Bute Energy

Aberedw Energy Park

Appendix 5.2:

ZTV and Visualisations Methodology

Aberedw Energy Park Limited

Aberedw Energy Park

Appendix 5.2: ZTV Mapping and Visualisation Methodology

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Contents

1. Introduction

1.1.1 This appendix sets out the approach to the production of the visualisations which accompany the Landscape and Visual Impact Assessment (LVIA) for the proposed Aberedw Energy Park (hereafter referred to as the 'Proposed Development'). Figures referred to in this appendix are located in Environmental Statement (ES) **Volume 2: Figures** and visualisations can be found in **Volume 4: Visualisations.**

1.1.2 The methodology for the production of visualisations was based on current good practice guidance from NatureScot (formerly SNH)[1] and the Landscape Institute[2]. Further information about the approach is provided below.

1.2 Maps Used for Field Work and Desk-based Study

- Ordnance Survey (OS) Maps:
  - Landranger 1:50,000 Scale; and
  - Explorer 1:25,000 Scale.
- Online map search engines:
  - Bing, mapping website; and
  - Google, mapping website.
- Computer programmes:
  - Google Earth Pro.

1.3 Data Used for Digital Terrain Modelling (DTM)

- LiDAR high resolution height data (DTM), obtained from Welsh Government (1 m grid spacing, resampled to 5 m, ±15cm RMSE);
- OS Terrain 5™ mid-resolution height data (DTM) (5 m grid spacing, 2.5 metres RMSE); and
- OS Terrain 50™ lower-resolution height data (DTM) (50 m grid spacing, 4 metres RMSE).

1.4 Digital Base Mapping

- OS 1:25,000 raster data (to provide detailed maps to show surface details such as roads, forest and settlement detail equivalent to the 1:25,000 scale OS Explorer series maps);
- OS 1:50,000 raster data (to show surface details such as roads, forest and settlement detail equivalent to the 1:50,000 scale OS Landranger series maps); and
- OS 1:250,000 raster data (to provide more general location mapping).

2. Zone of Theoretical Visibility (ZTV) Mapping

2.1 Turbine Blade Tip Height and Hub Height ZTVs

2.1.1 Evaluation of the theoretical extent to which the Proposed Development would be visible across the study area was undertaken by establishing a ZTV using computer software designed to calculate the theoretical visibility of the proposed turbines within their surroundings. ESRI's ArcPro 3.4.0 software was used to generate the ZTV. The Viewshed tool, found in the Spatial Analyst Toolbox within the ArcGIS software was used to calculate the theoretical visibility. The tool calculates areas from where the turbine hub (turbine nacelle) and maximum blade tip height are potentially visible. This is performed on a 'bare ground' computer generated terrain model, which does not take account of potential screening by buildings or vegetation. It should be noted that the software uses raster height

[1] Scottish Natural Heritage (SNH) (2017) Visual Representation of Wind Farms – Guidance (Version 2.2)
[2] Landscape Institute (LI) (2019) Technical Guidance Note (TGN) 06/19: Visual Representation of Development Proposals

data, but while it is displayed as continuous data (with each grid square referred to as a 'cell'), it assumes a single height value from the centre of that cell for the whole cell. Therefore, any height variations between centre points and edges of cells will not be recognised.

2.1.2 The DTM used for the LVIA analysis is LiDAR height data, obtained from Welsh Government in September 2024. The root-mean-square error (RMSE) of this data is ±15 cm. The DTM data is represented by 1x1 m grids, which was resampled (using geoprocessing tools in ArcPro 3.4.0) to a 5x5 m grid. This means that the software calculates the number of turbines visible from the centre point of each 5x5 m grid/square area. This data was used to calculate visibility within the LVIA 33 km study area. Visibility around the edges and beyond the 33 km buffer (which has been included to avoid an abrupt edge to the ZTV in the associated figures) was based on the LiDAR 1 m DTM data (resampled to 5 m).

