OAKLANDS FARM SOLAR PARK

Applicant: Oaklands Farm Solar Ltd

Environmental Statement

Appendix 5.2 – ZTV Mapping and Visualisation Methodology

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Appendix 5.2: ZTV Mapping and Visualisation Methodology

Final report
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Appendix 5.2
Zone of Theoretical Visibility Mapping and Visualisation Methodology

A5.2.1 This appendix sets out the approach to the production of the visualisations which accompany the Oaklands Farm Solar Park Landscape and Visual Impact Assessment (LVIA). Figures referred to in this appendix are located in **Volume 2: Figures** and **Volume 4: Visualisations**.

A5.2.2 The methodology for the production of visualisations was based on current good practice guidance from the Landscape Institute. Further information about the approach is provided below.

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 (Online - Available at: www.bing.com/maps); and
  - Google, mapping website (Online - Available at: www.maps.google.com).

Data Used for Digital Terrain Modelling (DTM)

- OS Terrain® 5 mid-resolution height data (DTM) (5m grid spacing, 2.5 RMSE).

Digital Base Mapping

- Ordnance Survey 1:25,000 raster data (to provide a detailed map of property locations in **Figure 5.9**); and
- Ordnance Survey 1:50,000 raster data (to show surface details such as roads, forest and settlement detail equivalent to the 1:50,000 scale Landranger maps).

Zone of Theoretical Visibility (ZTV) Mapping

A5.2.3 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 PV panels, the Proposed Development's substation and battery storage within their surroundings. ESRI's ArcMap 10.8.1 software was used to generate the ZTV. The Viewshed tool, found in the Spatial Analyst Toolbox within the ArcMap software was used to calculate the theoretical visibility. The tool calculates areas from which the PV panels (2.7m high), the Proposed Development's substation (variable heights of between 5-10.2m) and battery storage (variable heights of between 3.12-3.5m) are potentially visible. This was performed on a 'bare ground' computer generated terrain model (for **Figures 5.5a and 5.5c**), which does not take account of potential screening by existing buildings or vegetation. It is considered to over emphasise the extent of potential visibility and therefore represents a 'maximum potential visibility' scenario. The DTM (digital terrain model) data has not been altered (i.e. by the addition of local surface screening features) for the production of the ZTV, and no significant discrepancies between the used DTM and the actual topography around the study area was identified.

A5.2.4 The DTM used for the LVIA analysis is OS Terrain® 5 height data, obtained from Ordnance Survey in 2023. The root-mean-square error (RMSE) of this data is 2.5m. The DTM data is represented by 5x5m grids, which means that the software calculates visibility from the centre point of each 5x5m grid/square area. It should be noted that the software uses point height data, rather than continuous data, and assumes straight line topography between data points, and is therefore not able to take account of small scale, less than 5m in width, topographic features.

A5.2.5 A DSM (digital surface model) was created to account for local screening features. The existing buildings (estimated at 8m high) and areas of existing woodland (estimated at 15m high) were added in to DTM. A screening ZTV was run on the DSM to represent the potential screening provided by these elements (for **Figures 5.5b** and **5.5d**).

A5.2.6 The effect of earth curvature and light refraction has been included in the ZTV analysis and a viewer height of 1.5m above ground level has been used. The ZTV is used as a starting point in the assessment to provide an indication of theoretical visibility.

Visualisations

Viewpoint Photography

A5.2.7 The methodology for photography is in accordance with guidance from the Landscape Institute's Technical Guidance Note 06/19[1] . Photography was undertaken by LUC in October 2021, February 2022 and December 2022. Ranges were taken from the same locations when trees were both in leaf (summer) and not in leaf (winter) to ensure seasonality was represented in the baseline views. A Nikon D750 full frame sensor digital single lens reflex (SLR) camera, with a fixed 50mm focal length lens, was used to undertake photography from the viewpoint locations (**Viewpoints 1-11**).

A5.2.8 A tripod with vertical and horizontal spirit levels was used to provide stability and to ensure a level set of adjoining images. The camera was orientated to take photographs in portrait format from **Viewpoints 2, 5b and 7**, given their location within/close to the Site and proximity to the Proposed Development, and in landscape format from **Viewpoints 1, 3-5a, 6 and 8-11**. A panoramic head was used to ensure the camera rotated about the no-parallax point of the lens 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 **Viewpoints 2, 5b and 7** and 24˚ for **Viewpoints 1, 3-5a, 6 and 8-11**. 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. The Ordnance Survey coordinates of each viewpoint location were recorded with a GPS device and photographs of the tripod position were taken in accordance with Landscape Institute guidance.

A5.2.9 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. 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.

