Lower Thames Crossing

6.3 Environmental Statement Appendices
Appendix 7.8 – Technical Methodologies

(Clean version)

APFP Regulation 5(2)(a)

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

Volume 6

DATE: December 2022

Planning Inspectorate Scheme Ref: TR010032
Application Document Ref: TR010032/APP/6.3

VERSION: 2.0

Revision History

Version	Date	Submitted at
1.0	31 October 2022	DCO Application
2.0	19 December 2022	Response to advice provided under section 51 of the Planning Act 2008 by the Planning Inspectorate

Lower Thames Crossing

6.3 Environmental Statement Appendices
Appendix 7.8 – Technical Methodologies

List of contents

List of tables

Page number

List of plates

Page number

Introduction

1.1.1 This appendix sets out the technical methodology for the following topic areas:

a. Representative viewpoint photography

b. Photomontages, preparation and presentation

c. Zone of Theoretical Visibility (ZTV) modelling

1.1.2 Recommended best practice guidance contained within Landscape Institute guidance has been considered for each topic, as set out below:

a. Guidelines for Landscape and Visual Impact Assessment, 3rd Edition (GLVIA3) (Landscape Institute/Institute of Environmental Management and Assessment, 2013)

b. Landscape Institute Advice Note 01/11: Photography and Photomontage in Landscape and Visual Assessment (Landscape Institute, 2011)

c. Landscape Institute Technical Guidance Note 02/17: Visual representation of development proposals (Landscape Institute, 2017)

d. Landscape Institute Visual Representation of Development Proposals Technical Guidance Note 06/19 (TGN 06/19) (Landscape Institute, 2019a)

1.1.3 Photographs, photomontages and ZTVs often form an important part of planning applications and Environmental Statements, in which the preparation and presentation of reliable visual information is integral to the assessment of landscape and visual impacts. They are technical documents in this context and should be produced and used in a technically appropriate manner.

Representative viewpoint photography including methodology for collation and presentation

2.1 Overview and guidance

2.1.1 The requirements for baseline photography collation and presentation (together with photomontages) at the time of stakeholder consultation were detailed in the Landscape Institute Advice Note 01/11: Photography and Photomontage in Landscape and Visual Assessment (Landscape Institute, 2011), now withdrawn.

2.1.2 In relation to this, Scottish Natural Heritage (SNH) updated the Visual Representation of Wind Farms Guidance v2.2 (SNH, 2017). This included guidance on photography, with regards to both equipment required and representation of imagery. Given SNH updates and advances in equipment, the Landscape Institute prepared an update to the previous guidance. This was issued as a consultation draft titled Landscape Institute Technical Guidance Note: Photography and Photomontage in Landscape and Visual Impact Assessment (Landscape Institute, 2018).

2.1.3 Given the draft status of this Landscape Institute consultation document leading up to the first Development Consent Order application in October 2020, it was agreed with stakeholders that the methodology for collating and presenting photography should consider the recommendations contained within, which broadly followed the published SNH guidance.

2.1.4 After the methodology was agreed with stakeholders, the Landscape Institute published the finalised technical guidance note titled Visual Representation of Development Proposals TGN 06/19 on 17 September 2019.

2.1.5 An introduction to TGN 06/19 (Landscape Institute, 2019b) on the Landscape Institute's webpage (https://www.landscapeinstitute.org/visualisation/) explains that on publication of TGN 06/19, the previous Landscape Institute technical guidance notes (02/17 and 01/11) were withdrawn, however, *'they remain available for reference. It is the LI's* [Landscape Institute's] *view that the new guidance 06/19 should apply to new commissions undertaken from 17 Sep 2019 onwards, but a reasonable grace period will apply, and reasonable judgements should be made by practitioners over implications of the changeover.'* It is, however, considered that the methodology used for representative viewpoint photography and to prepare the Project photomontages meets the requirements of TGN 06/19, as explained further in Section 2.3.

2.2 Equipment

2.2.1 A good quality camera and lens are essential to the production of photographs and photomontages for landscape and visual impact assessment work. The Project team captured high resolution digital photographs with a Canon EOS 6D Mk II, a full-frame digital camera using a Canon EF 50mm f/1.8 STM (Stepper Motor) which is a fixed focal-length lens. The camera was fixed to a tripod 1.5m above ground and utilised a Manfrotto MA 454 Micro Positioning Plate and Manfrotto SBH-100 Ball Head to reduce parallax errors.

2.3 Methodology

2.3.1 Representative viewpoint locations were agreed with stakeholders. For each location, daytime (winter and summer) photography was undertaken, with night-time photography undertaken for a selection of specific viewpoint locations.