2.1.3 The DTM data has not been altered (i.e. by the addition of local surface screening features) for the production of the ZTV. The effect of earth curvature and light refraction has been included in the ZTV analysis and a viewer height of 2 m above ground level has been used. As it uses a 'bare ground' model, it is considered to over emphasise the extent of visibility of the Proposed Development and therefore represents a 'maximum potential visibility' scenario. The ZTV is used as a starting point in the assessment to provide an indication of theoretical visibility.

2.1.4 The ZTV was calculated to show the potential number of turbines visible to a maximum blade tip height of up to 200 m a maximum hub height of 125.45 m. The ZTV calculated to hub height is shown in **Figures 5.3a-b** and the ZTV calculated to blade tip height is shown on **Figures 5.4a-b**. Subsequent figures which include the ZTV make use of the ZTV to maximum blade tip heights. The Z (base) height of each turbine was derived from proposed platform 3D model provided by the project engineers, Pell Frischmann.

2.1.5 To construct cumulative ZTVs (CZTVs) to illustrate the cumulative visibility of the Proposed Development in conjunction with other wind energy developments, the ZTV to tip height of each wind energy development was generated (based on the tip height of each turbine to an applicable maximum radius in accordance with the current guidance (SNH, 2017)), and then combined with the Proposed Development ZTV (up to 33 km radius). The CZTVs are colour coded to distinguish between areas where the Proposed Development is predicted to be visible (either on its own, or in conjunction with other wind energy developments), and areas where other wind energy developments would be visible, but the Proposed Development would not.

2.2 Substation ZTVs

2.2.1 The same process as detailed above was applied for the production of the Substation ZTV (show on **Figure 5.6**). The ZTV was calculated to show the potential extent of visibility to a building height range of 5.03 m to 12.35 m.

2.3 Aviation Lighting ZTVs

Visible Aviation Lighting ZTVs

2.3.1 **Appendix 5.8: Aviation Lighting Impact Assessment** considers the potential landscape and visual effects arising from the introduction of visible aviation lighting. It is supported by ZTVs illustrating the predicted extents of theoretical visibility of lights mounted on both the nacelles of specific turbines. The reduced aviation lighting scheme for the Proposed Development is detailed in **Appendix 2.7: Aviation Lighting and Mitigation Report** and has been approved by the Civil Aviation Authority (CAA). It consists of medium intensity (2000 candela (cd.)) lights positioned on the nacelles of 6 of the 18 proposed turbines (T2, T6, T7, T10, T16 and T18). It was used to inform the preparation of the aviation lighting ZTVs.

2.3.2 The ZTVs are used to illustrate the theoretical visibility of the proposed visible aviation lighting across the 28 km radius study area (and up to 33 km within the Bannau Brycheiniog National Park) and are shown on **Figure A5.8.1** (with focused areas to a 15 km radius and 2 km radius shown on **Figure A5.8.2** and **Figure A5.8.3** respectively).

Aviation Lighting Intensity ZTVs

2.3.3 To supplement the hub height ZTVs, directional lighting intensity ZTV figures were produced. These ZTVs shown on **Figure A5.8.4** for the 28 km radius study area (and up to 33 km within the Bannau Brycheiniog National Park), a 15 km radius on **Figure A5.8.5** and a 2 km radius on **Figure A5.8.6**, have been prepared to illustrate the maximum and minimum predicted luminous intensity (candela/cd.) emitted from the nacelle mounted aviation lights relative to viewing angle/elevation.

2.3.4 The specific luminous intensity (cd.) of medium intensity aviation obstruction lights, which meet the minimum regulatory requirements, result in light being emitted most strongly at 0˚ (horizontal) to +1˚ angle. This can be reduced outside a 3° band from horizontal, and many modern aviation lights are capable of substantially reducing the level of light emitted at vertical angles outside this range. The reduction in emitted light intensity is especially evident at negative angles (below -1˚) which are important in terms of how receptors positioned at lower elevations than wind turbine nacelles may perceive the lights. This is referred to as vertical directional intensity mitigation and is inbuilt into the specific type of light, such as that referenced in **Appendix 2.7**, the CEL-WT-MIC light.

