



UNIVERSAL DESTINATIONS & EXPERIENCES UK PROJECT

Former Kempston Hardwick Brickworks
and adjoining land, Bedford

Environmental Statement Volume 3

Appendix 7.1 - Technical Methodology: Photography, 3D Modelling, Accurate Visual Representations

Part 1/8

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Appendix 7.1

Technical Methodology:
Photography, 3D Modelling,
Accurate Visual Representations

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Introduction

Michael Spence BA (Hons), MLD, CMLI, REIA, FRGS is the founding Director of MSEnvision Ltd, one of the UK's leading independent exponents of technical photography, verified photomontages and visualisations. Since 2013 Mike has been a technical advisor to the Landscape Institute on 'photography and photomontage in landscape and visual impact assessment', and has been undertaking this technical work for over 25 years. He is one of the main authors of the Landscape Institute's TGN 06/19 and provided technical support to Scottish Natural Heritage(NatureScot) on their windfarm visualisation guidance. He is a current member of the Landscape Institute Technical Committee. His background as a Chartered Landscape Architect, Registered EIA Practitioner and Fellow of the Royal Geographical Society working on strategic infrastructure projects has meant that the accuracy of the visualisation work is paramount, and technical photography, together with extensive surveying experience, use of GIS and detailed 3D modelling using real world co-ordinates ensures that the visualisations produced follow a clear and transparent methodology to ensure they are as accurate as possible.

Recent projects include the UNESCO World Heritage Sites at Valletta (Malta), Royal Botanic Gardens at Kew, Fountains Abbey for The National Trust, and West Cumbria Coal Mine for Friends of the Earth. Mike has also been working closely with Bath City Council on proposed development in the UNESCO World Heritage City of Bath. Mike's work and objective technical checks have been used at numerous Public Inquiries and Planning Hearings, on behalf of both local authorities, Historic England, the National Trust, Friends of the Earth and developers.

In April 2024 WSP contacted MSEnvision Ltd (MSE) to request Technical Photography, GNSS/ RTK Surveying, 3D Modelling and preparation of visualisations to illustrate the proposed impact of a development in Bedford.

Technical Photography and 3D Modelling

The photographs were taken with a full frame camera (Canon EOS 5D Mark IV) and 50mm lens combination consistent with Landscape Institute's TGN 06/19, GLVIA3 and the emerging understanding of the requirement for technical photography for visualisation work. As part of the work 38 viewpoints were identified providing views of the site and visited in April 2024. The weather was overcast and sunny with clear visibility.

Technical Photography

The camera was mounted on a Manfrotto 303 SPH panoramic tripod head, levelled using a Manfrotto Leveller, supported on a Manfrotto Tripod. The tripod head was levelled using a spirit level, to avoid pitch and roll. The camera was set with the centre of the lens 1.60m above ground level. Photographs were taken in Manual mode with an aperture of f/8 or f/11 and a fixed focal length throughout. Photographs were taken in landscape orientation. A Sigma 50mm f/1.4 lens was used for all viewpoint photographs.



A Single Frame 50mm photograph is insufficient to capture the extents of a wide, linear development. Each view was taken with a series of overlapping 50mm images, as shown above.



To ensure consistent geometry each image was cylindrically re-projected, as above. This ensures that a full 360 degree panorama can be created to match the 3D model view, as shown below:



From the 360 degree panorama a 90 (or 180 degree) degree portion can be extracted to present the context view as shown below:



Surveying

The position of each camera location was surveyed using Spectra Precision GNSS equipment with Real Time Kinematic Correction (RTK) which achieves an accuracy down to 1cm in eastings, northings and height (metres Above Ordnance Datum). The equipment included Spectra Precision SP85 GNSS smart antennae with Panasonic Toughpad data recorder. A photograph of the camera location was taken and presented with the viewpoint details.



3D Modelling

Using a 3D model built by MSE with added 3D LIDAR DTM height data into a geo-referenced model.

Camera locations surveyed on site were added to the geo-referenced 3D model.

Cylindrical renders generated using V-Ray for Rhino were exported from the 3D modelling software and used to overlay the cylindrical images. Target points from both the photograph and the model view were aligned to ensure a precise fit between the two images.