2.3.2 Photographers were provided with Ordnance Survey (OS) location coordinates indicating the position of each viewpoint on site via a Global Positioning System (GPS) enabled iPad and information on the requirements for each photograph view. A ground peg was put in place to mark the viewpoint location at the first visit (Winter Survey 2019) and a georeferenced marker added to the Geographic Information System (GIS) database. In addition, a photograph was taken of the tripod location (presented below in Plate 2.3 to Plate 2.18) and the photograph was geotagged through the GPS-enabled camera equipment. This ensured accuracy in the placement of the camera between the winter, summer and night-time photography. (Tripod photographs have not been presented for the additional viewpoint locations added in April 2022, to represent views of the nitrogen deposition compensation sites.)

2.3.3 Since the representative viewpoint photography was originally undertaken, some winter and summer photography has been updated in 2022 to capture any notable changes in baseline views. In addition, a slight adjustment was made to the location of two representative viewpoints (N-20 and N-31), to better reflect views of the Project. Updated tripod locations for these adjusted viewpoints are included below and supersede the relevant winter tripod locations shown in Plate 2.13 and Plate 2.15 respectively.

Plate 2.1 N-20

Plate 2.2 N-31

2.3.4 A consistent team of photographers was used to undertake all baseline photography. For each photograph, the camera was positioned at a height of 1.5m above the ground level, to approximate the level of the human eye in line with best practice. Via an iPad tablet, additional photography details were recorded, including focal length, date, time, weather and lighting conditions of the photograph, and horizontal field of view captured.

2.3.5 Following consultation with all stakeholders in January/February 2019, Representative Viewpoint imagery was undertaken as follows:

a. Winter photography was undertaken in February and March 2019.

b. Night-time photography was undertaken in February and March 2019.

c. Summer photography was undertaken in May and June 2019.

d. Additional Representative Viewpoint photography following finalisation of the Project design was undertaken in September and December 2019.

2.3.6 Photography was captured on site with a 50% overlap (20° angle) between each individual shot to reduce distortion with image blending. Each photo was captured as a high-quality jpeg image and stitched together in Photoshop utilising a cylindrical projection.

2.4 Presentation

2.4.1 All photography has been presented as 90° horizontal x 14.2° vertical views on an A1 length, A3 height sheet with an image size of 820mm x 130mm, in cylindrical projection, with multiple sheets per view to cover a required angle (up to 360°). There is no horizontal field of view overlap to allow photos to be presented next to each other.

2.4.2 Winter and summer views within Figure 7.17 (Application Document 6.2) are presented on the same sheet, one above the other (single sheet for 90° with up to four sheets for a 360° view), and where night-time views are included, these are presented within Figure 7.18 (Application Document 6.2), with the winter view to allow for comparison between the daytime and night-time views.

2.4.3 Each Representative Viewpoint identifies key existing features visible in the view along the top of the image. At the base of the image, the approximate extents of the construction compounds and Project during operation are indicated to aid interpretation by the reader. The full extents of the Project on each viewpoint photograph are indicated and the annotations do not therefore take account of features between the Project and the viewer, such as landform buildings or vegetation, which would in practice limit the extent of Project that would be visible.

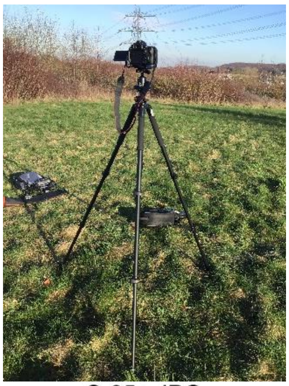
Plate 2.3 Representative Viewpoint location winter tripod setups (S01–S11)


S-01.JPG


S-05.JPG


S-08.JPG


S-02.JPG


S-05a.JPG


S-09.JPG


S-03.JPG


S-06.JPG


S-10.JPEG


S-04.JPG


S-07.JPEG


S-11.JPG

Plate 2.4 Representative Viewpoint location summer tripod setups (S01–S11)


S-01.JPEG


S-05.JPEG


S-08.JPEG


S-02.JPEG


S-05a.JPG


S-09.JPEG


S-03.JPEG


S-06.JPEG


S-10.JPEG


S-04.JPEG


S-07.JPEG


S-11.JPEG

Plate 2.5 Representative Viewpoint location winter tripod setups (S12–S22)


S-12.JPG


S-16.JPG


S-20.JPG


S-13.JPG


S-17.JPEG


S-20a.JPG


S-14.JPG


S-18.JPEG


S-21.JPG


S-15.JPG


S-19.JPG


S-22.JPEG

Plate 2.6 Representative Viewpoint location summer tripod setups (S12–S21)


S-12.JPEG


S-16.JPEG


S-20.JPEG


S-13.JPEG


S-17.JPEG


S-20a.JPG


S-14.JPEG


S-18.JPEG


S-21.JPG


S-15.JPEG


S-19.JPEG

Plate 2.7 Representative Viewpoint location winter tripod setups (S23–S34)


