realm

Teversham Road, Fulbourn

Photomontage methodology and supporting evidence

April 2022

Contents

1.0 Overview

This document has been prepared by Realm Communications to explain the methodology used to create accurate visual representations (AVRs) of the proposed development at Teversham Road, Fulbourn. The visual assessment of the proposed development reflects current best practice in relation to the verification of images, a process which is constantly being refined and improved with advances in technology and industry experience.

The purpose of the photomontages is to present an accurate overview of the proposed development which enables its effect on the landscape and views to be objectively evaluated. Every image contained within this document is verified unless otherwise stated. Final images should not be used as a standalone tool to assess the suitability of a development, but should be used in conjunction with a site visit.

This audit trail demonstrates the key stages of production (that can, if required, be checked by a third party) including photography, surveying, 3D modelling and camera matching processes - all critical to ensuring the accuracy of the final photomontages. These methodologies are in accordance with current best practice and follow recommendations from The Landscape Institute's Technical Guidance Note (TGN 06/19) : Visual Representation of Development Proposals.

The entities responsible for the preparation of the views that are set out in the following pages comprise:

Selection of viewpoints
Barton Willmore
7 Soho Square
London W1D 3QB
Phone: 020 7446 6888

Photography
Arcminute Ltd
25b Pall Mall Deposit
124-128 Barlby Road
Ladbroke Grove
London W10 6BL
Phone: 07774 857627

Survey of existing views and camera locations
Datum Survey Services
Brickfield Business Centre, Brickfield House
High Road, Thornwood, Epping CM16 6TH
Phone: 07977 111935

Production and checking of verified images
Realm Communications
The Workshop, Old Barn Cottage, Down Lane
Compton, Guildford GU3 1DQ
Phone: 01483 813888

Supply of house CAD and spot height information
Barton Willmore
7 Soho Square
London W1D 3QB
Phone: 020 7446 6888

Supply of landscape CAD and planting information
Barton Willmore
7 Soho Square
London W1D 3QB
Phone: 020 7446 6888

2.0 Methodology

2.1 Photography

The professional architectural photographer employed on this project was briefed by Realm to work to a methodology which conforms to the principles specified in section 1.0 Overview.

The following methodology statement has been supplied by Arcminute:

Photography brief The following methodology applies to the production of photographic images originated in March 2022 which form the pictorial basis for visual impact assessment photomontages for 2 views at Teversham Road, Fulbourn.

Overview The Arcminute system is designed to create geometrically accurate photography and verifiable data for all its associated parameters and is fully compliant with all guidelines covering images required to be aligned with survey data for use in planning applications.

Equipment Images are captured on a 36mm x 24mm 61 megapixel digital sensor in combination with the following lenses: 17mm, 24mm, 35mm, 52mm and 80mm with shift capability (specially selected for best in class resolution and customised to conform to the high precision focal length and optical axis settings required in the process). Re camera mounts, custom made designs for both single frame and panoramic capture are used to obtain high precision camera positioning and orientation tolerances.

Choice of lens We prefer to replicate (as far as possible) what may have already been provided in terms of preliminary view studies as typically these would have been generated using pre-considered factors as to what each view would need to illustrate e.g. context, key visual receptors etc. In the absence of a definitive steer, we will generally use a 74° HFOV lens for medium to close views in an urban environment and a 40° HFOV lens for long distance views. However, the actual size and nature of a scheme (single building or large multibuilding development) and its location will also be considered before lens selection. The Landscape Institute's latest guidelines have been relaxed with regard to lens choice and they are no longer insistent that a 'standard' lens be used wherever possible.

Photography The camera is set up at eye level (1.55-1.75m) and orientated to within 0.02 deg of pitch and roll to the horizon. The point on the camera that coincides with the origin of perspective is positioned in relation to a survey marker to within 2mm in XYZ. The scene is then captured in a RAW format using standard high quality architectural photographic practice.