2.3.5 Variation in the elevation angle between the light and the viewpoint (observer/receptor) can result in a considerable increase or decrease in the luminous intensity experienced at each representative viewpoint location. The intensity of light emitted at different angles is shown in the form of lighting intensity Zone of Theoretical Visibility (ZTV) mapping (as detailed above in relation to Figure **A5.8.4** to **Figure A5.8.6**).

2.3.6 The DTM data and methodology used for the calculation of the lighting intensity ZTVs were identical to the ZTV (hub height) as defined above, except that vertical limits are set for the output. The maximum and minimum predicted luminous intensity values (candela/cd.) emitted are based on the CEL-WT-MIC light referred to above, which meets the minimum requirements of ICAO/CAP393 medium-intensity nacelle mounted aviation light – including ICAO Minimum 2,000 cd. average intensity required between 0˚ (horizontal) and +3˚. These specific maximum and minimum luminous intensity values are derived from the manufacturer's technical specification and performance statistics for the CEL-WT-MIC light, as detailed in **Table 2.1** below. The ZTV was run six times (to represent each individual turbine light) with different upper and lower angle elevation limits (where 0° represents the horizontal plane), to represent the minimum average intensities required at different elevation angles.

Table 2.1 Maximum and minimum luminous intensity relative to viewing angle – CEL-WT-MIC light

Vertical Angle of Lighting from Nacelle	Approximate Maximum and Minimum Candela (cd)	Approximate Maximum and Minimum Candela (cd) at 10% (clear weather conditions)
Above 5°	147 to 34	15 to 3
4° to 5°	247 to 134	25 to 13
3° to 4°	481 to 237	48 to 24
2° to 3°	1160 to 481	116 to 48
1° to 2°	2119 to 1170	212 to 117
0° to 1°	2206 to 1968	221 to 197
-1° to 0°	2036 to 987	204 to 99
-2° to -1°	996 to 383	100 to 38
-3° to -2°	394 to 197	39 to 20
-4° to -3°	199 to 131	20 to 13
-5° to -4°	131 to 92	13 to 9
Below -5°	94 to 38	9 to 4

2.3.7 There is an overlap between each of the six layers which represents the visibility of each of the six lit turbines. **Figure A5.8.4** to **Figure A5.8.6** show the layer with the greater intensity on top (i.e. the individual turbine nacelle mounted light with the brightest emitted light), so as to represent the 'maximum' or 'worst case' effect scenario.

2.3.8 The ZTVs do not take account of the effect that distance has in reducing the amount of light falling on a particular area and therefore perceived brightness of light experienced on the ground, or the potential screening provided by vegetation or built form.

3. Preparation of Visualisations

3.1 Daytime Visualisations

Viewpoint Photography

3.1.1 The methodology for photography is in accordance with guidance from Scottish Natural Heritage (now NatureScot) and the Landscape Institute. Photography was undertaken by LUC between May 2023 and April 2025. A Nikon D750 full frame sensor digital single lens reflex (SLR) camera, with a fixed 50 mm focal length lens, was used to undertake photography from all viewpoint locations (except Viewpoints 2, 4, 8, 10, 15, 18, 23 and 29 which are represented by a wireline).

3.1.2 A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of overlapping images. The camera was orientated to take photographs in portrait format from close proximity viewpoints to the proposed turbines, and in landscape format from all other viewpoints. A panoramic head was used to ensure the camera rotated about the no-parallax point of the lens in order to eliminate parallax errors between the successive images and enable accurate stitching of the images. The camera was moved through increments of 15˚ (degrees) for those taken in portrait format and 24˚ for viewpoints taken in landscape format. The camera was rotated through a full 360˚ at each viewpoint. 24 photographs were taken for each 360˚ view in portrait format, and 15 photographs for each 360˚ view in landscape format.