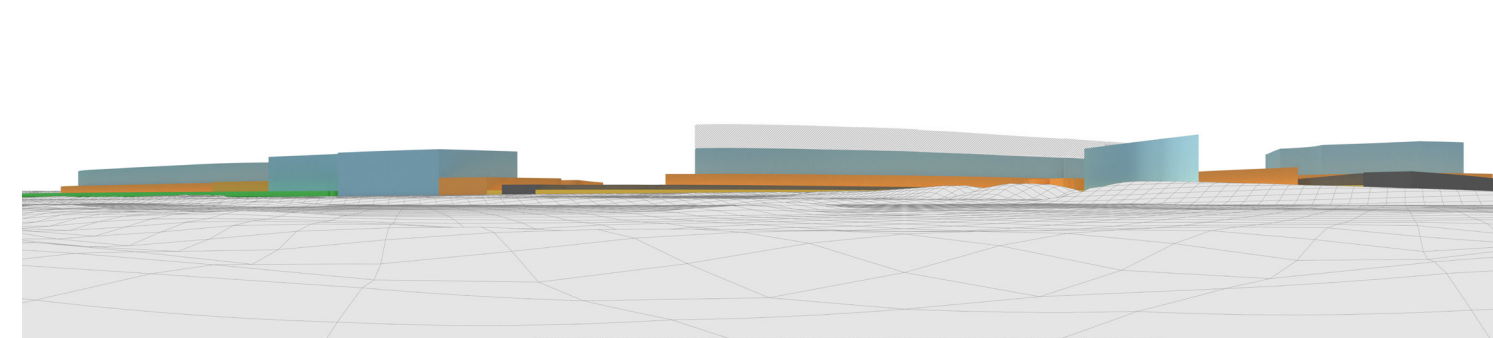
Visualisations are presented as either AVR 0, 1, 2 or 3. The differences are explained in the Landscape Institute's TGN 06/19: Visual Representation of Development Proposals.

The results are presented as a sequence of visualisations as follows:

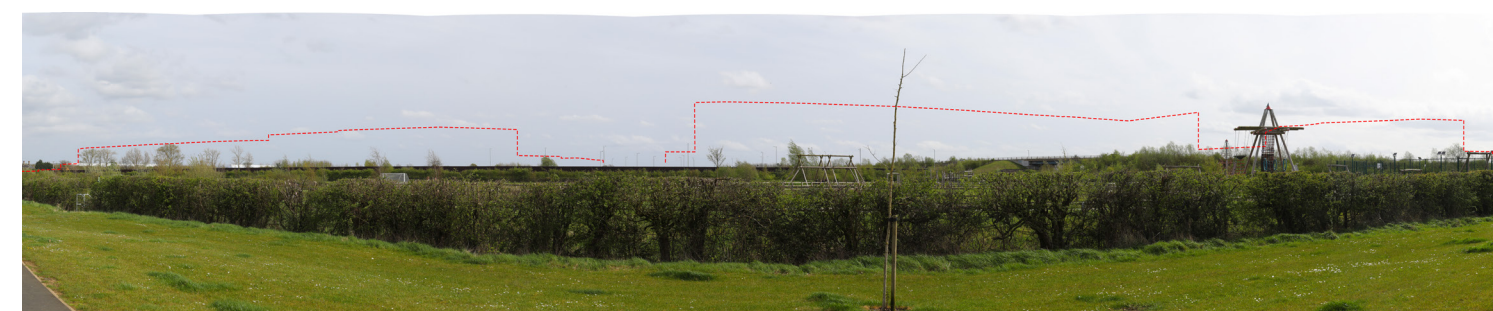
Existing Context View (AVR Type 1)



Predicted 3D Model View (AVR Type 2)