For panoramic images the camera is setup in portrait orientation and rotated around the camera coordinate capturing sequential frames with a 50% overlap. Each frame has the same orientation tolerance as a single frame capture.

For every view, a photographic record is made of the tripod location, the survey mark and the height reading of the camera above it.

Post production Standard image processing for dealing with RAW files is undertaken to create a TIFF image that honestly represents the scene in terms of tonality and colour. This image is then processed to remove lens distortion and identify the XY position on the image of the optical axis. Using an image that is fully corrected for distortion enables all the survey points in the image to be used for alignment and not just those confined to the so-called central 'safe area'.

For panoramic images the sequence of tiff images are assembled into a seamless and accurate equirectangular projection using specialist panoramic software. Due to the large size of any image created this way the final image is down sampled to a more manageable size based on 100 pixels per degree. For example, a 120 deg x 40 deg panorama has a pixel size of 12000 x 4000 or 48 megapixels. The image is then placed in a larger background where the optical axis is aligned with it's center in order to present the end users rendering application with a 'non shifted' image.

The following data is recorded on a text layer:

- Date and time
- Lens focal length (to nearest 0.001mm)
- Image size in pixels and mm
- Height above survey point (to nearest 0.001m)
- Lens shift (nominal figure to nearest mm)

The survey points are marked up on a separate layer by the survey team. This layer can be set in a blending mode so that the precise point on the image below the marked dot can be seen.

Where temporary survey targets have been set up in the scene the before and after images are included as separate TIFF layers to enable both accurate camera alignment and seamless removal of the targets for final output.

Issued files The following files were issued to Realm:

- A layered TIFF containing the image and all of the above data.
- A flattened JPEG showing the survey points for use in the alignment process
- A photo of the tripod setup
- Any other supporting evidence deemed relevant to the end user such as a KMZ file of camera locations and other supplementary photography.

2.2 Survey

All of the baseline photographs were taken by a professional architectural photographer. Each viewpoint location is surveyed and identified by Ordnance Survey co-ordinates. The heights and distances of significant points within each view that are easily distinguishable have also been recorded as Ordnance Survey grid and level datum and their accuracy has been checked relative to the fixed camera position. The survey points for each view provide an effective check for ensuring that the 3D model and existing views are accurately merged together.

The following methodology statement has been supplied by Datum Survey Services:

Survey brief We were commissioned to survey and record co-ordinates (Eastings, Northings and AOD Height) of known points of detail located around the study site known as Teversham Road, Fulbourn. Digital files of the 2 views together with camera point locations were provided by the photographer.

Date of surveys March 2022.

Camera point positioning Network RTK solutions were established using a Leica GPS + GLONASS SmartRover receiver. The equipment was set-up directly over the camera position (survey nail) and multiple observations were recorded. A second (reference) point was taken approximately 100m away from the camera position using the same method.

Data capture Traditional survey techniques were employed to record the points of detail within each view. A Leica TCRA TS15 Total Station with long range reflector-less distance measurement capabilities was set-up directly over the camera point and orientated to Ordnance Survey National Grid using the two sets of co-ordinates determined by the SmartRover receiver.

Deliverables The completed survey data was issued as follows:

- Excel Spreadsheet comprising point numbers, coordinate data and descriptions
- PDF copies of each photo with point locations and view specific point numbers clearly marked
- AutoCAD DWG file containing 3D survey points with view specific point numbers.

Several views lacked sufficient clearly defined detail to survey. In these instances retro targets mounted on ranging rods were introduced to act as ‘artificial’ points within the field of view.

2.3 3D building model

The 3D building model of the proposed house/units (which is superimposed upon the ‘existing’ views) was created by Realm using CAD supplied by Barton Willmore. The 3D digital model was located into OS space (the survey used for the camera matching is in this coordinate system) using a combination of OS extracts, local site surveys and the site plans as provided by the architects. Spot height information from the architect’s CAD was used to set the model’s Z position in metres Above Ordnance Datum (AOD).