3.1.3 The location of each viewpoint and information about the conditions was recorded in the field in accordance with NatureScot (SNH, 2017) and LI guidance (LI, 2019).

3.1.4 Weather conditions and visibility were considered an important aspect of the field visits for the photography. Where possible, visits were planned around clear days with good visibility, although weather conditions can change quickly in this part of the UK. Viewpoint locations were visited at times of day to ensure, as far as possible, that the sun lit the scene from behind, or to one side of the photographer. Photography opportunities facing into the sun were avoided where possible to prevent the wind turbines appearing as silhouettes.

Photographic Stitching, Wirelines and Photomontages

3.1.5 Photographic stitching software PTGui© 12.26 was used to stitch together the adjoining frames to create 360° panoramic baseline photography. A selection of identical control points was created within each of the adjoining frames to increase the level of accuracy when stitching the 360° panoramic photography.

3.1.6 The software package ReSoft© WindFarm version 5.1.1.4 was used to view the Proposed Development from selected viewpoints in wireline format. 1 m LiDAR DTM data (resampled to 5 m) and OS Terrain 5 DTM data were used to create a Digital Terrain Model (DTM) which provided a detailed and reliable representation of the topography for the wireline view. Turbine locations, type and size, and viewpoint location coordinates were entered. The software applies default turbine geometry in wireline views so turbines are shown with the specified blade tip heights, hub heights and rotor diameters (as detailed in **Chapter 2: Approach to the EIA** and **Chapter 4: Development Description**), but other dimensions such as tower diameter, hub and nacelle proportions, are generic and not exact to manufacturer specifications. This means that the turbine towers, hub and nacelle may appear larger in scale in the wireline images than in rendered models where additional turbine geometry may be set. The turbines shown within the wireline images can be considered schematic and illustrative, and the software graphically displays these in a way which allows their visibility to be clearly discerned in all visualisations, regardless of viewpoint distance. Viewer height was set to 1.5 m above ground level. In some instances, the viewer height was increased by a small increment to achieve a closer match between the terrain data and photographic landform content.

3.1.7 The DTM was amended to incorporate the proposed platforms upon which the proposed turbines are located. 3D CAD contours were provided and processed in ArcPro 3.4.0 and merged into the OS Terrain 5 DTM data.

3.1.8 Wind farm layouts included within the cumulative assessment were added to the ReSoft© WindFarm model.

3.1.9 The presentation of fully rendered daytime photomontages involved additional stages, as follows.

3.1.10 The Panoramic baseline daytime photographic images were imported into ReSoft© WindFarm software. From each viewpoint the wireline views of the landform model with the proposed turbines were carefully adjusted to obtain a match. Fixed features on the ground, such as buildings and roads, were located in the model and used as markers to help with the alignment process where necessary. Each view was rendered taking account of the sunlight and the position of the sun in the sky at the time the photograph was taken. Blade angle and orientation adjustments were also made to represent a realistic situation.

3.1.11 The exported renders were imported into Adobe Photoshop© where they were aligned and composited with the baseline photography. Turbines or sections of turbines which were located behind foreground elements in the photograph were masked (removed) where they were located behind foreground elements that appeared in the original photograph to create the photomontage.

3.1.12 The software package Blender© 4.2.9 was used for adding the access tracks and substation, where visible, to all viewpoints. These elements were informed by infrastructure data either imported as a GIS shapefile or modelled in 3D to their specified dimensions and positioned within a DTM created from the same DTM data used for the turbine alignment and renders. Cameras were set up within the 3D software to replicate the coordinate positions, view direction and field of view of the baseline photography and the model views were aligned. The views showing infrastructure were then rendered and combined with the baseline photography and rendered turbine views, using Adobe Photoshop© software, to create the photomontage images.

