Methodology overview

Overview / Background

Each of the views in this study has been prepared as an Accurate Visual Representation (AVR) following a consistent methodology and approach to rendering. Appendix D of the London View Management Framework: Revised Supplementary Planning Guidance (May 2010) defines an AVR as:

> "An AVR is a static or moving image which shows the location of a proposed development as accurately as possible; it may also illustrate the degree to which the development will be visible, its detailed form or the proposed use of materials. An AVR must be prepared following a well-defined and verifiable procedure and can therefore be relied upon by assessors to represent fairly the selected visual properties of a proposed development. AVRs are produced by accurately combining images of the proposed building (typically created from a three dimensional computer model) with a representation of its context; this usually being a photograph, a video sequence, or an image created from a second computer model built from survey data. AVRs can be presented in a number of different ways, as either still or moving images, in a variety of digital or printed formats."

In preparing AVRs of this type certain several key attributes need to be determined, including:

- the Field of View
- the representation of the Proposed Development
- documentation accompanying the AVR

Field of View and Field of View Selection

The term 'Field Of View' (FOV) or more specifically Horizontal Field of View (HFOV), refers to the horizontal angle of view visible in a photograph or printed image and is expressed in degrees. It is often referred to as 'angle of view', Using (HFOV) it becomes practical to make a comparison between photographs taken using lens of various focal lengths captured on to photographic film or digital camera sensors of various size and proportions. It is also possible to compare computer renderings with photographic images.

Comparing digital and film formats may be achieved using either the HFOV or the 35mm equivalent lens calculation, however quoting the lens focal length (in mm) is not as consistently applicable as using the HFOV when comparing AVRs.

Choice of Camera Lens

The choice of which lens to use - telephoto, standard or wide-angle lens - which will determine the Field of View, is made on the basis of the requirements for assessment and this will vary from view to view. In the simple case the lens selection will be that which provides a comfortable Viewing Distance. This would normally entail the use of what most photographers would refer to as a "standard" or "normal" lens, which in practice means the use of a lens with a 35mm equivalent focal length of between about 40 and 58 mm.

However in a visual assessment there are three scenarios where constraining the study to this single fixed lens combination would not provide the assessor with the relevant information to properly assess the Proposed Development in its context.
Firstly, where the relationship being assessed is distant, the observer would tend naturally to focus closely on it. At this point the observer might be studying as little as 5 to 10 degrees in plan. The printing technology and image resolution of a print limit the amount of detail that can be resolved on paper when compared to the real world, hence in this situation it is appropriate to make use of a telephoto lens.

Secondly, where the wider context of the view must be considered and in making the assessment a viewer would naturally make use of peripheral vision in order to understand the whole. A print has a fixed extent which constrains the angle of view available to the viewer and hence it is logical to use a wide angle lens in these situations in order to include additional context in the print.

Thirdly where the viewing point is studied at rest and the eye is free to roam over a very wide field of view and the whole setting of the view can be examined by turning the head. In these situations it is appropriate to provide a panorama comprising of a number of photographs placed side by side.

For some views two of these scenarios might be appropriate, and hence the study will include two versions of the same view with different fields of view.

AVRs are classified according to their purpose using Levels 0 to 4. These are defined in detail in Appendix C of the London View Management Framework: Supplementary Planning Guidance (July 2007). The following table is a summary.

AVR level	showing	purpose
AVR 0	Location and size of proposal	Showing Location and size
AVR 1	Location, size and degree of visibility of proposal	Confirming degree of visibility
AVR 2	As level 1 + description of architectural form	Explaining form
AVR 3	As level 2 + use of materials	Confirming the use of materials

In practice the majority of photography based AVRs are either AVR 3 (commonly referred to as "fully rendered" or "photoreal") or AVR 0 or 1 (commonly referred to as "wire-line").
The purpose of a Level 3 AVR is to represent the likely appearance of the Proposed Development under the lighting conditions found in the photograph. All aspects of the images that are able to be objectively defined have been created directly from a single detailed description of the building. These include the geometry of the building and the size and shape of shadows cast by the sun.

The purpose of a wire-line view is to accurately indicate the location and size and for AVR 1 the degree of visibility of the Proposed Development in the context of the existing photograph.

In AVR0 and AVR 1, each scheme is represented by a single line profile, sometimes with key edges lines to help understand the massing. The width of the profile line is selected to ensure that the diagram is clear, and is always drawn inside the true profile. The colour of the line is selected to contrast with the background. Different coloured lines may be used in order to distinguish between proposed and consented status, or between different schemes.

