
Transport
for NSW

Beyond the Pavement

Urban design policy, procedures and principles
for roads and waterways projects



Acknowledgements

This document has been prepared by the Urban Design Roads and Waterways team with assistance and advice from representatives of Transport for NSW.

All photographs are sourced from Urban Design Roads and Waterways team unless otherwise indicated.

Cover — St Peters Interchange. This interchange, providing connections between the M4 and M8 tunnels to Alexandria, Sydney Gateway and the airport and the Princes Highway, sits within a deep pit created for the brick making industry and then used as a waste dump. Three levels of bridging sit within the pit hiding the infrastructure from surrounding areas. The interchange is completely planted out and will in time frame the bridges and provide a forested shaded area and relief from the tunnel environment. The waste material has been sustainably retained on site in artificial hills and sculpted mounds with views of the wider area. The shared paths through the interchange and public space include sculptures from a range of eminent artists. The bridges are monumental, specifically designed to creating smoothly curving long spans with circular piers and capitals. Extensive LED lights provide a changing night-time effect. The portals, one a golden architectural veil, the other a cultural symbol for local Aboriginal people, sit like jewels at either side of the interchange.

Contents

Acknowledgement of country	2
Beyond the Pavement overview	4
Introduction	6
1 Urban design approach: Thinking Beyond the Pavement	14
2 Managing urban design in infrastructure projects	32
3 Urban design principles	52
Design principles	58
3.1 Principle one – Contributing to urban structure, urban quality and economy	60
3.2 Principle two – Fitting with the built fabric	78
3.3 Principle three – Connecting modes and communities and promoting active transport	87
3.4 Principle four – Fitting with the landform	99
3.5 Principle five – Contributing to green infrastructure and responding to natural systems	107
3.6 Principle six – Connecting with Country and incorporating heritage and cultural contexts into projects	121
3.7 Principle seven – Designing an experience in movement	135
3.8 Principle eight – Designing self explaining roads that safely respond to their role and context	147
3.9 Principle nine – Achieving integrated and minimal maintenance design	158
Appendix A	181
Roads and Maritime case studies in Beyond the Pavement 2014	181
Appendix B	194
A short global and historical perspective of urban design in relation to road and other transport infrastructure	194
Appendix C	212
Design methodology: advice for urban designers	212
Appendix D	216
Connecting with Country: Urban Design Considerations and Principles	216
Glossary	218
Other urban design references and further reading	222

Acknowledgement of country

Transport for NSW acknowledges Country, people and values and recognises the impacts we make on Aboriginal culture and heritage through our infrastructure projects. The outcomes of our projects can be a positive reflection of the Country, people and values of the Aboriginal culture of the area the project is located.

Over two decades, NSW has come a long way with the design of transport infrastructure. The input of urban designers has now become a mainstream activity. Greening road corridors has become a common term and the road network landscape estate is a recognised part of our green infrastructure asset. Designing with respect for context — architectural, landscape, historic and cultural — is a matter of course.

But something important has changed in recent years. There is now a rapidly growing awareness of the true nature of Australia — as a place where Aboriginal people have lived and shaped for many millennia; as a country with a unique, strong and ongoing spirituality and character to be admired globally; and as an ancient yet dynamic landscape and culture in which all our artefacts, cities, activities, stories and projects are situated.

We have an opportunity to create a new approach to our work, which reflects the Australian first people's culture and all its character, stories, sustainability and spirituality. To do this we need to engage with Aboriginal people on projects; respect and value their expertise; and integrate their understanding of country and place into the design process and outcome. This is called Connecting with Country.

This document puts forward the design principle — as part of the urban design of road and maritime infrastructure — that projects should be designed with a Connection to Country based upon local Aboriginal engagement. This may mean the design of the landform, or the landscape, or a creative input in structures, art and design, or simply a respectful understanding of the Aboriginal cultural context as a foundation of our work.

Explore the potential of the urban design process. Engage with communities and above all be imaginative and open minded in producing the best transport work you can do.





Beyond the Pavement overview

Commitment

Transport for NSW is committed to providing 'successful places' with the 'liveability, amenity and economic success of communities and places enhanced by transport'. (Future Transport 2056).

There are four physical urban design objectives which should be achieved on all road and maritime infrastructure work:

1. Projects should fit sensitively into the built, natural, and cultural environment in both urban and rural locations.
2. Projects should contribute to the accessibility and connectivity of communities and a general permeability of movement through areas by all modes of movement.
3. The design and management of projects should contribute to the overall design quality of the public domain for the community, including transport users.
4. Projects should help revitalise areas and contribute to the local and broader economy.

These outcomes should be met in a cost effective, safe and sustainable manner. Cost effective, safe and sustainable performance of infrastructure needs be an integral part of project planning, design, building and maintenance and should not be an after thought.

Urban design process

Urban design should be considered early, integrated into projects at the initiation phase and continued through the development, implementation, finalisation and operation phases.

Responsibilities for urban design in road and maritime work

Achieving good design is a collaborative effort both within project teams and across the organisation. It involves many areas of expertise, including project management, asset management, engineering, landscape architecture, architecture, bridge design, environmental and landscape management, traffic and transport and urban and regional planning.

The Urban Design Roads and Waterways team provides guidance and support in the use of this document and should be consulted regarding any proposed work and initiatives that affect the quality of the built environment. It works closely with the Urban Design Public Transport and Precincts team which primarily deals with public transport, rail and rail related projects.



Beyond the Pavement urban design principles

1. Contributing to urban structure, urban quality and the economy
2. Fitting with the built fabric
3. Connecting modes and communities and promoting active transport
4. Fitting with the landform
5. Contributing to green infrastructure and responding to natural systems
6. Connecting to Country and Incorporating heritage and cultural contexts
7. Designing an experience in movement
8. Designing self explaining roads that respond to their role and context
9. Achieving integrated and minimal maintenance design.

Header image: Balarinji Aboriginal Strategy and Design Studio's 'Canoe Paths' acoustic wall commissioned by Transport for its Rozelle office.

Introduction

What is urban design?

Urban design is both a process and a product, as captured in these two definitions:

“Urban design is the generally accepted name for the process of giving physical design direction to urban growth, conservation and change. It is understood to include landscape as well as buildings, both preservation and new construction, and rural areas as well as cities.”

Jonathan Barnett 1982

“Urban design... is ...the process and product of making and designing cities.”

Jacquelin Robertson 1985

The process of providing physical design direction to the development of human settlements should lead to good physical, functional and aesthetic design outcomes and successful places.

In NSW urban design is applicable to a variety of locations: the wilderness landscapes of the Pacific coast and New England tablelands; rural landscapes such as along the Hume and Newell highways; villages such as Nabitac and towns such as Moree; provincial cities such as Coffs Harbour; regional cities such as Newcastle and Wollongong; the landscapes of Sydney Harbour and rivers of New South Wales whose waterfronts accommodate boating and wharf infrastructure; and, Sydney as a global metropolis.

Jonathan Barnett’s definition is particularly appropriate for Transport for NSW where a process and design direction is needed for the complex work and multi disciplinary teams; the work is across the state in urban and rural contexts; the network involves as much landscape as built form; and the work done incorporates both management of the transport network as well as new projects.

Urban design in transport

Transport infrastructure is a major part of our settlements. The full scope of projects cuts across administrative, physical and cultural boundaries as well as professional and contractual ones. Project teams need to think across these boundaries as to how infrastructure contributes to and fits into the whole NSW landscape.

A transport authority is important in that it manages and develops this portion of our cities and landscapes and also because it sets an example to other organisations. These include other authorities involved in building things but also, and more importantly, other transport authorities such as councils and private sector operators.

Road and maritime infrastructure is an important part of the built and natural environment for a number of reasons:

- ▶ It has a major influence in shaping settlements. Roads and streets provide an underlying structure for an area and are a key part of the overall transport infrastructure accommodating different modes of movement, connecting areas, providing access to developments, communities, parks and waterfronts are a key part of the physical fabric of our cities.
- ▶ Interchanges of all types – form focal points in the built environment around which communities can develop.
- ▶ It is a major visual feature in the built and natural landscapes; road, rail and bridges can be impressive and attractive feats of engineering which add visual interest and identity to the environment, or, if not designed well, can be visually unappealing and fail to be embraced by the community.

- ▶ It is the means by which travellers experience the built and natural environment, appreciate the historical and cultural landscape, and understand their whereabouts.
- ▶ Roads and streets are a major part of the public space between buildings: depending on their scale and location roads and streets can provide the setting in which we stroll, eat and drink, shop, experience trees and landscape, use public buildings and ride bicycles, thereby contributing to the character and vitality of settlements.

In relation to transport infrastructure, urban design brings together all of these considerations to achieve an integrated and context sensitive design and quality infrastructure. This involves 'thinking beyond the pavement', that is, considering more than just engineering or other criteria.

In time as Transport evolves, it is suggested a single design document could unify the urban design approach to all projects.

New Challenges and Opportunities

Design direction cannot stand still in the light of constant institutional, infrastructural and built environmental change. Since the last update in 2014, the following developments have taken place and addressed in this update:

- ▶ Transport for NSW has published 'Future Transport 2056' and the Greater Sydney Commission has published 'A Metropolis of Three Cities' to guide the Greater Sydney area. These two documents address the importance of liveability, sustainability and productivity (the key pillars of urban design); the need to consider both movement and place in providing transport; and the development of Greater Sydney as three cities (Parkland, River and Harbour) and five districts all with distinct values and characteristics.
- ▶ The development of a Transport Reconciliation Action Plan and the need to embed Aboriginal engagement principles and design input into our processes and projects.
- ▶ The importance of working towards achieving zero harm and the imperative to make sure people are safe in their work and leisure time.

- ▶ The transport infrastructure program is of an unprecedented scale with potentially massive city and region shaping consequences and opportunities.
- ▶ The Greater Metropolitan area of Sydney is itself experiencing a quantum change in the scale and speed of urban growth and development. Development should be coordinated with road and transport related infrastructure.
- ▶ Transport now needs to address the Greater Sydney Commission, the new 'design object' in environmental legislation, the goal of establishing a metropolitan 'green grid', urban transformation areas and new Council boundaries and responsibilities.
- ▶ The need to address the impacts of technological change and innovation on mobility, road environments and urban areas.
- ▶ The growing demand and expectation for the provision of active transport by way of pedestrian and bicycle movement within and across our road corridors as part of daily life.
- ▶ A greater awareness of the quality of our built environment and the concepts of place and place-making.
- ▶ A greater appreciation and connection to our waterways – the harbours, rivers, creeks, lakes and dams, identified as the 'blue grid'.



The south coast landscape is a place, the towns of Berry and Gerringong are also places, sections of roads and streets within those towns are places, and beaches, river bends and valleys are places too. All these places are precious to communities and any work within them must protect or improve their qualities. Understanding this is a pre-requisite for a good project manager and vital to the reputation of the Government.

Beyond the Pavement as part of a whole of Government urban design approach

The first editions of Beyond the Pavement in 1999 and 2009 were early urban design direction documents in NSW.

In 2011 'Creating Places for People', the Federal Urban Design Protocol was published and set down requirements for good design for communities, addressing liveability, sustainability and productivity. The direction taken in Beyond the Pavement supported the Protocol.

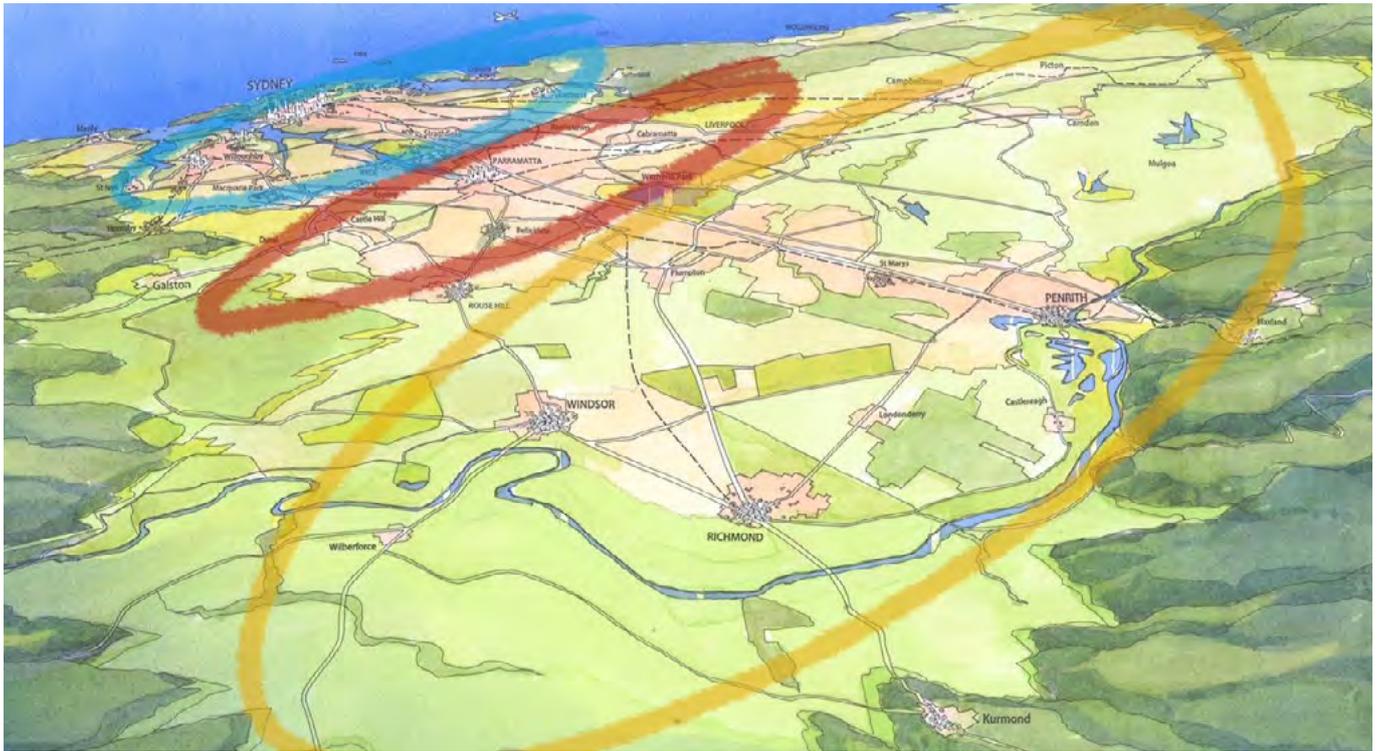
In 2017 'Better Placed' was published by the NSW Government Architect to promote good design and support the NSW Planning Act.

'Better Placed' sets down seven overarching objectives that should be applied to all public work.

- ▶ Better Fit
- ▶ Better Performance
- ▶ Better for Community
- ▶ Better for People
- ▶ Better Working
- ▶ Better Value
- ▶ Better Look and Feel.

"Beyond the Pavement has through two decades remained relevant, practical and achieved substantial results in the work carried out in the cities and regions of NSW. Good design outcomes and an integrated approach to our transport infrastructure is of vital importance to us all. This new version refreshes the approach and continues the good work."

Abbie Galvin, NSW Government Architect



Sydney exists in a vast landscape setting bounded by the mountains, rivers and sea, influenced by millennia of Aboriginal interaction and care of the landscape and centuries of migration. The planning of the Greater Sydney area recognises the scale and potential of the area with the promotion of three cities – the western Parkland City (yellow), The central River City (red) and the eastern Harbour City (blue). All three lie within the broad boundaries of the Darug and Eora Nations. An awareness and respect for this extraordinary setting and history – and a measure of humbleness – is vital in designing and building the city and its infrastructure successfully.

These are not specific to transport and Beyond the Pavement, translates these into the four Physical Urban Design Objectives, the three Urban Design Performance Requirements and the nine Urban Design Principles which are consistent with the Better Placed approach.

‘Greener Places’ also produced by the NSW Government Architect, guides the provision of green infrastructure – the green spaces, parks, rivers, tree lined streets and roads and gardens – and a high quality tree canopy cover to cool hot urban areas. Beyond the Pavement supports the ‘Greener Places’ approach and through its objectives, requirements and principles, as well as the associated Landscape Guideline, helps deliver greener places.

Since ‘Better Placed’ the NSW Government has produced the ‘Connecting with Country Draft Framework’ and the ‘Designing with Country Discussion Paper’. These set down the need to recognise Country, Aboriginal peoples connection to it, and listening and responding to Country in all planning, design and delivery work in Australia. This enriches our built environment, improves our lives and helps with reconciliation. The Beyond the Pavement process is one mechanism to integrate connecting with Country into design.

The Movement & Place initiative, which drives a consideration of both transportation and the quality of the built environment, embraces Beyond the Pavement as an urban design tool for developing and delivering high quality roads and streets. Beyond the Pavement is one of the suite of M&P documents. Beyond the Pavement also supports the Design of Roads and Streets Manual which addresses the form and the design outcomes for a range of road and street typologies in each of the M&P Quadrants.

‘The Future Transport Strategy’ sets down a goal of connecting communities, supporting successful places and enabling a strong economy. Beyond the Pavement is a design tool that helps project managers, engineers and urban designers deliver this goal.



Urban design encompasses the shaping of the full scope of a settlement or development in its landscape and cultural context. Transport influences or is responsible for a significant portion of the built environment — in this image the Sydney Harbour bridge, the harbour and its wharfs, roads and streets, the rail line and station, signage, lighting, toll gantries, street trees, the Ennis Road enclosed viaduct space (now offices), a new lift onto the Harbour Bridge and a short tunnel along Burton Street. This whole image forms an integrated built and natural landscape.

The scope of urban design

Everything we do in planning, designing and managing transport infrastructure has urban design implications because our projects affect people's lives in terms of enjoyment, business, health and many more things.

The Beyond the Pavement approach applies to all physical road and maritime projects and activities, including but not limited to:

Road and motorway infrastructure

- ▶ Arterial road upgrades, new highways and motorways, bypassed roads, road bridges, tunnels and viaduct retrofits and the networks of they are part.
- ▶ Shared paths and pedestrian and cycle bridges.
- ▶ Maintenance and management of road bridges and road types from motorways and main roads to roads and streets in town centres.

Traffic management infrastructure

- ▶ Traffic facility and intersection improvement design and associated road corridor improvement related to traffic efficiency.

Freight infrastructure

- ▶ Freight road networks to serve economic development, truck stops, rail bridges over road and road connections to multi modal freight terminals.

Road based public transport

- ▶ Bus transit ways, BLines, bus stations, bus stops and bus priority facilities.



Active transport

- ▶ The design and provision of bicycle and pedestrian networks and projects including bridges.

Maritime infrastructure

- ▶ The upgrade and redevelopment of wharfs (the geographic scope of maritime covers all rivers in New South Wales as well as Sydney Harbour).

Heritage and art

- ▶ Heritage conservation, adaptive reuse and interpretation work in general.
- ▶ The embedding of art into project design as well as the inclusion of art pieces.
- ▶ Aboriginal engagement and collaboration in the design of projects.

Project elements

- ▶ Project elements such as noise walls, road furniture and lighting.

Landscape

- ▶ The dynamic managed landscape associated with places, projects, roads, streets, parks and project elements in urban environments.
- ▶ The design of landscape systems associated with the repair of impacted landscape, creation of new landscape, cuttings, medians and batter designs, river diversions and rest areas in rural environments.

How this document is structured

Section 1 – Urban Design Approach: Thinking Beyond the Pavement

This section sets out the approach to urban design. It outlines the purpose of adopting an urban design method and contains the objectives, requirements and responsibilities for urban design.

Section 2 – Managing urban design in infrastructure projects

This section sets out the requirements and processes to manage and carry out urban design throughout the lifecycle of infrastructure projects. The procedures described are consistent with project management systems for major and smaller projects.

Section 3 – Urban design principles

This section describes nine key principles of urban design that should be incorporated into infrastructure projects.

The purpose of these principles is to provide direction for the physical design of infrastructure projects and to help project and design teams and network planning teams produce projects, networks and corridors of high quality. But these are not a set of rules to be dogmatically followed.

Appendices

The document is supplemented by:

- ▶ An appendix outlining how past projects, designed and built according to urban design principles, turned out and are performing and the lessons learnt.
- ▶ An appendix covering the international perspective on the urban design of transport infrastructure.
- ▶ An appendix on the design methodology for projects, to be considered by urban designers.
- ▶ An appendix identifying the principles for Aboriginal engagement in the urban design process and product.

These appendices are followed by a glossary of terms used in this document, a list of figures, and a list of references and documents for further reading.



Beyond the Pavement was first published in 1999. It was rewritten and published as a policy in 1999, refreshed and updated in 2014 and now updated for TfNSW two decades since in inception.

1

Urban design
approach:
Thinking Beyond
the Pavement

1.1 Approach

An urban design approach should be adopted on all road and maritime infrastructure related work that affects the quality of the built, natural and community environment, as set out in this document.

Urban design should be integrated into the process of planning, developing, delivering and managing transport assets.

Project teams should ‘think beyond the pavement’ – that is consider the broader context of which infrastructure is a part as well as the broader government framework and agenda to which our projects should contribute.

Project teams should ‘think beyond the pavement’ – that is consider the broader context of which infrastructure is a part as well as the broader government framework and agenda to which our projects should contribute.

1.2 Purpose

The purpose of this approach is to deliver high quality transport infrastructure, by:

- ▶ Understanding and protecting, as far as possible, the qualities of the landscape and the built environment.
- ▶ Considering the qualities of our culture, the deep history as well as the more recent history, in our design and management processes
- ▶ Contributing to the quality and health of the built environment in urban and rural contexts and leaving a legacy for the future.
- ▶ Protecting and improving the quality of life of communities – their liveability and attractiveness for investment – in terms of physical connections, access to facilities, noise minimisation, views, safety and security and sense of place.
- ▶ Achieving memorable and not mediocre infrastructure that serves a purpose to communities, regions, states and Australia.

1.3 Physical design objectives

The scale of involvement of urban design should be pitched to the complexity, sensitivity and value of the project – in consultation with the Urban Design Roads and Waterways team – however road and maritime infrastructure projects should adopt the four main physical design objectives:

- ▶ Projects should fit sensitively into the built, natural, and cultural environment in both urban and rural locations.
- ▶ Projects should contribute to the accessibility and connectivity of communities and a general permeability of movement through areas by all modes of movement.
- ▶ The design and management of projects should contribute to the overall design quality of the public domain for the community, including transport users.
- ▶ Projects should help revitalise areas and contribute to the local and broader economy.

1.3.1 Sensitivity to environments

Road and maritime infrastructure should be in harmony with and, as far as possible, protect the scale and unique qualities of the places in which it is situated:

- ▶ It should fit sensitively into its natural setting – the landform, landscape, natural patterns and systems, vegetation and ecology of a place, and harbour and river environments.
- ▶ It should fit sensitively with the form and scale of the built environment and respond to the community and cultural setting in terms of where people meet, visit, recreate, work or shop, and the places that are special to them. In this it should recognise and incorporate an understanding of the cultural qualities of the place – the Aboriginal cultural Connection to Country, the ethnicity, artistic and spiritual qualities of place and the scenic qualities – all of which make somewhere valued.
- ▶ It should be built in communication and consultation with the community, the traditional owners of the land and all those impacted by the work.

This responsiveness to environments is also referred to as ‘context-sensitive design’.

1.3.2 Accessibility and connectivity

The planning and design of roads, bridges, wharfs and related infrastructure should provide good safe connections and movement options for people by:

- ▶ Enabling a proximity to amenities and minimising the time and effort involved in travel.
- ▶ The frequency and ease with which they can cross major roads.
- ▶ Their connectedness with other communities and parts of the urban environment.
- ▶ The ease of road access to rail stations, ferry wharfs and bus stops and how well buses service residential areas.
- ▶ How well environments allow for walking and cycling, for people of all ages and abilities.

Urban design is as much concerned with functionality and the dignity of all people being able to move freely around, as it is with the quality and character of place.

1.3.3 Public domain quality

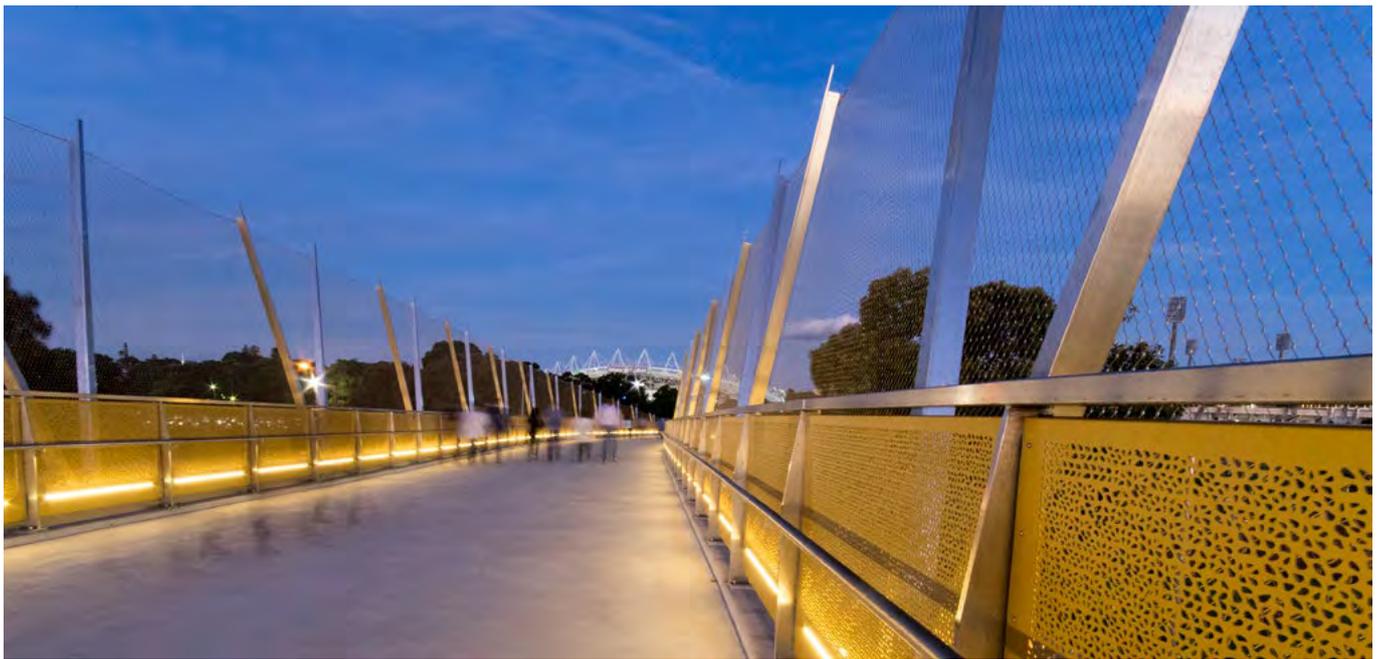
Roads, transit ways, bridges, tunnels, wharfs, bicycle and pedestrian paths, all roadside elements and noise walls should be designed as a valued part of the public domain. They are major built elements, can add character and help transform areas for the greater good, for example:

- ▶ The presence of vegetation contributes to the uniqueness of a place, the ‘greening’ of a corridor or city and the overall tree canopy cover of an area (and all the benefits that provides).
- ▶ The retention of views helps define the scenic quality of a journey.
- ▶ The design quality of structures and elements — the architecture of the infrastructure — contributes to how a place looks and feels and how safe, robust and durable it is.
- ▶ At the finer, more human scale, roads can function as liveable streets for communities — walkable, landscaped, well lit, interesting and safe.
- ▶ The road corridor may include art — artistic input to the design of transport elements, the use of sculpture or the use of paintings and graphics.
- ▶ Improvements to the public domain may extend beyond the corridor, such as the main street of a town where through traffic is removed by the building of a town bypass.
- ▶ The quality of the public domain can be adversely affected by visual clutter, for example, poor placement and proliferation of signs.

1.3.4 Revitalisation

Projects should be productive and serve to enhance the economy and viability of areas through taking the opportunity to:

- ▶ Minimise crime through good passive surveillance and vandalism avoidance techniques.
- ▶ Improve project areas by managing contamination, removing weeds, reducing noise and repairing derelict land.
- ▶ Connect missing links in walking and other routes to provide shorter access to shops, businesses and other transport modes.
- ▶ Reuse residual land positively for open space or business use.
- ▶ Improve the environmental quality of the area (shade, seating, lighting etc) which improves pedestrian activity, raises the attractiveness and value of business and property and reduces crime.
- ▶ Contribute to businesses by ensuring good brand visibility, customer access and quality spaces commensurate with the business needs.
- ▶ Incorporate creativity and artistic input into an area to add interest, vibrancy and patronage of places.
- ▶ Provide space for social interaction and entrepreneurialism (markets, buskers)



Through liaison with the NSW Heritage Council, the Government Architect and the Urban Design Roads and Waterways team, an integrated urban design and engineering process was adopted at the outset for the Albert Tibby Cotter Walkway. An innovative steel box girder was designed to deliver the span requirements across Anzac Parade with specially shaped piers in alignment with the fig trees. The need for compliant access grades was delivered through two ramps curled into compact spirals creating a ribbon effect overall and a dramatic sense of arrival and departure. A perforated screen was used which combined lighting and leaf motifs in a gold colour to recognise sporting achievement and the underside of the Morton Bay fig leaves. The safety screen utilises a tensile mesh which allows good views and is practically transparent from a distance. The bridge connects the stadium precinct with Central Station and was designed to integrate with the light rail project and its bridge across the Eastern Distributor and a walking connection along Devonshire Street. The bridge is mainly used for events and transports over a third of a million people per year at the most recent counts. It also connects the two sides of the park with a 6 metre wide route, used by walkers cyclists and horse riders, avoiding the need to cross this busy road.

1.4 Urban design performance themes

The physical urban design objectives must be achieved in a safe, cost effective and sustainable manner. For this to occur, safety, cost effectiveness and sustainability needs to be considered throughout the design process. They should form part of design reporting at all project stages, as far as is appropriate.

1.4.1 Safety and towards zero harm

“Feeling safe is crucial if we hope to have people embrace city space. In general, life and people themselves make the city more inviting and safe in terms of both experienced and perceived security.”

Jan Gehl 2011

Transport has a strong safety culture. It adopts an approach whereby infrastructure, vehicles, people and movement are all addressed in the design and management of networks so that no harm befalls anyone.

The consideration of safety applies to all activities; therefore promoting safety is integral to an urban design approach to road and maritime infrastructure. This includes safety for construction and maintenance workers building and looking after our design outcomes; safety for the community and users of our projects in that design principles and standards are addressed; safety in terms of designing places that prevent or mitigate crime; and safety in terms of providing places that contribute to the long term health of society.

- ▶ All design should comply with engineering requirements – the location, size and suitability of trees and other infrangible objects must be considered, as should good visibility so pedestrians, cyclists and drivers can safely interact.
- ▶ Good design should lead to safe maintenance, particularly of the landscape, so that grass cutting and tree management can be carried out without risk or harm to workers.

- ▶ An urban design approach to roads and tunnels can contribute to safer driver behaviour by avoiding confusion, reducing monotony and providing visual clues to improve the ‘legibility’ of the road and its speed conditions.
- ▶ Frangible vegetation in rural areas can be used as a safety measure – it can reduce headlight glare or cushion the impact of cars accidentally leaving the road.
- ▶ Road network and road corridor planning should help avoid future conflicts between higher speed through traffic roads and town centres and communities.
- ▶ Design should lead to good passive surveillance of pedestrians and cyclists by other road users and nearby residents. The principles of Crime Prevention Through Environmental Design (CPTED) should be ensured.
- ▶ Designs must be able to be built safely – this has particular relevance to planting on steep cuttings and besides high speed roads.
- ▶ The needs of the vision and mobility impaired and the elderly should be considered in design.
- ▶ Places need to be designed for individual and collective human safety by day and night and made resistant to hostile vehicle attacks.
- ▶ Safe long term environments should be created so that the harmful effects of the sun, noise and poor air quality are minimised.
- ▶ Safety and the trauma caused by unsafe situations should be considered as a spectrum with harm at one end then stress, comfort and well being at the other end.

1.4.2 Cost effectiveness and value

Infrastructure projects are justified for funding when the financial benefits outweigh the costs. This is measured using a Benefit Cost Ratio (BCR). A high BCR is usually preferable – however the size and nature of the project, the context of the area and the contribution to the corridor, region, state or nation need to be taken into account.

Generally the actual physical costs of a project are easier to work out than the benefits. There are few widely accepted standards for calculating the value of good design, such things as shade from trees, a well-designed building or bridge, artwork, retention of heritage, integration of parkland, cycling and walking opportunity or a safer, cleaner environment.

Importantly the cost of avoiding weeds, the cost of a failed batter because of poor landscape, the reputational cost of a poorly accepted project outcome and the ensuing difficulties in approvals for other projects are all also difficult to calculate but very real.

However despite being hard to calculate good design has always been effective in adding value to cities and places and helping gain community and customer acceptance. Areas that offer good accessibility for all transport including walking, that have safe tree lined roads and streets, that include public spaces, and thoughtful well cared for buildings and structures and have minimal vandalism will be desirable to people.

Knowing that good design has wider benefits does not excuse urban designers from caring about cost. Governance is about the wise use of resources and good designers need to make sure cost is considered as an urban design issue. Some further cost issues include:

- ▶ Good design, if considered early enough, is very often cost neutral and is simply a different, better way of thinking about a project.
- ▶ An urban design approach can help to reduce cost, for example: minimising cut and fill; minimising use of structures such as noise walls and retaining walls; avoiding unnecessary land take and awkward parcels of residual land that then need to be maintained; deterring vandalism through clever design, artworks and use of robust, durable materials; and avoiding the need to mitigate impacts.
- ▶ Adopting an urban design approach means thinking about maintenance and whole of life costs. It is usually better to produce a higher quality more durable design outcome, of value to the community and travellers, than to introduce ongoing maintenance liabilities and higher operational costs of cheaper products.
- ▶ Urban design should not be misinterpreted as solely a way of adding features to a project or compensating for poor design. Refinement and simplicity (ie elegance) are generally preferable to additions and complexity.
- ▶ Once the optimal scope and cost parameters of a project are agreed – which should be based on transport, economic and urban design or ‘place’ factors – it is essential that urban design outcomes are delivered within the framework of the allocated project budget.

“There is hardly anything in the world that someone cannot make a little worse and sell a little cheaper, and the people who consider price alone are that person’s lawful prey. It is unwise to pay too much, but it is also unwise to pay too little.”

