NPA VISUALS

B&NES Site Allocations Cumulative Views

Visually Verified Montages for the B&NES Local Plan and Landscape Sensitivity Assessment

30296-NPA-XX-XX-RP-Y-0010-P03

September 2026

Document Control

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P03	**09/09/2026**	**TJ**	**CH**	**Introduction, Viewpoint Information & Methodology pages added**

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Introduction

Purpose of the report:

These visually verified montages have been prepared by Nicholas Pearson Associates for Bath and North East Somerset Council in order to inform the emerging local plan and the supporting Landscape Sensitivity Assessment (AtkinsRealis, 2026) where the cumulative landscape impact – including on the Cotswolds National Landscape and its setting – is assessed.

The montages show the cumulative visual impact of emerging site allocations in the local plan in order to inform the Landscape Sensitivity Assessment's assessment of harm arising from those allocations, the council's decision-making on site allocations and emerging policy requirements (including mitigation measures). The Health and Safety Executive (HSE) consultation zones for gas pipelines in the area are included in the montages to show the area affected by the constraint indicating where development is unable to be located or is severely restricted.

Methodology

The Technical Methodology used by NPA Visuals to produce the visually verified montages can be found on page 16.

How to interpret / use this document

The Viewpoint Location Plan (Figure 1.02) shows the location of the three viewpoints and outlines the site locations. The colours used in the visually verified montages 'proposed views' are cross referenced to the plan in the bottom right corner of the page.

The site extrusions showing the location of the proposed developments have been lit with a daylight system that corresponds to the time and date of the photograph. The lighting of the extrusions aids in the visual clarity and understanding of the sites, however it also means that each of the three shades of grey are not absolutely represented in each view as a consistent solid colour.

When viewing digitally, the scale bar found at the bottom of each view is a reminder to the viewer that the scale bar should be as close as possible to the correct real world scale. it is accepted that all viewers have different screens of varying resolutions and it may not be exactly correct. If the document is printed, the scale bar must be true to size. When printed or viewed on screen, the images must be viewed at a comfortable arm's length to correctly represent the view.

For each view, the document contains a representative view, existing view, and a proposed view. The representative view is displayed at 100% scale and is reprojected cylindrically. Viewing procedures are described in a short paragraph at the base of each representative image.

Existing and proposed views are presented at 53.5° × 18.2°, in accordance with Scottish Natural Heritage (SNH) guidance, which was subsequently endorsed by the Landscape Institute (LI) as best practice for large-scale and expansive landscape developments, including wind farms and major housing schemes. These views are reproduced at 150% enlargement, reflecting the LI's recommended approach for scale-representative visualisations in open landscapes.

As explained in our Technical Methodology, and in the Landscape Institute's Visual Representation of Development Proposals (Technical Guidance Note 06/19), the 150% enlargement factor is intended to provide a more realistic binocular perception of scale and distance when viewing printed visualisations.

The 150% Enlargement Factor (Ref: Landscape Institute, Visual Representation of Development Proposals, Technical Guidance Note 06/19)

3.8.6 Whilst presenting a 50mm FL image (39.6° HFoV) at A3 size is a straightforward use of the camera image, this approach has been found to be lacking in respect of expansive projects in open landscapes or seascapes, such as windfarms. This is because, for a 50mm FL image printed at A3 and held at comfortable arm's length, the scale of the viewed image is smaller than reality.

3.8.7 As a result of research in Scotland over the last decade (see Section 5 - Further Reading) there is a consensus that increasing the printed image size by 150% (as if a 75mm FL lens had been used) provides a better impression of scale for most viewers using two eyes (binocular vision). This is particularly appropriate for projects such as windfarms, whether viewed on a desktop or on site.

3.8.8 The approach of this guidance is, therefore, to recognise that, for larger-scale projects with more distant components such as windfarms, the approach taken in SNH 2017 (put simply, a 150% enlargement) is appropriate.

In all three Proposed Views, there is a HSE Gas Pipeline constraint shown as a Yellow line. This line sits at ground level throughout. The yellow line is dashed where is sits behind the site extrusions to clarify its location. Data used to create the HSE Gas Pipeline ©Crown Copyright and Database Rights 2026, Health and Safety Executive. Contains Ordnance Survey data under OS Licence number 100021025.