S-23.JPEG


S-27.JPG


S-31.JPG


S-24.JPEG


S-28.JPG


S-32.JPG


S-25.JPG


S-29.JPG


S-33.JPG


S-26.JPG


S-30.JPG


S-34.JPG

Plate 2.8 Representative Viewpoint location winter tripod setups (S22–33)


S-22.JPEG


S-23.JPEG


S-24.JPEG


S-25.JPEG


S-26.JPEG


S-27.JPEG


S-28.JPEG


S-29.JPEG


S-30.JPEG


S-31.JPEG


S-32.JPEG


S-33.JPEG

Plate 2.9 Representative Viewpoint location winter tripod setups (S35–S39)


S-35.JPG


S-39.JPG


S-36.JPG


S-37.JPG


S-38.JPG

Plate 2.10 Representative Viewpoint location summer tripod setups (S35–S39)


S-35.JPEG


S-39.JPEG


S-36.JPEG


S-37.JPEG


S-38.JPEG

Plate 2.11 Representative Viewpoint location winter tripod setups (N01–N12)


N-01.JPEG


N-05.JPEG


N-09.JPEG


N-02.JPEG


N-06.JPEG


N-10.JPEG


N-03.JPEG


N-07.JPEG


N-11.JPEG


N-04.JPEG


N-08.JPEG


N-12.JPEG

Plate 2.12 Representative Viewpoint location summer tripod setups (N01–N12)


N-01.JPEG


N-05.JPEG


N-09.JPEG


N-02.JPEG


N-06.JPEG


N-10.JPEG


N-03.JPEG


N-07.JPEG


N-11.JPEG


N-04.JPEG


N-08.JPEG


N-12.JPEG

Plate 2.13 Representative Viewpoint location winter tripod setups (N13–N24)


N-13.JPEG


N-17.JPEG


N-21.JPEG


N-14.JPEG


N-18.JPEG


N-22.JPEG


N-15.JPEG


N-19.JPEG


N-23.JPEG


N-16.JPEG


N-20.JPEG


N-24.JPEG

Plate 2.14 Representative Viewpoint location summer tripod setups (N13–N24)


N-13.JPEG


N-17.JPEG


N-21.JPEG


N-14.JPEG


N-18.JPEG


N-22.JPEG


N-15.JPEG


N-19.JPEG


N-23.JPEG


N-16.JPEG


N-20.JPEG


N-24.JPEG

Plate 2.15 Representative Viewpoint location winter tripod setups (N25–N35)


N-25.JPEG


N-29.JPG


N-32.JPG


N-26.JPG


N-29a.JPG


N-33.JPEG


N-27.JPEG

Photograph not available

N-30.JPG


N-34.JPEG


N-28.JPEG


N-31.JPEG

Photograph not available

N-35.JPG

Plate 2.16 Representative Viewpoint location summer tripod setups (N25–35)


N-25.JPEG


N-29.JPEG


N-32.JPEG


N-26.JPEG


N-29a.JPEG


N-33.JPEG


N-27.JPEG


N-30.JPEG


N-34.JPEG


N-28.JPEG


N-31.JPEG


N-35.JPEG

Plate 2.17 Representative Viewpoint location winter tripod setups (N36–N47)


N-36.JPEG


N-37.JPEG


N-38.JPEG


N-39.JPEG


N-40.JPEG


N-41.JPEG


N-42.JPEG


N-43.JPEG


N-44.JPEG


N-45.JPEG


N-46.JPEG


N-47.JPEG

Plate 2.18 Representative Viewpoint location summer tripod setups (N36–N47)


N-36.JPEG


N-40.JPEG


N-44.JPEG


N-37.JPEG


N-41.JPEG


N-45.JPEG


N-38.JPEG


N-42.JPEG


N-46.JPEG


N-39.JPEG


N-43.JPEG


N-47.JPEG

Photomontages, production and presentation

3.1 Overview

3.1.1 The overall aim of the photomontages presented in Figure 7.19 (Application Document 6.2) is to simulate the likely visual changes that would result from the Project by representing both the landscape context under consideration and the proposed development (the Project), as accurately as is practical.

3.1.2 Photomontages have been prepared at locations agreed with stakeholders and represent the opening year (year 1) photomontage presented on the winter baseline view and a design year (year 15) photomontage presented on the summer baseline view.

3.1.3 Photomontages utilise baseline photographs (captured as detailed in Section 2.2) of an actual scene to be composited with a digital computer-rendered image of the Project. They are subject to the same inherent limitations as photographs, for example, only showing the scene as it would appear under the same conditions that prevailed when the original photograph was captured. This compositing process will typically include digitally blending the base photography with the computer-rendered image, whilst taking into account any masking by foreground features. Compositing necessarily requires digital manipulation, carried out with visual skill, judgement and objectivity.

