Frodsham Solar

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Appendix 6-2: Visualisation Methodology

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Frodsham Solar

Environmental Statement

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Visualisation Methodology

Prepared for: Frodsham Solar Ltd

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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 to support the planning application has been produced. The methodology addresses the production of Zone of Theoretical Visibility mapping and viewpoint visualisations.

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:

i) 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';

ii) Landscape Institute (2019), *Visual Representation of Development Proposals. Technical Guidance Note 06/19*. This document is referred to hereafter as 'TGN 06/19'.

1.1.4 The remainder of this Methodology document is structured as follows.

1.1.5 Section 2.0 addresses the production of the ZTV mapping that informs the LVIA.

1.1.6 Details of how the Viewpoint locations were selected and which 'Type' of visualisation has been provided at each Viewpoint are set out in **ES Volume 1 Chapter 6: Landscape and Visual Amenity** [**EN010153/DR/6/1**]. This is a requirement of the Technical Methodology specified in Appendix 10 of TGN 06/19.

1.1.7 Section 3.0 gives details of how the viewpoint visualisation material was produced, and includes the remaining details required by the Technical Methodology specified in Appendix 10 of TGN 06/19.

2.0 ZONE OF THEORETICAL VISIBILITY

Data Source

2.1.1 The ZTVs were produced using the 2m First Return LIDAR Digital Surface Model (DSM) available from the Environment Agency. The DSM data was captured during 2022 and takes account of screening features such as buildings and vegetation.

2.1.2 This data consists of a series of spot levels at 2m intervals. The declared 'root-mean-square error' (RMSE) of this dataset is 15cm, i.e. the degree of error between the actual on-the-ground height of any particular location and the height as indicated by the DSM is between 15cm.

ZTV Creation

2.1.3 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.

2.1.4 The ZTVs illustrate the following:

i) The theoretical visibility of proposed fencing (maximum height 2.4m).
ii) The theoretical visibility of the proposed Solar Array Development, as follows:
   a) Within Solar PV Areas A01 – A06[1]. the maximum height of the Solar PV Modules would be 3.5m above ground level.
   b) Within Solar PV Areas B01 – B18 and C01 – C06, the maximum height of the Solar PV Modules would be 4m above ground level.
   c) Within Solar PV Areas A01 – A06, the maximum height of String Inverters, Standalone Transformer Stations, and Power Conversion Units would be 3.5m above ground level.

[1] Refer to **ES Vol 3 Figure 2-1: Indicative Construction Site Layout** [**EN010153/DR/6.3**] for the location of individual Solar PV Areas.

d) Within Solar PV Areas B01 – B18 and C01 – C06, the String Inverters, Standalone Transformer Stations, and Power Conversion Units would have a base height of 6.52m AOD[2] (approx. 2m above ground level), and their maximum height would thus be 10.02m AOD (5.53m above ground level).

iii) The theoretical visibility of the 4m high CCTV columns located along the fenceline.

iv) The theoretical visibility of the proposed BESS reflecting both Options and the height of the highest structures proposed (4.5m).

v) The theoretical visibility of the 8m high structures at the Frodsham Solar substation (both Options).

vi) The theoretical visibility of the 13m high structures at the Frodsham Solar substation (both Options).

vii) The theoretical visibility of the proposed 15m high pylons.

2.1.5 The ZTVs were calculated based upon a series of points representing each of the structures listed above.

2.1.6 In relation to Solar PV Modules points were generated randomly within the area where these would be located at a maximum spacing of 50m.

2.1.7 In relation to structures within the BESS and substation compounds points were generated randomly within the area where these would be located at a maximum spacing of 25m.

2.1.8 In relation to the String Inverters, Standalone Transformer Stations, and Power Conversion Units, single points were used to represent the location of each individual feature.

2.1.9 In relation to the fencing and CCTV columns, points were generated along the length of the fencing at a spacing of 50m.

[2] The base height has been set as relative to Ordnance Datum to reflect the findings of the flood risk modelling – refer to ES Vol 1 Chapter 2.0: Proposed Development [EN010153/DR/6.1] and ES Vol 2 Appendix 9-1: Flood Risk Assessment [EN010153/DR/6.2]. As the site is relatively level this equates to an approximate height above ground level, which has also been stated.

2.1.10 Single points were used to represent individual pylons along the length of the SPEN Grid Connection route.

2.1.11 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.

2.1.12 The ZTVs are displayed on **ES Volume 3 Figures 6-4a** to **6-4j** [**EN010153/DR/6/3**].

2.1.13 In relation to the ZTV of the proposed Solar PV Modules, colour banding has been used to differentiate between locations where more or fewer structures would be theoretically visible.

Limitations

2.1.14 A ZTV, as use of the term theoretical implies, 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.

2.1.15 An additional caveat is that the ZTVs simply illustrate that part of a structure would be theoretically visible. As such, it 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 building roof, or the top of a stack). This is especially relevant in the case of the Proposed Development, where views from the surrounding area are often restricted by vegetation cover.

2.1.16 The ZTVs produced using the DSM does reflect the presence of screening features in the landscape. However, it should be recognised that the DSM 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.

2.1.17 In particular, the DSM does not reflect any changes in landform that have occurred subsequent to the date of data capture as a result of the ongoing tipping of dredgings within Cell 6 of the former Manchester Ship Canal Dredging Deposit Grounds immediately south-west of the Solar Array Development Area (refer to **ES Volume 3 Figure 1-4** [**EN010153/DR/6/3**] for location). As such, the visibility of the Proposed Development may be less than shown on the ZTV Figures.

2.1.18 Additionally, the DSM 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 Proposed Development could potentially be underestimated in places.

2.1.19 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 Proposed Development. 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

Photography

Date of Photography

3.1.1 Initial viewpoint photography was taken in April 2023, and was forwarded to Cheshire West and Chester Council ('CWaCC') in October 2023 so that the viewpoint locations could be agreed.

3.1.2 In March 2024, photography was shot from two additional locations requested as part of post-scoping consultation by CWaCC and the Canal and River Trust. Additionally, photography from each of the viewpoints where photomontages would be produced from was reshot to take advantage of more accurate GPS equipment (see below).

3.1.3 In July 2024, photography was shot a further two locations requested as part of post-scoping consultation by the Canal and River Trust.

3.1.4 In February 2025, photography was reshot from two viewpoints that CWaCC had requested that a photomontage would be produced from (again to take advantage of more accurate GPS equipment), and photography was taken from a further viewpoint location within Runcorn identified following public consultation.

2023 Photography

3.1.5 Viewpoint photography was taken using a Canon EOS 5D Mark II digital single lens reflex (DSLR) camera with a full-frame sensor, using a 50mm lens. The camera was mounted on a tripod to ensure a stable support and minimise camera shake. The camera was mounted on a panoramic tripod head (Nodal Ninja MkII), which 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. The camera is levelled using a bubble spirit level and an auto-leveller device (Nodal Ninja EZ-Leveller II). Camera height was 1.5m above the ground.

3.1.6 All photographs were taken in landscape format. Photographs were typically taken over a full 360 degree sweep from each viewpoint location. The precise location of each photograph was recorded using a hand-held Garmin Oregon 600 GPS device (which has an accuracy of approximately 3m).

2024 Photography

3.1.7 Viewpoint photography was taken using a Canon EOS 6D Mark II digital single lens reflex (DSLR) camera with a full-frame sensor, using a 50mm lens. The camera was mounted on a tripod (Manfrotto 55) to ensure a stable support and minimise camera shake. The camera was mounted on a panoramic tripod head (Manfrotto MH057A5), which 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. The camera is levelled using a bubble spirit level and an auto-leveller device (Manfrotto 338). A wired remote shutter release was used to take each photograph, further minimising camera shake. Camera height was 1.63m above the ground.

3.1.8 All photographs were taken in landscape format. Photographs were typically taken over a full 360 degree sweep from each viewpoint location. The precise location of each photograph was recorded using an Emlid Reach RS2+ GPS Receiver using NTRIP[3] corrections to give an accuracy of less than 17cm (and less than 2cm at most of the Viewpoints). A photograph was also taken of the tripod location (these photographs are included in Annex A).

Photomontages

Introduction

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

[3] Network Transport of RTCM via Internet Protocol. Use of NTRIP corrections allows high absolute accuracy by allowing the GPS to access survey base units remotely via the internet, and using these to correct the readings from the GPS device to cm accuracy.

3d Model

3.1.10 A digital model of the Proposed Development was created based upon information provided by the Applicant to reflect the indicative design based upon the parameters set out in Chapter 2.0 of the PEIR. This was imported into industry standard software (Autodesk 3DStudioMax), along with the viewpoint survey data recorded in the field (as discussed above). This enables a series of 'camera' points to be created within the 3d model, reflecting the view from each viewpoint towards the Proposed Development.

3.1.11 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.

3.1.12 The models were then lined up with the individual photographs that focus on the Solar Array Development. 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 Proposed Development, which would appear 'behind' and which, if any would be removed.

3.1.13 Once the models are lined up as accurately as possible, the Proposed Development was rendered, having regard to the particular materials and colours that are to be used, and to reflect light conditions typical of the time and date of the photography.

3.1.14 Proposed planting was also added to the model, reflecting the anticipated height of new tree cover in Year 0 and Year 10, as follows:

i) Planted height of trees and shrub to be approximately 0.6m.
ii) Assumed growth rates for new planting of approximately 0.5m per annum.
iii) New tree planting to have reached a height of approximately 5.5m approximately ten years after planting.
iv) New and existing hedgerows to be managed at a height of approximately 2.5m-3m, noting that in some locations lower managed heights may be set to preserve views of the wider landscape.

Photomontage Production

3.1.15 Following the lining up of the 3D model with the photographs that includes the Solar Array Development, and the rendering of the Proposed Development, the full sweep of photos taken from each viewpoint were stitched together using the software package PTGui. 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.

3.1.16 The resulting stitched viewpoint image was loaded into Adobe Photoshop. Any parts of the Proposed Development that would not be visible from an individual viewpoint due to the presence of intervening features were cropped out.

Limitations

3.1.17 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 field visits and should be considered in the context of the totality of views experienced from the viewpoint and not just focussed on the Proposed Development.

3.1.18 Photography was taken in April 2023 and March 2024 and as such reflects visibility at that time of year, with deciduous foliage beginning to appear.

3.1.19 The software (3DStudioMax) used to produce the model of the Proposed Development 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 Proposed Development would appear in each view. As all of the viewpoints are located relatively close to the Proposed Development any discrepancies in the height of the proposed new structures would be minor. As such, it is not considered that this is material to the conclusions of the LVIA.

Presentation & Viewing

3.1.20 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.

3.1.21 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.

3.1.22 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.

3.1.23 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**.

Annex A: Tripod Location Photographs

Viewpoint 1

Viewpoint 2

Viewpoint 3

Viewpoint 4

Viewpoint 5

Viewpoint 6

Viewpoint 7

Viewpoint 8

Viewpoint 9

Viewpoint 10

Viewpoint 12

Viewpoint 13

Viewpoint 14

Viewpoint 15

No tripod photograph

Viewpoint 16

Viewpoint 17

Viewpoint 18

Viewpoint 19

Viewpoint 20

Viewpoint 21

No tripod photograph

Viewpoint 22

Viewpoint 23

Viewpoint 24

Viewpoint 25

Viewpoint 26

Viewpoint 27

Viewpoint 28

Viewpoint 29

Viewpoint 30