EAST PARK
ENERGY

East Park Energy

EN010141

Environmental Statement
Volume 2 – Technical Appendices

Appendix 5-2: ZTV and Photomontage Methodology

Document Reference: EN010141/DR/6.2

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009: Regulation 5(2)(a)

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EAST PARK ENERGY

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Environmental Statement
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1.0 INTRODUCTION

1.1.1 The purpose of this methodology is to provide an understanding of how visualisation material prepared has been produced to support the Environmental Statement (ES), including Zone of Theoretical Visibility (ZTV) mapping and photo-realistic visualisations (or 'photomontages') from selected viewpoints.

1.1.2 It should be recognised that production of visualisations is only one component of a Landscape and Visual Impact Assessment (LVIA), which will consider a range of other factors when identifying and assessing changes to the landscape and to views. The use of visualisations is a useful aid when undertaking LVIA, but the assessment process is not dependent on them. LVIA may be undertaken without use of visualisation material, although for major developments the inclusion of visualisations is accepted practice.

1.1.3 Current good practice regarding the production of visualisations is set out in:

- Landscape Institute and Institute for Environmental Management and Assessment (3rd edition, 2013), *Guidelines for Landscape and Visual Impact Assessment.* This document is referred to hereafter as 'the GLVIA'; and
- Landscape Institute (2019), *Visual Representation of Development Proposals. Technical Guidance Note 06/19.* This document is referred to hereafter as 'TGN 06/19'.

2.0 ZONE OF THEORETICAL VISIBILITY

2.1 Data Source

2.1.1 The ZTVs are based on two different landform models:

- A digital terrain model (DTM), available from the Environment Agency, which is considered to be an absolute worst-case in terms of visibility. This is generated using LiDAR Composite DTM 2m data captured in 2022. This data consists of a series of spot levels at 2 m intervals. The declared 'root-mean-square error' (RMSE) of this dataset is 15 cm, i.e. the degree of error between the actual on-the-ground height of any particular location and the height as indicated by the DTM is a maximum of 15 cm.
- A digital surface model (DSM), available from the Environment Agency, which is considered to be a more accurate representation in terms of visibility. This is generated using LiDAR Composite DSM 2 m data captured in 2022. The DSM data takes account of screening features such as buildings and vegetation.

2.1.2 The LVIA focuses on the DSM ZTV as it provides a more realistic guide to where the Scheme would be visible from, whilst the DTM ZTV provides an important guide to where the Scheme would absolutely not be visible from due to topographic screening.

2.2 ZTV Creation

2.2.1 The ZTVs were calculated and created using QGIS. The ZTV calculation process takes account of the curvature of the earth's surface and light refraction. The eye height of the receptor in the computer model was set at 1.7m above ground level in accordance with guidance set out in GLVIA.

2.2.2 The ZTVs illustrate the following:

- The theoretical visibility of the main solar array, illustrated in **ES Vol 3 Figures 5-3a and 5-3b [EN010141/DR/6.3]**. While the solar panels would be a maximum of 3m above ground level (AGL), the associated transformer units would be 3.15m AGL and therefore the ZTVs have taken the higher measurement of 3.15m AGL as their basis for the Scheme.

- **ES Volume 3 Figure 5-3c [EN010141/DR/6.3]** illustrates the percentage of the solar array visible throughout the study area, again based on a height of 3.15m AGL. Colour banding has been used to differentiate between locations where more or less of the array would be theoretically visible.
- The theoretical visibility of the proposed substation and BESS compound, reflecting both potential sites and the height of the highest structures proposed structures (13.6m AGL for the substation and 4.4m AGL for the BESS). The ZTV for the BESS and substation is provided at **ES Vol 3 Figure 5-3d [EN010141/DR/6.3]**.

2.2.3 Given the nature of the Scheme it is impractical to model the visibility of each individual structure. As such a series of points were generated randomly within the extent of the footprint of the structures based on the following parameters.