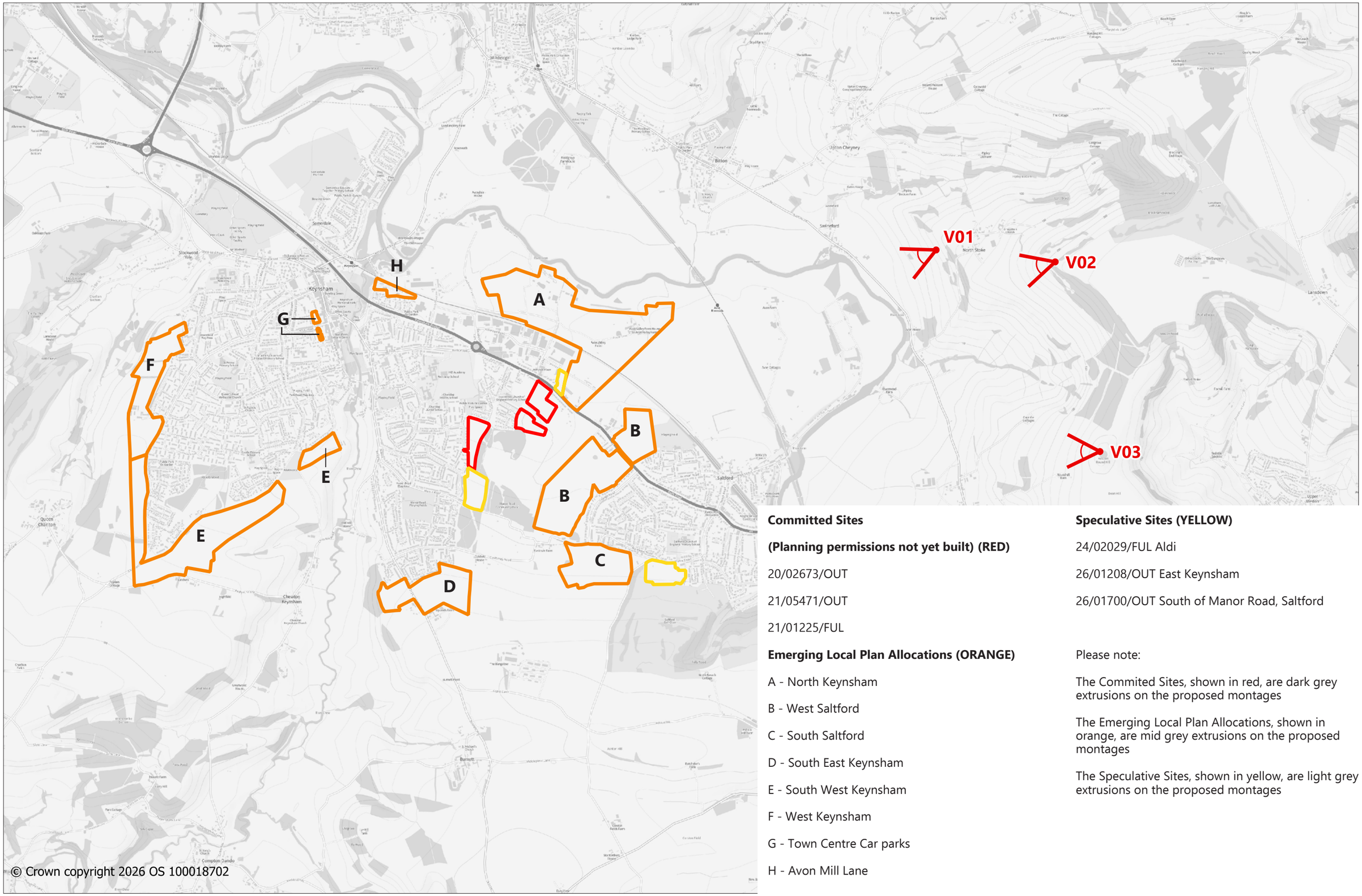
Caveats and limitations:

The montages are proportionately high-level to inform plan-making and the Landscape Sensitivity Assessment and do not go into as much detail as a full Landscape and Visual Impact Assessment.

The site boundaries presented relate to where development is likely to occur at each site, and do not include the full site allocation boundary (which includes land for nature recovery, biodiversity net gain, public open space and the HSE Gas Pipeline consultation zones). The boundaries correspond with the land to be released from the Green Belt through the local plan.