John Ruskin 1819–1900

1.4.3 Sustainability

An urban design approach can facilitate sustainable infrastructure and sustainable living in many ways. The following should be used as a checklist by project teams and urban designers:

- ▶ Achieve Transport's Net Zero and emission reduction targets, and climate resilience targets.
 - ▶ Create a transport network that is resilient, responsive and optimally adapted to climate change.
 - ▶ Embed performance-based sustainability outcomes into the planning, design, construction and operation of all Transport assets and services.
 - ▶ Achieve longevity through durable, relatively low maintenance outcomes that transcend the fashions and styles of the day.
 - ▶ Use lower energy products where possible such as recycled products, geo polymer concretes, LED lamps.
 - ▶ Facilitate good connections for walking and cycling, reducing the need for motorised travel – ideally at least to an equivalent length to the road and support good integration with public transport.
 - ▶ Integrate green infrastructure – and all its ecological and cleaning benefits – into road corridors, drainage systems and projects.
 - ▶ Incorporate and adaptively reuse natural and cultural heritage into a project's location and design.
 - ▶ Use water sensitive design approaches to clean water, irrigate landscape and avoid structural drainage systems
 - ▶ Pursue the wise use of resources on a project, balancing cuts and fills and using excess site won materials to enhance the urban design outcome (flattening batters, mounds and false cuttings instead of noise walls, artistic landforms in rest areas, interchanges, using local stone in the project walls and spaces, and so forth).
- ▶ Consider the sustainability of the supplier or source, in the use of all products and materials.
 - ▶ Assist in the cooling of cities and reduction of urban heat islands through providing tree canopy, vegetation on surfaces (cooler than most other surfaces) and where practical using higher albedo (lighter, less heat absorbent) surfaces.
 - ▶ Strive to make project elements serve multiple purposes (for example bridge under croft space utilised for buildings or sports facilities, lighting for safety and for architectural interest, fauna crossings that contribute to active transport, bridge elements and walls that integrate art, noise mounding that contributes to open space, landscape that serves ecological, water quality and amenity objectives).
 - ▶ Provide opportunities for the use of photovoltaic cells on buildings and walls to generate power for low energy functions such as lighting.

“Nature is a dynamic process that is rarely independent of human interaction. Nevertheless, we must intervene in a way that facilitates, rather than disrupts natural (and social) processes.”

Gary Strang, Infrastructure as Landscape

The Anzac Bridge strengthening project, in which the Urban Design Roads and Waterways team played a major role, has made the bridge a safer place with more substantial fences and robust cables; it has been cost effective by improving the maintenance costs of looking after the bridge through new walkways and lifts; and it has improved the sustainability of the infrastructure through improved cable covers, cable connections and shock absorbers extending its life by many years.







The strengthening project adopted Beyond the Pavement principles and was an integrated engineering and urban design exercise. The urban design vision for the bridge guided the engineering solutions, avoided clutter and visual degradation, helped the team choose equally viable options (but differing in appearance), and helped achieve a sleek design that fitted the aesthetic of the structure and preserved good views to and from the bridge. As a result the visual impact assessment process went smoothly and successfully with the community and stakeholders.

1.5 Responsibilities for urban design

Urban design is a collaborative effort, both within the organisation and with the design and delivery contractors it uses. Good design is the product of both client and the contractor working together, excelling in their roles. Both are equally responsible for the urban design outcome and both have to play a role if the project is to be successful.

The following are the discipline and business responsibilities for implementing this urban design approach.

1.5.1 The Urban Design Roads and Waterways team

The Urban Design Roads and Waterways team is a group of professional architects, landscape architects and urban designers experienced in urban design policy, collaborating across relevant professional institutes, working across government, industry and academic and research sectors, and integrating with engineering, traffic, transport, planning and environment expertise. It is responsible for:

- ▶ Developing and managing high level urban design direction across the organisation from a central point of view to achieve overall urban design quality on projects across the state.
- ▶ Setting the preconditions, guiding and reviewing planning and assessment work and facilitating and monitoring good urban design outcomes on all infrastructure programs and projects consistent with this document.

- ▶ Enabling a whole of government perspective and international perspective to bear on infrastructure work.
- ▶ Providing education and training in urban design and how it is applied.
- ▶ Sharing project knowledge and experience across the whole of Transport and helping achieve consistency in overlapping project and divisional programs of work.

In response to these functions the Urban Design Roads and Waterways team works as a strategic group. It is involved in projects at all phases, but is not embedded in regions or the individual projects themselves. It coordinates a shortlist of urban design contractors for use in project teams and acts as the interface in project issues.

The Urban Design Roads and Waterways team provides services and advice to project teams in terms of briefs, client requirements, Scope of Works and Technical Criteria, training, reviews, convening of panels and review groups, tender assessments, assistance in multi criteria analysis and value engineering, urban designer selection, resolution of urban design options, strategic design solutions, design advice presentations of projects to design interested customers, stakeholders and the community and monitoring of construction and maintenance.



Figure 1 The scope and breadth of the Urban Design Roads and Waterways team's role. It is important for those who develop urban design policy to be engaged in the promulgation and implementation of that policy.

1.5.2 Project engineers and designers

Project technical advisors – including geotechnical, civil and structural engineers and road and bridge designers – need to consider this approach and, in particular, the compendium of urban design guideline documents on bridges, noise walls, slope stabilisation and tunnels. The application of all guidelines and standards should be applied with common sense, lead to holistic solutions and serve the objectives of the Beyond the Pavement. Where solutions are not clear cut a context sensitive approach should be followed considering community and safety issues and risk management practices should be adopted.

1.5.3 Project directors and managers

Project managers and project directors, project office directors, program managers and asset managers dealing with major and minor projects, should use this document, champion and nurture good design and liaise with the Urban Design Roads and Waterways team.

On large or complex projects directors and managers should utilise urban designers from the Registration Scheme for Construction Industry Contractors who should be integrated into the project management process.

The use of urban design contractors familiar with Beyond the Pavement is an important mechanism that can help the Urban Design Roads and Waterways team facilitate good urban design outcomes across a large number of projects. It gives project managers direct and daily access to professional urban designers.

1.5.4 Other disciplines

This document also has value to:

- ▶ **Environmental managers and officers** who facilitate the environmental assessment, documentation and approval of infrastructure projects. These personnel should collaborate with project managers and the Urban Design Roads and Waterways team so that urban design and environmental assessment processes are integrated.
- ▶ The **Aboriginal engagement teams** who manage matters relating to Aboriginal cultural heritage and support greater participation by Aboriginal people in our infrastructure projects
- ▶ Staff involved more generally in **community involvement and communications**: the design of a project is often challenged by the community and stakeholder interests and an understanding of the principles in this document and what it can achieve will assist such staff in providing information and contributing to important negotiations.
- ▶ Staff involved in the development of **strategies, plans and designs** for road networks and road corridors, transit ways, strategic bus corridor routes and facilities, plans and facilities for walking and cycling and in ferry wharf upgrades and redevelopment.
- ▶ Those involved in **freight network efficiency** and related upgrades and facilities across the road network.
- ▶ Those responsible for **traffic management** including elements such as intersection designs, fixed signage, variable message signage, pinch point improvements, clearways and the like, as well as overall network efficiency. Traffic management has a huge impact on the quality of the built environment and needs to be done with urban design outcomes in mind.
- ▶ Staff responsible for **road safety policies and advice**: urban design can make an important contribution to safer roads and safer communities. Urban design specialists must address safety requirements and standards in their work.
- ▶ **Property managers** and those responsible for the purchase, development or sale of Government land: an urban design approach can help realise the full potential of land and increase land values.

1.5.5 Urban design contractors

The urban design contractor is primarily expected to:

- ▶ Carry out contextual analysis and refine the Beyond the Pavement physical urban design objectives and design principles as applicable to the project.
- ▶ Contribute to the design of the project — in the whole and in parts — in collaboration with the project manager and other team members in accordance with the agreed objectives and principles, Transport urban design guidelines and the performance requirements, and processes in this document.
- ▶ Contribute to the assessment of project impacts in accordance with the Guideline for Landscape Character and Visual Impact Assessment and help to avoid or minimise these impacts in the design of the project.
- ▶ Prepare relevant urban design documentation and contribute to the preparation of environmental documents for project approval.
- ▶ Help communicate a project's urban design principles and ideas to communities, Government agencies and other stakeholders. This could include graphics, models, visual simulations and presentations. These tools can be used to develop and test designs with the team.

1.5.6 Engineering contractors

Engineering contractors are expected to:

- ▶ Integrate urban design into their projects.
- ▶ Manage urban designers as part of their teams in accordance with this document.

1.6 Evaluation

The Urban Design Roads and Waterways team is responsible for the monitoring and review of this document. Its success will be evaluated against:

- ▶ The corporate documents and the degree to which urban design helps the aspirations of customer focus, efficiency and effectiveness and impact and reputation.
- ▶ How the project has responded to the performance requirements and the design principles set down in Section 3.
- ▶ The extent to which a project meets the agreed urban design objectives and the scope and quality of works required in the project's technical criteria and deed.

1.7 Related information

A number of detailed guidelines, dealing with specific issues and elements, are produced as a suite of documents on a continuing basis according to the needs of the organisation and government. These should be read as a related part of this approach.

The Urban Design Roads and Waterways team also produces discussion papers which, while not strictly guidelines, are generally based on research and intended to promote ideas and potential solutions around particular issues of urban design that can help improve the infrastructure work that is carried out.

There are also program urban design frameworks, practice notes and special standards that make good points of reference for project design. These are all listed below.

1.7.1 Road and maritime urban design guidelines

- ▶ Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW.
- ▶ Shotcrete Design Guidelines: Design guidelines to avoid, minimise and improve the appearance of shotcrete.
- ▶ Noise wall design guideline: Design guidelines to improve the appearance of noise walls in NSW.
- ▶ Designing to minimise vandalism (draft) The Underpass Design Guideline
- ▶ Landscape design guideline: Landscape design and maintenance guidelines to improve the quality, safety and cost effectiveness of Green Infrastructure.
- ▶ Water Sensitive Design Guideline: applying water sensitive urban design principles to NSW transport projects
- ▶ Tunnel Urban Design Guideline: Design guideline to improve the customer and community experience of road tunnels

1.7.2 Urban design research and discussion papers

As needs dictate the Urban Design Roads and Waterways team produces discussion papers to raise awareness on arising issues or as precursors to a guideline. Discussions papers have been produced on a range of subjects including:

- ▶ Safer Designed Places: A discussion paper on the potential on the potential of urban design to create valued public environments resistant to vehicle based terrorism, 2017
- ▶ Under the Viaduct: a joint paper with ARUP on the use of bridge undercroft space
- ▶ Land bridge discussion paper. Re stitching the Built and Natural Environment, Centre for Urban Design, 2017
- ▶ Valuing Design, a joint paper with Jacobs on applying a financial value to good design practices.

1.7.3 Current urban design frameworks

From time to time urban Design Frameworks are needed to help achieve consistent quality and approach along a corridor or program of work delivered in stages.

- ▶ New England Urban Design Framework
- ▶ Westconnex Urban Design Framework
- ▶ Pacific Highway Urban Design Framework
- ▶ The Princes Highway Urban Design Framework
- ▶ The Zero Emission Bus Depot Urban Design Framework

1.7.4 Urban design practice notes and special standards

- ▶ Landscape Character and Visual Impact Assessment Practice Note
- ▶ The Pedestrian Bridge Standard as part of Bridge Aesthetics.
- ▶ Road Network Planning, Urban Design 'Place' Character Assessment ,Methodology and Guidance Notes Roads and Maritime Services – Updated April 2019

1.7.5 Other relevant policies, guidelines and reports

This urban design approach should be read and used in conjunction with other complementary publications including:

- ▶ Around the Tracks: Urban design for heavy and light rail
- ▶ Managing Heritage: issues in rail projects guidelines
- ▶ Creativity Guidelines: for transport systems
- ▶ Multi-level and at-grade Commuter Car Parks urban design guidelines
- ▶ Towards zero NSW Government Road Safety Plan 2021
- ▶ Transport for NSW Disability Inclusion Action Plan 2018–2022
- ▶ Transport for NSW Reconciliation Action Plan
- ▶ NSW Government Architect Better Placed, Greener Places and associated publications
- ▶ Balancing Movement and Place A Practitioners Guide
- ▶ Design of Roads and Streets Manual

Road and maritime urban design guidelines



Road and maritime design discussion papers

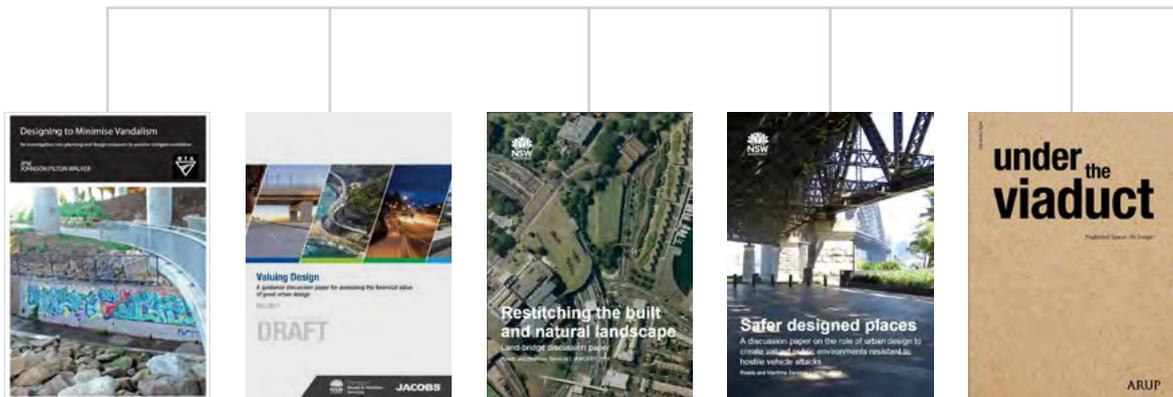
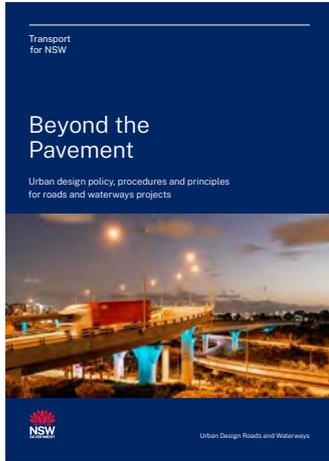


Figure 2 Suite of urban design documents

Road and maritime urban design approach



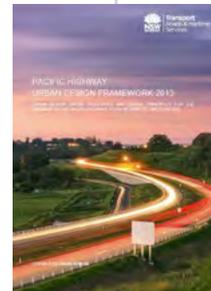
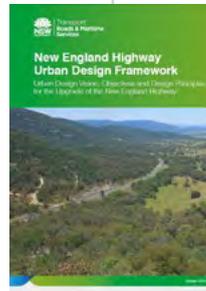
Landscape character & visual impact assessment



Environmental Assessment Planning Approvals



Urban Design Frameworks



2

Managing
urban design in
infrastructure
projects

2.1 Addressing urban design as a process

Urban design involves creating infrastructure that is sensitive to its context, serves communities well and has a refined, safe and durable end product. It also enables new possibilities to occur in the urban environment and innovation in the design of infrastructure itself. It requires that a process be followed.

This section sets out the project management procedures and methodologies to achieve the desired urban design outcomes. This process to be followed is incorporated in ProjectPack, and other project management systems or practices.

There are many examples of projects and programs that have followed this process and achieved successful results.

2.1.1 Need for a strategic approach to urban design

With the scale of current infrastructure program and its speed of delivery there is a need to take a strategic approach both across the program as a whole and on individual projects in order to keep the big picture and not lose sight of what is important in the quality of what we do. This is not to say that detail is unimportant; as is often recognised, ‘the devil is in the detail’. The art is to keep both the strategic and the detail in mind.



Essentially, this means the following:

- ▶ Urban design frameworks and strategies are important for whole projects, corridors and networks.
- ▶ Adopting a 'Movement and Place' approach to road network planning will set the conditions for future work that will respond to communities and places.
- ▶ Projects need to link to the broader urban design goals and initiatives of government . For example the Greater Sydney Commission plans and 'Better Placed'.
- ▶ We should always identify what is essential to select and concentrate on to get the greatest effect and if necessary let the rest take care of itself.
- ▶ Decision making should consider project benefits that go beyond conventional benefit-cost analysis.
- ▶ Possibly the most strategic action is to get the key players together at the start of a project, conduct an open process of debate and agreement to collaborate, include independent thinkers and practitioners capable of challenging the conventional wisdoms and involve key decision makers.



While a rail project and not directly the subject of this document, the light rail project in Newcastle demonstrates the delivery of good urban design principles. The project helps revitalise the town centre, improve physical and visual connections between the town and its waterfront and provide an accessible high quality transport choice through the city centre from the rail station. The project has led to major improvements to the public domain including to the footways, urban tree canopy as well as seating and open space.

2.1.2 Integrating urban design into the project management process

All scales and types of project need to be thought about in terms of their urban design. Large, complex projects need to factor in urban design thinking from their inception, as set out in ProjectPack. Smaller projects also need to address urban design from their inception, but may need less involvement because of their smaller scope and shorter duration.

The following sections provide guidelines on how to incorporate urban design into project management. They should be tailored according to the scale and type of project.

Figure 3 Urban design as an integrated part of the project management process

Phases	Sub phase	INSW Gate	Key Urban Design Activities
Project initiation		0 (justification)	<ol style="list-style-type: none"> 1 Urban Design Roads and Waterways team to provide input to business case, cost and value assessments, 'Route Network Plans' and project justification. 2 Advise whether an urban design framework is required, assist in engagement of registered urban design contractor to prepare urban design framework and review the framework.
	Strategic assessment	1 (Strategic assessment)	<ol style="list-style-type: none"> 3 Review and provide input to urban design brief for development phase of work. 4 Registered urban design contractor to be engaged to carry out contextual analysis, develop urban design objectives (or review urban design framework objectives) and assess options against the urban design objectives. 5 Provide input to multi criteria analysis.
Project development	Concept	2 (Business case)	<ol style="list-style-type: none"> 6 Registered urban design contractor to be engaged with engineers to develop concept design as best practice integrated urban design and engineering in line with urban design framework where applicable. 7 Collaboration and co-design with the local Aboriginal people, elders, designers, and artists and Registered Aboriginal Parties to develop an understanding of place and how the project design and its elements can be shaped to provide a 'Connection to Country' for road users and the community. 8 Registered urban design contractor to be engaged to carry out landscape character and visual impact assessment in parallel with concept development. 9 Review concept design and landscape character and visual impact assessment.

Phases	Sub phase	INSW Gate	Key Urban Design Activities
Project delivery	Delivery readiness	<p>3 (pre tender)</p> <p>4 (Tender evaluation)</p>	<p>10 Review urban design brief or Scope of Works and Technical Criteria.</p> <p>11 Registered urban design contractor to be engaged with engineers to develop detailed design in line with concept design and urban design policy and guidelines.</p> <p>12 Review detailed design and/or tender submissions.</p>
	Delivery	<p>5 (Pre-commissioning)</p>	<p>13 Where necessary Urban Design Roads and Waterways team to input into Design Review Panels and review all submissions to Panels for compliance with Beyond the Pavement</p> <p>14 Project built in accordance with integrated urban design and engineering design. Urban Design Roads and Waterways team to be involved in monitoring of implementation. Landscape asset advisors involved in landscape implementation review.</p>
Project finalisation	Finalisation	<p>6 (post implementation)</p>	<p>15 Post completion reviews and lessons learnt workshops. (Potential policy and guideline review)</p> <p>16 Urban Design Roads and Waterways team landscape asset advisors to be involved in monitoring of landscape maintenance and handover to other authorities so that the landscape matures successfully and safely.</p>
Operation & management *			<p>17 Review of the network and its opportunities and deficiencies in terms of landscape quality and the ongoing achievement of successful places.</p> <p>18 Urban Design Roads and Waterways team involved in network maintenance and the issues and opportunities of the maturing landscape asset.</p>

Project initiation

In the initiation phase the broad approach to networks, programs and corridors is established. Urban design involvement at this stage is essential and at its most influential.

Network and corridor strategies prioritise future investments in new road infrastructure

Transport for NSW analyses the State Road Network, the ferry networks and active transport networks to determine their physical condition, safety record, efficiency and the future needs and opportunities arising from urban and regional growth and urban revitalisation. They then prepare strategies to manage road use, optimise existing infrastructure and prioritise future investments in new road infrastructure.

Urban design objectives and principles for a program of work, network or corridor can, among other factors, help to:

- ▶ Define a future transport network structure and character in relation to the quality of existing environments, places and the planning aims and policies for a region.
- ▶ Integrate the major arterial road network within regional transport networks and local road networks.
- ▶ Integrate public transport facilities into the road environment.
- ▶ Incorporate ecological and open space systems along and across corridors.

Network and corridor strategies provide a framework to coordinate road infrastructure within State and local land use plans. These strategies give guidance to the property and infrastructure industries, local councils, property owners and communities on how the Government proposes to manage State Roads over time.

Corridor and network urban design frameworks

Road network strategies can lead to upgrade programs such as the Pacific Highway on the north coast. Such programs require specific whole-of-corridor urban design frameworks.

The preparation of corridor and network urban design frameworks greatly assist in the planning and design of corridor upgrades. An overarching framework of urban design objectives and principles for corridors can:

- ▶ Inform the individual projects to achieve a consistent and appropriate outcome for the corridor.
- ▶ Help avoid unnecessary, repetitive and costly design work on each project in the corridor.
- ▶ Assist in the strategic location and design criteria of facilities required along the corridor, for example, rest areas.
- ▶ Provide a basis for agreement between stakeholders and Government on corridor level issues.

Corridor and network urban design frameworks recognise that:

- ▶ Corridors traverse diverse ecological landscapes and community areas.
- ▶ Regional development and transport systems affect the future form and character of road corridors and, in turn, impact on individual projects.
- ▶ Individual projects are just one part of the travel experience of the corridor and landscape in which they fit.
- ▶ While the corridor design should be unified, there is also a need for projects to be sensitive to the character of the different places through which the route passes.
- ▶ Designing each individual project as a separate entity can be costly, visually inconsistent and confusing.
- ▶ A whole-of-corridor or network approach can help lead to the best decisions regarding land acquisition and improve strategic corridor cost estimates.

Project development

The development phase involves the investigation and selection of a preferred option followed by the concept design development of a preferred route or project.

Options investigation and preferred option selection (where applicable)

Projects generally involve an investigation of options. One of the reasons for this is so that the project is appropriately scoped and situated in the best location before starting the concept design stage. There is relatively little scope for changing the project location to resolve a problem once the concept design has started.

Project or route selection must integrate urban design considerations into the options selection process. An analysis of context, formulation of urban design objectives and principles, and development of urban design criteria to measure those objectives, is an important early input (along with other criteria) to the selection of a preferred option.

This method can help achieve a future route that:

- ▶ Best fits into its context.
- ▶ Avoids or minimises at the outset impacts such as the severance of communities, the disruption of natural systems and patterns, noise, visual intrusion, the destruction of the cultural landscape and heritage, and erosion in the quality of the built environment.
- ▶ Best realises the potentials for regional development and multi-modal transport if appropriate.

Any urban design documentation carried out at this stage should be carried forward into concept design development and form part of a project's environmental assessment.

Concept design development

Once the preferred option has been decided on, the concept design is developed. The concept design must address urban design objectives and principles, that is, be an integrated engineering and urban design outcome. Project stakeholders and the community should be able to understand:

- ▶ The project's intended urban design outcomes and the benefits that go beyond narrow economic criteria. How the project fits into the natural, built and community context.
- ▶ Residual impacts (those that the concept design is unable to address) and the design mitigation measures proposed.
- ▶ At the Concept Development stage it is critical to engage with the community so that their knowledge is integrated into the analysis and design. Foremost among this, consultation must occur with the original custodians of the land – the Aboriginal community and Torres Strait Islanders – who can provide fundamental insights into its nature and meaning, what needs to be protected and what should be celebrated in the design of infrastructure.
- ▶ Cost estimation and approval at the outset should include the full urban design scope of works of a project in terms of an integrated engineering and urban design outcome.

Project Delivery

Project implementation involves a project's procurement, detailed design and construction. Project implementation translates the concept design into the final detailed design and built outcome.

Detailed design

The detailed design must:

- ▶ Be consistent with, and further develop, the approved concept design and the urban design objectives of the project.
- ▶ Achieve best practice urban design in accordance with the project budget, the required function of the project, the principles outlined in this document and supporting Transport urban design guidelines for specific elements.

Delivery methods

There are several methods of delivery that influence the design process:

- ▶ Construct-only is one contractual process traditionally used. The Government provides the design, which the contractor then builds – so design quality is directly controlled.
- ▶ Contracts that offset the design to the contractor include: design and construct; design, construct and maintain; and build, own, operate and transfer. In these cases the design work is carried out by the contractor, in accordance with a scope of works, including urban design.
- ▶ Alliance contracts require the client and contractor to collaboratively develop the design of a project. A scope is required but the alliance team has the opportunity to refine and improve it. Incentives and a collaborative environment can assist in the development of good urban design outcomes, but, similarly to other forms of contracting, good outcomes are dependent on the quality and skills of the project team.
- ▶ Unsolicited bids and the Project Deeds that follow

Detailed design brief: scope of works and technical criteria

Under these different contracts the Government provides a brief called the scope of works and technical criteria. This brief includes a section on urban design requirements, together with the relevant urban design guidelines. Compliance with design scope, including urban design, is reviewed throughout the contract with the assistance of the Urban Design Roads and Waterways team.

Whether in an alliance, design and construct or construct only process the concept design is to be developed into a detailed design that can be documented, priced and built by construction companies. Model briefs (scope of works) are available to cover the different types of contract.

The scope of works and technical criteria should allow opportunities for the design team to improve on the quality of the tendered design or find better ways of doing things.

Construction

The implementation of the detailed design must be monitored so that urban design outcomes are delivered to a high level of workmanship.

Where required, project managers should be assisted by urban design professionals who understand both design quality and contractual situations. The Urban Design Roads and Waterways team plays a critical advisory role in this process and should be consulted.



The design needs monitoring during construction. Checking earthworks shaping, signing off on trial panels, ad hoc advice on design changes, and planting operations oversight are all important aspects of ensuring a project turns out well. In this example on the Tintenbar to Ewingsdale tunnel the monitoring was important to check that the landform wrapping around the cut and cover portals was successful.

Project finalisation

The finalisation phase involves project review and the start of maintenance actions.

Post-completion review

A post-completion urban design review is generally carried out by the Urban Design Roads and Waterways team.

The urban design commitments described in the environmental assessment are compared to the final built outcome. These commitments are tracked through the stages of the implementation phase to investigate why the project went well or why the outcomes were not achieved as envisaged. Lessons and recommendations are developed for future projects.

A post-completion urban design report must be signed off by the project implementation manager so that the review is correct and balanced.

Monitoring the maintenance requirements

The design process needs to consider ongoing maintenance needs at all stages.

Once a project is completed, it is essential to monitor and review the design to check that:

- ▶ The planting and seeding has established in accordance with contract specifications.
- ▶ Maintenance will continue on the built and natural elements beyond the project's opening.
- ▶ The need for watering, plant replacement, weed removal, and graffiti and vandalism repair is minimised.

2.1.3 Methodology for urban design contractors

Much urban design work is carried out by the private sector, working to standards set in contract documents and in accordance with urban design policy, procedures and guidelines.

Innovation, design intuition and freedom to express potential design solutions are encouraged. Intuition and creativity can be compatible with a logical engineering process. Urban designers can help project teams with a rigorous and transparent design methodology.

When the methodology to developing a design has not been described and discussed in the team, some urban design inputs can appear to be unduly subjective and difficult to justify. This can make the design process:

- ▶ Time consuming.
- ▶ Difficult or confusing to implement.
- ▶ Complicated during implementation.

While there are many different ways to go about developing design, the absence of a clearly described methodology to develop options and test a range of solutions is a serious issue.

Appendix C of this document sets out a methodology to guide urban designers on design and to better inform project managers as to the approach they should expect. In simple terms, the method should relate to four main steps: contextual analysis, the setting of objectives, design and assessment iterations, and monitoring of implementation.

2.2 Overall management principles to deliver urban design

2.2.1 Principles for the Urban Design Roads and Waterways team

The Urban Design Roads and Waterways team is responsible for developing this urban design approach and facilitating urban design on infrastructure projects. This involves a cyclical process as follows:

The development of an urban design approach and supporting detailed guidelines results in the need to equip staff with relevant skills and experience. Urban design training helps managers to implement urban design in the planning, design development and implementation stages of a project. Post-completion urban design reviews of projects provide feedback for research and development, which then influences policy making.

The Urban Design Roads and Waterways team has a responsibility to advise and assist planners in their network and corridor studies and activities.

The Urban Design Roads and Waterways team also works with network and asset managers on the maintenance and improvement of the transport asset.

A key area of involvement is to guide and assist project directors and managers to optimise urban design in all project stages. In particular, advice and assistance is provided on:

- ▶ The urban design objectives, principles and performance criteria.
- ▶ The urban design scope for a network, corridor or project.
- ▶ Landscape character and visual impact assessment
- ▶ The adoption of the urban design process in major projects, as part of *ProjectPack*.
- ▶ The adoption of the urban design process in minor projects, as part of *MinorProject*;
- ▶ Urban design principles
- ▶ The briefs for and selection of urban design contractors.

- ▶ The engagement of Aboriginal artists and designers in projects.
- ▶ The review of project deliverables.
- ▶ The project's scope of works and technical criteria for tender at the implementation stage.
- ▶ The monitoring of construction to achieve high quality urban design outcomes.
- ▶ Landscape establishment and strategies for long term landscape sustainability
- ▶ The post-completion urban design review of projects.
- ▶ Urban design contractor performance reporting advice.

The Urban Design Roads and Waterways team also plays an interface role with the Government Architect and local authority Government Architects and urban designers.

2.2.2 Principles for project managers

This section sets out the requirements that managers of any work affecting the built environment need to meet to produce good urban design outcomes. It applies to asset and program, as well as project managers.

Consider urban design holistically at the start of a project

The program, asset or project manager must take into consideration urban design from the earliest planning stages of a corridor, program or project. A common misconception is that urban design need only be considered in the latter stages of a project in order to 'dress it up' or improve the concept design. On the contrary, urban design is a process that should contribute to all phases of work:

- ▶ In the asset management phase when the network is being assessed for its performance.
- ▶ In the corridor planning studies when individual corridors are being reviewed as to their contribution to movement and place.

- ▶ In design guidelines and frameworks for programs of work such as highway upgrades when the standards for the upgrade are set down.
- ▶ In route and options assessment when multi criteria analysis differentiates options and the best project location is born.
- ▶ In concept design and environmental assessment work when landscape character and visual impacts can be avoided and minimised (and made positive) in the development of concept designs.
- ▶ In the procurement stages when briefs and contracts are written and the scope and conditions for a project are set down for others to deliver.
- ▶ In the detailed design stage when the quality of the concepts are decided and how the elements fit together.
- ▶ In the building of the project when workmanship and materials quality defines the quality of the outcome.

Urban design should be considered early on in relation to small projects as well as large projects.

The integration of an urban design perspective helps:

- ▶ Realise a program or project's potential.
- ▶ Avoid impacts (not just mitigate them).
- ▶ Produce an integrated engineering and urban design (which represents an improved public domain).

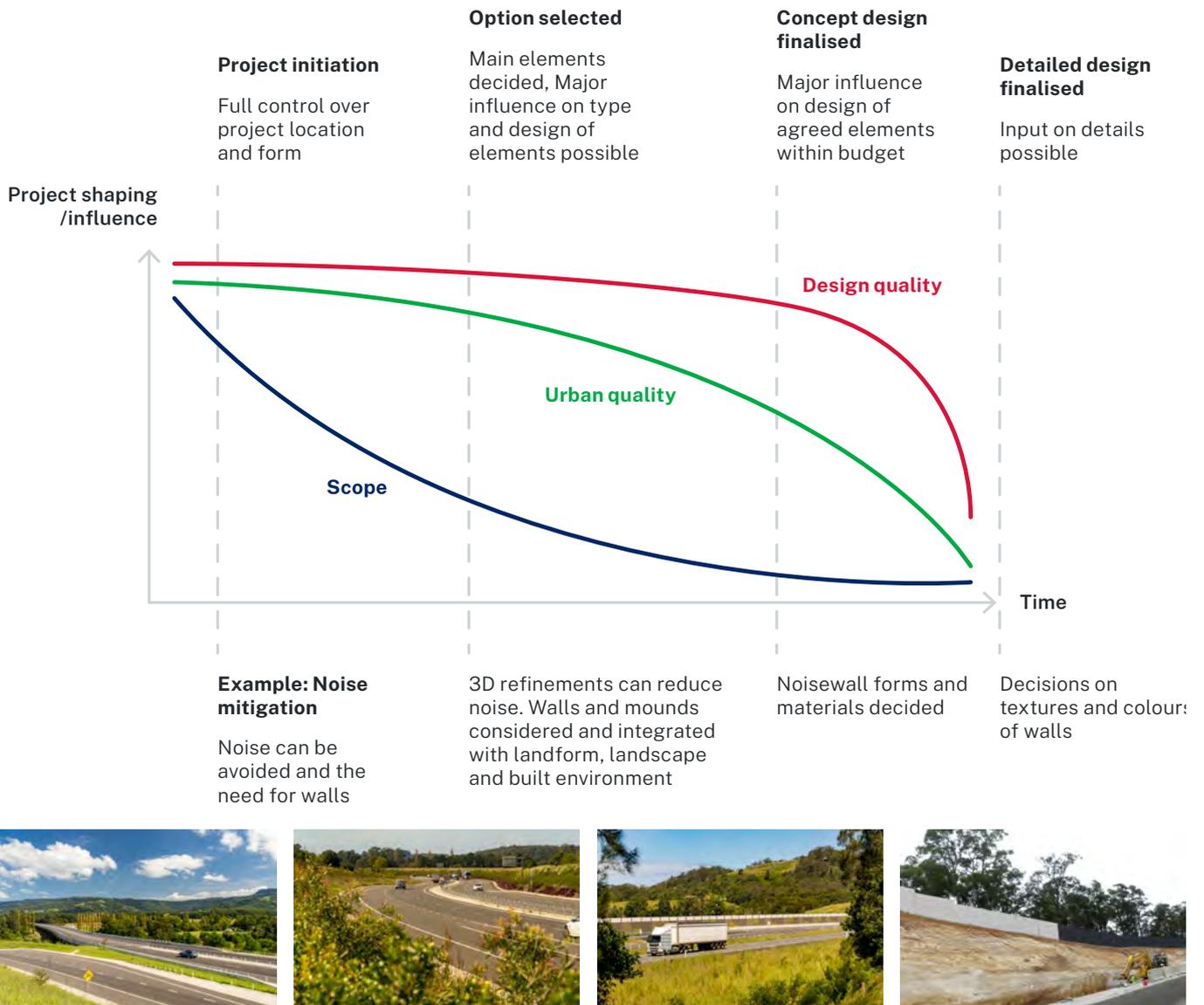


Figure 4 The influence on the quality of a project outcome changes in scale and nature throughout time. Initially major conceptual and locational benefits can be accrued. At the end of the project only detailed design benefits can be accrued. The scope of the project (ie the main elements and their location) is the quickest aspect to decline as the project budget is locked in at an early stage. Urban quality (eg shape and form) can be influenced for a longer period of time although as the project design becomes frozen key moves are not possible. Design quality (eg details such as materials, textures and colours) has the longest currency but at the end of the project the capacity to influence it declines rapidly. The design process needs attention through all project phases to be as successful as it can be.