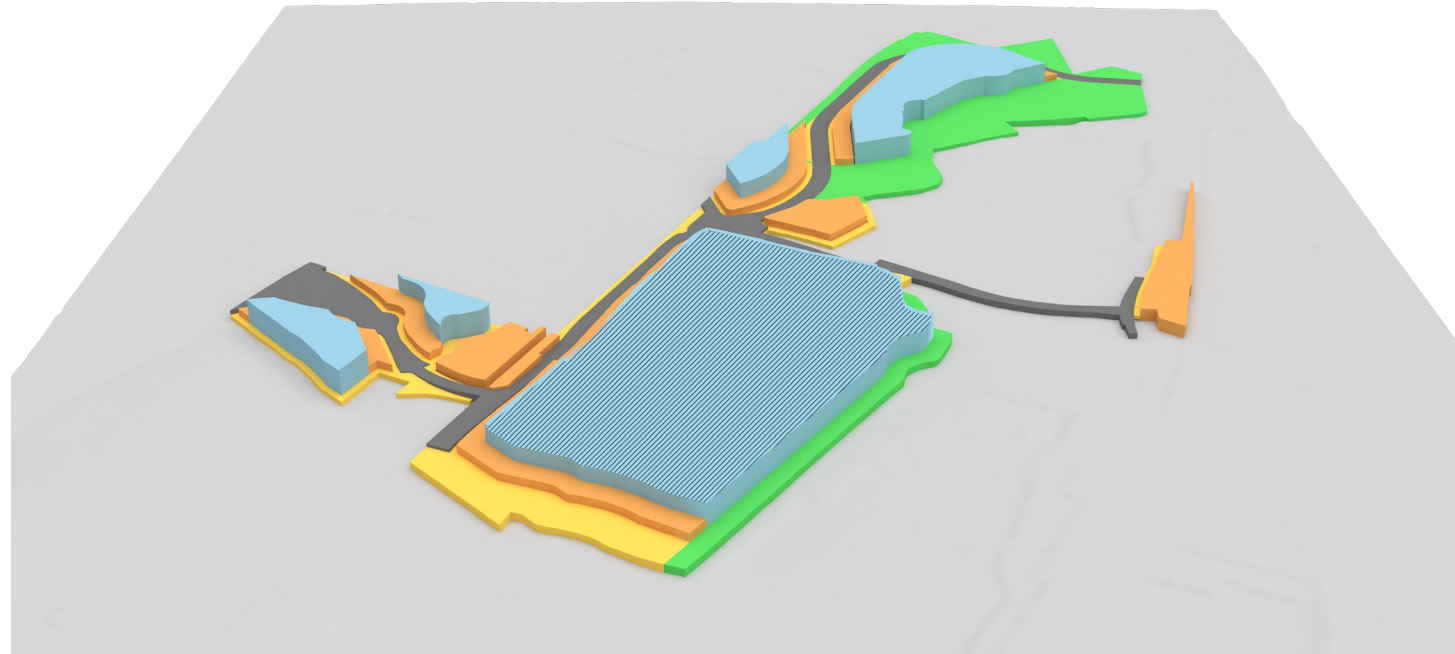


Predicted Wireline View (AVR Type 1)

