View A15

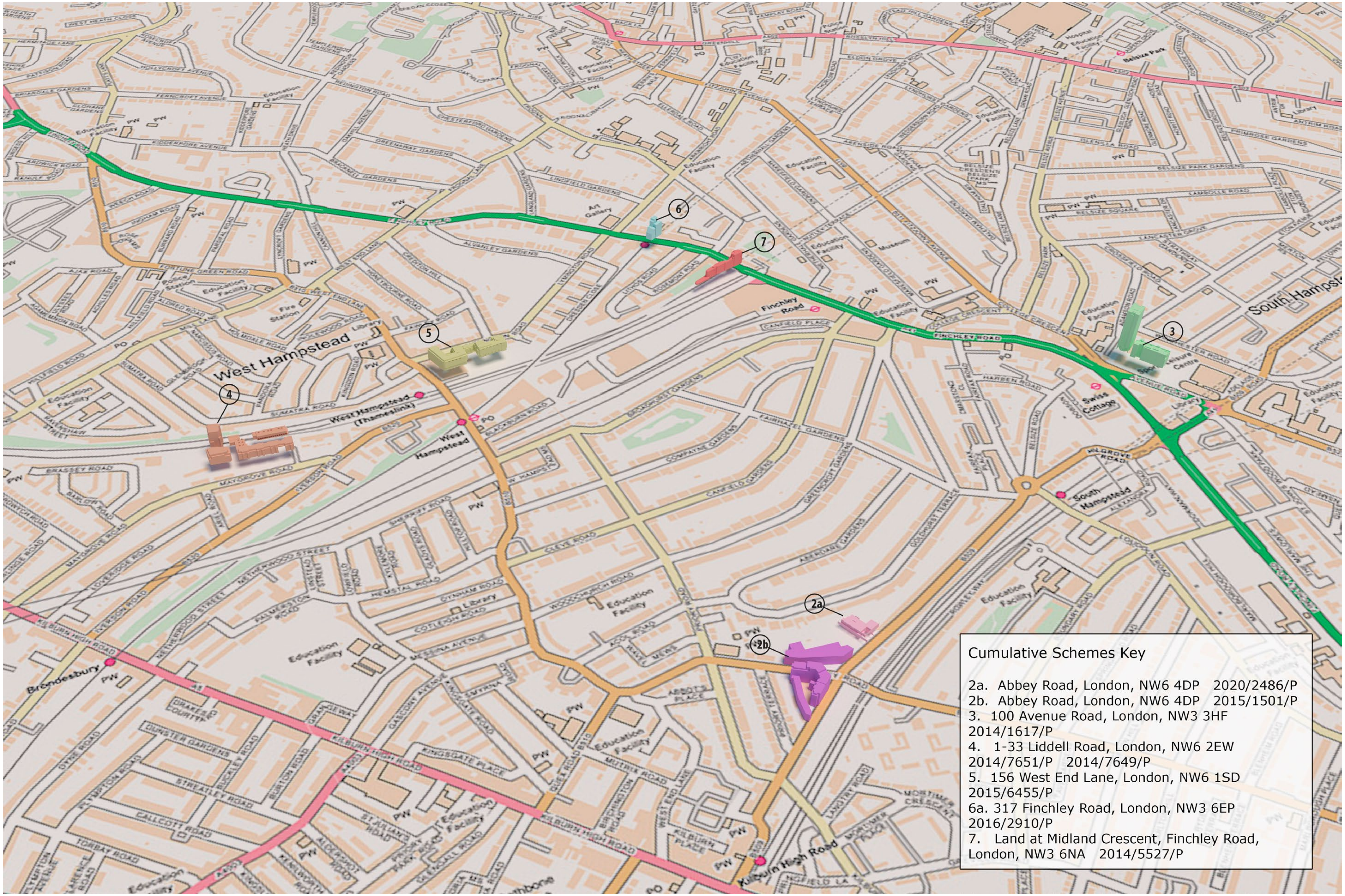
Alvanley Gardens – South

D17733 / 24mm / 27/11/18 / 12:14

Cumulative

24mm – 36.9° 35mm – 27.2° 50mm – 19.8° Image scalling factor = 37% at A3, 105% at A0 50mm – 19.8° 35mm – 27.2° 24mm – 36.9°

