AVR Methodology

Overview

The process of generating verified views (also referred to as accurate visual representations (AVR)) for the Proposed Development at Junction 9, M40, Bicester was carried out by The Environmental Dimension Partnership (EDP).

High quality/resolution photographs were taken from the agreed locations by EDP. An adequate number of visible features present in the photographs were subsequently identified using DSM LiDAR, and the location and bearing of the camera was recorded. A geo-referenced development model was constructed to OSGB36. With a known camera position and orientation, photographic and DSM extracted existing visible features, the development model was accurately aligned to the photograph.

The AVRs produced have an estimated accuracy tolerance of +/-1m.

The pages in this document should be printed at their intended size and not be scaled to fit smaller page sizes and should be printed on 297mmx841mm paper.

Site visit

EDP visited the site on the 29th April and 7th September 2021 to obtain viewpoint photography. The view positions were recorded using a handheld GPS. The exact locations were refined using aerial photography and LiDAR DSM.

This section explains in detail the processes involved in the preparation of Accurate Visual Representations (AVR) The following procedures set out an efficient, consistently accurate, robust, repeatable and traceable approach to achieve a high level of accuracy.

Verified photomontages, also referred to as Accurate Visual Representations (AVR) or Visually Verified Montages (VVM), are the 'top level' in terms of accuracy and documentation. Verified imagery is relied upon at public inquiry and in support of contentious planning applications/ appeals and must therefore be robust and free from erroneous/ambiguous information. From the outset, a project where verified photomontages are required MUST be approached with the intention of absolute precision and will be based upon a traceable data set.

Standards

The images in this document fully comply with the following guidance:

1. The Landscape Institute Technical Guidance Note TGN 06/19 Visual Representation of Development Proposals
2. The Landscape Institute/IEMA Guidelines for Landscape and Visual Impact Assessment (3rd edition 2013);
3. The SPG London View Management Framework (March 2012).

Preparation

Following a formal instruction from the client, the scope of the project was agreed. The client identified a number of viewpoints and supplied a map of required view locations.

Focal length, image format, required content and context was agreed prior to the site visit. The photographer was familiar with the scope of the project and read any relevant information that was made available by the client.

Photography

The site visit was done on 9th April and 7th September 2021, and consideration was made to:

1. Forecast weather conditions
2. Shot itinerary based on sun position/time of day
3. Access / distance to site / duration of journey to site and required time on site
4. Suitable parking

Equipment used (see Appendix B for specification):

1. Camera, in working order with charged batteries (Canon EOS 6D)
2. Empty CF cards, at least 3x32Gb cards and 128Gb across additional cards in various capacities in case of failure
3. Battery charger
4. 50mm lens (Canon EF 50mm f/1.8 USM)
5. Lens cloth
6. Remote cabled shutter release
7. Tripod with indexed/panoramic head (Manfrotto 303)
8. Tripod head levelling base (Manfrotto 438)
9. Small magnetic spirit level
10. Plumb bob
11. Spray paint (upside down street marking paint)
12. Hilti nails / pegs and hammer
13. Tape measure

Lens Selection Criteria

In order to capture appropriate and relevant context, it was agreed that a 50mm lens should be used in combination with a panoramic tripod head. A series of shots were taken (with the camera in portrait orientation) to form panoramic photographs for each view location.

On site procedure

1. Based on the order of viewpoints on the itinerary, each view location was visited. The tripod was erected and camera attached, along with the 50mm lens, shutter release, spirit level and plumb bob. The bob was hung from the bottom of central tripod assembly after a nodal point adjustment had been made.
2. The height of the lens' central axis above ground level was measured and set to 1.60m using the tape measure.
3. A spray paint mark was used directly below the plumb bob to mark the location for the surveyor to measure.
4. Using a camera phone 4 shots (n,e,s,w) were taken of the assembled tripod, camera and bob in situ over the marker. A shot of the marker was also captured.
5. The following camera settings were used:

- Manual 'M' mode
- Bracket set to +/- 0.75 stops
- Aperture at f8 to ensure wide depth of field and minimal diffraction.
- ISO <100
- Auto White Balance (AWB)
- Evaluative metering
- RAW capture only to avoid loss of dynamic range and image quality degradation associated with 8bit jpeg format
- Enabled highlight warning
- Check that TS-E lens is not 'tilted' or shifted if in use
- Used 'Live View' and zoom function to fix and verify focus on the site, This also enables 'mirror lockup' and therefore less camera shake.
- Evaluative metering.