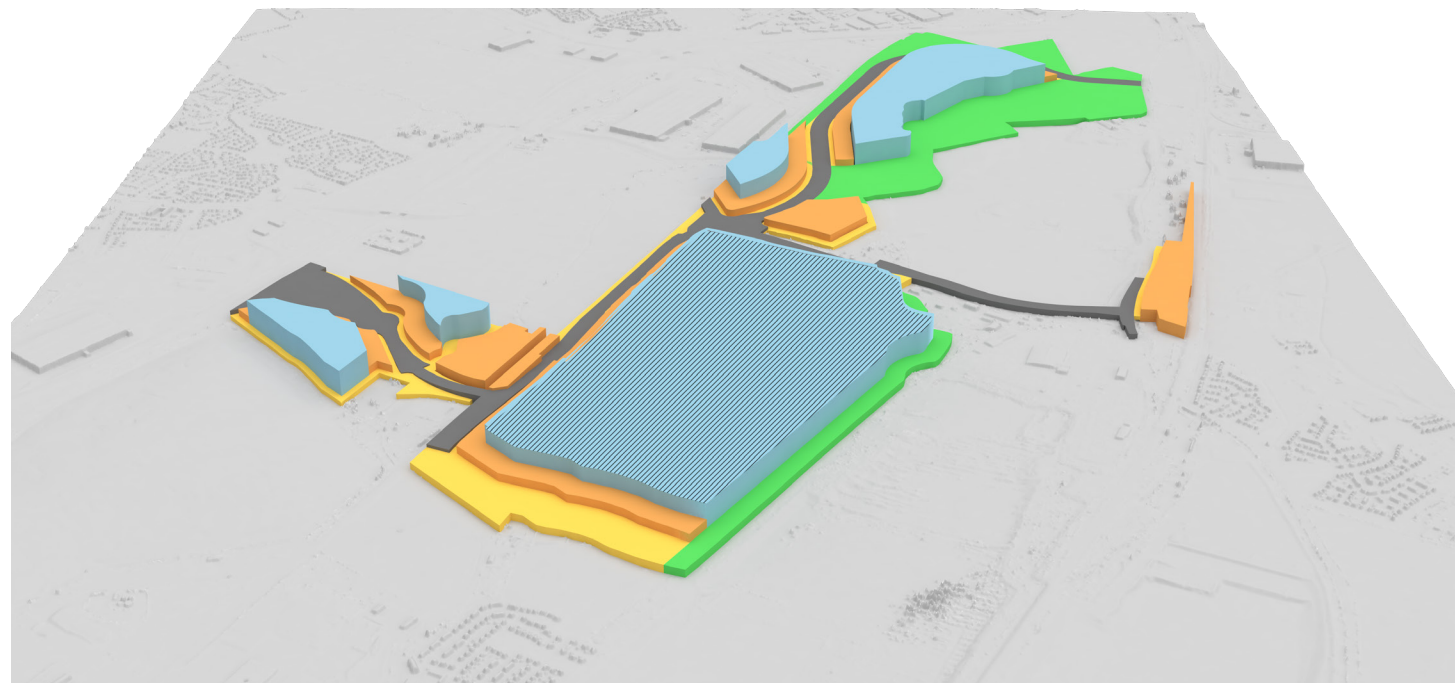


The following images illustrate the combination of LIDAR DSM and the complex geo-referenced 3D Model built by MSE.