Include urban designers as equal members in a multidisciplinary design team

The project manager needs to build a multidisciplinary project team in which urban design staff sits alongside engineers, traffic planners, road safety advisors, environmental specialists, and others required for the task at hand.

On a small or simple project it may be that only a few people with broad skills make up the team, in which case urban design input can be provided by the Urban Design Roads and Waterways team.

Urban design contractors are needed on large and complex projects with multidisciplinary teams guided by the Urban Design Roads and Waterways team.

Encourage the whole team to be responsible for a good urban design outcome

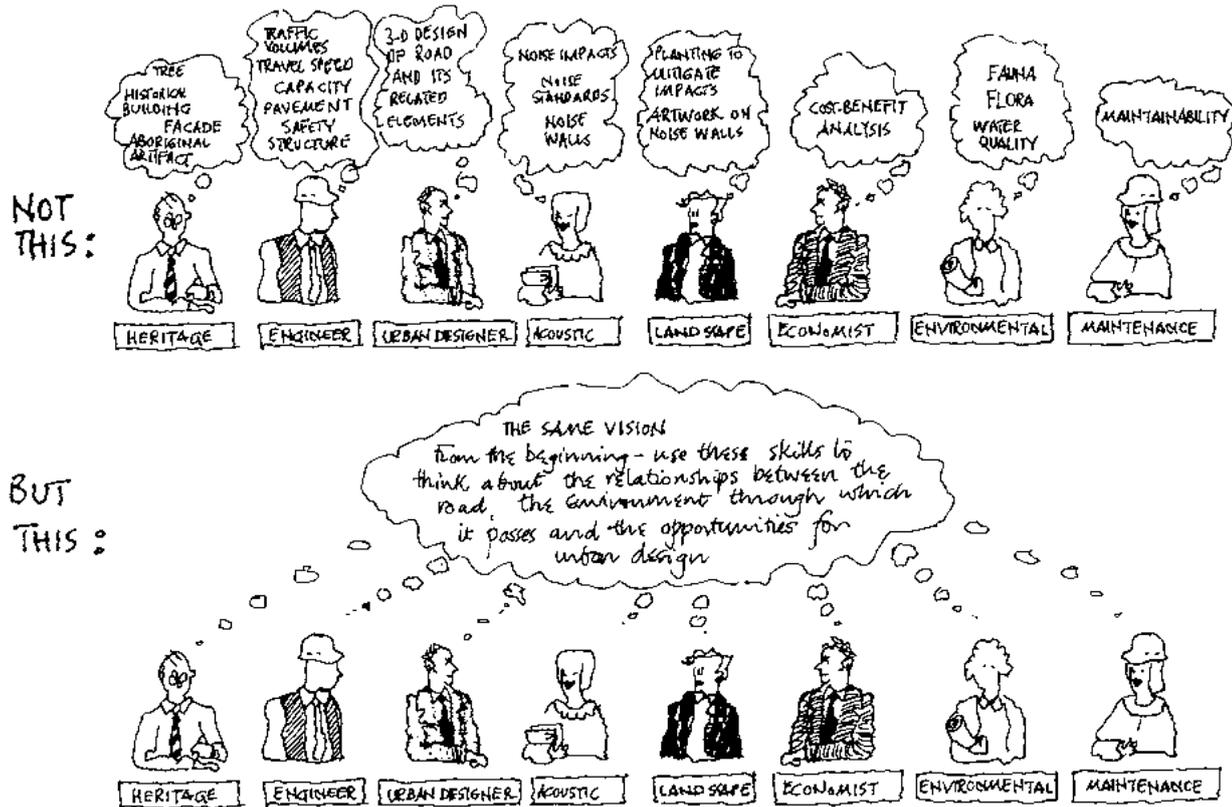
At the start of a project, the project manager is responsible to make sure the project team is working together to develop a common vision and take joint responsibility for achieving the project objectives and urban design outcomes.

This involves more than just assembling a range of disciplines to have input into the design. Instead, project managers should facilitate a team that works together interactively to formulate and achieve the same vision and objectives.

In order to achieve this team responsibility, the project manager should:

Incorporate urban designers into the team as equal members alongside engineers, traffic planners, safety practitioners, environmental specialists and others.

- ▶ Identify, and gain commitment to, the project objectives at program or project initiation.
- ▶ Facilitate regular joint meetings – ensuring team members play a meaningful role in discussions throughout the design process.
- ▶ Remain open-minded to different opinions.
- ▶ Inspire the team to produce a project of high urban design standard that is cost-effective, safe and sustainable, including the maintainability of the design in terms of its ‘hard’ and ‘soft’ elements.



Jackson Teece/Source: Beyond the Pavement – RTA Urban and Regional Design Practice Notes, December 1999.

Figure 5 Working together, collaborating, listening and resolving issues to achieve the goal of a high quality product for the people of NSW

Use suitable urban design professionals for the project

It is essential to use the most qualified and experienced urban design professionals for a project.

While the urban design process requires collaboration across a broad group of different disciplines, the term urban designer usually refers to architects or landscape architects that have extended their expertise into the field of urban design; they also have skills and experience in infrastructure design and often in city and regional planning. Urban designers may also come directly from the planning discipline rather than a strictly design background and can also make a useful contribution to project teams in the areas of environmental assessment, design review and community consultation. Participation in urban design may furthermore involve graduates and professionals who have carried out special urban design training or completed urban design courses.

Some contractors have different experiences and knowledge in different geographic areas and project types.

The Urban Design Roads and Waterways team can advise project managers on these issues and on preparing an urban design brief tailored to the program or project. Any tender bid should demonstrate the right set of skills for the particular project.

The Urban Design Roads and Waterways team manages a register of urban design contractors on the Registration Scheme for Construction Industry Contractors. Urban design professionals can, at any time, apply to be included on the register, but can also be removed from the register if they are consistently underperforming.

Transport requires that any contracted urban designer be a member of the registration scheme. This is the case whether the urban designer is employed directly by the Government or indirectly, for instance, as a sub-consultant of a lead professional services contractor.

In order to qualify for the register, work standards and levels of experience have to be met as set out in the Registration Scheme for Construction Industry Contractors. This means that urban design teams must include landscape architects and architects, and experienced in the design, assessment and implementation of major transport infrastructure. This also applies equally to urban design teams who may be part of lead engineering companies as it does to specialised urban design (and landscape) companies.

It is important that project managers consult with the Urban Design Roads and Waterways team in regards to the need for urban design contractors and suitable companies for a particular scale and type of project.

All urban design contractors working on projects are subject to mandatory Contract Performance Reporting in the same way as lead engineering design companies. This reporting is done by the Project Manager in consultation with the Urban Design Roads and Waterways team.

Manage and resource the contracted urban design task adequately

The project manager can help urban designers meet the requirements of the urban design brief and other expectations regarding quality, deliverables, cost and time.

The urban design input should be adequately resourced. Consideration needs to be given to:

- ▶ The time required for attendance at briefings, meetings, workshops and presentations.
- ▶ The time and resources required for site visits, urban design analysis, and design integration with engineering, including design iterations.
- ▶ The preparation or use of design and presentation techniques such as architectural models, drive-through simulations and urban design documentation. When considering communication tools, the project manager should discuss options with the Communication and Stakeholder Engagement Branch prior to requesting proposals and commissioning. There is a range of technology available.

These considerations also need to be taken into account by urban designers in their tender bids, whether made directly, or indirectly through a lead engineering company, prospective project proponent or delivery consortium.

Integrate urban design with environmental assessment and project approval

“Traditionally, the detailed design of roads has been primarily undertaken on engineering grounds and environmental effects have subsequently been mitigated. The Fitting Roads Approach... (that is, context sensitive design)... combines engineering and environmental considerations from the outset of the design process, thus reducing the requirement for environmental mitigation.”

The Scottish Office 1997

The Government carries out environmental assessments of all its project proposals.

The NSW Environmental Planning and Assessment Act, 1979 and its regulations require all road projects to be subject to either an Environmental Assessment or a Review of Environmental Factors.

Environmental assessment is part of the project design process. Ongoing design consideration and assessment should:

- ▶ Produce concepts that inherently avoid or otherwise minimise environmental impacts, thereby reducing the need for ‘add-on’ mitigation.
- ▶ Identify opportunities to improve the corridor’s built, natural and community environment and produce a high quality public domain that is fit for the purpose of the project.

Pursue a cost-effective maintenance outcome

The project manager should review concept and detailed designs so they are practical, cost-effective and require minimal, or an appropriate level, of maintenance.

Project managers should consult the Urban Design Roads and Waterways team as part of the maintenance review. It is incumbent on both project managers and the Urban Design Roads and Waterways team to make sure that design solutions do not create an unacceptable maintenance liability.

At the same time, the level and type of maintenance needed to over a project’s life cycle should be considered and is sustained.

Support design continuity throughout a project’s design, development and delivery

Projects are developed in stages, can take many years to complete and invariably involve different teams. Good design solutions can become diluted over time, if not altogether lost. At worst, this reduces the quality of the final built outcome while, at best, funds may need to be spent on re-design.

It is important that urban design is considered across all stages of the project – throughout development and implementation. This can be achieved by:

- ▶ Continuity of urban design input.
- ▶ Continuity of project management.
- ▶ Clear urban design briefs.
- ▶ Clear and well documented design reports that consistently refer to the urban design objectives for the project.

Continuity of urban design contractors

Utilising the same designers, especially the individual personnel involved throughout the project, is the ideal way to achieve design continuity.

This may not always be practical due to competitive tendering rules for the different stages of a project, underperformance of contractors or changes in contractors and their personnel. Nonetheless, the continuity of urban design personnel can improve the design result.

Continuity of project management

Ensuring an overlap between the project manager in the design development phase, the project manager in the project implementation phase and the asset manager in the operational phase is an effective way to achieve urban design continuity.

Projects that are run collaboratively by project managers who are responsible for both development and implementation tend to demonstrate a better urban design outcome than those where the development manager responsible for the concept design simply hands the project over to the implementation manager to manage the detailed design and construction, without detailed background of the project and how the scope and features have been developed.

In the development phase, implementation managers should test the practicalities of implementing design concepts, and should also be encouraged to contribute to the development of better and more cost-effective solutions.

Development managers should then help guide the design intentions and concepts through implementation, essentially so that the integrity of the concept design is upheld, if not improved.

The project is ultimately part of the transport asset, which means asset managers should be involved in the design at all stages.

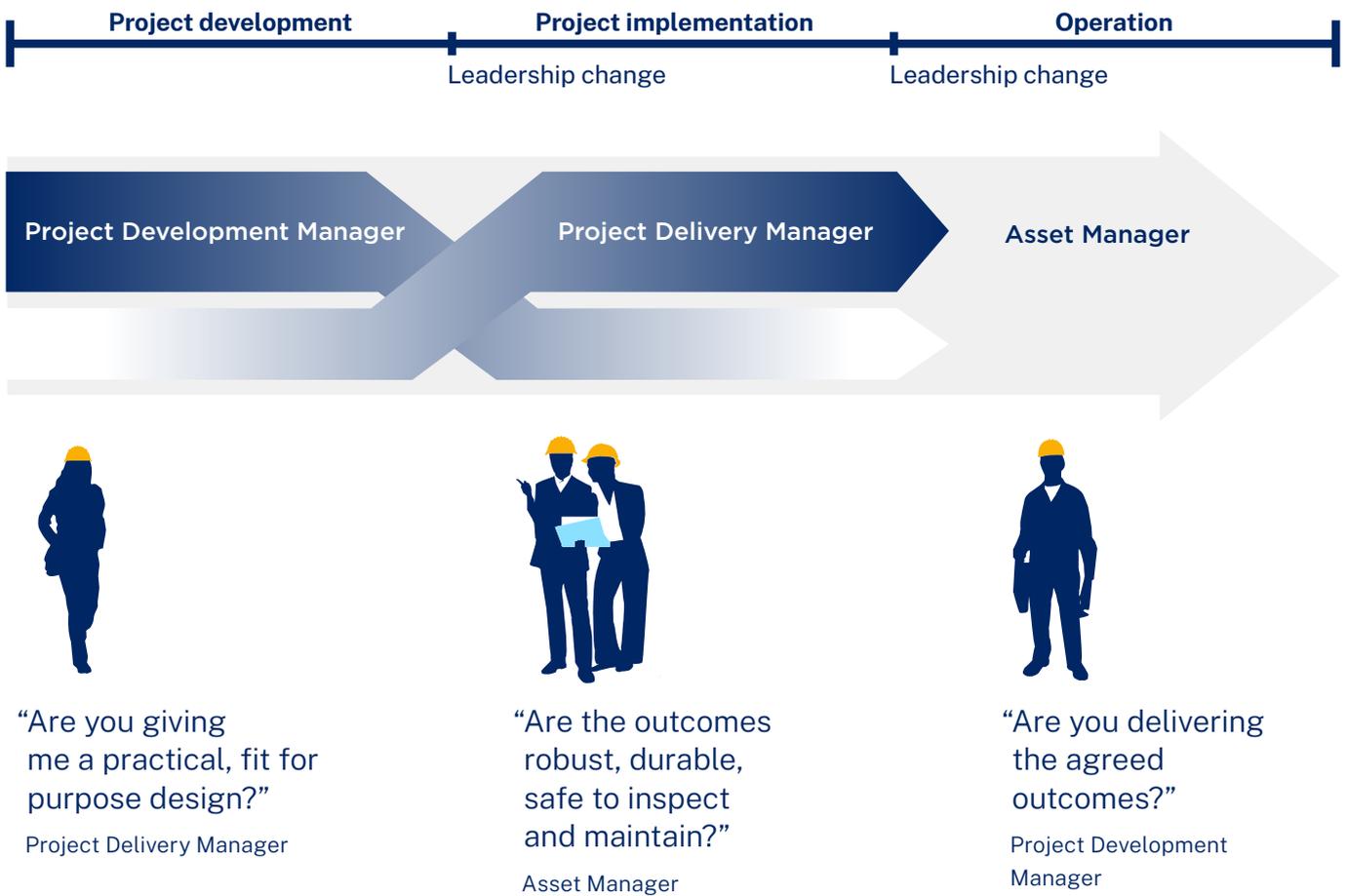


Figure 6 Projects are long and pass through many leadership changes. Individual leaders must work as a team respecting each other's challenges and ensuring continuity of design quality from vision to maintenance.

Prepare clear and well documented urban design briefs

A clear urban design brief should be prepared at each stage of a project.

The brief should be concise enough for a focused approach to a project but flexible enough to cover unforeseen contextual issues and allow for innovation and creativity.

Poorly articulated briefs lead to poorly designed projects. When the objectives of the brief are clear, the products of the brief (often referred to as 'deliverables' or 'outputs') are tailored to the project, and the timetable is achievable, then the project is more likely to be successful.

Encourage systematic urban design reporting

As a project proceeds, urban design reporting is a means of ensuring design continuity and consistency across project phases. It assists in communicating the scope, purpose and features of a project to all personnel involved, including other agencies, over what may be a period of many years.

Such reporting also serves an important function in preserving the 'corporate memory' of a project, especially if the design team changes or if a project is deferred and then resumed.

Design reporting should feed into the formal environmental assessment reports to be prepared, and should be as succinct as possible.

Consult and communicate with the community, stakeholders and professionals on urban design

“The role of public involvement and community participation ... is widely regarded as one of the most important elements of ensuring a solution that is context-sensitive.”

USA National Cooperative Highway Research Program 2007

Community and stakeholder involvement is integral to planning and managing road projects. Serious consideration is given to how a road project can be designed and improved through wide consultation with the community and stakeholders. Project managers are advised by communications teams on such involvement.

Adopting an urban design approach can make a project more acceptable, if not more welcome, to the community and stakeholders. In two-way consultations urban design intentions are illustrated as comprehensively and realistically as possible. Consultation with Government agencies and interest groups should identify the full range of design issues that need to be taken into account.

The following presentation techniques should be considered, but tailored to the scale, importance, complexity and sensitivity of the project:

- ▶ Computer animations, including simulated drive-throughs, are valuable in explaining the three-dimensional qualities of a project. Although such modelling can be expensive, it can be of great assistance in explaining a project and assisting in a project's design process. Computer-generated animations should be prepared on all large-scale projects, particularly freeways, motorways and significant bridges, or where large cuttings occur in the landscape. In the end, simulated models can be a cost-effective communication and design tool.
- ▶ Architectural models, to illustrate the three-dimensional, complex aspects of projects.
- ▶ Photomontage and drawings showing standard elevations, cross-sections and plans. These must show important views from residential areas, scenic lookouts and the road itself. Simulation products can make photomontages relatively easy to produce.
- ▶ Simple line drawings can be acceptable, depending on the size and sensitivity of the project, particularly in the early stages of design.

These techniques can expedite the process of integrated engineering and urban design, communicate the project's intention to communities and stakeholders, and promote the project to clients and Government.

Transport has a panel of suppliers for animated products.

Support continuous learning in urban design

Project managers and the Urban Design Roads and Waterways team must learn from past successes and failures if they are to improve and produce better outcomes. To assist in this, post-completion reviews of selected projects are undertaken. As part of this process, the Urban Design Roads and Waterways team prepares post-completion urban design reviews in consultation with project personnel.

Consider the use of urban design review panels

The Urban Design Roads and Waterways team acts as experienced urban design advisors on projects. From time to time special Urban Design Review Panels need to be set up for a range of reasons including:

- ▶ A Panel can help provide design assurance if the project is large or particularly prominent and has a broad influence across a range of stakeholders, government departments and areas.
- ▶ If the project has a number of potential and unusual design solutions, a panel can provide a broader base of knowledge and support.
- ▶ Planning conditions require Panels to be used.

The Urban Design Roads and Waterways team has standard Terms of Reference for Design Panels. The NSW State Design Review Panel is also available for projects and has similar terms of reference.

Urban Design Review Panels are intended to provide critique and advice as to the best practice implementation of 'Beyond the Pavement' and other Government Urban Design Policy. They are often confidential and advisory only. The final decision for adoption of a Panel's advice rests with the project manager or director.

It is advantageous for the Urban Design Roads and Waterways team to be a part of such panels as it can help provide a bridge between contractor and project manager, is impartial and can help strengthen the design governance role. In all cases the Urban Design Roads and Waterways team must review the project outcomes prior to a DRP.

Panels should be used judiciously. They are expensive and require resources to manage. The Urban Design Roads and Waterways team exists as an independent in house group sitting outside individual project structures. In general they should be used to review projects.

Opposite: The Wattle Street ventilation compound was reviewed by the WestConnex Urban Design Panel (including the Government Architect and the Director of Urban Design in RMS). The result is a well crafted brick compound in keeping with the brick structures in the Haberfield area and a perforated, backlit, aluminium panel lightening the visual effect of the structure against the sky. The layout of the building was adjusted to line up with the surrounding streets and additional planting and green space created.



3

Urban design principles

Urban design as a product

In addition to a policy and process, design principles provide direction for projects and help them achieve TfNSW aims. They also help define the project outcome and the criteria for success. Nine principles are included, broadly covering what is expected in projects. These are explained and illustrated individually but in practice are interrelated and apply holistically.

The principles are illustrated with project images and case studies showing how they work and how they contribute to place-making.

The final section illustrates how the principles come together to make a project.

The following diagram summarises the nine fundamental principles for achieving the integrated engineering and urban design outcomes that the Government wants from its projects. Each of these principles is expanded in sections 3.1 to 3.9.

These principles:

- ▶ Capture the urban design qualities that any project should have and from which more project-specific urban design objectives and principles can be derived.
- ▶ Form the basis for thinking about design (influencing the project).

- ▶ Form a basis for evaluating design (deriving the criteria to judge the quality of a project's urban design).
- ▶ Are universal – transcending modes, organisational and institutional change

The principles should not be considered in isolation. They are interrelated and therefore need to be considered as a whole. Good design does not result from systematically ‘ticking the boxes’.

Rather, successful design stems from an understanding of the interrelationships between all design aspects and addresses these in a unifying manner. As depicted in the diagram, an integrated engineering and urban design outcome is the end result of such an approach.

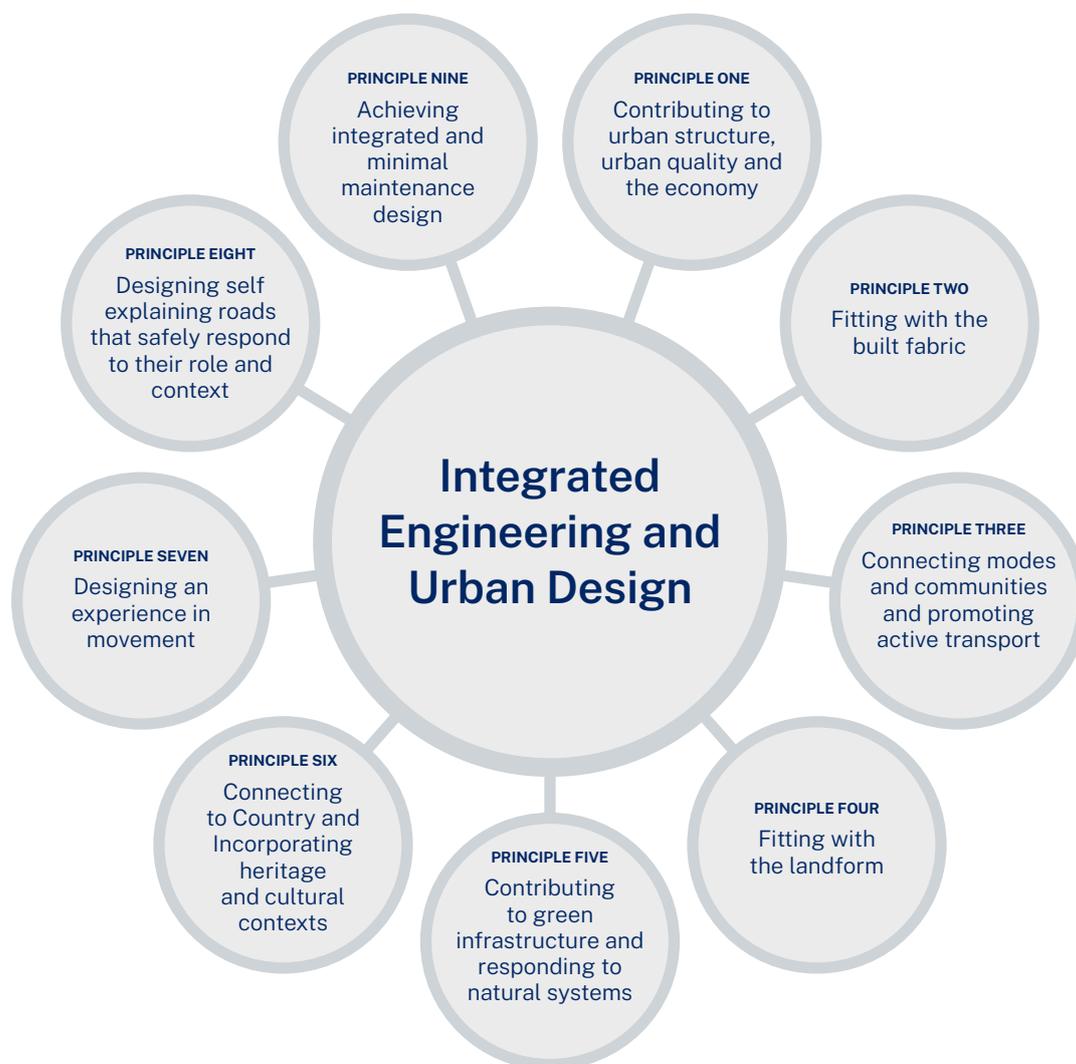


Figure 7 The nine design principles of good road and maritime projects, which make up integrated engineering and urban design and deliver Better Placed.

Principle one

Contributing to urban structure, urban quality and the economy

- ▶ Consider the role of networks in the structuring of towns, cities and regions.
- ▶ Consider the role of road and maritime infrastructure in revitalizing and transforming areas.
- ▶ Consider both transport and community needs in planning and designing road networks and hierarchies.
- ▶ Consider the place-making benefits of lowering speed limits where operational speeds are below posted speeds
- ▶ Create streets and boulevards that provide a sense of place.
- ▶ Consider the potential urban design opportunities of a reduction in traffic volume.
- ▶ Make the most of major infrastructure projects
- ▶ Maximise the development opportunity of underutilised and obsolete parts of infrastructure
- ▶ Re-stitch the built and natural environment severed by road infrastructure
- ▶ Contribute to integrated public transport and urban development in the shaping and functioning of the city
- ▶ Contribute to the design integration of freight movement and facilities into metropolitan and regional environments
- ▶ Consider the urban design impacts and opportunities of autonomous vehicles on the quality of the road network and built environment

Principle two

Fitting with the built fabric

- ▶ Keep the road footprint to the minimum possible to achieve a good design outcome.
- ▶ Integrate noise control into road corridor and project design.
- ▶ Avoid adverse visual impacts in the planning and design of roads and wharfs.
- ▶ Consider the potential use of adjoining land.
- ▶ Design road boundaries in response to local character

Principle three

Connecting modes and communities and promoting active transport

- ▶ Consider connectivity into and through surrounding urban environments.
- ▶ Consider connectivity between modes.
- ▶ Consider where people want to cross and the quality of crossing points along a busy road.
- ▶ Incorporate inter-modal connectivity in designing the upgrade of existing or building of new ferry wharfs

Principle four

Fitting with the landform

- ▶ Form a road in response to topography and landform.
- ▶ Consider geology and slope stabilisation design as part of the project.

Principle five

Contributing to green infrastructure and responding to natural systems

- ▶ Integrate natural patterns and systems into road design.
- ▶ Achieve physical continuity of natural systems.
- ▶ Integrate trees creatively and safely into road corridors
- ▶ Use natural characteristics in the road's landscape design.

Principle six

Connecting to Country and Incorporating heritage and cultural contexts

- ▶ Integrate historic buildings and precincts into the design of transport infrastructure.
- ▶ Adaptively reuse heritage infrastructure in projects.
- ▶ Provide a Connection to Country integrating Aboriginal wisdom and creativity into the project's urban design
- ▶ Protect, incorporate and interpret Aboriginal heritage in project design.
- ▶ Recognise European cultural plantings.
- ▶ Protect bridges of heritage significance within their setting.
- ▶ Preserve roads that provide a sense of history.

Principle seven

Designing an experience in movement

- ▶ Enhance the view from the road.
 - ▶ Provide visual stimuli within the road corridor.
 - ▶ Provide visual markers and stimuli within road tunnel environments
 - ▶ Consider the ferry travel experience
 - ▶ Consider the experience in movement for active and land based public transport
 - ▶ Create a progressive sequence of visual events.
-

Principle eight

Designing self explaining roads that safely respond to their role and context

- ▶ Self explaining roads.
- ▶ Distinguish between the different functions and speeds of roads by differentiating their appearance.
- ▶ In centres design for a slower movement pace and a finer grain of design quality.
- ▶ In between centres design for the required speed and a commensurate visual experience in movement.
- ▶ Improve the legibility of roads.
- ▶ Considerations for bypassed roads.

Principle nine

Achieving integrated and minimal maintenance design

- ▶ Create clean lines and a coordinated and neat composition of infrastructure elements along a corridor or within a project
- ▶ Reconsider design standards
- ▶ Use robust durable materials fit for purpose and place.
- ▶ Provide a self-reliant and minimal maintenance natural landscape.
- ▶ Avoid opportunities for vandalism.
- ▶ Consider the design quality and maintainability of major road and maritime components and individual built elements.

In this section each of the nine urban design principles is illustrated with a case study to demonstrate the Principle in further depth and show how it contributes to the making of place.

These are not intended to be perfect examples and, indeed, each demonstrates successes and learnings. They are included as clear illustrations of the application and outcome of the design principle. It is also important to appreciate that each case study demonstrates all of the principles combined as a whole, as far as the context allows.

The case studies are supplemented by various examples to demonstrate a particular point. These examples include projects in urban and rural contexts that fall under a range of work programs. All the case studies and examples in this document represent many areas and disciplines working together, from both within and outside of Government – from network planners to development and project managers and their teams, specialist and technical personnel, asset managers, and engineering and urban design professionals.

Design principles

1 – City shaping

Sydney motorways



2 – Built fabric

Great Western Highway



3 – Connections

Iron Cove



6 – Heritage

Berry bypass



7 – Visual experience

Hunter Expressway



The nine design principles of Beyond the Pavement and their synthesis

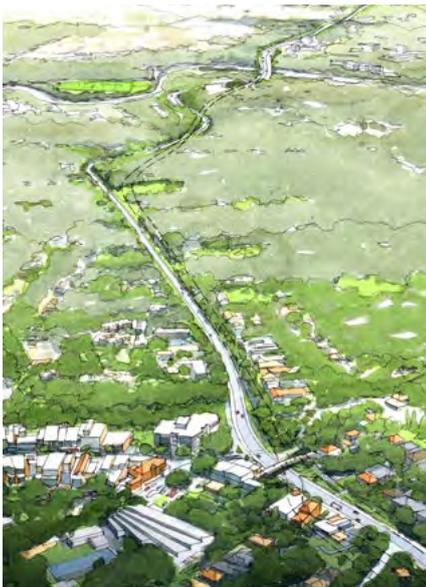
4 – Landform
Pacific Highway



5 – Greening
M7



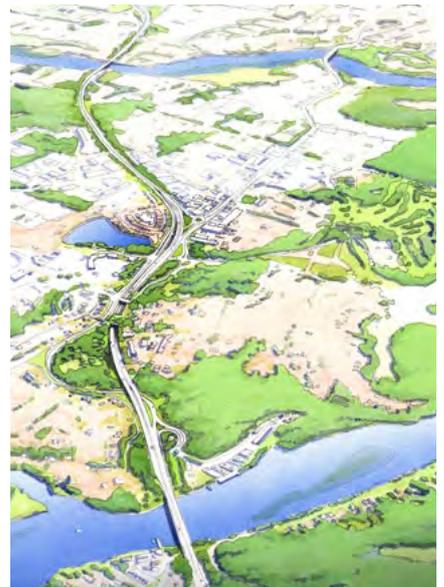
8 – Self explaining roads
Lane Cove



9 – Integrated and durable
Ferry wharfs



Synthesis
Banora Point



3.1 Principle one – Contributing to urban structure, urban quality and economy

Introduction

This section explores the role of infrastructure as a tool in city and regional design. Transport can and does contribute to the creation of new urban structure or the re-ordering of existing urban structure through the shaping of road and transport related networks – influencing the form and quality of the built environment, facilitating economic development and area improvement, achieving a better performing network and integrating freight into the urban fabric. All of which contributes to the economic development and revitalisation of our cities, towns and regions.

What is revitalisation?

Revitalisation simply means ‘to give new life to’. It is one of the main aims of urban design when we are developing and improving cities and towns. Well designed transport can help revitalise areas and create new development by improving access and connectivity between modes and places and thereby gives stimulus to urban and regional economies. However, other things are needed, and these include:

- ▶ Transport integrated as part of the urban development fabric – functionally, physically and visually
- ▶ Removal or repurposing derelict, polluted land or places badly impacted by industry or traffic
- ▶ Green infrastructure, for example, parks, trees and connection to nature that beautify our cities and make them more sustainable – as expounded in this document
- ▶ Recreation facilities, walking and cycling loops, playgrounds, gyms and playing fields needed for communities to be healthy and thrive
- ▶ High streets, markets and places for commerce to inject an economic vibrancy and creativity into living environments

- ▶ Waterfront improvements and better public access
- ▶ Schools, health centres community halls, libraries, creative centres like music venues and other public buildings
- ▶ Safe and secure environments that attract people and offer good surveillance
- ▶ Good planning and design of the above

Transport is a major contributor to economic development and revitalisation. Our many projects, significant budgets and scope and influence can change places for the better by taking an urban design approach. For example, Berry Bypass, used elsewhere in this document as a case study, besides saving the fabric of the historic town has had a major effect economically and socially on the town centre resulting in revitalisation of the shops, cafes and tourism scene. While the primary reason for the project was improved transport, by alleviating the traffic and trucks from the town the project has done far more for the future of the area than just transport. Revitalisation can come in many forms from major bypasses and tunnels but also from opening up small connections like Powell’s Creek on Parramatta Road, providing improved lighting to make places safer and more attractive at night, planting trees on a high street such as Newport on Sydney’s Northern Beaches and through better use of under-croft bridge space such as at Ennis Road in Kirribilli.

Economic development, of which revitalisation is part, refers to broader economic growth and efficiency which better infrastructure brings, for example, by supporting freight movement and logistics facilities.

What is the relationship between urban design and freight?

Planning for and managing freight is one of the key functions of Transport and is important to address in urban design thinking.

Freight, is the lifeblood of our communities without which building work, maintenance, home deliveries and shops to name just a few vital things would not exist. Freight, representing the economy on wheels, is taking up an increasing share of the traffic stream in road corridors and on the road network in general. This has a number of implications for urban design and so needs to be thought about as part of the problem of design. There is a natural tension between the movement of an increasingly large number and size of trucks and the urban environments through which they pass and service. Demand for freight network efficiency has to be weighed against the liveability of the city and quality of the urban fabric. The liveability questions relate to noise, pollution, community safety, protection of the character of the built and natural environment, and so on.

The development and use of tunnels separating freight from communities is an effective solution to the problem although not all freight can use tunnels and at some point they need to leave them, enter, and service, our communities. Bypasses such as Berry Bypass are also good solutions to remove the freight not accessing the towns.

In its broader sense it must be recognised that the industrial structure of cities is part of urban design, part of the character of cities and not to be ignored. It is part of the image of the city as well as its economic functioning and should be expressed.

Guidelines

Major road systems are more than just infrastructure for the efficient movement of people, goods and services. As well as meeting traffic needs, these road systems have a prime influence on the structure, revitalisation and functioning of the urban environment.

Investment in the road system also has major implications for urbanism — the quality of the urban environments in which communities live, work and recreate. Major road systems strongly impact on essential community needs such as access and connection, convenience, movement choice and an attractive environment.