Panoramic Shots:

1. A sufficient horizontal field of view was determined to include the site and sufficient relevant context, vertical field of view was also considered based on height of the proposals and proximity to the site - the views were very close to the site, so the camera was set in portrait orientation.
2. The tripod was levelled using the tripod mounted level. Following this the panoramic tripod head was levelled using the levelling base. The levelling base was microadjusted by partially engaging the clamp. Using the digital level built in to the camera, pitch and yaw angles were adjusted to achieve level. Levels were checked at the mid point and each end of the panorama. A trial sweep of the panorama was performed while checking the digital level to ensure a perfectly level set of shots.
3. A minimum of 50% shot overlap must was achieved with the camera in portrait orientation. The panoramic tripod head assembly was adjusted to rotate incrementally at approximately 50% of the total horizontal field of view of the selected lens with the camera is in portrait orientation.
4. The panoramic tripod head was adjusted to centre the lens nodal point to the rotational axis of the tripod. It was important to ensure this is set to the correct measurement in order to avoid parallax.
5. With the camera centred on the site, 'live view' and x10 magnification was enabled and an appropriate point was identified to focus on.
6. Once focused, and accounting for conditions, the correct exposure was achieved by adjusting the shutter speed.
7. The panorama was shot from left to right, taking three bracketed shots per rotational increment, through the panorama attempting where possible to avoid cars and any other moving objects.
8. Shots were previewed to check the quality, focus, highlight warning and histogram for the shots to ensure that a well exposed usable set of photographs had been captured.
9. ETR (expose to the right) method was used to achieve noise free shots - using the histogram and bracketing the shutter speed was adjusted to achieve an over exposed (but not clipped) +0.75 bracket shot.

Photography Post Processing
RAW files were processed in Adobe Camera Raw after shot approval in Adobe Bridge. The processed RAW files were then taken into Adobe Photoshop to be stitched and saved as full resolution TIF files. The process was as follows:

Downloading and Reviewing:
1. Downloaded *.CR2 RAW files from CF card using a CF card reader. The files were saved to the appropriate project folder on the network.
2. The tripod and marker shots were downloaded to the same location and depositied in a 'documentation' folder.
3. Shots were reviewed with Adobe Bridge, and selections were made based on sharpness, composition, suitability for stitching and exposure.

Processing:
4. Using Adobe Camera Raw, simple and standard digital photo processing techniques were applied ie sharpening, noise reduction and chromatic aberration correction. Settings were adjusted as necessary to achieve the best exposure, shadow detail and clarity.
5. Using Adobe Photoshop, the processed RAW files were stitched to form a panorama of cylindrical projection.
6. The completed panorama was saved as an 8bit tiff file.

AVR Control Data (Using LiDAR DSM)
The AVR control was performed using Environment Agency 1m resolution LiDAR DSM.

A wide area of DSM data was translated from composite 1km2 tiles in ASC format to form a meshed grid representing existing topography, built form and significant vegetation.

AVR Production
Modelling of the Proposals
A model of the proposed development was provided by the project Architect. A full set of CAD (DWG) floor plans was also made available by the project architect in order to verify the accuracy of the supplied 3D model.

The landscape proposals were modelled from supplied drawings.

Autodesk 3DS MAX 2019 was used to bring together the proposed scheme model and site plans to generate a master 3D environment.

Autodesk 3DS Max has poor floating point performance and requires that OSGB36 coordinate based drawings and models need to be reprojected nearer to scene origin (0,0).

A project global shift value (x and y axis) was designated when modelling was started. This value was a coordinate for the centre of the site. All drawings were corrected by the global shift value.

Importing of AVR Control Data
The LiDAR DSM Meshed grid was imported in to 3DS Max and was also corrected to the global shift value. When imported virtual cameras were created where specified in the GPS data.

Aligning the 3D Scene to the Baseline Photography
3DS MAX was used to generate high resolution *renders from the virtual cameras set up in the 3D environment.

**Rendering is the process of generating an image from a model (or models in what collectively could be called the 3D environment), by means of computer programs - specifically, in this case Chaos Group V-Ray 5.0 for Autodesk 3Ds Max 2019.*

The virtual camera was configured to match a similar field of view to that of the panoramic baseline photograph.

The render from each camera shows the LiDAR DSM mesh. In order for the render to match the cylindrical projection of the photograph it was necessary to render the mesh to a cylindrical projection (using the spherical camera type in VRay 5 by specifying exact horizontal and vertical field of view parameters)

This render of the LiDAR mesh was taken into Adobe Photoshop converted to a smart object and overlayed on to the baseline photograph. The smart object was scaled (uniformly) so that the LiDAR mesh aligned to the same visible features identified in the photograh, ie topography, built form and significant vegetation. The position of the smart object was locked so that it could not be moved accidentally.

The baseline photography was then effectively aligned to the 3D environment, and when the proposed model was rendered (in cylindrical projection) from this environment and placed in to the smart object it was therefore automatically correctly positioned in the photograph.

Output of the finished AVR
The style of AVR was discussed with the client and it was agreed that fully rendered and wireline visualisations were required.

For the fully rendered visualisations a photorealistic render was generated from the 3D model that matched the time of day of the photograph, and subsequently inserted in to the aligned smart object. Masks were applied to the smart object to hide aspects of the proposed scheme that are hidden by existing features.

A similar approach was employed for the wireline visualisations, with lines applied to the render to represent the maximum visible extent of the proposed.

Using the smart object, the field of view of the baseline photography was calculated, measured and subsequently cropped (non destructively) to a fixed field of view of 90 degrees in the horizontal axis for all views.

Using Adobe InDesign, each completed AVR was presented in a document that conforms with the relevant guidance.