The Countryside Agency
Landscape
Access
Recreation

Including landscape in road design, construction and mitigation

A good practice discussion note

Helping everyone to respect, protect and enjoy the countryside

The Countryside Agency

The Countryside Agency is the statutory body working to make the quality of life better for people in the countryside and the quality of the countryside better for everyone. It is a non-departmental body sponsored by the Department for Environment, Food and Rural Affairs (Defra).

The Countryside Agency is changing as a result of Defra's Rural Strategy published in July 2004) and the Natural Environment and Rural Communities Bill which is expected to complete its passage through Parliament in spring 2006. The Bill includes changes to:

- establish a Commission for Rural Communities that will act as a rural advocate, expert adviser and independent watchdog with a particular focus on disadvantage. Currently operating as a division of the Countryside Agency, the Commission will become an independent body when the Bill becomes law;

- form a single new body - Natural England - that will integrate the Landscape, Access and Recreation division of the Countryside Agency with English Nature and most of Defra's Rural Delivery Service (RDS). Natural England will work for people, places and nature, with responsibility for enhancing biodiversity, landscapes and wildlife in rural, urban, coastal and marine areas; promoting access, recreation and public well-being, and contributing to the way natural resources are managed - so that they can be enjoyed now and by future generations.

These changes are expected to come into effect in October 2006, at which point the Countryside Agency will cease to exist.

We may be changing, but our skills, knowledge and enthusiasm will continue to benefit people in rural England. To find out more about our work, and for information about the countryside, visit our website: www.countryside.gov.uk

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Research and photographs supplied by Maritta Boden (Land Use Consultants) and Keith Rowe (ADAS)

Distributed by:
Countryside Agency Publications
PO Box 125
Wetherby
West Yorkshire LS23 7EP

Telephone: 0870 120 6466
Fax: 0870 120 6467
Email: countryside@twoten.press.net
Website: www.countryside.gov.uk

Minicom: 0870 120 7405 (for the hard of hearing)

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Introduction

The Countryside Agency's interest in roads derives from our statutory responsibilities – to protect the interests of designated landscapes such as National Parks and Areas of Outstanding Natural Beauty (AONB), and to act as a consultee on major infrastructure schemes. The Landscape, Access and Recreation Division of the Countryside Agency focuses on the impacts of transport on the countryside, and on the contribution that different transport modes can make to creating a more accessible countryside that is open to everyone. This discussion note seeks to kickstart the debate regarding roads and landscapes rather than to provide definitive guidance on best practice. It encourages the integration of the highway and its structures and earthworks with the landscape in a way that responds to the special character of each individual location. We hope the discussion note be of use and interest to practitioners involved in roads.

There is a need for more detailed research to bring other case studies to light, bring engineers and landscape architects together to discuss innovation, and to share experience between those engaged with the trunk road network and those working on local roads, to the benefit of landscape quality and character. The case studies in this note – two built schemes and one planned scheme – show how design, construction and mitigation can be used to reduce the negative landscape impacts of new roads. Situated in designated landscapes, we would expect these schemes to demonstrate good practice in reducing their impacts on landscape; but the innovative thinking and processes that they highlight could be applied to other schemes in non-designated, rural landscapes. We hope that we will continue to work with the Highways Agency and other roads practitioners to avoid and reduce the impacts of roads on landscape when the Countryside Agency becomes Natural England in October 2006.

Commendation from the Highways Agency for this discussion note

The Highways Agency and its predecessors were at the forefront of incorporating environmental design into highway engineering, building up a team of environmental specialist staff including landscape architects and horticulturists to advise and support their civil engineers

as the post war road building programme gathered pace in the late 1950s. The resultant high degree of landscape integration achieved with a range of road types bears testimony to the results of the partnership of disciplines in the design process. This is reflected in the Good Roads Guide series of advice notes in the Design Manual for Roads and Bridges, first published in 1992. The Agency is pleased to commend the Countryside Agency's discussion note to practitioners as a valuable aid to the optimum design and management of highways.

Objective of this discussion note

The main objective of this discussion note is to identify and publicise a small selection of case studies in which planned or constructed trunk road schemes have departed from standard or altered their design, construction or mitigation specifically in order to reduce or avoid negative landscape impacts (as detailed in Section 2). It is intended that the key audience for the case studies are landscape and transport practitioners engaged in road schemes, including those local authority officers working on de-trunked strategic rural roads.