Framing the view

Typically AVRs are composed with the camera looking horizontally i.e. with a horizontal Optical Axis. This is in order to avoid converging verticals which, although perspectively correct, appear to many viewers as unnatural in print form. The camera is levelled using either a mechanical levelling devices or traditional spirt level to ensure the verticality of the Picture Plane, being the plane on to which the image is projected; the film in the case of large format photography or the CCD in the case of digital photography.

For a typical townscape view, a Landscape camera format is usually the most appropriate, giving the maximum horizontal angle of view. Vertical rise may be used in order to reduce the proportion of immediate foreground visible in the photograph.
Horizontal shift will not be used. Where the prospect is framed by existing buildings, portrait format photographs may be used if this will result in the proposal being wholly visible in the AVR, and will not entirely exclude any relevant existing buildings.

Where the Proposed Development would extend off the top of the photograph, the image may be extended vertically to ensure that the full height of the Proposed Development is show. Typically images will be extended only where this can be achieved by the addition of sky and no built structures are amended. Where it is necessary to extend built elements of the view, the method used to check the accuracy of this will be noted in the text.

Project Methodology

Future Realities UK was commissioned to produce a series of visually verified illustrations of the proposed Athlone House Development on behalf of Athlone House Ltd. Future Realities UK carried out the view verification images independently using current best practice and follow recommendations from The Landscape Institute's 'Guidelines for Landscape and Visual Impact Assessment' (2nd Edition, 2002) and their subsequent Advice Note (01/11).

View location and identification

We were briefed on number and location of the views required by JFA Environmental Planning. Nine of the viewpoints were from locations that were previously agreed with the remaining three being new locations (views 10, 11 and 12). For each of the new viewpoints, we selected locations where the development would be most visible from. We carried out a preliminary site visit to best select the new 3 views and noted their location using gps equipment. For the remaining 9 views, using the photographs for reference and their locations as marked on a supplied os map we identified the required views taking into account any site obstructions. The position of each view was marked on the ground using a special paint, to allow for later identification by the photographer and surveyors (the exception being view 1 where we used a tile intersection to avoid marking the tiled surface and view 9 where we used a temporary marker as the photo and survey was taken at the same time.

Photography

Future Realities commissioned Adam Parker, a specialist Architectural photographer to shoot the 12 views. He shot the photographs using a Cannon SLR 1Ds Mark III and using either a Cannon TS-E 45mm F/2.8. lens for distant views or a Cannon TS-E 24mm F/3.5 for more close-up views. We accompanied the photographer during his photo shoots to ensure the photos were take from the correct position. For each of the viewpoints and with the aid of a plumb bob, the camera was positioned exactly centred over the previously marked location point and at a height of 1.65m to the centre of the lens. The orientation of the camera is adjusted so that the optical axis and the horizontal axis of the sensor is aligned with the 'astronomical' horizon. (This is the horizon as set by a gravity governed bubble level. It determines a line that passes through the sensor perpendicular to its face which is 90 degree to one that points directly to the centre of the earth. It differs from the visible horizon due to both the earth's curvature and atmospheric refraction and for long distance views suitable compensation must be applied by the end user according to standard survey formulas.) T

he location, time, date and camera settings were noted in a log and each view was assigned a unique reference in keeping with a previous numbering scheme. The image was captured using the native camera RAW format to ensure maximum tonal and colour information is retained for use in the image processing stage. Choices for aperture and focus distance are designed to render all parts of the scene 'in focus'.

Camera and Lens selection

It was decided that a 50mm lens would be suitable for the majority of the views in terms of detail and clarity. A 50mm lens on a full frame camera has a horizontal field of view of about 39.6 degrees. Given the distant nature of the majority of the shots, the FOV was deemed to be too small to convey the full scene to the viewer. Following a number of tests, a horizontal field of view of about 68 degrees was felt to be more suitable. While this could be achieved by using a wide angle lens, because of the distance between the viewpoints and the proposal it was felt that we should aim to achieve the maximum resolution and accuracy.

It was decided by using a high quality shift lens system and stitching 3 images to form a very high resolution panoramic image we would get the best result. The lens chosen was a Cannon TS-E 45mm F/2.8. Using this lens would allow the photographer to shift left and right of the camera position for later stitching of a very accuracy panoramic image. The 45mm shift lens chosen is of the highest quality in terms of resolution/clarity with a horizontal field of view of about 42.7 degrees.