3D Model with greyscale LIDAR 2m DTM



3D Model with greyscale LIDAR 1m DSM

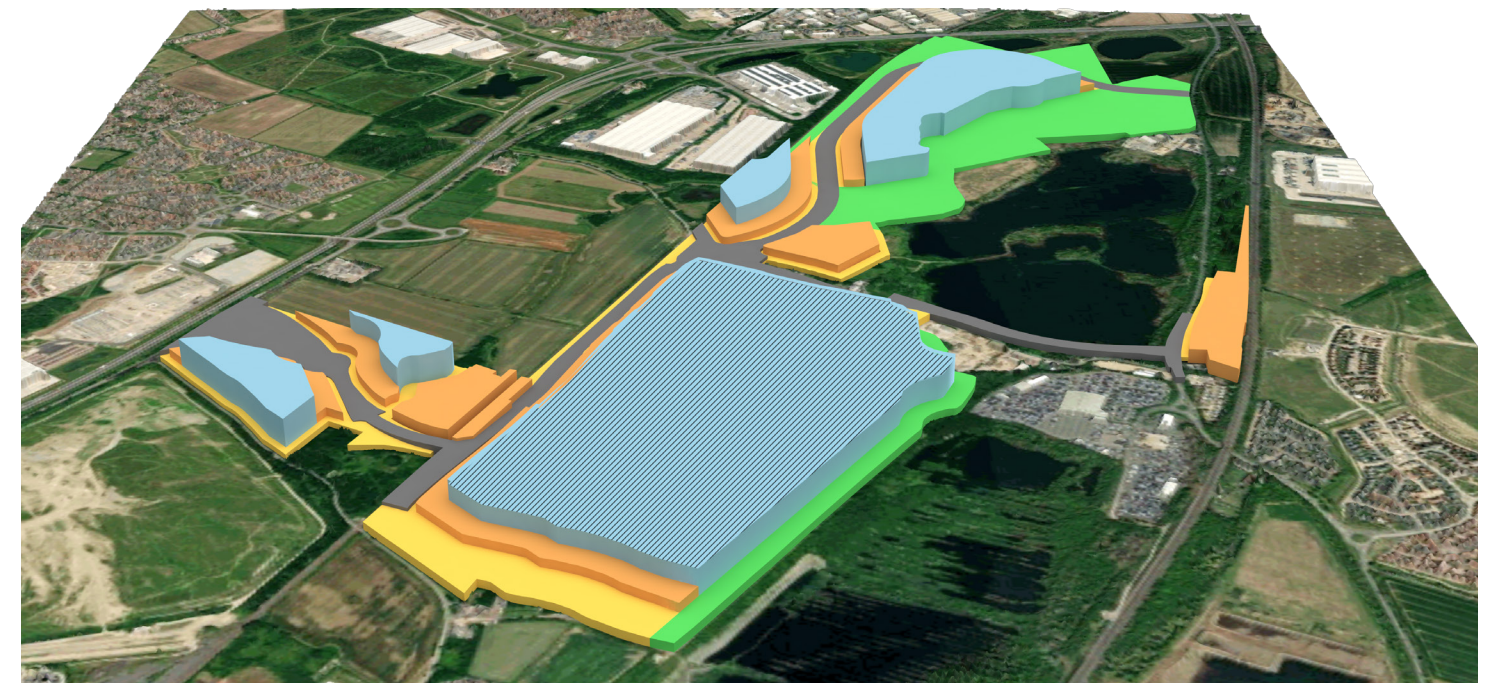


Heights used to create the 3D Model

Refer to Tables 2-1 and 2-2 in Chapter 2

East Gateway Zone Formation Level 37.5mAOD
West Gateway Zone Formation Level 36.0mAOD
Core Zone Formation Level 42.0mAOD
Lake Zone Formation Level 35.5mAOD

3D Model with LIDAR DSM/aerial photograph



50mm lens on Full Frame Sensor Camera

For decades it has been accepted that a 50mm lens on a full frame sensor camera provides the optimum image to replicate what is seen by the human eye. There are important differences between the human eye (binocular) and the camera lens (monocular). These have been explored in research by The Highland Council & the University of Stirling, as well as by myself through the Landscape Institute. We know that a single frame 50mm image on an A3 sheet of paper provides the same view as that gained in the field by someone with one eye closed.

Planar or Cylindrical Projection

All photographs are taken as single frame planar images. Each single frame image has a single point of perspective lying at the centre of the image. To correctly match and align with the 3D modelling software the camera must be mounted on a levelled tripod, and directed towards the proposed development.

When a viewpoint is close to the development, or a development is wide or you want to show the context of a view, a wider panorama is required. The alternative is to use a series of overlapping 50mm images and generate a 'cylindrical' perspective view.

The 3D model renders have been rendered out in cylindrical projection to allow the precise image re-mapping to match each 90 (or 180) degree cylindrical photograph.

3D Modelling Software

The work has largely been undertaken using Rhino 3D. All 3D modelling has been undertaken in metres and geo-referenced to align with OSGB36. RESOFT Windfarm was also used which is a 3D modelling package which we use to check on vertical and horizontal alignment of the 3D model against the precise image geometry. This is also set up to OSGB36. RESOFT Windfarm has been used to generate the geometric grid from LIDAR DTM data present in all 3D model visualisations.

Scripting has been used to align the 3D model perfectly to the underlying LIDAR DTM data.

Viewing Printed Images

The visualisations have been prepared to be printed in the Technical Methodology at A3 (420 x 297mm) and in the separate 'Verified Visualisations' document at A1 (841mm x 297mm), to show the scale of the proposed development.

The image size is considered to give a fair representation of the view for everyone, and the scale of the development in that view

Summary

This work has been undertaken in accordance with the Landscape Institute TGN 06/19 and the developing understanding of visualisation work. The accuracy of camera locations and 3D modelling conforms with the Landscape Institute's Type 4 (the highest level of accuracy). The 3D modelling has been produced to AVR2 (simple cardboard cut-out).