Appendix B Cumulative Schemes



Appendix C Cityscape Verified Views Methodology

Table of views

View	Visualisation type	Level of accuracy of location	Render / wireline	Ref	OS-E	OS-N	Height (AOD)	Height (AGL)	Heading	Lens	Lens choice	Field of view	Date	Time
1	Type 4	Better than 0.05m	Render + Wireline	D24899	525640.40	185193.58	68.18 M	1.60 M	171º	24mm	Inclusion of relevant context	74º	23/08/20	14:37
2	Type 4	Better than 0.05m	Render + Wireline	D17731	525707.04	185281.90	70.53 M	1.60 M	155º	24mm	Inclusion of relevant context	74º	27/11/18	12:21
3	Type 4	Better than 0.05m	Render + Wireline	D18323	525965.03	185473.82	88.34 M	1.60 M	183º	24mm	Inclusion of relevant context	74º	23/08/20	15:44
7	Type 4	Better than 0.05m	Wireline	D23062	526436.74	184944.64	72.37 M	1.60 M	250º	24mm	Inclusion of relevant context	74º	23/08/20	11:22
11	Type 4	Better than 0.05m	Render + Wireline	D17739	526208.65	184651.19	49.41 M	1.60 M	319º	24mm	Inclusion of relevant context	74º	27/11/18	11:19
12	Type 4	Better than 0.05m	Render + Wireline	D17740	526120.63	184670.45	47.23 M	1.60 M	315º	24mm	Inclusion of relevant context	74º	27/11/18	11:24
13	Type 4	Better than 0.05m	Wireline	D18334	526182.88	184741.97	49.75 M	1.60 M	280º	24mm	Inclusion of relevant context	74º	06/03/19	12:25
14	Type 4	Better than 0.05m	Render + Wireline	D17746	526125.63	184352.39	41.11 M	1.60 M	348º	24mm	Inclusion of relevant context	74º	27/11/18	12:55
15	Type 4	Better than 0.05m	Render + Wireline	D17742	525960.21	184551.95	44.96 M	1.60 M	330º	24mm	Inclusion of relevant context	74º	27/11/18	11:33
16	Type 4	Better than 0.05m	Wireline	D18333	525606.68	184656.97	51.68 M	1.60 M	63º	24mm	Inclusion of relevant context	74º	06/03/19	12:31
18	Type 4	Better than 0.05m	Render + Wireline	D17745	525520.75	184834.31	55.56 M	1.60 M	108º	24mm	Inclusion of relevant context	74º	27/11/18	11:54
19	Type 4	Better than 0.05m	Wireline	D24229x200	538936.10	177334.50	47.20 M	1.60 M	299º	200mm	Magnification of relevant detail	10º	27/03/21	09:37
A4	Type 3	Better than 1m	Wireline	D18320	526184.67	185993.07	118.49 M	1.60 M	196º	24mm	Inclusion of relevant context	74º	06/03/19	14:49
A5	Type 3	Better than 1m	Wireline	D18324	525953.08	185384.21	79.98 M	1.60 M	171º	24mm	Inclusion of relevant context	74º	06/03/19	15:37
A9	Type 3	Better than 1m	Wireline	D23056	525612.43	183950.27	38.73 M	1.60 M	17º	24mm	Inclusion of relevant context	74º	01/03/21	13:23
A13	Type 3	Better than 1m	Wireline	D23059	525178.69	184920.26	49.32 M	1.60 M	108º	24mm	Inclusion of relevant context	74º	23/08/20	14:21
A14	Type 3	Better than 1m	Wireline	D18325	525652.28	184927.97	55.09 M	1.60 M	108º	24mm	Inclusion of relevant context	74º	06/03/19	14:02
A15	Type 3	Better than 1m	Wireline	D17733	525867.93	185125.18	58.77 M	2.60 M	161º	24mm	Inclusion of relevant context	74º	27/11/18	12:14

C.0.0 Introduction

C.0.1 Methodology overview

The methodology applied by Cityscape Digital Limited to produce the *'Type 4 Photomontages survey / scale verifiable'*[1] or views contained in this document are described below. In the drafting of this methodology and the production and presentation of the images, guidance has been taken from the 'TGN 06/19 Visual Representation of development proposals' (TGN06/19) from the Landscape Institute published on 17 September 2019 in support of GLVIA3.

The disciplines employed are of the highest possible levels of accuracy and photo-realism which are achievable with today's standards of architectural photography and computer-generated models.

C.0.2 View selection

The viewpoints are selected through a process of consultation with relevant statutory consultees by townscape/heritage consultants and having regard to relevant planning policy and guidance.

1 'TGN 06/19 Visual Representation of development proposals.'
Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp. 21-2

C.1.0 Photography

C.1.1 Digital photography

High quality digital full frame sensor cameras are being utilised.

C.1.2 Lenses

In accordance with TGN 06/19, Cityscape balances the need to include the extent of the site and sufficient context with the stated preference for 50mm lenses. For local urban views a wide angle lens of 24mm or 35mm is generally used. For more open spaces the default is 50mm, intermediate distance views are photographed with a lens between 35mm to 70mm and occasionally long range views may be required with lens options ranging from 70mm to 1200mm.

As a guide, the following approach is used:

View	Lens options
Relevant foreground, urban context or large site	24mm – 35mm
Open spaces, where proposed development can be included	50mm
800 to 5000 metres – intermediate	35mm – 70mm
5000+ metres – long	70mm – 1200mm

Examples of these views are shown in Figures C.1 and C.2.

C.1.3 TGN 06/19

States that:

"2.2 Baseline photography should: [...] include the extent of the site and sufficient context;"[2]

"1.1.7 If a 50mm FL lens cannot capture the view in landscape or portrait orientation (for example, if the highest point of the development is approaching 18° above horizontal) the use of wider-angled prime lenses should be considered, working through the following sequence of fixed lenses in this order: 35mm FL > 28mm FL > 24mm FL > 24mm FL Tilt-Shift. Tilt-Shift Lenses are considered at Appendix 13. In these unusual situations, the reasoning for the choice and the approach used should be documented, and the agreement of the competent authority should be sought (see Appendix 10 Technical Methodology)."[3] and

"Views should include the full context of the site / development and show the effect it has upon the receptor location.[...]"[4]

2 TGN 06/19 Visual Representation of development proposals.'
Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp. 5, Paragraph 2.2

3 TGN 06/19 Visual Representation of development proposals.'
Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp. 28, Paragraph 1.1.7

4 'TGN 06/19 Visual Representation of development proposals.'
Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp. 35, Paragraph 4.1.5

C.1.4 Digital camera

Cityscape uses high quality professional DSLR (digital single lens reflex) and DSLM (digital single lens mirrorless) cameras. The cameras utilise FFS (full frame sensors) so declared focal lengths require no conversion to be understood in line with TGN 06/19 guidelines.

Cityscape use high quality lenses that are matched to the resolution of the cameras to ensure high contrast and sharp rendition of the images.