3.1.4 The photomontages have been presented with a horizontal view angle of 56° and a vertical view angle of 18.2° on a page size of A1 width and A3 height (image size 827.62mm by 260mm). Where the horizontal field of view required to illustrate the Project exceeds 56°, photomontages have been presented on continuation sheets. Where continuation sheets have been used, no image overlap has been applied.

3.2 Methodology

3.2.1 The production of a photomontage includes the following tasks:

a. Preparation of a Computer Aided Design (CAD) file containing all viewpoints and the alignments of the Project to be used for digitising relevant reference elements. Reference elements positioned with the aid of information gathered on site surveys, as well as aerial photography for horizontal plane positioning and Light Detection and Ranging (LiDAR) data for vertical plane positioning.

b. Viewpoints and reference elements brought into 3DS Max software and ‘cameras’ added within the model to replicate the view from each viewpoint.

c. Lighting system (Daylight) set up in 3DS Max, representing the lighting conditions and shadows when the photography was undertaken.

d. Cameras adjusted to best match each photographic panorama against imported reference elements.

e. 3D design information imported into 3DS Max software.

f. Each view is rendered as an image with the 3DS Max camera matched with the 3D model of the Project, at the same size, scale, resolution and aspect ratio as the digital photography. This gives a series of 3D rendered images ready for compositing with the photos of the existing baseline site.

g. Non-visible areas of the rendered 3D model are masked in the image using Photoshop.

h. Features within the baseline photography to be removed to facilitate the Project are masked in Photoshop, for example, existing vegetation or buildings. In addition, foreground details such as trees, buildings or signage are overlaid as masks, ensuring the depth of the various items is represented correctly.

i. High-resolution render processed for each view – producing a raster image (alpha separated). Photographic textures and materials can be applied, which starts the process of turning the wireframe 3D model into a photo-realistic image.

j. Final colour balancing/clean-ups carried out and image is exported from Photoshop.

k. Images imported into CAD using predefined drawing templates to ensure the correct image size and extent is applied for each viewpoint.

3.2.2 In a small number of locations, where illustration of vegetation to be removed has opened new views towards previously obscured landscape, it has been necessary to digitally simulate the newly visible background features. This mainly consists of the terrain surface and land cover, with newly exposed areas of sky rendered with colours similar to that in the surrounding baseline photography.

3.2.3 In a few instances where land use shown in baseline photography has been changed to illustrate the Project proposals, stock photography elements have been used to add the relevant details to the photomontage photography, for example, agricultural planting changed to grassland or wetland.

3.3 Photomontage locations

3.3.1 Following consultation with stakeholders including Natural England, Kent Downs Area of Outstanding Natural Beauty (AONB) Unit, Kent County Council, Gravesham Borough Council, Medway Council, Essex County Council, Thurrock Council, London Borough of Havering and Brentwood Borough Council, Representative Viewpoint locations were agreed for production of photomontages, and their specific horizontal field of view requirements. This is summarised in Table 3.1.

Table 3.1 Photomontage locations and requirements

Photo-montage number	Representative Viewpoint reference	Description	Indicative photo-montage view requirements	Photo-montage view angle presentation
1	S-05a	View from the Kent Downs AONB on Park Pale overbridge, part of the National Cycle Network (NCN) Route 177 and Darnley Trail recreational route (Local Landscape Character Area (LLCA) West Kent Downs (sub-area Shorne)). View centred west.	View focused on central reservation of the existing A2 corridor (Section 1).	56.5°
2	S-12	View from the Kent Downs AONB on Brewers Road/Luddesdown Trek/NCN Route 177, adjacent to Brewers Wood/Shorne Wood, part of Shorne Woods Country Park (LLCA West Kent Downs (sub-area Shorne)). View centred south-south-west.	View focused on modified Brewers Road overbridge as it crosses the A2 (Section 1).	56.5°
3	S-13	View from the Kent Downs AONB on Brewers Road overbridge and the Luddesdown Trek above the A2 eastbound carriageway (LLCA West Kent Downs (sub-area Shorne)). View centred south.	View focused on the improved A2 eastbound carriageway (Section 1).	56.5°
4	S-14	View from the Kent Downs AONB on Brewers Road overbridge and the Luddesdown Trek above the A2 westbound carriageway/High Speed 1 (HS1) (LLCA West Kent Downs (sub-area Shorne)). View centred north-east.	View focused on the improved A2 westbound carriageway (Section 1).	56.5°
5	S-17	View from the Kent Downs AONB on the NCN Route 177/Timeball and Telegraph Trail Long Distance Path, on Thong Lane adjacent to the Inn on the Lake Hotel (LLCA West Kent Downs (sub-area Shorne)). View centred south.	View focused on the current position of the Thong Lane bridge over A2 (Section 1).	113°
6	S-18	View from the Kent Downs AONB on the HS1 green bridge and Timeball and Telegraph Trail Long Distance Path (LLCA West Kent Downs (sub-area Cobham)). View centred north-west.	View focused on the current position of the Thong Lane overbridge at the A2 (Sections 1 and 2).	56.5°