The visually verified montages in this report have been prepared using a 'worst-case' assumption that the allocation area is developed in full as single, large development blocks. They do not incorporate the mitigation measures or policy requirements subsequently set out in the Local Plan, and do not model the proposals shown in the indicative concept plans developed for the Local Plan.

The live applications included in this report are included for completeness to show the impact should they be granted planning permission. They are not emerging allocations in the Local Plan but may end up getting planning permission before the local plan is adopted, and have been modelled as such to show their cumulative visual impact alongside the emerging site allocations and other committed sites.



Committed Sites

(Planning permissions not yet built) (RED)

20/02673/OUT

21/05471/OUT

21/01225/FUL

Emerging Local Plan Allocations (ORANGE)

A - North Keynsham

B - West Saltford

C - South Saltford

D - South East Keynsham

E - South West Keynsham

F - West Keynsham

G - Town Centre Car parks

H - Avon Mill Lane

Speculative Sites (YELLOW)

24/02029/FUL Aldi

26/01208/OUT East Keynsham

26/01700/OUT South of Manor Road, Saltford

Please note:

The Commited Sites, shown in red, are dark grey extrusions on the proposed montages

The Emerging Local Plan Allocations, shown in orange, are mid grey extrusions on the proposed montages

The Speculative Sites, shown in yellow, are light grey extrusions on the proposed montages

NPA VISUALS

Project No	30296	**Client**	B&NES
Date	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Status	Preliminary	**Figure**	1.02 Viewpoint and Site Location Plan

View 1 - PROW below North Stoke

OS: 369844, 168981

Date of Photo:	26/03/2026 09:32
Weather:	Bright
Visualisation Type:	Type 4
AVR Level:	2
Bearing of View:	245 SW
Camera:	Canon 5d MkIV DSLR
Frame Type:	Composite
Projection:	Planar
Lens Focal Length:	50mm
Horizontal FOV:	53.5°
Distance to site :	1940m

View 2 - Little Camp

OS: 370701, 168895

Date of Photo:	26/03/2026 09:32
Weather:	Bright
Visualisation Type:	Type 4
AVR Level:	2
Bearing of View:	254 W
Camera:	Canon 5d MkIV DSLR
Frame Type:	Composite
Projection:	Planar
Lens Focal Length:	50mm
Horizontal FOV:	53.5°
Distance to site :	2765m

View 3 - Kelston Round Hill

OS: 371023, 167530

Date of Photo:	26/03/2026 09:32
Weather:	Bright
Visualisation Type:	Type 4
AVR Level:	2
Bearing of View:	271 W
Camera:	Canon 5d MkIV DSLR
Frame Type:	Composite
Projection:	Planar
Lens Focal Length:	50mm
Horizontal FOV:	53.5°
Distance to site :	3210m

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

When printed, cylindrical images need to be curved around the viewer to represent real-world viewing angles. Alternatively they could be viewed flat by moving the head to maintain a constant viewing distance across the panorama. (Ref: LI TGN 06/19)

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	100% (Monocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.04 View 1 - PROW below North Stoke - Representative

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Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	150% (Binocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.05 View 1 - PROW below North Stoke - Existing

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	150% (Binocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.06 View 1 - PROW below North Stoke - Proposed (Yellow outline - Gasline Area shown at ground level)

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

When printed, cylindrical images need to be curved around the viewer to represent real-world viewing angles. Alternatively they could be viewed flat by moving the head to maintain a constant viewing distance across the panorama. (Ref: LI TGN 06/19)

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	100% (Monocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.07 View 2 - Little Camp - Representative

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	150% (Binocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.08 View 2 - Little Camp - Existing

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	150% (Binocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.09 View 2 - Little Camp - Proposed (Yellow outline - Gasline Area shown at ground level)

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

When printed, cylindrical images need to be curved around the viewer to represent real-world viewing angles. Alternatively they could be viewed flat by moving the head to maintain a constant viewing distance across the panorama. (Ref: LI TGN 06/19)

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	100% (Monocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.10 View 3 - Kelston Round Hill - Representative

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	150% (Binocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.11 View 3 - Kelston Round Hill - Existing

