

On the road to good design:

Design review at National Highways



Foreword



As a leading national infrastructure provider, National Highways is committed to raising the design quality of our network. We set up a dedicated design panel and carry out independent reviews of key schemes and standards to help us achieve this.

This is the first overview of design reviews undertaken between the end of 2017 and 2021 for a range of schemes and standards. It sets out the process and benefits of design review and learning from those undertaken so far.

Although it is sometimes difficult to separate the influence of the advice received from wider consultation, planning and design processes, all the reviews have had a positive impact in challenging us and promoting good road design. Design review has also proved to be a positive experience for teams and I recommend the process outlined here to the wider highways sector.

In addition to the specific advice received, common themes and issues have emerged from design review which we can all learn from. Examples include reinforcing the importance of people and place in design and the need to better explain our design processes. Design review has helped us on the road to good design and our journey continues.

The establishment of a dedicated design review panel and this publication was recommended by our Strategic Design Panel. I would like to thank members for their continued support and advice during the next period of design reviews. I would also like to thank members of the design review panel and the Design Council for their expert advice to date to help us improve the quality of our schemes and standards.

I look forward to seeing the results of improved design on the ground as schemes reviewed to date are constructed and design review is applied more widely.

A handwritten signature in black ink that reads "Mike Wilson". The signature is fluid and cursive, with the first name "Mike" and last name "Wilson" clearly distinguishable.

Mike Wilson

Chief Highways Engineer and Chair of the Strategic Design Panel



A preliminary design
for the A417 Missing
Link, Gloucestershire

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Executive summary

Improving the quality of the strategic road network has been a key ambition of National Highways since 2015. That year saw the publication of the Licence requirements for good design and the establishment of the Strategic Design Panel (the Panel). In March 2021 the Panel recommended that a report be prepared to capture learning from design reviews to date.

Defining the impact of design review

Design review is integral to National Highways' (formerly Highways England) approach to good road design. It provides project teams with independent advice on good design. It helps schemes deliver positive impacts for local communities and better environmental outcomes. It also provides tangible benefits to National Highways in terms of implementing best practice and working efficiently.

From the Panel's fourth progress report, one engineering design lead noted,

“The advice received was invaluable in the shaping of our scheme proposals, particularly in the early stages of development, helping to define those factors that should influence the design and how the design should respond in its context.”

Highways England (2021) Strategic Design Panel progress report 4

How design review is improving outcomes

Design review is a broad approach to evaluating built environment projects used across a variety of sectors. In 2015, the Panel was established to provide advice on how to implement good design at Highways England (now National Highways). It recommended setting up an independent design review panel (DRP) and using design review to support individual project teams. That way, improvements to design quality would in part come from project teams.

In *The road to good design* (2018), 10 principles for good road design were set out. The DRP used these to assess each scheme put forward. The Design Council facilitated this process on behalf of the Panel. Design reviews provided National Highways with scheme-specific observations as well as general recommendations for placing good design at the heart of improvements to the network. The case studies included in this report illustrate the positive impact design review has had where used. The first formal design review was held at the end of 2017 with a further 29 undertaken since.

Looking ahead

In its fourth progress report, the Panel noted how National Highways had made positive progress in embedding good design within the business. However, it concluded there was still work to be done. One of the Panel's key recommendations was to publish a report on design review. In the pages that follow, the important role that design review now plays at National Highways is demonstrated. Highlighted are common lessons from design review to date and the potential for the process to improve design quality further, not just for National Highways, but also for the wider highways sector.

The focus on good design

The strategic road network is one of England's most important infrastructure assets. It connects people and places, as well as supporting the local and national economy.

“Great infrastructure uses design to solve problems... When visible, it should look good too. Projects shape the landscape for decades, even centuries. Generations of people will see them, use them and be affected by them every day.”

*National Infrastructure Commission (2020)
Design Principles for National Infrastructure*

Good infrastructure is the result of good design. The National Infrastructure Commission has an ambitious vision for the design of national infrastructure. The government through its National Infrastructure Strategy (HM Treasury, 2020) also recognises good design as “*an essential element in securing high performance of infrastructure from the start*”.

Setting and achieving a vision

Large infrastructure projects such as new bypasses or improved motorway junctions play a vital role in supporting sustainable growth and delivering prosperity. Such large-scale projects can involve lengthy planning approvals or construction timeframes. Good design can help to address some of the associated risk of delay by ensuring projects meet a range of needs from the outset. This is where early design review can play a significant role in the process.



The design of the A14 Orwell Bridge, Suffolk, was reviewed by the Royal Fine Arts Commission

The role of design review

Design review is an independent and impartial evaluation process. It brings together a panel of built environment experts to assess the design of a specific proposal. The projects that design review considers, are most often in sensitive locations or with the potential to have a significant impact. The process is designed to improve the quality of places for the benefit of the public.

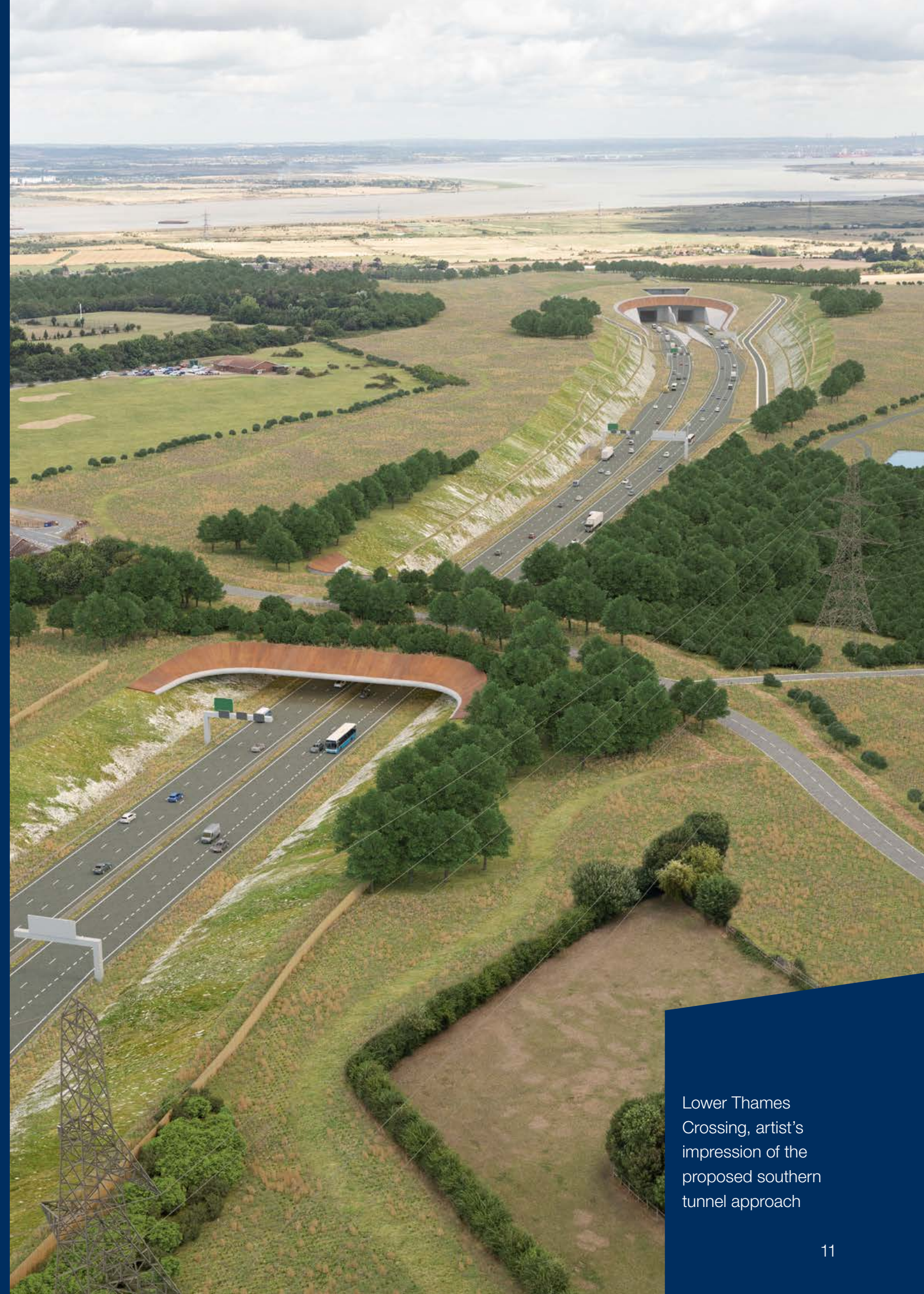
Design review is focused on outcomes for people. It explores how a scheme can better meet the needs of the people who use it or who are affected by it. It is a constructive process aimed at improving the quality of engineering, architecture, urban design, planning and landscape.