Photo-montage number	Representative Viewpoint reference	Description	Indicative photo-montage view requirements	Photo-montage view angle presentation
7	S-20a	View from Jeskyns Community Woodland. Also represents views from northern end of footpath NS177 (LLCA Istead Arable Farmlands). View centred north-east.	View focused on the woodland notch on the distant ridgeline at the HS1 and Project corridors (Section 1).	56.5°
7a	S-22	View from Watling Street on the A2 overbridge (LLCA Gravesend Southern Fringe). View centred east-south-east.	View focussed along the existing A2 corridor towards the M2/A2/Lower Thames Crossing junction (Section 2).	56.5°
8	S-25	View from footpath NS167 at the western edge of Thong Village Conservation Area (LLCA Higham Arable Farmland (sub-area Thong)). View centred south-west.	View focused on the existing A2 service station and M2/A2/Lower Thames Crossing junction (Section 2).	113°
9	S-28 and S-(CH)01	View from footpath NS169 adjacent to Gravesend urban edge, looking towards Shorne Woods within the Kent Downs AONB (LLCA Higham Arable Farmland (sub-area Thong)). View centred east-south-east.	View focused on the M2/A2/Lower Thames Crossing junction (Section 2).	113°
10	S-30	View from Thong Lane in the eastern urban edge of Gravesend (Riverview Park) adjacent to the entrance of Southern Valley Golf Club (LLCA Gravesend urban area). View centred south-south-east.	View focused on where the Project crosses Thong Lane (Section 2).	56.5°
11	S-31	View from footpath NG8 located within Southern Valley Golf Club at the urban edge of Gravesend (Riverview Park) (LLCA Higham Arable Farmland (sub area Chalk)). View centred east-north-east.	View focused on the Project as it crosses the golf course/arable landscape (Section 3).	56.5°
12	S-33	View from intersection of footpaths NG7, NG8 and NG9, on northern edge of Southern Valley Golf Club course (LLCA	View focused on the Project's South Portal	113°

Photo-montage number	Representative Viewpoint reference	Description	Indicative photo-montage view requirements	Photo-montage view angle presentation
		Higham Arable Farmland (sub area Chalk)). View centred north-west.	(Sections 3, 4 and 5).	
13	S-38b	View from Saxon Shore Way Long Distance Path/footpath NS138 at intersection with bridleway NS318 immediately adjacent to Shornemead Fort. Also represents views from footpath NG1 (LLCA Shorne and Higham Marshes). View centred south-west.	View focused on the Project's South Portal (Sections 3, 4 and 5).	56.5°
14	N-02	View from Fort Road, adjacent to residential properties at Tilbury urban edge (LLCA Tilbury and Docks Urban Area). View centred east-north-east.	View focused towards North Portal (Sections 7 and 8).	56.5°
15	N-07	View from bridleway 58 (off Love Lane) (LLCA West Tilbury Urban Fringe). View centred west-south-west.	View focusing on Project (on structure) as it crosses Tilbury Loop railway line (Section 9).	113°
16	N-08	View from Low Street Lane adjacent to cluster of rural residential properties (LLCA West Tilbury Urban Fringe). View centred east.	View focusing on Project (on structure) as it crosses Tilbury Loop railway line (Section 9).	113°
17	N-12	View from residential properties in East Tilbury (off Beechcroft Avenue) (LLCA West Tilbury Urban Fringe). View centred south-west.	View focusing on Project as it crosses the agricultural landscape and Muckingford Road (Section 10).	56.5°
18	N-17	View from footpath 45 located within Orsett Golf Course (LLCA Linford/Buckingham Hill Urban Fringe). View centred south-south-east.	View focusing on the diverted Hoford Road as it crosses the Project (Section 10).	113°
19	N-19	View from residential properties at Orsett Heath/Chadwell St Mary (LLCA White Croft/Orsett Heath	View centred on Hornsby Lane as it crosses the agricultural fields in which the	113°