NPA VISUALS

0cm (Original image width 820mm) 10cm

To view this image digitally, calibrate this scale bar, on screen, for a correct scale representation and view the image at a comfortable arm's length

Visualisation Type	Type 4	**Project No.**	30296	**Client**	B&NES
Image Enlargement	150% (Binocular)	**Date**	Sept 2026	**Project**	B&NES - Site Allocations and Cumulative Montages
Page Size	A1 Width	**Status**	Preliminary	**Figure**	1.12 View 3 - Kelston Round Hill - Proposed (Yellow outline - Gasline Area shown at ground level)

Technical Methodology

Overview

A Verified View is an image that combines a photographic view with an accurate 3d CAD representation of a proposed development, displayed to an agreed level of detail. Using a baseline of verifiable visual data and information, its purpose is to impartially and if required, realistically represent the proposal. Not just the appearance and context, but also its scale. By using verifiable visual data this image can then be used by others (if required) to scrutinise the work, without its accuracy being questioned.

Verified Views may also be referred to as Visually Verifiable Montages (VVM) and Accurate Visual Representations (AVR)

UK guidance

Our work adheres to key UK guidance and best practice.

Third Edition of the Guidelines for Landscape and Visual Impact Assessment (GLVIA3) (2013)

Landscape Institute's Technical Guidance Note 06/19 (2019)

London View Management Framework Supplementary Planning Guidance (2012)

NatureScot (Formerly Scottish Natural Heritage) Visual Representation of Wind Farms Version 2.2 (2017)

English Heritage: Seeing History in the View (2011)

Note: When regulatory authorities establish their own guidelines, they can supersede these standards, even if those guidelines are based on similar principles.

AVR Levels:

Ref: London View Management Framework Supplementary Planning Guidance (2012)

When producing verified views, a series of options are available to aid design and planning decisions according to the level of detail required. The following classification types are presented to broadly define the purpose of an AVR in terms of the visual properties it represents. This classification is a cumulative scale in which each level incorporates all the properties of the previous level.

AVR Level 0 Location and size of proposal

AVR Level 1 As level 0 + degree of visibility of proposal

AVR Level 2 As level 1 + visual architectural form and details

AVR Level 3 As level 2 + use of realistic materials and lighting

Landscape Institute Visualisation 'Types': Ref: Landscape Institute guidance note 06/19

Type 4: visualisations where the highest level of locational accuracy. Image scaling may be required.

Type 3: Visualisations where a verifiable process and printed scale representation is not required.

Project Specific Technical Methodology

Project Title	B&NES - Site Allocations and Cumulative Montages
Site Location	Saltford & Keynsham
Status	Pre-Planning
Architect	NA
Landscape Architect	NA
Planning Consultant	NA
Heritage Consultant	NA
Coordinate System	OSGB36 (EPSG 277000)
Method used to locate Camera	All Views OS Data, DSM & DTM
Camera Matching Technique	All Existing and Proposed Views Planar (Model Camera Aligned) Representative Views Cylindrical (Render Aligned)
Details used for camera matching	All Views DSM & DTM, and Features extracted from Aerial Photography / Ordnance Survey
Accuracy of Camera Location & Alignment	All Views ±1.5m
Modeling Software	3ds Max
Compositing Software	Photoshop / PT GUI
Other applications	InDesign
Height and Age of Proposed Planting	NA
Season(s)	All Views Spring
Lens and Formats	All Existing and Proposed Views 50mm / 53.5° x 18.2° – View at 150% All Representative Views 50mm / 90° Cylindrical – View at 100%
LI Visualisation Type	All Views Type 3
AVR Level	All Views AVR 1
Design Data Provided	2d CAD Plans
Accuracy of Model Location	±1.5m
Method used to locate model	Horizontal: DXF file provided by Client Vertical: DXF file glued to DTM in 3d Studio Max
Other Notes	See page 4 'Introduction' for further information

Technical Methodology

Photography Equipment

Canon 5D MkIV full frame digital SLR camera (Full frame sensor)

Canon 5D MkIII full frame digital SLR camera (Full frame sensor)

Canon EF 50mm f/1.4 STM lens

Sigma 50mm f/1.4 EX DG HSM

Canon EF 28mm f/1.8 USM Lens

Canon TS-E 24mm f/3.5 L II

Manfrotto Tripod 190

Nodal Ninja Ultimate M2 Panorama Head with Advanced Rotator RD16-II

NN4-D16-Nodal Ninja NN4 Panorama head with RD-16 rotator base

Arca-Swiss Style Standard Camera Plate

NN-EZ-Nodal Ninja EZ Leveler MKII (Tribrach)