For design review to be successful, it must be a robust and defensible process. The advice provided must also meet consistently high standards as summarised by the Design Council's following 10 principles:

Design review is:

- Independent** It is conducted by people who are unconnected with the scheme's promoters and decision makers, and it ensures that conflicts of interest do not arise.
- Proportionate** It is used on projects whose significance, either at local or national level, warrants the investment needed to provide the service.
- Expert** It is carried out by suitably trained people who are experienced in design and know how to criticise constructively. Review is usually most respected where it is carried out by professional peers of the project designers, because their standing and expertise will be acknowledged.
- Timely** It takes place as early as possible in the design process, because this can avoid a great deal of wasted time. It also costs less to make changes at an early stage.
- Multidisciplinary** It combines the different perspectives of architects, urban designers, urban and rural planners, landscape architects, engineers and other specialist experts to provide a complete, rounded assessment.
- Advisory** A design review panel does not make decisions, but offers impartial advice for the people who do.
- Accountable** The review panel and its advice must be clearly seen to work for the benefit of the public. This should be ingrained within the panel's terms of reference.
- Objective** It appraises schemes according to reasoned, objective criteria rather than the stylistic tastes of individual panel members.
- Transparent** The panel's remit, membership, governance processes and funding should always be in the public domain.
- Accessible** Its findings and advice are clearly expressed in terms that design teams, decision makers and clients can all understand and make use of.

*Design Council (2019)
Design Review Principles and Practice*



Lower Thames Crossing, artist's impression of the proposed southern tunnel approach

What is the impact of design review?

The benefits of good design

Good design considers multiple elements and balances them out at the start of any proposal. It places people, place and safety at the heart of the design process and is achieved through early consideration of aspects like form, scale, appearance, landscape, materials and detailing.

The *National Infrastructure Strategy* (HM Treasury, 2020) sets out the imperative for good design: “In line with the design principles set out by the National Infrastructure Commission (NIC), the government is committed to embedding good design in all infrastructure projects...”

In other nations, the Design Commission for Wales promotes good design to maximise efficiency and value for money while reducing maintenance, refurbishment and running costs. Architecture & Design Scotland emphasises the power of good design to improve people’s lives and resolve multiple and sometimes conflicting issues. Here in England, the Design Council report, *The value of good design (2002)*, highlights how good design can have a positive impact across society in the form of economic and social benefits. This includes reducing crime, promoting civic pride and improving business outcomes. The report also highlights that good design can help reduce planning risks and delays.

National Highways recognises the benefits of embedding good design into decisions about the strategic road network. In 2018, *The road to good design* was published which set out a vision and 10 principles of good road design.

Good road design that reflects these ten principles can improve the safety, sustainability and longevity of the strategic road network. It can also benefit users, surrounding areas and local communities.

As the Design Council (2020) states in *Moving beyond financial value: How might we capture the social and environmental value of design?*

“Bad design can increase inequalities and contribute to the climate crisis. But good design can improve people’s health and wellbeing, and lead to a more sustainable, regenerative world.”

The principles of good road design:

Safe and useful

Good design creates safe roads that meet users’ needs and support other wider objectives.

Inclusive

All users and communities are considered to reduce barriers to access and participation.

Understandable

‘Self-explaining roads’ focus on the essentials and eliminate unnecessary and confusing clutter.

Fits in context

Good road design demonstrates sensitivity to the landscape, heritage and local community.

Restrained

Good road design can enhance a sense of place and add to what we have inherited.

Environmentally sustainable

Multi-functional, resilient and sustainable, good roads achieve net environmental gain.

Thorough

The design of all elements of the road environment are considered together and integrated.

Innovative

An innovative and resourceful approach that is mindful of context is necessary for better outcomes.

Collaborative

Collaborative working is a rigorous process that finds both dependencies and opportunities.

Long-lasting

With quality materials and careful detailing, good road design brings lasting value.

Continuous consideration of good road design within National Highways schemes will ensure these opportunities are identified early on. It also ensures that the diverse groups and individuals that use the network or live nearby are included in the design process.

The importance of design review

Design review provides an independent view on the design quality of schemes and standards. It supports design development through constructive assessment against the principles of good road design. Design review also gives project leaders the confidence that their project has been through a rigorous evaluation of design quality before seeking consent.

Design review allows National Highways to tap into a wide range of independent expert design advice. The process adds an extra layer of insight. This is especially true when there is a need to develop innovative ideas or approaches on projects.

Design review is used regularly across other nationally significant infrastructure projects, for example High Speed 2 and the Thames Tideway Tunnel. It supplements the advice of statutory consultees and offers fresh perspectives on design that project teams may be too close to see.

The National Infrastructure Commission (2020) recommends design review panels be set up for every nationally significant infrastructure project. A Design Council guide, *Design Review: Principles and practice* (2019), shows how a wide range of groups benefit from design review on projects of all sizes. This includes local authorities, developers and community groups.

The *National Planning Policy Framework* (Ministry of Housing, Communities & Local Government, 2021) endorses design review. Many local authorities across England now regularly use design review panels (Place Alliance/UDG, 2017). The use of expert independent design advice is also encouraged in the *National Policy Statement for National Networks* (Department for Transport, 2014) to ensure principles of good design are embedded into infrastructure proposals.

This widespread adoption of design review emphasises the growing awareness and importance of good design which National Highways endorses.



The A628 crosses and provides access to the Peak District National Park

Design review at National Highways

Why design review for the strategic road network?

National planning policy and the National Highways Licence (Department for Transport, 2015) requires a focus on good design. Paragraph 5.26 of the Licence states, “The holder must have due regard to relevant principles and guidance on good design, to ensure that the development of the network takes account of geographical, environmental and socio-economic context.” This led to the publication of *The road to good design*. In this vision document, the journey towards good design was set out:

“We aim to put people at the heart of our work by designing an inclusive, resilient and sustainable road network; appreciated for its usefulness but also its elegance, reflecting in its design the beauty of the natural, built and historic environment through which it passes, and enhancing it where possible.”