Considering network planning and design in this way can substantially contribute to better traffic distribution, community safety, protection of the urban fabric, and an improved noise and air environment for communities. Some particular considerations are:

- ▶ Impact of design speed through sensitive areas that affects the road footprint, size of intersections, conflicts with parking needed to support shopping along arterial roads, incompatibility with cyclists, safety of pedestrians along and across a corridor, tree lined streets, noise and air pollution, and so forth
- ▶ Delivery of a network, access and way finding hierarchy to support industrial agglomerations, freight terminals, sea ports and airports with a clear visual identity, minimal conflict with general traffic and protection of living and shopping environments
- ▶ Careful placement and design of truck rest areas in urban and rural contexts with clear urban design outcomes in mind such as legibility, rest facilities, lighting, shade and landscape.

3.1.1 Consider the role of road networks in the structuring of towns, cities and regions

Urban areas are formed not only by their geographical location, topography, coasts and rivers, but also by the initial transport lines laid down on this natural canvas. The combinations of main routes and their off-shoots go a long way towards deciding the character of a place, in terms of both its open areas and built form. For instance:

- ▶ Roads help to define the axes, avenues, streets, public frontages and focal points that towns, cities and regions are built upon and that help to make them distinct. Urban streets and associated urban block patterns and subdivisions have traditionally given order and structure to urban areas, from neighbourhood to city scales. Major reordering of city traffic, such as through tunnelling, bypassing of town centres, road coupling and traffic management, can have far reaching effects by enabling urban and arterial road revitalisation to occur.
- ▶ The network is also a framework for movement by other modes, including pedestrian, bicycle and bus, and so plays a vital role in supporting neighbourhoods and town centres. The town centre roads and streets bypassed by major infrastructure do not necessarily remain in their original form role and condition. The bypass, whether over under or alongside, is but one side of the equation in a major infrastructure project and the bypassed road or street should not be overlooked. It may be that the bypassed road needs to retain its original form and transport capacity; however, the usual case is that the bypass occurs because the transport needs of the state are not compatible with the liveability requirements of the towns. For example Berry Bypass was needed because the transport requirements of the Princes Highway were incompatible with a small country town.

- ▶ Consider the role that land-bridges can play in re-stitching and re-vitalising the city severed by freeways, railways and car parks. The land-bridge mechanism also has great potential in fitting new infrastructure with the landform and in contributing to green infrastructure networks in cities.

Tunnelling under busy roads and dense areas has great urban design potential for cities. As well as traffic (and its impacts) moving underground there are some key surface benefits possible:

- ▶ urban renewal of related derelict areas including additional provision of open space
- ▶ active transport improved
- ▶ surface revitalisation of bypassed roads
- ▶ public transport improved



William Street was able to be transformed as part of the Cross City Tunnel project offering an improved and alternative route. Footways were widened and resurfaced, trees planted, a cycleway incorporated, bus facilities street furniture upgraded. All of this contributed to the revitalisation of the street.

3.1.2 Consider the role of road and maritime infrastructure in revitalizing and transforming areas

Worldwide, the building of infrastructure such as motorways, bridges and ferry terminals and wharfs with a recognisable urban design quality has given cities and towns a strong image and sense of future. Such infrastructure has acted as both a stimulus and support for economic, cultural and tourist development and urban improvement. Examples include the Sea Cliff Bridge in North Wollongong; the Gateshead Millennium Bridge in Newcastle, UK (see Appendix B Bridge Aesthetics) and the Passeig Garcia Faria in Barcelona, Spain (see Appendix A). Attention should be given to:

- ▶ The potential of dilapidated and underutilised areas to benefit from insertion of well designed and well connected infrastructure.
- ▶ How the infrastructure can be used as a symbol of a town, city or place.
- ▶ How the infrastructure can serve new activity and new ideas for the use of land functionally and visually.
- ▶ How wharf upgrades can be a catalyst for wider foreshore transformation as well as the wharfs and their spaces.

3.1.3 Consider both transport and community needs in planning and designing road networks and hierarchies

“It is short sighted to think that significant changes in land use and regional structure can be realised without fundamentally reordering our circulation system. Only an integrated network of urban places and multi-use street systems can support the change we need for the next century of growth.”

Peter Calthorpe 2002

As the quote from Peter Calthorpe emphasises, we need to think beyond the notions of the suburban arterial grid and the system of functional street types. Such thinking has the capacity to produce the urban sprawl characteristic of modern suburbia in developed countries.

Instead, we should envisage a more diverse and complex road and transport pattern. Such a pattern should provide:

- ▶ Greater choices in the modes and scales of movement.
- ▶ New types and forms of land use with mixed activity and high densities.
- ▶ Urban infill and revitalisation which can transform undeveloped or obsolete sites.
- ▶ The support of future local activities and neighbourhoods that are walkable places.

There is a need to find alternatives to large numbers of trucks moving at speed through town centres, and to town centres creating major congestion and environmental problems along arterial routes.

As such, the transportation network requires an interconnected regional road hierarchy, within which there are network and corridor characteristics which are clearly distinguishable.

There are broad road types that can be categorised by the relative importance of their transportation and land use function, with freeways serving the greatest levels of traffic movement and local roads tending towards greater liveability and community activity.

Differentiation of road types in strategic road network planning can help the overall design of an area and thereby help avoid the noise, visual, and safety conflicts between traffic and communities.

When planning and designing road networks, the following should be considered:

- ▶ Freeways and motorways are the high speed, high volume roads whose access is controlled. They primarily link regional hubs and cities. As the major transport networks and corridors accommodating regional truck movement, commuter traffic and regional bus services, they accordingly have their own character. They allow other roads to have a greater public transport and community function and different character.
- ▶ At the other end of the spectrum are roads that provide local community access and are interfaced with frequent intersections and pedestrian crossings. Such roads have lower speeds, allow easy bus access and accommodate walkable environments. They form a more concentrated street network that provides circulation between and within neighbourhoods and support community activities such as local cafe life.

Positioned on the spectrum between motorways and local roads, are the main arterial roads. These are diverse and range from higher speed principal arterials to lower speed, lower volume transit arterials. They make up the majority of the State Road Network for which Transport is responsible and must be carefully considered in terms of transport, urban structure and character.

Principal arterials generally connect with freeways and motorways. Despite their relatively high speeds, they need to respond in character to the places through which they pass. Access is generally controlled and intersections are spread out at key locations.

Transit arterials have more of a community local access role. They make better public transport corridors for bus and cycling, are more walkable than the busier arterials, and have a higher degree of property access and parking. They are better suited to being tree lined boulevards and walkable environments. It is along such routes, rather than the busier major arterials, that town centres could be organised.

These different road types need not be isolated, and roads can change in function and character along their length in response to context.

Rail relationships to this road network hierarchy must also be considered. The road network needs to link to the train stations. Stations, terminals and transport interchanges have traditionally formed urban development nodes and have the potential to become the focus for ‘transit-oriented’ development.



Barrenjoey Road is a part of the state road network on the northern beaches. Posting and re-designing the road through the high street at 50km/h has allowed a smaller road footprint and the provision of more trees in the space available, and has created an identity for the Newport village centre.

3.1.4 Consider the place-making benefits of lowering speed limits in urban areas where operational speeds are well below the posted speed.

Speed has an effect on many aspects of the built environment including noise, pedestrian safety and the sense of comfort for pedestrians. A balance has to be made in building and managing roads between the speed of roads and the needs of communities. This balance relates to the hierarchy of the road. Clearly regional connections need to operate at speeds which allow people to make journeys in reasonable times.

In many urban situations in built up areas the speeds of vehicles are generally low due to high traffic volumes and numbers of intersections, pedestrian crossings and traffic lights. However the potential vehicle speed – at off peak hours or more commonly at night for example – creates a need for road design requirements that have an impact on the built environment. For example as speeds increase the radius of curves increases or likewise stopping sight distances and clear zones. All these, particularly clear zones, have an effect on how well roads fit into the urban fabric. Lower speeds mean a neater smaller road footprint and the ability to plant trees alongside roads and streets – whatever the actual speed of most traffic.

3.1.5 Create roads, streets and boulevards that provide a sense of place

Roads should be designed according to their role and the character of the area through which they pass. It is possible for roads to have a distinctive character along their length, with a defined public domain and recognisable adjacent development and activity. They are one of the principle means of experiencing a place visually, socially and economically. Distinctiveness of route and sense of place helps give the urban environment clarity of physical form and sense of place. It helps inform our understanding of towns, cities and regions.

For both pedestrians and vehicle users it is, to a great degree, the roads and streets that make cities and regions liveable and attractive. It is important to bear this in mind when planning roads and streets.

Depending on their context, city streets can form a three-dimensional space for strolling, shopping, resting and meeting. The immediate adjacent built fabric both demarcates and forms the road space three-dimensionally. The quality of the street as a public domain is defined by: building forms, uses and architectural detail; trees and planting; lighting and street furniture; the ability to park cars and bicycles; and all of the footpath and associated activity that gives it life.

A boulevard is a special form of street that gives cities great distinction due to its greater width and grandness of space, and the larger scale of the buildings and trees that tend to line it. Boulevards serve a structural function, improving comprehension of an area by linking important destinations, large monumental buildings and major public spaces. They also provide places for social and commercial activities. Although boulevards are often formed on major axes or diagonals, some boulevards are formed on a lesser scale or in more informal contexts.

Tree planting can transform both urban arterials and local roads into streets and boulevards with character and charm.

3.1.6 Consider the potential urban design opportunities of a reduction in traffic volume after a road bypass

As well as the benefits of simply reducing traffic volumes, the bypassing of areas, tunnelling beneath them, or the spreading out of traffic provides an opportunity over time for the road to evolve as a better place for people, with a strong public transport focus and good urban character. This can occur by:

- ▶ Reducing speeds where the bypassed road has a lower order movement function
- ▶ Reducing the number of lanes commensurate with the traffic and correspondingly widening and improving the footpath and introducing street trees.
- ▶ Reallocating road space for bus transit, providing facilities for cyclists and allowing greater integration of parking into the corridor.
- ▶ Providing more frequent, convenient and safely designed pedestrian crossings.
- ▶ Creating a well-designed interface between footpaths and adjacent buildings.

Bypassing rural towns can result in adverse changes if there is insufficient consideration of the need to allow ease of access to the bypassed area. Therefore:

- ▶ Views of bypassed areas should be provided where possible, with straightforward access associated with the view.
- ▶ Signage and place marking should be well designed and effective in encouraging access.
- ▶ Access to the bypassed area should generally remain on the same alignment as the original route unless change to the structure and function of the area is desirable. (Land uses such as shopping, housing, schools and open space evolve over time to fit with the main traffic routes through an area, changing these routes can have effects on the community.)

3.1.7 Make the most of major infrastructure projects

Major infrastructure projects, which involve large public and private investment, extensive land take and sustained effort in planning, design and construction over many years, should be thought about in the broader context of what they can contribute outside of their immediate brief. Where appropriate they can help with ‘the heavy lifting’ in terms of improving areas. For example major projects have in the past improved pedestrian connections (eg the new Iron Cove Bridge shared path), new parks and improved access to green space (eg The M7 Abbotsbury Park).



A physical model, built for community consultation work for the St Peters Interchange as part of the WestConnex motorway project, shows the interchange located in the former St Peters Tip. The depth of the tip was used to accommodate the three layers of bridging without the infrastructure protruding significantly above surrounding ground levels. The waste matter of the tip was largely kept on site and capped and landscaped, dealing with the waste and using it for landform purposes. Approximately 6 hectares of the tip area is being transformed into active transport corridors and green open space. Nearly 1 million plants are being used in the interchange design. A major and challenging city problem has been dealt with through a major infrastructure project.

3.1.8 Maximise the development opportunity of underutilised and obsolete parts of infrastructure

Infrastructure by itself is space consuming, dominates the environment visually and is usually built for a single purpose. It is potentially a public resource which can be re-purposed and transformed to the benefit of the city as well as the infrastructure authority. This is especially the case with parking lots which can be bridged over, as Millennium Park in Chicago, and rail and road viaducts

which can be put to new urban uses and improved architecturally as in Paris and Berlin. It is also common for the spaces under road viaducts to be improved with lighting, artworks and markets.

More opportunities should be identified to make use of unutilised viaduct spaces. It is wise investment, can assist in improving security and surveillance and can be inspiring, but can only be achieved well with a collaborative design approach.



The Ennis Street bays in the viaduct space under the northern approaches to the Sydney Harbour Bridge in vicinity of Milsons Point Railway Station were used to relocate some 300 Roads and Maritime staff from prime office space in North Sydney whose lease was about to expire. This now forms part of a tree-lined walkable village, with on street parking and taxi ramps, and a more active café life which the additional employment supports. The internal space of the viaduct has been completely reconfigured as a state of the art head office. Two green walls have been built in the lobby. Importantly, the scheme is part of heritage conservation. The Sydney Harbour Bridge is listed on the State Heritage Register with the Ennis Road bays in Kirribilli forming part of the original fabric as designed by J.J.C Bradfield. Façade modification of bays includes architecturally designed window lengthening, new framed glass and louvre windows, blockwork infill and reinstated awnings. A heritage interpretation plan including the commissioning of Aboriginal artwork, and bronze inlays incorporating plans and quotes from Bradfield has been implemented throughout the building and interpretation panels and a collection of Dudley Parker oil paintings incorporated.



Nearly 2km of undercroft space near Parramatta under the M4 viaducts was cleared and revitalised. New paving and planting were implemented and a graphic art design applied to the bridge piers. The utilitarian space has been cost effectively unified and given a new look with the vibrant colours and designs. The improvements have made the space feel safer for cyclists. The area is becoming an artistic hub with the Simeon Nelson sculptural noise walls on the M4 viaduct above.

3.1.9 Re-stitch the built and natural environment severed by road infrastructure

Increasingly cities are repairing environments cut off from one another by infrastructure. The infrastructure authorities themselves have a big role to play in the collaborative effort involved, as has been the case with Transport. The principal mechanism used to re-stitch the built and natural environment, re-join neighbourhoods and stimulate activity and development is to build land-bridges. These are structural covers usually built in the air space over a freeway, railway and also large car parks. They are invariably landscaped hence the

term 'green lid'. Land-bridges are most easily developed as part of the urban design scope of works of a major infrastructure project. By its nature land-bridges serve many purposes and therefore reference is made to this mechanism in relation to the urban design principles of fitting infrastructure with the land form, designing with nature and adding to green infrastructure networks. This has great possibilities in both urban and rural environments in NSW.



The land-bridge over the Eastern Distributor adjacent to the Art Gallery of NSW creates a continuous space in the city over the road space. It provides a landscape setting for the gallery, connects green spaces either side of the Domain, minimises noise in the area, creates views of the city and over the bay at Woolloomaloo and incorporates a significant link for pedestrians, cyclists and car users. This formed part of the urban design scope of works of the projects paid by extending the toll period for northbound traffic.

3.1.10 Contribute to integrated public transport and urban development in the shaping and functioning of the city

Road corridors contain road-based public transport in the form of buses, trams and rapid rail systems which, together with the land uses they attract and the associated buildings and transport elements, gives them a structural and visual identity. The planning, design and delivery of road-based public transport in road corridors requires coordination with the civil engineers, transport experts and urban designers in Transport and collaboration with state transport and planning authorities, affected councils, the Government architect and developers of stations, over-station development, adjacent sites and the related public domain. This can be further complicated by the accommodation of cyclists and pedestrians in the same corridors, their access to transport systems and buildings, parking, vehicular services to stations and buildings from arterial roads, utility service relocation, sorting out intersection efficiencies and in building demolitions required for the transport task but that can destroy the quality of the built environment. The challenge is acute when the transport delivery program is very large as in Sydney. Thus,

Transport is squarely in the business of supporting public transport and helping, through this task, in the shaping and functioning of the city. To not be involved in this would be counter-productive. Some key considerations are:

- ▶ In the first instance provide supporting urban design review and advice on design, planning approval requirements and avoidance or mitigation of impacts as part of a whole-of-government collaborative team
- ▶ Help to achieve direct, safe and comfortable connectivity to station concourses for all relevant modes and users especially where crossing of arterial roads is concerned as part of integrated access plans
- ▶ Help stations and developments have a good road and street address especially through the continuity of street trees, planting of new vegetation, provision of awnings, continuity of high quality surface materials and lighting
- ▶ Help to protect historic buildings and elements and integrate urban redevelopment in scale with, and architecturally sensitively to, the surrounding built fabric.

- ▶ Encourage continuity of activity at street level surrounding buildings, avoid dead space and allow for on-street parking as far as possible.
- ▶ Adopt principles of safety by design to protect pedestrians from vehicular attack.
- ▶ When it comes to provision of light rail and bus transitways in arterial road corridors as to functioning and design, examine international best practice,

carefully locate stations, create an architectural identity, maintain a human scale and feel, protect existing vegetation as far as possible and prepare a landscape plan with both 'soft' and 'hard' elements to create linear and precinct identity, stitch the transport into its adjacent environment and contribute to shade and the greening of the city.



The BLine provides a vital public transport option on the Northern Beaches. The project involved changes to the road space, new stations servicing centres and contributing to revitalisation and car parks providing parking for people catching the bus. The car park at Manly Vale incorporated a living and breathing green wall to help clean the air on a busy intersection. The project continues the tradition, started with the TWays, of utilising road space for bespoke designed bus routes. Adopting a whole of corridor approach to bus corridors helps create a valuable road based public transport outcome that has a consistent approach that contributes to the urban fabric

3.1.11 Contribute to the design integration of freight movement and facilities into metropolitan and regional environments

The growing movement of freight and need to make the network more efficient has become a major problem affecting the quality of cities in terms of their physical fabric, noise, safety and living conditions. This can only be solved by inter-disciplinary collaboration and involving urban designers as a central part of the effort. Key considerations are:

- ▶ Consider the implications of design speed through sensitive areas affecting influencing the road footprint, size of intersections and how they can be crossed, conflicts with cyclists, pedestrians, buses and parking, noise and pollution at town centres and affecting adjacent residential areas, implications for landscape, and so forth
- ▶ Organise the road hierarchy to support development of and access to industrial areas, ports and airports and multi-modal terminals taking cognisance of their form and identity, way finding and lighting
- ▶ Work through the urban design implications of the interface between rail and roads including freight along road corridors and provision and widening of rail bridges over road
- ▶ Carefully design truck rest stops as to their visibility, access and egress, lighting, rest facilities, shade and landscape and signage and interpretation.

3.1.12 Consider the urban design impacts and opportunities of electric and autonomous (driverless) vehicles on the quality of the road network and built environment

Vehicle technology will eventually change how traffic works, road space is used and places along a corridor feel and look. New technologies can have downside as well as beneficial urban design effects which need to be thought about. We need to keep up with research into and applications to cities of driverless vehicles and other technologies in this field such as electric vehicles. When dealing with infrastructure networks and projects thought should be given to at least the following:

- ▶ The inclusion of adequate space for charging vehicles and ensuring wait times are well catered for in attractive service centres and rest areas.
- ▶ The potential to reduce the road footprint, widen footpaths, introduce trees, accommodate cycling and convert road space to public transport use
- ▶ The impacts on road crossing for pedestrians and cutting off the two opposite sides of the road resulting from continuous bunching and queuing of driverless vehicles from passenger to freight
- ▶ The impacts on the urban design quality of road intersections due to driverless vehicle congestion and turning movement requirements
- ▶ How buildings are serviced by driverless freight vehicles
- ▶ The possible impacts of communications pylons for driverless vehicles
- ▶ Network as well as corridor impacts

Conclusion

These considerations in transport network planning and design can help solve conflicts between busy roads, town centres and nearby communities. They can help create road and street environments that are safe and fit for their intended purpose, and can help make cities and towns more liveable and sustainable. When well designed they can help deliver important supporting elements such as truck rest stops and support the industrial structure of the city.

Case study 1

The Sydney Motorway projects in the Greater Sydney area

The Sydney Motorway network including Westconnex has enabled the revitalisation of a number of areas of derelict land otherwise highly expensive to have been restored. The Rozelle Railyards (1) and the St Peters tip (2) are two examples where many hectares of inaccessible land are being turned into public open 'green' space. The development of Parramatta road over the coming decades will be made easier through the removal of some surface freight traffic and the fact that there is an alternative route.

The project has been driven by an Urban design vision: "The Westconnex motorway shall be a sustainable, high quality and transformational project for Sydney's Global City, the people of Sydney and NSW. Exhibiting design excellence as a whole and in all the constituent parts, it

should be sensitively integrated into the natural and built environment, help build communities and contribute to the future liveability of the city".

This project in the making is a significant metropolitan shaping investment and works toward the realisation of this urban design vision. It provides a subterranean network that completes and extends the motorway system, and potentially promotes new development, better connects neighbourhoods, cleans up derelict sites and creates significant parkland, cycle ways (23km) and footpaths. Special attention has been paid to the architecture of critical infrastructural elements such as portals, ramps and bridges, and to the landscape design and quality that stitches the project into its different settings, and contributes to green infrastructure in the city.



Rozelle Railyards has been an unused and derelict space for decades. As part of the WestConnex project it has been cleaned up, decontaminated and being turned into a large piece of green public open space and playing fields. The motorway tunnels are located beneath the parkland and the portals and ventilation buildings are along the City West Link frontage.



2

1



The portals and ventilation buildings of Westconnex stage 1b direct freight and major traffic loads beneath the city creating the opportunity for surface streets to be revitalised.



3.2 Principle two – Fitting with the built fabric

The built fabric should be understood as the buildings, streets, public spaces, cultural plantings of a place as a whole – within the setting of the broader landform and landscape in which it sits.

Introduction

This section addresses the design of road and maritime infrastructure in the least disruptive and most beneficial way for communities and the quality of the built environment.

Guidelines

The built environment is the three-dimensional assemblage of architecture, infrastructure and public spaces. Part of its quality is determined by the relationships between built and natural elements. This is the setting in which communities live and interact and, in turn, reflects community lifestyles and needs. The built environment provides a sense of place and identity for the community. Urban life and character differs in NSW – from the built form and fabric of small towns and their main streets to the precincts and corridors of metropolitan areas. The character and functioning of the built and community environment needs to be understood and incorporated into the design of transport infrastructure and works best when it leaves the features, character and scale of the built environment as intact as possible and is in scale with it. The following guidelines aim to achieve a sensitive fit between roads, maritime infrastructure and the built environment.

3.2.1 Keep the project footprint to the minimum possible to achieve a good design outcome

Applying primarily to road projects, the location and design of road projects should avoid overpowering the scale of the urban and community fabric and affecting its uniqueness. A project footprint is the area or mark it makes on the land. Footprints are becoming larger because of increased engineering and safety standards as well as the multiple requirements of road corridors, including the accommodation of buses, bicycles, pedestrians and utilities over and above general traffic. Arterial road upgrades can involve the lateral expansion of an existing roadway. An upgrade may disturb adjacent properties, buildings and spaces, and vegetation within and adjacent to the road. In such cases, the scale and quality of the existing road corridor is altered. Motorways make by far the largest footprint in urban areas, and are usually out of scale with the historic built fabric. Reducing the impact of the footprint and integrating motorways into the built environment is a special challenge. The road footprint, whatever the type and function of a road, should be minimised as far as possible to be in scale with its context and to reduce damage to the built environment. Consideration of the footprint is, however, a complex matter. For instance, a relatively large land take for a road corridor can sometimes:

- ▶ Allow split carriageways
- ▶ Accommodate more vegetation
- ▶ Reduce the perception of hard pavement
- ▶ Allow for batters instead of retaining walls
- ▶ Allow the road to be joined with the adjacent built and community environment.

At the same time, account needs to be taken of the possible need for unavoidable future road augmentation and also maintenance requirements.

The ways in which physical design helps to achieve a minimal footprint are through:

- ▶ The variation of horizontal and vertical alignments of carriageways: this should be done in a manner which suits the scale and character of each particular context, diminishes the need for high, long and obtrusive road cuttings, and maximises the potential for corridor improvement.
- ▶ The use of vegetation as part of design to integrate the road with the built and community environments (as opposed to simply using vegetation as a way to reduce visual impacts).
- ▶ Avoiding, where possible, overly wide intersections that remove corner buildings, significant vegetation and open space, and create uncomfortable environments for pedestrians.
- ▶ As far as possible, intersection design should allow developers to build out to the corner lines of properties, emphasise public spaces and provide walkable intersection areas. Opportunities to reconfigure corner properties and re-create the built environment should be explored. Safe street tree planting can also be a useful element to help create a greater sense of enclosure of the intersection space.



The Eastern Distributor was set down into a trench, minimising visual and noise impacts. Retaining walls ensured a minimal footprint and were designed to respond to the Victorian Terrace architecture on South Dowling Street.

3.2.2 Integrate noise control into road corridor and project design

The proximity of busy roads to community environments results in traffic noise levels that need to be attenuated. Protecting community environments, including critical institutions such as schools, hospitals and nursing homes, requires noise mitigation measures, most commonly noise walls. The communities may request noise walls, even when other options are available and despite the potential for visual intrusion, reduction of sunlight, loss of character and social alienation that noise walls can bring.

Noise walls can create a 'tunnel' effect on the environment and can have a barricading effect around communities. They can also be intrusive in appearance if not designed well. Corridor location and design should endeavour to reduce potential noise levels so as to avoid or reduce the need for walls at all. This approach should apply right at the route selection stage of a project.

Opportunities should be explored with councils, developers and other interest groups for compatible land use policies, development setbacks and layouts. Consider the feasibility of architectural treatment of properties affected by traffic noise, and the creation of so-called 'noise barrier buildings' in terms of their orientation and architectural design. Less noise sensitive land uses and developments near major roads should be encouraged, as far as possible, through mechanisms such as rezoning and master planning.

Once a preferred route or project is selected, ways to address the attenuation of noise levels include:

- ▶ The design of the corridor to reduce noise generation through changes in horizontal and vertical alignment and the choice of pavement.
- ▶ The consideration of earth mounds to reduce noise, while addressing issues of corridor width, development setback and the privacy of residents. Where this is not feasible or practicable then a combination of mound and low noise walls should be considered.

If it is not possible to control noise levels within the road alignment and barriers are required, then the barriers need to be designed so that:

- ▶ They are consistent and integrated with the road design.
- ▶ There is space for a sustainable landscaped buffer.
- ▶ Noise walls are considered an architectural element in their own right.

Often, the most effective design solution involves a combination of approaches.



A noise mound integrated into the landscape ensuring views of the water but effectively blocking noise from the road.

3.2.3 Avoid adverse visual impacts when planning and designing transport projects

Designing projects to fit into the built environment will help avoid visual impacts. There may be instances where this is not always possible and certain measures should be considered:

- ▶ Using mounding and false cuttings to help screen intrusive elements behind landform.
- ▶ Allowing space for screen planting where necessary and where appropriate for the landscape and built character of the area.
- ▶ Considering off-site planting, beyond the road corridor's width, subject to agreement with stakeholders, funding availability and maintenance arrangements.

3.2.4 Consider the potential use of adjoining land

Following the completion of a project there may be land left over. Putting this land to a useful purpose can greatly enhance a project's urban design outcomes. It can help to provide a continuous urban environment along and across a route. It can also help to minimise maintenance costs and yield better financial returns. Such benefits, which should be considered early in a project's planning and concept design, can be usefully documented in a project's environmental assessment.

In order to address these issues the following should be kept in mind in road design:

- ▶ The examination of opportunities to make better use of residual and other sites along a corridor for landscaping and public open space, public facilities, adjacent urban development or redevelopment (especially along bus corridors) and works to restore the urban fabric.

- ▶ The possibility of designing and developing such parcels simultaneously with the infrastructure. Such an integrated approach represents best practice.
- ▶ The creation of a pleasing interface between the transport corridor and property fence lines when making property adjustments to accommodate the project. Community consultation is vital on this matter. It is desirable that Transport has a say in the quality of the design of boundary fences and walls by developers that impact on the road corridor.
- ▶ Avoidance of awkward, unsightly, and difficult to maintain parcels of residual land.

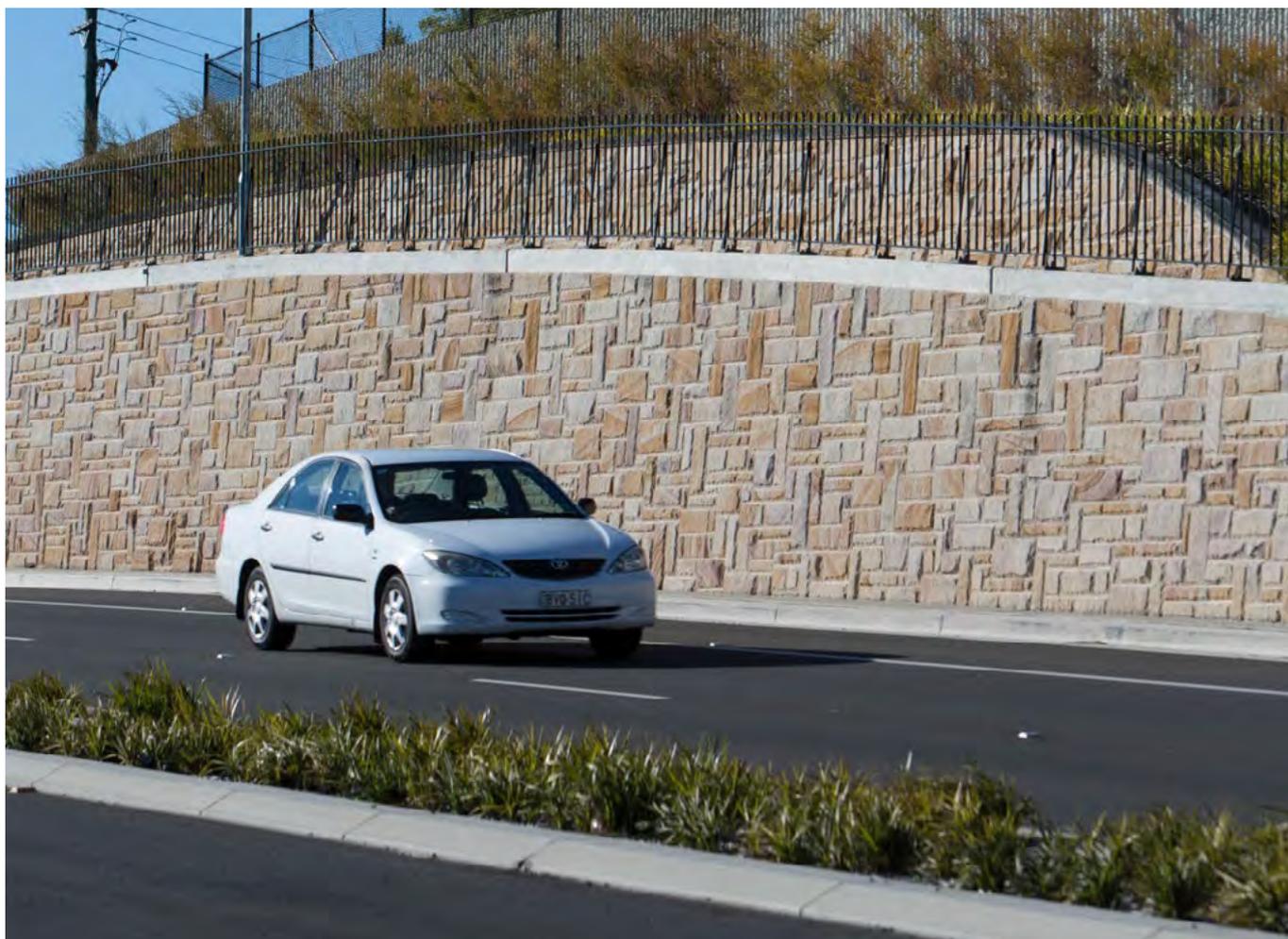
3.2.5 Design road and street boundaries in response to local character

Along non access controlled roads with frequent subdivisions, driveways and individual built character, the project should endeavour to provide a sensitive interface between publicly and privately controlled lands.

When property adjustments occur, consider with landowners the best relocation, alignment, re-use or new design of fences, gates and walls.

Explore opportunities between the kerbside of the road and the ultimate property fence line to create terracing (depending on topography), vertically separate the footpath, incorporate bicycle paths and plant native vegetation.

All of this helps to create a human scale, the individualisation of property frontage and a good neighbourhood image along the corridor.



The use of sandstone in the retaining walls on the Great Western Highway provides a high quality context sensitive outcome

3.2.6 Design buildings which contribute positively to the public domain

Buildings in the transport space are very visible both to transport customers as well as the community, in part because they often stand isolated from other buildings but also because of the high numbers of people that use them.

Tunnel buildings, multi-storey car parks, ventilation outlets and motorway control centres are large, highly visible pieces of the built environment and need to be designed with character and an approach that is respectful to the local area.

Wharfs and bus stops, are smaller buildings but have a prominence due to their multiple use and presence across the city. They need to have a common language with some sensitive variation if necessary for way finding and adaptation to the local context.

Substations, water tanks, toilet blocks and other ancillary buildings may be small, but their proliferation has a visual impact. An unobtrusive form and appearance and integration with the landscape will help them fit into the built environment. Occasionally something more prominent, but carefully designed can achieve the same outcome. The artwork wraps on the substation buildings in many cities is a good example of this.

Conclusion

The widening of roads and their intersections and the building of new roads can be conspicuous, erode the existing built environment and affect its character.

Transport projects therefore require a sensitive response to the built context. The character of the built environment needs to be understood and responded to. The scale, footprint and alignment of the road can then be dealt with in a manner which protects that character as far as possible, while also protecting communities from visual and noise impacts.

In this regard it is important to avoid, as far as possible, the need for noise walls.

Putting adjacent parcels of land to a useful purpose is an important way in which projects can be integrated with the existing built fabric. Planting and seeding can play a supporting role. Such an approach can avoid unnecessary and difficult to maintain residual land while being publicly and financially beneficial.

All of this should be considered from the early stages of road planning and design.



An art program run by the local authority has wrapped the substations in drawings and paintings by the local community.



The North West Metro Station design follows a 'leaf' form which creates an imageable structure in the town centres, contributing to the Western Parkland City character. (Photo by Cath Bowen)

Case study 2

The Great Western Highway in the Blue Mountains

An urban design approach has been taken to the systematic upgrade of the Great Western Highway along the dramatic ridgeline of the Blue Mountains World Heritage Area. As well as being a key inter-regional highway it serves as the principle local traffic spine for many towns along its length connecting local communities.

The quality of the public domain, the frontages and access are important issues within the mountains. The basic built structure of the corridor is a pattern of villages and towns, adjacent to or straddling the intertwined highway and railway alignments, separated by natural bushland. This pattern has been described as 'a string of pearls' whose integrity needed to be protected.