Using the discussion note

Section 1 provides a summary of three case studies:

- A470 Cardiff to Glan Conwy Trunk Road, Snowdonia National Park.
- A3 Hindhead, Surrey Hills AONB (not yet constructed).
- A34 Chieveley / M4Junction 13 – Newbury, North Wessex Downs AONB.

Section 2 provides a user-friendly table setting out the key processes, technical issues and opportunities raised by the three case studies.

Background

National policy on roads in high quality and designated landscapes

The 1998 and 2004 Transport White Papers include a presumption against new or expanded infrastructure in environmentally sensitive areas such as National Parks, AONBs and SSSIs. PPS 7 also states that major development in these locations should only take place in 'exceptional circumstances', and that quality and character of the wider countryside is protected and, where possible, enhanced.

Sources of guidance on roads and landscape

- Webtag sets out Department for Transport's guidance on the appraisal of the landscape impacts of road schemes and can be found at http://www.webtag.org.uk
- The Design Manual for Roads and Bridges (DMRB) sets out the Highways Agency standards for road design and construction and has specific section on landscape which can be viewed in Volume 10: Environmental Design & Management. The DMRB is currently being revised, in particular in relation to landscape and visual impacts, and so it is intended that the provision of the case studies in this note will also where possible, demonstrate specific aspects of the revised DMRB guidance on landscape and assist with the revision of further sections of the DMRB.
- The Countryside Character Network provides a database of Landscape Character Assessment linked to Joint Character Areas of England and information can be found at http://www.ccnetwork.org.uk
- The Welsh Office publication Roads in Upland Areas, Welsh Office Highways Directorate, 1990.
- Scottish Office publications Roads, Bridges and Traffic in the Countryside, 1992 and Roads, Bridges and Traffic in the Countryside: Environmental Policies and Practices on Rural Roads, in Villages and Historic/Conservation Areas (draft), 1995.
- Highways Agency publication The Appearance of Bridges and Other Highway Structures, Highways Agency, HMSO, 1996 provides guidance that helps to ensure that all aspects of visual excellence are considered and achieved in bridge building as well as in the design and provision of tunnels, retaining walls and associated lighting and signs.

The Countryside Agency's role

The Countryside Agency is the statutory body working to conserve and enhance England's countryside; to spread social and economic opportunity for the people who live there; and to help everyone wherever they live to enjoy the countryside. The Agency has duties to conserve and enhance England's designated landscapes – National Parks, AONBs and Heritage Coasts. These duties are set out in the 1949 National Parks and Access to the Countryside Act, the 1968 Countryside Act and also in the more recent Countryside and Rights of Way Act 2000.

The Countryside Agency's transport policy seeks to protect the special qualities of England's finest countryside. The policy is intended to influence road schemes to ensure that changes to the existing network or improvements to existing roads are in keeping with the character and sensitivity of the surrounding landscape. Linked closely with this, is

the desire to minimise the effects of traffic and associated pollutants. The Countryside Agency's own publications on road design in rural locations provide more detailed guidance on mitigation measures and should be used as core reference material.

- Roads in the Countryside, Countryside Commission, Chris Blandford Associates (1995).
- Lighting in the Countryside: towards better practice, prepared for the Countryside Commission and the Department of the Environment (1997) and can be viewed at http://www.odpm.gov.uk/index.asp?id=1144822
- Design Issues for Rural Traffic Management – a report for The Countryside Agency (Jan 2000), accompanied by Design Issues for Rural Traffic Management – Conference Proceedings, a report for The Countryside Agency (April 2000). Both reports by Landscape Design Associates and Ross Silcock Ltd.
- Rural Routes and Networks – creating and preserving routes that are sustainable, convenient, tranquil attractive and safe, the Countryside Agency, Institute of Civil Engineers (2002).

Section 1: Case studies

A470 Cardiff to Glan Conwy Trunk Road
Dolwyddelan to Pont-yr-Afanc, Gwynedd, North Wales

Location:
Between Betws-y-Coed and Dolwyddelan, Lledr Valley, North Wales.

Client:
National Assembly for Wales.

Consultees:
Snowdonia National Park Authority, Countryside Council for Wales, Environment Agency, Cadw (Welsh Assembly), National Trust.

Companies involved:
Halcrow, Wyn Thomas Gordon Lewis, Laing O'Rourke, Arup, Cresswell, TACP , Gwynedd Archaeological Trust, Amenity tree care.

Cost:
£17.5 million for 7.2km length of highway. [£5m grant from EC Objective 1].