Highways England (2018) The road to good design

The role of the Strategic Design Panel

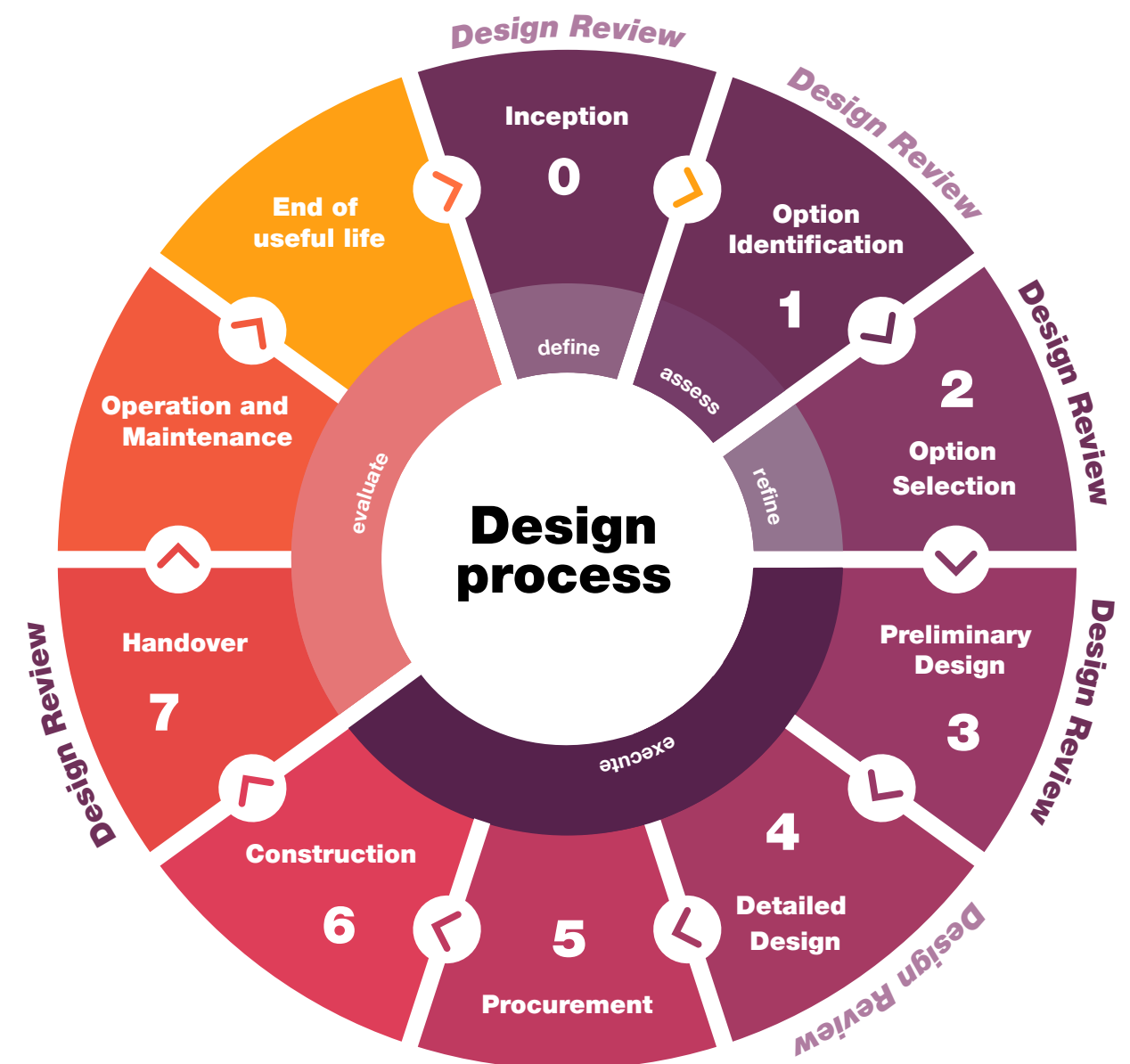
Another requirement of the National Highways Licence was to establish a ‘design panel’ to offer advice on sensitive schemes and design standards. The Panel was established in 2015. The Panel meets quarterly and is chaired by Chief Highways Engineer, Mike Wilson. Members include representatives from the following organisations:

National Trust, Natural England, Campaign to Protect Rural England, Historic England, Campaign for Better Transport, Connected Places Catapult, Chartered Institute of Highways and Transportation, Design Council, Institution of Civil Engineers, Landscape Institute, Royal Institute of British Architects, Institution of Structural Engineers, Transport Focus

The Panel helped shape the vision and principles for good road design set out in *The road to good design*. It also recommended a dedicated design review panel (DRP) be set up to consider highway schemes and standards in more depth.

A DRP was set up in November 2017. To date it has been independently facilitated by the Design Council, through the National Highways professional services framework and the Atkins Jacobs Joint Venture. Potential schemes and standards are shortlisted for consideration and referred for review by the Panel.

Design review covers the core elements of the lifecycle of any scheme. To date, reviews have focused on stages two, three and seven of the design process as shown:



How design review works

To date, design reviews have been coordinated through the National Highways' Safety, Engineering and Standards Directorate and focus on sensitive or complex schemes at various stages.

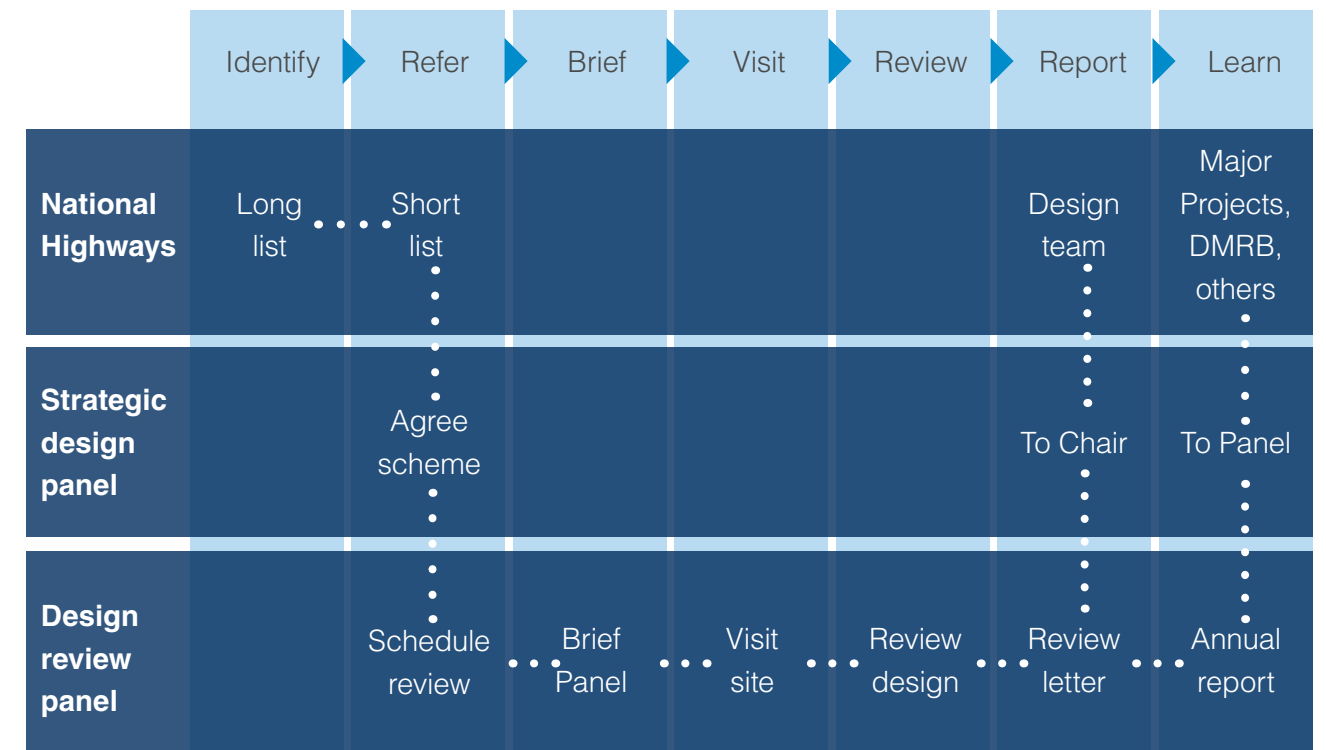
Schemes for review to date were shortlisted through the following criteria, including:

- sensitivity, such as adjacency to National Parks, Areas of Outstanding Natural Beauty and urban areas, designations such as Sites of Special Scientific Interest, ancient woodland and scheduled monuments, and potential for significant impact on the landscape
- previous presentation to the Panel and recommendation for review
- project Control Framework (PCF) stage – priority given previously for Stage 3 schemes nearing a Development Consent Order application
- scale of scheme and national significance
- the type of scheme to ensure review of a broad range
- sensitive schemes at PCF stage 0/1
- schemes recommended for a follow-up review by the DRP

After checking the scheme against these criteria, the Panel recommended a review. Each scheme was then put forward for review to the DRP as shown in the overview of the process in the diagram on page 19.