Photo-montage number	Representative Viewpoint reference	Description	Indicative photo-montage view requirements	Photo-montage view angle presentation
		Urban Fringe). View centred north-north-east.	Project will be located (Section 10).	
20	N-21	View from the junction of Hornsby Lane/A1013 Stanford Road (LLCA White Croft/Orsett Heath Urban Fringe). View centred south-south-west.	View south-south-west consisting of the Project slip road and A13 (Section 11).	56.5°
21	N-23	View from Grays urban edge (off Long Lane) (LLCA White Croft/Orsett Heath Urban Fringe). View centred east-north-east.	View east-north-east centred on the existing A1089 and junction with the A13, including the relocated overbridge along the A1013 (Section 11).	113°
22	N-25	View from the intersection of footpath 93, footpath 96 and bridleway 206 on southern urban edge of Orsett. Also represents views from footpaths 82 and 94 (LLCA Orsett Lowland Farmland). View centred south-west.	View centred on Baker Street, where the Project (new Project to A13 slip road on structure) will be located (Section 11).	56.5°
23	N-27	View from bridleway 161 adjacent to junction of Green Lane/Stifford Clays Road (LLCA Orsett Lowland Farmland). View centred north-north-east.	View centred on new Green Lane overbridge as it crosses the Project (Sections 11 and 12).	56.5°
24	N-29a	View from bridleway 219 located on the Mardyke Way in Orsett Fen, open access land (LLCA Thurrock Reclaimed Fen (sub area Mardyke)). View centred east-north-east.	View focused on the Project as it crosses Orsett Fen on the edge of the Mardyke (Section 12).	113°
25	N-33	View from intersection of footpaths 89 and 90 at Bulphan Fen (off Harrow Lane). Also represents views from footpath 159 (LLCA Thurrock Reclaimed Fen (sub-area Mardyke)). View centred south-west.	View focused towards the Project located within Orsett Fen (Section 12).	113°
26	N-39	View from footpath 231 near St Mary Magdalene Church, in North Ockendon Conservation	View towards the Project and the M25 slip roads	113°

Photo-montage number	Representative Viewpoint reference	Description	Indicative photo-montage view requirements	Photo-montage view angle presentation
		Area (LLCA Belhus Lowland Quarry Farmland). View centred west.	including the edge of commercial glasshouses, and Ockendon Road (Section 13).	
27	N-42	View from permissive path within Thames Chase Forest Centre (LLCA Thurrock Reclaimed Fen (sub-area Thames Chase)). View centred south-east.	View focused to the Project on embankment (Section 13).	113°

3.4 Landscape Institute Technical Guidance Note update

3.4.1 As explained in Section 2.3, the methodology used for preparation of the Project photomontages was agreed with stakeholders prior to publication of the current Visual Representation of Development Proposals TGN 06/19 (Landscape Institute, 2019a).

3.4.2 TGN 06/19 introduces a new categorisation system, 'Visualisation Types 1–4', to delineate the types of project visualisation that can be produced and provides guidance on appropriate use.

3.4.3 The methodology agreed for the Project, prior to the publication of TGN 06/19, best coincides with the following TGN 06/19 Visualisation Types:

a. Type 1: annotated viewpoint photograph, with the emphasis on baseline information. This type aligns with the Project Representative Viewpoint baseline photography presented in Figure 7.17 and Figure 7.18 (Application Document 6.2).

b. Type 3: photomontage. Used to accompany planning applications and landscape and visual impact assessments. This type best aligns with the Project photomontages presented in Figure 7.19 (Application Document 6.2).

3.4.4 As recommended within TGN 06/19, Table 3.2 sets out the technical methodology checklist followed for the Project.

Table 3.2 Technical methodology checklist

Technical methodology	Response
Photography	
Visualisation Types Methodology	Type 3
Method used to establish the camera location (e.g. handheld GPS/Global Navigation Satellite System (GNSS), GNSS/Real-Time Kinematic, survey point, visual reference)	GPS
Likely level of accuracy of location (#m, #cm etc)	1m

Technical methodology	Response
If lenses other than 50mm have been used, explain why a different lens is appropriate	50mm used
Written description of procedures for image capture and processing	Yes
If panoramas used: make and type of Pano head and equipment used to level head	Panoramas used. Manfrotto MA 454 Micro Positioning Plate Manfrotto SBH-100 Ball Head
If working outside the UK, geographic co-ordinate system (GCS) used (e.g. WGS-84)	OSGB36
3D model/visualisation	
Source of topographic height data and its resolution	Combination LiDAR + OS Terrain 2m and 5m
How have the model and the camera locations been placed in the software?	Based on survey coordinates
Elements in the view used as target points to check the horizontal alignment	Existing buildings, telegraph poles, pylons, gantries
Elements in the view used as target points to check the vertical alignment	Topography, existing buildings, gantries
3D modelling/rendering software	Autodesk 3DS Max 2018
Generally	
Any limitations in the overall methodology for preparation of the visualisations?	n/a
Visualisation Type	Type 3
Projection	Cylindrical
Enlargement factor for intended sheet size	100% @A3
Date and time of captured photography	10/02/2019 (winter) and 24/06/2019 (summer)
Make and model of camera, and its sensor format	Canon EOS 6D MkII
Make, focal length of the camera lens(es) used	Canon EF 50mm f/1.8 STM
Horizontal field of view (HFoV) of photograph/visual	Varies – dependent on image width
Direction of view: bearing from north (0°) or compass direction	Stated on each sheet
Camera location grid coordinates: eastings and northings to relevant accuracy; height of ground in metres above ordnance datum (mAOD)	Stated on each sheet
Distance to the nearest site boundary, or key development feature, as most appropriate	Stated on each sheet
Height of the camera lens above ground level and, if above 1.65m or below 1.5m, why?	1.5m – stated on each sheet
Additional imagery	