2.4 3D landscape

The landscape was developed in 3D using topographic survey information, planting plan, tree/shrub removal plan and species/heights lists as supplied by Barton Willmore. In collaboration with the landscape architect, all new trees/shrubs added to the terrain were selected based on the most appropriate model from our library to give an impression of the proposed landscape. All planting is indicative only.

2.5 Camera matching

The verification process confirms the accuracy of the 3D model in relation to each view. The camera matching process involves accurately matching the position of the virtual camera with the real world camera in OS space, and the location of the 3D model of the proposed development within each (existing) view. This is achieved through aligning the imported 3D cloud of survey points within the base photo and 3D environment, creating a virtual camera that replicates the exact position and height of the real world camera to produce an image where the rendered survey points match in visual location those recorded by the survey team and photographer.

The specifications of the lens type relating to each existing view are also entered into 3DS Max to help guide with alignment. An alignment is deemed correct only when all survey points sit exactly over the pixel in the photo that corresponds with the marked-up survey photo. If all points match, the virtual camera must therefore be correctly aligned.

For each view we measure the distance from camera to target and apply respective equations to establish the potential adjustment necessary to compensate for both curvature of the earth and light refraction. Typically, when the real world camera is positioned within 1.5km from the target, the effects of curvature of the earth and light refraction are deemed to be negligible in terms of their visual impact and therefore no adjustment is made to the Z axis of the building model within the view.

2.6 Lighting and rendering

To accurately light the 3D model, 3DS Max’s ‘daylight system’ is set to replicate the solar time, date and geographic location (longitude and latitude) as recorded in the base photograph. The settings used for each base photograph (F stop, shutter speed etc) are replicated in both this ‘daylight system’ and the virtual camera set-up. This process mimics the virtual sun so that the lighting falls upon the 3D model as it would in real life at the point when the photograph was captured. Fine tuning is sometimes necessary to better match the resultant lighting and shadows to the base photograph.

Once the camera matching and lighting processes are complete, the render of the 3D model is output to the same pixel resolution as per each respective base photograph.

2.7 Post production

Fully rendered views The render of the three-dimensional model was superimposed on the existing still views in Adobe Photoshop. The foreground of the existing views was then copied and placed over the rendered model in order to ensure that the depth is accurate within the photomontage view between the foreground, background and the rendered model. At this stage, for the fully rendered photomontages, the textured model can be further adjusted to match the resolution, colouring and saturation of the photograph taken to create a close impression of what the textures of the buildings and structures would look like. This is a qualitative exercise and requires interpretation by the designer on how the structure will look. A final qualitative check of all of the photomontage images has been carried out to ensure that they provide objectively accurate views of the proposed development.

2.8 Recommended viewing distances

It is recommended that final images are viewed at an optimum viewing distance (in relation to the size of printed photomontage) to give a correct sense of scale. We recommend that images are printed to a size that creates a comfortable viewing distance of between 300 to 500mm. The recommended viewing distance for each image is specified within Section 4.0 of this document.

2.9 Caveats

None.

3.0 Supporting evidence

Ordance survey co-ordinates			
View Ref	Eastings	Northings	AOD Height
1	551398.924	256483.075	12.676
2	551422.871	256491.82	12.472