Summary of the scheme:
To widen a narrow, hazardous section of trunk road. The route is a major highway link between north and south Wales and also a vital corridor for accessibility to and from mid-Wales. The objectives of the scheme were to improve road safety and journey time reliability by upgrading the road to a standard compatible with modern trunk road standards whilst mitigating its environmental impact and taking advantage of opportunities to enhance the environment. Fitting the road carefully into the landscape was one of the client's primary goals.

A landscape-driven scheme with very high engineering and landscape design standards and a keen understanding of the sensitive location, landscape character, constraints and opportunities. This case study demonstrates strong commitment to achieving a scheme that is well integrated with its National Park surroundings.

Environmental constraints:

- Highest quality rural upland landscape within Snowdonia National Park.
- Area of high biodiversity value, including proximity to SSSI.
- Difficult steeply sloping terrain with rock outcrops and watercourses.
- Drainage problems due to high rainfall and steep slopes.
- Existing bridges and structures of high historic value (listed) plus other archaeological sites.

Design and construction:

This was a design and build contract with a large number of specialist project partners. Crucial to the success of the project has been careful design and programming, innovation in construction, diligent application of Environmental and Quality Management Systems, and the establishment of good relationships between the Project Partners, the local community and statutory bodies. An Environmental Management System was established, with an Environmental Action Plan. An Environmental Co-ordinator with a dedicated Deputy stationed permanently on site oversaw this, and an Environmental Liaison Group was also set up.

Key points:

- Full trunk road design standards have been relaxed because of the high quality landscape, with upland area principles adopted.
- Engineering and design have been landscape driven, because the protection of the landscape was a primary goal.
- Restricted existing road corridor and steep terrain dictated the widening approach – constructing a new route was not an option.

Solutions and consequences:

- Difficulties of constructing a widened road within the steep ravine were overcome through innovative engineering solutions particularly in the design of retaining walls.
- Rock cuts were excavated along joint lines to achieve a natural appearance. One side of the original road boundary throughout the scheme was retained to conserve the local setting and sense of continuity.
- The use of slate and stone-faced walls instead of metal crash barriers required a relaxation of normal highway design standards, but followed the guidance of Roads in Upland Areas (WO 1990). There was extensive use of local stone from nearby Blaenau Ffestiniog, with construction supervised by a qualified Dry Stone Walling Mason.
- Kerbs were only used where essential for road drainage and safety, and hard-strip widths were reduced. Use of traffic signs was kept to a minimum and BT lines diverted underground.
- Drainage pollution control measures were used at outfalls, with new channels lined with slate, and special dry culverts for otters.
- Walls were constructed with gaps to provide nesting or roosting sites for reptiles, birds and bats.
- Floristically rich meadows were translocated and soils retained as an indigenous seed source. Natural regeneration and locally sourced plant seeds were used.

Sensitive mounding/ground modelling responds to the landform and improves the integration of the scheme into the surrounding landscape. On side roads the use of wooden post and rail fencing between road schemes and neighbouring properties ensures a rural feel to the view. The scheme has made good use of native woodland planting, which has been used to integrate into adjacent existing woodland and to screen footbridges/underpasses. The open downland landscape has been restored through the removal of earlier mature roadside planting, which had begun to subdivide the landscape.

A34 Chieveley / M4Junction 13 - Newbury

Location:
On A34 (3km in length) and includes M4 J13, Newbury, Berkshire. The scheme included the re-working of the former junction area comprising of the M4 motorway, grade separated junction, dual carriageway, motorway service area, motorway maintenance compound and the Newbury showground.

Client:
Highways Agency.

Companies involved:
Gifford WSP (the employers agent), Constains, Mott MacDonald, Walters UK Ltd, Coopers Partnership and RPS Group Plc. The latter two were environmental designers to contractor and employer's agent and contractor respectively.

Cost:
£38.3 million, awarded in March 2003 and opened to traffic 17 months later in August 2004

Summary of the scheme:
The scheme included the construction of ten new bridges and 3km of new dual carriageway. The main objective of the scheme was to improve the free flow and safety of traffic on the A34 by providing unimpeded flow for the north–south through-traffic. This would help alleviate congestion on the roundabout and the slip roads forming Junction 13 of the M4. The aims of the scheme were to:

- Reduce delays by removing half of the A34 through-traffic from the roundabout, free capacity and lead to more reliable journeys.
- Reduce noise – by using noise-reducing surfacing on all roads and constructing noise barriers.