C.1.5 Position, time and date recording

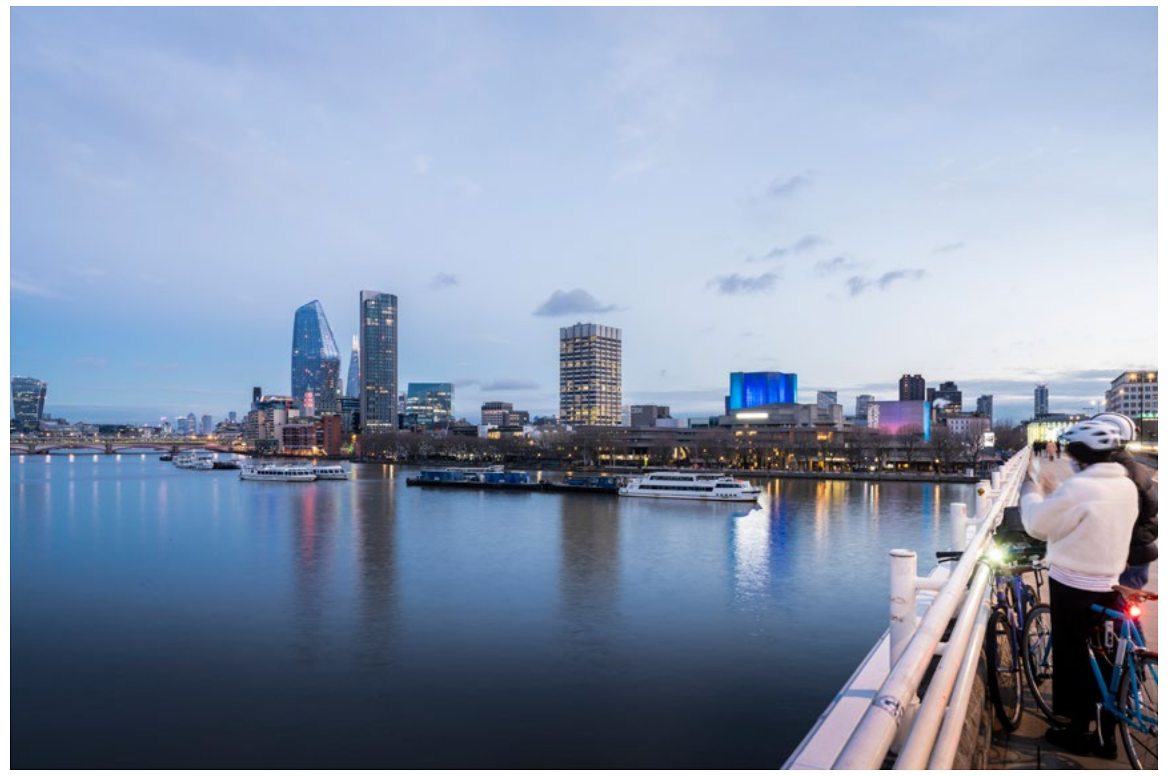
The photographer is provided with (i) an Ordnance Survey map or equivalent indicating the position of each viewpoint from which the required photographs are to be taken, and (ii) a digital mockup rendered with a context model of the desired view. For each viewpoint the camera is positioned at a height of 1.60 metres above the ground level which closely approximates the human eye altitude, and falls into the 1.5-1.65m range provided by TGN 06/19[5].

If local conditions required a deviation to capture the view, the exact height can be found in the Table of Views. A point vertically beneath the entrance pupil of the lens is marked on the ground as a survey reference point and two digital reference photographs are taken of (i) the camera/tripod location and (ii) the survey reference point (as shown in Figures C.3 and C.4). The date and time of the photograph are recorded by the camera.

5 'TGN 06/19 Visual Representation of development proposals.'
Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp. 50

Figure C.1: Local view

Figure C.2: Intermediate view



C.1.0 Photography (continued)

Figure C.3: Camera location

Figure C.4: Survey reference point

C.2.0 Digital image correction

C.2.1 Raw file conversion

Professional digital cameras produce a raw file format, which is then processed for both high detail and colour accuracy. The final image is saved as an 8 bit tiff[6] file.

C.2.2 Digital image correction

The digital photographs were prepared for the next stage of camera matching (see Sections C.6 and C.7).

All lenses exhibit a degree of geometric distortion. The most common types are radially symmetrical along the principal axis of the lens, and tend to grow in size towards the perimeter of the image. The outer edges of the images are therefore not taken into consideration to reduce inaccuracies. Figure 5 illustrates the 'safe' or non-distortive area of an image which is marked by a red overlay.

The adjusted or corrected digital image, known as the 'background plate', is then saved ready for the camera matching process (see Sections C.6 and C.7). In preparation for the survey (see Section C.3.2) Cityscape indicates on each background plate the safe area and priority survey points, such as corners of buildings, retained elements and party walls for survey (see Figure C.6).

Figure C.5: Area of interest to be surveyed

Figure C. 6: Background plate highlighting critical survey points in green and secondary survey strings in red

6 TIFF is the name given to a specific format of image file stored digitally on a computer.

C.3.0 Type 4 visualisations

C.3.1 Type 4 visualisation

Unless otherwise specified visualisations are completed to TGN 06/19[7] Type 4 Photomontage / Photowire (survey / scale verifiable) standards.

C.3.2 Survey

An independent surveyor is contracted to undertake the survey of (i) each viewpoint as marked on the ground beneath the entrance pupil of the lens at the time the photograph is taken (and recorded by way of digital photograph (see Section C.1 above) and (ii) all the required points on buildings, hard landscape features or immobile permanent objects within the safe zone. The survey is coordinated onto the Ordnance Survey National Grid (OSGB36) by using GNSS (global navigation satellite system such as GPS[8]) equipment (see, for example, Figure C.7) and processing software. The Ordnance Survey National Grid (OSGB36) is chosen as it is the most widely used and because it also allows the captured data to be incorporated into other available digital products (such as Ordnance Survey maps). The height datum used is Ordnance Survey Newlyn Datum and is also derived using the GNSS.

Improvements to the real-time position of GNSS data is achieved by RTK (real time kinematic) compensation, which utilises a comparison between known base stations positions and their current position fix to produce correction data to the measurements. The required points on each building are surveyed using conventional survey techniques utilising an electronic theodolite and reflectorless laser technology (shown in Figure C.8). In certain circumstances, a viewpoint may need to be surveyed using conventional survey techniques as opposed to RTK, if, for example, the viewpoint is in a position where GNSS information cannot be received.