To date, the design review process has included the following steps:

- Design teams supply Design Council advisors with scheme information and an initial briefing.
- The Design Council prepares the associated briefing materials in line with best practice.
- A further briefing meeting scheduled to agree the scope of the review and to prepare the design team.
- Review meeting undertaken, chaired either by the nominated DRP Chair or Vice Chair.
- As part of the review meeting, the design team facilitates a site visit where appropriate, presents the scheme and demonstrates consideration of the ten design principles of good design.
- Panel provides feedback and comments relating to the material presented.
- A review letter is issued to the design team and Chair of the Panel which details the findings and gives advice.
- The chair of the DRP presents a summary of reviews undertaken to the Panel at their quarterly meeting.



Panel relationships and overview of the design review process.

During the COVID-19 pandemic, design reviews have been held virtually.

The aim of each design review is to provide independent and impartial advice to the design team. There is no pass or fail and it is not an examination. However, there is a Licence requirement for National Highways to give due regard to the advice received. Design teams are advised to use design review to discuss the most significant design issues and to seek advice from DRP members on these. Advice given to teams for communicating design at review is provided in Appendix A.

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The design review panel

The DRP comprises a group of 36 leading built environment experts. It includes a Chair and two Vice-Chairs appointed by the Design Council. For the period 2017-2021 these were:

John Lyall	(Chair) architect
Lynda Addison	(Vice-Chair) town and transport planner
Martin Stockley	(Vice-Chair) civil, structural, transport and infrastructure engineer

The DRP comprises the skills and disciplines needed to provide an independent and expert design review of highway schemes and standards. To date, each review followed a standardised approach and members were expected to follow specific guidelines:

Before a review:

- abide by the Seven Principles of Public Life (known as the Nolan Principles)
- advise the Design Council of any conflict or potential conflict of interest
- treat the discussion, panel's advice and all scheme and agenda information as confidential
- study the agenda and any briefing materials carefully prior to the review
- take on board all matters raised at the Design Council briefing prior to the review
- make themselves known as a Design Council panel member and take on board the information provided

During a review:

- provide expert advice
- conduct themselves professionally
- voice all points in front of those who have presented in the room as opposed to making them in private later at a debrief
- collectively address all items listed in the agenda and agreed at the briefing meeting
- express fundamental observations or reservations about a project, clearly and concisely, to the client and design team



A design review of the Lower Thames Crossing

Panel members 2017-2021

**Gideon Amos
(past member)**

Architect, planner and qualified urban designer specialising in sustainable development

Maayan Ashkenazi

Independent consultant for local planning organisations engaged in academic research into urbanisation and health

David Bonnett

Architect with a background in local authority and private practice with a PhD in designing for people with disabilities

Adam Brown

Architect working on public sector projects

Jessica Bryne-Daniel

Landscape designer with specialist interests in meaningful design and strategy formation

Andrew Cameron

Engineer with a background in transportation, architectural engineering and urban design

Richard Cass

Architect and landscape architect with experience as a masterplanner and project manager on regeneration schemes

Peter Clash

Architect covering urban design and masterplanning, transport, infrastructure and bridges

Lynne Ceeney

Global Head of Sustainability for a professional services company with specific experience in the built environment

Annie Coombs

Landscape architect and town planner with experience as an examining inspector for nationally significant infrastructure projects

**Michael Coombs
(past member)**

Civil engineer with experience across a wide variety of building projects and bridges

Sophia de Sousa

A leading advocate and enabler of community-led, participatory and co-design practice and research

Noel Farrer

Landscape architect with 30 years' experience in both the public and private sectors, and past president of the Landscape Institute

Karl Fitzgerald

Civil engineer with a focus on infrastructure planning and masterplanning for large-scale development projects

Julie Greer

Urban designer, planner and heritage consultant with experience at the Olympic Delivery Authority

Phil Jones

Chartered engineer with extensive experience in the planning and design of highways and other infrastructure, transport planning and street design

Maria Kheirkhah

Multidisciplinary artist and academic mapping systems of visual knowledge and culture

Panel members 2017-2021

Janice Morphet Town planner and visiting professor at the Bartlett School of Planning, author and researcher, former local authority chief executive

Peter Neal Landscape architect, environmental planner and expert in the planning, design, funding and management of open spaces

John Pugh-Smith Planning barrister with over 40 years' experience with design issues in planning, civil litigation and mediation contexts

Kay Richardson Landscape architect and urban designer with experience in heritage risk management and conservation management planning

Anna Rose Architect and urban planner with expertise in mixed-use urban masterplans and public realm projects across the USA and Europe

Yasmin Shariff Architect of award winning heritage buildings and environmentally responsive projects, and former Senior Lecturer at the University of Westminster

Nick Sharman Local government consultant with wide experience of public and private sector regeneration

Ros Southern Landscape architect with experience including parks, public realm, healthcare, housing and major mixed-use sites

Alexandra Steed Landscape architect and masterplanner with experience in Canada, Qatar and UK. Lecturer at the Bartlett

David Ubaka Architect, urban designer and project director, specialising in viability appraisals, transport and highways infrastructure, housing and public realm

Paula Vandergert Sustainability professional with more than 25 years' experience and research fellow at the University of East London

Charles Wagner Town planner and building surveyor with experience including public realm policy and practice

Helen Walker Urban planner and built environment strategic policy analyst focused on sustainable communities and places

Lorna Walker Chartered chemist, qualified civil engineer, sustainability consultant and an Examining Inspector for nationally significant infrastructure projects

Michael Wells Professional ecologist and eco-urbanist who led the ecological design for the Athletes' Village for the 2012 London Olympics

Jane Wernick Structural engineer with both UK and overseas experience including residential, institutional infrastructure and cultural projects

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Design reviews 2017-2021

In October 2017, the Design Council via the Atkins Jacobs Joint Venture were commissioned to deliver independent design reviews. In most cases design review has applied to individual schemes in design. In others, it is in the form of standard review workshops or evaluations of built schemes.

Each design review is followed by a summary letter to the team that outlines the key recommendations from the scheme's review panel. The Panel also requested completed scheme evaluation reports to provide a baseline to monitor the implementation of the principles of good design.

Reviews

late 2017 and 2018	2019	2020	2021
Lower Thames Crossing	DMRB appearance of structures standard review	DMRB standard GG103 implementation evaluation	A417 Missing Link follow-on review
A303 Amesbury to Berwick Down	Air Quality Barrier design guide review	Smart Motorways Programme design review	A12 Chelmsford to A120
M25 J10/A3 Wisley interchange	Lower Thames Crossing follow-on review	Lower Thames Crossing follow-on review	A14 Cambridge to Huntingdon evaluation
A417 Missing Link	Trans-Pennine Tunnel study follow-on workshop	A57 Link Roads	M6 J16-19 and M3 J2-4a smart motorway evaluation
A27 Arundel Bypass	A21 Tonbridge to Pembury evaluation	A45/A46 Tollbar End design evaluation	A66 Northern Trans-Pennine follow-on review
A556 Knutsford to Bowden evaluation	DMRB landscape design standard review		M3 Junction 9 improvements
A5036 Port of Liverpool	A66 Northern Trans-Pennine		A27 Arundel Bypass follow-on review
Lower Thames Crossing follow-on review	A27 Arundel Bypass follow-on review		
Trans-Pennine Tunnel study workshop	A417 Missing Link follow-on review		

Overview of design standard and other workshops

Design Manual for Roads and Bridges (DMRB) GG103 implementation - workshop

DMRB standard GG103 was published in July 2019. It covers general requirements for sustainable development and design. In March 2020, Jacobs were asked to map GG103 requirements against existing practice within National Highways, industry best practice, UN Sustainable Development Goals and similar standards in the UK rail sector. The mapping took place across two workshops, which included a member of the DRP, for the A14 Section 6 (Huntingdon) in March 2020 and M6 Junction 13-15 in April 2020. The workshop led to a series of prioritised recommendations for enhancing the implementation of GG103 including reporting and training.