3.1.13 Finally, the Planar projection 53.5˚ wireline and Photomontage images were created from wider cylindrical projection 90˚ Panoramic images using PTGui© 12.26 software.

3.2 Dusk/ Night-time Visualisations

3.2.1 Guidance on the approach to aviation lighting impact assessment, developed by Scottish Government and NatureScot, was published in November 2024[3]. This guidance advocates that where automatic dimming mitigation is adopted photomontage visualisations showing lights illuminated only to the 200 candela (cd) scenario (e.g. not less than 10% of the minimum peak intensity) need be presented.

3.2.2 Photomontage visualisations have therefore been prepared form two representative dusk/night-time assessment viewpoints that represent dimmed aviation lights to 10% of their maximum luminance intensity (i.e. 200 cd.) in times of clear meteorological conditions, where visibility exceeds 5 km at the point of measurement (i.e. sensors on the turbine nacelles). The two viewpoints are:

- Dusk/night-time Assessment Viewpoint N1: Perthi Common (which is the same location as daytime Viewpoint 6); and
- Dusk/night-time Assessment Viewpoint N2: Hay Bluff, Bannau Brycheiniog National Park (which is a very similar location to daytime Viewpoint 27).

Dusk/Night-time Viewpoint Photography

3.2.3 Baseline photographs from the two dusk/night-time assessment viewpoints were taken between July 2024 and April 2025, using the same camera equipment and similar procedure as the daytime views. Baseline photography, including the presence of existing sources of artificial lights where applicable, was taken in clear atmospheric conditions. 360˚ ranges of photography were taken at regular intervals starting shortly before sunset or sunrise (depending on the viewpoint) with subsequent ranges taken as natural light faded and existing manmade light sources became visible or before natural light increased at dawn.

3.2.4 In accordance with good practice guidance, baseline photography has been carried out in appropriate conditions close to dusk. NatureScot guidance states *"The visualisation should use photographs taken in low light conditions, preferably when other artificial lighting (such as street lights and lights on buildings) are on, to show how the wind farm lighting will look compared to the existing baseline at night… We have found that approximately 30 minutes after sunset provides a reasonable balance between visibility of the landform and the apparent brightness of artificial lights, as both should be visible in the image"* (paragraphs 174-177, pages 35 and 36). The baseline photography selected for the visualisations was captured at approximately 30 minutes after civil twilight on the date of the photography, with reference to guidance from NatureScot[4,5,6].

3.2.5 A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of adjoining images is captured. The camera was orientated to take photographs in landscape format. A panoramic head was

[3] Scottish Government and NatureScot (2024) Guidance on Aviation Lighting Impact Assessment
[4] NatureScot (2024) General pre-application and scoping advice for onshore wind farms
[5] Scottish Natural Heritage (2017) Visual Representation of Wind Farms – Guidance (Version 2.2)
[6] Scottish Government and NatureScot (2024) Guidance on Aviation Lighting Impact Assessment

used to ensure the camera is rotated about the no-parallax point of the lens in order to eliminate parallax errors between the successive images and enable accurate stitching of the images. The camera was rotated through increments of 24˚ and through a full 360˚ at each viewpoint. Fifteen photographs were taken for each 360˚ view.

3.2.6 Exposure settings were carefully optimised at each viewpoint with shutter speed, aperture and ISO levels balanced to ensure the photography provided an accurate representation of the conditions at the time.

3.2.7 For the purposes of this application, and due to prevailing weather conditions, the dusk and daytime baseline photography for Viewpoint N2 / 27 - Hay Bluff, Bannau Brycheiniog National Park – was not captured from the same location. The photography locations are situated within relatively close proximity however, with the daytime photography captured downslope from the trig point on the summit of the hill, and the dusk photography captured from the summit. The locational details for each are set out in **Appendix 5.5: Visual Assessment Tables** and **Appendix 5.8: Aviation Lighting Impact Assessment**.