- Improve the local environment by extensive ground modelling around the village of Chieveley, to shield the village from the noise and visual impact of the M4 and A34, much of the land was returned to agriculture.
- The landscape proposals include extensive indigenous tree and shrub planting and the restoration of the open downland landscape. Public rights of way were also improved through the construction of two new equestrian bridges to reconnect links severed by earlier schemes and to create the 'Chieveley Community Circuit' linking the villages of Curridge and Chieveley.
- Improve safety – reduction in accidents at Junction 13 roundabout.

In the Secretary of State decisions of February and October 2002 on the draft Orders, he accepted the Inspector's recommendations to include two new equestrian bridges after objections by the landowner, reduced an area of land to be acquired by CPO for planting immediately bordering the M4 and A34 and changed the access arrangements to Chieveley Service Area.

Environmental constraints:

The scheme was constructed entirely within the North Wessex Downs AONB. In terms of landscape impact overall, it was considered to have a moderate adverse impact on the landscape in the year of opening, although this should reduce to no change as planting matures. The Environmental Statement emphasised the importance of ensuring that the design of the landscape was in keeping with the landscape character of the area.

Design and construction:

The proposed scheme was designed to minimise any adverse effects on the environment whilst considering other factors such as road safety, engineering design and cost. A range of mitigation measures to reduce the effect of noise and visual impact were introduced, these included extensive ground modelling with the use of carefully sited planting to reflect the open nature of the down land landscape as well as an environmental barrier. The scheme has been optimised to reduce the land take required and apart from an outlying agricultural building, no properties were demolished.

Solution and consequences:

- Landscape – Techniques used to integrate the scheme into the surroundings included earth mounding achieving a cut/fill balance, screen planting, specialist seed mixes for grassland, use of locally sourced native trees and shrubs, planting linked into existing woodland and wherever possible returning the landscape area to agricultural use and a 500m long visual barrier, consisting of a close boarded fence with associated hedge planting tapering from 2 to 1m high to provide additional screening to supplement ground modelling.
- Planting – Indigenous species, mainly forest transplants (groups of feathered trees) to marry with local vegetation. Landscape planting to soften the appearance of new engineering features and link the site with existing vegetation, enhancing the setting of the existing service area and associated development.
- Flood – attenuation ponds have been created for drainage management and Southern Marsh orchids translocated from the scheme earthworks to a suitable location near the ponds.
- Wildlife – On and off site planting to create new woodland to enhance existing habitats particularly for dormice. Four safe crossing points for badgers including dedicated badger tunnels under new sections of the road, modification of other features such as existing culverts and foot/equestrian over bridges and in excess of 5.5km of badger proof fencing.
- Public Rights of Way – the network has been enhanced by the replacement of the Bussock Wood footbridge crossing the M4 with a new equestrian bridge and the construction of a new dedicated bridleway/footbridge across the A34. These two enhancements combined, create the new ‘Chieveley Community Circuit’.
- Noise – noise reducing thick asphalt wearing course system and noise barriers adjacent to Chieveley and the Hilton Newbury North Hotel.

A3 Hindhead Scheme (not yet constructed)

Location:
The A3 at Hindhead, Surrey between Hammer Lane to the south and Boundless Road to the north.

Client:
Highways Agency.

Companies involved:
Construction by Balfour Beatty with Mott MacDonald as designers, and Atkins as the Agency's representative. RPS were the landscape consultants for the Environmental Statement.

Cost:
The scheme should cost approximately £239 million. If the scheme as published is approved by the Secretary of State for Transport and funding is confirmed, the main construction work will commence in 2008 and the tunnel should be opened to traffic in 2012.

If this tunnel and road improvement scheme is constructed as planned, there will be a significant improvement in the quality of the landscape within the Devil's Punch Bowl, Hindhead Common and within the Surrey Hills AONB. Achievements in securing stakeholder involvement, landscape, biodiversity and access objectives have ensured that the statutory process was less problematic than might have been expected for a scheme in such a sensitive landscape.

Summary of the scheme:

The scheme proposes to create a new 6.7km length of dual lane carriageway and twin bored tunnels will take the A3 under the Devil's Punch Bowl SSSI, spanning 1.9km. Closure of the old A3 across the Punch Bowl north of Hindhead is an integral part of the scheme. The scheme is designed to:

- Alleviate severe traffic congestion on the A3/A287 in the centre of Hindhead, improve journey times, road safety and reduce peak hour rat running in the locality.
- Overcome the high volume of traffic, which is above the normal flow range for a single carriageway.
- Overcome the poor horizontal and vertical alignments with restricted visibility, with several priority junctions and many private access points, which introduce conflicts between local and through traffic.
- Restore and enhance the landscape and biodiversity of the Devils Punch Bowl and significantly improve accessibility and the environment for walkers, horse riders and cyclists.