DMRB landscape design standard (LD117) review - workshop

This document review workshop took place in July 2019. The purpose was to advise on the draft revision of guidance on Landscape Design to the DMRB. The draft revision built on previous guidance from the Good Roads Guide. The workshop looked at how well landscape design is considered holistically by project teams. It also considered how landscape design can be an integral part of road design, construction and legacy. Recommendations were made on enhancing landscape character and environmental quality above simple mitigation in the standard.

DMRB appearance of structures standard (CD351) review - workshop

This document review workshop in February 2019 covered a draft revision to the appearance of structural elements of the DMRB. It looked at how previous guidance for bridges had been applied and how the revision addressed key issues in designing other structures. The workshop made recommendations on how to provide design teams with stronger guidance on following good design processes.

The review of DMRB standards is described in more detail in section 9: Design review case studies.

Trans Pennine Tunnel study

The initial design workshop for the Trans-Pennine Tunnel strategic study was held in December 2018. It included an extensive site visit along a potential route that tracks the existing A628 through the Peak District National Park. The workshop explored how such a potential road and tunnel could create an exemplar piece of infrastructure to promote conservation, placemaking, sustainability and innovation as part of the

strategic study. Recommendations included further analysis of place, broader 'optioneering' and articulating the value of the project better. These recommendations were explored in a follow-up workshop in March 2019 which also considered developing design objectives for the strategic study. sustainability and innovation as part of the study. Recommendations included further analysis of place, broader optioneering and articulating the value of the project better. These recommendations were explored in a follow-up workshop in March 2019 which also considered developing design objectives for the strategic study.

Air Quality Barrier design guide

This workshop in March 2019 was a pilot for this type of project. It raised several issues for consideration as a standardised barrier solution for difficult air quality sites was sought. The proposed nine-metre high vertical barrier was evaluated for appropriateness, particularly in terms of the standardised approach and its flexibility in relation to the needs of nearby communities. The workshop concluded with design advice to consider the wider impacts and potential of the approach as well as how to best develop future design guidance documents.

Smart Motorways Programme

The Smart Motorways Programme (SMP) has been in place since 2014. It has demonstrated the benefits of a responsive, data-driven approach to the strategic road network. Looking ahead to the next decade, two workshops in May 2020 considered the design process and standardised products. The panel reviewed the Smart Motorway Design Guide and Rapid Engineering Model (REM) and how they had contributed to design time savings and better design outcomes for the SMP. The panel recommended enhancing the REM and design processes, reviewing procurement and project management, giving further consideration to sustainability and resilience and clarifying the use of standardised elements.

Overview of scheme design reviews

A5036 Port of Liverpool Access

The DRP considered improvements to Princess Way and the proposed rerouting of port traffic along a new section of road in August 2018. The preferred route through Rimrose Valley Country Park presents significant design challenges. Suggestions from the DRP included redefining the aims of the scheme in terms of regeneration opportunities, landscape design, engagement and integration with the surrounding community. The team was also advised to consider further the streetscape of the existing A5036. The DRP also made recommendations regarding community engagement in the future design and construction of the new route.

Heavy traffic on the existing A66 Northern Trans-Pennine link in Cumbria



Heavy traffic
passes Stonehenge
on the existing
A303 through the
World Heritage
Site, Wiltshire



A66 Northern Trans-Pennine

The DRP visited the route between the A1 and M6 during the options stage in September 2019. The review commended the broadening of the aims of the project beyond reducing journey times to consider the wider landscape and driver experience. It was suggested that focusing on biodiversity, water management, local character and the road's diverse users could create an exemplar project that could become a destination. The scheme returned for a second review in May 2021. This demonstrated that advice from the 2019 review had been considered and further recommendations were made as design work progresses towards planning.

A303 Amesbury to Berwick Down

Proposals for this upgraded route require much sensitivity considering the UNESCO World Heritage Site context. The review in December 2017 suggested more focus was required on user experience, functionality and elegance. The sensitivity of the Till Valley led to recommendations for bolder and more ambitious options and an enhanced overall design narrative or explanation of the scheme. This would help win support from local communities and ensure the design as it progresses sits well within the local environment. Further architectural input and giving consideration to the involvement of an artist in relation to detailing and materials was also recommended.

M25 Junction 10

The review in January 2018 provided the DRP with the opportunity to see the site on foot as well as from the road. This gave a fresh perspective on the opportunities to improve the road user's experience, connectivity and ecological outcomes, as well as meeting the primary aim of reducing congestion. The DRP recommended that the surrounding natural heath, common land and formal gardens should be at the forefront of design thinking. With a wider design framework, the DRP felt the scheme could contribute further to the regeneration of the wider area. It also advised clearly communicating these aspirations, options and visualisations to the public.

A57 Link Roads

In July 2020, the DRP considered proposals for a bypass at Mottram that has the potential to reduce journey times and enhance the quality of life for residents. Recognising the extra challenge of a new design team working on the project, the DRP noted its enhanced proposals for road design and appreciation of local character. However, it added that there was further potential to positively transform the area. Through close engagement with the community and local authority, the DRP felt this scheme could deliver wider transformation, combining housing, community amenities, public transport, biodiversity and local connections, particularly with detrunking works on the existing A57.

A12 Chelmsford to A120

This proposal to increase the carriageway to three lanes in both directions was reviewed by the DRP in February 2021. The DRP was pleased that the scheme had been referred for review at an early stage. It stated that by focusing on a design-oriented approach rather than a purely functional one, the design team could integrate further improvements in the visual character, environment and needs of local people. An example of this was exploring how areas along the existing and proposed road relate to each other and by moving away from two-dimensional design tools.

A27 Arundel Bypass

Following a site visit and review in June 2018, the DRP considered further options in September 2019 and the preliminary design in October 2021. The bypass has been a long-standing project to reduce congestion at Arundel and provide a more reliable east-west connection through West Sussex. The original recommendation was to move away from a mitigation-based approach and to consider wider opportunities. The 2019 recommendations included aiming for net-gain in terms of biodiversity and pursuing opportunities to work with stakeholders in the area. In 2021 the DRP recommended further consideration be given to the design of significant structures such as the proposed viaduct.