Hand held spirit level

Canon RS-80N3 Remote Switch

UV, Polarising, Graduation & neutral density filters

Batteries & chargers

SD cards

Plumb bob, tape measure, spray paint & Hilti nails

Compass

Lenses and Baseline Image Format

No 'one size fits all', and we will use the most appropriate set of lenses / formats to convey the view. Only prime lenses are used, in the following order of preference: 50mm, 24mm, 24mm/Shift. 28mm? Both landscape and portrait orientations are considered when planning the photography. The 50mm lens has always been regarded as the "standard" lens on a full frame 35mm camera and closest to the human eye when the image is printed at A3 and viewed at arm's length. 50mm lenses are not always appropriate for all situations and so when viewing Verified Views based on other lenses, the observer must be aware of the limitations of the printed format. Alternative lenses are only selected when the viewpoint is close to the site. This means that even at a reduced printed scale, the observer is still able to identify all the features visible by the naked eye. (Ref: LI TGN 06/19 Appendix 1.1 & 13.1)

Full Frame Sensor lenses are quoted as having the following Horizontal Fields of View. Canon EF 50mm: 39.6 Degrees / Canon TS-E 24mm: 74 Degrees. However, the exact field of view cannot be assumed, and the actual field of view may vary +/- 2 or 3 degrees depending on the lens.

The Effective Focal Lengths (EFL) shown below represent the calculated field of view for our lenses based on known measurements.

Canon EF 50mm f/1.4 STM lens – EFL51.4mm (38.6° HFoV / 26.3° VFoV)

Sigma 50mm f/1.4 EX DG HSM – EFL 47.8mm (41.2° HFoV / 28.2° VFoV)

Canon TS-E 24mm f/3.5 L II - EFL 24.7mm (73.7° HFoV / 51.8° VFoV)

We use a range of baseline image formats which can be used according to the project type and guidance requirements.

50mm / 39.6° Planar – View at 100%

A single photograph taken with a Sigma/Canon 50mm lens, producing a 39.6° horizontal field of view (HFoV), suitable for viewing at arm's length. This is the preferred baseline format. A wider contextual image may be included if needed.

50mm / 53.5° Planar – View at 100%

A stitched composite of images taken at 20° (landscape) or 15° (portrait*) intervals using the Sigma/Canon 50mm lens. Stitched with PTGui to produce a 53.5° planar HFoV, suitable for locally panoramic settings. A wider contextual image may be included if required.

50mm / 90° Cylindrical – View at 100%

A cylindrical composite of images taken at 20° (landscape) or 15° (portrait*) intervals using the Sigma/Canon 50mm lens. Stitched with PTGui to create a 180° or 360° image, cropped to 90° HFoV and 27° vertical. Suitable for very wide panoramic settings. Final image should be viewed curved at arm's length.

50mm / 53.5° x 18.2° – View at 150%

A planar composite from Sigma/Canon 50mm photos taken at 20° (landscape) or 15° (portrait*) intervals. Stitched with PTGui to create a 53.5° x 18° image commonly used for assessing sites in a panoramic landscape setting as per the SNH Visual representation of wind farms.

50mm / 27° x 18.2° – View at 150%

A single Sigma/Canon 50mm image with a 39.6° HFoV cropped to 27°. Suitable for sites occupying a small visual area where higher detail is required. A wider contextual image may be included if required.

24mm / 74° – For Context Only

A single image from a Canon TS-E 24mm f/3.5L II lens with 74° HFoV. reproduced at a size 'for context only, especially of tall buildings in restricted settings. If required, shift mode can remove parallax distortion and converging verticals which more closely matches what the brain interprets. In all cases the red arrows indicate the vertical and horizontal points of perspective (Optical Axis) whilst the 'graticules' represents the horizontal and vertical fields of view. The use of this lens derives from the London View Management Framework Supplementary Planning Guidance: Appendix C: Accurate Visual Representations. March 2012.