Environmental constraints:

Even without traffic, the existing A3 is an intrusive element in the dramatic landscape of the Devil's Punch Bowl. The route lies within the Surrey Hills AONB, passes around and through the Devil's Punch Bowl SSSI and Wealden Heaths Special Protection Area. The National Trust owns much of the area. These designations placed a severe constraint on improvement options, but also created extraordinary opportunities for environmental and landscape gain.

Design and construction:

The contract selected for this scheme was Early Contractor Involvement (ECI), which involved appointing a contract led team to progress the scheme before Draft Orders are published. Balfour Beatty and their designers, Mott MacDonald, were appointed in September 2002.

Solutions and consequences:

Key solutions and their consequences were:

- Tunnelling to restore the sense of remoteness and tranquillity currently severed by the existing busy A3.
- Maximised retention of existing vegetation, key landscape features, restored heathland and stabilised woodland edge.
- Accommodation of spoil on site and the grading out of embankment slopes to marry into the existing landform. Screening of traffic and tunnel services buildings through the provision of false cuttings along embankments.
- Noise attenuation fencing with smooth flowing earth mounds commensurate with operational requirements.
- Identification and negotiation of off-site planting and ensuring all planting proposals were consistent with the character of the area.
- Stakeholders involved in design and future management of the scheme.
- Limited low watt, flat glass lanterns set at zero degree inclination to minimise any nighttime lighting impacts.
- Highway design standards relaxed for side roads and vertical and horizontal alignment altered to achieve a better landscape fit within the footprint.
- Preservation of strategic views and design of new landscaping to ensure that long-term management is viable.
- Contractor bound to five years aftercare prior to passing to Managing Agent. The longer-term management will be informed by a 25-year management strategy.

This case study was selected as an example of good design and planning, however it cannot be judged as an example of good practice until the scheme is constructed. It should be noted that there is potential for the environmental design to be diminished if costs need controlling.

Section 2: Process/technical issues and opportunities drawn from case studies

PROCESS ISSUES	OPPORTUNITIES
Stakeholders Opposition to a scheme on environmental grounds can delay projects, create financial risk and have a major impact on ability to deliver improvements. There are often many different stakeholders with a wide variety of views and agendas. This makes achieving a consensus very challenging.	Foreseeing key issues from the outset, engaging with stakeholders at the earliest possible point and maintaining contact throughout scheme design and statutory processes can help provide effective solutions. Stakeholder liaison should go beyond the statutory consultation procedure, starting at the beginning of the design process, identifying as wide and diverse a local group as possible and keeping them informed through all the key milestones of the development. It should be an information sharing approach that still leaves room for statutory consultees to take positions and negotiate over statutory concerns. It is important for stakeholders to understand the complexity of roles and responsibilities of different organisations. *Examples:* The A470 Scheme established a Local Environmental Liaison Group to build in stakeholder objectives in design and planning and later to ensure co-operation between the construction site team and the local community. The A34 Chieveley / M4 Junction 13 Improvement Scheme appointed a full time Project Community Liaison Manager to help resolve local issues. Aside from the community liaison manager there was a 24-hour helpline, clearly defined complaints procedures, advanced notification of works and specific construction activities. Pre construction exhibitions, liaison with schools and attendance at community, parish and group meetings were also undertaken. These meetings were followed through in the form of public meetings throughout the construction period, notified through six newsletters and a dedicated website. The work also adhered to the Considerate Constructor's Scheme and was awarded the Considerate Constructors Gold Award.