M3 Junction 9 Improvements

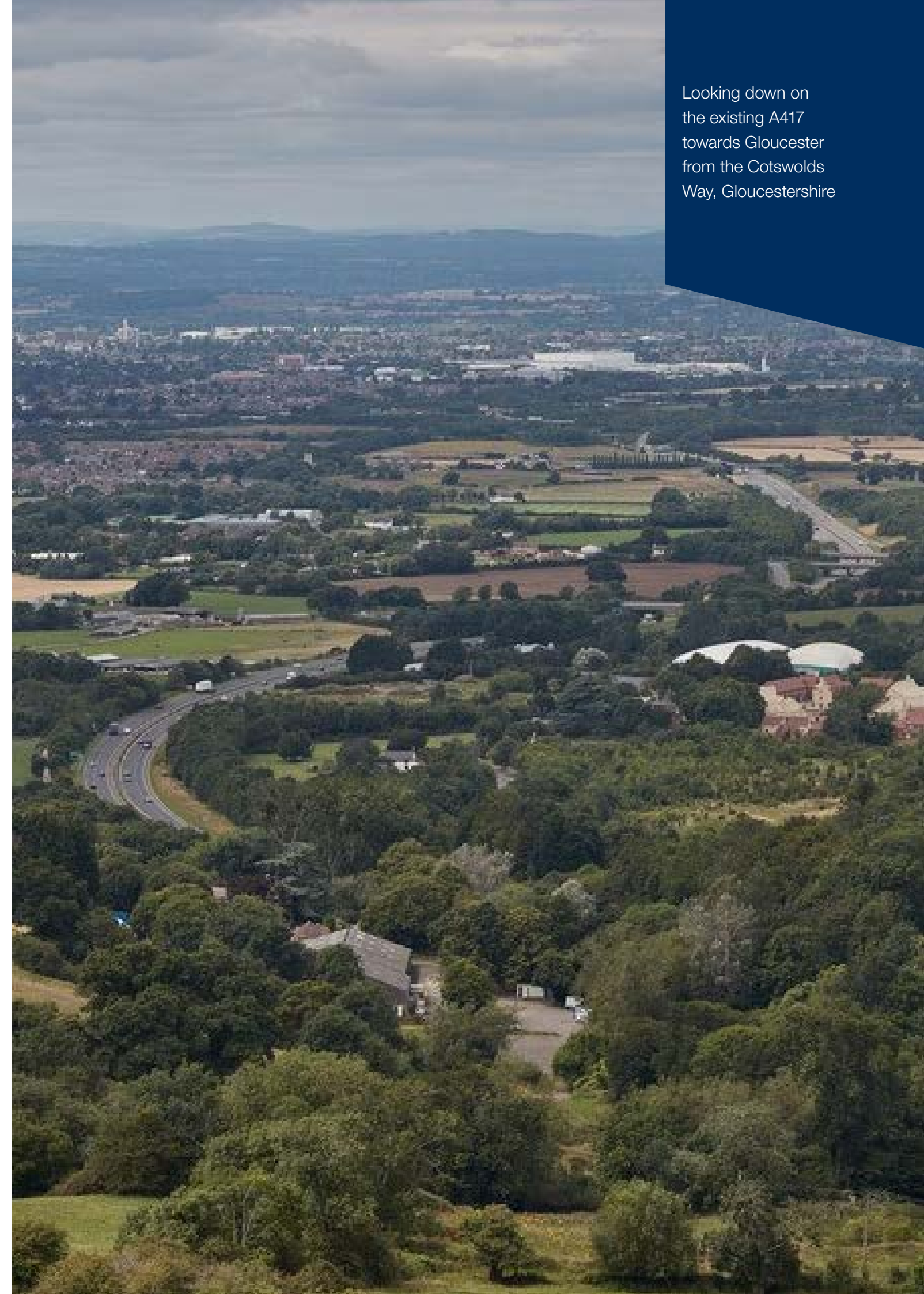
In March 2021, the DRP considered proposals to improve junction 9 of the M3 motorway with the A34 to improve safety and reduce journey times. This is a complex and sensitive site adjacent to the River Itchen, with the historic city of Winchester to the west and South Downs National Park to the east. In light of this, the DRP recommended that the design focus on the most appropriate way to place the necessary engineering into the landscape. The DRP also encouraged a move away from mitigation only to also seek positive opportunities such as enhancing routes for walking, cycling and horse riding.

A417 Missing Link

This major project has been reviewed on three separate occasions – in April 2018, November 2019 and again in February 2021. The ‘missing link’ will complete the route upgrade for the A417 between the M4 and M5 motorways to reduce congestion and improve safety. At each stage, the design team had considered previous advice and advanced the proposals. At the last review, the DRP noted considerable progress, for example in the decision to change the gradient at Crickley Hill.

The review of this scheme is described in more detail in section 8: Design review case studies.

Looking down on the existing A417 towards Gloucester from the Cotswolds Way, Gloucestershire





The completed A14 Cambridge to Huntingdon scheme, Cambridgeshire

Lower Thames Crossing

This is one of the UK's most significant infrastructure projects, focused on easing congestion on road networks in the South East. It has been reviewed four times – in December 2017, November 2018, April 2019 and July 2020. As a generational project with the potential to be a catalyst for widescale regeneration, it has changed over this period. In its latest review, the panel highlighted how design has been a driving factor in shaping and delivering the team's vision of a highway that responds to its setting and the needs of local communities.

The review of this scheme is described in more detail in section 8: Design review case studies.

Overview of completed scheme design evaluations

These evaluations of recently completed schemes (designed before publication of the principles of good road design) were led by the Atkins Jacobs Joint Venture, with the participation of a DRP member. This process did not involve a formal panel, but did include a site visit. Following the evaluation, a report was prepared for the Panel. These evaluations will serve as a baseline to monitor progress against the ten principles of good design as new schemes designed in accordance with them are completed.

A556 Knutsford to Bowden

The A556 opened to traffic in March 2017 and consists of a new 7.6km dual carriageway connecting the M6 with the M56. The evaluation in July 2018 found a new safe and reliable connection between the motorways. The design uses false cuttings to screen the new road, incorporates a green bridge to connect habitats and repurposes much of the former road for the benefit of local communities. However, the lack of an overall design strategy results in some uncoordinated elements and standardised details regardless of context. Although the treatment of the detrunked road sets a good precedent by providing attractive facilities for walking, cycling and horse riding, connectivity with a wider network of such facilities is difficult.

A21 Tonbridge to Pembury

The A21 opened in September 2017 and widened 4km to dual carriageway. The evaluation in June 2019 found the scheme had improved safety and relieved congestion. The establishment of new woodland and improvement of other woodland to mitigate the impact of the road were commendable. The provision of improved facilities for walking and cycling and their connection to a wider network through close working with others, was also successful. However, considering its location partly within the High Weald Area of Outstanding Natural Beauty, there was some weaknesses

in responding to local landscape character. The road user experience had also changed significantly, albeit with many benefits, but a sense of place and especially enclosure, had been compromised.

A45/A46 Tollbar End

Opened in March 2017, this scheme next to Coventry Airport widened the A45 Stonebridge Highway over 3km and provided an underpass at the Tollbar End roundabout. The evaluation undertaken in July 2020 found it had successfully relieved congestion and improved reliability. It was also successfully supporting local growth and development. The provision of wetland areas, the use of stone matting and wildflower verges were also successful details. However, the opportunity to reinforce a sense of place as a gateway to Coventry had been missed and the previous green parkway character of the road mostly lost. Although new pedestrian and cycle facilities had been provided, they could have been more attractive and convenient for users.

A14 Cambridge to Huntingdon

This scheme opened in May 2020 and upgraded 34km of the A14 to mostly dual three-lane carriageway. The March 2021 evaluation found many of the issues identified in an earlier 2016 Design Council design review had been successfully addressed, including the design of the River Great Ouse viaduct. The design of standard concrete bridges were also well considered and make a positive contribution to the overall journey. Two landmark footbridges over the A14 were also commended, but the location of gantries and signage detracted from the appearance of these and other bridges. Over time the amount and variety of woodland, hedgerow, grassland, marginal and aquatic planting, will undoubtedly integrate the scheme with the adjoining landscape and leave a strong legacy. However, some aspects of fencing, carriageway design and walking and cycling facilities highlight perhaps a lack of coordination and attention to detail at a human scale.

Smart Motorway Programme: M6 J16-19 & M3 J2-4a

This evaluation in March 2021 considered two smart motorway schemes. One was the 21km M3 (J2-4a) running through Chobham Common completed March 2018, the other the 28km M6 (J16-19) across the Cheshire Plain completed March 2019. The successful design and construction of these schemes on busy live motorways was commendable. The reuse and improvement of existing infrastructure to successfully reduce congestion and improve reliability had also reduced the potential environmental impact of the schemes. However, despite the standard components used for smart motorways, there could have been a more consistent approach to detailing, materials and response to context in the design of these two first generation schemes.



The completed A45/A46 Tollbar End scheme, West Midlands

Design review outcome trends

As the number of completed reviews increases over time, trends will become more evident. However, the reviews to date highlight how project teams have learned from the process and taken on board advice from design review.

Over the past four years, the following trends that could help guide other design teams have emerged.

Positives

- Project teams have generally been positive and eager to participate in the review process and join a creative conversation about scheme design issues.
- Project teams have shown a willingness to learn from the process and consider recommendations made by the review panel.
- The process of the design review is helping project teams to reflect on the overall design process and the balance required between standard highway design and the need to respond to context and place.
- Project teams are continuing to consider the value of good design and the principles of good design.
- The DRP are asking questions that may later arise and will need to be addressed when seeking planning consent.

Opportunities

- Design narrative – while the communication of the design process has improved there is still a need for further progress. Some earlier schemes that were conceived some time ago, lacked this approach to explain their design.
- Landscape strategy and vision – this has improved, but there is further potential for the highway to become an integral part of the landscape.
- Articulation of user experience – this still needs evidencing more in the design process and therefore become more evident at review.
- Community involvement – further work needed to fully engage communities in the design process itself in a clear and inclusive manner.
- Approach to wider walking, cycling and horse-riding networks – there needs to be improved understanding of connectivity to maximise opportunities for local movement networks.
- Placemaking and understanding of context – whilst this has improved, project teams should always fully articulate their understanding of context and sense of place at review.

