers substantially… however, I cannot find that the turbines would render the cottage an unattractive place to live.' (para 248)	Distance Occupy small proportion of the panorama
		800-900m	Not overbearing	'it [is contended] that there would be significant additional cumulative impacts from the Flood's Ferry turbines some 860m to the east. As illustrated on…the photomontage, most of the turbines at Flood's Ferry … would be prominently seen within the same wide scene as all the turbines at Burnthouse Farm. Nevertheless, they would be separated by a substantial tract of open farmland…In my opinion [the properties] would not be changed to an unattractive place to live.' (para 250)	Distance in view Distance between different developments would reduce cumulative impact
		General Comment		'Given the small scale nature of the development, spacing of the turbines, distances involved, orientation of properties and amenity space and openness of view, any effects on outlook would not cross the public interest line here at Burnthouse.' (para 123)	Scale of development Spacing of turbines Distance Orientation Openness of view

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
Case: Kelmarsh **Ref:** APP/Y2810/A/11/2154375 **Date:** 2011 **Decision:** Planning permission granted	5 no turbines 126.5m to tip.	Distances unknown. Reviewed a number of properties in detail.	Not overbearing	'Overall, while the wind turbines would have a visual impact that would change the living conditions of nearby residents…that change would not be harmful. As such, I see no departure from the requirements of LP Policy GN2 or the 'test' applied by previous Inspectors.' (para 60)	Extent of turbines within view Vegetative screening Degree of separation
Case: Mynydd Pwllyrhebog **Ref:** APP/L6940/A/11/2147835 **Date:** 2011 **Decision:** Planning permission granted	7 no turbines 115m to tip	Properties outside of 2km	Not overbearing	'In my opinion some of the greatest effects on residential amenity would be experienced in and around the terrace known as 'Fair View'… Although Fair View is outside the 2Km study radius, this terrace is in an elevated position with uninterrupted views along the street and from gardens towards the … wind farm. The orientation would be such that the … turbines would extend the field of view occupied by turbines to include an area that would otherwise be seen as open grassland. Even so, the proposed turbines would be prominent, rather than dominant.' (para 22)	Unscreened views Elevated position Orientation
		Properties within c2km.	Not overbearing	'There are residential areas that are closer to the appeal site than Fair View, including the northern end of the High Street in Gilfach Goch and parts of Clydach Vale. However, in these areas there would be other features in the street scene and landscape that would draw they eye from or screen the proposed turbines.' (para 22)	Other features within view to draw eye Screening
Case: Langham **Ref:** APP/D2510/A/10/2130539 **Date:** 2011 **Decision:** Planning permission refused (effects on residential amenity not a factor)	6 no. turbines 127m to tip	530m	Not overbearing	'… Although [the turbines] would dramatically change the view from this property, I do not consider that the turbines would have a dominating impact that would harm the living conditions of residents.' (para 66)	Vegetation
		750m	Not overbearing	'Some local residents might find the view unpleasant, but that would not by itself mean that the turbines would be so overwhelming that they had an oppressive effect that harmed the residential amenity and living conditions of the occupiers.' (para 65)	Vegetation Slim profile of turbines - Occupy small part of overall outlook
		Parts of settlement at c1100m to 1300m	Not overbearing	'The turbines would be prominent features from the windows of many dwellings, and from the valued private amenity space and gardens of local residents. However, at these distances, and given the type of structures involved, this would not be sufficient to elevate the adverse visual impact into a consideration that would significantly harm the living conditions of occupiers. (para 70)	Distance Type of structures
Case: Baumber **Ref:** APP/D2510/A/10/2121089 **Date:** 2010 **Decision:** Planning permission refused (effects on residential visual amenity contributed towards decision)	8 no turbines, min tip height 125m.	17 properties within 900m of turbines. Closest at c698m.	Effects on residential visual amenity were not simply linked to distance; for instance modifying factors reduced visual effects from closest property. However, effects on	'In terms of the visual impacts on local residents two dwellings would experience serious adverse effects with the proposed turbines appearing unpleasantly overwhelming in relation to each property as a whole…the consequences here would amount to far more than a loss of a view; the outcome would inevitably be the creation of unacceptable living conditions.' (para 97)	Principal views from house Effect of arrival and departure point of house Occupy large extent of the view Contrast in scale of turbines to surrounding buildings Height and spread

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
			two properties (distances of 739m and 702m) were found to be unpleasantly overwhelming and create 'unacceptable living conditions'.		
Case: Carland Cross **Ref:** APP/D0840/A/09/2103026 **Date:** 2010 **Decision:** Planning permission granted	10 no. turbines with tip height 100m.	Properties over 1km away	Not overbearing	'…[these] I consider much too distant to suffer unsatisfactory living conditions in consequence of the proposed turbines simply being visible) (para 24)	Distance
		900m	Not overbearing	'The quality of living conditions currently enjoyed here would, I consider, in consequence be diminished and the present occupiers' enjoyment of the property would, I accept, be much lessened. However, although the proposed turbines would intrude significantly into the pleasant views across open countryside from the property, it would still in my estimation be widely held to be an attractively rural place in which to live.' (para 25)	Open aspect Lack of vegetation as screening Single windows – no alternative outlook
		600m	Not overbearing	' Blade tips might be seen rotating above the trees from south facing windows in Penhallow and obliquely from the rear garden of Illgram …In neither case would living conditions in my estimation be significantly affected. (para 26)	Vegetative screening Oblique views
		400m	Not overbearing	'The present outlook would not much change and existing living conditions here would, I consider, remain as now and be satisfactory.' (para 26)	Existing views across concrete filling station Existing movement evident from passing traffic
		700m	Not overbearing	' The high quality of this view would unquestionably be much diminished by an array of turbines rotating in the …Being effectively sandwiched between the road and the proposed turbines, it seems to me that some might regard this as likely to become an unattractive place in which to live, although I consider that the proposed turbines are sufficiently distanced and far enough spaced to avoid that opinion being held by most.' (para 27)	Distance Spread of turbines
Case: Mynydd Y Gwair **Ref:** APP/B6855/A/09/2114013 **Date:** 2010 **Decision:** Planning permission refused (effects on residential amenity not a factor)	19 no turbines 127m to tip.	Within 2km	Not overbearing	'Turbines would be visible from most of the dwellings within about 2k of the nearest turbines, but following my visits to the vicinity of these dwellings, I do not consider that the visual intrusion at any dwelling would be unacceptably harmful to the visual amenity of the occupiers' (para 64)	
Case: Roos **Ref:** APP/E2001/A/09/2113076	9 no 126.5m to tip turbines	800m	Not overbearing	'I accept that the change of view from residential properties would be objectionable for many who live in the area. However… the turbines are unlikely to be so visually	Turbines seen within context of wider landscape and skyline Dis tance from dwellings

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
Date: 2010 **Decision:** Planning permission granted				dominant or overwhelming as to cause severe harm to the visual amenity component of residential amenity.' (para 35)	Tall structures of 'little mass' - occupy small proportion of view Vegetation/other buildings give screening
Case: Sillfield **Ref:** APP/M0933/A/09/2099304 **Date:** 2010 **Decision:** Planning permission refused (effects on residential visual amenity contributed towards decision)	3 no turbines. Height unknown.	Properties over 2km away		'..beyond that range the turbines might be prominent in the landscape but it is unlikely that they could reasonably be perceived from dwellings as dominant and intrusive; there would be a change to the view but no direct, serious harm to living conditions. (para 45)	Distance
		770m	'[Turbines] significantly detract from living conditions'	' Closer to the site visual impact would be both more dramatic and severe. [from these properties] the three turbines would be intrusive in the open landscape and dominant at close range…I believe that the visual impact on Crosslands Cottage, the principal elevation of which directly faces the appeal site, would significantly detract from living conditions there. (para 48)	Partly screened Direct orientation
				50. The intimidating effect of the turbines would in my opinion be particularly evident from the gardens of both these properties but it would also be felt around Sillfield as a whole and particularly by residents passing to and from their properties or relaxing in gardens. As the hamlet is at present generally peaceful, despite its proximity to the motorway to the west, the scale and movement of the turbines would be particularly disturbing. The motorway is largely screened from view and only makes its presence felt in low background noise whereas the turbines would be a close, insistent and severe visual intrusion.	Orientation Elevation Screening
		4 no properties within settlement (of 6) at 745m, 708m, 692m, 744m:	Not overbearing	'…would each be screened from direct view to a greater or lesser extent by buildings, hedges or trees.' (para 49)	Screening from buildings and vegetation
		2 no properties within settlement (of 6) at 670m and 686m	'…markedly detract from enjoyment of both the house and its open space.'	'Both [properties]… are on higher ground [and] would be much more effected...In my view the appearance and height of the turbines at close quarters and on elevated ground, and the motion of the blades, would be intrusive and intimidating and would markedly detract from enjoyment of both the house and its open space. (para 49)	Orientation Elevated position of development Distance Movement of blades
		Settlement of 6 properties as noted in two previous sections (at distances ranging from 670m to 745m). General comment	'intimidating effect of the turbines'	The intimidating effect of the turbines would in my opinion be particularly evident from the gardens of both these properties [at 670m and 686m] but it would also be felt around [the settlement] as a whole and particularly by residents passing to and from their properties or relaxing in gardens. As the hamlet is at present generally peaceful, despite its proximity to the motorway to the west, the scale	Existing peaceful location of settlement Scale of development Movement of turbines