PROCESS ISSUES	OPPORTUNITIES
Engineering Rules, Regulations, Codes of Practice and Guidelines Highway and safety standards have the potential to override most other issues. If these standards are applied inappropriately, it can create the appearance of an over-engineered or visually cluttered highway.	Engineering standards need to be relevant and sensitive to landscape character. Safety, engineering and landscape objectives and standards can be integrated in a way that recognises the unique landscape character of the protected landscape. Careful judgement will be required to evaluate the effects of speed limits/ traffic calming/ lighting/ and crash barriers in relation to environmental objectives. Teamwork and clear objectives are very important. If a good working relationship is established between the landscape architect, engineer and other team members, the landscape effects of such standards can be assessed, and a balance struck so that the landscape objectives can be attained, with any adverse impacts minimised, whilst other goals are also achieved. *Example:* Guidance on building roads in upland areas was used for the A470 Scheme to avoid over engineering the route.
Programme & funding Tight deadlines, limited budget and the lack of clear environmental objectives all hamper the achievement of landscape objectives in road design and building. Practitioners need to ensure that there is enough time and money to deliver an exceptional scheme.	Good teamwork comes from top down leadership, and good project management is more about people than numbers. There is a need for a well-led multi-disciplinary team with an integrated approach, able to ensure that where required, departures from standards meet landscape objectives. Such a team will need to have a clear sense of purpose, clear responsibilities and be highly focussed, with all members able to contribute. Continuity of personnel and a focus on skills and experience of road design for all involved (not just the engineers) is also very important. It is important to ensure that the team selected have sufficient relevant experience to deal with a particular scheme and its complexities. The funding of schemes is closely linked to their objectives and priorities. A lack of strong commitment to landscape objectives can lead to funding being prioritised away from non-essential engineering works. Designated landscapes may suffer as a result so in these cases it is important that landscape is considered a core/ essential issue to be funded. *Example:* The A470 Scheme demonstrated good teamwork and commitment to achieving a high quality highway landscape with full stakeholder support. The scheme drew on European Funds for Rural Development – Objective 1 Grants, as landscape was a priority issue.

PROCESS ISSUES	OPPORTUNITIES
Contract type The type of contract will influence the construction method and the ability to secure agreement on landscape objectives at different stages of the process.	The New Engineering Contract (NEC) incorporates features for construction projects carried out on a partnering basis. Partnering is founded on creative teamwork, crossing the traditional contractual boundaries. To foster the team spirit, the parties must have a common cause, share mutual objectives and respect, being open and frank about their expectations, with an agreed approach to problem resolution and a commitment to active pursuit of 'continuous, measurable improvement'. The most common form of partnering now being used in Road Engineering Schemes is Early Contractor Involvement (ECI). ECI enables knowledge, skills and experience to be drawn from the stakeholders, designers, contractors and others much earlier in the project cycle. Although the prime purpose is to speed up delivery and enhance value for money, environmental gains can also be a key output. ECI can provide an opportunity for environmental gains to be agreed by all stakeholders in the early stages of a scheme, and for these to be followed through to implementation on the ground. However, successful delivery of environmental objectives is not necessarily guaranteed, and particular care needs to be taken to ensure that environmental design standards are not reduced when working with sensitive landscapes. *Example:* The design and construction for the A3 Hindhead Scheme has been procured using the Highway Agency's Early Contractor Involvement process, which involved appointing a contract led team to progress the scheme and consult with stakeholders before Draft Orders were published.
Planning and management framework Once a Scheme has been constructed land use adjacent to a highway can change or work undertaken by utilities networks can degrade the original scheme objectives, unless future change is planned and co-ordinated.	There is a need for a long term planning framework to guide the process of highway planning and ensure the various players collaborate and co-ordinate. A document needs to be produced that covers such issues as the design length of the Scheme, memorandums of agreement for management activities, maintenance obligations and specifications, future highway options (new routes or widening), potential for offsite development, and changing land use adjacent to the scheme. *Example* The A3 Hindhead Scheme includes a landscape and ecological management plan covering 25 years in addition to the standard 5-year after care period. This is because a significant proportion of the mitigation measures will rely on heavy screen planting to reduce visual impacts and the planting will only become effective after 15 years. As this is an un-built scheme it will be important that any long-term landscape management proposals are adopted and accepted into the Term Maintenance Contracts for the area if the scheme goes ahead.