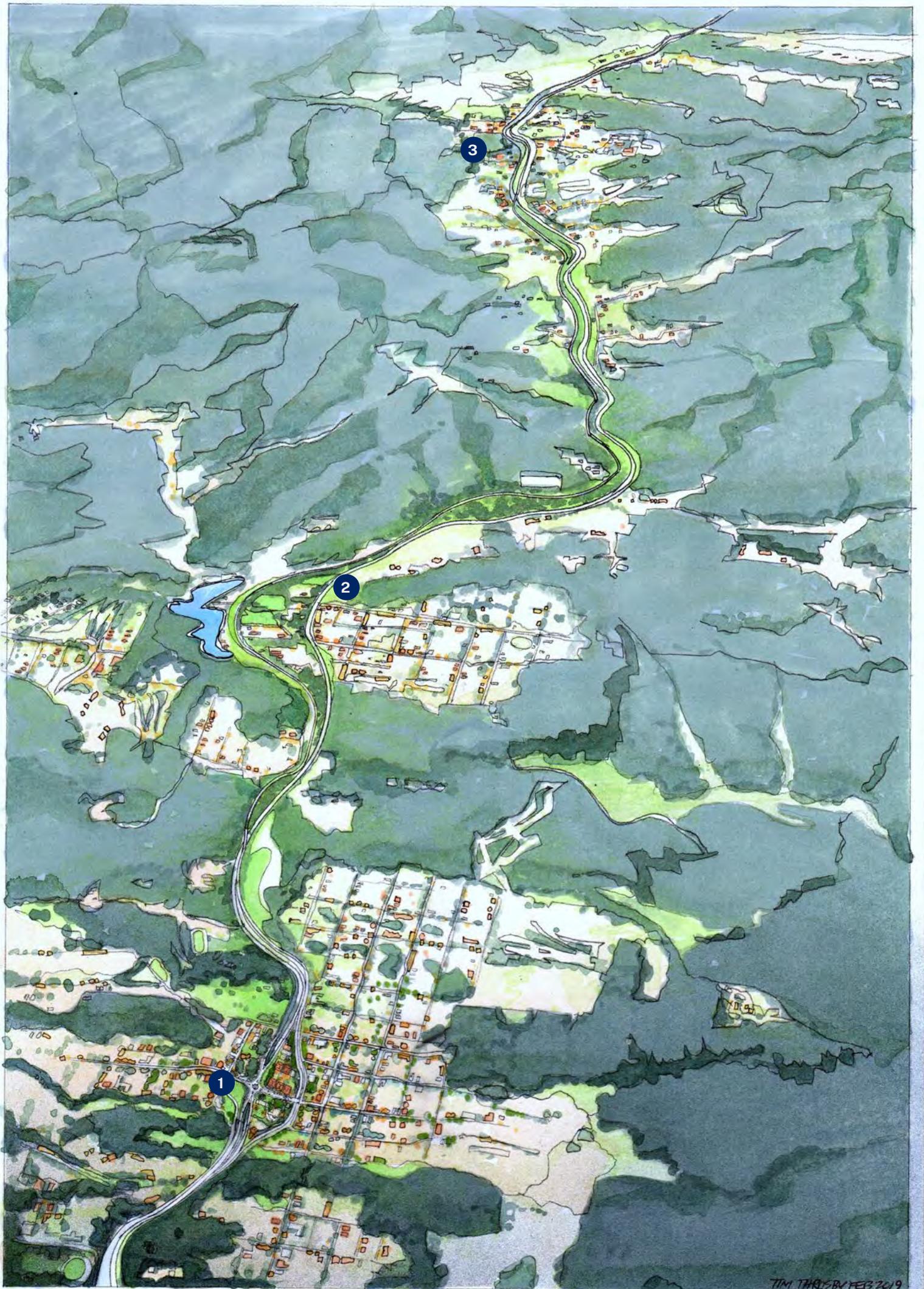
The town of Leura is a major NSW tourist destination and to protect its fabric and the Leura Mall — a structuring street of the town — the Great Western Highway was set in

a cutting with a 100+m land-bridge (1). At Wentworth Falls (2) terracing (independent carriageway grading) and stone work has layered the roads in the mountain setting.

At Hazelbrook new pedestrian bridges and a preserved and improved park has ensured good connection across the highway to the railway station. At Lawson a new town centre has been created off the highway, (3) the town square has been improved and old cart tracks from the original route, preserved and interpreted.

At Falconbridge the speed limits have been dropped to 60km/h and the designed speed matched to the posted speed to reduce road standards and geometries to provide a more fitting design. The whole approach to the Great Western Highway upgrade has been one of place-making so that the outcome is accepted by the community and the road user. Tourism has improved and so has road safety. Finally it is notable that with the support of council and innovative designers, not one noise wall has been built on this whole stretch of road.







Memory Park was retained and improved in the upgrade works to the Great Western Highway at Hazelbrook. The park provides a reflective space for people shielded from noise below the corridor alignment.



The Great Western Highway upgrade at the historic Blue Mountains town of Leura was set below the grade of Leura Mall allowing a 110m wide land-bridge, minimising traffic noise, creating views and forming a sensitive continuation of the main street.



Lawson Douglass town centre revitalised and separated from traffic as part of the Great Western Highway Upgrade

3.3 Principle three – Connecting modes and communities and promoting active transport

Contributing to the accessibility and connectivity of communities by all modes of movement including walking, cycling and catching road and water based public transport is an important role for transport authorities. Connectivity makes cities and towns more resilient.

Introduction

This section deals with the need to integrate all patterns and modes of movement when planning and designing roads. It is important to achieve good physical connections within and between communities and between all modes of movement. This can improve community neighbourhoods by providing greater opportunity for areas to be serviced by bus and create more walkable and liveable urban environments. Within this, it should be noted that increasing attention is being given world-wide to the design of bicycle and pedestrian bridges as part of creating continuous active transport networks thereby contributing to the safer and healthier cities; the Dutch in particular are forerunners of such active transport design and building.

Guidelines

How streets join up with each other – their ‘connectivity’ – allows physical connection of communities and bus, as well as car, access. The functionality, social interaction and quality of life of communities is also helped by the degree to which streets, urban environments and developments allow pedestrians and cyclists to travel, take short cuts and select alternative routes – area ‘permeability’. These urban attributes can be diminished by roads that:

- ▶ Divide areas or neighbourhoods.
- ▶ Are difficult to cross.
- ▶ Deliberately block through flow, such as cul de sacs.
- ▶ Spread urban development over long distances.
- ▶ Make walking and cycling difficult for all ages and abilities.
- ▶ Deny access into neighbourhoods by the continual prohibition of right-hand turns.

Maintaining traffic efficiency needs to be weighed up against community needs for access. Network connectivity and area permeability related to pedestrian, bicycle, bus and other movements can be achieved by considering the following guidelines.



The Yandhai Nepean Bridge provides a safe and open crossing of the Nepean River for all active transport users, replacing the narrow noisy road bridge footway. The bridge opens up the potential of a new walking loop either side of the Nepean River. It is an iconic feature in the landscape that gives the town of Penrith a new identity. The name Yandhai means walking in the past and present in Darug.



3.3.1 Achieve inclusive connectivity into and through surrounding urban environments

“Street patterns of most residential areas... are based on the discontinuous cul-de-sac or loop pattern rather than the interconnected grid. Block sizes are too large to permit a range of route choices, and land use patterns are coarse, with activities widely spaced and segregated by type.”

Anne Forsyth and Michael Southworth 2008

Street layouts with frequent cul-de-sac type roads make it difficult to provide good permeable connections. Such layouts can make it difficult to access shops and activities and to be serviced by bus, and as a result generate unnecessary car use. Instead, an interconnected layout can penetrate areas and accommodate bus as well as bicycle and pedestrian movement. Smaller scale, short cut and alternative penetration of the urban environment may also be required, specifically for bicycle and pedestrian movement. People follow their natural desire lines for movement whether or not paths are provided, so the nature and quality of the whole movement environment is important:

- ▶ Geometric, grid-type layouts usually achieve a high level of connectivity — physical and movement connection within and between environments.
- ▶ The needs of pedestrians and cyclists are different to those of motorists. Short cuts, laneways and contra-flows are highly desirable to encourage walking and cycling and make places accessible.

- ▶ Footpaths, bicycle paths and shared paths should be integrated into the existing local pedestrian and cyclist network and can be used to connect communities.
- ▶ In all cases pedestrian and cycle facilities should be designed to fit with the local character, have a ‘human scale’ and be neat in appearance. They should offer good passive surveillance and be safe, convenient and legible for all users, including people with disability.
- ▶ The design and provision of footpaths, bicycle paths and shared paths should link with similar facilities for which councils are responsible. Where the Government provides matching funding for the design and implementation of a council’s bike plan and access mobility plan, the facilities should achieve connectivity with and match the design quality of those built by Transport (and vice versa).

3.3.2 Consider connectivity between modes

As well as good connections between destinations, connectivity between modes should be smooth, inclusive, safe and pleasant:

- ▶ Rail stations and bus stops should, wherever possible, be accessible for cyclists and pedestrians as well as vehicles.
- ▶ Bus stops should be located where pedestrian desire lines are greatest, at obvious focal points and reasonably close to street crossings. They should also have benches and preferably provide shelter from within which approaching buses can be seen. In general, bus stops should be near road intersections and at mid-block crossings.

3.3.3 Consider where people want to cross and the quality of crossing points along a busy road

Road location and design should minimise cutting through and severing the built and community fabric. The severing of communities is often caused by the upgrade of existing arterial roads and provision of new corridors. Freeway-standard infrastructure can completely separate communities from one another and from other parts of a city or town. Severance of areas as a result of upgrading roads or building new roads is usually a matter of serious concern to the affected communities, but busy roads need not be barriers between them. A well-designed road can provide good connections to the local street system and allow crossings that maintain or enhance the neighbourhood and its built fabric. Good design increases the physical links to shops, jobs, community facilities and access to bus services, and improves opportunities for walking and cycling. To minimise severance of communities the following points should be considered:

- ▶ Adequate crossing points for cyclists and pedestrians should be provided along all roads and at regular intervals where possible. Street crossings should be at intersections. The frequency, location and nature of crossings should consider existing and future desire lines. This potentially avoids pedestrians taking risks and crossing roads in dangerous locations. It also gives structure to town centres and community environments.
- ▶ Roundabouts, especially the proliferation of small ones, can make it inconvenient for pedestrians and cyclists to cross roads. They tend to push crossings for pedestrians and cyclists well away from their desire lines and the intersections where they naturally want to go. Roundabouts should be used with consideration, preferably in low speed environments, and scaled appropriately to their purpose and urban context. There should be suitable road surface treatment to make all crossings 'self-evident' for pedestrians, cyclists and drivers, and this should be reinforced by reduced traffic speeds.
- ▶ The design of bicycle routes along a corridor and at intersections should reflect the network functions for both the road and the cycleway, and also the built and community environmental context. This influences, for example, whether the crossing is at grade or grade separated.
- ▶ On more transit orientated arterials (those with higher densities that can support road based public transport); crossing points for cyclists and pedestrians should connect with bus stops, and be provided at signalised intersections. Ideally, crossings should be spaced every 400 metres (approximately five minutes walking distance). Their location should take into account the preferred pedestrian routes and expected levels of pedestrian activity.
- ▶ While pedestrian crossings at grade with surrounding streets are generally preferable, being more direct and flat, pedestrian and cycle bridges are sometimes unavoidable for specific topographic, safety and traffic efficiency reasons. They are usually built at select locations along busy corridors such as at schools, or to cross major roads. In these instances:
 - The lengths of access ramps should be kept to a minimum.
 - Lifts should be included depending on funding and maintenance constraints.
 - Adequate landings should be created at footpaths.
 - Designers should work to achieve best possible passive surveillance.
 - The bridge should be visually pleasing.



The revitalisation of Bourke Street has been a successful outcome of the Eastern Distributor project. After the motorway opened the street had less traffic and was able to be returned to a two way street. The inclusion of the cycleway, part funded by state Government, has also helped in the improvement of this vibrant and iconic Sydney Street.

- ▶ The use of pedestrian and cycle bridges should be implemented only where most appropriate. Bridges are generally better than pedestrian underpasses as the latter do not have passive surveillance and are subject to vandalism. Bridges should be designed in accordance with Transport's Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW.
- ▶ Where advertising is used to fund the bridge this should be integrated into the bridge design in accordance with the Bridge Aesthetics guideline.

3.3.4 Incorporate inter-modal connectivity when designing the upgrade of existing or building of new wharfs

As well as forming nodal points at waterfront edges for the surrounding community wharfs, in most instances, serve as multi-modal terminals connecting to local and regional bus, bicycle and pedestrian networks and having taxi drop-off and parking facilities within their precincts. Design must achieve this safely, seamlessly and with identity. The better this is done the greater is the attraction for increased ferry patronage and the greater is the opportunity to comprehend the city. Wharf upgrades are also catalysts for foreshore transformation.

3.3.5 Incorporate public transport and active transport infrastructure into the design of projects

Incorporating active and public transport into rail and ferry projects is essential as people travel, not just from station to station, but from home to destination and vice versa. Station and wharf precincts must integrate from the planning stage parking, bicycle access, walking, buses and taxis and do so in a way that looks well conceived and a natural part of the area.

The road network, already offering door to door access, needs to try harder to support and integrate active and public transport.

However, like rail and its many forms, it is to be stressed that a road is not a mode. Road corridors — existing and planned — have the potential to accommodate many forms of movement so it is not a matter of road versus rail when it comes to investment. The selective transformation of road corridor space for multi-modal use is one of the most sensible design strategies to make the most of a land consuming public asset, encourage a shift from the car to public and active transport, anticipate autonomous vehicular travel and improve urban quality. Some key considerations are:

- ▶ Corridors should not act as barriers by virtue of its traffics and fencing dividing two sides of the city but should be designed to be as permeable as possible, especially for pedestrians; we need to think laterally as well as lineally and also three-dimensionally, in cross-section.
- ▶ Consider variations in lane width narrowing lane widths on lower speed roads in built up areas to accommodate more generous walking and cycling path widths.
- ▶ We should strive to create boulevards with generous landscaped medians, tree lined sidewalks, seating and, if possible, service roads with parking.
- ▶ Bus stops and indents, and autonomous vehicle pull up zones, should be thought about as pedestrian nodes close to road intersections and at mid-block crossings and located at shopping, eating and civic precincts.

- ▶ One way to make all of this workable and to minimise the conflicts between different types and needs of movement, including freight, is through traffic management — to lower traffic speeds similar to school zones if necessary.
- ▶ Inserting light rail into a road corridor is as much a road design exercise as a rail project. Road and rail design teams need to work together within an urban design framework.
- ▶ Fitting bicycle networks into arterial road corridors requires more than just painted areas on roads. Cycleways can help revitalise areas and create opportunities for vegetation. They need to be designed well with good edging, surfaces and clear sight lines.

3.3.6 Consider the making of walking and cycling loops

Transport has the capability and potential for creating or enabling active transport loops as part of its projects which are becoming highly popular for recreational and health reasons as well as playing a role in commuting. Explore the opportunities for walking loops by examining existing routes and obstructions. Use the opportunity for new bridges to improve walking and cycling and making routes safer.

Conclusion

Connection, access, land and water modal choice, convenience, and ability to walk and cycle are key attributes of a community's quality of life. They should be fundamental in guiding road patterning and corridor design. An interconnected and multi-modal road network hierarchy can contribute substantially to connecting modes and communities, and can provide structure to urban environments.

Design teams should seek alternatives to cul-de-sac models with poor connections for communities and reduced opportunities to be serviced by buses.

Where they are not access controlled, main roads should be made as easy, comfortable and safe as possible for pedestrians and cyclists to cross and access bus stops, shops and neighbourhoods. Continuity of bus patterns along and across a corridor and into adjacent areas is important. Not only should pedestrian and bicycle networks permeate and connect neighbourhoods, but they should be integrated with regional networks as part of road corridor planning and design.



Sketch of proposed shared path and gardens at Rozelle Railyards. The WestConnex project includes 23km of new active transport paths as part of the project scope — 1 km more than the length of tunnel.

Opposite: The road upgrade at the new Northern Beaches hospital in Sydney is a major infrastructure project and significant change to the area. It was built to provide consistent access to the hospital for emergencies, vital service vehicles and patients and a road network appropriate to the needs of the growing area. With this purpose and context, the project has been developed to achieve the Beyond the pavement objectives and has a depressed through road, a design theme reflecting the nearby ocean and surfing culture, durable and refined materials and the safe integration of existing and new native vegetation. The project also caters for the movement of pedestrians. East-west shared paths run alongside both sides of the new road, grade separated on the south side. Distinctive curvilinear bridges provide north south connections and in time potential walking and cycling loops throughout the area.



Case study 3

The third Iron Cove Bridge in the Inner West

This project across the bay is much broader than a mere duplication of the second Iron Cove Bridge. Its primary purpose is one of public transport — to create dedicated space for buses in the busy Victoria Road corridor which was severely constrained by the old bridge. The scope of this project additionally includes integration of a wide shared pedestrian and bicycle path across the new bridge (1), the footpath in the old bridge having been noisy, narrow and unpleasant to use.

A ramp connection from the bridge down to the Drummoyne Pool and the north side of the Bay Run (2) and a new section of path through King Georges Park (3) provides a continuous inclusive connection with the Bay Run loop which is a regional as well as local attraction.

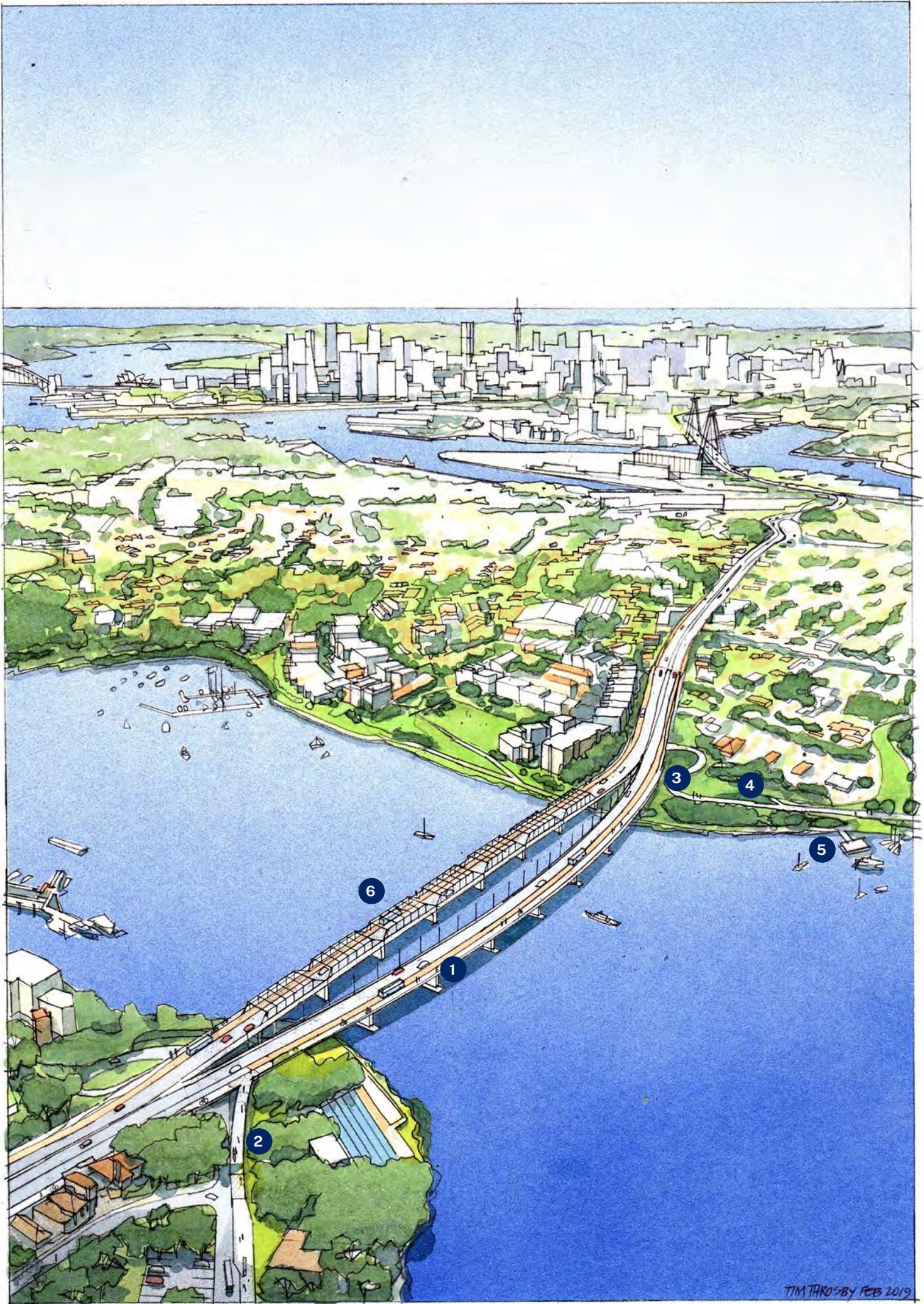
The project scope also incorporates new fig plantings and revitalisation of King George Park including a new playground (4), which was previously used as a construction compound for the project and a pontoon donated from the project works (5).

The Iron Cove Bridge duplication and Bay Run project successfully promotes active transport, allows better arterial bus movement through the corridor, improves water connections and links surrounding communities. The new modern bridge is curved away from the Pratt Truss Iron Cove Bridge (6) with its art deco elements to form a visual separation and visual contrast and to protect the historic old bridge. Its eight tapered piers are designed to align with the piers of the old bridge.

Views across the bay to the west are stunning for users. The new bridge was built in sections and then pushed out, or incrementally launched, from the Rozelle side of the bay. This complex engineering achievement required bridge slabs to be formed in precise curved sections and craned into place on the new bridge alignment.



The Bay Run path was realigned and improved, the playground in King Georges Park was used for the project construction site but rebuilt to modern standards. The pontoon used for the project was retained for boating access.





The Iron Cove bridge duplication with its 4.8m shared path completed an important link in the Bay Run, finishing a loop and triggering a large increase in popularity and the completion of other stretches of the walk. The effect has been more outdoor exercise, more people, café developments, recreation upgrades and the contribution to an iconic inner west asset.



The 4.5m wide shared path provides a fitting continuation of the Bay Run largely superseding the narrow walkway kept on the eastern side of the bridge. The railings are designed to allow views of the bay and a concrete edge to the path naturally provides a strip for walkers to stand and take in the view.

3.4 Principle four – Fitting with the landform

Introduction

This section addresses the need to least disturb the natural topography and, as far as possible, design the project and its earthworks to respond sensitively to landform. This principle applies primarily to road transport infrastructure but the principles have an applicability to smaller transport projects that have an interaction with topography.

Guidelines

The landform includes topography, geological character, coastlines, rivers, creeks and other water bodies. All road infrastructure traverses or intrudes into such terrain, and is subject to the constraints of that terrain. Landform has even broader implications. It is the defining feature of the landscape, whether this landscape is rural, coastal, escarpment or urban. Familiar landscapes with their landform, vegetation, human settlements, built structures and special sites are part of a region's culture and visual quality. In all cases, road location and design should be in sympathy with this. Well designed roads flow and respond to the topography, lakes, rivers and coastlines, to the natural and farmed vegetation patterns and to the forms and patterns of built settlement in the landscape. They move with the topography and skirt sensitive and difficult areas. In this way, a more physically appropriate and aesthetically pleasing road is produced. Also, roads formed in this way have the potential to be cost-effective. This design approach need not prevent using road infrastructure creatively within the landform to transform a landscape or provide a new experience that is physically and aesthetically appropriate for the context.

3.4.1 Form a road in response to geology, topography and landform

After route selection, the vertical and horizontal alignment of a road is the most fundamental decision that can be made in a project. As well as being a large factor in influencing the impact of a road and its traffic on the natural, built and community environment, road alignment affects subsequent earthworks, slope stabilisation, walling and bridging. Consequently, a road should be formed three-dimensionally, that is, in relation to topography and to the landscape as a whole. The key ways to form a road three-dimensionally – and these are subject to the particular context – are:

- ▶ Work with contours, in addition to cross-sections, to mould the road into the landscape and minimise disturbance on natural landform.
- ▶ Understand and respond to the underlying geological constraints in road location and design.
- ▶ Where possible, create gently curving alignments in undulating, natural landscapes.
- ▶ Independently grade carriageways on hillsides to minimise earthworks, reduce deep cuttings and fit the road more comfortably into the overall topography and landform.
- ▶ Grade out cuttings to a gradient slope that is no steeper than a 1:2 and less where possible, unless stable rock is present and the objectives of the design support rock cuttings.
- ▶ Avoid cutting through spurs and ridgelines but follow hillsides and, if necessary, aim for saddles.
- ▶ Shape permanent water control ponds and swales to follow the landform with rounded off slopes and varying grades to create a natural form.

- ▶ Consider curving the road alignment in cuttings to avoid a notch on the skyline. Also, consider varying median widths in keeping with the context. For example, adopt narrower medians in more constrained contexts and wider medians where the landscape is more expansive.
- ▶ Consider varying earthworks grades in keeping with the context. For example, use shallower grades with flatter undulating landform and steeper grades with hilly landform.

- ▶ Round off the tops, bottoms and ends of cuttings and embankments to help integrate earthworks with natural landform.

Across all of this it is critical to understand and incorporate in design the underlying geological constraints.



The Sydney to Newcastle freeway was built through the sandstone landscapes of Sydney's north shore and the Central Coast. Peter Spooner, a pioneering landscape architect, worked with the engineers of the Department of Main Roads to minimise the road footprint in areas where the sandstone cuts could be kept vertical and align the road so that a curvilinear from minimised the 'notch' effect in the ridges. The central median retained a 'mohawk of rock which in subsequent carriageway widenings was able to be retained in places. The sandstone, the alignment, the mohawks, the vegetation and the views create a memorable landscape and an iconic journey experience.



Sea Cliff Bridge, our only ocean side bridge and one of the few in the world, was selected as an option to avoid the cost of tunnelling into the escarpment, avoid the use of shotcrete and significant slope stabilisation and eliminate the never-ending maintenance on the Illawarra escarpment. The road and bridge strongly follows the form of the coastline and offers significant views over the ocean. A heritage line of Norfolk Island Pine trees was retained as part of the alliance project.

3.4.2 Consider slope stabilisation design as part of the project

Embankments that cross valleys and low-lying land should not be intrusive. Unsightly cuttings and stabilisation treatments, such as those extensively covered with shotcrete (sprayed concrete), should be avoided or not be visible from within a road corridor or from its surroundings.

If the route is not built at the same level as the adjacent land then some form of cutting or embankment is necessary. Slopes are subject to erosion which cannot be allowed to damage the transport infrastructure. As a result, some form of stabilisation is required, which if not considered carefully, can have a serious visual impact for customers and from surrounding regional viewpoints.

The following are ways to help make sure that the appearance of stabilised slopes is in keeping with the overall context:

- ▶ In open, rural areas a relatively shallow grade and vegetated slope are the most appropriate ways to achieve sensitive environmental fit and to minimise

maintenance. Cuttings should ideally be graded to a maximum slope of 1:2 and revegetated and embankment slopes graded to 1:4.

- ▶ Sometimes it is necessary to steepen cuttings. Where shallow grading is not possible, steep exposed rock faces are acceptable and can provide a distinctive landmark. Where rock is stable consideration should be given to retaining a visible rock cut, especially where the rock is dramatic and its geology interesting.
- ▶ Where space is restricted in urban areas, where contexts are highly sensitive or where there are geological constraints, panelling or walling may be appropriate. Panels can be used to cover unsightly piling or large areas of shotcrete used in the retention of cuttings. The design must consider the ongoing maintenance of the panels and the piling behind them.
- ▶ The need for shotcrete as a stabilisation method and finish should be avoided, or at least minimised and textured and shaped appropriately.

Across all of this, it is essential to understand and work within the constraints of the underlying geology and geotechnical factors.



A combination of stable rock with a textured shotcrete applied in minimal areas to stabilise the cutting and provide structural support (The Spit, Sydney)



On the Great Western Highway at Wentworth Falls, independently graded carriageways on curvature create terraces which minimises earthworks and the road footprint. They create an opportunity for the design of retaining walls to contribute to the journey and views.

Further information on the avoidance, minimisation and design of shotcrete is contained in the *Shotcrete Design Guideline*.

Conclusion

A good fit with the landscape should be a fundamental tenet of all infrastructure location and design. Forming a road in response to topography, and considering slope stabilisation as part of the landform, can produce many desirable outcomes while overcoming a whole range of issues.

This approach can help avoid cutting across the landform and bisecting or intruding into valued landscapes. The location, scale and design of earthworks and structures should be kept in character with the existing landscapes and neither intrudes into views from key

sites and nearby properties, nor affect sites which may be of significant heritage or conservation value, or that have visual prominence or value. Cuttings that create awkward notches on the skyline, scars on hillsides and unsympathetic junctions between new and existing landscapes should be avoided. Importantly, it should be realised that a sensitive fit between infrastructure and landscape and cost-effectiveness are not mutually exclusive. When slope fits with the landform, long-term safety and maintenance liabilities are minimised.

Case Study 4

The Ewingsdale Tunnel in the Cape Byron area

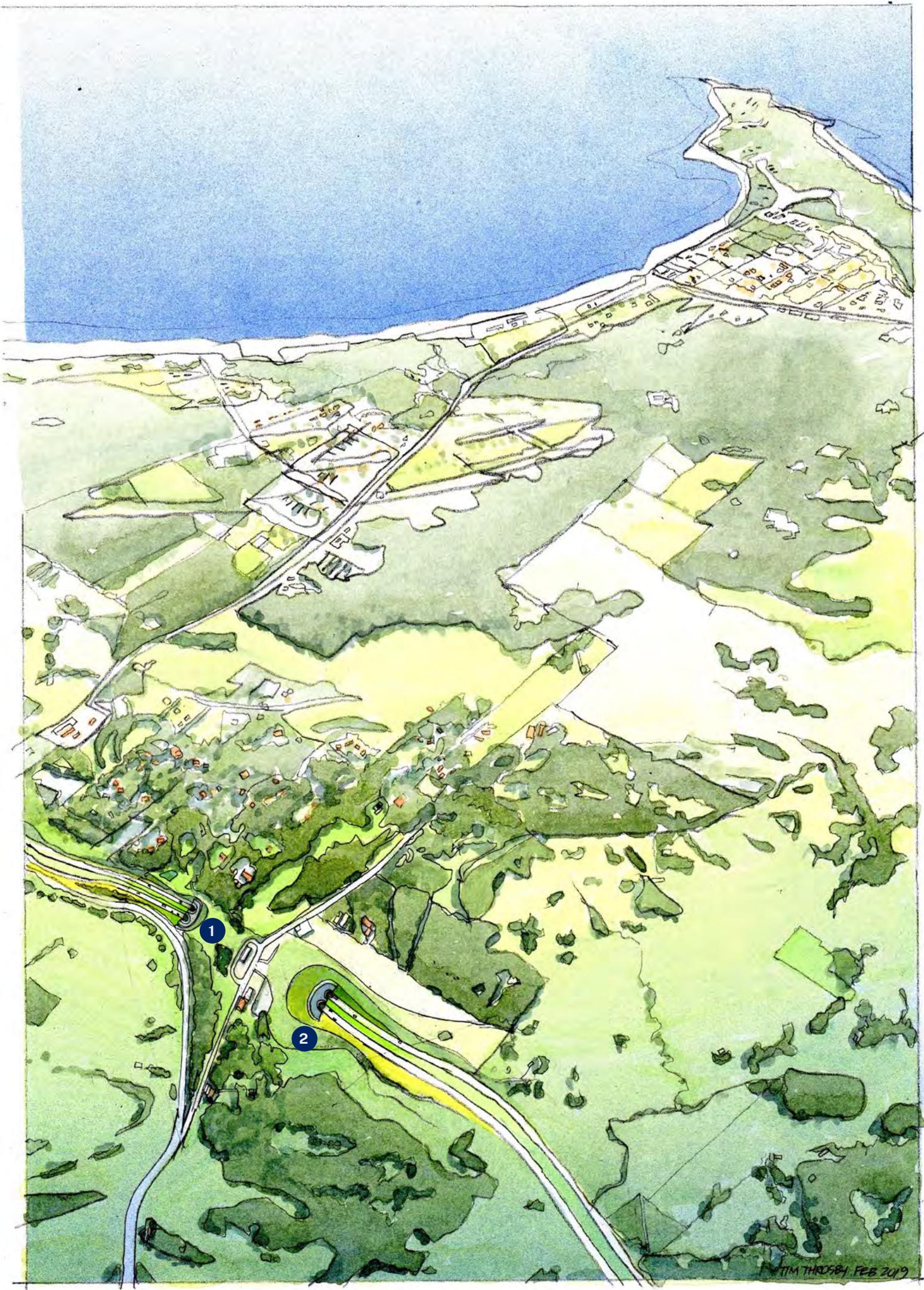
The Pacific Highway Urban Design Framework requires projects to flow with the landscape creating a seamless fit with the topography. Few projects do this as well as at the Ewingsdale ridge where a major feature of this 17km section of new motorway is its passing through the St Helena ridgeline in a short tunnel to avoid a deep cutting scarring the landscape (1).

The tunnel retains as much of the hillside topography as possible extending under the natural ridgeline, which forms a threshold between the elevated plateau and the coastal hinterland and Byron Bay. The hillside has been re-created to fill the original landform, and the portals and approaches have been designed to integrate the structure with the natural landform (2).

North of the tunnel a clear noise wall (3) allows views of Cape Byron and the Pacific Ocean. South of the tunnel the highway takes a flowing alignment through the topography and agricultural lands. It has a series of simple refined bridges and is characterised by rounded cuttings and native planting. Its fit into the valley and undulating setting, with a rich continuous landscape and integration with farmlands, creates a memorable visual experience.



The white tunnel portal collars contrast and highlight the landscape and landform around. They divert storm water and provide a maintenance safety parapet. The landform wrapped around the portals and laid back to natural grades is a long term safe earthworks solution which avoids walls, their maintenance and graffiti.





The view from the tunnel portal heading north frames the view of Cape Byron.



The tunnel control centre was set into the ground below the ridge line ensuring open views to Cape Byron

3.5 Principle five – Contributing to green infrastructure and responding to natural systems

Introduction

This section provides guidance on two interrelated principles. The first is the value of incorporating natural characteristics – the natural forms, materials and processes in the environment – into transport infrastructure design thereby contributing to the protection and enhancement of the underlying ecological systems and biodiversity. This, Ian McHarg called ‘design with nature’. The second principle is to contribute to green infrastructure to create continuous networks that not only help sustain ecology and biodiversity but, among other things, physically shape the environments in which we live, complement urban density, provide cool and shade, sequester carbon, beautify our cities and help to better stitch our projects into their surrounds and areas with one another.