- Solar Array and Transformers.
  - 100 no. points within each area of solar panels
  - Minimum distance 50m between each point
- BESS and Substation.
  - 100 no. points within the BESS/substation area
  - Minimum distance 25m between each point.

2.2.4 For the avoidance of any doubt, the ZTVs do not reflect the presence of any proposed planting. As such, they present a worst-case scenario of theoretical visibility.

2.2.5 The ZTVs are displayed on **ES Vol 3 Figures 5-3a to 5-3d [EN010141/DR/6.3]**.

2.3 Limitations

2.3.1 A ZTV, as use of the word ‘theoretical’ indicates, is not an absolute indication of the extent of visibility but rather a computer-generated aid that utilises available relative data to indicate areas of inter-visibility and screening in relation to a specific modelled object. ZTVs are tools to assist the LVIA. The technique aims to give a better understanding of the areas where visibility is likely and unlikely but imperfections in data are such that it must only be seen as an aid to understanding. This limitation needs to be recognised when interpreting the ZTVs.

2.3.2 An additional caveat is that the ZTVs simply illustrate that at least part of a structure would be theoretically visible. As such, a ZTV typically makes no distinction between a clear view of all or most of a proposed feature and a view of a very small proportion of a feature, for example one corner of a solar array, or the top of the substation building. This is especially relevant in the case of the Proposed Scheme, where views from the surrounding area are sometimes restricted by intervening vegetation cover.

2.3.3 The ZTVs produced using DSM data reflects the presence of screening features in the landscape. However, the DSM data reflects a single moment in time (i.e. when the underlying aerial photography was taken). In reality, the extent and/or height of vegetation cover is dynamic and changes as vegetation inevitably increases in stature over time and/or is planted, trimmed or removed. Similarly, there is potential for buildings to have been erected, demolished or modified, subsequent to the data being captured.

2.3.4 DSM data also tends to assume that vegetation captured forms a solid visual barrier, when in reality views can sometimes be available through leaves and branches, especially in winter when deciduous foliage is absent. As such, the real-world visibility of the Scheme could potentially be underestimated in places. This is taken into account by the assessor when on Site and when preparing the assessment.

2.3.5 Finally, the DSM does not distinguish between the ground surface and the surface of structures and vegetation. As a consequence, the ZTV output may indicate visibility from areas known to be occupied by woodland and buildings. Whilst in theory it may be possible for people to experience the views from such locations (by climbing onto roofs, or into the tops of trees), this is not representative of typical day to day visibility, and as such there is the potential to overstate the actual visibility of the Scheme. Ordnance Survey open mapping data (OS Zoomstack Woodland and OS Zoomstack Local Buildings) has been added to the ZTV figures (as a solid white hatch on top of the ZTV information (but beneath base mapping), to mask out mapped areas of tree cover, noting this is unlikely to be exhaustive but helps refine the ZTV.

3.0 VIEWPOINT VISUALISATIONS

3.1 Photography

Introduction

3.1.1 Photography from all 83 representative viewpoint locations was taken during February and March 2024. Photography during winter months is considered to be a 'worst-case' in terms of visibility as deciduous trees have shed their leaves, reducing the screening provided by deciduous hedgerow and trees within the study area.

Commented [SM1]: 83 viewpoints now

3.1.2 In addition, further photography was taken prior to deciduous leaves falling from 49 of the 82 viewpoints. Whilst this site work occurred in late September into the start of October 2024, leaves had not fallen and it represents 'summer' photography in LVIA terms.

3.1.3 Photographs were taken from publicly accessible locations, as no private access was considered necessary. Where viewpoint photography was required to reflect potential visibility from locations within private land, such as a residential property, the nearest publicly accessible location (such as a road or footpath) was selected as a proxy location.

3.1.4 Photographs of the tripod in position at each of the viewpoint locations are included in Section **Error! Reference source not found.**. These photographs represent the tripod position during the first photograph taken at each position, almost entirely which was during winter months. Where summer photography has also been taken at a viewpoint, the photographer replicated the camera position shown in the photo within Section 4.0. Viewpoint 83 is the only exception to this as it comprises a late addition to the viewpoint list and photography could only be carried out during summer months, just prior to submission of the DCO.