TECHNICAL ISSUES	OPPORTUNITIES
Landscape The design standards for roads will vary depending on the scheme. Where there is a requirement for a wider road corridor, shallower curves and slopes to reflect higher design speeds, it can lead to a reduced ability to fit the road into the landscape and may result in over and under passes, additional cutting and embankments, which could increase landscape impacts. Vertical and horizontal road alignments have a significant impact on the landscape. Alignments are dictated by specific DRMB engineering and safety standards. The landscape design process must go hand in hand with the engineering design and the most important aspects are choice of route and alignment. If the route is well integrated with landscape character and well aligned with the topography then the need for screen planting may be minimal.	Understanding and appreciating landscape character is a fundamental part of designing a high quality highway. The key characteristics of distinct landscape types should be defined and should influence highway design. Landscape character and designations should guide the choice of route, design standards and solutions. Some areas, even within protected landscapes will be more sensitive than other areas and so an assessment of landscape sensitivity will be required. A detailed understanding of the geology/rock formations will help to influence design treatment, for example whether it is safe to leave exposed rock faces or whether they need to be stabilised. Where grading/profiling of embankments and cuttings is required to marry with the surrounding landscape character, reduce noise and visual impacts, it is important to integrate new earthworks into the surrounding landform and to create a natural fit, rounding the top of the earthworks. This may result in a widening of the scheme's boundary and a greater footprint to accommodate gentler gradients which in certain locations may be beneficial and can allow the return of land from highway estate back to farming. The widening of the scheme's boundary however needs balancing against further land take and other environmental impacts including biodiversity. It is essential that landscape objectives are considered when fixing the vertical and horizontal road alignments. Where possible they should respond sensitively to the topography through which the scheme passes. It is also important to explore altering alignments to reduce the need to import fill and to balance scale and sectional geometry. Altering road alignments can also help motorists accept lower speed limits, which may be more appropriate to the surrounding environment. However one of the issues that designers will have to contend with is using relaxations and departures from standards in scheme design where speeds and visibility are affected. It is important to retain strong views/vistas, views of distinctive landmarks and create a sense of orientation and place for road users whilst being sensitive to local residents and users in the surrounding area. Other visual elements to consider include changes in widths of verges, perceived integration of verges with agricultural land, variations in views to create a sense of interest and ensure that when new structures (eg bridges) are constructed they are as kept as low as possible to avoid visual dominance. The interests of non-motorised users should be an integral part of the scheme and the closure and reinstatement of severed routes are important for both access and landscape reasons. Redundant roads can be converted to routes for non-motorised users (as described in DMRB TA91/05).

OPPORTUNITIES

Examples:
On the A470 the visual impact of the highway upon adjoining landowners and users of the National Park, such as road users and walkers was of paramount importance.

The A34/ M4 junction improvement scheme has resulted in extensive ground modelling to integrate the scheme into the surrounding landscape whilst reducing visual impacts.

The A3 Hindhead scheme should result in significant ground modelling to reduce visual glare from traffic. The scheme design seeks to accommodate spoil and grade out embankment slopes to marry into existing landform. Proposals indicate that the road, traffic and tunnel entrances and service buildings will be screened through provision of false cuttings along the embankments in order to eliminate light or luminance from the road surface and views of traffic headlights. Hindhead should result in a relaxation of road design standards to accommodate a better fit of side roads into the landscape and the vertical and horizontal alignment of the main line keeping within the footprint of the road scheme. This is a variation from the proposed grade separated junction and its associated link road onto the existing A3. The Scheme should also result in exceptional improvements to the amenity of the area for non-motorised users and the key environmental objective is to reinstate the severed A3 for landscape and access benefits.

Please note that the opportunities listed above are merely a brief outline of some of the issues that need to be considered and other source of information including the DMRB Volume 10 Environmental Design and Management must also be reviewed.

TECHNICAL ISSUES	OPPORTUNITIES
Vegetation and nature conservation Roadside vegetation is important in reflecting local landscape character, reducing noise levels and providing views. Appropriately located planting will soften the appearance of new engineered features, can link existing vegetation, enhance the setting of the landscape and ensure the scheme fits into the landscape in a sensitive manner.	Schemes should seek to retain and manage existing vegetation where possible, and ensure that new planting reflects subtleties in local landscape character associated with woodland blocks, copses and hedgerows as well as the form of field patterns. Whilst it has been national policy for many years to use indigenous species the use of locally sourced seed for grassland and native trees and shrubs will help to regenerate character and biodiversity. Biodiversity and landscape are closely linked. The UK Biodiversity Action Plan identifies priority habitats and species that need to be identified, protected and conserved. Schemes should also create safe crossing points for protected species e.g., dedicated badger tunnels, modification of existing culverts and foot/equestrian, green bridges and translocation of rare plant habitats. Where further land take is possible, the splitting of dual carriageways enables the planting of central reservations that diffuse the visual impact of the road alignment, however this needs to be carefully balanced against the effects of further land take on biodiversity and adjacent communities/land uses. Practitioners should also explore the opportunities to develop wider landscape strategies/ planting schemes with local landowners to integrate the road scheme into its setting. *Examples:* Both the A470 scheme and A34 Chieveley/ M4 Junction 13 Improvement Schemes are good examples of the use of plants (trees, shrubs and herbs) that are locally indigenous and with good attention to detail in their growing conditions to ensure successful establishment. This involved research and trial sites, producing hardy stock in similar growing conditions, use of local progeny seeds, soil translocation, plug and root trainer planting and natural regeneration. A34/M4 improvements resulted in the translocation of Southern Marsh orchids, additional dormice nesting boxes and new planting, the recreation of an open downland landscape, the creation of badger tunnels, the modification of existing culverts and foot/equestrian bridges as well as badger-proof fencing. The A3 Hindhead proposals include a green bridge called the 'Miss James Walk' which will create a wildlife corridor particularly at night.