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
				and movement of the turbines would be particularly disturbing. The motorway is largely screened from view and only makes its presence felt in low background noise whereas the turbines would be a close, insistent and severe visual intrusion.' (para 50)	
		Two properties at 629m away.	'dominant and overbearing'	'[The properties] stand in isolation on high ground… from where the turbines would be in full view across lower ground in the middle distance. Although the property owner accepted that the view was panoramic, and the Appellant argued that the turbines would only feature in part of that view, it is an important part and they would inevitably attract attention through their size and blade movement. The latter would be particularly disturbing in that one turbine would appear effectively "stacked" behind another. In my opinion, whilst screening from hedges and parts of the buildings would largely conceal the turbines from view from the static caravans behind the houses, they would be insufficient to prevent them from appearing dominant and overbearing when seen from both the dwellings and their immediate surroundings, in a way that would inevitably cause significant harm to living conditions.' (para 51)	Elevated properties Small part of a panoramic view Size and movement Stacking effect of multiple turbines Some screening but insufficient
Case: Baillie **Ref:** IEC/3/105/3 **Date:** 2009 **Decision:** Planning permission granted	21 turbines, tip height 110m	6 no houses within 500m from turbines. Closest at 250m and 300m	Not overbearing	'… The issue that arises here is whether the significant adverse visual impact on local residents would be so great as to render the development unacceptable… Here, the view from nearby houses would not be lost or wholly obstructed, but would be dramatically altered. The height of the turbines and the rotating motion of the blades, combined with their proximity, would result in the wind farm becoming a dominant element in certain views particularly when the windows of the principal rooms face towards it. This effect would be reduced to some extent by the limited arc which it occupies in the wide overall field of view.' (para 8.21) '…I find that the issue to be addressed is whether the adverse effects which would be experienced by some of the residents of the 60 or so houses which are within two kilometres of the nearest turbines is sufficient to outweigh the wider public benefits which the development is designed to achieve. In my judgement, on the merits of this case, I find that these adverse effects are not so great as to be unacceptable'. (para 8.26)	Main rooms/gardens directly orientated towards development Broad landscape setting Few houses orientated towards development Small number of houses involved Support expressed by some of the residents Distance from turbines Compact layout of wind farm Developments position within an open landscape Capacity of the landscape to accommodate a wind farm
Case: Beechtree **Ref:** APP/K1128/A/08/2072150 **Date:** 2009	3 no wind turbines 100m to tip.	500m	Not overbearing	'The proposal would have a significant effect on the outlook from the [property and] …I have no doubt that this would fundamentally change the outlook from this property. A landscaping scheme might help to ameliorate particular lines of sight from certain windows, but it would not screen out views of the turbines without creating a shaded and	Top of blades 110m above property Main elevation would directly face the development Main views affected (living room, main bedroom, garden)

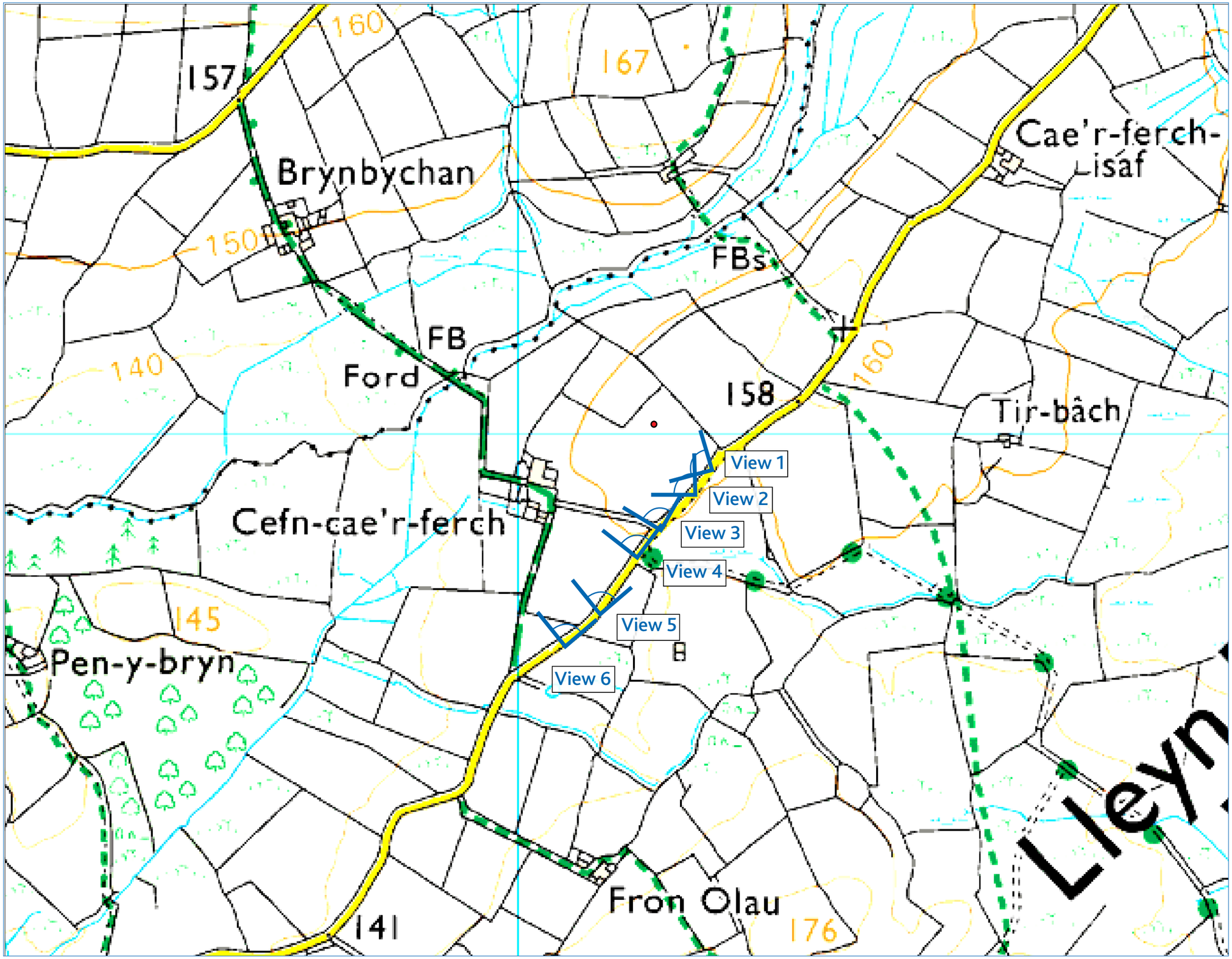
Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
Decision: Planning permission refused (effects on residential amenity not a factor)				claustrophobic amenity space for the occupiers… The occupiers of this property would certainly be constantly aware of the presence of such high, moving structures. However, the turbines would be slender structures, and I do not believe that they would, at this distance and height, have an overbearing or dominating impact that would harm the residential amenity that the occupiers of [the property] could reasonably expect in this rural agricultural setting. A large bulky structure close to a dwelling, which gave it an enclosed feel might have such an effect, but that is not the case here. My judgement is that the appeal scheme would not have an unacceptable effect on the living conditions of the occupiers of [the property]…by reason of its adverse visual impact. '(para 31)	Constant awareness of high moving structures Slender structures Distance and height Agricultural setting
Case: Enifer Downs **Ref:** APP/X2220/A/08/2071880 **Date:** 2009 **Decision:** Planning permission refused (effects on residential visual amenity contributed towards decision)	5 no. turbines. 120m to tip.	C 360m	'Unpleasantly overwhelming and unavoidable'	' my impression is that the visual experience of the occupiers from the main living rooms and garden of their property would be comparable to living actually within the turbine cluster…I consider that the looming presence of rotating turbines of the height proposed would be unpleasantly overwhelming and unavoidable…' (para 67)	Turbines spread fully across the outlook Upward tilt of the head required to see the blade tips
		Properties c 510m to 800m	'Unpleasantly overwhelming'	'The occupiers of these properties too would be faced with the unavoidable and, in my estimation, unpleasantly overwhelming presence of rotating turbines spreading both horizontally and vertically across a substantial proportion of their main outward field of view. By comparing the turbine spacing to the distance from these properties, I again liken that to conveying the impression of living in or at a wind farm, rather than simply having a turbine cluster close by.' (para 68)	Turbines spread fully across outlook
		Settlement c 800m to 1km	'Visually invasive'	'…the outlook from the whole of this small community would be dominated by their unavoidable presence, whether seen as a complete cluster, individually or just in glimpses of moving blades. In this case it is the spread of the turbines rather than their height that would, in my judgment, be so visually invasive as to make the settlement a less satisfactory place in which to live than it is now. (para 69)	Spread of turbines
		650m	Not overbearing	'There are some individual properties closer or equally close to turbines that I judge would be less affected…[the turbines would] appear much more tightly grouped, and thus less intrusive in the view.' (para 70)	Grouping of turbines – effects the extent of spread across outlook
		General conclusion	'living conditions would be demonstrably harmed'	'…in those cases that I have identified where the full height and maximum spread of turbines in the numbers proposed would be seen at their greatest from closest to (typically at up to about 800 m), and with little or nothing by way of intervening screening, it is my conclusion that living	Height and spread of turbines within view Lack of screening