- Design process – there is still a tendency for reactive mitigation to be presented at review, rather than proactive avoidance or enhancement through design.
- Sustainability and climate change – the design process and solutions should demonstrate a stronger appreciation of sustainability and adaptation to climate change.

Progress against the 10 principles

The Panel continue to monitor progress against the 10 principles of good road design. Some of the key observations on the principles to have emerged through design review include:

Safe and useful – Safety was emphasised by all schemes, but the ‘useful’ aspect of this principle less so. The function of the road was well addressed in reviews, but not as much its potential to structure areas and regions or as a corridor for growth and regeneration, natural systems, public transport and utilities.

Inclusive – Potential time savings for road user was emphasised, but not necessarily the quality of their experience or that of other users. The potential for wider connectivity was often not explored in reviews and limited evidence presented of working with local communities beyond required consultation.

Understandable – It was perhaps too early in the design process for many schemes to demonstrate an appreciation for understandable roads in terms of detail and minimising clutter. The potential for the landscape or context to provide visual clues to drivers did not appear to be often well understood or considered in reviews.

Fits in context – Minimising visual impact, although important, often appeared to take precedence over place making. Clarification of ‘fit’ as an appropriate response to context should be considered to avoid the general presumption of screening, with little consideration of the view from the road presented at review for example.

Restrained – Some schemes presented increasingly complex solutions and mitigation rather than seeking simplicity and restraint by rethinking the design approach or challenging requirements. However, a lack of detail and presentation of alternatives made it difficult to evaluate this principle at times.

Environmentally sustainable – Progress appeared mixed for this principle. Approaches that relied heavily on mitigation were often presented, rather than opportunities for enhancement. More understanding and consideration of natural systems and the built and historic environment may need to be demonstrated.

Thorough – Although there has been improvement, there is still a need for the broader design approach, not just highway engineering, to be explained at review. A truly multi-disciplinary approach is not always apparent at review, with some disciplines it would appear to be involved primarily to mitigate impact.

Innovative – It could be too early in the design process to fully evaluate this principle at review, but there often appeared to be more potential for innovation than the traditional approaches presented. There may also be a reluctance to present uncommitted ideas for discussion at review, but innovation should be encouraged.

Collaborative – From reviews it was clear statutory consultation was being undertaken successfully, but there was less emphasis on collaboration, particularly with non-statutory stakeholders and communities. This could be due to presentation, but collaborative working both within teams and externally should be encouraged.

Long-lasting – With many schemes at a preliminary design stage, progress against this principle was often unclear. A lack of detail and presentation of maintenance or whole life costing made consideration difficult at reviews. There may also be a reluctance to present uncommitted ideas.

One of the most significant outcomes from design review has been to encourage design teams to reflect on their overall design process. How do they respond more broadly to context and people/ place-centred design as emphasised in the ten design principles, while meeting basic functional and safety requirements?

Green bridge over the completed A556 Knutsford to Bowden scheme, Cheshire



Key learning and recommendations

Feedback on the review of schemes and standards to date has allowed the Panel to identify lessons learnt and to make recommendations for improvement. Although many of these recommendations were initially identified in the third progress report of the Panel, they have been confirmed through additional reviews and expanded.

The Panel has made the following recommendations to National Highways from design review by category:

- actions to improve the design review process
- ways that project design teams can improve their approach
- learning for National Highways to improve the design process for roads projects

Design review process

- Structure reviews to address more clearly the ten principles of good road design.
- Ensure that the selection process for identifying projects for review remains rigorous, with the criteria for including the project for review clearly set out.
- Design opportunities and issues arising from different potential routes (on landscape, wider movement, setting, views) should be demonstrated. Reviews prior to preferred route announcement would enable this.
- Continue to use an independent DRP for scheme reviews, and investigate developing other models such as that used for completed schemes and use of design workshops.
- Undertake design evaluations of completed schemes designed following the publication of The road to good design.
- Carry out detailed design reviews for specific infrastructure hardware, for example gantries or maintenance access areas.
- Consider more sequential reviews of major schemes through the various Project Control Framework (PCF) stages.
- Ensure briefing of the design team delivers benefits from the process, for example, appropriate display materials. Presenting teams should be encouraged to show rough early concept ideas and options at review, demonstrating the working process.
- Obtain better feedback from design teams on the review process.

Project design teams

- Encourage project teams to incorporate the thinking set out in The road to good design. Use a place-centred approach which ensures landscape, heritage and ecology knowledge feeds into a design narrative, and ensure design teams incorporate landscape and architectural input from the early stages.
- Clearly articulate a vision for each project, with a strong, confident design narrative. Schemes should be presented as a wider design opportunity, not just a solution to a traffic problem. Express and investigate opportunities, not just mitigation.
- Establish route corridor characteristics and design narrative. For example, appreciate the successive change in landscape character along a route.
- Focus on the successive visual experience of the motorist and passengers in the design early on – what will they see?
- Establish key views early on to understand long-distance changes to the landscape, and how the scheme is experienced up close.
- Ensure wider walking, cycling and horse-riding networks are considered and improved as part of the design process.
- Explore and use precedents of multi-disciplinary good design in infrastructure, with evidence of why they were successful.
- Explore the dynamic between the scheme objectives, the speed limits set by the client requirements and how the design for a scheme could evolve.
- Make more time for design detailing and consider it earlier in the process. Additionally, design needs to be carried out at an appropriate scale - details cannot be designed effectively at small scales.

National Highways (medium term)

- Introduce a requirement for a design narrative into the PCF - ideally as part of stage 1.
- Improve design objective setting and introduce design principles at PCF stage 0/1. There is great scope for scheme objectives to think much more broadly about value. For instance, the value of landscape protection and enhancement, social and environmental sustainability, and improving health and wellbeing.
- Establish the landscape characteristics and a design narrative for each SRN corridor, potentially as part of Route Strategy documents.
- Each project should have a designated role of 'design champion' who ensures the design quality of the scheme.
- Develop a mechanism for design exploration of the road user experience - a graphic communication tool that can be utilised at early design stages.
- Use the new DMRB standard GG103 to instigate change away from mitigation led design to an opportunity place centred approach.
- Create a case study resource, illustrating successful aspects of completed schemes.

National Highways (long term)

- Review the current process for community involvement in the design process. Consider more collaborative working and other approaches for supporting meaningful interaction.
- Consider including a good design requirement within Client Scheme Requirements.
- Where relevant, review changes to design teams between PCF stages to ensure design continuity and efficiency.
- Review the composition of design teams. Investigate options for including an artist in the team for appropriate projects. Consider that the procurement of design teams includes landscape and architectural input from the earliest stages.

“The Panel recommends that design reviews continue and further schemes, particularly those less complex or sensitive, should be encouraged to participate. This will help to improve design outcomes more widely, and further embed the principles of good design.”

Highways England (2021) Strategic Design Panel progress report 4

The completed M6 Junction 16-19 smart motorway, Cheshire



Design review case studies

A417 missing link

A crucial connection

The A417 missing link is a three-mile stretch of single-carriageway between the Brockworth bypass and Cowley roundabout in Gloucestershire. So-called because it is the only single carriageway of an otherwise continuous dual-carriageway route between the M5 at Gloucester and the M4 at Swindon. It is important to the local and regional economy and lies within the Cotswolds Area of Outstanding Natural Beauty.

This scheme is a landscape-led highways improvement project to deliver a safe and resilient, free-flowing road while also conserving and enhancing the special character of the area. Reducing transport delays is just one of the aims. The scheme is intended to enhance the surrounding environment where possible, improve access for local people and help boost economic growth.

Impact of design review

The A417 missing link scheme has been reviewed three times. The first design review was held in April 2018 before a preferred route was selected. The panel compared the two main options and advised that landscape considerations should drive the design of whichever route was selected. The scheme also needed a design narrative and visualisations of key structures and intersections.