Photographic Stitching, Wirelines and Photomontages

3.2.8 Photographic stitching software PTGui© 12.26 was used to stitch together the adjoining frames to create 360° panoramic baseline photography. A selection of control points were positioned over each of the adjoining frames to increase the level of accuracy when stitching the panoramic photography.

3.2.9 3ds Max software was used to render the turbines with the aviation lighting proposed for the Proposed Development. Light sources were created to match the specifications provided in terms of luminous intensity (candela units), colour and position. Real-time camera data was imported into the 3DS Max physical cameras within the model environment including F-stop and FOV (field of view) values. The sunlight and daylight system within the software was set to accurately simulate the natural light still present at the date, time and geographical location of night-time photography. The turbines in the night views were orientated with the hub facing the viewer (and not obscured by turbine blades). This ensures that the images show the maximum visibility of the lighting proposed to be installed on the hubs of the turbines.

3.2.10 The exported renders were imported into Adobe Photoshop© where they were aligned and combined with the baseline photography. Turbines or sections of turbines which were located behind foreground elements in the photograph were removed to create the photomontage.

3.2.11 As with the daytime images the exported renders were then composited with the baseline photographic view using Adobe Photoshop© software and converted from Cylindrical Projection to Planar Projection using PTGui© software.

3.2.12 Finally, Adobe InDesign© software was used to present the 53.5˚ horizontal included angle photomontages. The dimensions for each image (printed height and field of view) are in accordance with the requirements set out in the guidance, and consistent with similar photomontages presented to illustrate daytime effects. Photography information and viewing instructions are provided on each page.

3.2.13 The dusk visualisations aim to be representative of the visual appearance of the proposed aviation lighting (as set out in **Appendix 2.7**) at dusk in clear viewing conditions. They are prepared to demonstrate the worst case scenario. However, it should be noted that due to limitations in software, distance to the lights and atmospheric conditions cannot be modelled in the 3D environment. These elements are illustrated in post-production during the photomontaging process in photoshop, informed by the existing light sources within the baseline photography where possible.

3.2.14 The visualisations have been created using Autodesk 3DS Max©/Vray© modelling and rendering software, which allows modelling of any light source in candela or micro lumen units (also known as lux). In accordance with the latest NatureScot guidance, a single photomontage has been created for each dusk viewpoint showing the ‘reduced lighting intensity scenario’ (200 candela) for all visible hub lights across the scheme. If the photomontages are being viewed on a screen, it is recommended this is done in a darkened environment with low levels of lighting, avoiding any screen glare (i.e. no reflections or light shining directly onto the surface of the screen which will alter the perceived light being cast out from the screen, as this has the effect of making things appear lighter or darker than they actually are to the human eye). The turbines in the night views are orientated with the hub facing the viewer (and not obscured by turbine blades). This ensures that the images show the maximum visibility of the lighting that is proposed on the turbine hubs.

3.2.15 The photomontages do not seek to replicate the additional variable influence which distance (between the light and the viewpoint/observer) or atmospheric attenuation[7] by moisture (cloud/rain/fog) or by dust or other particulates[8] can have on the observed brightness[9] of the lights. However, it is understood that the additional influence of these factors could lead to a further decrease in the brightness as it is perceived.

3.2.16 The photomontages prepared and presented in the ES illustrate a likely 'maximum case effect' in clear conditions for each representative viewpoint, providing an indicative tool, which is referred to when visiting the viewpoint in the field. As with any visualisation, limitations are recognised, including issues relating to print quality and paper surface if printed, or size, screen brightness and output resolution if viewed on screen. Judgements on levels of effect were informed by research and the aviation lighting intensity ZTVs (**Figures A5.8.4 to A5.8.6**), observations made in the field work for this project, and experience from other projects.