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
				conditions would be demonstrably harmed by significant and over-dominant visual impact. There would be conflict with the relevant SP and LP policies safeguarding against un-neighbourly development whether from noise, flicker or visual impact. (para 71)	
Case: Gorsedd Bran **Ref:** APP/R6830/A/08/2074921 **Date:** 2009 **Decision:** Planning permission refused (effects on residential visual amenity contributed towards decision)	13 turbines 125m to tip	10 properties, distances unknown	'Overbearing'	'It was suggested that as turbines become taller the appropriate separation distance between turbines and dwellings should also increase. In my view there is no specific distance at which turbines are too close. It all depends on the circumstances. In my view they are too close when the height, size of swept area, and relative elevation of the turbines is such that they appear unacceptably overbearing when viewed from a dwelling or its immediate surroundings.' (para 10) '…From at least all these properties the views of the turbines would be such that the presence of such large turbines located on the elevated appeal site would be overbearing. (para 14)	Setting of dwelling Visibility of turbines from garden and approach to house Elevation
Case: Sixpenny Wood **Ref:** APP/E2001/A/09/2101851 **Date:** 2009 **Decision:** Planning permission granted	10 no turbines 125m tip height	General Comment		'…there is no right to a view per se, and any assessment of visual intrusion leading to a finding of material harm must therefore involve extra factors such as undue obtrusiveness, or an overbearing impact, leading to a diminution of conditions at the relevant property to an unacceptable degree.' (para 32)	
		Minimum 600m		'The occupants of [the dwellings closest to the development]…would be the most seriously affected by the development. It was clear to me that the turbines would be very prominent in views from those properties...But that prominence does not necessarily equate to harm. There would, of course, be a significant change in the view from those properties. The outlook would change from an aspect generally across open fields to an outlook in which turbine or turbines would be the major feature within the landscape. I can well appreciate that many would find that a serious diminution of their outlook, though accept that others would find them acceptable and attractive. …it is my judgement that given [the] spacing and configuration, the turbines would not be so dominant that they would introduce unacceptable obtrusiveness, be overbearing to the point of oppressiveness, or otherwise lead to visual intrusion which would amount to significant harm to living conditions.' (paras 33-35)	Slim profile of turbines Spacing of turbines The landscape still a major horizontal component of the view

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
Case: Wadlow – Secretary of State Decision **Ref:** APP/W0530/A/07/2059471 **Date:** 2009 **Decision:** Planning permission granted and this permission subsequently upheld by Secretary of State (2009)	13 no turbines 120m to tip	Number of settlements, closest being 2km from development. Examined number of properties, closest being 800-820m from development.	Not overbearing	'Visual impact on individual buildings is also unlikely at distances of more than 1 km, where residential amenities will not be affected to such an extent that occupation of dwellings becomes impossible for a "reasonable person" … Indeed, unacceptable visual dominance is unlikely to occur at distances much beyond 650-700m whereas here the two nearest properties are in the 800m-820m range. (PARA 9.26)' '…Likewise, I do not consider that simply being able to see a turbine or turbines from a particular window or part of the garden of a house is sufficient reason to find the visual impact unacceptable (even though a particular occupier might find it objectionable). Nonetheless, when turbines are present in such number, size and proximity that they represent an unpleasantly overwhelming and unavoidable presence in main views from a house or garden, or are likely to cause overshadowing (and particularly flicker effects), there is every likelihood that the property concerned would come to be widely regarded as an unattractive (rather than simply less attractive, but not necessarily uninhabitable) place in which to live. It is not in the public interest to create such living conditions where they did not exist before, and it is against that threshold that I have assessed the effects on outlook.'(para 12.34)	Topography Elevation Vegetative screening Visibility from principal residential windows Large skylines Directness of view
Case: St Johns Hill **Ref:** P/PPN110/634 **Date:** 2007 **Decision:** Planning permission granted	9 no turbines 100m to tip	Closest c. 400m	Not overbearing	' It is receptors to the north and west of the site and a few within the site which would be most likely to receive significant visual effects, including some direct views of the windfarm. These are located in an open landscape where the turbines would appear less dominant than in a more enclosed or intimate scale of landscape.'	Most properties orientated away from development Buildings act as screening Open landscape
Case: Llethercynon Wind Farm **Ref:** APP/T6850/A/03/1122720 **Date:** 2004 **Decision:** Planning permission refused (effects on residential visual amenity contributed towards decision) N.B Older case but its definitions of 'prominent' and 'dominant' and what constitutes an 'overbearing'	6 no turbines 76m tip height	2 no properties at 1km and 680m	'Dominating'	Number of properties assessed ranging from 680m to c3400m. Distance not the only factor but at two properties where turbines at 1km and 680m away, impacts found to be 'dominating and 'dominating and major' respectively. (para 16.33)	Orientation Landform Vegetative screening Elevation Stacking effect of blades Scale
		920m	'Severe impact'	'…[the turbines] would be considerably elevated above the level of the new farmhouse and would be dominating and intrusive because of their scale, proximity and relative elevation, having a severe impact on the outlook from the property. This property would be the most affected and I agree the appellant's assessment of a major impact.' (para 16.33)	Elevation Distance Scale

Case/Ref/Date/ Decision	Development	Distance of Property/Properties from Turbine(s)	Overall Impact on Residential Visual Amenity	Assessment Comments	Modifying Factors (where noted)
effect are often quoted by inspectors		General Comment		'In my opinion the visual impact of the proposed wind farm on each individual resident living in the vicinity is an aspect of the public interest. I fail to see how the public interest can be safeguarded by development that would be visually harmful when seen from several neighbouring properties. In this case it is not merely the residents of the properties identified who would be subjected to the adverse visual impact of these turbines but all the people who visit those properties on business or pleasure and people using the roads serving these properties. And in the case of those living in Cwm Gwilym I do not consider that it is in the public interest to impose on them the severe impact that would result if this proposal went ahead. The harmful effect on residents, both individually and cumulatively, weighs heavily against the wind farm.' (para 16.35)	

Appendix 3 : Viewpoint Analysis Figures



KEY:

View point
Refer to Figure 1.1

Turbine

North

FIGURE A3-1.1

VIEWPOINT LOCATIONS FOR WIND TURBINE - 17.8M HIGH

1:5,000

GILLESPIES

M5082-1 140522 -TURBINES & PYLONS VIEWPOINTS

Figure A3-1.2 Views to Wind Turbine - 17.8m High

View1

Distance to Turbine: 95m (apparent height* 11.43 cm)

View 2

Distance to Turbine: 105m (apparent height* 10.34 cm)

View 3

Distance to Turbine: 130m (apparent height* 8.35 cm)

View 4

Distance to Turbine: 170m (apparent height* 6.39 cm)