Technical methodology	Response
Baseline photograph	Yes
Photomontage generation: a composite view generated by overlaying multiple layers of image data: the photograph, 3D model of terrain (LiDAR Digital Terrain Model (DTM)) and/or 3D model of surface (LiDAR Digital Surface Model (DSM)), 3D model of proposed development, 3D model of landscape mitigation	Yes
A photograph of the tripod location to confirm the camera/tripod location	Yes

Comparison of Project methodology with published guidance (TGN 06/19)

3.4.5 The main variation in the agreed methodology used to prepare the Project photomontages and TGN 06/19 is set out below.

3.4.6 Page 19 of TGN 06/19, Table 4, sets out suitable photographic formats for Type 3 visualisations, including a 100% enlargement factor relevant to a Full Frame Sensor (FFS)/ 50mm lens for an A3 sheet size. However, the enlargement factor used for the Type 3 Project visualisations (photomontages) is 150%. The reason for applying a 150% enlargement factor was to show sufficient detail, in particular in more distant views. Where the resulting reduction in horizontal field of view presented on each sheet has required cropping of the extent of Project illustrated, continuation sheets have been used to illustrate the main Project elements in each view.

Zone of Theoretical Visibility modelling

4.1 Introduction

4.1.1 A ZTV analysis is a computer-generated tool to identify the 'theoretical' extent of visibility for the Project.

4.1.2 The ZTV shows theoretical visibility only and so it is important to fully understand that its accuracy is limited to the digital information that it has been based upon and the algorithm used in its calculation. It is stressed that the ZTV remains a tool only, in the landscape and visual impact assessment of the Project. A ZTV alone cannot indicate the potential visual impacts, nor show the likely significance of impacts that the Project will have.

4.1.3 However, it does guide an appreciation of the potential and maximum visibility of the Project, that can then be used to focus the visual assessment process on those areas affected and avoid those areas which will not be affected.

4.2 Digital information

4.2.1 The highway design is provided as an Autodesk AutoCAD drawing, in which a point is added at every 10m of the central reservation all along the Project road, including points as they go around any junctions.

4.2.2 OS Terrain 5 is a DTM based on a grid of 25m^2 cells, and is effectively split into individual pixels/squares of 5m by 5m. It has a vertical root mean square error (RMSE) of 1.5m in urban areas and major communication routes, and a 2.5m RMSE for rural, mountain and moorland areas.

4.2.3 The LiDAR Composite DSM 1m is a DSM based on a grid of 1m^2 cells, and is effectively split into individual pixels/squares of 1m by 1m. The DSM has a vertical RMSE of 15cm and is based on a survey undertaken in 2018.

4.2.4 The DSM includes heights of objects, such as buildings and vegetation as well as the terrain surface, whereas the DTM solely comprises the terrain surface (also known as the bare earth model). The DSM allows more accurate analysis of where the potential maximum visibility of the Project will occur, by including buildings and vegetation within the model.

4.3 Limitations and assumptions

a. Project road sections 4, 5, 6, 7 and 8 have been excluded from the ZTV analysis as they are below ground, associated with the tunnel and the tunnel headwalls.

b. The 5km ZTV analysis has been limited to within a 6km area to ensure the full extent of the 5km area is considered. The 2.5km ZTV analysis has been limited to within a 3km area to ensure the full extent of the 2.5km area is considered.

c. ZTV analysis for the proposed utility diversions during the construction phase of the Project, has not been undertaken, with the exception of the overhead electricity and pylon diversions as detailed below. The proposed utility diversions are temporary, generally short term in duration and typically below-ground operations (cut and cover construction and/or directional drilling), a ZTV analysis would therefore be of limited value. In these instances, professional judgement has been used to define the 'visual envelope' (the geographical extent that the proposals are likely to be visible from the surrounding landscape) for assessment purposes.

d. The ZTV analysis remains a tool only in the landscape and visual impact assessment of the Project. A ZTV alone cannot indicate the potential visual impacts, nor show the likely significance of impacts that the Project will have.

e. The ZTV takes account of vegetation removal and retention as detailed in Figure 2.4: Environmental Masterplan (Application Document 6.2) and Appendix 7.12: Arboricultural Impact Assessment.

f. The ZTV analysis has modified the DTM so that the Project route located below the existing ground level is considered in the analysis.

g. The analysis considers a range of the Project route elements. However, ZTVs have not been prepared for technology, signage or lighting columns.

h. A height of 4.5m has been assumed to represent the maximum height of vehicles (a high-sided vehicle) travelling the Project route and side roads.