3.3 Presentation of Photomontage and Wireline Visualisations

3.3.1 The printed figures for the viewpoint visualisations produced in accordance with current NatureScot guidance (SNH, 2017) requirements are presented in ES **Volume 4: Visualisations.**

3.3.2 Adobe InDesign© software was used to present the figures. The dimensions for each image (printed height and field of view) are in accordance with NatureScot guidance (SNH, 2017) requirements. Photography information and viewing instructions are provided on each page where relevant.

3.3.3 The elongated A3/A1 width format pages presented for each viewpoint are set out as follows:

- The first page contains two maps – an OS 1:50,000 scale map showing the viewpoint location, direction of the 90˚ horizontal included angle baseline photography, wireline views and 53.5˚ horizontal included angle photomontage view and an OS 1:250,000 scale map showing the Proposed Development and other existing or proposed wind farms.
- The following page contains 90˚ baseline photography and wireline to illustrate the wider landscape and visual context. These are shown in cylindrical projection and presented on an A1 width page. Additional pages in the same format are provided where relevant to illustrate wider cumulative visibility up to 360˚.
- The subsequent pages contain 53.5˚ horizontal included angle wireline(s) and photomontage(s). These images are both shown in planar projection and presented on an A1 width page.
- For Viewpoints 2, 4, 8, 10, 15, 18, 23 and 29, wireline only views are presented (as agreed with Powys County Council (PCC)). For this viewpoint, 90˚ horizontal included angle wirelines to illustrate wider cumulative visibility up to 360˚, and a single or multiple 53.5˚ horizontal included angle wirelines are presented.
- For Viewpoints 6 and 27, the baseline dusk and photomontage views are presented as 53.5˚ planar horizontal included angle and photomontages.

3.4 RVAA Wireline Visualisations

3.4.1 On the basis of guidance included in the Landscape Institute's GLVIA3 and Residential Visual Amenity Assessment (RVAA) Technical Guidance Note 2/19 (LI TGN 2/19)[10], indicative wireline visualisations (**Figures A5.7.4 to 5.7.38**) based on a bare ground digital terrain model have been generated from all individual properties/property groups included in the RVAA (see **Appendix 5.7: Residential Visual Amenity Assessment**) using Resoft Windfarm software.

3.4.2 Single or multiple 90˚ horizontal included angle wirelines (up to three wirelines labelled View A > View C) are presented dependant on the horizontal angle of view occupied by visible turbines of the Proposed Development. For wirelines representative of a group of properties, a representative property location has been selected within the group of properties to illustrate the 'maximum effect' within the property group (e.g. the greatest number, proportion,

[7] The decreasing brightness of light as it passes through the atmosphere and is scattered or absorbed by processes in the atmosphere.
[8] Microscopic solid or liquid particles suspended in the atmosphere, which may be natural, such as dust or pollen, or man-made pollutants, such as smoke of vehicle emissions. Sea salt is also prevalent in maritime environments, and liquid water in the form of water droplets suspended in the air as cloud or fog is common.
[9] The measure of luminous intensity of light that passes through a unit area of surface at a particular distance. The observability of light depends on the illuminance of a light and determines how bright a light appears.
[10] Landscape Institute (2019) Technical Guidance Note 2/19: Residential Visual Amenity Assessment (RVAA)

or horizontal extent of turbines evident). The images include the full extent of the Proposed Development and have been generated based on a 1.5 m viewing height.

3.4.3 It should be noted that the wirelines are not necessarily representative of the primary outlook of the property and do not show features such as buildings and trees that may provide screening or filtering of views. These indicative wireline visualisations therefore represent a ‘maximum visibility scenario’ which may potentially be experienced from the property or its curtilage with no screening features in place. This should be borne in mind when viewing the images.

3.4.4 The illustrative wireline visualisations show the turbines numbered for ease of reference and show the direction of view in degrees. The wirelines illustrate the proposed turbines, along with any other existing or proposed wind farms considered in the cumulative assessment. The wirelines do not include illustration of ancillary development or tracks, but these are taken into account in the assessment (assessors used Google Earth Pro where necessary to check visibility of these components in 3D).