View 5

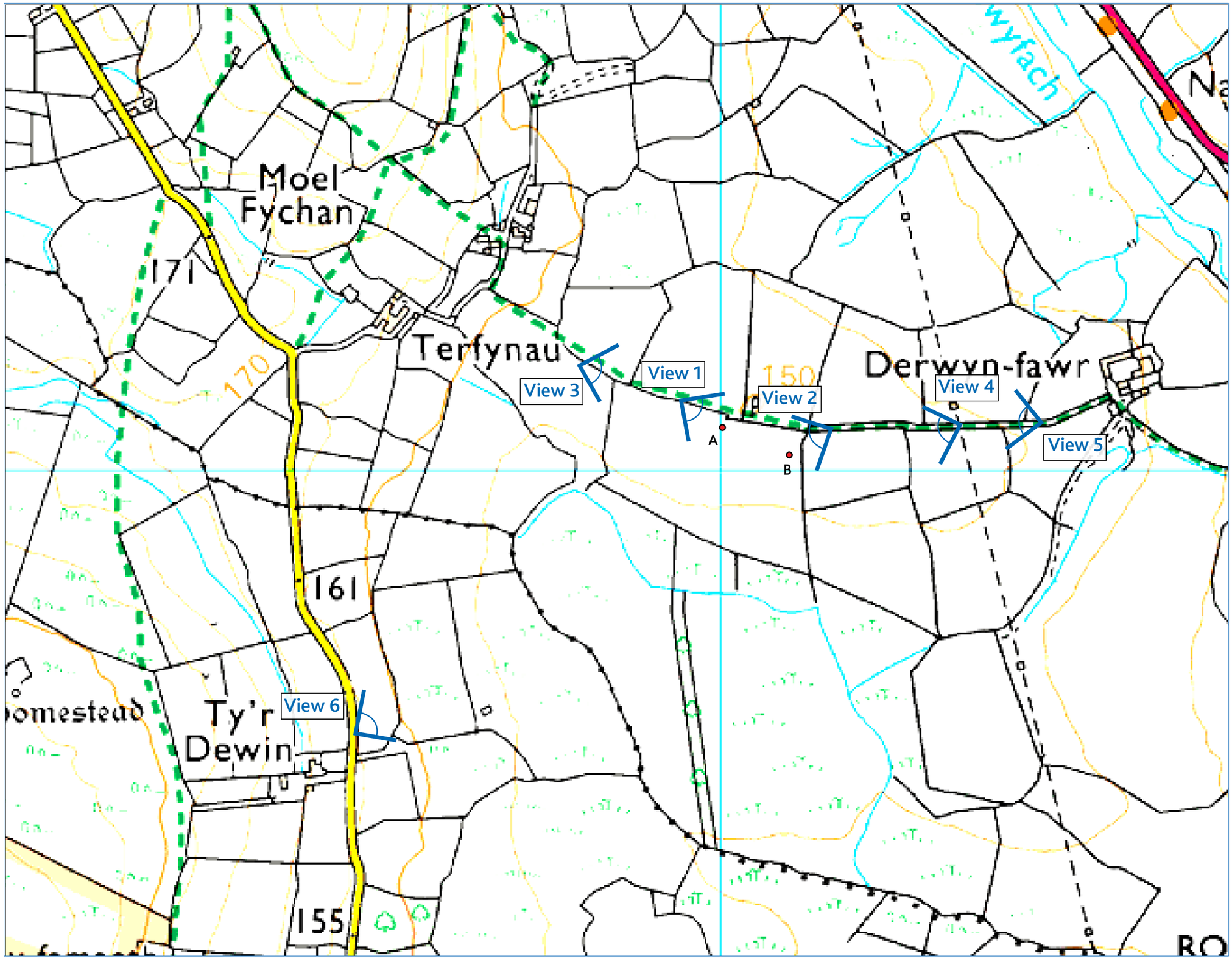
Distance to Turbine: 255m (apparent height* 4.26 cm)

View 6

Distance to Turbine: 310m (apparent height* 3.5 cm)

* Apparent height of turbine/pylon at arms length of 61cm from viewer)

N.B All distances rounded to the nearest 5m



KEY:

View point
Refer to Figure 2.1

A Turbine A

B Turbine B

North

FIGURE A3-2.1

VIEWPOINT LOCATIONS FOR WIND TURBINE - 34.2M HIGH

1:10,000

GILLESPIES

M5082-1 140522 -TURBINES & PYLONS VIEWPOINTS

Figure A3-2.2 Views to Wind Turbine - 34.2m High

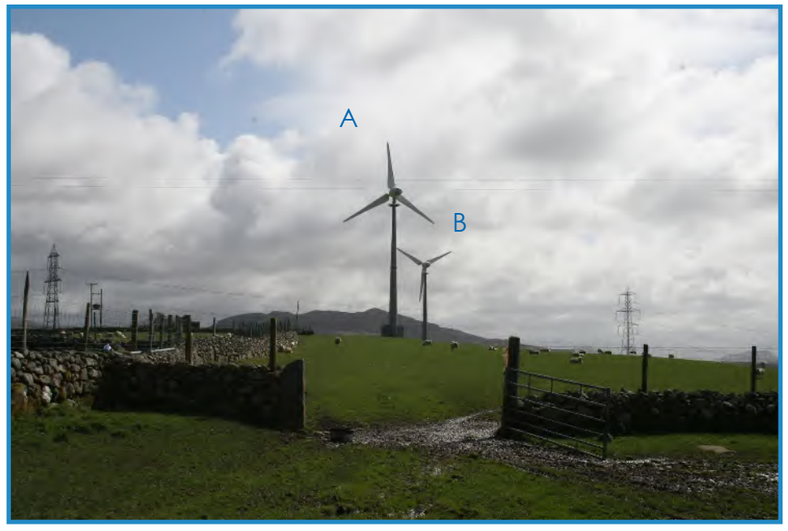
View1

Distance to Turbine A: 70m (apparent height* 29.8 cm)
Distance to Turbine B: 170m (apparent height* 12.27 cm)

View 2

Distance to Turbine A: 145m (apparent height* 14.39 cm)

View 3

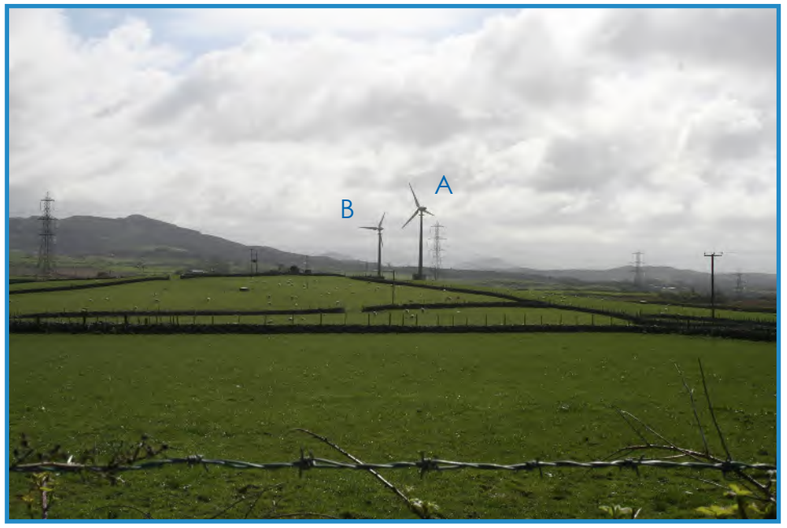


Distance to Turbine A: 185m (apparent height* 11.28 cm)
Distance to Turbine B: 285m (apparent height* 7.32 cm)

View 4

Distance to Turbine A: 365m (apparent height* 5.72 cm)
Distance to Turbine B: 280m (apparent height* 7.45 cm)

View 5



Distance to Turbine A: 375m (apparent height* 5.56 cm)
Distance to Turbine B: 475m (apparent height* 4.39 cm)

View 6

Distance to Turbine A: 640m (apparent height* 3.26 cm)
Distance to Turbine B: 685m (apparent height* 3.05 cm)

* Apparent height of turbine/pylon at arms length of 61cm from viewer)

N.B All distances rounded to the nearest 5m

KEY:

View point
Refer to Figure 3.1

- A Turbine A
- B Turbine B
- C Turbine C
- D Turbine D

FIGURE A3-3.1

VIEWPOINT LOCATIONS FOR WIND TURBINE - 53M HIGH

1:10,000

GILLESPIES

M5082-1 140522 -TURBINES & PYLONS VIEWPOINTS

Figure A3-3.2 Views to Wind Turbine - 53m High

View1

Distance to Turbine A: 95m (apparent height* 34.03 cm)
Distance to Turbine B: 190m (apparent height* 17.02 cm)
Distance to Turbine C: 285m (apparent height* 11.34 cm)
Distance to Turbine D: 380m (apparent height* 8.51 cm)

View 2

Distance to Turbine A: 135m (apparent height* 23.95 cm)

View 3

Distance to Turbine A: 265m (apparent height*12.2 cm)
Distance to Turbine B: 265m (apparent height* 12.2 cm)