Note:

Portrait orientation is used when sites sit high or low in the view (Such as a view from a hilltop looing down or vis versa), keeping the camera level. In all cases the red arrows indicate the vertical and horizontal points of perspective (Optical Axis) whilst the 'graticules' represents the horizontal and vertical fields of view.

Technical Methodology

Preparation & Viewpoint Photography

Each view of the proposal is represented so that an informed decision can be made by balancing the needs of the viewer. Wherever possible, consultation with the relevant planning professional takes place on the matter and our final methodology is based on the most appropriate agreed set of professional Guidance.

All baseline and proposal data is compiled so we can plan and agree the viewpoint locations with the client and relevant authorities. If the information is available, we will also "pre-visualise" the viewpoints showing both the existing and proposed. This can also be used as an accurate guide on site and a tool to discuss all options with the client to ensure that our site photography covers all the potential locations and captures the full extent of the proposed scene correctly.

Prior to the site visit we prepare a "site pack" containing all the drawings and information we require on site. Pre-planning also includes a review of transport options so that public transport is used wherever possible. Route planning and time estimates are considered, and a site risk assessment is completed for record.

Suitable weather conditions are sought so that the proposals may be clearly visible in the context of the view. We endeavour to take the photographs at the appropriate time of day to reduce the chance of the site being in shadow or back-lit. Therefore, when planning a site visit, detailed consideration is given to weather forecasts and sunrise/set times, particularly during the winter when the low angle of the sun can be problematic. Photographs correctly portray the view which is obtained at each representative viewpoint whilst avoiding obvious obstructions.

At each viewpoint the camera is mounted on a tripod at an approximate height of 1.65m above existing ground level, which best represents the average human eye level. The height of the lens "nodal point" is checked by using a tape measure.

The Tribrach and hand held spirit level is used to ensure that the camera is horizontal/vertical. The cameras on board spirit level may also be used. Using the plumb bob, the "nodal point" is whenever possible positioned over a surveyable feature which can be identified on the 3D model. Where a pre-existing surveyed feature is not available, spray paint or Hilti nails are used to locate the point for future surveying if required.

As part of the verification procedure, photographs of the tripod and survey point, in situ, are taken using a second camera, so that the surveyor can identify the location. These images are also reproduced in the document to aid on site assessment by third parties if required.

All baseline photographs are taken using manual settings with a target ISO of 100. A medium aperture with a minimum shutter speed of 1/125 sec ensures that all images are sharp and have a good depth of field. Evaluative metering mode and Auto White Balance is all selected as standard. It should be noted that these settings are preferred but may need to be adjusted according to the climatic or physical conditions.

Photographs are taken in a RAW format using manual settings to enable the best quality results. If necessary, the original RAW file can be submitted as part of the verification process

The photographer takes note of the weather conditions and direction of view. All other details relating to the photograph are stored in the image EXIF data.

Baseline Imagery Processing

Following review in Adobe Bridge, the original Canon RAW files are selected and processed in Adobe Photoshop to adjust white balance, colour accuracy and sharpness. The images undergo further correction procedures to ensure the horizon is precisely horizontal and any lens/barrel distortion is compensated for. The images are then saved as uncompressed Photoshop files for future compositing. Separate .jpg images are saved for use in the camera matching process.

Surveying

The level of accuracy necessary for the individual viewpoints or project is agreed in advance by the client and planning authority. The level of 'Survey Verification' depends upon the distance of the site from the viewpoint and how critical the accuracy is and at what stage the planning application is at.

All Data processing is conducted and referenced back to Ordnance Survey Grid (OSGB36 / EPSG 2770)

Option 1: Surveyed Camera Data (±0.1m accuracy)

For each agreed photo viewpoint, a location plan is provided to the surveyor along with marked up referenced photographs showing the camera in situ and the preferred survey reference points. The surveyor then establishes the location of each viewpoint using a Leica Global Positioning System (GPS). Where GPS positioning was not possible near to the required survey point, the surveyor works back from an established GPS location.

The surveyor records a range of reference points, using a reflector-less Total Station. Viewpoint marker points are in the foreground and background, high level and low level. These can include existing building ridges, lighting columns, bollards or similar such details. The reference points are individually numbered and referenced on screen-shots or marked up photographs. All reference points must be within the central zone of the photograph where least distortion occurs.

Data is presented in Spreadsheet form, 3d .dwg plus a photograph marked with the reference points.