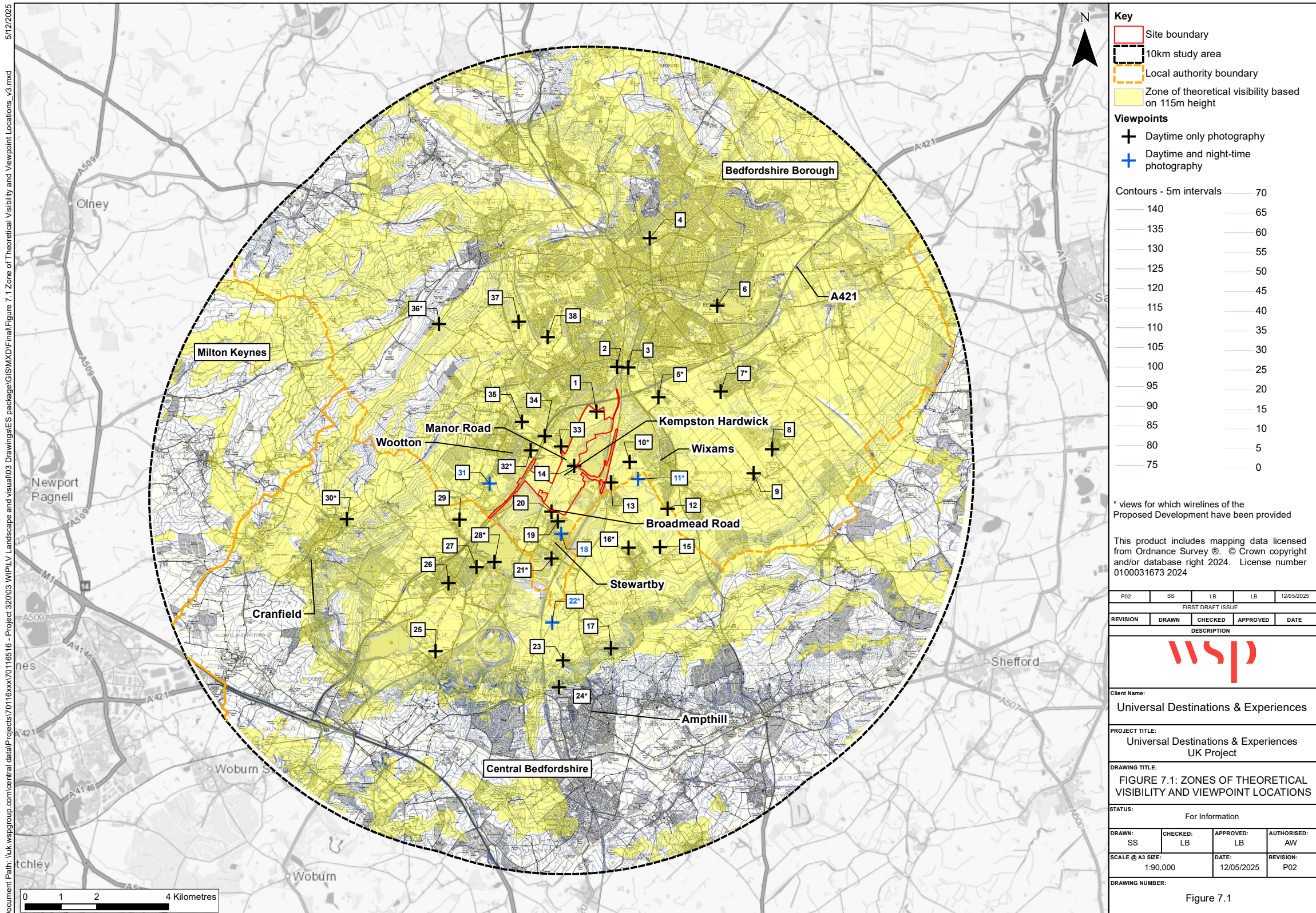
The photography has been undertaken in an extremely robust manner, using professional full frame sensor DSLR and 50mm lens with levelled tripod. The camera position has been surveyed using highly accurate GNSS equipment, giving high levels of accuracy of camera location. The 3D model has been built in Rhino 3D using detailed information contained in the planning application drawings. An additional check on the vertical scaling has been undertaken using RESOFT Windfarm. The proposed 3D Model aligns perfectly with the underlying LIDAR DTM.

The resultant visualisations are highly accurate.