4.4 Viewer height

4.4.1 Viewer height in a ZTV is set at 2m above ground level. This is higher than the camera height recommended for photograph visualisations (1.5m high) and compensates for potential inaccuracies in digital terrain data and to ensure that the 'worst case' is represented.

4.5 ZTV scenarios

4.5.1 ZTV analysis for the construction and operational phases of the Project has been undertaken, as set out below.

Construction phase

4.5.2 ZTVs have been prepared for each compound in Figure 7.8 (Application Document 6.2), where either the duration of the works exceeds the short term (five years), or proposed activity includes features that are 15m high or above. This analysis has been undertaken up to a 6km extent, using the OS Terrain 5 DTM at a 5m resolution. Defined areas of indicative operations within each construction compound have been analysed as follows:

a. Up to 6m in height (earth/material and plant storage, general access and compound activity)
b. Up to 15m in height (earth/material storage, workers' accommodation, site offices/welfare facilities and workshops/stores, including segment factory)
c. Up to 25m in height (slurry treatment plant and concrete batching plant)

Operational phase

4.5.3 The ZTV analysis for the operational phase of the Project has considered the following scenarios:

a. A Comparative ZTV using the OS Terrain 5 DTM at a 5m resolution, with points dropped onto the existing and proposed relocated overhead line pylons to a 5km extent (bare earth model), identifying differences between the existing and future theoretical visibility in Figure 7.9 (Application Document 6.2)

b. ZTV using the OS Terrain 5 DTM (bare earth model) at a 5m resolution, with points dropped onto the proposed highway alignment (at 10m centres) along the centreline and outer carriageways, gantries, overbridges and side roads to a 6km extent

c. ZTV using the LiDAR Composite DSM 1m (and allowing for the absence of anticipated vegetation removal for the Project) at a 1m resolution, with points dropped onto the proposed highway alignment (at 10m centres) along the centreline and outer carriageways, overbridges and side roads to a 3km extent

d. ZTV using the LiDAR Composite DSM 1m (and allowing for the absence of anticipated vegetation removal for the Project) at a 1m resolution, with height added to the points along the centreline and carriageways, to account for the assumed 4.5m height of a Heavy Goods Vehicle (HGV), to a 3km extent

e. ZTV using the LiDAR Composite DSM 1m (and allowing for the absence of anticipated vegetation removal for the Project) at a 1m resolution, with the proposed environmental mitigation measures (false cutting earthworks only) included in the DSM model, with points dropped onto the proposed highway alignment (at 10m centres) along the centreline, and outer carriageway, overbridges and side roads to a 3km extent

f. ZTV using the LiDAR Composite DSM 1m (and allowing for the absence of anticipated vegetation removal for the Project) at a 1m resolution, with the proposed environmental mitigation measures (false cutting earthworks only) included in the DSM model, with height added to the proposed highway alignment points, to account for the assumed 4.5m height of an HGV to a 3km extent

4.6 Method for calculation of ZTV

4.6.1 The ZTV calculation is performed using Esri Arc Pro 2.4.1, under the Viewshed analysis tool via the 3D Analyst or Spatial Analyst ArcMap extensions. This is then saved to the Esri Geodatabase of the Project.

References

Landscape Institute (2011). Landscape Institute Advice Note 01/11: Photography and Photomontage in Landscape and Visual Assessment. (Withdrawn)

Landscape Institute (2017). Landscape Institute Technical Guidance Note 02/17: Visual Representation of Development Proposals. (Withdrawn)

Landscape Institute (2018). Landscape Institute Technical Guidance Note: Photography and Photomontage in Landscape and Visual Impact Assessment. Public Consultation Draft 2018-06-01. Accessed April 2020.

[redacted]

Landscape Institute (2019a). Visual Representation of Development Proposals Technical Guidance Note 06/19. Accessed January 2022.

[redacted]

Landscape Institute (2019b). Visualisation of development (Introduction to new Landscape Institute Technical Guidance Note TGN 06/19). Accessed Jan 2022.

[redacted]

Landscape Institute and Institute of Environmental Management and Assessment (2013). Guidelines for Landscape and Visual Impact Assessment. Third Edition (GLVIA3). Oxfordshire: Routledge.

Scottish Natural Heritage (2017). Visual Representation of Wind Farms Guidance v2.2.

If you need help accessing this or any other National Highways information, please call **0300 123 5000** and we will help you.

If you have any enquiries about this publication email **info@nationalhighways.co.uk** or call **0300 123 5000***.

*Calls to 03 numbers cost no more than a national rate call to an 01 or 02 number and must count towards any inclusive minutes in the same way as 01 and 02 calls.

These rules apply to calls from any type of line including mobile, BT, other fixed line or payphone. Calls may be recorded or monitored.

Printed on paper from well-managed forests and other controlled sources when issued directly by National Highways.

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ

National Highways Company Limited registered in England and Wales number 09346363