Design with nature

Landscape architect Ian McHarg argued nearly a half a century ago that engineers need to consider much more than commonplace road engineering criteria if they are to make engineering good. He especially expressed the need to ‘design with nature’ and to understand and conserve the ‘intrinsic values’ of an area. His clear message was that roads and transport should not cut swathes through neighbourhoods and landscapes, and should not destroy the ecology upon which life depends.

In designing transport infrastructure it is essential to think about the patterns and characteristics of the natural environment and underlying ecosystems and biodiversity that will be affected. This is the case in both urban and rural environments. Transport, by its very nature, has a linear corridor character. It will almost inevitably pass through a number of different types of terrestrial and aquatic ecosystems. These ecosystems develop their physical patterns and specific characteristics in response to terrain, soil types and hydrology. Since ecosystems extend well beyond the immediate corridor, location and design can have impacts that are regional in scale.

Once the roadworks are complete the landscape starts to regenerate. This regeneration is influenced by the design and management plans. Corridors can act as barriers to wildlife and sever vegetation communities. This can however, be minimised by medians that are adequately wide, crossing points that fit with natural patterns and the use of local provenance native vegetation and plants that suit the conditions.

As well as being important for the sustainability of the natural environment, natural systems and ecology are an attribute of the landscape and furthermore are an essential part of the urban design of infrastructure. They contribute to the structure, character and sense of place of an area and provide a visual experience of value to the community and travellers. They are the only element of transport infrastructure that improves with time. Designers and transport managers need to consider this dimension.

Additionally, the natural environment, natural systems and ecology have recreational use and value as part of the outdoor life of the community. Transport should be designed to respond to, rather than diminish or destroy, natural patterns deemed to be of value to the community.

Contribute safely to green infrastructure networks

As well as protecting and responding in infrastructure design to natural systems we should endeavour to add to the natural environment by contributing to green infrastructure networks. There is a planning, political and community call for this as well as international precedent

Green infrastructure is a relatively new term used to describe a structure or network of natural open spaces and linkages – in their natural form as well their built form – in urban and rural contexts. When we protect and do not destroy natural and open spaces and linkages, incorporate them in road and transport infrastructure design and add to them by stitching them together and creating more, we contribute not only to the broader pattern and form and visual attractiveness of the landscape but to life supporting systems. This helps make infrastructure environmentally sustainable. Green links, parks and street tree planting are an important part of green infrastructure as is agriculture and in themselves serve as organising mechanism of cities.

Transport systematically undertakes the greening of road corridors across the entire State. Vegetation is a vital component of the transport corridors of the NSW. Some of the many benefits include: providing habitat; minimising erosion on road verges, cuttings and embankments; absorbing carbon dioxide; providing shade; adding character and interest to roads and streets; and, screening traffic and improving views. Road transport projects can include significant areas of native tree and shrub planting and grasslands. Each year hundreds of thousands of trees are planted or sown into road verges. These trees, shrubs and grasses generally originate from native seed collected in NSW, which ensures the trees have the best chance of survival, use least water and fit in well with the forests and ecosystems of this part of Australia.

The elements of green infrastructure as understood in terms of policy for NSW are: natural green space including national parks and nature reserves, waterways, wetlands and coastal margins; agricultural and other productive land and farms including vineyards, market gardens and orchards; greenways including river and creek corridors, cycle ways and routes along major road corridors; parks and gardens including regional parks, urban parks, open space reserves and formal gardens; public residential and other tree lined streets including road verges; squares and plazas including public as well as private courtyards and forecourts; sports and recreational facilities including ovals, school and other institutional playing fields

and other major parks and golf courses; private and semi-private residential gardens including shared spaces around apartment buildings, backyards and roof and community gardens; and green roofs and walls including roof gardens and 'living' walls.

Landscape architects and ecologists work together to prepare vegetation plans, designed in harmony with the broader landscape character. These drawings are then costed and the plants sourced from local nurseries. The vegetation can be established using seed that is sown directly into roadsides, or using plants grown from seed in nurseries and then transplanted into verges and medians.

On large projects tens of thousands of trees can be planted which mature to become great woodlands corridors. Examples include the North Coast Pacific Highway or avenues of honour such as on Remembrance Driveway on the Hume Highway between Sydney and Canberra. In towns and cities, shrubs and trees are used to create a seasonally attractive and environmentally beneficial public domain.

In the design of any green infrastructure the safety needs of the builders, maintainers and transport users need to be taken into account. Trees should be in a safe location to avoid collisions and sight distance issues. Safety can be improved through the use of barriers or the trees removed before they become a problem. Trees should not clash with the movement envelopes of trams, trains or buses. Vegetation should be able to be maintained safely without having to close the transport mode. This means safe access paths and safe places to park vehicles.



Set back from the travel lane, tree planting on Cowpasture road will in time help provide tree canopy and mitigate the temperatures of Western Sydney. This approach to the landscape fits well in the 'Parkland City' in the Greater Sydney Plan.



The Pacific Highway creates a green lush vegetated corridor for nearly 700 km between Newcastle and the Queensland border

Although vegetation matures and improves with age it needs maintenance to help it establish, keep it from damaging roads and bridges and keep it from encroaching safe sight lines and clear zones. Maintenance includes regular weeding, watering and vegetation thinning.

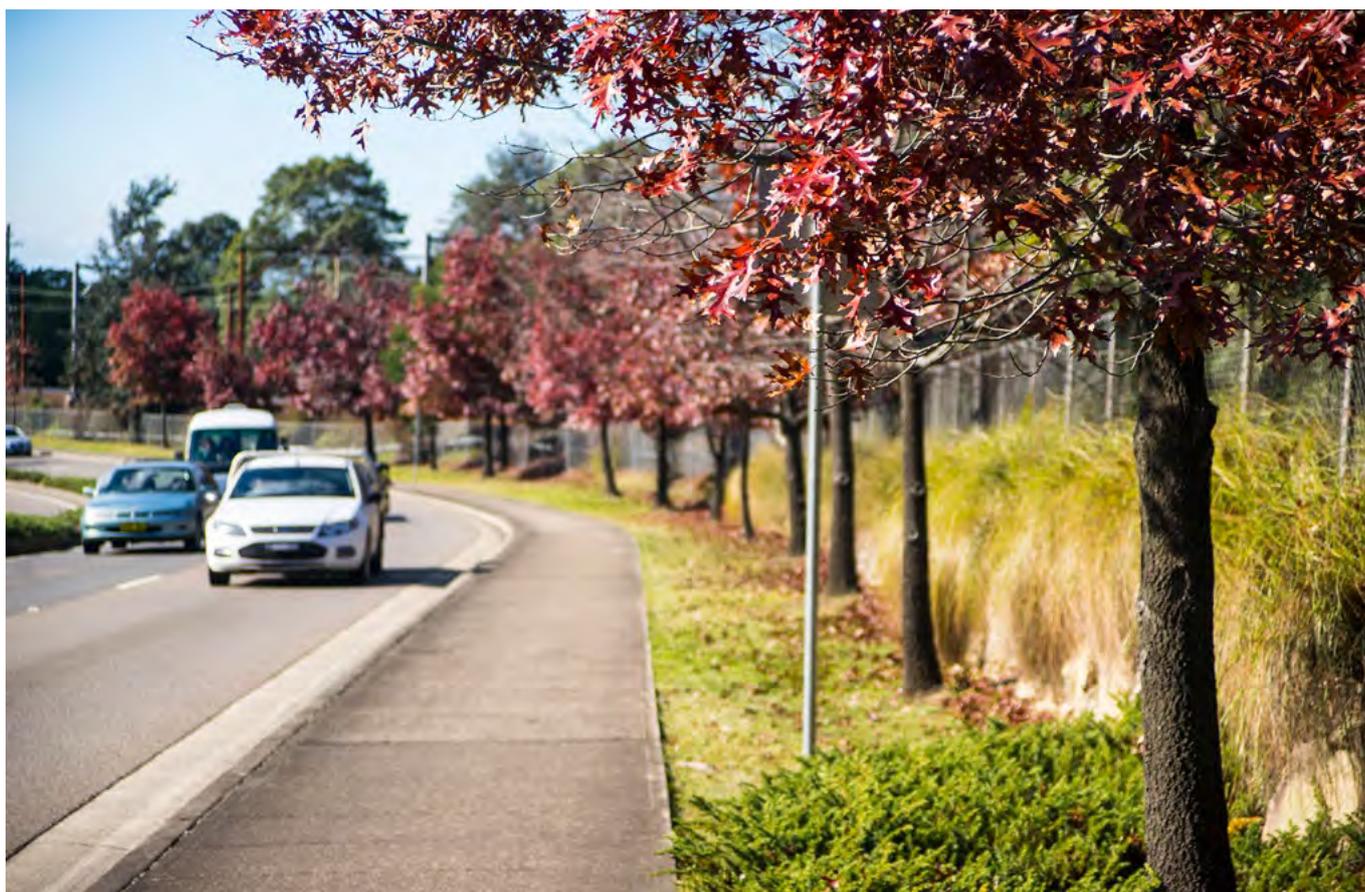
In time, this dedication to the landscape will improve our towns, cities and regional areas. In terms of the whole NSW state road system it is estimated that the total landscape area is approximately 170,000 hectares. This is a significant estate and roughly equivalent to 16 million tonnes of carbon offset.

The Urban Design Roads and Waterways team promotes a best practice green infrastructure approach within which there is a strong objective for greening corridors and preserving valued landscapes. Its water sensitive urban design guideline sets down best practice storm water treatment using natural vegetated means. A compendium Transport landscape guideline sets down principles and guidelines for the landscape design and management of the NSW state road network and other transport assets.

On projects and depending on context, around 1–2% of a project implementation costs are for establishing green vegetated verges and medians. Approximately 10,000 trees and shrubs are planted on each kilometre of new highway as well as native seeding. It is estimated that the total state road landscape area managed is around 170,000 hectares with a vegetated cover roughly equivalent to 16 million tonnes of carbon offset.

In the light of its large metropolitan infrastructure program Transport needs to specifically address the metropolitan vision, objectives and principles for creating a Sydney Green Grid devised by the NSW Government Architect in association with the NSW Department of Planning and Environment. The green grid is conceived as a spatial framework for the development of Sydney. A recreational grid, ecological grid, hydrological grid and agricultural grid is combined through a network of green infrastructure which needs to be reinforced and further developed. As well as being a connective network concept it also links to places and nodal points of the metropolitan area:

The Sydney Green Grid promotes the creation of a network of high quality open spaces that supports recreation, biodiversity and waterway health. The green grid will create a network that connects strategic, district and local centres, public transport hubs and residential areas.



Pin Oaks were used on the Great Western Highway Upgrade at Faulconbridge. They were safely set back behind the required clear zone for the designed and posted 60km/h highway. They create a seasonal impact on the journey as well as a marker for the town and the different driving conditions.



Tree planting at Tallawong Station on the North West Metro to improve the built environment and provide much needed shade.

Guidelines

3.5.1 Consider the landscape as an integrated part of the whole project design solution not as a final optional layer

Revegetation and planting and its establishment and maintenance is often a challenge because it is considered (and designed) as the final layer of a project, applied after all else is complete.

In reality the landscape is not the final topping but an integral part of a project and represents the culmination of good engineering through all the layers a project from geotechnical to soil management work. Vegetation represents a stable low maintenance long term outcome

for the land's surface but will only thrive and be successful when the right landforms, gradients, substrate, soils and drainage are provided and integrated to support it. Nature demonstrates this principle well as plants will not naturally colonise an unstable slope until it has been eroded and flattened enough to support a succession of plants (and associated soils) from pioneers to eventually more mature (climax) species.

In the same way that a building's façade is an integrated part of its structure, protecting its internal environment, its structural elements, fundamentally contributing to its appearance and integral to its success so the landscape must be considered, if a project is to be successful in the long term and not a liability.



Progressive landscape completion on the Woolgoolga to Ballina section of the Pacific Highway upgrade. The slope gradient, the substrate roughness, the soil depths, the use of locally won soils and the native seeding have all contributed to an outcome that, with appropriate establishment, will provide a long term landscape for the motorway. Creating this outcome progressively helps minimise erosion of uncovered surfaces and helps provide a green outcome on opening.

3.5.2 Integrate natural patterns and systems into road design

All places have their own unique natural character based upon the interplay of geology, topography, vegetation, water courses and climate. For example, the Illawarra Region is characterised by the proximity of the escarpment, foothills, flame trees, fig trees and the many bays and peninsulas which abut the ocean. The north coast of NSW is characterised by the great rivers crossing the coastal plain and the tall eucalypt forests which cover the undulating topography. The New England Tableland is characterised by steep sided gullies, open plateau grasslands and heavily forested valleys and escarpment edges. The mid west is characterised by long plains punctured by vegetated rises. The harbour and river landscapes of NSW have their own special characters ecologically, geographically and culturally.

Integration of natural systems and patterns supports local biodiversity and reinforces self-reliance and natural resilience.

It is necessary to understand and integrate the natural characteristics of each place into road design— particularly in terms of landform and planting and seeding decisions. This will help to achieve a road that fits the landscape and the ecology and will help make the road feel a part of the landscape.

3.5.3 Achieve physical continuity of natural systems

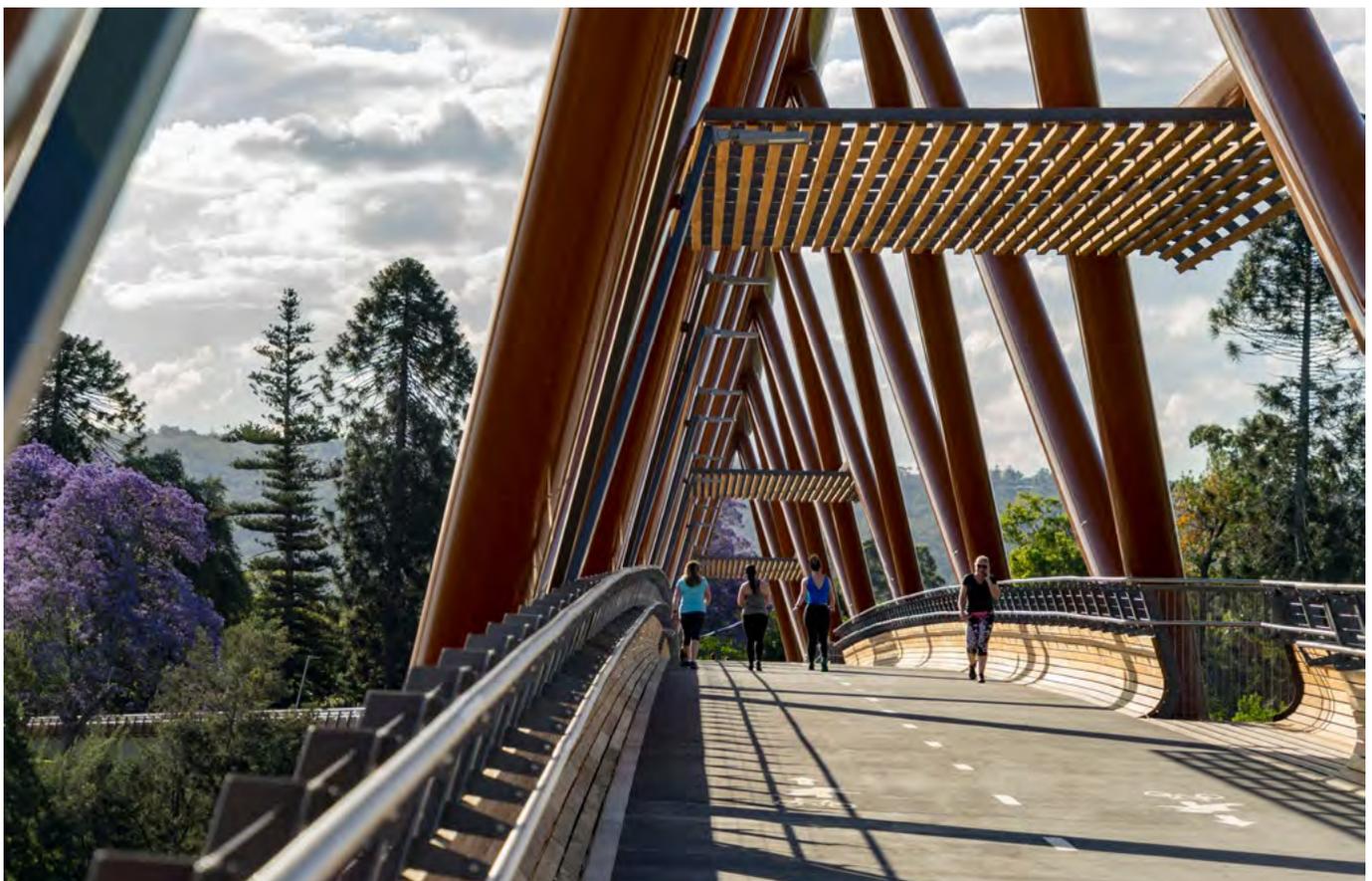
Route selection and design should endeavour to achieve sustainable outcomes and restore or replace natural system linkages. Such objectives lead to better, more fitting design outcomes and an improved road user experience. For example, continuous tree canopies provide cover for wildlife movement as well as habitat in their own right. They also offer a windbreak for farmers, shade for cattle and recreational benefit for bushwalkers. In light of these concerns, the following guidelines should be taken into account in road design:

- ▶ Select and design landscape planting and vegetation to help reconnect natural systems and habitat.
- ▶ Avoid severance of natural systems in road design especially when crossing rivers, creeks and waterways.

- ▶ Use landscaped medians where appropriate to incorporate or continue habitat, subject to road safety considerations.
- ▶ Use local landscape materials and treatments.

3.5.4 Achieve a visual and physical connection to the landscape

A visual and physical connection Green infrastructure has been found to improve our health, and relieve stress by providing a connection to nature. Hospitals for example integrate gardens and courtyards to assist in the recuperation process. Road and bridge projects should provide a connection to green infrastructure either existing or created for the project.



The Yandhai Nepean bridge provides extensive views of the river landscape for the community of Penrith and visitors.

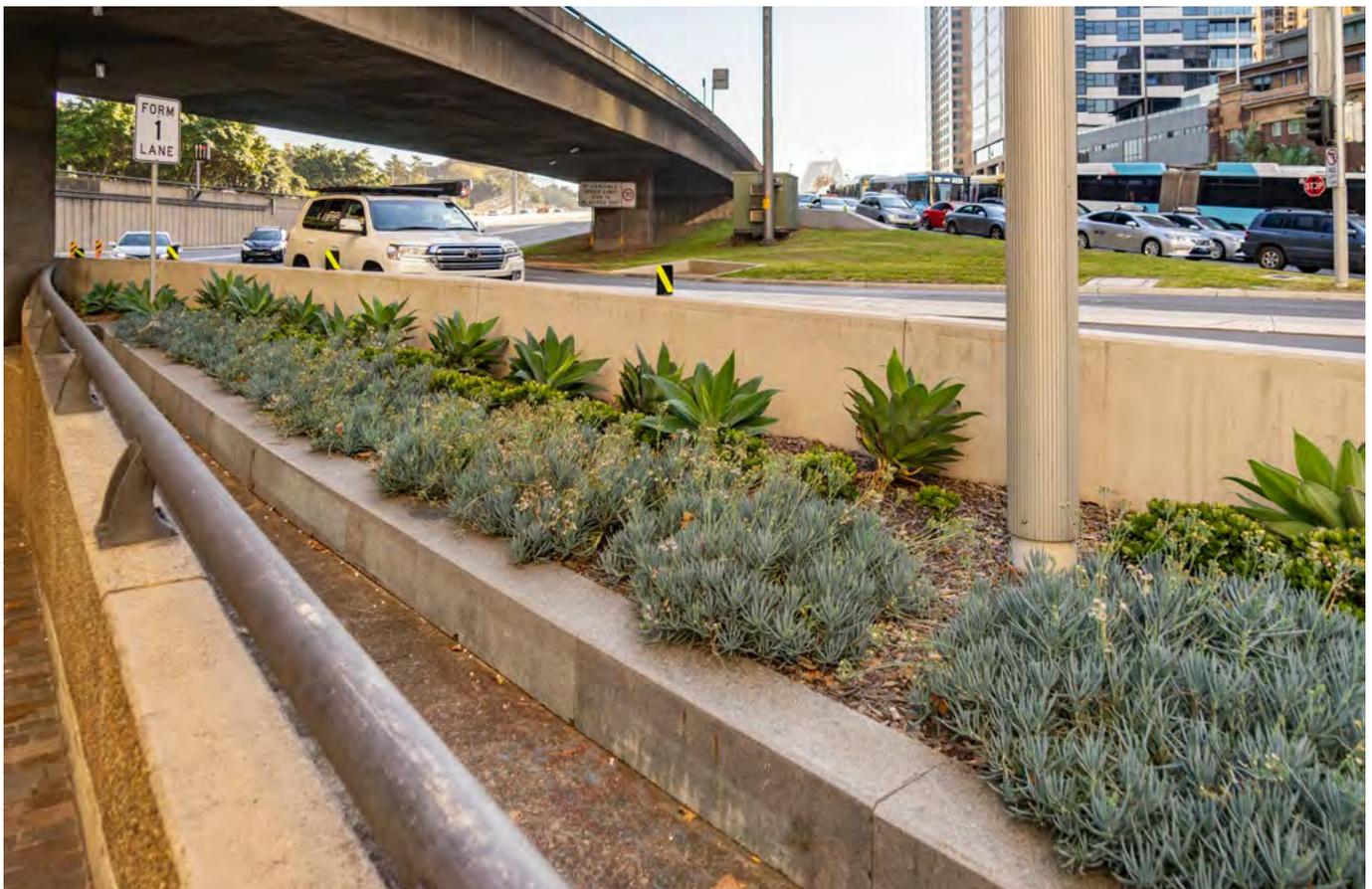
Route selection and design should endeavour to achieve sustainable outcomes and restore or replace natural system linkages. Such objectives lead to better, more fitting design outcomes and an improved road user experience. For example, continuous tree canopies provide cover for wildlife movement as well as habitat in their own right. They also offer a windbreak for farmers, shade for cattle and recreational benefit for bushwalkers.

Aboriginal people can help advise on the selection and planting and management of native flora. This can help interpret the local stories, achieve greater plant resilience and help reflect the Australian seasons.

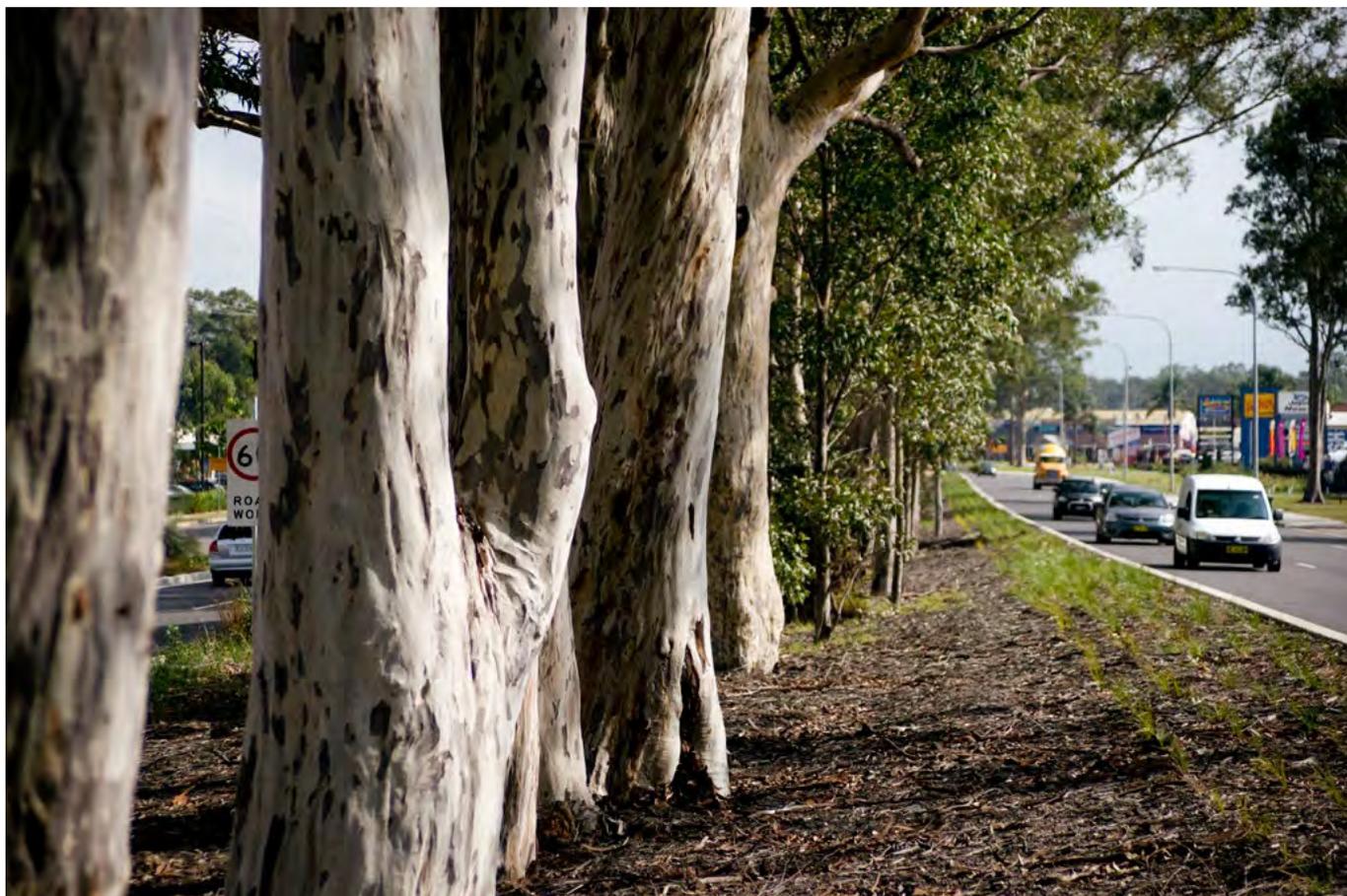
3.5.5 Consider the resilience of the landscape to climate change and minimal landscape maintenance

Landscapes that are overly reliant on maintenance to survive and mature will be less successful than self-reliant landscapes. Changes to our climate will exacerbate this issue. Landscape designs should consider the resilience of plants and plant combinations and be robust and durable.

- ▶ Where possible use wide ranging native species particular to larger areas of Australia rather than niche plants only able to survive in particular conditions or places
- ▶ Consider the use of succulent species in drier areas or areas not able to receive much water
- ▶ Use trees which are the largest plants and need the least maintenance per unit area



Succulent plants used in dry city areas can survive and contribute to the greening of the city



The existing mature native trees in South Nowra were retained as part of the Princes Highway upgrade adding a landscape maturity to the setting.

3.5.6 Use natural characteristics in the road's landscape design

In road design, particularly concerning the landform and landscape aspects, much can be learnt from the local natural characteristics of an area. Watercourses and wetlands show us how to locally channel and cleanse water. Forests and woodlands indicate how trees and shrubs best propagate themselves in terms of their spacing and groupings, and reveal which species work well together and naturally suit the area. Rock outcrops and general ground conditions show us what the local fauna have adapted to and depend upon. It is important to create conditions in the landscape design which support local biodiversity and help establish and perpetuate natural processes. These conditions include:

- ▶ Diverse ground conditions with variable gradients and materials, from rock to deeper soils.
- ▶ Seeding and planting of native species of local provenance, improving plant survival and resilience, reducing water consumption and supporting local fauna.

- ▶ Natural plant spacing which reflects the need to out-compete weeds but also provides space for the plants at maturity.
- ▶ Plant groupings that are mutually supportive and thrive in the particular environment.
- ▶ A 'water-sensitive design' approach using open drainage channels with native plants, rocks and gravels, to help cleanse road storm-water runoff (refer to the Urban Design Roads and Waterways team's Water Sensitive Design Guideline).
- ▶ Use of excess local natural materials such as rock and timber can help recover biodiversity and create habitat.

Where a project has biodiversity requirements in the project's conditions of approvals, such as the need to revegetate areas, this should be considered as part of the project's design.



Large areas of concrete are not sustainable with regard to long term durability (weeds will always find gaps to grow) as well as providing shade and a cooler built environment. The width of this median is sufficient to include planting in this location (Camden Valley Way).

3.5.7 Integrate trees creatively and safely into project designs

Civic beauty is why the practice of planting trees along city streets took root, but now the benefits of urban forests have a reach as broad as their leafy canopies. Today, trees are considered infrastructure as necessary as roads, bridges, pipes and tunnels. It's why the Society of Municipal Arborists use the tagline "Trees: The only infrastructure that increases in value over its lifetime." Planning, June 2017, USA

Roads and streets provide an opportunity to integrate trees into our urban areas and contribute to the protective tree canopy and the health of our communities. Every 10% increase in tree canopy lowers the ambient temperature by more than 1 degree.

Trees must be designed into our projects at the outset to achieve safe and sustainable outcomes that can be looked after without harm to workers. In certain places it may be necessary to consider the role of frangible trees. Importantly, trees are part of the beautification of cities, towns and villages giving them identity and making them attractive for living and investment. They should not be an add-on at the end of a project.

The Landscape Guideline addresses this area of work in more detail.

Conclusion

The closer the design outcome is to the natural landscape the more ecologically valuable the road landscape will be, and the more likely the natural systems will be to survive without costly intervention. If they are not designed well, roads can seriously damage the natural environment. The incorporation of trees in a project's scope of works and their creative and safe design and management planning makes a fundamental contribution to the sustainability of the environment, the quest for shade and the visual character of the project and corridor of which it is part. By designing roads in accordance with the guidelines in this section and other environmental documents, it is possible to both minimise ecological impacts and create a more sensitive and interesting design outcome.

Case study 5

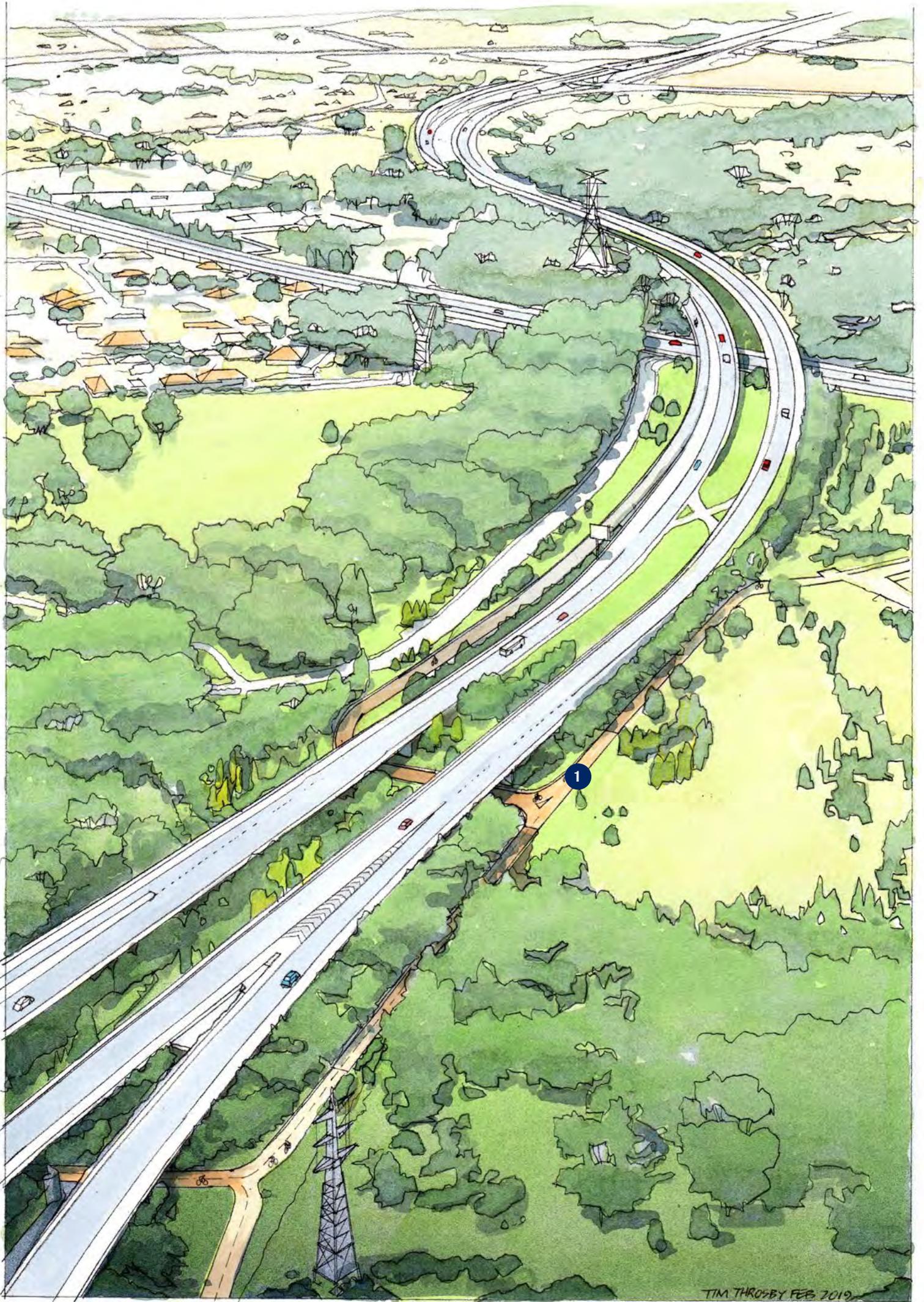
The M7 active transport corridor in the western Parkland City

A key success of this integrated motorway and cycleway project and one which provides wider benefits to Western Sydney is the delivery of a green corridor that is generously landscaped with native species in the wide median and the verge, that connects to the Western Sydney Parkland and that creates a major new park to compensate for loss of original green space. The 4m wide shared path runs alongside the M7 separated from traffic. (1)

It has its own bridges over roads and creeks (2), integrates into surrounding pedestrian and cycle networks and, with its landscape curtilage, is an almost continuous piece of regional green infrastructure in its own right that provides shade, rest stops with heritage interpretation and visual interest for users.



M7 shortly after opening in 2005 with the new landscape still in the establishment period. (Photograph by Roger D'Souza)





The landscape after 10 years growth helps settle the road into the landscape, prevents erosion and weed growth and provides much need shade for the shared path.

The M7 and its cycleway provides a 40km green transport corridor through Western Sydney. On opening, drought badly affected the planting, but after time and with care from the maintenance crews, the native trees and grasslands have established and form a substantial green infrastructure asset. There are several important design principles relating to this cycleway and others of a similar nature.

Ensuring a balance of treed areas and open areas with views of the wider landscape is important to make the cycleway feel safer and more interesting.