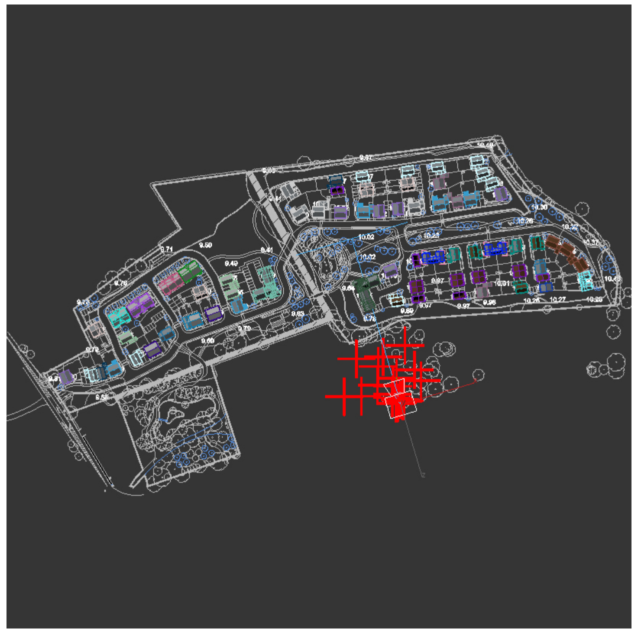
View 1

01.1 Ordinance survey co-ordinates			
Point Ref	Eastings	Northings	AOD height
101	551396.21	256484.516	11.374
102	551394.898	256484.101	11.727
103	551349.985	256489.905	15.59
104	551364.77	256490.424	13.141
105	551391.573	256488.959	12.633
106	551391.982	256491.971	13.039
107	551360.516	256522.692	12.507
108	551379.431	256516.146	10.818
109	551378.621	256499.785	12.157
110	551392.131	256499.057	10.166
111	551398.186	256487.299	11.408
112	551395.284	256505.914	10.535
113	551400.239	256486.936	13.861
114	551400.779	256486.008	11.443
115	551410.653	256513.11	15.249
116	551416.581	256503.777	11.649
117	551401.735	256486.244	13.898
118	551383.628	256524.414	11.053
119	551402.534	256534.278	10.205

1.3 View 1 camera location

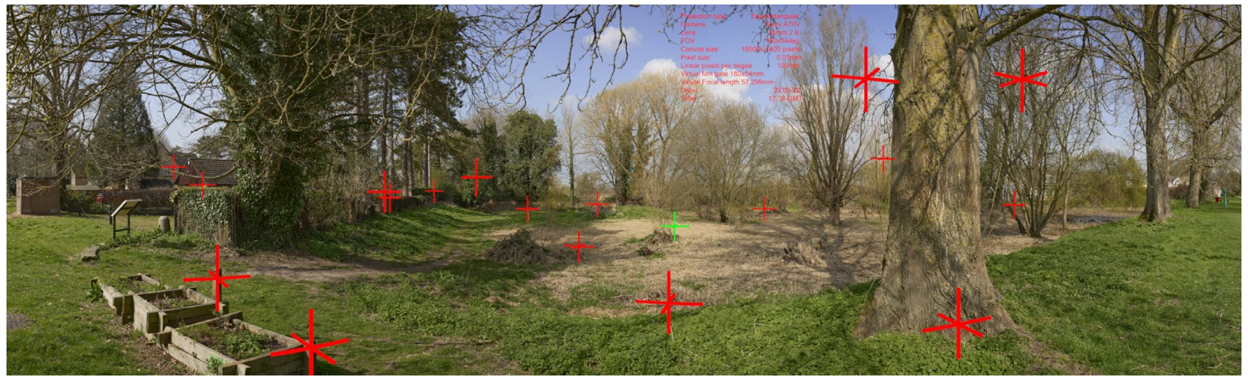
Eastings	551398.924
Northings	256483.075
AOD height	12.676
Approx distance to centre of site	147m
Approx bearing from North	344°