TECHNICAL ISSUES	OPPORTUNITIES
Structures and fixtures Signs, lighting, crash barriers, noise barriers, line painting, kerbs, etc all need a consistent and sensitive design approach that is appropriate to the local landscape character to avoid visual confusion and clutter. Lighting of road schemes can be very obtrusive and permanent lighting during the hours of darkness on rural roads can have a detrimental effect on the environment and on the tranquil qualities of designated areas. It is desirable to use locally sourced materials for sustainability and design value, helping to blend highway into landscape. Following the rulebook or generic product catalogues may not be best practice in terms of landscape quality.	Practitioners need to explore ways to minimise road signage and reduce road noise through surface treatments to achieve a quieter environment. In some cases it maybe possible to explore opportunities for bespoke signage which reflects local landscape character or to take simple design decisions such as reducing the size of signs or of lighting columns – however these departures from standards will need to demonstrate significant environmental gains if they are to be accepted. It is important to ensure lighting levels remain low and unobtrusive, reducing glow especially in tranquil areas. A recent publication produced by the Countryside Agency and CPRE in March 2005 Mapping Tranquillity – Defining and Assessing a Valuable Resource states that tranquillity is based on locations defined as “places which are sufficiently far away from the visual or noise intrusion of development or traffic to be considered unspoilt by urban influences”. Good design should challenge whether lighting is necessary on safety grounds (all trunk road lighting schemes, including roundabouts, are subjected to a test of whether night time accidents exceed 28%) and where it is required, reduce light spillage by reducing reflective angles or column height or making greater use of reflective surfaces and novel lighting technology. It should explore opportunities to light routes at specific times for heavy traffic flows, weather conditions or planned maintenance. Contrary to popular misconception, roundabouts may not have to be lit. Recent advice has proposed a single central lighting column to indicate a roundabout. For safety barriers, the use of tension steel cables or plant verges to soften visual impact can be considered. The use of kerbs should be kept to a minimum and where possible, alternatives such as rumble strips or cats eyes used instead. Carriageway surfacing needs a reinforced edge to prevent it breaking up. This could be a flush channel unless a kerb upstand is needed to direct drainage. Where kerbs are used, they should be minimal and where possible, flush to the ground, offering a softer edge. Where necessary, fencing and noise attenuation barriers should be a sympathetic colour, reflective of local landscape features (rural style fencing) and allowing a variety of views and visual horizons. Other roadside boundaries (such as walls) should be of a design and

OPPORTUNITIES

material sympathetic to the local landscape character. Materials should be sourced locally where possible to reflect the local vernacular, although in some case it maybe appropriate to use new materials in a contemporary manner. Designers should explore the provision of accommodation hedges with post and wire 'temporary' fences in hedgerow country, rather than the almost universal highway boundary of timber post and rail fencing.

It is important to ensure that follow up work does take place, with road authorities checking to see if features such as wildlife tunnels and screening have achieved the desired effect and modify them where necessary.

Examples:
Judges of the Better Building Award states that the A470 had a "great use of local materials and represented a very soft addition to the environment, this scheme shows that roads can also be specific to their geography".

A34/M4 junction improvement scheme: to reduce noise, reduce spray and enhance driver safety, a proprietary asphalt product was used on the road surface.

The A3 Hindhead scheme which will remove all motorised traffic from the existing trunk road through the Devil's Punchbowl, seeks to reduce the impact of the tunnel portals through the use of low wattage lights with flat glass lanterns set at zero degree inclination to ensure that the upward light ration is low and sky glow is reduced. In addition, lighting to the tunnel portals will only be used in the case of an accident or planned maintenance; a considerable departure from standard road design.

The A34/M4 junction includes a 500m long visual barrier, consisting of a close-boarded fence with associated hedge planting to provide additional screening to supplement ground modelling. In addition, timber post and rail fencing was used on some of the side roads, the open nature of the fencing generating a strong sense of integration with the surrounding landscape.

The Countryside Agency
Landscape
Access
Recreation

John Dower House, Crescent Place
Cheltenham, Gloucestershire GL50 3RA

Tel 01242 521381
Fax 01242 584270

www.countryside.gov.uk

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