C.3.3 False origin

3D modelling programs, unlike CAD/BIM programs, have inherent inaccuracies the further an object is away from the origin. Cityscape decide on and record a local, ‘false origin’ that is used to move the model closer to the origin. This alleviates the inaccuracies. The 3D model of the proposed development, consented scheme models, and survey data are all moved uniformly to this new false origin. When performing positioning checks (see Section C.5.2) the offset between false origin and OS are added back to the coordinates.

Figure C.7: Field survey being carried out, GNSS receiver

Figure C.8: Field survey being carried out, total station

7 ‘TGN 06/19 Visual Representation of development proposals.’ Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf (Accessed: March 2022).pp.11, Table2, pp 21-24.

8 https://www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/land/guidelines-for-the-use-of-gnss-in-surveying-and-mapping-2nd-edition-rics.pdf

C.4.0 Type 3 visualisations

C.4.1 Type 3 visualisation

These visualisations are as described in TGN 06/19[9] Type 3 Photomontage / Photowire (not survey / scale verifiable) standards. In contrast to Type 4, Type 3 visualisations rely on good quality data for camera matching, but are not relying on surveys as described in Section C.3.2. Data sources such as GPS, OS Maps, 3D City models, geo-referenced aerial photography, LiDAR or 3D models can be used.

The individual data source used is declared in an accompanying table. The possible angular shift of a 1m lateral displacement of the camera against its actual coordinate depends on the distance of the object from the camera[10]:

Distance from camera	Apparent shift
10m	5.7°
100m	0.57°
1,000m	0.057°
10,000m	0.006°

Cityscape also create 3D DSM (Digital Surface Model) models from publicly available data sources, such as Defra LiDAR scans from the Defra Data Services Platform. We always choose the newest data available at the highest possible resolution, typically at 1m resolution. The data is processed to coordinate onto Ordnance Survey National Grid (OSGB36), and converted to a Square Grid DSM. The square grid is then optimised into a TIN (Triangulated Irregular Network). The optimisation has been validated to produce no loss in usable information of the geometric mesh. This process follows the guidelines set out in 'Guidance – Visual representation of wind farms – Feb 2017'[11].

Digital Surface Model (DSM) source data is typically the Defra LiDAR
Composite DSM, 2020, resolution 1m.

9 'TGN 06/19 Visual Representation of development proposals.'
Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp.11, Table2, pp 19-20.

10 'TGN 06/19 Visual Representation of development proposals.'
Available at: https://landscapewpstorage01.blob.core.windows.net/www-landscapeinstitute-org/2019/09/LI_TGN-06-19_Visual_Representation.pdf
(Accessed: March 2022).pp 56-57

11 'Guidance – Visual representation of wind farms – Feb 2017'
Available at: https://www.nature.scot/sites/default/files/2019-09/Guidance%20-%20Visual%20representation%20of%20wind%20farms%20-%20Feb%202017.pdf
(Accessed at March 2022). pp 8-9

C.4.2 False origin

3D modelling programs, unlike CAD/BIM programs, have inherent inaccuracies the further an object is away from the origin. Cityscape decide on and record a local, 'false origin' that is used to move the model closer to the origin. This alleviates the inaccuracies. The 3D model of the proposed development, consented scheme models, and survey data are all moved uniformly to this new false origin. When performing positioning checks (see Section C.5.2) the offset between false origin and OS are added back to the coordinates.

Figure C.11: 1m resolution LiDAR GeoTIFF

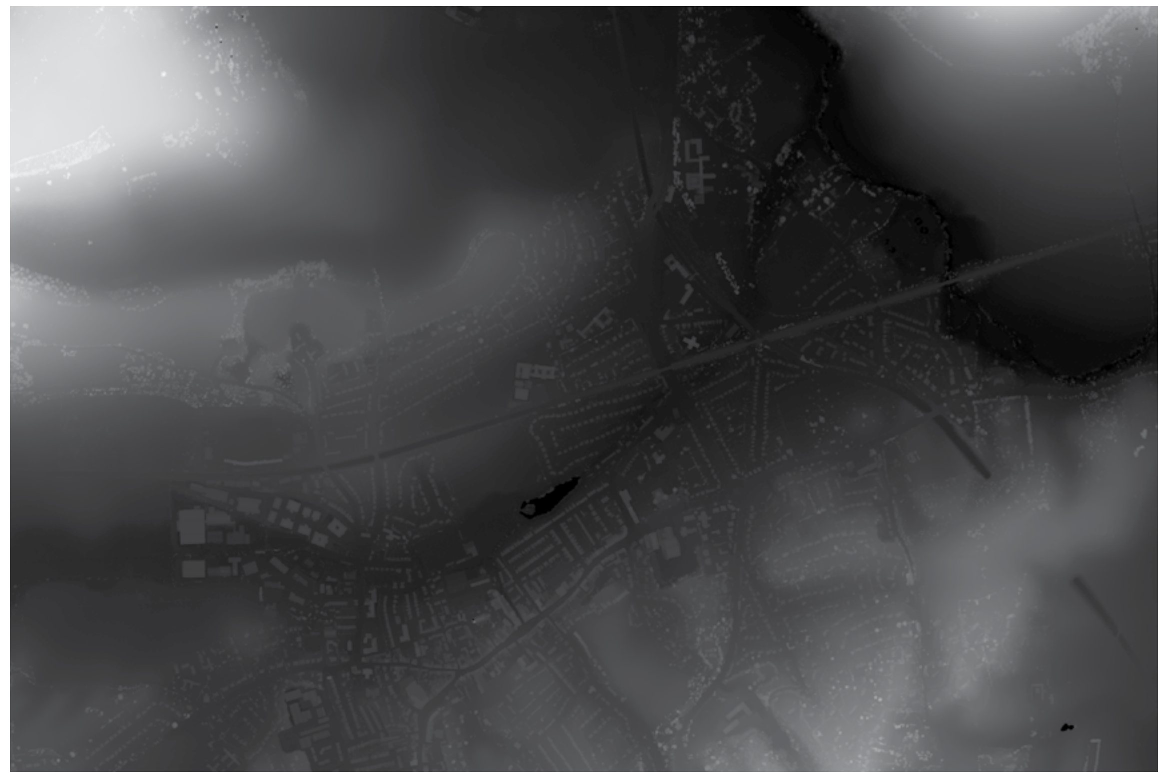


Figure C.12: Resulting 3D TIN mesh

C.5.0 Model positioning

Applies to Type 3 and Type 4 visualisation.