View 4

Distance to Turbine A: 390m (apparent height* 8.29 cm)
Distance to Turbine B: 385m (apparent height* 8.4 cm)
Distance to Turbine C: 390m (apparent height* 8.29 cm)

View 5

Distance to Turbine A: 510m (apparent height* 6.34 cm)
Distance to Turbine B: 505m (apparent height*6.4 cm)
Distance to Turbine C: 500m (apparent height*6.47 cm)
Distance to Turbine D: 530m (apparent height* 6.1 cm)

View 6

Distance to Turbine A:750m (apparent height* 4.31 cm)
Distance to Turbine B: 735m (apparent height* 4.4 cm)
Distance to Turbine C: 710m (apparent height* 4.55 cm)
Distance to Turbine D: 715m (apparent height* 4.52 cm)

* Apparent height of turbine/pylon at arms length of 61cm from viewer)

N.B All distances rounded to the nearest 5m

KEY:

View point
Refer to Figure 4.1

A Turbine A

B Turbine B

FIGURE A3-4.1

VIEWPOINT LOCATIONS FOR WIND TURBINE - 93M HIGH

1:20,000

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Figure A3-4.2 Views to Wind Turbine - 93m High

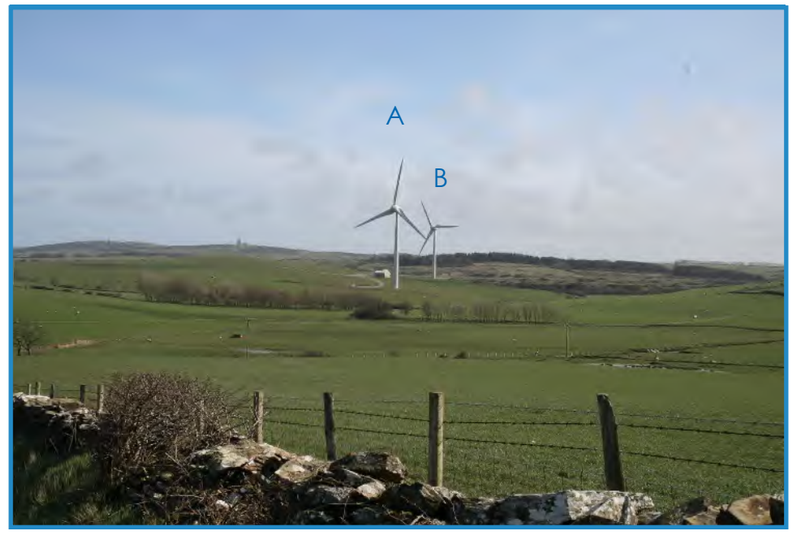
View1

Distance to Turbine A: 570m (apparent height* 9.95 cm)
Distance to Turbine B: 910m (apparent height* 6.23 cm)

View 2

Distance to Turbine A: 620m (apparent height* 9.30 cm)

View 3



Distance to Turbine A: 765m (apparent height* 7.42 cm)
Distance to Turbine B: 1140m (apparent height* 4.98 cm)

View 4

Distance to Turbine A: 800m (apparent height* 7.09 cm)
Distance to Turbine B: 930m (apparent height* 6.1 cm)

View 5

Distance to Turbine A: 1680m (apparent height* 3.38 cm)
Distance to Turbine B: 1385m (apparent height* 4.1 cm)

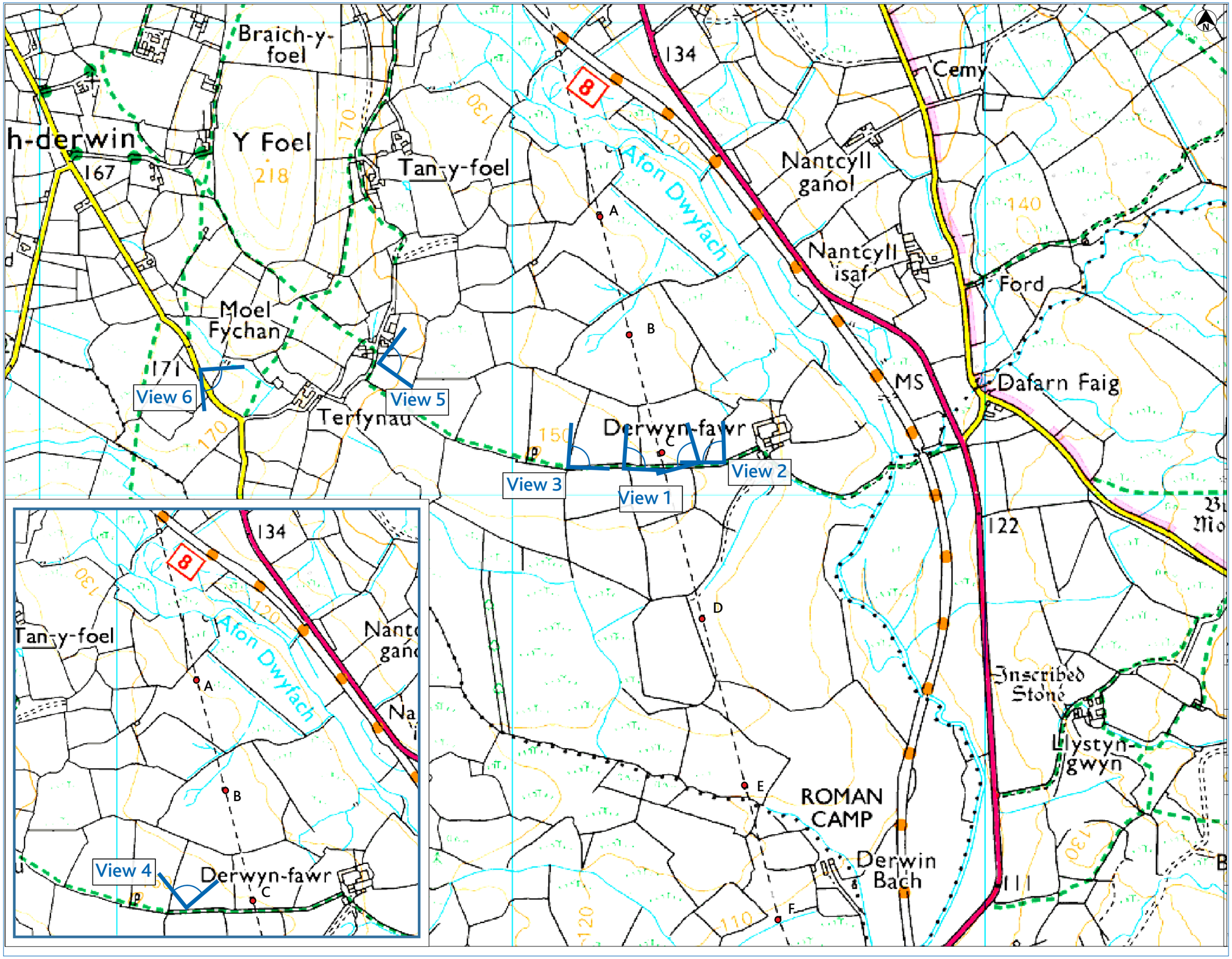
View 6

Distance to Turbine A: 1750m (apparent height* 3.24 cm)
Distance to Turbine B: 2105m (apparent height* 2.7 cm)

* Apparent height of turbine/pylon at arms length of 61cm from viewer)

N.B All distances rounded to the nearest 5m

Figure A3-5.1 Viewpoint Locations for Pylons 50-59 m High



KEY:

- View point Refer to Figure 5.1
- A Pylon A (50 m)
- B Pylon B (50 m)
- C Pylon C (53 m)
- D Pylon D (59 m)
- E Pylon E (56 m)
- F Pylon F (57 m)

N.B All pylon heights are rounded to the nearest metre.