[1] Landscape Institute (2019) Technical Guidance Note 06/19: Visual Representation of Development Proposals.

Photographic Stitching and Photomontages

A5.2.10 Photographic stitching software PTGui© 11.19 was used to stitch together adjoining frames to create panoramic baseline photography using cylindrical projection. A selection of identical control points were created within each of the adjoining frames to increase the level of accuracy when stitching the 360° panoramic photography. The baseline photography (captured in summer and winter for **Viewpoints 1-11** is provided in **Volume 4: Visualisations**.

A5.2.11 Photomontages showing the Proposed Development on completion at Year 1 and Year 10 have been produced at AVR3 Level for **Viewpoints 1, 2, 3, 5a and 8** using the photography captured in winter to demonstrate the worst-case scenario in terms of potential visibility of the Proposed Development (i.e. when Leaves are absent from vegetation and the extent of screening is reduced relative to the summer).

A5.2.12 For the remaining **Viewpoints 4, 6, 7, 9, 10 and 11**, these are shown at AVR2 Level (single colour massing where visible and composited and masked into the baseline photograph). The PV panels, the Proposed Development's substation, transformer units, deer-fencing and security fencing have been modelled within the views where visible and placed at the correct heights. The PV panels have been aligned to sit at the maximum allowable height above ground level. A dotted outline has been applied to the areas of PV panels where they are hidden, and the PV panels have been masked out of the view where they are not visible (i.e. where they sit behind intervening features in the views such as existing vegetation). These viewpoints also use the photography captured in winter. The visualisations are contained in **Volume 4: Visualisations**.

A5.2.13 Viewpoint 5b is shown with a baseline photograph only (taken during winter) to demonstrate that the Proposed Development is not visible and is screened by intervening woodland.

A5.2.14 Autodesk 3DS Max© and GNU/GPL Blender© software was used to create an accurate and reliable 3D representation of the site and surrounding topography using Ordnance Survey Terrain 5 height data.

A5.2.15 Viewpoints were micro-sited using hi-resolution aerial photography alongside the GPS photography positions and on-site tripod photographs. Views were then created within the software which replicated the camera parameters and perspective geometry of the baseline photography. 90-degree sections of the stitched panoramas were added to the background of each 3D view, alignments were further refined by locating and modelling visible viewpoint markers to accurately define the view direction of each camera within the model.

A5.2.16 The Proposed Development layout was provided to LUC as AutoCAD files from Baywa r.e. UK and used for placement reference and/or directly added into the 3DS Max and Blender models. The 3D model contains the main components of the Proposed Development (The solar PV panels, the Proposed Development's substation and battery storage facility). Other assets required in the production of the panoramas (deer fencing, security fencing, transformer units and security cabin) were created from fully-dimensioned information supplied by Baywa r.e. UK and Pell Frischman. Pell Frischman supplied AutoCAD files and PDF guidance reference documents in relation to the groundwork areas concerning the widening of the southern crossroad junction, visible from the four view directions at Years 1 & 10 contained within **Viewpoint 1 – Coton Road** (**Figures 5.10a-q**)

A5.2.17 All panoramas showing planting mitigation in the photomontages at Year 1 & Year 10 have been created in conjunction with the proposals illustrated in **Appendix 5.6: Outline Landscape and Ecological Management Plan.** Assumed planting heights (growth rate) at Year 1 for new woodland trees and associated scattered areas of new trees are between 1 to 3m. Assumed planting heights (growth rate) at Year 10 for new woodland trees and associated scattered areas of new trees are between 5 to 7m. Any enhanced hedging at Year 1 & Year 10 is assumed to be at a height of 2.5 to 3m. Newly planted whips and associated hedgerows at Year 1 are shown at a height of 0.6m. New areas of hedgerows which have matured by Year 10 are shown at a height of 2.5 to 3m.

A5.2.18 Autodesk 3DS Max© software was used to render the 3D model views of the Proposed Development for all AVR3 panoramas and GNU/GPL Blender© software for all AVR2 panoramas, taking account of the sunlight conditions and the position of the sun in the sky at the date and time the photographs were taken.

A5.2.19 The next stage required the rendered 3DS Max and Blender view render exports to be composited with the baseline photography using Adobe Photoshop© software to create the photomontage images.

A5.2.20 Adobe InDesign© software was used to collate and present the figures. All viewpoints have been presented as separate images with a 90-degree horizontal field of view (FOV). In some viewpoints the Proposed Development extends beyond a 90-degree FOV, in which case, it has been shown across multiple pages. For viewpoints with a photomontage, the first two images of each figure present the baseline summer and then a baseline winter panorama, followed by its corresponding winter photomontage for continuity at Year 1 and Year 10 for that view at a 90-degree horizontal field of view.