C.5.1 Model source

A wireframe 3D model of the proposed scheme if not provided is created by Cityscape from plans and elevations provided by the architects and from survey information of the ground levels on site and various other points on and around the site, such as the edge of adjacent roads and pavements etc. provided by the surveyor.

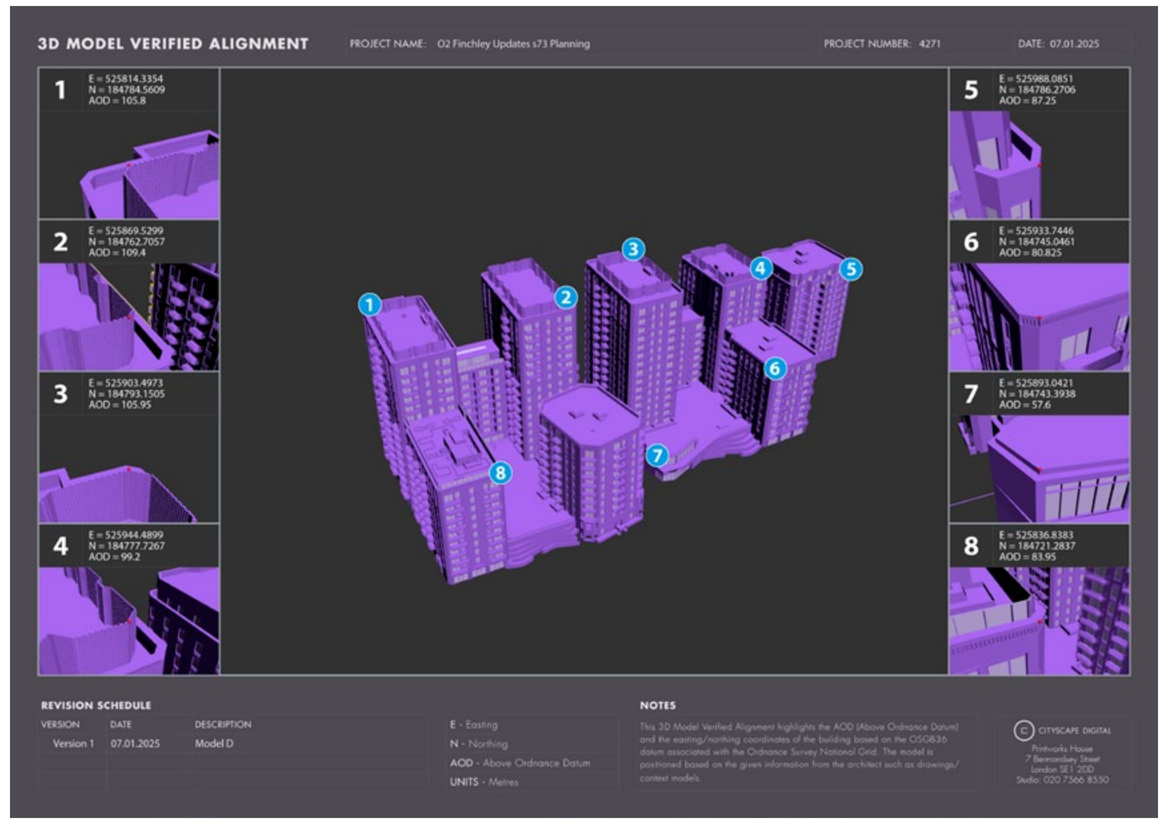
C.5.2 Proposed model position check

The architect supplies a 3D model in OS coordinates that can be used 'as is' for position checks as described below (utilising the false origin as described in Section C.3.3). Alternatively, a non OS located model can be provided together with a floor plan that is positioned in an OS map. The model can then be positioned by way of setting it on the floor plan. Heights are either preserved from the original model if supplied in AOD, or taken from supplied elevations.

Once the model is positioned, confirmation of height and Easting/Northing Coordinates is requested from the architect.

At least two clear reference points are agreed and used to confirm the placement of the model.

Figure C.13: Proposed model position check



C.6.0 Camera matching – Type 4 visualisations

C.6.1 Cityscape Digital's database

Cityscape Digital has built up a comprehensive database of survey information on buildings and locations in central London; the database contains both GNSS survey information and information regarding the dimensions and elevations of buildings gathered from architects and other sources.

The outlines of buildings are created by connecting the surveyed points or from the information obtained from architects' drawings of particular buildings. By way of example of the high level of detail and accuracy, approximately 300 points have been GNSS surveyed on the dome of St. Paul's.

The database 'view' (as shown in Figure C.14) is 'verified' as each building is positioned using coordinates acquired from GNSS surveys. In many instances, the various coordinates of a particular building featured in one of the background plates are already held by Cityscape as part of their database of London. In such cases the survey information of buildings and locations provided by the surveyor (see Section C.3.2) is used to cross-check and confirm the accuracy of these buildings. Where such information is not held by Cityscape, it is, where appropriate, used to add detail to Cityscape's database.

The survey information provided by the surveyor is in all cases used in the verification process of camera matching.