The cycleway should have an interdependently graded alignment, suited to the slower speeds of cyclists, to make the route less monotonous and tiring. Also cycle bridges can be shorter than road bridges so money can be saved.

The cycleway alignment should, where needed alternate between each side of the road to connect to key destinations and other cycle routes. The cycleway should help form other off motorway cycle loops.

3.6 Principle six – Connecting with Country and incorporating heritage and cultural contexts into projects

“Many of our roads and railway lines follow the ceremonial paths travelled by the ancestors as they crossed traditional country for family and cultural responsibilities and trade. Our transport system is a living, breathing network that connects us with each other and which carries our stories across cultural border lines.”

Transport Reconciliation Action Plan 2019–2021

Introduction

This section addresses the need to understand Country, and the heritage and cultural context of a road and outlines ways to incorporate this understanding in its design.

Heritage is often taken to mean old, historic, of things past and now no longer. But this is not the case, it is our journey to the present day, encompassing both deep history and recent times, teaching us about ourselves. An important event or project milestone that happened yesterday or last year, is a part of our heritage just as much as something a decade, a century or a millenia ago. Designing something well creates heritage for our future.

Aboriginal heritage is ancient yet is ongoing and vital to our future. Our colonial heritage is much younger, but an integral part of our cities and systems. More recent migrations add richness and depth to Australia’s built environment and culture. And the last few years of significant change, another layer of heritage.

Connecting with Country means continuing or repairing that connection to the land, to the stories and events, to the practices and wisdom of First Nation’s people. But it is also a part of connecting with all our heritage, the built form, the songlines, the old roads and streets. the art and creativity of all people, the land management, farming and industrial craftsmanship, the architecture, parks, cultural plantings of early colonists and the waves of newer arrivals, and the remembrance of events and times of great challenge and of great joy.

Guidelines

“Designing with Country is not possible without engaging with, and more importantly, being guided by Aboriginal community and recognised knowledge holders”

Designing with Country Government Architect NSW

“It is now accepted that the best of what has been handed down to us should be protected...”

Scottish Executive: A Policy Statement for Scotland, 2001

Once heritage is destroyed we never get it back. Heritage should not ever be wiped out because of haste in project approval, design and delivery and saving cost. There should always be a commitment to the identification, assessment and incorporation of heritage.

The heritage that road location and design is concerned with includes: places of Aboriginal cultural and historical significance; sites, buildings, ensembles and structures of European cultural and historical significance; and cultural plantings which are part of urban and rural settings. Our heritage provides continuity, a unique sense of history and tradition, visual distinction and a sense of local and state identity. Heritage often contributes to landmark features along a route. Roads not only provide access to and views of our heritage, making it part of the road experience, but may themselves be of heritage significance and worthy of preservation in some form. All these aspects of heritage have meaning for the community, can never be replaced and should be respected. Because heritage is a complex issue that requires some objectivity, urban designers and project managers should use the experience and work of heritage specialists in developing appropriate responses to cultural and heritage issues. They should also draw on as much local knowledge as possible. It is especially important to consult with Aboriginal communities which might be affected. Aboriginal people are the primary source of information on the value of their heritage and how this is best conserved. This section sets out the design guidelines that should be taken into account in the consideration of heritage issues.

3.6.1 Work with the Aboriginal community to protect, incorporate and interpret Aboriginal knowledge, expertise and cultural heritage in project design

We should strive to provide a Connection to Country, integrating Aboriginal sense of place, wisdom, creativity and story into a project's urban design. This supports the NSW Transport Reconciliation Action Plan.

This policy advocates designing with Country at all stages of a project guided by the NSW Government Architect document 'Designing with Country' and the following points:

- ▶ **Context:** It is important to look beyond the road corridor into the surrounding area. The whole landscape will have profound meaning for Aboriginal culture.
- ▶ **Co-design:** Consult with the Aboriginal community, Elders, experts, designers, Registered Aboriginal Parties and artists. Seek their input.
- ▶ **Local input:** Aboriginal involvement should be local to the area to achieve the right knowledge, experience and a Connection to Country.
- ▶ **Value expertise:** Aboriginal cultural input should be respected and financially valued for its contribution.
- ▶ **Comprehensive design:** Connecting with Country can manifest itself in many ways in a project including the landscape, project form, interpretation as well as artworks.



Tunnel building at St Peter's Interchange, designed by urban designers and local Bidjigal Aboriginal elders and artists. The design is called 'Movement of Shells, Movement of Time.'



The Women who Made the Sea sculpture at the Nambucca Highway Service Centre on the Pacific Highway was created by Balarinji Aboriginal Design and Strategy Studio, collaborating with three local Gumbaynggirr artists – Denise Buchanan, Francine Edwards and Annalisa Wilson in conjunction with fabrication artist Stephen Newton. The sculpture is a source of pride for the Gumbaynggirr community and educates travellers and locals alike on the Gumbaynggirr Dreaming story and the importance of the area's ecology.



One of 18 paintings, drawn for each bridge location by local Aboriginal artists, on the Woolgoolga to Ballina upgrade of the Pacific Highway. The largescale paintings depict stories of the area - the fauna, flora, totems and events - and have been produced in high visibility reflective materials. They help provide a connection to Country but should not be seen in isolation from good design and the collaboration with local Aboriginal groups in the planning of the road alignment, the views, the landscape and species selection and the work of Aboriginal builders and suppliers.



Shorelines and Storylines, an artwork on the noise wall at Burnt Creek deviation, was created by Balarinji Aboriginal Design and Strategy Studio in collaboration with the late Jessica Birk, a locally connected Aboriginal artist.

3.6.2 Integrate historic buildings and precincts into design thinking

Heritage 'items' generally receive attention in the planning and design of roads and maritime precincts. State and Commonwealth legislation ensures that heritage items are protected or, if approval is granted for their removal, that they are recorded. It is often the case that the value of the heritage or cultural context in which a heritage item sits is at least as important as the item itself. As such, heritage items should be considered as part of the history, physical environment and visual quality of a place. The integrity of a heritage entity, for example, a heritage building and its entire curtilage, should be protected. Design should avoid cutting through and severing heritage sites and their structures, destroying buildings and items of heritage importance (whether or not they are 'listed'). Likewise it should not unnecessarily disturb or destroy intact cultural plantings and building groupings that define the character of a place. With respect to these issues, the following points should be taken into account:

- ▶ Where appropriate maximise the incorporation of historic buildings as landmarks along a route by protecting them visible from the road.
- ▶ Where appropriate deviate the proposed route, at least beyond the curtilage of a building or ensemble of buildings, including the associated vegetation that contributes to the composition and character of the site, subject to funding.
- ▶ Design access to such sites in a way that is both sensitive to and reinforces the curtilage, by giving consideration to:
 - the use of service roads which can: keep the upgrade of a road or new road away from the site while keeping it visible; allow vegetation of the corridor; accommodate walking and cycling along the frontage; and accommodate parking and tourist buses.
 - the preservation or introduction, of a formal axis or causeway into the site.

- keeping the footprint of the road to a minimum, or at least, mitigate its potential impact on the quality of the corridor, for example, by carriageway separation and planting; all together, the project and historic buildings and ensembles need to be brought into a compatible and balanced composition.
- ▶ Vegetation is usually an integral part of the heritage context, therefore:
 - retain the vegetation associated with the heritage item and its curtilage.
 - vegetate the corridor to fit in with or otherwise complement the pre-existing vegetation.
- ▶ Where adjacent to heritage items, select road elements which are sympathetic to the heritage involved. Such elements should be simple and complementary in character. They should not appear ‘fake’ or attempt, for example, to replicate the detailed design of the item, but should be compatible.
- ▶ Design and locate signage to minimise the visual impact on heritage buildings and ensembles, as well as structures of heritage significance, such as bridges, heritage landscapes, Aboriginal heritage and culture, historic roads and the broader landscape of which these are part.

3.6.3 Adaptively re-use heritage infrastructure in projects

The opportunity should be taken, where possible, to re-use heritage infrastructure in the planning and design of infrastructure projects. This may include redundant infrastructure for water supply, road and wharfs.

Re-using heritage infrastructure links us with our past, helps provide identity and a sense of place and is a wise use of resources.



At Plough and Harrow Park, built as part of the M7 project, the old farm sheds were adaptively reused as a restaurant and café. The former Roads and Maritime worked closely with National Parks and Wildlife Services who managed the park and the lease for this building (picture Richard Glover).



Memory Park in the Blue Mountains uses cultural plantings as part of the heritage interpretation of the site.

3.6.4 Recognise European and Aboriginal cultural plantings

There may be particular plantings in towns, cities and the countryside that can be considered to have heritage value, even if their heritage value has not yet been assessed and formally listed on an environmental plan or heritage register. These can include species planted to create a nostalgic connection to the countries of immigrants, collections planted by landowners and botanists and Aboriginal trees of significance for wayfinding or scar trees. They should be preserved and respected. New culturally appropriate plantings can be created to serve as landmarks in different local contexts.

3.6.5 Protect bridges of heritage significance within their setting

Bridges of heritage significance are both a community and area asset. An urban design approach to the protection of such bridges recognises the contribution they make to the character, history and cultural environment of areas and communities. This recognition needs to be put in the context of current policy and scarce funding resources.

The protection and rehabilitation of classes of bridges, as well as specific bridges, of heritage significance is part of the Transport asset management strategy. Of the numerous bridges listed on the S170 Register, Transport makes a special effort to protect and rehabilitate bridges of heritage significance (in accordance with its timber truss bridge strategy). Bridges of heritage significance are selectively protected and rehabilitated in a manner



sensitive to their particular heritage values, through which their useful life can be extended another 20–30 years. There are 27 timber bridges in NSW that will be protected.

The following urban design guidelines should be considered in relation to bridges of heritage significance. Further information can be found in *Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW*.

- ▶ Where it is intended to duplicate a bridge that is considered to have heritage value and be suitable for contemporary use, the new parallel bridge should either duplicate its form and proportions (more suitable with concrete structures), or else provide an acceptable contrast in keeping with the original bridge and setting of which it is part (for example truss type bridges). In all cases the paired structures should read as a unified whole.
- ▶ Uphold the vistas and viewpoints to and from the old bridge and its curtilage, as far as possible.
- ▶ Integrate and reinforce the quality of the precinct in which the bridge sits, including river embankments and precincts on either side, as far as possible.
- ▶ Modify the design of a heritage bridge to strengthen it and accommodate re-use in keeping with heritage guidelines so that it retains its working value to the community as a working asset.
- ▶ Accommodate access to walking trails at heritage bridges and encourage users to learn about the heritage of the bridge and its context through, for example, the provision of signage and heritage interpretation panels.



There has been agreement in the NSW Government for the conservation of 27 heritage timber bridges of which Abercrombie bridge, pictured here, is a part. These are a beautiful and vital part of our landscape and history and as such need to be incorporated into our thinking of corridors and projects. They will remain important connections for country roads and towns.



3.6.6 Preserve roads that provide a sense of history

NSW has a history and legacy of historic roads, including many of the oldest in the nation. Their identification, preservation, management and promotion recognise that historic roads guide us through our history, helping us to experience places that make the state unique. Their transformation into roads which meet current day use requirements needs to be done with care. It is not simply the issue of removing or replacing them that is at stake: there is also their vulnerability to ‘improvements’, such as widening, straightening, the removal of established roadside trees, the removal of original walls and the addition of contemporary signage.

The character of a historic road is affected by changes to the larger setting and community through which it passes, for example, through inappropriate zoning and development. We must also consider that our constructions are not simply for this generation; what we create and build today will become the heritage of tomorrow, although they are subject to modification in the future. With regard to these issues, the following guidelines should be taken into account:

1. Align the road to move responsively through the historic and cultural landscape, both Aboriginal and European.
2. If it is difficult to preserve the entire extent of the road, endeavour to keep a thematic sample of the cultural landscape as a minimum.
3. Recognise the benefits of historic (and generally scenic) roads to regional and local tourism.
4. While still meeting road safety needs, select suitable lane width and road footprint, including shoulders and clear zones, in terms of the historic character of the road and its corridor.
5. Consider the design of all elements – including edges, vegetation, signage, lighting, drainage features, retaining walls and bridges and use of materials – as part of a historic road.
6. Elements, forms and colours of the landscape can be incorporated in the road corridor as themes of design.
7. Rest areas lend themselves to the placement of interpretation sign boards which can serve to emphasise the sense of place for both the community and road travellers.

Conclusion

Not only should heritage be protected as far as possible, but it should also be recognised as an attribute of the road environment and also the waterway environment. The process of incorporating heritage and other valued cultural contexts into design should make use of heritage experts in the advisory and design fields and community so that all viewpoints and concerns are considered. Advice from the TfNSW Heritage Committee can be particularly useful because of the status and range of interest groups included, the agencies and institutions they represent and the depth of knowledge they collectively possess. All dealings with Aboriginal heritage should comply with the principles in Appendix D.

Opposite: The utilitarian lights on the Sydney Harbour Bridge have been replaced with authentic reproductions of the original lights. LEDs within the mast arm have made this possible. The original design and materials were used with the frames cast in Bronze in Western Sydney



PYLON LOOKOUT

Case Study 6

Berry Bypass in the Shoalhaven area

Berry is a charming, intact, irreplaceable historic rural town in the Shoalhaven region of the NSW south coast with a resident town population of some 2,600. The town was being increasingly affected by traffic on the Princes Highway through Queen Street (1).

This was having a detrimental impact not only on the main street but the overall character, functioning and attractiveness of the town as a whole. In order to improve

safety, travel times and keep the heritage quality of Berry as intact as possible, it was decided to build a bypass route for the through traffic (2).

The bypass has been designed to fit in with the edges of the town providing interchanges at either end of Queen Street (3). A planted noise mound provided a rural outlook for the town while effectively blocking noise. Identification and protection of Aboriginal heritage and sites of cultural value featured strongly in this project.



The project incorporated a planted mound which blocked noise from the bypass but also continued the views of greenery and vegetation rather than imposing a wall in this pastoral setting.





Berry Bypass alleviated the traffic pressures on the town. It provided a high speed attractive bypass and experience of the south coast NSW landscape and a quieter town centre with people able to easily cross the road and enjoy themselves in a stress free uncluttered environment. This work has ultimately protected the heritage and cultural qualities of this important country town and improved the tourism experience.

3.7 Principle seven – Designing an experience in movement

Introduction

This section underlines the need to design road infrastructure and related systems of movement that provides a physically and visually stimulating travel experience, avoids boredom, assists in wayfinding and best allows an appreciation of the values of the landscape through which the customer passes. The following guidelines put forward ways to meet these needs.

Guidelines

“The expressway should offer the traveller a stimulating, coherent, and developing experience.”

Appleyard and Lynch 1964

Roads journeys can cover large distances, such as a corridor through a metropolitan area, along an entire coastline or between towns. They can also be over relatively short distances, such as getting to the city from the airport or travelling between suburbs. Urban design recognises that travelling to a destination is not simply a matter of getting from A to B. It is a journey through areas and landscapes in different contexts and at different scales and speeds. This journey should be visually and physically stimulating for the traveller, make travellers aware of the environments through which they pass and allow travellers to recognise and find their whereabouts and anticipate their future direction.

A number of key issues are discussed and elaborated below. These serve as a useful prelude to the guidelines that follow.

Loss of visual perception

The changing scale and speed of travel has reduced our visual perception of the landscape including that of the built environment. Good urban design should make places more visible, legible and memorable under varying experiential conditions. Until the mid-twentieth century, as we travelled we were able to build up a mental ‘map’ of familiar landmarks, vistas, spaces and architectural details. Our experience was primarily at the scale of the pedestrian, the tram (gradually being brought back into cities) or slow moving traffic. This level of detail and richness has changed with the scale and speed of contemporary travel. Once we leave the pedestrian scale, which is the case most of the time, our experience is much coarser, fleeting and regional, especially along highways and freeways. Our awareness and recognition of the qualities of places and our sense of whereabouts is being lost in the process. There is an opportunity to reverse this.

Boredom for drivers during travel

Long stretches of monotonous views and daily repetitive driving with low visual stimulation is not conducive to good driving and can lead to a loss of concentration. Road design should not deprive the traveller of visual stimulus but rather endeavour to heighten the travel experience, although in a manner that avoids distracting the driver. Over and above the implications for the quality of the built environment, particular consideration should be given to the possible loss of concentration and driver error that can result when continuous straight roads of constant width and spatial cross-section occur within a corridor or across a road network; when travelling in one direction feels just like travelling in the opposite direction; when there are repetitive movements at similar curves; when views are restrictive or monotonous; and when continuous landscaping encloses the visual field of the driver over long distances.

Legibility of the road environment

There is a need for the internal road environment – its internal physical three-dimensional design as opposed to internal traffic management devices such as line marking – to be clearly understood in order to avoid driver, and also passenger, stress. Stress may result from such factors as confused decision points, unexpected off-ramps and unexpected tunnel locations. Stress may result from glare, visual flicker and the visual clutter of roadside elements, including billboards. Furthermore, stress may result from billboards obstructing the landscape, particularly at axial locations. Unwanted distractions and surprises should be avoided as far as possible and ‘built out’ of the design. Road design should have clarity. It should provide a travel experience in which the road environment is legible and easy to anticipate, especially at speed.

At a level down in speed, in corridors more oriented to transit, designers should address the experience in movement by bus and tram, bicycle and foot in terms of whereabouts, stops, connections and areas served.

Design approach

To avoid these problems – loss of visual perception, boredom during travel and stress from travel – and achieve a stimulating journey, roads need to be thought about and designed, or ‘choreographed’, as an experience in movement. In order to achieve this, engineers, planners and urban designers need to work together and collaborate with safety experts. They need to examine the landscape in order to identify the various landmarks, elements and qualities that characterise it and that can form part of the journey experience. This would include topographical features and structures as well as natural and developed patterns.

This approach, involving what has been termed sensuous criteria for highway design, emphasises the effect of design on the visual sense. Meeting these sensuous criteria is sometimes thought about as ‘choreographing’ the experience of travel – the designing of the visual and physical aspects of movement.

3.7.1 Enhance the view from the road corridor

The principal features and symbols of the landscape, as well as the activities which take place in it, should be visible and related to its design. A road needs to be vertically and horizontally aligned and detailed in order to expose these characteristics – with the objective of heightening the journey experience through the landscape and consequently the traveller’s perception and sense of place, culture and history.

The following principles of physical design should be adhered to:

- ▶ On road corridors consider variations in curvature, differentiation of lanes, separation of levels and alignments and use of super-elevation. Independent grading of carriageways allows views to be opened up for travellers from the carriageway in each direction and varies the effect of a constant road width on long sections of highway.
- ▶ Consider the coordination of elements, avoid the visible use of shotcrete, minimise the potential for graffiti vandalism and consider the quality of fence boundaries.
- ▶ Expose interesting and valued views not only through road alignment but the ‘transparent’ design of elements, particularly noise barriers and parapets.
- ▶ Avoid obstructing views with plantings, yet consider framing views through landscape design where appropriate and subject to safety and maintenance criteria.



Designed by artist Dominique Sutton 'The Sprinter' was commissioned for the Sydney 2000 Olympic Games. It was relocated to the M4 East corridor as part of Westconnex Stage 1b and creates a memorable landmark by day or night.

3.7.2 Provide visual stimuli within the road corridor

Thought should be given to heightening the journey experience by creating additional landmarks and points of interest within and across the road reservation. This can be especially important over long distances which require extra visual stimulation and driver orientation. The addition of such elements can assist when the surrounding landscape is homogeneous and monotonous.

A strong sense of whereabouts can be evoked by such design measures as:

- ▶ Distinctive bridges.

- ▶ Opening up and allowing views of natural features, rivers, mountains and the ocean.
- ▶ Distinctive landscape designs.
- ▶ Median treatments and median variation.
- ▶ Feature lighting.
- ▶ Selective use of materials and colour.
- ▶ Large scale sculpture and place markers – as endorsed and assisted financially by the community or Government.

Elements such as these can complement our visual experience of the broader external landscape. Creating landmarks and interest must be thought about as part of the total project composition in space and time.



The principles of creating a visually stimulating journey apply equally well to the rail corridor. The north west Metro is on an elevated viaduct structure in the Western Parkland City. The journey provides a new and interesting perspective of the region.

3.7.3 Provide visual markers and stimuli within road tunnel environments

Use means such as alignment, colour, form, lighting, graphics and special installations. For further information refer to the Transport Tunnel Design Guideline.

3.7.4 Consider the ferry travel experience

The journey experience by ferry can be a highlight of the traveller's day, the harbour experience is dictated by the weather, landscape and many other factors but the wharf experience is within the control of Transport. There are three key considerations in their design relating to this principle.

- ▶ The approach and views from water
- ▶ The approach and views from land
- ▶ The experience within the ferry precinct

A simple sculptural design approach consistent across a suite of wharfs and integrated with landside landscape, heritage and access facilities has proved to be a good approach in helping fit the wharfs into the harbour setting and creating journey interest.



Birchgrove wharf is located in Yurulbin Park. The wharf is tucked away within the landscape and is unobtrusive in the views out over the harbour and in views back towards the land from the water.

3.7.5 Consider the experience in movement for active and land based public transport

Consider the bus experience, tram experience, cycling experience and pedestrian experience in relationship to each other and in relation to the environments served and passed through.

These modes bring the experience in movement closer to places, the built fabric, public open space, vegetated environments and lighted environments and to corridor elements such as parking and building access.

3.7.6 Consider the value of a theme or rationale for a major road corridor

Many roads around the world have adopted a theme or approach. These can be based around boulevards, parkways, highways or motorways and address the unique cultural qualities of the road or its role. For example the Pacific Highway has a character related to the coastline and landscape of NSW. Combining this with an Aboriginal connection to country the idea of a 'Songlines Driveway' is emerging with Aboriginal design and artistic input into the projects past and present.

Roads built to serve major airports have a role to play in welcoming people to Australia.

The Hume and Federal Highways support the Remembrance Driveway which at the time of publication of this document is 65 years old.



The Hume Highway and the Federal Highway have for over 65 years been the Remembrance Driveway paying tribute to the holders of Victoria Crosses and to all those who have fallen in the second world war and Crises since then.

3.7.7 Create a progressive sequence of visual events on major road projects and programs

The view from the road and the view within the road corridor contribute to the total experience in movement and should be incorporated into a fully 'choreographed' road. Each route should provide a sequence of events which, while distinct and memorable, are also progressive and flowing, calm and coherent to the driver. This can be achieved as follows:

- ▶ Through contrast between a sinuous flowing route and straight passages.
 - ▶ By considering visual events that occur or need to be designed at logical intervals and critical points.
 - ▶ By using a considered palette of design elements, materials and colour.
 - ▶ Design should be thematic and vary with context, rather than be repetitive.
- ▶ Short sequences of interest may occur within larger ones, for example, the approach to a city centre or the experience along a short stretch of shoreline within a longer journey.
 - ▶ Not only should a highway and its parts be interrelated, they should also be related to other highways and circulation systems on some systematic design basis.
 - ▶ All decision points and interconnections should be visually distinct and capable of being anticipated; visual clarity of decision points is essential for good driving. Changes should not be sudden, jolting or stressful but part of a 'planned' event. Road safety should not rely on line marking, safety barriers and engineering design standards alone. The choreography and engineering should be mutually reinforcing.
 - ▶ Useful ways to alert drivers to changes and potential dangers ahead might include visual clues such as creating transitions in the road character when approaching a different environment.



The Sir Roden Cutler Interchange marks the intersechange of the Remebrance Driveway and the M7. The marker posts highlight this place helping in wayfinding. The pyramid and finial detail is unique to this place.

-
- ▶ Deep cuttings and other changes, which momentarily isolate the traveller from the wider landscape, provide a distinct visual experience within the road corridor at suitable locations.
 - ▶ Create a distinct frontage to town centres and developments, that is, give them an 'address'.
 - ▶ Consider gateways for towns or regions which are formed by the road infrastructure and landscape rather than additional built 'gateway' elements.
 - ▶ Major rural intersections should be designed to provide a milestone along the journey and indicate the presence of towns or communities; culturally and locally important trees can be used to highlight the intersection and mark the journey.
 - ▶ Trees are the most memorable aspect of a roadside planting design and are clearly noticed when travelling; species selected should have an appropriate scale for a road corridor.
 - ▶ Trees should be provided (located outside clear zones) along arterials roads that pass through a city or town to reduce the expanse of the road, create a boulevard, provide a sense of place and define crossing points and 'gateways' into town centres and villages.

Conclusion

Instead of being a monotonous experience, travel along corridors by all modes can be turned into an interesting one. This can help to make the journey feel shorter, and in the case of private vehicles potentially keep drivers alert. The project design should provide visual stimuli and lead to a progressive sequence of 'calm' events involving the infrastructure, its elements and views of the landscape. These events can take on a theme for a whole corridor.

Opposite: The Pacific Highway provides a visual experience of the Pacific coastal landscape of NSW not the Pacific Ocean. The Pacific Highway Urban Design Framework published in 2004 has maintained this vision for all the corridor upgrades. On the final section of the upgrade between Woolgoolga and Ballina, the bridge at Harwood typifies the approach. Views of the great rivers and their valleys (in this case the Clarence) are provided through the use of two rail bridge barriers. The old bridges, kept for local access and their character, are visible on the journey.



Case Study 7

Hunter Expressway in the Hunter Valley area

The 40km Hunter Expressway links the M1 Pacific Motorway near Seahampton with the New England Highway at Branxton in the Hunter Valley Region. Its alignment and design is informed by a landscape and visual analysis of the corridor that identified the extent of key visual catchments, panoramic and local views, major ridgelines including those within the Sugarloaf Range, major cuts and a variety of landscapes as part of the travel sequencing.

The landscape includes pristine bushland setting through strongly undulating ranges, the Buchanan Floodplain with expansive views both sides of the corridor fringed

by eucalypt forest, the Kurri Sand Swamp Woodland, the spotted gum forest east of Branxton and bridging over an area of high Aboriginal cultural value.

A number of landscaped interchanges (1) of different size with legible layouts serve as markers along the journey identifying location and points of road connectivity to towns and important economic activities in the region. Distinctive overpasses with wall type abutments (2) act as portals to the next visual experience. Double rail barriers maximise views, such as from viaducts, to the surrounding landscape.



The Hunter Expressway road alignment and design allows for dramatic views of the topography and landscape contributing to the journey experience and understanding of the landscape.





The Hunter Expressway utilised the bridge and underpass elements to accentuate the change in character along the route. Wall type abutment bridges were used rather than 'spill through' abutments to help create gateways or portals between one landscape character area and another. (Photo Greg Jackson)

3.8 Principle eight – Designing self explaining roads that safely respond to their role and context

“Centres, both in metropolitan and regional areas, are the places where the majority of jobs and services are located as well as attractions like shops, restaurants and parks. Roads through and around these centres serve an important movement purpose, allowing people to travel to and from the centre and move around easily within it. They also serve a place function by operating in a way that allows attractive places for people and strong local economies to develop and thrive.”

Future Transport 2056, TfNSW March 2018

Introduction

This Principle focuses on designing or managing roads that naturally lead to the appropriate speed and driver behaviour for the character of the area. This supports the functioning and character of a place – be it a strategic town centre, village, destination or area of significance – as well as the functioning of the interconnecting road corridor

This supports the Future Transport approach that roads provide both a transport function as well as a social, commercial and character role. A singular traffic and engineering approach to the design of infrastructure can erode the character of places and road corridors, making them place-less and unpleasant. It can additionally hamper the possibility of attractive and identifiable places developing in the future as our towns and cities change and grow.

If roads and streets are self explaining in relation to their context and function they naturally and intuitively indicate to road users how they should be moving appropriately through an area, without needing a proliferation of signage, or necessitating policing. This helps in creating naturally safer road environments.

Achieving a safe outcome for all road users and the community is fundamental to the way the Government does business and is an important consideration in an urban design process.



A road posted at 50km/h should look markedly different from a road posted at 100km/h due to its geometries safety standards and its overall urban design composition

3.8.1 Self explaining roads

Self explaining roads are roads and streets that naturally encourage drivers to adapt their behaviour in a way that is compatible with the function speed and context of the road. To put it another way, through the road conditions, drivers should feel uncomfortable exceeding the speed limit, and should be aware of the type of conditions ahead without excessive prompting from road signage. Additionally, a self explaining road can potentially reduce the need for a large number of traffic devices to control behaviour.

“The road should be designed so that driving above the speed limit is uncomfortable and obvious to the road user.”

Centre for Road Safety

Such a concept is not new. It can be argued that designers have long been dealing with this issue of legibility. For instance, using the analogy of buildings, they generally represent their function. The church, home, library and office are all generally all recognisable for their usage. Where they are not, there may be some discomfort or confusion.

In a similar way, planning and design should create identifiably different road characters which will help to avoid situations such as drivers being unaware, or not warned of changing conditions ahead, for example: where there is a high level of pedestrian use such as at a town centre or school; where drivers are taken by surprise at the appearance of pedestrians and cyclists along routes; and where road users are unaware of moving into different speed zones at any point along the road.

Urban design has an important role to play in bringing this sort of legibility to the road corridor. An integrated team in which relevant disciplines collaborate can be instrumental in implementing the principle of self explaining roads and assist in making roads more legible and self explanatory for road users and pedestrians.

There are several guidelines that should be considered:

3.8.2 Distinguish between the different functions and speeds of roads by differentiating their appearance

Road design should clearly differentiate between classes of road, where possible making each class distinctive so that people are able to categorise them to match their function and use.

This may be achieved by developing road hierarchies and differentiating these by their corridor widths, landscape approach, adjacent land uses and environments. Within each class, road engineering and traffic features – such as width of carriageway, road markings, signage, use of street lighting and clear zones – should be mostly consistent throughout the route. A good example is the appearance of a motorway. This class of road leaves the driver with no doubt about what sort of road it is – several wide lanes, one way traffic, no cross roads and no pedestrians.

Conversely a high street with its lighting, seating, street trees, footpaths, paving, tighter geometry and crossing points is clear through its appearance that pedestrian activity is prevalent, speeds need to be slower and more cautious driving behaviours adopted.

Differentiating roads in this manner requires transport planners to work with urban designers early in the network and corridor planning process.

3.8.3 In centres design for a slower movement pace and a finer grain of design quality

Centres involve more walking and resting, visiting and residing. The environment is consequently seen up close and details are noticed. What might work in a design sense at 50, 80 or 100km/h – long avenues, simple streamlined designs – will not work for pedestrians who will notice paving materials, buildings, tree species, light levels, steep gradients etc. Pedestrians also need shade, seating and areas to stop and rest.



Lawson, Great Western Highway. The pedestrian areas required a finer grained design approach commensurate with the needs of residents and visitors. This helps create a strong distinction between higher speed trafficked areas and lower speed pedestrian areas, improving safety and contributing to the economic viability of the Blue Mountains centres.

3.8.4 In between centres design for the required speed and a commensurate visual experience in movement

Principle 7 deals with this in more detail, but commensurate with the road type and speed, the design of transport infrastructure needs to respond to the speed and the kinetic experience. Noise walls for example need to be consistent along long lengths of motorway, as even changes in design a kilometre apart can be highly noticeable and need to be considered carefully or they will introduce clutter. Bridges form a whole family of structures easily seen within an hour or two. At higher speeds a vista needs space and therefore time to be noticeable. A view of the coastline, for example, while walking can be taken in over some time and in detail, however in a moving vehicle the view can be fleeting. Also a larger wider road needs a commensurately larger tree species to create a well-proportioned avenue effect.

3.8.5 Improve the legibility of roads

It is beneficial to improve the legibility for road users and provide drivers with visual clues as to how to drive and what to expect on a particular road. Hard (built) and soft (planted) design devices can be used as additional indicators to influence driver behaviour:

- ▶ Alignment variation, planting or views of structures to warn of such environments as bends or built up areas, can assist the driver in recognising the type of road they are on.
- ▶ Vegetation types to differentiate the width of the clear zone (which varies with design speed), for example, low ground covers within and taller frangible plants at the edge, will clearly differentiate design speeds.
- ▶ The appearance of the whole road design concept can assist. On higher speed roads, the elements should naturally display unity and consistency along the corridor. At lower speeds there should be a greater recognition of the adjacent context and local landform, with a finer grained design approach emphasising the need for slower speeds.

-
- ▶ It is important to consider changes in road character at the edges of a town and where possible coincide the change in speed zone with the change in character

3.8.6 Considerations for bypassed roads

When transportation needs become so great that a road located in a centre dominates its character, then some form of transport bypass, whether arranged laterally or underground or achieved by another transport mode, may be necessary.

Aside from the removal of traffic, which is often the biggest factor in affecting place, there are some major moves in the planning and design of a bypass project that can help adjust driver behaviour and revitalise the bypassed road or street.

- ▶ **If possible maintain access conditions**
Centres often evolve along their high streets and in bypassing them it is important to maintain the direction and ease of movement along the high street, to help retain the visitation and commercial characteristics and to not physically change the town's urban grain and quality. This generally requires an interchange or intersection at either end of the bypassed road or town, rather than a mid town access point which would constitute a fundamental change to a town on a road.
- ▶ **Try and make the most of the immediate change in traffic on the bypassed road**
When the Sydney Harbour Tunnel opened, the initiative was immediately taken to provide bus lanes on the Harbour Bridge. Any delay would have seen general traffic using the lanes making them harder to justify closing. Any earlier, and the resulting congestion would have been problematic. If the objective is to promote public or active transport or improve the amenity of the centre, it is important to swiftly implement the appropriate changes.

- ▶ **Consider lower posted speeds on bypassed roads**
Consider the role of the bypassed road in the road network and the speed posting that is appropriate to allow for a more liveable main street for shoppers, café goers and visitors stopping. Lower speed posting reduces noise, discourages unnecessary traffic use and allows for narrower clear zones and tree planting which in turn help make a self explaining road
- ▶ **Consider road width narrowing**
Consider the potential for transferring traffic lanes (particularly ones that were historically added as the traffic volumes increased) to footpath space, parking and cycle ways and the potential for incorporating trees. A narrower road carriageway creates a strong visual cue as to the speed drivers should travel.
- ▶ **Safely introduce tree planting**
Consider the potential for tree planting in towns as visual cues to encourage slower speeds but also create a cooler environment and improve the overall liveability. Slower speeds and road narrowing create opportunities for canopy cover over road and footpath space, and create a street atmosphere less dominated by traffic.

► **Consider alternative traffic management options**

Traffic management conducive to transport needs are not necessarily the same as those suited to centres. As the Eastern Distributor has demonstrated, reducing traffic volumes on streets has enabled the removal of the one way couple of Crown and Bourke Street. This has resulted in less of a dual carriageway effect and a more normal street which, combined with a cycleway, has improved access and the viability of cafes and local stores.