Option 2: Existing Topographic Survey Data (± 0.1m accuracy)

Where the camera has been taken on or at pre-existing surveyed point, this and the rest of the survey can be used to identify features in the viewpoint. In many cases these include street furniture, manholes, kerbs, buildings, ridge and eave levels or similar. Data is usually provided in a geo-referenced 3d .dwg format, or converted to a 3d format based on stated levels in the survey.

Option 3: GNSS surveyed Location (±0.1-1m accuracy) – Note: Accuracy will vary depending on conditions and viewpoint location.

A GNSS survey device attached to the camera tripod is used to obtain horizontal and vertical coordinates of the camera position. The accuracy of the coordinates is captured and stored with the coordinates, where this method is used, please refer to the project information table for specific accuracies. A real time correction (RTK) service may be used to increase the accuracy of the coordinates where needed.

Option 4: Using Publicly available Geographic data (±2.0m accuracy)

Digital Surface Models (DSM) / Digital Terrain Models (DTM) / Ordnance Survey / City (Z) Model / Aerial photography can be used to identify 3D point locations. In many cases these may include existing building ridge-lines & Parapets, Street furniture, kerbs or similar such details. Data includes Camera locations and specific 3D points to assist in the camera matching process.

Note: While in most cases this method will be within the ±1.5m accuracy tolerance, depending on the site location and the available data, only ±3-5m accuracy may be achievable in some areas

Option 5: Standard Handheld GPS surveyed Location (± 5.0m accuracy)

Handheld GPS device or Mobile Phone app using What Three Words can be used for location positioning in rural areas where publicly available geographic data may not be available and the site is at a significant distance or accuracy is not as critical.

Technical Methodology

3d Modelling, positioning, and accuracy

The proposals supplied by architects and landscape architects are combined with the site survey and mapping data so that the Unit scale and locations correspond. The scale accuracy of the proposed model (Supplied by others or constructed by NPAVisuals) is agreed with the architect/client and clearly stated in the Technical Methodology. This may differ from Pre-Application work to detailed design.

The proposed designs, received from the design team, are georeferenced to the relevant geographic coordinate system, local to the country/region of the project - within the United Kingdom this is usually the Ordnance Survey Grid - OSGB36 (EPSG 277000)

Where documents are received that may not be to a defined coordinate system, we will use as much information provided as possible to locate the design information to the coordinate system. (for example re-locating drawings based on topographic or ordnance survey information.) The information used to align the proposals to the coordinate system is noted in the Project Summary Table.

Due to software limitations, all georeferenced data will be translocated based on a defined datum to a local coordinate system based on the nearest logical grid square without rotating the model (keeping north as north). This keeps the correct building orientation and scale relative to the georeferenced coordinate system without introducing corruption from being too far from the software origin point.

The levels of the model are located to the Geographic Coordinate System Datum level. In the case of the United Kingdom, levels Above Ordnance Datum (AOD) are used. Levels from proposal documents are checked against local topographic survey, and country wide DTM levels for consistency. A minimum of 2 proposed levels on different vertical aspects of the proposals should be checked to ensure accuracy. (Eg. Ground Floor Levels, and maximum Ridge/Roof Levels).

Confirmation of OS Coordinates and Levels is requested from the architects.

If/when the proposed design is updated, this process is completed again, to ensure accuracy of the building location in the model. And to reduce errors that could occur from incorrectly assuming similar parts of the proposed model have not changed, when they might have been adjusted in the design process.

Camera Matching & Verification:

Irrespective of whether the final VVM is output as a single or composite panoramic image, each Verified View is based upon a single rendered image.

Viewpoint markers are used to tie the photograph to the CAD Camera view. These are surveyed features and points such as lamp posts, walls, boundaries and buildings; anything that has a known location. These markers are required to be as accurate as possible and should ideally be positioned within the central portion of the image. They should be at both varying heights, distances and breadth within the view. The background plate photograph is imported into 3ds Max to verify the accuracy of the match.

The location accuracy and angle of view may also be checked by triangulating the position and preparing view line sections. This is a reliable method successfully used for location finding in the field.