C.6.2 Camera matching process

The following information is required for the camera matching process:

- Specific details of the camera and lens used to take the photograph and therefore the field of view (see Section 1);
- The adjusted or corrected digital image i.e. the 'background plate' (see Section C.2);
- The GNSS surveyed viewpoint coordinates (see Section C.3.2);
- The GNSS surveyed coordinates of points within the the background plate (see Section C.3.2);
- Selected models from Cityscape's database (see Section C.6.1);
- The GNSS surveyed coordinates of the site of the proposed scheme (see Section C.3.2);

The data is combined in a 3D software package and is then used to situate Cityscape's virtual camera such that the 3D model aligns exactly over the background plate (as shown in Figures C.15, C.16 and C.17) (i.e. a 'virtual viewer' within the 3D model would therefore be standing exactly on the same viewpoint from which the original photograph was taken (Figure C.3). This is the camera matching process.

Figure C.14: Selected GPS located models (yellow) from Cityscape's database, situated on Cityscape's London digital terrain model

Figure C.15: The background plate matched in the 3D GPS located models

Figure C.16: Background plate matched to the 3D GPS located models

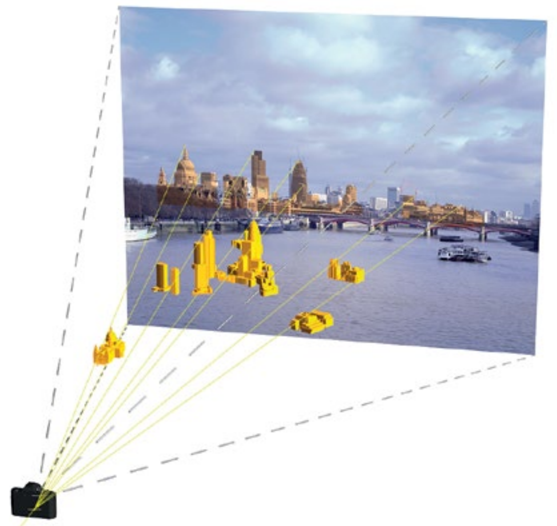
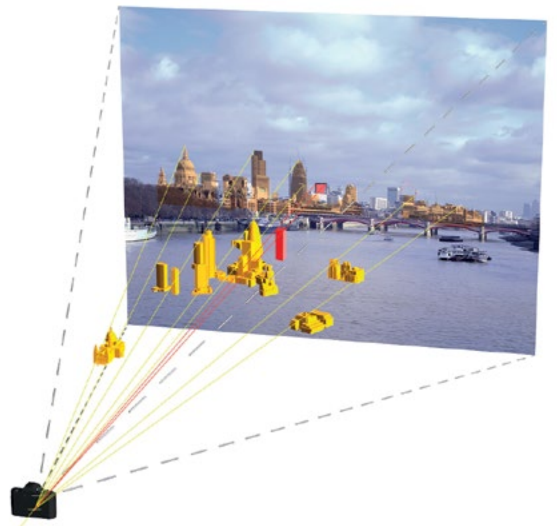


Figure C.17: The camera matched background plate with an example of a proposed scheme included in red



C.7.0 Camera matching – Type 3 visualisations

C.7.1 Cityscape's context models

Cityscape have purchased available 3D city models of large parts of London and other parts of the UK that are modelled to within 25cm accuracy. Where available this data is used to create camera matches for Type 3 visualisations, or additional data is purchased.

In addition, or where 3D city models are not available, DSM data is used for camera matching (see Section C.4).

C.7.2 Camera matching process

The following information is required for the camera matching process:

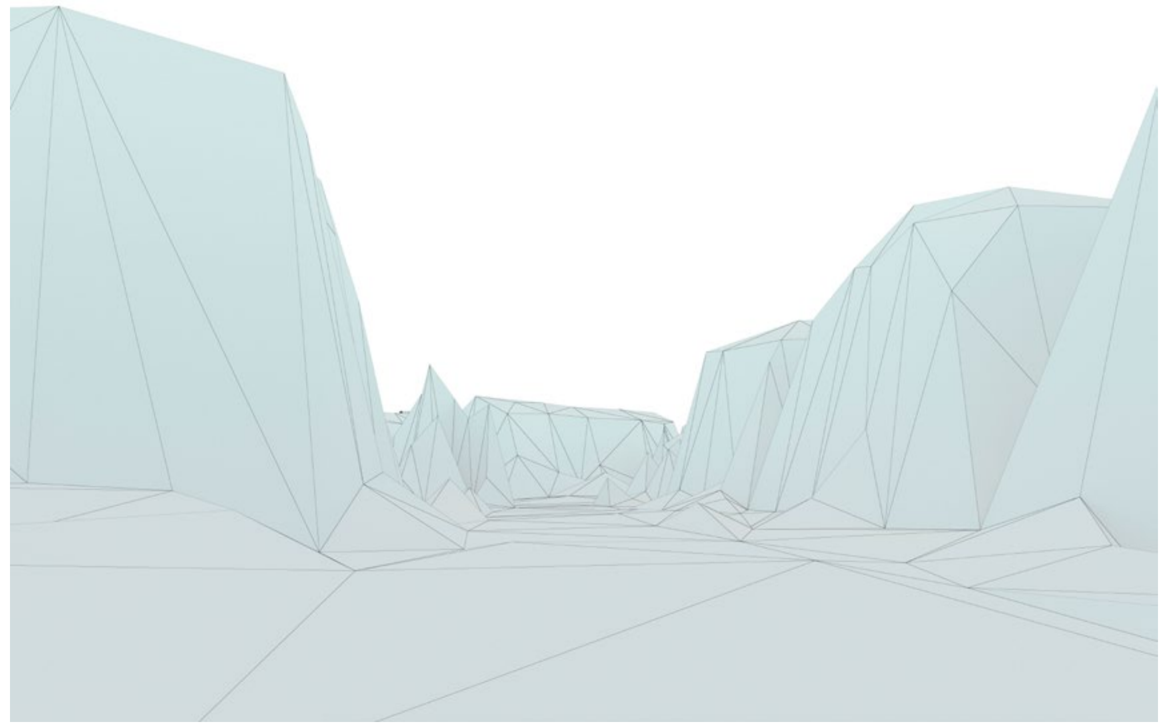
- Specific details of the camera and lens used to take the photograph
  and therefore the field of view (see Section C.1);
- The adjusted or corrected digital image i.e. the 'background plate' (see Section C.2);
- 3D city model and/or DSM context model (see Section C.4);
- Selected models from Cityscape's database (see Section C.6.1);
- A 3D model of the proposed scheme (see Section C.5)

The data is combined in a 3D software package and is then used to situate Cityscape's virtual camera such that the 3D model/Digital Surface Model (DSM) aligns exactly over the background plate (as shown in Figure C.20) (i.e. a 'virtual viewer' within the 3D model would therefore be standing very close to the same viewpoint from which the original photograph was taken (Figure C.3).
This is the camera matching process.

Figure C.18: Background plate: digital photograph, size and bank corrected as described in Section 2

Figure C.20: Camera matching: the background plate matched in DSM TIN mesh

Figure C.19: Render: DSM model render, camera matched



C.8.0 Rendering

C.8.1 Wireline image (AVR 0/1)

The proposed developments are shown using a constant thickness wireline. The line is generated from a computer rendering of the 3D model and follows an 'inside stroke' principle.

Rendering is a technical term referring to the process of creating a two dimensional output image from the 3D model. The 'inside stroke' principle is followed so that the outer edge of the line touches the outline of the render from the inside, fairly representing the maximum visibility.

The camera matching process is repeated for each view and a wireline image of the proposal from each viewpoint is then produced. The wireline image enables a quantitative analysis of the impact of the proposed scheme on views.

C.8.2 Rendered image (AVR 3)

In order to assist a more qualitative assessment of the proposals, the output image needs to be a photo-realistic reflection of what the proposed scheme would look like once constructed. This is called an AVR3.

C.8.3 Texturing

The process of transforming the wireframe 3D scheme model into one that can be used to create a photorealistic image is called texturing[12].

Prior to rendering, Cityscape requires details from the architect regarding the proposed materials (e.g. type of glass, steel, aluminium etc.) to be utilised.

Cityscape also use high resolution photographic imagery of real world material samples, supplied by the client or the manufacturer, to create accurate photorealistic textures for use in all our images. This information is used to produce the appearance and qualities in the image that most closely relates to the real materials to be used (as shown in Figure C.21).

C.8.4 Lighting and sun direction

The next stage is to light the 3D model to match the photographic environment. The date, time of the photograph and the latitude and longitude of the city are input (see Figure C.22) into the unbiased physically accurate render engine. Cityscape selects a 'sky' (e.g. clear blue, grey, overcast, varying cloud density, varying weather conditions) from the hundreds of 'skies' held within its database to resemble as closely as possible the sky in the background plate.

The 3D model of the proposed scheme is placed within the selected sky (see Figure C.23) and using the material properties also entered, the computer calculates the effects of the sky conditions (including the sun) on the appearance of the proposed scheme.

12 Texturing is often referred to as part of the rendering process, however, in the industry, it is a process that occurs prior to the rendering process.

Figure C.21: Screenshot of some materials in the 3D rendering package.

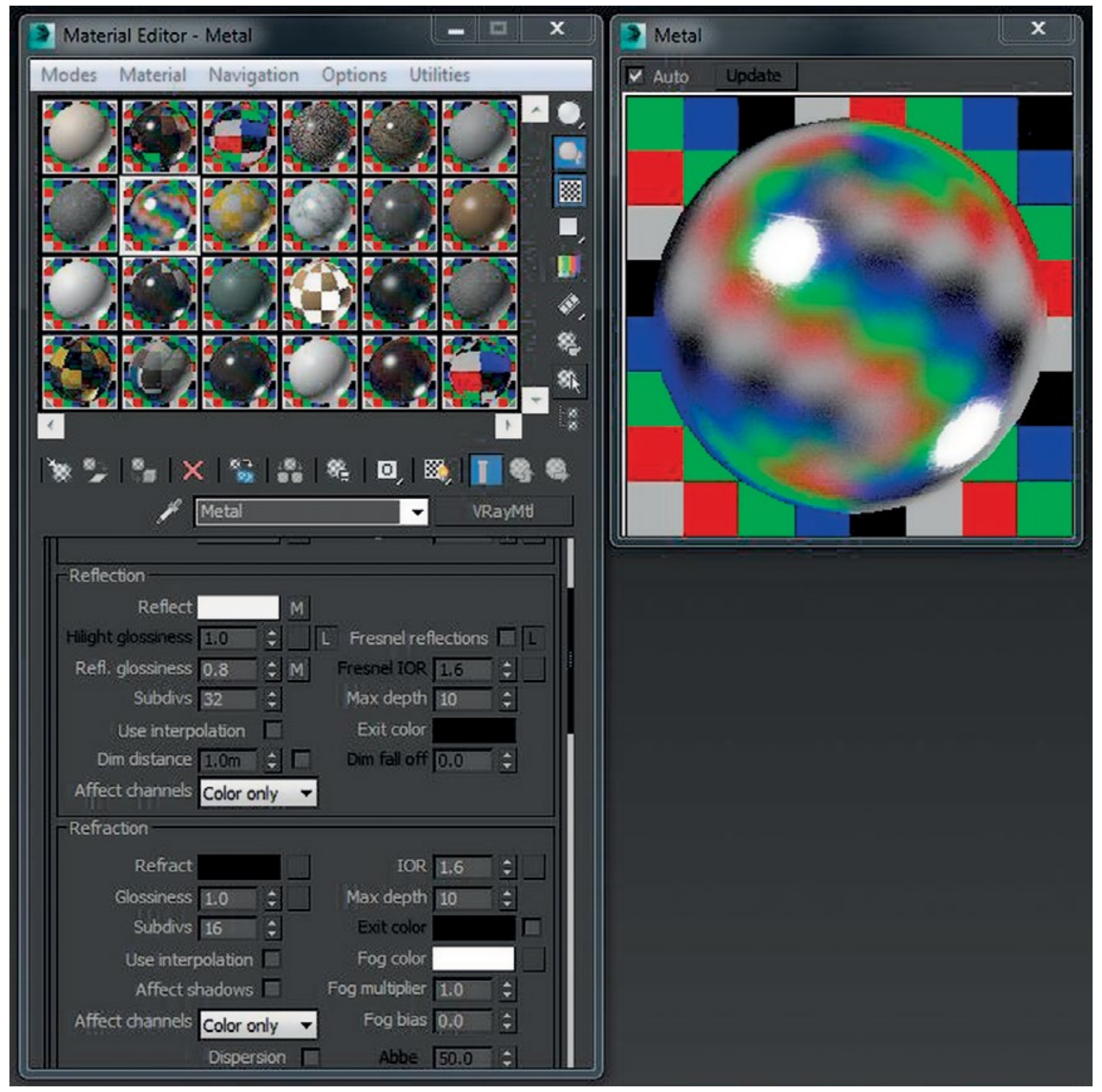


Figure C.22: Screenshot of environment information (time, date and year) entered to locate the sun correctly (see Section 7.

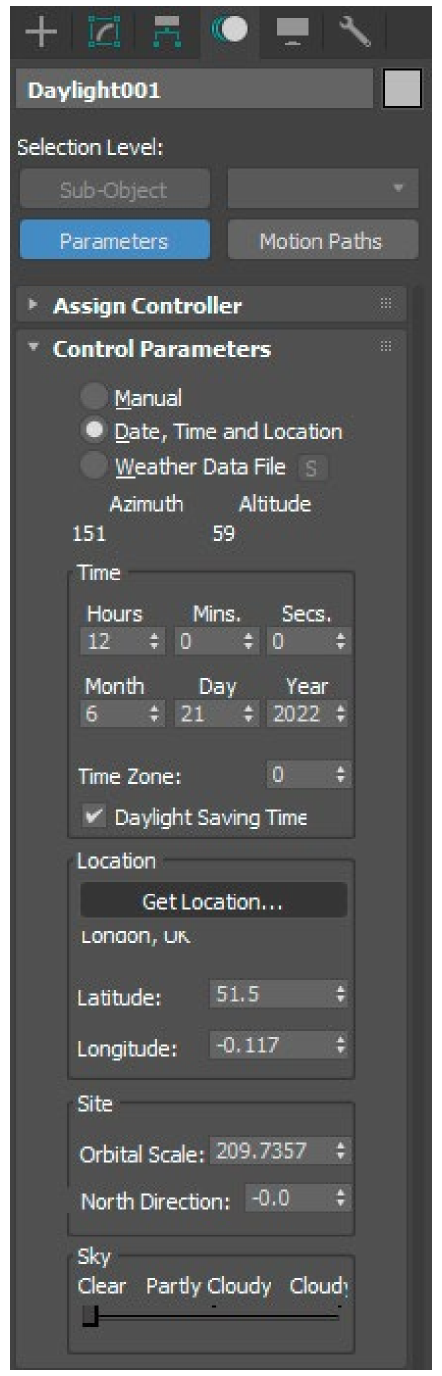
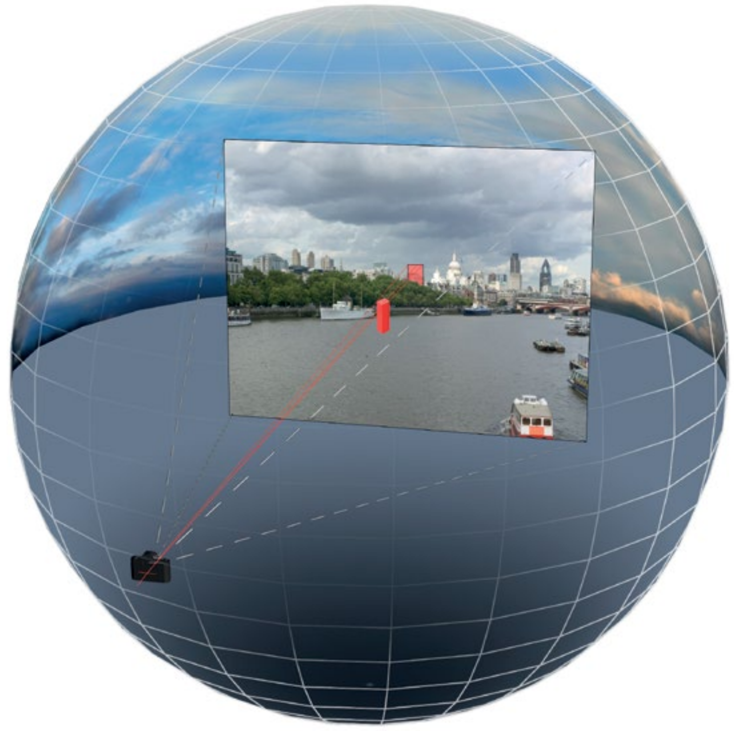


Figure C.23: Example of a proposed scheme highlighted in red within the selected sky and rendered onto the background plate



C.9.0 Post production

C.9.1 Post production

Finally, the rendered image of the scheme model is inserted and positioned against the camera matched background plate.

Once in position, the rendered images are edited using Adobe Photoshop®. Masks are created in Photoshop where the line of sight to the rendered image of the proposed scheme is interrupted by foreground buildings (as shown in Figure C.24).

The result is a verified image or view of the proposed scheme (as shown in Figure C.25).

Figure C.24: Process red area highlights the Photoshop mask that hides the unseen portion of the render

Figure C.25: A photo-realistic verified image

Cityscape Digital

Printworks House
7 Bermondsey Street
London SE1 2DD

020 7566 8550