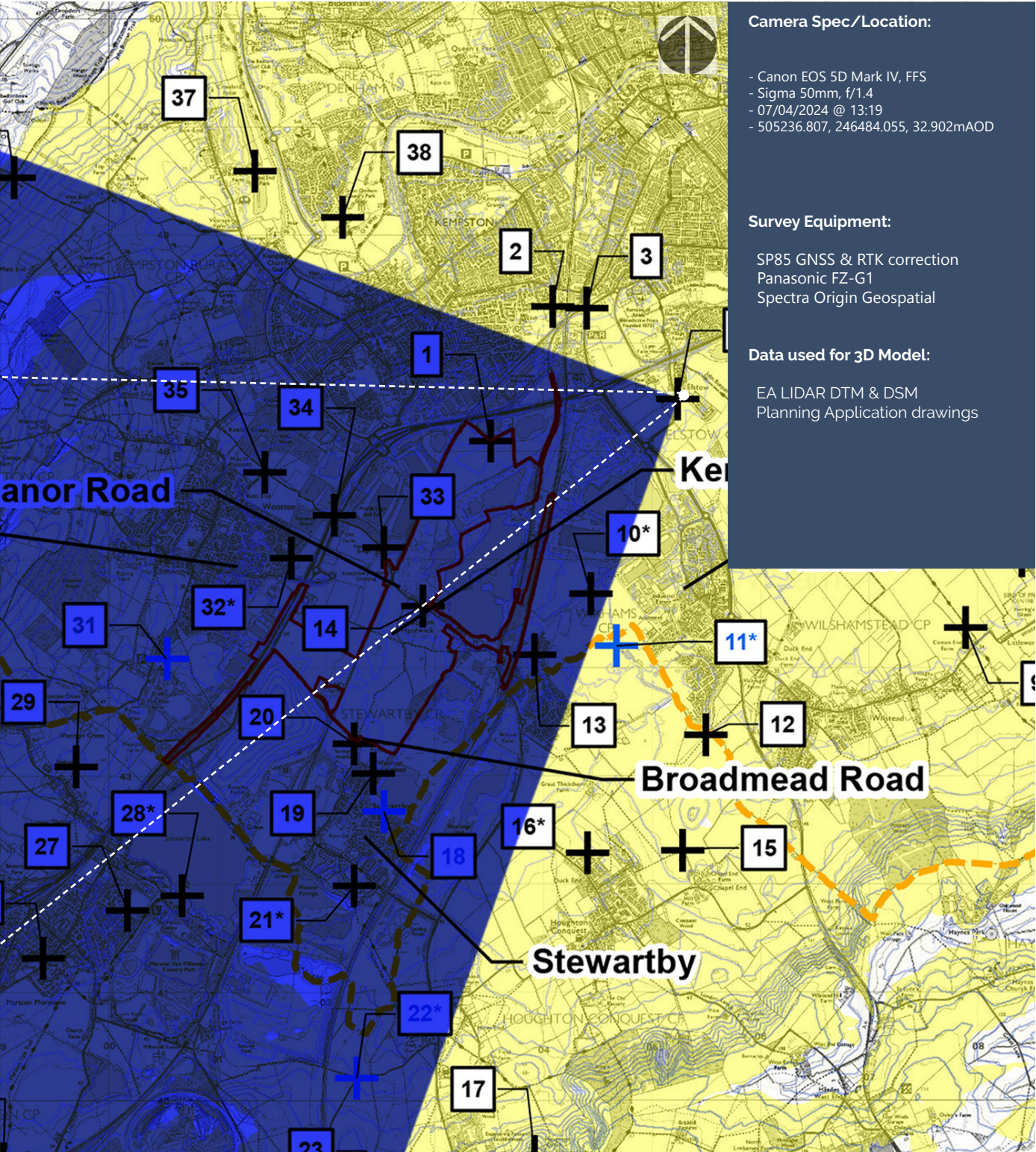
The photography, surveying, 3D modelling and ZTV have followed a transparent methodology, and the resultant visualisations and the size at which they are presented are considered robust and fit for purpose to illustrate and understand the positioning, and scale and massing of the proposed scheme in its local and wider context.



M.A.Spence BA(Hons), MLD, CMLI, REIA, FRGS 12 May 2025
Principal, MSEnvision Ltd



Camera Location:



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Tripod:

