# A417 Missing Link
# TR010056

# 6.4 Environmental Statement Appendix 7.7 Visually Verifiable Montage Methodology

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

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## Development Consent Order 202[x]

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## 6.4 Environmental Statement
## Appendix 7.7 Visually Verifiable Montage Methodology

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## 1.1 Photography and imaging

1.1.1 For this Environmental Statement (ES), verified viewpoint photography was undertaken in winter by a professional photographer and survey team, over four survey dates. Surveys were undertaken on 15 January, 23 January, 4 February and 7 February 2020.

1.1.2 Additional baseline viewpoint photography in summer and winter was carried out by qualified landscape architects following best practice guidelines required to capture suitable photographs to be used in the Landscape and Visual Impact Assessment (LVIA) and visual representations. This photography is presented in ES Figure 7.10 Photosheets and Visualisations (Document Reference 6.3).

1.1.3 The purpose of the verified viewpoint photography is to simulate the likely visual changes that would result from the scheme and produce printed images of a size and resolution to sufficiently match the perspective in the same view. However, as these are simulations, they should never be considered as a substitute for visiting the actual viewpoint in person.

1.1.4 The photomontages produced from the verified viewpoint photography are subject to the same inherent limitations as photographs, for example the scene would only appear under the same conditions that prevailed at the time the original photograph was taken. The photomontages therefore provide an illustrative tool indicating the potential visual impact of the scheme.

1.1.5 The methodology applied to produce the verified view data collection and baseline viewpoint photography is described below and was undertaken in accordance with GLVIA3 and LI TGN 06/19.

1.1.6 Viewpoint locations were provided via an online Grid Reference Finder. Permissions from landowners were required and granted where applicable. Sample photographs from previous site visits were also supplied for reference purposes.

### Photography

Verified photography

1.1.7 Verified photography was undertaken by a professional photographer and a survey team, who captured high resolution digital photographs using a full-frame Sony A7rIV Digital SLR camera with a 35mm fixed focal-length lens for daytime views and a Panasonic S1 for night-time views. For each shot, the camera was fixed to a custom made high precision panoramic camera mount on a Lecia Survey tripod at a height of 1.65m above the ground, with a panoramic scale of 15 degrees to provide sufficient overlap of portrait frames.

1.1.8 A full 360 degree sequence of images were taken with an overlap between each of the images. Each sequence of images had a shared central point of perspective. A photograph was taken of the camera in its location. For the daytime views, an aperture of F8 was selected to provide optimal resolution for the 61mp sensor. For night-time views, an aperture of 2.8 was selected to provide enough exposure for the very low light conditions. The 24mp camera was chosen in place of the 61mp camera for the night-time views for its superior low light capability. Where night-time versions of the views were required, a survey nail was placed in the ground directly under the point of perspective as indicated by a laser ‘plummet’ integral to the mount so when the view was revisited at night the

camera could be positioned to within +/- 1mm in the Easting and Northings as previously located. The height was within 100mm.

1.1.9 Survey markers or fixed survey points were placed out in the landscape within the view to help facilitate accurate camera matching. Photography and survey data collection was done sequentially from the same tripod location.

LVIA baseline photography

1.1.10 Baseline viewpoint photography was undertaken using a Nikon D610 Full Frame Digital SLR fitted with a fixed 50mm Lens at 6016 x 4016 pixels. For each, shot the camera was mounted on a tripod positioned at a height of 1.6m above the ground with a panoramic scale of 15 degrees to provide sufficient overlap of frames. Baseline viewpoint photography was also captured in RAW and stitched using Image Composite Editor to create a seamless panoramic image that is a geometrically accurate two-dimensional projection of the scene. Baseline photography was not used in the production of the photomontages.

**Survey**

1.1.11 Survey data was carried out using a Leica total station to record a set of co-ordinates with the view which are aligned to Ordnance Survey using a Leica Viva GNSS system. Where there were insufficient fixed survey points, temporary survey points were placed, and the survey was undertaken at the same time as the photography. The standard accuracy for temporary survey points is +/- 2mm Eastings and Northings and 25mm above ordnance datum (AOD).

1.1.12 If the subject is more than 5km from the camera the earth's curvature affects the view. Control points close to the subject are therefore recorded to provide an accurate correction to distortion caused by the earth's curvature.

**Image processing**

1.1.13 For the verified photography, all images were captured in RAW format. They were then converted into TIFF format using software Lightroom and CaptureOne and remapped to remove all lens distortion. The individual frames were stitched together to create a seamless image in an equirectangular projection using PTGUI (a panorama photo stitching program).

1.1.14 The image was then placed into a background template in Photoshop and relevant camera information (meta data) added in a text layer. For views with night-time versions, these were layered on top of the daytime versions and positioned until geometric registration was achieved at the horizon to negate the vertical offset setup tolerance. To match night-time images in terms of accurate representation of light levels to the naked eye, the photographer and a representative from the landscape team undertook a qualitative assessment, which included at least 10mins of acclimatisation to darkness and use of a red light to preserve this when operating the equipment. In order to better represent the reduced colour perception of the human eye in low light conditions, colour saturation levels were reduced in all areas of the image apart from those illuminated by artificial light.

## 1.2 Visualisations

**3D model**

1.2.1 A three-dimensional computer model of the scheme was produced, based on two-dimensional detailed design drawings, including proposed materials.

1.2.2 The drawings of the scheme were inserted into 3D Studio Max ensuring that a real-world scale and the same co-ordinate system as the survey data was used.

1.2.3 The georeferenced model was then overlaid onto Digital Terrain Model (DTM) data.

**Camera matching**

1.2.4 The alignment values for each camera position and orientation were calculated in software using a 'resection' process which also cross references the survey and photographic data for any errors. The intrinsic and extrinsic camera data and Ordinance Survey (OS) coordinates were entered into a spreadsheet together with an offset value for a local point of origin to reduce their numerical size of coordinate data for accurate 3ds Max operation.

1.2.5 A script was then run in 3ds Max to automatically create a fully aligned 3ds Max V-ray 'spherical panorama' camera, render out survey points and create a text summary of the data used. This creates a scene within the virtual camera which simulates the same view as that represented in the original viewpoint photography.

1.2.6 Wireline renders of the DTM were then used to confirm this alignment, providing a highly accurate verification system.

**Rendering**

1.2.7 VRaySun and VRaySky are lighting features within 3D Studio Max. These were used, along with physically accurate material properties, to calculate the effect of the sun and daylight conditions on the appearance of the scheme, and to then create photorealistic images.

**Post production**

1.2.8 Adobe Photoshop was used to combine the photorealistic image with the relevant baseline viewpoint photograph. Reference points in both the photorealistic image and baseline photograph were aligned. Photoshop masks were then used to hide parts of the photorealistic image which would be obscured behind land, trees, buildings or other structures, so that the final visualisation only shows parts of the model that would be visible. This is a qualitative process using skill and care to ensure that the photomontages provide objectively accurate views of the scheme.

**Presentation**

1.2.9 The finished final photomontages are presented alongside the corresponding baseline viewpoint photographs at the same size, to provide a direct comparison.

1.2.10 Viewpoint OS grid coordinates and viewpoint height AOD are noted on ES Figure 7.10 Photosheets and Visualisations (Document Reference 6.3). Additional information on the visualisation figure includes: details of the camera; the lens focal length; the horizontal field of view; the direction of the view; and the distance of the viewpoint. The photomontages and baseline viewpoint photography are presented in ES Figure 7.10 Photosheets and Visualisations (Document Reference 6.3).