The second review took place in November 2019. At this point the scheme had moved to PCF stage 3. The panel noted the design team had changed and the new team had challenged the brief to give more emphasis to all users, not just motorists. New emphasis on landscape and biodiversity improvements were welcomed. So too were wider considerations, such as addressing UN Sustainable Development Goals.

At the third review in February 2021, the panel commended the significant progress made. In particular, the evolution of the landscape-led approach resulting in a more respectful project. Stakeholder engagement was thorough. The decision to change the gradient at Crickley Hill was seen as better for the visual landscape and driver experience. The continued refinement of structures was also positive.

Good road design recommendations

At the third review, the DRP agreed that the A417 Missing Link was a genuinely landscape-led scheme that could become an exemplar. The road gradient change from 7% to 8% should reduce the impact of the scheme significantly.

A narrative to explain the design was still advised. And the panel advised more work was needed to green the Cotswold Way crossing at the next stage. Walkers, cyclists and horse riders should also be considered separately at the next stage as their needs are very different. Another recommendation was to actively assess sections of the road that will no longer be part of the network, as these will still need to work positively for those who do continue to use them as local routes.

A417 Missing Link,
artist's impression
of the proposed
Cotswold Way
crossing



Lower Thames Crossing

Aiming high

The Lower Thames Crossing will create a new tunnel under the River Thames to connect Kent, Thurrock and Essex. It will double capacity across the river east of London to provide quicker and more reliable journeys. It is seen as one of the most ambitious road projects ever embarked upon in the UK. It also represents the largest single road investment since the M25 was completed more than 30 years ago.

The road tunnel will be the longest in the UK and at 16m in diameter, one of the widest bored tunnels in the world. As a result, the design process has been subject to one of the most comprehensive consultations ever undertaken in the UK.

Impact of design review

By the time of the first of four design reviews in December 2017, the Lower Thames Crossing had already undergone a lengthy consultation and route selection process. The original review recommended the design team continue to focus on three quoted design objectives – legacy, enhancement and placemaking – rather than standard mitigation. The DRP also suggested that a design narrative would help support ongoing consultation.

In November 2018, the panel focused exclusively on a draft design narrative. It offered points of clarification to enhance the document.

Recommendations from the third review in April 2019 included using local details to help achieve broader ambitions including enhancing sustainability.

At the fourth review in July 2020, the panel commended the design team for its use of a design narrative. That document had, it noted, helped support a series of enhanced design features that the panel recommended should be incorporated into the Development Consent Order application.

Good road design recommendations

The proposed Lower Thames Crossing is expected to be completed by 2030. By that point, a wide range of stakeholders will have commented on and influenced the design. A design narrative has played a crucial role in the consultation process as well as helping the design team formulate its vision and details for achieving it.

The DRP has had a positive impact on these plans and helped the design team follow the principles set out in The road to good design. In particular, focusing attention on the stated ambitions to connect people, places and processes to ensure positive opportunities come from the scheme. For example, the latest panel feedback suggested using the design narrative in the tender process to carry the principles through to construction. It also recommended balancing the needs of drivers better with walkers, cyclists and horse riders and local communities, while continuing to engage with people throughout the process.

Lower Thames Crossing, artist's impression of the proposed Mardyke viaduct

DMRB standards workshops

The National Highways Licence requires advice to be sought on design standards, as well as schemes. The Design Manual for Roads and Bridges (DMRB) was updated during road period 1 and the opportunity was taken to review a number of new standards. This included standards for the design and appearance of structures, landscape design and sustainable development and design.

Instead of a typical design review for a scheme, the review of standards used a workshop format from which the DRP provided specific feedback on the documents, two at the draft stage and on the implementation of another.

Impact of design review

The first document review in February 2019 covered the draft standard for the design and appearance of structures (CD351). It highlighted positive steps in moving away from overly prescriptive guidance. It recommended that design be considered more broadly than simple reference to aesthetics. Further recommendations included the use of visualisations and diagrams to support written reports for individual schemes.

During the second document review in July 2019, the panel considered the draft standard for landscape design (LA117). Recommendations included refining the definition of landscape design, landscape quality and road design, to reflect the importance of landscape.

Panel members also recommended including guidance on costs – particularly whole-life costs – to support the case for good design.

The third document review in March 2020 evaluated the new standard for sustainable development and design (GG103) against UN Sustainable Development Goals, existing best practice and similar standards in the UK rail sector. Following two workshops with project teams as case studies, a series of recommendations were made, including preparing an accessible project team training programme to aid understanding and implementation. It also suggested simple reporting on the standard by design teams, ‘spot-check’ style audits and consideration of barriers to successful implementation of GG103.

Good road design recommendations

Reviews of key good design DMRB standards provided useful feedback to authors. The document workshops demonstrated how the principles of good road design could be made clearer in standards for design teams.

The landscape design review recommended amendments to ensure design objectives such as cost, maintenance, buildability and sustainability would become key to embedding good design. The design and appearance of structures review not only suggested changes to the approach, but also some of the language. This would provide more clarity to design teams and ensure good road design became rooted in everyday phrasing and practice.

Following the two reviews of draft standards, the third considered how best to implement a new standard and help design teams meet the goals of sustainable development and support good design.



M25 Junction 10/A3 Wisley Interchange, artist's impression of the proposed Cockcrow green bridge

Appendix A: Communicating design at review

Communicating concepts and ideas visually helps build a shared understanding and consensus in discussions and is crucial to a successful design review. The design review panel should be able to readily understand 'why' the scheme is the way it is from the information provided. Teams to date have been briefed as follows to help them prepare for design review, subject to the stage a scheme is at.

Information for design review

While a digital presentation can be useful to communicate the development of the design through analysis and to set out how decisions have been arrived at, drawings at a minimum of A1 should also be available for reference at review. These should have limited and legible text labels and a clear key. Aerial photos are also useful, but CAD drawings without context, much less so.

The following drawings are recommended. However, some elements could be covered by a single drawing, or through several.

- Wider landscape context of the scheme, including an assessment of the urban, natural or rural landscapes and places through which the scheme passes and any cultural significance of the landscape and features.
- Wider movement network, including connectivity with surrounding roads, lanes and streets, walking and cycling routes and public transport.
- A diagram visualising design opportunities and constraints, including social, economic and environmental. For example, archaeology, biodiversity, ecology, nearby communities, planned or potential development, new or changed connections.
- A concept or strategic diagram illustrating how the scheme has responded to the landscape and wider context.
- A route plan, including road numbers, names, key structures including bridges and retaining walls and elements of the proposed route such as gantries.
- Overall general arrangement showing the scheme at a suitable scale such that the route can be readily understood.
- Walking, cycling and horse-riding network impact and opportunities.
- Key views from places where people are likely to experience the scheme and sensitive viewpoints to understand visual impact.

- Large scale drawings of key aspects, such as junctions, bridges, facilities, or interfaces with sensitive landscapes, communities and buildings that the design team consider important and wish to discuss.
- Sections at key points along the route.
- Fly-throughs and visualisations, if available and appropriate, and visualisations of the road user's experience.
- Early sketches and concept drawings for the road and its structures, if available and appropriate.

Presenting at design review

The design objectives should be clearly set out – both the wider scheme objectives and specific design objectives. The design team should demonstrate an understanding of context/place and present a design narrative that has developed from this understanding and where appropriate a design vision for the scheme.

The following members of the design team should present the scheme:

- Design Manager
- Landscape Architect
- Architect (if applicable)

The following should also be present for the site visit and discussion:

- Project Manager/Director
- other key individuals actively involved in the design of the scheme or consultation

The design team should demonstrate:

- an understanding of context/place and how this has informed the design response
- key opportunities and design challenges
- an appreciation of the user experience
- where practicable, the application of the 10 principles of good design

The presentation should not:

- focus solely on the background - a summary is sufficient
- spend significant time on discarded options unless they have informed the design process
- focus solely on constraints and mitigation
- attempt to 'sell' the scheme

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