There are two ways of camera matching;

For planar baseline photography:

> *This can be achieved within the 3D modeling program by aligning a virtual camera with the reference survey points to obtain an accurate match. The survey is rendered out, overlaid onto the existing photograph and, if necessary, adjusted to align correctly to detailed or distant elements that may have been difficult to get pixel perfect precision in 3ds max. This is to ensure that we have aligned the cameras correctly to the existing photograph. The rendered Survey points are then replaced by the final render to ensure accuracy.*

For cylindrical baseline photography:

> *This can be achieved within the 3D modeling program by aligning virtual planar camera and survey points with a version of the cylindrical image re-projected to a planar perspective. The reference points are then rendered out cylindrically to the required horizontal and vertical FoV, and this is aligned in Photoshop to the cylindrical baseline image. The survey image is then replaced with the rendered model output, based upon the same camera and render settings.*

Texturing, Rendering & Post Production

3ds Max is used for applying photo-realistic surfaces and materials to the 3D model. Material references and planting sizes are based upon information provided by the Architects / Landscape Architect

The exact resolution of the photograph is used as the size for the final rendered output of the 3D Model view so that the two overlay each other precisely.

Adobe Photoshop is used to blend the render(s) of the model(s) with the existing baseline / base plate photograph. Where elements are removed from the baseline photograph, reference photography and/or models of the existing site are used to accurately place elements that were not seen in the original photography.

Technical Methodology

Image composition and Presentation

Each viewpoint is intended to capture the view as perceived and experienced by the observer.

A practical and aesthetic approach is applied to our viewpoint photography where good composition is important. No one format or lens is suitable for all situations; as a rule of thumb, rural and coastal sites tend to require a 50mm based "panoramic" format (in line with SNH & LI TGN 06/19 guidelines), whilst urban sites can require a more considered approach where alternative lenses and formats may be required.

Viewpoint photographs are taken so that the camera is level to the horizon, so that converging verticals and perspective distortion is avoided. Proposals are wherever possible, positioned in the central portion of the view

The final baseline imagery can be single frame planar or composite panoramic images.

Most technical guidance advises that the final verified views should be presented in Planar format. However linear sites or panoramic urban views (such as cityscapes, power lines, roads and solar farms for example), may be best presented cylindrically.

When a proposed development is at distance, whilst the observer is aware of the wider area within their peripheral vision they tend to focus on the area in question. In these circumstances it is important to consider the limitations of printed technology and electronic viewing methods and the verified view may presented on a baseline photograph with a smaller field to be reproduced at a scale suitable for viewing at a comfortable arm's length (This can be up to 75mm EFL in accordance with SNH & or 150% according to LI TGN 06/19 guidance). To ensure that the viewer is provided with a representation of the wider context, a "representative" view with a wider horizontal field of view may be presented alongside. This may be a single frame photograph or panorama of either 60° or 90° HFoV and "provides landscape and visual context only"

All imagery is formatted at A3 with the occasional use of A1 wide by A4 high (840 x 297mm) for panoramic views. Most however is viewed electronically on screen and so a scale bar is provided to assist the viewer.

Reproduction

To assist the viewer in understanding the characteristics of the lenses used, baseline photographs and verified views can be annotated around the border, to indicate the field of view and optical axis of the lens used. This border is divided up into degree increments indicating the field of view. The position of the optical axis indicates whether the photograph was taken with vertical shift. The above added graphic is simply an alternative way of quickly knowing the lens used. This is particularly useful when a number of viewpoints of a proposal are taken with varying lens types.

It is important to reproduce each document and view at the correct size for both practicality and to ensure view accuracy when combined with the listed recommended viewing distance (as detailed on each view)

Each verified view is accompanied by a viewpoint location plan and photographs of camera locations together with the verification data and camera matching reference imagery. A Technical Methodology is included.

Viewing Procedures

The purpose is to reproduce the Verified View so that it correctly reconstructs the perspective seen from the location from which the photograph was taken.

We aim to reproduce all wire frames and photomontages so that they can be viewed at a comfortable arm's length. When comparing the view in the field, the viewer must keep their head motionless and fix their eyes on the centre of the view. This ensures that the represented view falls within the human field of view. If requested an acetate print can be provided for viewing on site. This can help the viewer align the key features on the image with those in real life.

Cylindrical views are only intended for viewing as a printed image or in an appropriate electronic viewing application. The printed image should be viewed on an arc that matches the images field of view, at a comfortable arms-length.

Additional Notes

See page 4 'Introduction' for further information