Digital Processing

The Photographs are imported into a proprietary image processing application which converts the RAW camera data into a lossless RGB format file suitable for use in 2D image editing and 3D modelling applications. At this stage there are also tonal and colour adjustments which aim to replicate the scene as honestly as possible as it was perceived by the photographer at the time of capture. Corrections are made for Chromatic Aberration and we use Lens calibrated correction software to remaps the image to remove any optical defects which create distortion of the image additional to the normal affects of projecting a 3D scene onto a 2D flat capture surface.

From the photos, Future Realities identified key points within the scene, including the corners of roofs, ledges, windows, tree/branches and road markings and those points were marked and referenced onto the photos. (Those annotated photos would later be used as background images inside the 3d software to match with the supplied 3d surveyed points). In some cases there weren't enough identifiable points within the photo and artificial markers were used that appeared in the photo and could also be surveyed. Those annotated photos were then given to the surveying team.

Surveying

The survey works were undertaken by Glanville Group using GPS equipment together with a Trimble S6 Total Station instrument, which incorporates long range reflector less electronic distance measuring equipment. Accuracy: 2 mm + 2 ppm. The survey was tied back to OS and it addition we linked back to the existing site Survey to which our 3d model was related to.

The survey points were later provided to Future Realities in digital Northing Easting format as both a list of coordinates as well as CAD data files. As some of the surveyed points were over 1km away from the camera position we added a correction to distant points to allow for the Earths Curvature and refraction of light using the formula [H=C(squared)*(1-2K)/2R] with 'H' being the height correction, 'C' being the distance to the survey point, 'K' the refraction coefficient (which for the purpose of this calculation we have used 0.075 for reference and 'R' being the radius of the earth in metres (6,367,000).

Verification process

A 3d computer model was created that precisely aligned to the survey information coordinate system. Each of the points surveyed were created inside the virtual model in a position that directly relates to the survey. At each of the view verification locations a virtual camera was set up in the 3D software matching the survey coordinates and also matching the lens/fov of the real camera. For each of the views to be verified we selected the centre annotated image and used it as a background inside our 3d software.

The scene was verified by matching the newly created 3d points based on the survey information with the annotated points of the 2d background image. A renderable reference pointer is aligned with each of the 3d points and a computer render is created at a resolution to match the photograph. This was overlaid onto the background image to compare the image created by the actual camera and its computer equivalent. Based on the results of this process adjustments were made to the camera definition. This process was iterated until a match had been achieved between the photograph and 3D model.

The architects for the scheme, Robert Adam Architects, supplied to Future Realities a detailed 3d cad model of the scheme and cad drawings showing its level and position in relation to an existing site survey. Using this information we aligned the 3d model to exactly match our 3d scene. For each of the views, 3d virtual lighting was set in our 3d software to match the sunlight conditions at the time that the source photograph was taken. Materials/textures were created for the proposed 3d model based on information supplied by Robert Adam Architects and a series of rendered layers were created for later compositing in Photoshop.

Post Production

The rendered layers were composited using Adobe Photoshop. For AVR 0 style renders the rendered images are composited onto the photograph and a red outline is created to replicate the outline of the building. For AVR 3 style renders the rendered images are composited onto the photograph and the objects in the foreground such as trees are placed in front of the rendered image to replicate the real world situation. Where the demolished building is not hidden by the proposed building it is carefully painted out by replicating what would be visible behind it once it is demolished.

To aid comparison where the proposal is visible we created both an AVR 0 and an AVR 3 that can both be compared to the existing image. Finally we extended the horizontal field of view by stitching our previously shifted left and right images on to the centre verified image. Due to the nature of the shift lens used this gives an almost perfect match without distorting or curving the image. All overlapping portions of the images are outside the area encompassing the proposal.

Recommended viewing distances are calculated based on planer rather than cylindrical panoramas using the formula D=W/(2*TAN(A/2)) where 'D' is the correct viewing distance in mm, 'W' is the actual printed image width in mm (**of the image, not the page**), 'A' is the HFOV in degrees and 'TAN' is the trigonometric tangent function.

Presentation

To aid easy comparison between the different images, for presentation purposes the images were cropped in the vertical so the vertical field of view corresponds with that of a 'standard' 50mm lens.   The exception being views 10 and 12 where in addition to the above a comparison was also provided at the native VFOV of the 24mm lens and the HFOV was cropped to 68 degrees. All photo and image filed of views are documented in the supplied table.