01.2 OS survey points marked on photograph

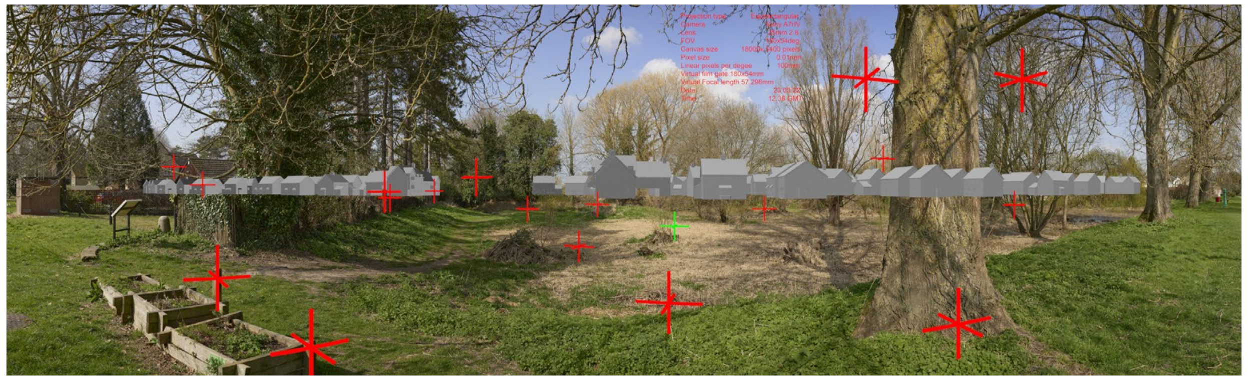


01.4 Screen grab of camera location in 3D Studio Max software

01.5 Screen grab of calculated horizon line



01.6 Screen grab of camera matching to OS data



01.7 Screen grab of model matched to photograph

01.8 Final camera matched photomontage

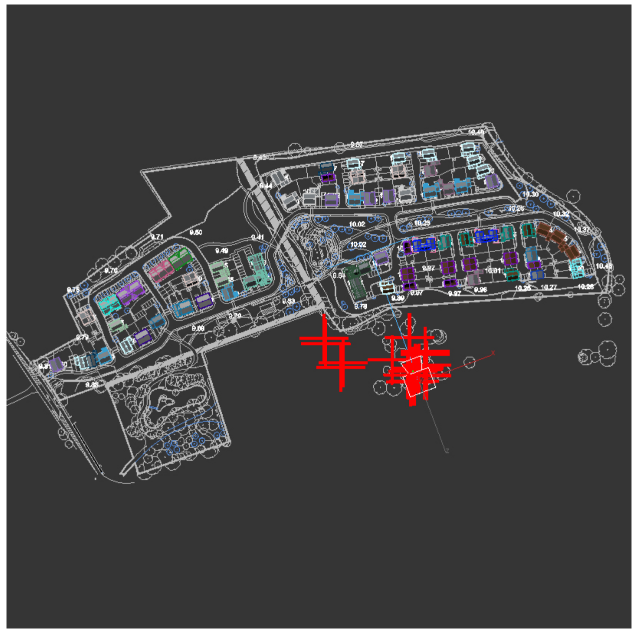
View 2

01.1 Ordinance survey co-ordinates			
Point Ref	Eastings	Northings	AOD height
201	551418.296	256492.617	13.874
202	551355.135	256504.44	18.549
203	551357.075	256508.391	15.575
204	551342.02	256525.006	15.118
205	551340.397	256529.621	16.207
206	551399.189	256510.933	10.224
207	551417.439	256501.011	11.618
208	551412.966	256498.142	15.068
209	551419.381	256503.857	16.266
210	551422.523	256503.925	14.763
211	551421.78	256502.93	9.528
212	551427.919	256515.581	19.642
213	551427.519	256497.717	14.428
214	551429.076	256497.558	12.751
215	551429.329	256506.662	9.532
216	551414.273	256530.618	9.787
217	551427.848	256518.116	15.531
218	551415.195	256491.853	11.461