Equipment and Image Capture

3.1.5 A Canon 5D Mark IV full frame sensor camera was used for the viewpoints in conjunction with a 50mm prime lens (35mm format equivalent), which is within the 'standard' focal length range. The full frame sensor in the camera therefore, results in no magnification.

3.1.6 The camera was mounted on a tripod using a panoramic tripod head at 1.6m above ground level to simulate the view at eye level. The panoramic tripod head allows for the rotation of the camera at fixed intervals around a fixed point in vertical alignment with the camera lens, thereby eliminating parallax error.

3.1.7 The orientation of the camera was adjusted so that the optical axis and the horizontal axis were aligned with the horizon. This is the 'astronomical' horizon as set by a gravity governed bubble level.

3.1.8 All photographs were taken in landscape format. Photographs were typically taken over a full 360 degree sweep from each viewpoint location. Panoramas were deemed essential due to the proximity of certain viewpoints to the proposed structures and the need to show the context of the Scheme. so Individual photographs were taken at 15-degree intervals to allow for overlap.

3.1.9 The precise location of each photograph was recorded. GPS readings were taken from the central tripod position that the camera was placed using an Emlid Reach RS2 GNSS Receiver, which achieved a high level of accuracy. The degree of tolerance has been recorded for each viewpoint position and surveyed points at all viewpoints selected for photomontage production have achieved an accuracy level of within 10cm.

3.1.10 The images were captured in the camera's RAW image mode to ensure maximum quality. Camera settings were chosen carefully for each viewpoint; the camera was set to aperture priority mode, a small aperture of f/11 was used and the focus distance selected specifically to render all parts of the scene in focus whilst retaining image quality.

Post Production

3.1.11 The full sweep of photos taken from each viewpoint were stitched together using PT Gui Pro specialist panorama creation software. The software reads the exif data attached to each individual photograph file to identify the specifications of the camera and lens, ensuring accurate production of the stitched panoramic image.

3.1.12 As a 15 degree overlap between individual images was allowed when shooting the photography, only the central portion of each image was added to the stitched panorama. This minimises the small amount of optical distortion effect caused by the camera lens. The stitched cylindrical panoramas were then cropped for use as baseline 'existing' views.

3.2 Photomontages

Introduction

3.2.1 Photomontages are computer generated images, showing images of the Scheme superimposed upon the existing photography, with the aim of producing a visualisation that should give a realistic impression of how the Scheme would appear within the landscape.

3D Model

3.2.2 A digital model of the Scheme was created based upon design information. This was imported into industry standard software (Autodesk 3DStudioMax), along with the viewpoint survey data recorded in the field. This enables a series of 'camera' points to be created within the 3d model, reflecting the view from each viewpoint towards the Scheme.

3.2.3 A series of markers were added to the model, representing real-world locations such as topographic features, vegetation and buildings. The locations of these markers were determined via the use of aerial imagery (e.g. Google Earth), Environment Agency LIDAR data, and OS Mastermap.

3.2.4 The models were then lined up with the stitched panorama. The markers were used to ensure that the model lines up both horizontally and vertically as accurately as possible with the photograph (by matching the markers with the real-world equivalent), and to assist with identifying which features in the photograph would appear ‘in front’ of the Scheme, which would appear ‘behind’ and which, if any would be removed.

3.2.5 Once the models were lined up as accurately as possible, the Scheme was rendered, having regard to the particular materials and colours specific as part of the design, and to reflect light conditions typical of the time and date of the photography.

Photomontage Production

3.2.6 The resulting rendered image was imported into Adobe Photoshop. Any parts of the Scheme that would not be visible from an individual viewpoint due to the presence of intervening features were cropped out.

3.2.7 Photomontages have been produced at 18 of the 83 viewpoint locations at Year 0 of the operational stage of the Scheme and 18 have been produced at Year 10 of the operational stage. Year 0 is a point at which mitigation planting will be implemented on the Site, however trees (individual and within woodland) and hedgerow trees will not have established. The Year 0 images therefore illustrate a ‘worst-case’ in terms of the visibility of the Scheme. Refer to Table 5.3 in Chapter 5 for planting heights which have been referred to in the production of Year 10 photomontages.

Limitations

3.2.8 It should be understood that viewpoint visualisations can never provide an exact match to what is experienced in reality. Visualisations are tools in the assessment process but independent from it. They illustrate the view in the context of a specific date, time and weather conditions, that would be seen within a photograph and not as seen by the human eye. As such, visualisations need to be used in conjunction with site visits and should be considered in the context of the totality of views experienced from the viewpoint and not just focussed on the Scheme.

3.2.9 The software (3DStudioMax) used to produce the model of the Scheme from each Viewpoint does not take account of the curvature of the earth's surface, and assumes a flat horizon. The effects of the earth's curvature do influence what is visible, especially in longer range views. If a flat horizon is assumed, then a feature located approximately 5km away from any viewpoint would appear approximately 1.7m higher than in reality. As such the model slightly exaggerates the height that the Scheme would appear in each view. However, as all of the viewpoints are located relatively close to the Scheme any discrepancies in the height of the proposed new structures would be negligible and this is not considered to be material to the presentation of photomontages.

Presentation & Viewing

3.2.10 Once the final viewpoint images have been produced, they are inserted into a figure template, which also includes information about the viewpoint, including the date and time of photography, and details of the camera used.

3.2.11 The images presented on each sheet are displayed at an enlargement factor in accordance with the guidance set out in TGN 06/19. The enlargement factor is stated on each sheet.

3.2.12 The field of view displayed for each viewpoint has been determined in accordance with the guidance set out in TGN 06/19 and is stated on each sheet.

3.2.13 Each sheet should be printed at the size stated on it. All printed sheets should be viewed **held flat at a comfortable arm's length**.

4.0 TRIPOD PHOTOGRAPHS

Viewpoint 1

4.1.1 Date taken: 20.02.2024

Viewpoint 2

4.1.2 Date taken: 20.02.2024

Viewpoint 3

4.1.3 Date taken: 20.02.2024

Viewpoint 4

4.1.4 Date taken: 20.02.2024

Viewpoint 5

4.1.5 Date taken: 01.02.2024

Viewpoint 6

4.1.6 Date taken: 20.02.2024

Viewpoint 7

4.1.7 Date taken: 20.02.2024

Viewpoint 8

4.1.8 Date taken: 27.02.2024

Viewpoint 9

4.1.9 Date taken: 01.02.2024

Viewpoint 10

4.1.10 Date taken: 01.02.2024

Viewpoint 11

4.1.11 Date taken: 01.02.2024

Viewpoint 12

4.1.12 Date taken: 27.02.2024

Viewpoint 13

4.1.13 Date taken: 27.02.2024

Viewpoint 14

4.1.14 Date taken: 27.02.2024

Viewpoint 15

4.1.15 Date taken: 07.03.2024

Viewpoint 16

4.1.16 Date taken: 07.03.2024

Viewpoint 17

4.1.17 Date taken: 07.03.2024

Viewpoint 18

4.1.18 Date taken: 07.03.2024

Viewpoint 19

4.1.19 Date taken: 07.03.2024

Viewpoint 20

4.1.20 Date taken: 27.02.2024

Viewpoint 21

4.1.21 Date taken: 27.02.2024

Viewpoint 22

4.1.22 Date taken: 07.03.2024

Viewpoint 23

4.1.23 Date taken: 27.02.2024

Viewpoint 24

4.1.24 Date taken: 27.02.2024

Viewpoint 25

4.1.25 Date taken: 27.02.2024

Viewpoint 26

4.1.26 Date taken: 27.02.2024

Viewpoint 27

4.1.27 Date taken: 27.02.2024

Viewpoint 28

4.1.28 Date taken: 01.02.2024

Viewpoint 29

4.1.29 Date taken: 01.02.2024

Viewpoint 30

4.1.30 Date taken: 01.02.2024

Viewpoint 31

4.1.31 Date taken: 01.02.2024

Viewpoint 32

4.1.32 Date taken: 01.02.2024

Viewpoint 33

4.1.33 Date taken: 01.02.2024

Viewpoint 34

4.1.34 Date taken: 19.02.2024

Viewpoint 35

4.1.35 Date taken: 19.02.2024

Viewpoint 36

4.1.36 Date taken: 19.02.2024

Viewpoint 37

4.1.37 Date taken: 19.02.2024

Viewpoint 38

4.1.38 Date taken: 19.02.2024

Viewpoint 39

4.1.39 Date taken: 19.02.2024

Viewpoint 40

4.1.40 Date taken: 19.02.2024

Viewpoint 41

4.1.41 Date taken: 19.02.2024

Viewpoint 42

4.1.42 Date taken: 07.03.2024

Viewpoint 43

4.1.43 Date taken: 07.03.2024

Viewpoint 44

4.1.44 Date taken: 07.03.2024

Viewpoint 45

4.1.45 Date taken: 07.03.2024

Viewpoint 46

4.1.46 Date taken: 27.02.2024

Viewpoint 47

4.1.47 Date taken: 07.03.2024

Viewpoint 48

4.1.48 Date taken: 27.02.2024

Viewpoint 49

4.1.49 Date taken: 27.02.2024

Viewpoint 50

4.1.50 Date taken: 27.02.2024

Viewpoint 51

4.1.51 Date taken: 19.02.2024

Viewpoint 52

4.1.52 Date taken: 19.02.2024

Viewpoint 53

4.1.53 Date taken: 19.02.2024

Viewpoint 54

4.1.54 Date taken: 19.02.2024

Viewpoint 55

4.1.55 Date taken: 19.02.2024

Viewpoint 56

4.1.56 Date taken: 07.02.2024

Viewpoint 57

4.1.57 Date taken: 07.02.2024

Viewpoint 58

4.1.58 Date taken: 07.02.2024

Viewpoint 59

4.1.59 Date taken: 19.02.2024

Viewpoint 60

4.1.60 Date taken: 20.02.2024

Viewpoint 61

4.1.61 Date taken: 19.02.2024

Viewpoint 62

4.1.62 Date taken: 19.02.2024

Viewpoint 63

4.1.63 Date taken: 20.02.2024

Viewpoint 64

4.1.64 Date taken: 20.02.2024

Viewpoint 65

4.1.65 Date taken: 07.02.2024

Viewpoint 66

4.1.66 Date taken: 07.02.2024

Viewpoint 67

4.1.67 Date taken: 07.02.2024

Viewpoint 68

4.1.68 Date taken: 07.02.2024

Viewpoint 69

4.1.69 Date taken: 19.02.2024

Viewpoint 70

4.1.70 Date taken: 19.02.2024

Viewpoint 71

4.1.71 Date taken: 19.02.2024

Viewpoint 72

4.1.72 Date taken: 20.02.2024

Viewpoint 73

4.1.73 Date taken: 07.02.2024

Viewpoint 74

4.1.74 Date taken: 07.02.2024

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4.1.75 Date taken: 07.02.2024

Viewpoint 76

4.1.76 Date taken: 07.02.2024

Viewpoint 77

4.1.77 Date taken: 20.02.2024

Viewpoint 78

4.1.78 Date taken: 20.02.2024

Viewpoint 79

4.1.79 Date taken: 07.02.2024

Viewpoint 80

4.1.80 Date taken: 07.02.2024

Viewpoint 81

4.1.81 Date taken: 07.02.2024

Viewpoint 82

4.1.82 Date taken: 07.03.2024

Viewpoint 83

4.1.83 Date taken: 18.07.2025