North

FIGURE A3-5.1

VIEWPOINT LOCATIONS FOR PYLONS 50-59 M HIGH

NTS

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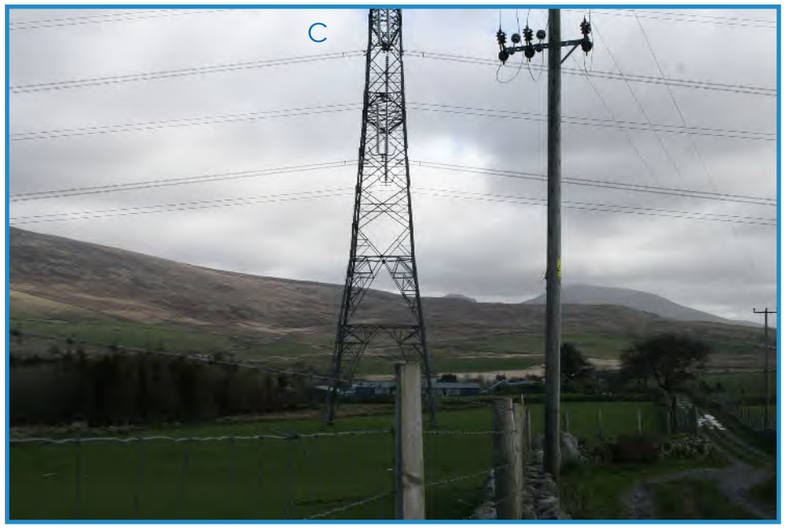
Figure A3-5.2 Views to Pylons 50-59 m High

View1



Distance to Pylon C: 105m (apparent height* 30.79 cm)

View 2

Distance to Pylon C: 135m (apparent height* 23.95 cm)

View 3

Distance to Pylon C: 195m (apparent height* 16.58 cm)

View 4

Distance to Pylon B: 290m (apparent height* 10.52 cm)
Distance to Pylon A: 530m (apparent height* 5.75 cm)

View 5

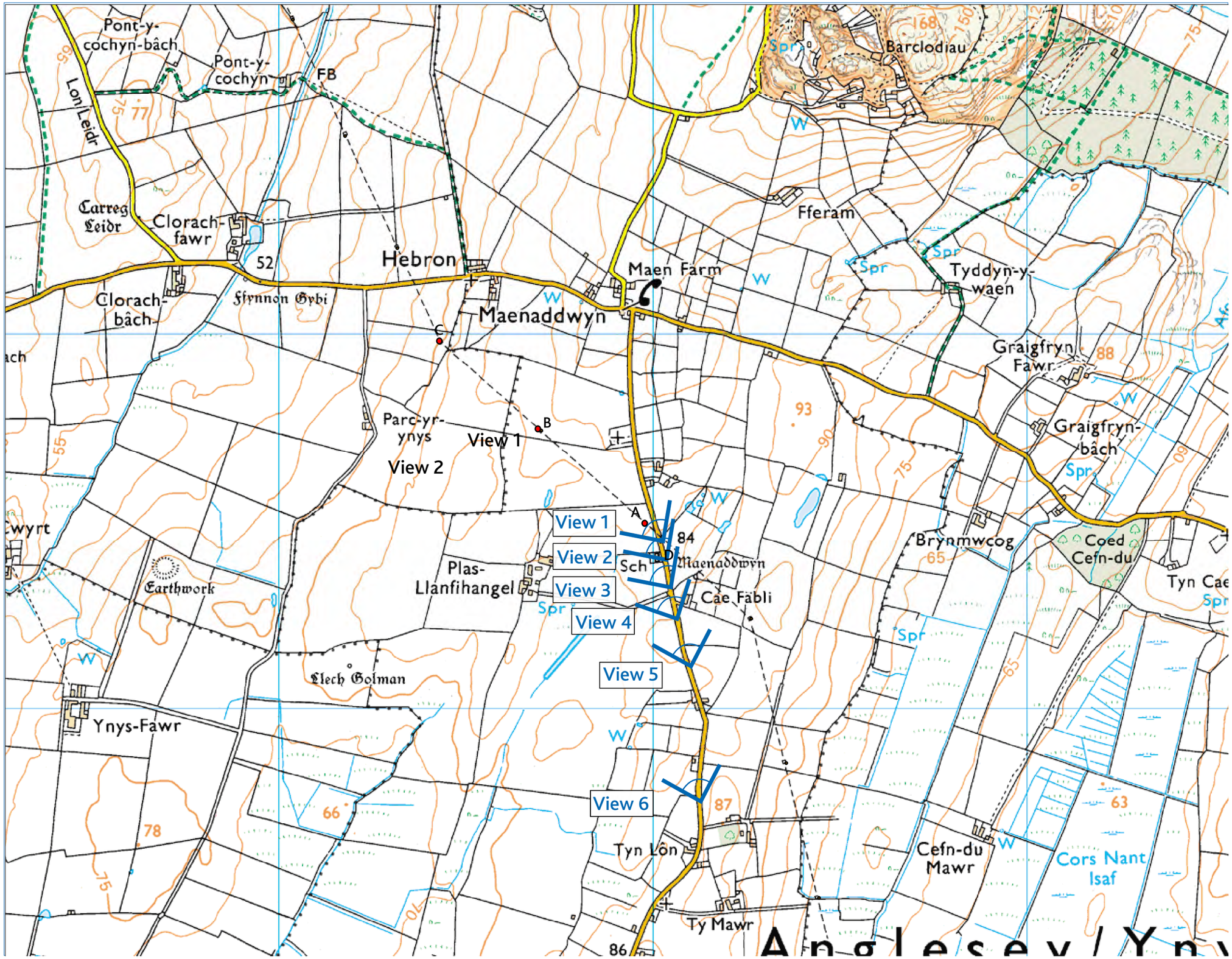
Distance to Pylon B: 535m (apparent height* 5.70 cm)

View 6

Distance to Pylon C: 990m (apparent height* 3.27 cm)
Distance to Pylon D: 1190m (apparent height* 3.02 cm)
Distance to Pylon E: 1460m (apparent height* 2.34 cm)

* Apparent height of turbine/pylon at arms length of 61cm from viewer)

N.B All distances rounded to the nearest 5m



KEY:

View point
Refer to Figure 6.1

- A Pylon A (56 m)
- B Pylon B (59 m)
- C Pylon C (55 m)

N.B All pylon heights are rounded to the nearest metre.

North

FIGURE A3-6.1

VIEWPOINT LOCATIONS FOR PYLONS 55-59 M HIGH

1:10,000

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Figure A3-6.2 Views to Pylons 55-59 m High

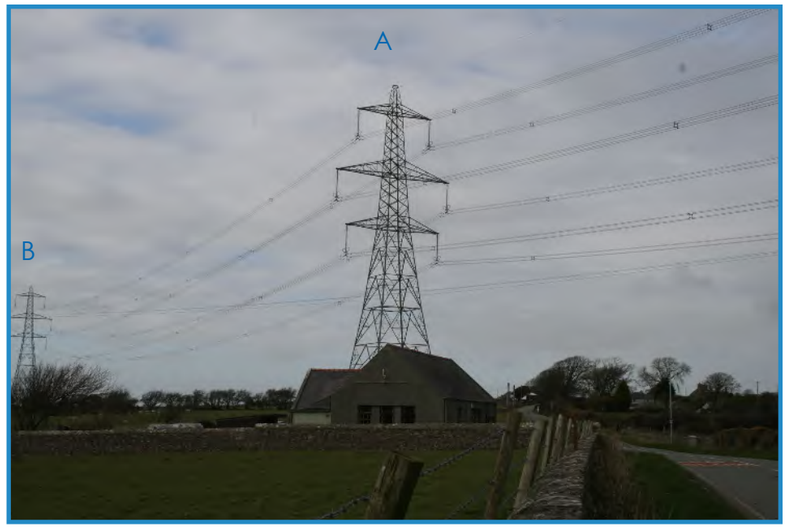
View1

Distance to Pylon A: 75m (apparent height* 45.55 cm)
Distance to Pylon B: 450m (apparent height* 8.00 cm)
Distance to Pylon C: 810m (apparent height* 4.14 cm)

View 2

Distance to Pylon A: 115m (apparent height* 29.70 cm)
Distance to Pylon B: 485m (apparent height* 7.42 cm)

View 3



Distance to Pylon A: 175m (apparent height* 19.52 cm)
Distance to Pylon B: 535m (apparent height* 6.73 cm)

View 4

Distance to Pylon A: 270m (apparent height* 12.65 cm)
Distance to Pylon B: 625m (apparent height* 5.76 cm)

View 5

Distance to Pylon A: 400m (apparent height* 8.54 cm)
Distance to Pylon B: 750m (apparent height* 4.80 cm)
Distance to Pylon C: 1100m (apparent height* 3.05 cm)

View 6

Distance to Pylon A: 760m (apparent height* 4.49 cm)
Distance to Pylon B: 1085m (apparent height* 3.32 cm)
Distance to Pylon C: 1420m (apparent height* 2.36 cm)

* Apparent height of turbine/pylon at arms length of 61cm from viewer)

N.B All distances rounded to the nearest 5m

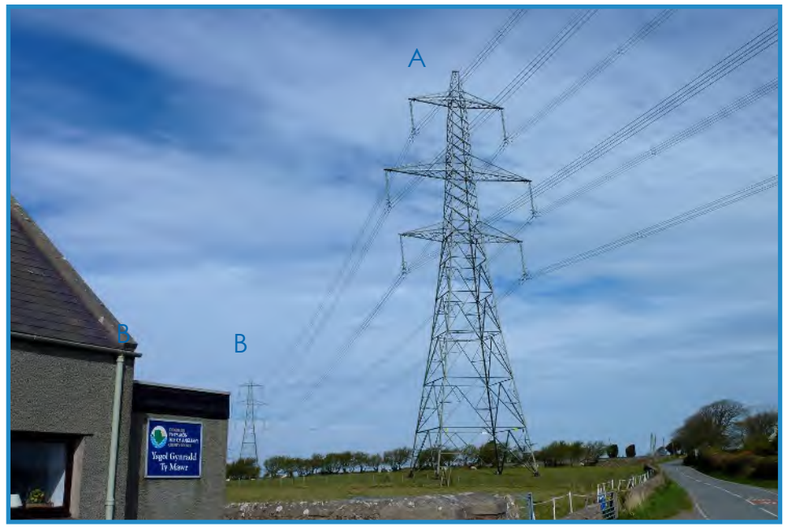
Appendix 4 : Supplementary Pylon Viewpoint Photographs

Figure A4 Supplementary Viewpoint Photographs to Pylons 55-59 m High

View1

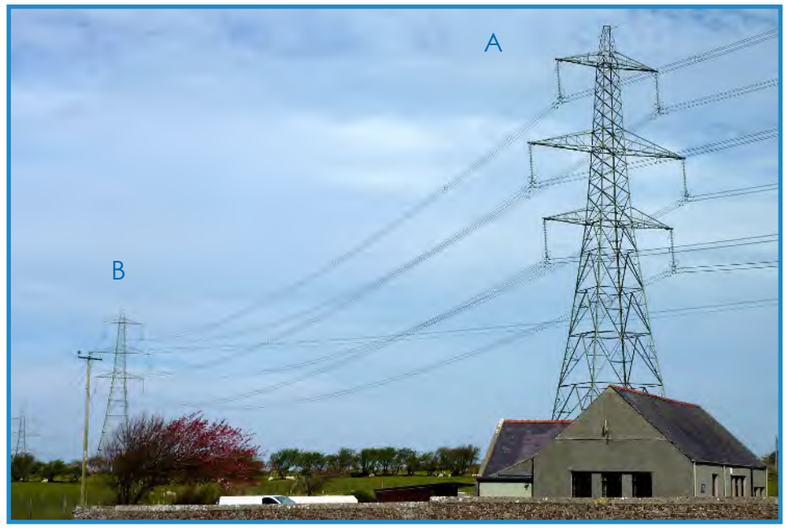
Refer to Appendix 3, Figure A3-6.2, View 1 for comparison

View 2



Refer to Appendix 3, Figure A3-6.2, View 2 for comparison

View 3



Refer to Appendix 3, Figure A3-6.2, View 3 for comparison

View 4

Refer to Appendix 3, Figure A3-6.2, View 4 for comparison

View 5

Refer to Appendix 3, Figure A3-6.2, View 5 for comparison

View 6

Refer to Appendix 3, Figure A3-6.2, View 6 for comparison

Note: Viewpoint distances from pylons are not shown as the accuracy of the data source has not been confirmed; however viepoint locations are broadly similar to those in Figure A3-6.1 (Appendix 3)

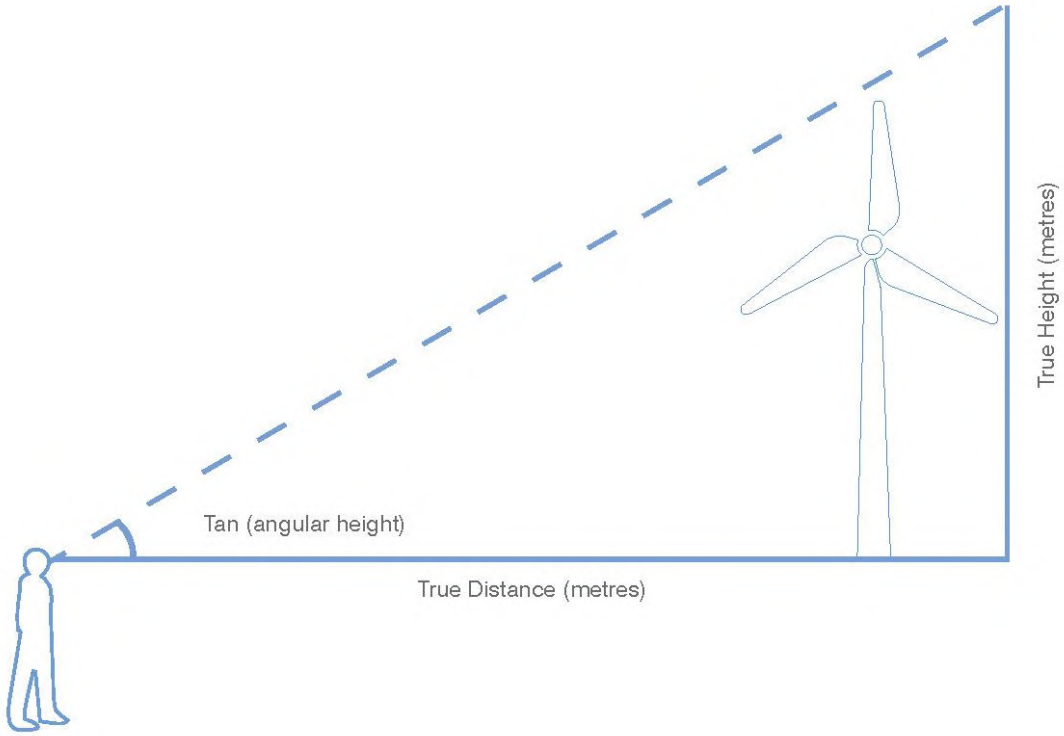
Appendix 5 : Theoretical Apparent Height Model

Appendix 5 : Theoretical Apparent Height Model

The **apparent height** of a turbine or pylon is defined as the height that the structure would appear at arm's length (61 cm) from the viewer (i.e. the structure would appear to be the same height as an X cm high object held at arm's length (61 cm) from the viewer).

The steps presented below are based on trigonometry[1] and are used to work out the apparent height of a structure at arm's length (61 m), when the true height and distance from the viewer are known. This example is based on a 100 m turbine viewed from a distance of 1000 km.

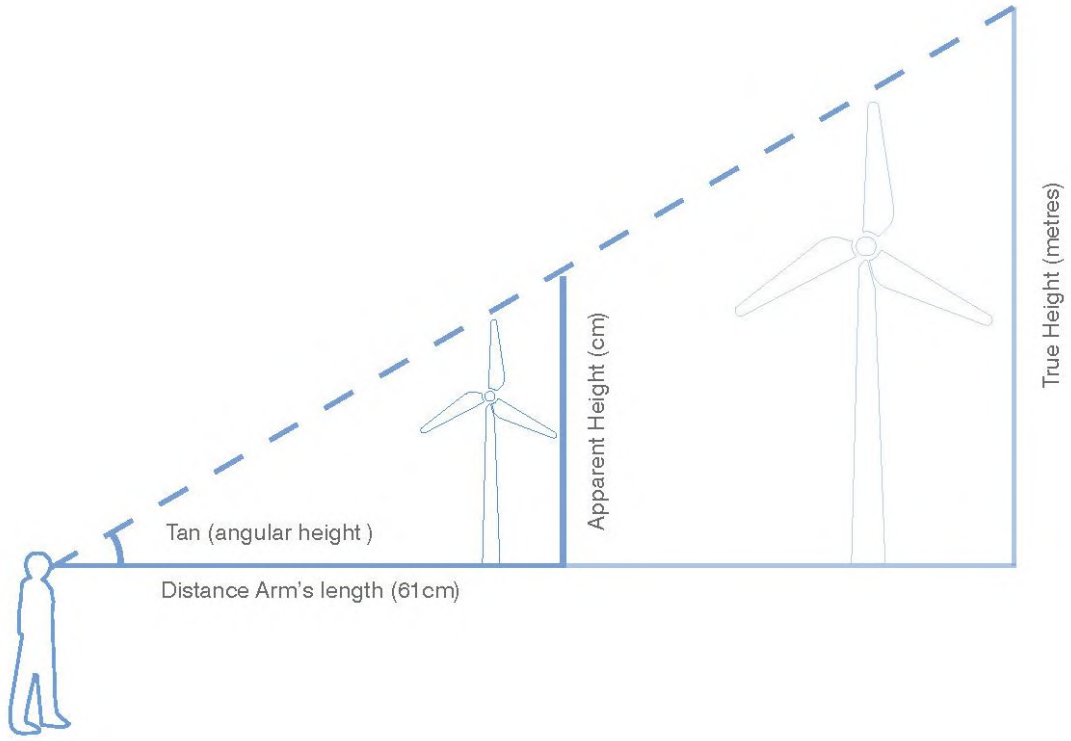
STEP ONE: Firstly work out the tan (angular height) by inserting the known true height and the known true distance from the viewer into the formula below (i.e. In this example divide the height by the distance to work out the angular height: 100 m ÷ 1000 m = 0.1).



$$\text{Tan (angular height)} = \frac{\textbf{100 metres} \text{ (True Height)}}{\textbf{100 metres} \text{ (True Distance)}}$$

[1] Trigonometry is a branch of mathematics that studies relationships involving lengths and angles of triangles.

STEP TWO: Insert 61 cm (arm's length) as the distance and 0.1 the Tan (angular height) worked out in STEP ONE into the formula, as below:



0.1 (Tan (angular) height from STEP ONE) **=** **X cm** (Apparent Height) / **61 cm** (Arm's Length Distance)

STEP THREE: To work out the apparent height of the turbine, rearrange the formula as below (i.e. Multiply 61 cm (arm's length distance) by 0.1 (Tan (angula height) taken from STEP ONE): 61 cm x 0.1 = 6.1 cm).

61 cm (Distance Arm's Length) **X** **0.1** (Tan (angular height)) = **6.1 cm** (Apparent Height)

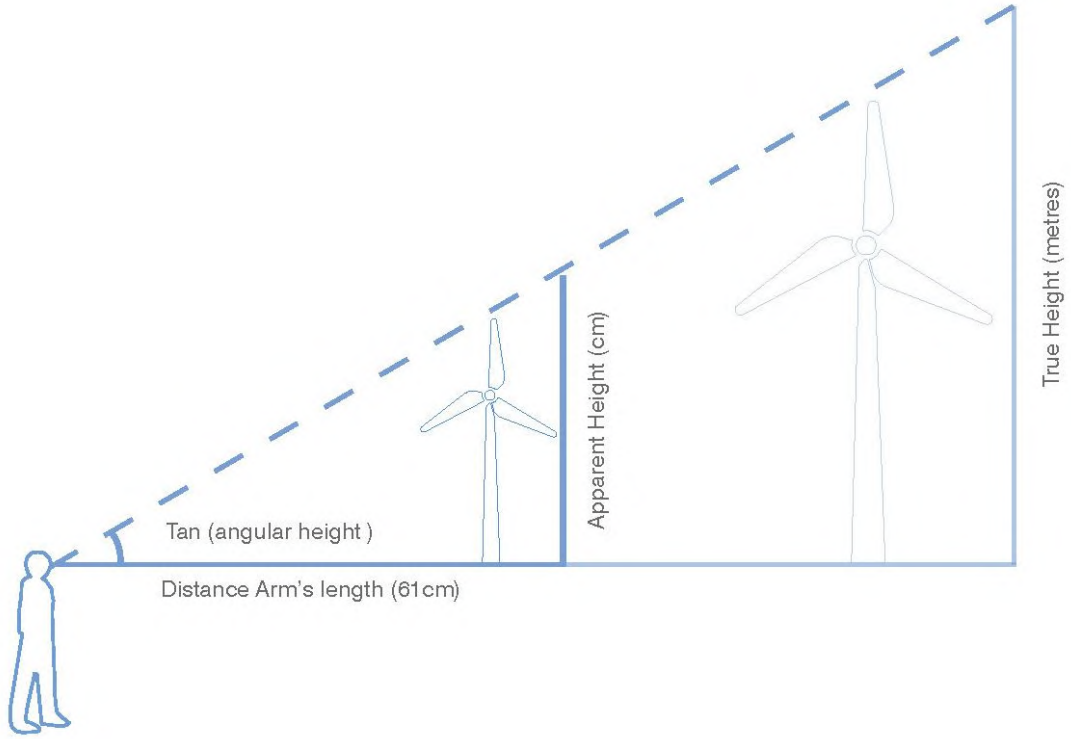
In this example a 100 metre high turbine located 1 km away from the viewer would appear to be the same height as a 6.1 centimetre object held at arm's length (61 cm) from the viewer.

Appendix 6 : Residential Visual Amenity Assessment Trigger Distances - Formula

Appendix 6: Residential Visual Amenity Assessment Trigger Distances - Formula

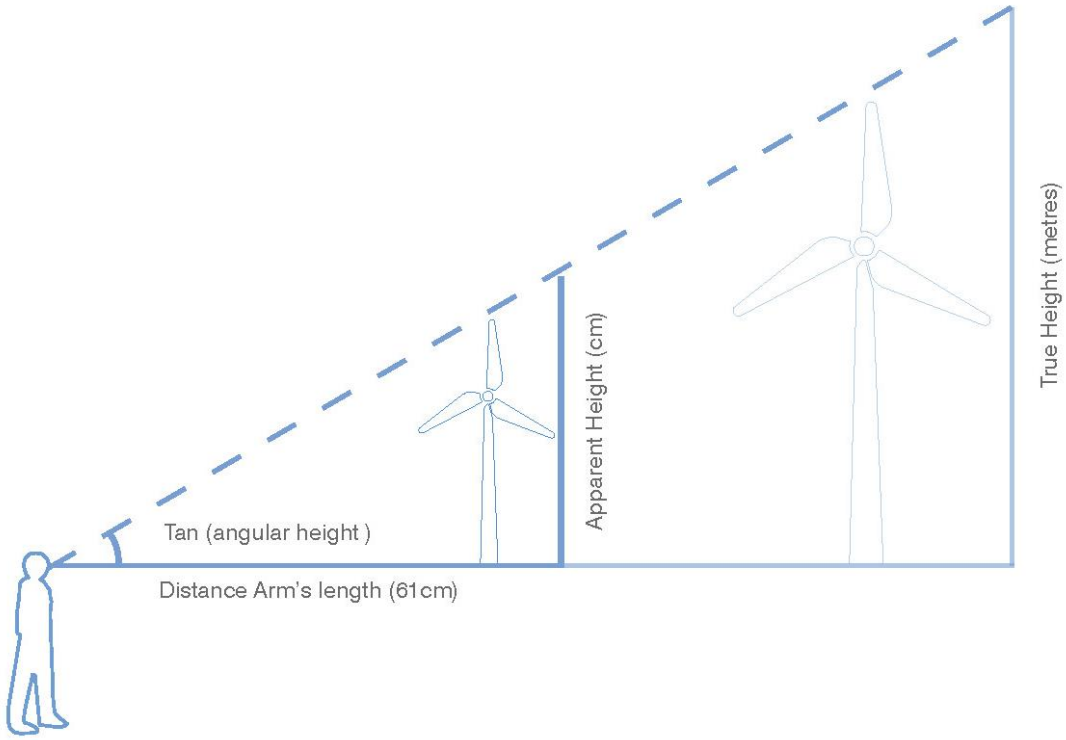
When the proposed height of a wind turbine or pylon is known (in this example we assume 100 m high turbine), the distance at which its apparent height would be around 7.5 cm can be worked out as illustrated in the following steps.

STEP ONE: Firstly work out the tan (angular height) by inserting 7.5 cm as the apparent height and 61 cm (arm's length distance) into the formula below (i.e. Divide the apparent height by the arm's length distance to work out the Tan (angular height): 7.5 cm ÷ 61 cm = 0.122950).



0.122950 (Tan (angular height)) **=** **7.5 cm** (Apparent Height) / **61 cm** (Arm's Length Distance)

STEP TWO: Insert true height (assumed to be 100 m turbine in this example) and 0.122950 (the Tan (angular height) worked out in STEP ONE) into the formula below.



$$\textbf{0.122950}\ \text{(Tan (angular) height from STEP ONE)} = \frac{\textbf{100 m}\ \text{(True Height)}}{\textbf{X cm}\ \text{(True Distance)}}$$

STEP THREE: To work out the true distance at which the apparent height of the structure would be 7.5 cm, rearrange the formula from STEP TWO as below (i.e. Divide 100 m (Assumed True Height) by 0.122950 (Tan (angular height) taken from STEP ONE): 100 m ÷ 0.122950 = 813 m (rounded to the nearest metre)).

$$\textbf{813 m}\ \text{(True Distance)} = \frac{\textbf{100 m}\ \text{(True Height)}}{\textbf{0.122950}\ \text{(Tan (angular) height)}}$$

In this example, when the viewer is 813 metres away from a 100 metre high turbine it would have an apparent height of 7.5 cm (i.e. appear to be the same height as a 7.5 centimetre object held at arm's length (61 cm) from the viewer).

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