1.3 View 2 camera location

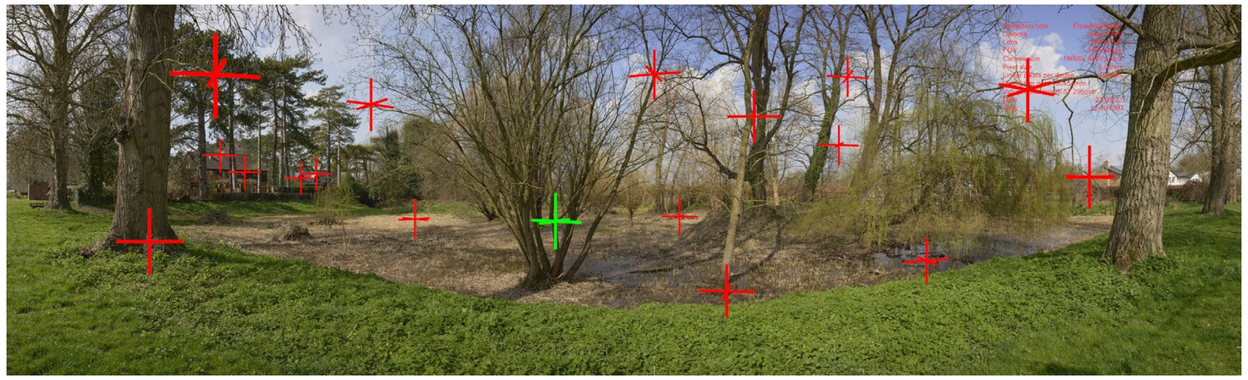
Eastings	551422.871m
Northings	256491.82m
AOD height	12.472m
Approx distance to centre of site	156m
Approx bearing from North	339°

01.2 OS survey points marked on photograph

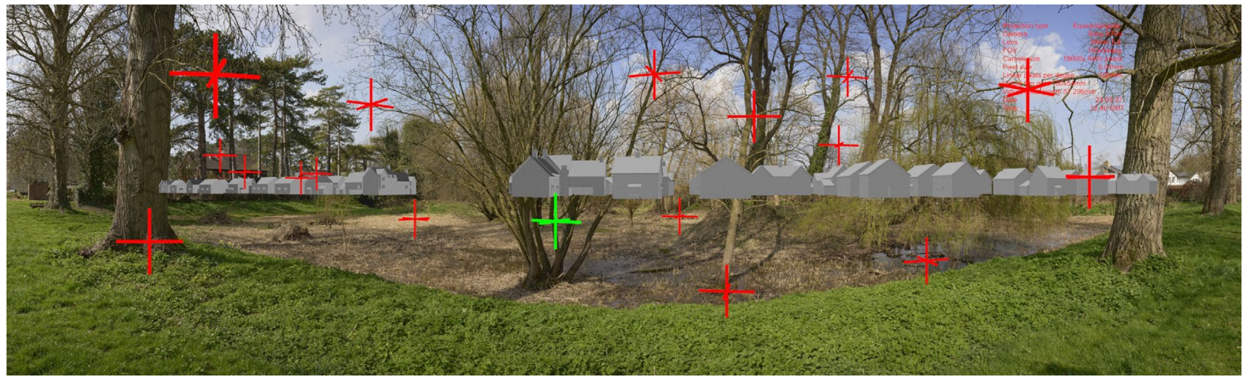


01.4 Screen grab of camera location in 3D Studio Max software

01.5 Screen grab of calculated horizon line



01.6 Screen grab of camera matching to OS data



01.7 Screen grab of model matched to photograph

01.8 Final camera matched photomontage

4.0 Final verified photomontages

View 1 existing

10 frame stitched view | FOV 180 x 54 degrees | Camera height above survey point 1650mm | Nominal lens rise 0mm | Date 23.03.22 | Time 12:36

View 1 proposed at year 1 planting

To achieve the optimum viewing distance of between 300-500mm (as per The Landscape Institute's guidelines), we recommend printing this image edge to edge on A0 landscape and viewing it from a distance of 360mm. Please refer to section 2.8 on page 4 of this document for further information.

View 2 existing

10 frame stitched view | FOV 180 x 54 degrees | Camera height above survey point 1650mm | Nominal lens rise 0mm | Date 23.03.22 | Time 12:40

View 2 proposed at year 1 planting

To achieve the optimum viewing distance of between 300-500mm (as per The Landscape Institute's guidelines), we recommend printing this image edge to edge on A0 landscape and viewing it from a distance of 360mm. Please refer to section 2.8 on page 4 of this document for further information.

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