- It is important to note that whatever the role of a road in our towns and corridors an urban design approach must be applied to the design of the road and the broader road corridor to achieve the best quality outcome.

Conclusion

A self-explaining approach to road design can assist in improving driver behaviour and road safety. Designing self explaining roads can lead to urban design outcomes that are more sensitive to context and responsive to place, whether town centre environments or interconnecting regional roads.



Menai Road was bypassed by Bangor Bypass. It was subsequently posted at 50km/h with a narrower road width and trees, vegetation, footpath and car parking bays included into the reclaimed space.

Opposite: The opening of the Eastern Distributor motorway provided alternative road transport choices and created the potential for Bourke Street in Surrey Hills to change over time and respond more to the community needs and active transport.



Case Study 8

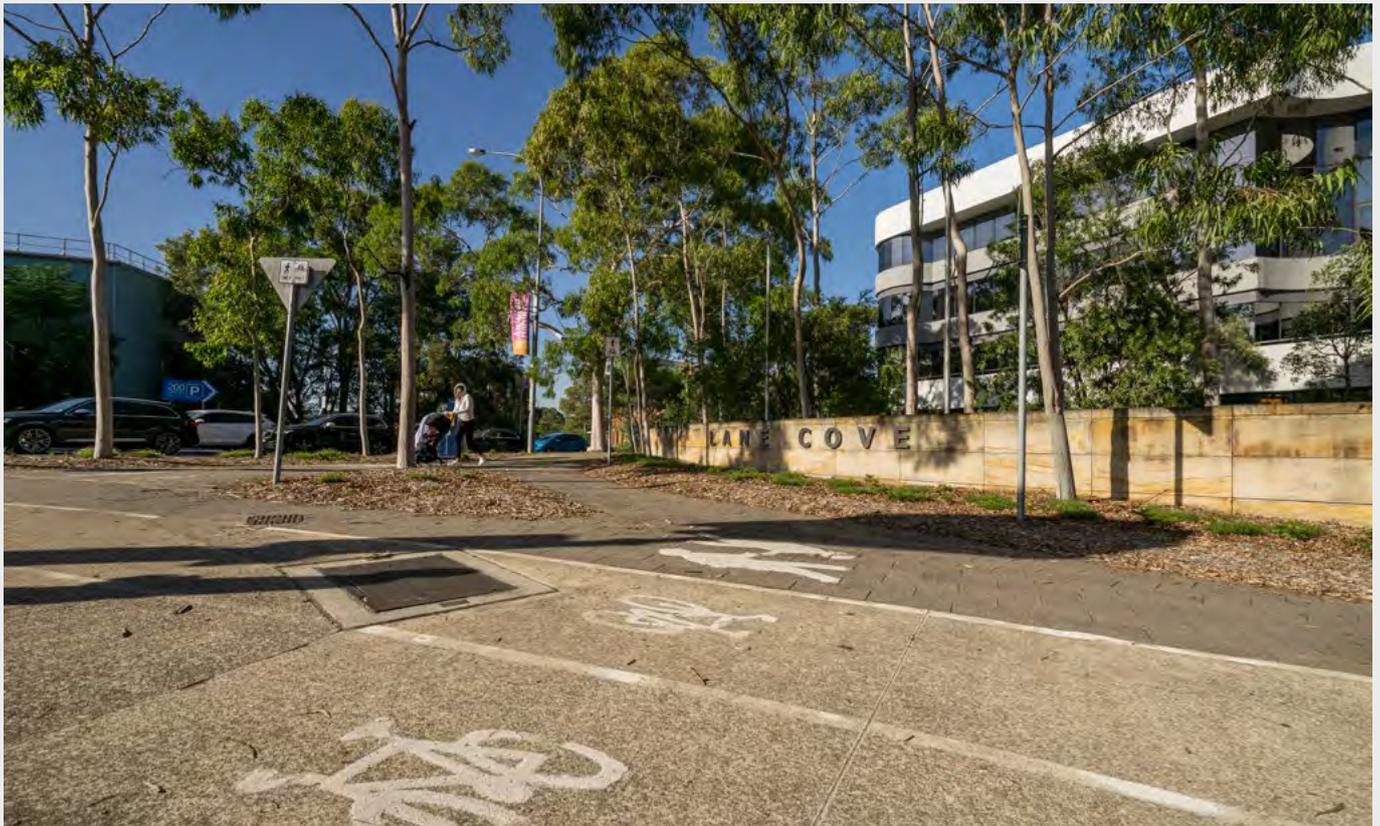
Lane Cove Tunnel and Epping Road in the Lane Cove area

The 5km tunnel under Epping Road between the Lane Cove River and Gore Hill Link (1) not only completed the 110km Sydney orbital motorway network but diverted the regional surface traffic allowing Epping Road to be completely reconfigured in scale, function, visual character and relationship to neighbourhoods and industrial and commercial areas (2).

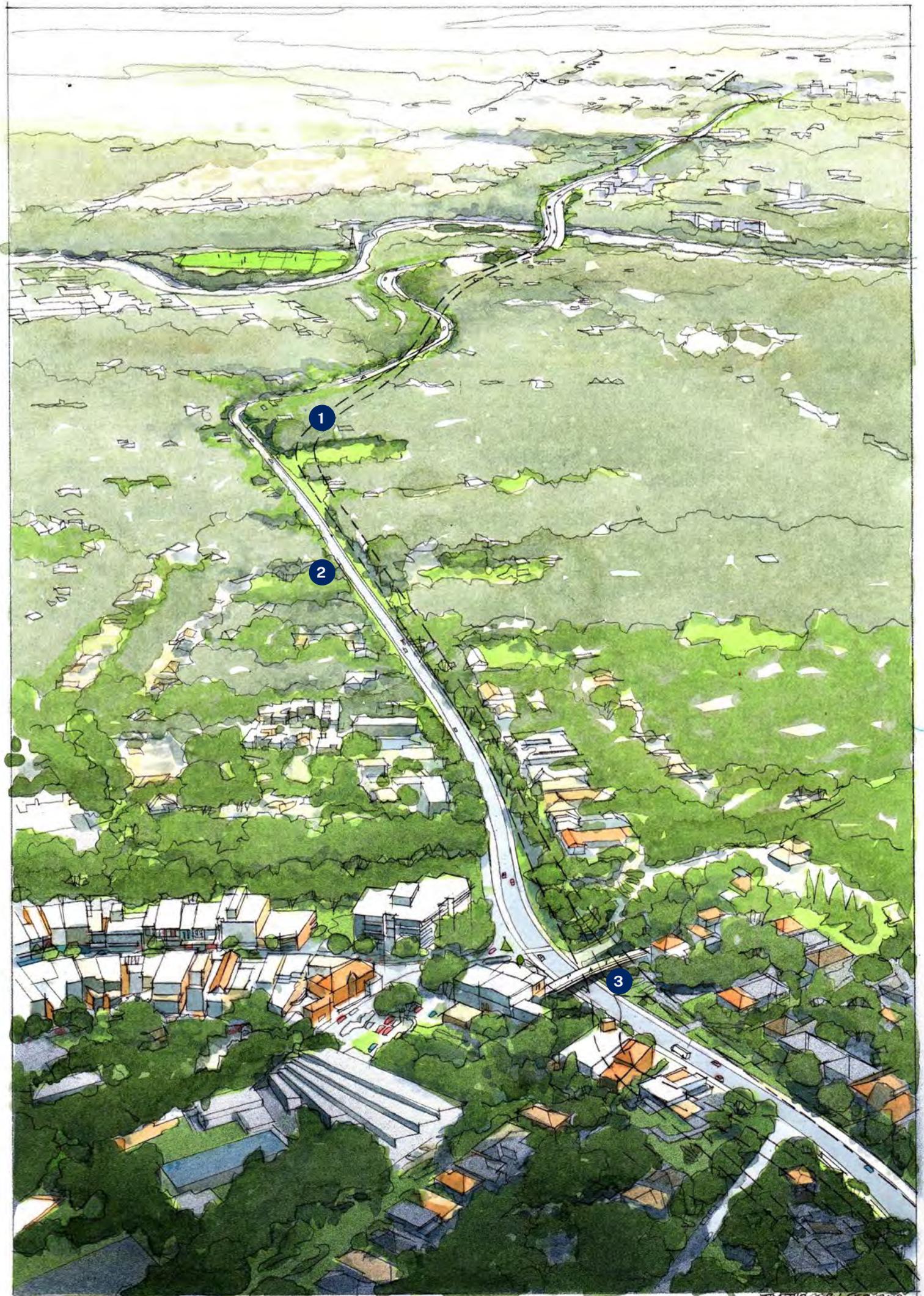
As part of the tunnel scope of works the road environment was changed from a 3-lane principal arterial to a transit corridor with dedicated 24-hour bus lanes and new shelters, new and modified pedestrian and cycle

paths, improvement of the streetscape in terms of trees, vegetation and property frontages, a new bus interchange with pedestrian overpass (3) connecting the Lane Cove town centre and better connectivity across the corridor for pedestrians and traffic.

Thus, two completely different road environments with different speeds and clues to movement have been created. One relates to the tunnel and its design and the other to the reconfigured Epping Road and its changed streetscape, pattern of movement networks and connections — with reduced speed of traffic.



Lane Cove Road Epping Road intersection





Epping Road realigned after the tunnel opened to accommodate better bus and active transport.



Lane Cove Tunnel eastern portal just prior to opening. The tunnel provided a four lane bypass of Epping Road and the Lane Cove area and completed the Sydney orbital motorway.

3.9 Principle nine – Achieving integrated and minimal maintenance design

Introduction

This section deals with the need to achieve well designed projects that are visually appealing, incorporate durable materials and require minimal maintenance. The following text highlights key issues and provides design direction relating to the whole and selected aspects and elements of infrastructure, for which more detailed amplification is set out in the supporting urban design guidelines (page 30).

The quest for better design across all projects was sparked in particular by what was considered to be the ugly and utilitarian M2 Motorway built in the 1990s with its significant expanses of bland shotcrete and noise walls blighting the Sydney landscape. The roads authority considered the original M2 a design outcome that should not be repeated, that our design aspirations should be higher and we should have pride in our projects. We have learnt a lot since the M2.

Guidelines

Achieving this principle does not mean expensive and elaborate design with add-on features but rather an integrated approach to good design from the outset. It is not what engineers refer to as ‘gold plating’ – designers doing the unnecessary and adding costs – but it can, and ideally should, exceed the run of the mill project designs. This however requires more thought and time and may require commitment to some additional financial resources. Not doing so may turn out to be more expensive anyway, because the lack of forethought and mistakes need to be corrected later, smarter solutions to design may have been missed and approval may be difficult with unwanted conditions imposed. Projects have even been known to be sent back to the drawing board. Cost and time cutting can prove to be false economy with the reputation of Transport moreover at stake.

An integrated engineering and urban design approach incorporating the architectural and the landscape should be common practice. It involves setting the form of a project, integrating its details and paying attention to appearance. Infrastructure should be aesthetically pleasing and considered as part of the quality and identity of areas. Infrastructure may well be considered as sculpture in the landscape with its own identity but does not need to be an iconic design, a stand-out, unless called for politically or an opportunity presents itself.

Infrastructure must be neat and thought about. It should not be disjointed but rather form part of a total composition. Its elements should be well articulated with each other and its materials and finishes robust and durable. While it is good in many ways if infrastructure can be memorable, it is often better if made as unobtrusive as possible in its setting.

Considering maintenance is an essential component of an urban design approach to a project. The State Transport Network is extensive and growing. Maintenance is consequently a large and costly component of expenditure by the Government and must be a serious consideration in design, in both major and minor projects. Ensuring a project outcome is as low maintenance as possible is something that needs to be considered at all design stages and integrated with the look and functioning of a project. For example low maintenance and good aesthetics are both served by high quality design that is:

- ▶ Not arbitrary
- ▶ Neat, uncomplicated and coordinated.
- ▶ Robust and durable in material and form.
- ▶ Accessible, easy and safe to maintain where maintenance is required.
- ▶ As resilient as possible to graffiti and other public damage and to natural wear and tear

Consequently transport infrastructure should not be planned and designed as separate entities each according to their own standards and unrelated to the design of the whole. Rather, there should be a unified design of road, bridge or wharf, elements integrated with each other, fit for purpose and context and requiring little or no maintenance.

An urban design approach can help make sure that good aesthetics and low maintenance are complementary. Indeed, durable, robust and low maintenance design is good design.

Of critical importance to the final design outcome is the continuity of design through all phases and commitment to its delivery on the ground.

The following guidelines summarise the approach required.

3.9.1 Create clean lines and a coordinated and neat composition of infrastructure elements along a corridor or within a project

The uppermost principle is that the design of infrastructure is to be seen as a whole regarding its visual form and lines, how it sits in a built and natural landscape setting, the integration of its parts and elements, the expression of its functionality and the associated architecture and landscaping. Everything follows from this.

Design of all elements — including retaining walls, noise walls, bridge elements, guard rails, fences, median barriers, shared paths, traffic and directional signs and lighting — needs to be integrated into the overall design of a road, with elements fitting together and fitting in sensitively with the context through which the road passes.

Simplicity is often the best approach to a given design issue. Designs that are more complex than the constraints or needs dictate are harder to build and maintain, fussy and lack refinement and elegance. They are also often more expensive than they need be.

The following guidelines set out the general requirements for coordinated design:

- ▶ Consider the number and placement of all road elements relative to one another and in relation to the road design as a whole — how the elements contribute to the unity of the road corridor, and how the over-use of different road elements can be avoided.
- ▶ In general, minimise the number of design solutions to a given problem, for example an inordinate range of noise wall panel types raises far more difficulties in repair and replacement than one type. The same can be said for paint colours, fencing types, railings etc. There can still be scope for variety and contrast of panel forms and colours in selected locations.



Clean lines and coordinated elements characterise the Hunter Expressway

- ▶ Avoid dead empty spaces and clumsy connections by considering where these things may occur and providing ‘fail-safes’ in the design, such as planting along the bases of all walls to avoid weedy, unmaintained areas and graffiti vandalism.
- ▶ All elements that humanise the built environment — seating, lighting and all other elements of the outdoor landscape — must be durable, simple and refined and fit in with the character of the built environment and public spaces in regards to materials, colour and compatibility with plantings. Again, there can still be potential for contrast in selected locations to enliven an environment.

3.9.2 Intelligently use design standards

“Not all technical standards are absolutes, they involve trade-offs in terms of cost, speed of construction and customer impact as well as community, environmental and property impacts”

Chief Executive, Roads and Maritime

One of the constraining factors in achieving design excellence is the standards imposed or otherwise rigidly adopted by civil engineers, traffic managers, road designers, road safety experts and the likes. Many of these standards are internal to Transport while others are externally conceived by peak research and institutional bodies such as ARRB and Austroads essentially to achieve national consistency in design. Many of these standards have very practical origins based on the best safety outcomes. But they have often been developed by different specific disciplines in isolation and not written in consideration of all the other standards that exist. As such they are neither holistic nor a guide in achieving high quality built, natural and community outcomes.

It is the skill of engineers and designers to see through these standards to the desired design outcome – to apply the standards intelligently, identify the more rigid ones from the more flexible and explore how they can be brought together, relaxed or, where they are contrary to each other, re-thought. Good design is not the sum of all the standards added together. It requires creativity, compromise in terms of single issues and should lead to a holistic outcome that exceeds the quality of the individual rules.

3.9.3 Use robust and durable materials fit for purpose and place

Road and maritime environments are harsh places subject to damage from vehicles, transported freight, the weather, bushfires and vandalism. They need to last a long time and remain safe and sturdy. In doing so, they need to transcend the fashions of the day and look as good as when they were built, for many years.

Design materials should be suitable for this environment and context. In some cases a higher capital cost may be justified to reduce long-term maintenance. Examples of this include:

- ▶ Light, fragile materials such as glass and aerated concrete should be used sparingly and protected if necessary.
- ▶ Planting should be long-lived, hardy and planted with suitable soil depth and at densities which out-compete weeds.
- ▶ Timber should be used only where other materials are unsuitable, especially in bushfire prone areas.

3.9.4 Avoid opportunities for vandalism

In the planning and concept design stages of a project, the opportunities for vandalism should be considered and avoided:

- ▶ The need for noise walls, retaining walls, underpasses and other large areas prone to graffiti vandalism should be avoided as far as possible in built up and secluded areas. Where they cannot be avoided they should be designed to deter graffiti vandalism.
- ▶ Glass noise walls and glass panels for bus shelters should be avoided, with clear plastic panels or other translucent or transparent materials used instead.
- ▶ Surfaces which are accessible to graffiti and lack passive surveillance should be minimised and planted over where possible. Textured finishes look attractive, help provide an identity to an area and deter graffiti vandalism.
- ▶ Ledges providing access to walls and spaces able to be graffiti vandalised should be avoided.
- ▶ Exposed fittings, fragile additions or artworks should be avoided.

3.9.5 Consider the design quality and maintainability of major road components and individual road elements.

Major road components (such as bridges, interchanges, tunnels, rest areas) and individual road elements (such as walls, barriers, lighting, signs) must not only be thought about as part of the architecture of the road as a whole. They must also be thought about as durable and aesthetically pleasing designs in themselves.

Noise walls

Noise walls need special consideration due to their extent of use and their high visibility from and towards the road:

- ▶ Road design should seek to avoid too many differently designed noise walls on the project. Such outcomes appear thoughtless and uncoordinated, and are difficult to maintain and replace when damaged.

Noise wall guidelines have been developed by Transport which covers:

- ▶ The need for landscape to screen walls.
- ▶ Wall design as a consistent, smooth and flowing element.
- ▶ Noise wall location at the top of cuttings or parallel and adjacent to the road.
- ▶ Noise wall colouration preferably either in the natural material or a dark grey colour.
- ▶ Noise wall texture to deter graffiti and facilitate painting.

For further information in relation to noise wall design see *Noise Wall Design Guideline: Design guidelines to improve the appearance of noise walls in NSW*.

Bridges

A bridge can be made as unobtrusive as possible to hide within the landscape, as distinctive as possible to contrast and stand out in the landscape or as simple and elegant as possible to complement the landscape. Bridges should be designed with consideration of their context and role in accordance with the following guidelines:

- ▶ Locate, align and design bridges to fit in with other elements of the landscape and built elements or instead, create a counterpoint.
- ▶ Major structures (such as bridges) associated with the entry to country towns or particular settings should be planned and designed with special care as they can form 'gateways' and signature landmarks in the landscape.
- ▶ Design bridge elements and families of bridges in terms of a unified bridge architecture.
- ▶ Additional non-structural elements on bridges should be avoided. Where necessary, they should be designed as a fitting part of the whole structure.

For further information in relation to bridge design see *Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW*.

“Major infrastructure [bridges] will serve the community for many decades. It should not just last, but also provide a lasting legacy of excellence for future generations. Minor bridges at the least should have good manners, a low maintenance objective and a degree of finesse.”

Bridge Aesthetics



The ventilation outlet for the Cross City Tunnel fitted well into the architecture of the city at this location with a backdrop of skyscrapers and modern structures. Its slender design further minimises its impact in a beautiful way. (Photo Patrick Bingham-Hall)

Tunnels and portals

- ▶ Tunnel portals should be distinctive and elegant, address their rural or urban context and clearly and safely mark the transition between open road and enclosed tunnel.
- ▶ Where possible there should be limited physical or visual clutter at portals from directional, speed or variable message signs.
- ▶ A design transition into the tunnel through colour, texture and lighting should be considered.
- ▶ The tunnel journey and elements such as safety bays and emergency exits should be clearly marked by means of shape, colour and texture.

- ▶ Panelling of tunnel walls should be neatly aligned with barriers with a consistent gap.
- ▶ Ventilation outlets should fit into their context

For further information in relation to tunnel design see the Urban Design Roads and Waterways team's *Tunnel urban design guideline – to improve the customer and community experience of road tunnels*.

Signage and advertising

In terms of signage and advertising, the optimum is:

Signage (including advertising) along road corridors must be considered in urban design terms. The over-use, inappropriate location and poor design of signage can diminish the quality of a road corridor's public domain. Signage and advertising need to be considered early, as part of the task of road design and corridor management. Transport should, as far as possible, encourage the following:

- ▶ The overall number of signs that add to the clutter along a road corridor should be minimised where possible.
- ▶ The location of signage within a corridor should not undermine the scale and character of the area, dominate the skyline or block significant views for road users and the community.
- ▶ Variable message signs should be located carefully away from good local views of the landscape and valued structures; they can be particularly visually intrusive and obstructive due to their scale, design and prominence of the messages. This occurs because variable message signs (and often traffic and directional signs) are implemented when a project is completed without considering the design of the whole project and without regard for the broader context through which the road passes.
- ▶ Minimise the number of traffic signals and directional signs as far as possible to reduce the visual impact of these elements – while taking traffic and road safety considerations into account.
- ▶ Consideration should be given to the scale and form of advertising in relation to the nature and quality of the landscape, townscape and buildings, and the quality of road design being sought.

- ▶ Any safety devices, platforms, lighting or logos should be considered and assessed as part of the signage proposal.
- ▶ The signage structure and composition should be of a high quality design and finish.

See: Transport corridor outdoor advertising and signage guidelines, Assessing development applications under SEPP 64, State of New South Wales through the Department of Planning, July 2007 (and its updates).

“The fewest possible signs of the smallest adequate size in the clearest simplest form.”

Dame Sylvia Crowe 1955



Place markers on the Pacific Highway designed to highlight the regional qualities not able to be fully appreciated from the highway

The Lizard tree bridge on the Hume Highway provides a milestone on the journey south and is a robust integrated piece of artwork.



Artworks

There is occasional public and institutional pressure to provide artworks in road projects, and sometimes a call from Government to do so. Sometimes a genuine opportunity may present itself in the course of designing a road project or in a tender bid. While artwork may help successfully achieve the urban design principles in this document, it is not the purpose of an urban design process to provide art. Artwork should certainly not be used to compensate for good design or cover up bad design. However, artworks are important in giving a place character and value and the case can be made for legitimate artworks to become part of the scope of a road project and a useful adjunct to the public domain. In these cases:

- ▶ The selected artworks should be part of a coordinated road design rather than an add-on decoration. For example, artworks should be used thematically and integrated with the whole project.
- ▶ There is also a place for a public art program separate to the project process and with its own funding. This ensures a focus on the art and a respect for the artists. The artists should collaborate with the urban designers to find the best location for the art and maximise its potential.
- ▶ The scale of the artworks should be relevant to the speed environment and be able to be observed without undue distraction of the driver.
- ▶ The artworks should strive to serve the community and the transport user.
- ▶ Above all, artworks must be durable and robust, without exposed and easily damaged elements. They have the potential to make infrastructure more robust by deterring graffiti vandalism.
- ▶ Where it is agreed to decorate existing structures, decoration should have purpose and presence and ideally relate to the landscape history and culture of the area.

- ▶ The incorporation of Aboriginal artwork with Aboriginal artists contributes to, expresses and respects our deeper cultural and historical history.

Project managers are encouraged to include artists in the project team to assist in achieving these goals and in developing the design and design themes appropriate for the type of project. There should ideally be participation from community on the location, design and provision of artworks. Incorporating Aboriginal artwork in our project designs is always a fine gesture.



The Aspire sculpture by Warren Langley (photo Richard Glover) was initially the outcome of an approach to revitalising an unsafe dark space under bridge viaducts. The project involved tidying up the space, new paving and walling and the sculpture itself. Roads and Maritime worked with the City of Sydney Council to make this a valuable and useful part of the city fabric.

The Metcalfe street noise walls on the Warringah Expressway involve Richard Goodwin, an artist and designer. He developed a texture which was applied to the concrete walls, based upon the Walter Burley Griffin designs of an incinerator in the local area. The texture also deters vandalism. The walls are strong and durable, integrate art and are unique to the place.





Rest areas are important pieces of open space or ‘parks’ for road users. The need seating shelter facilities and a pleasant shady outlook as in this rest area on the Pacific Highway

Rest areas

A simple, attractive and shade-providing landscape design is one way to encourage road users to stop and relax at rural road rest areas. Rest areas in these instances should be designed as small parks, ideally with good views and allowing good natural surveillance around, and to, the site. They should have well located and designed seating and toilet facilities. Interpretive panels and signage relating to site significance and cultural heritage can add to the quality of a rest area. A pathway circuit to allow stretching of legs can be an attraction.

- ▶ The location of rest areas should be strategic. As well as travel distance criteria requiring stop-revive-survive facilities, consideration should be given to scenic spots and views, historic and cultural significance of sites, and visibility on approach.
- ▶ There should be some consistency in rest area design where there are several along a route.
- ▶ Layout of rest areas should avoid conflicts between trucks, cars and pedestrians, and vehicular access and egress should be carefully located to be visible and safe.



- ▶ Rest areas should not be secluded, private spaces. They need to be as open and visible to the road as possible to avoid security issues and vandalism.
- ▶ Rest area facilities need to be durable, robust and easy to use to avoid frustration and potential damage and vandalism.
- ▶ They can include interpretation of the place in which they sit thereby providing local knowledge to users, artistic interest and celebration of culture.



A consistent elegant approach to rest area signage, that can be updated, is sculptural and also provides good shade.

Car parks

Transport provides car parking for many purposes including for transport interchanges, bus transit way stations, boat ramps, rest areas and for commuter car sharing use. There are a few simple guidelines that make these car parks more pleasant and attractive to use (refer to the Commuter Car Park design guideline for further information):

- ▶ Wherever possible the car park design should include a generous tree cover either by retaining existing trees or planting new trees. These provide much valued shade for cars during the day and help provide a more attractive facility.
- ▶ Car parks should have good surveillance throughout, avoiding secluded areas, providing lighting and where possible incorporating good views from surrounding public areas.
- ▶ Large expanses of car parking should be broken up by low level vegetated areas, to minimise visual impacts and allow storm water to drain and irrigate the landscape.
- ▶ A safe, clear footpath access route should be provided in large busy car parks, following as closely as possible the natural desire lines of people going to and from the access points.

Utilities, lighting and other elements

- ▶ Facilities for services — including power, water, sewerage, telecommunications, gas and street lighting — should, where possible, be designed in common or combined trenches and be compatible with planting and shared paths.
- ▶ Consideration should be given to placing overhead power lines underground to reduce clutter and improve the simplicity and neatness of a corridor.
- ▶ Lighting should be simple, resistant to vandalism and selected to minimise fixtures. The street character or historic character of an area should be respected in the selection of lighting types and luminosity.
- ▶ Utility boxes and fencing should blend into the background as far as possible by being discreetly located and finished in a dark, unobtrusive colour. This will help avoid vandalism.
- ▶ Use dark, receding colours on shared bicycle and pedestrian paths to avoid being visually obtrusive and creating glare that can result from the use of plain concrete. They should have clean edge lines and be well articulated at crossing points and bus stops.

Buildings and shelters

Transport designs, builds and maintains a number of buildings and shelters on its network. These include bus stations, toilet blocks for rest areas, wharfs for ferry networks and tunnel control centres.

It is important in the design of these that the rules of simplicity and durability are followed. Architects should be engaged to achieve quality structures that are consistent if a suite of buildings is to be developed such as wharfs or toilets.

Landscape architects should be engaged so these buildings fit well into their environment and include well designed related open vegetated space.

Conclusion

Elements in the transport space, should look as though they have been considered as part of the whole architecture. A random distribution and differing design elements with incompatible designs can be untidy and visually confusing. Such elements are hard to maintain and are potentially easy to damage. This can diminish the quality of the corridor.

Transport infrastructure must be designed to be low maintenance as well as aesthetically pleasing. To achieve this, design should be robust and self-reliant and opportunities for vandalism avoided. Simplicity of design can improve appearance and can also have dramatic effects in minimising maintenance costs.

Case Study 9

The commuter ferry wharf upgrades of Sydney Harbour

This program, centred on Sydney Harbour and the Parramatta River, makes an important contribution to connecting modes and communities along the waterway corridors. At the same time, it contributes to the design structure of the metropolitan area, its image and liveability. The wharfs form community nodal points served by pedestrian, cycle and bus networks and accommodating commuter parking and taxi drop-offs and so function as multi-modal interchanges. Over and above being points of arrival and departure for commuters and tourists the wharfs form precincts with a public domain made up of public open space, waterfront and community facilities, vegetation and historic elements and their views. The neighbourhoods surrounding wharfs are desirable living environments and tend to have high land values. Their populations are to a large degree dependent on wharf access and commuter network services which offer alternatives to unnecessary car travel. There are 47 wharfs being replaced and modernised. The new wharfs, developed from a prototype constructed at

Milsons Point, are architecturally designed and purpose built, representing a new image and approach to wharf infrastructure in Sydney.

The new expanded wharf at Milsons Point adjacent to Luna Park and the Sydney Harbour Bridge (1) delivers a major component of the Commuter Wharf Upgrade Program in Sydney. In order to support an increase in services, six years after the last revamp, this wharf is a duplication project that re-orientates the alignment of the previously modernised wharf which was perpendicular to the quay, to now parallel it. By extending its length the new expanded wharf provides dual berthing taking double the amount of ferries. The entire wharf precinct is designed three-dimensionally with a distinctive modern architecture of lightweight appearance. It is formed beautifully in its waterside and landside settings and offers many viewpoints. Besides being a landmark area in its own right the site falls within the buffer zone of the World Heritage listed Sydney Opera House (2).





TIM THRESBY FEB 2019

Materials are transparent with paint colour responding to the surrounding palette, having neutral tones and being low in reflectivity. There is a new covered aluminium gangway connected to and supported by the fixed structure and a new hydraulic platform; the gradient of the gangway varies according to the tides. The design has zinc roofs, glazed screens and stainless steel handrails. In order to open views there is an expanded waiting area together with new signage, wayfinding, lighting and customer information and opal ticketing. In order to minimise erosion and achieve durability, pilings are steel finished. The design of landside elements fit well with the existing steps, heritage sandstone sea walls, and decorated balustrade defining the promenade edge and with materials within the public domain. The promenade itself is simply laid out; a line of palm trees forms a

colonnaded edge to the upper promenade, which is further defined by the robust set of stone clad steps running the length of the walkway to the bus stop at the eastern end making the wharf upgrade part of a larger public transport interchange.

Importantly, Milsons Point is part of a suite of wharf designs for the harbour and river giving them a common transport infrastructure identity. The architectural kit of parts rolled out for each wharf design however is differently applied to each context and with natural and built heritage elements incorporated into the design, making the individual wharfs precinct-specific within the whole. This approach has been applied at McMahons Point (3) and Neutral Bay (4) and all the others wharfs.



Balmain Wharf at Thames Street. The heritage shelter was retained as part of the ferry wharf design and creates a fitting gateway to the wharf in keeping with the character of the area.



Milsons Point wharf from the Harbour Bridge Walkway



The McMahon's Point wharf was located carefully to avoid visual impacts and visual intrusion in the Sydney Opera House World Heritage Buffer Zone while allowing ease of access for ferry captains. Through community request the wharf building was located on the land with the pontoon area left open to the elements.



Milsons Point wharf was the first of the new wharfs and set the theme for the program on Sydney Harbour. Almost 10 years after it was upgraded the popularity of the ferry network necessitated a duplication of the capabilities which has been completed with minimal impact.

3.10 Synthesis – Bringing the principles together

It is the bringing together of all of these principles of urban design that makes a project good. The degree to which these principles can be unified depends on the project.

These principles constitute key directions of design and are only the starting point. They are a point of departure into the exploration of design on each project, which will take its own course as the context and issues demand and as imagination is applied.

The Urban Design Roads and Waterways team will continue to develop these principles and to produce supporting guidelines that address particular aspects.

Use should be made of the References and further reading set out in this document.

Case Study

Banora Point upgrade of the Pacific Highway in the Tweed Heads area

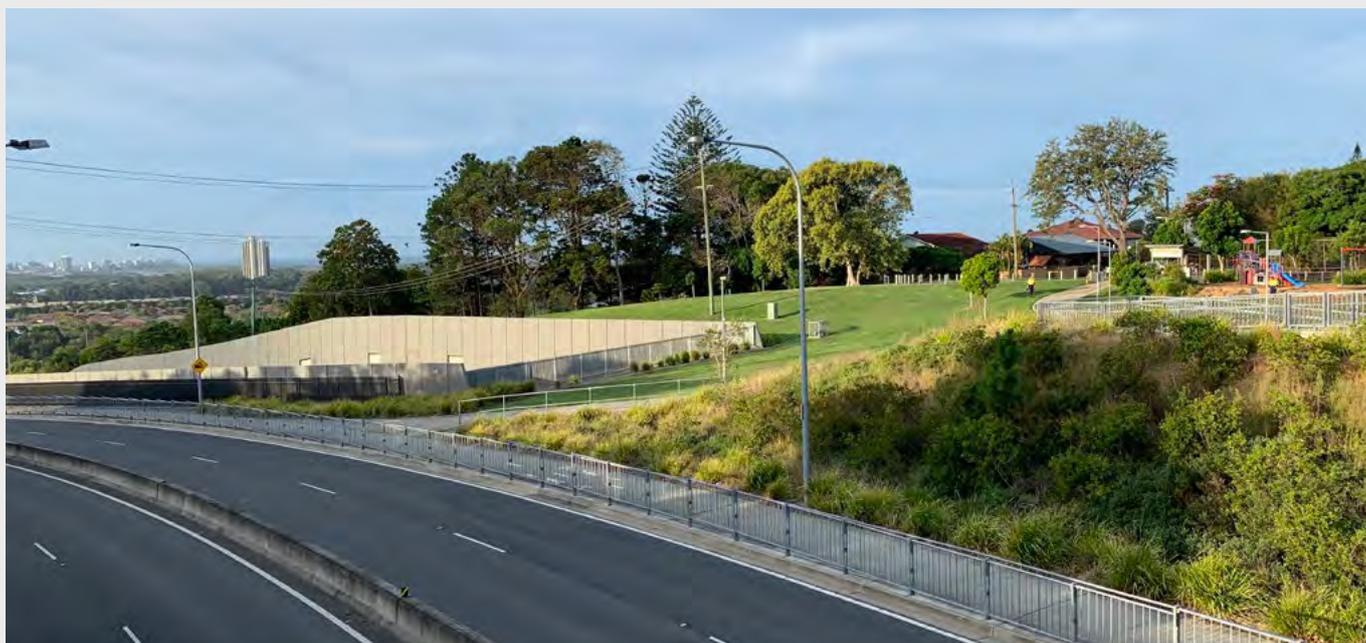
The Banora Point Pacific Highway upgrade is a transformational project and holistic solution to the development of a highway in the complex Lower Tweed environment that brings all nine urban design principles together. It addresses the Pacific Highway Urban Design Framework aimed at achieving 'a sweeping, green highway integrated with the built and natural landscape, providing panoramic views and presenting an architecturally simple refined road infrastructure with variation according to the context.'

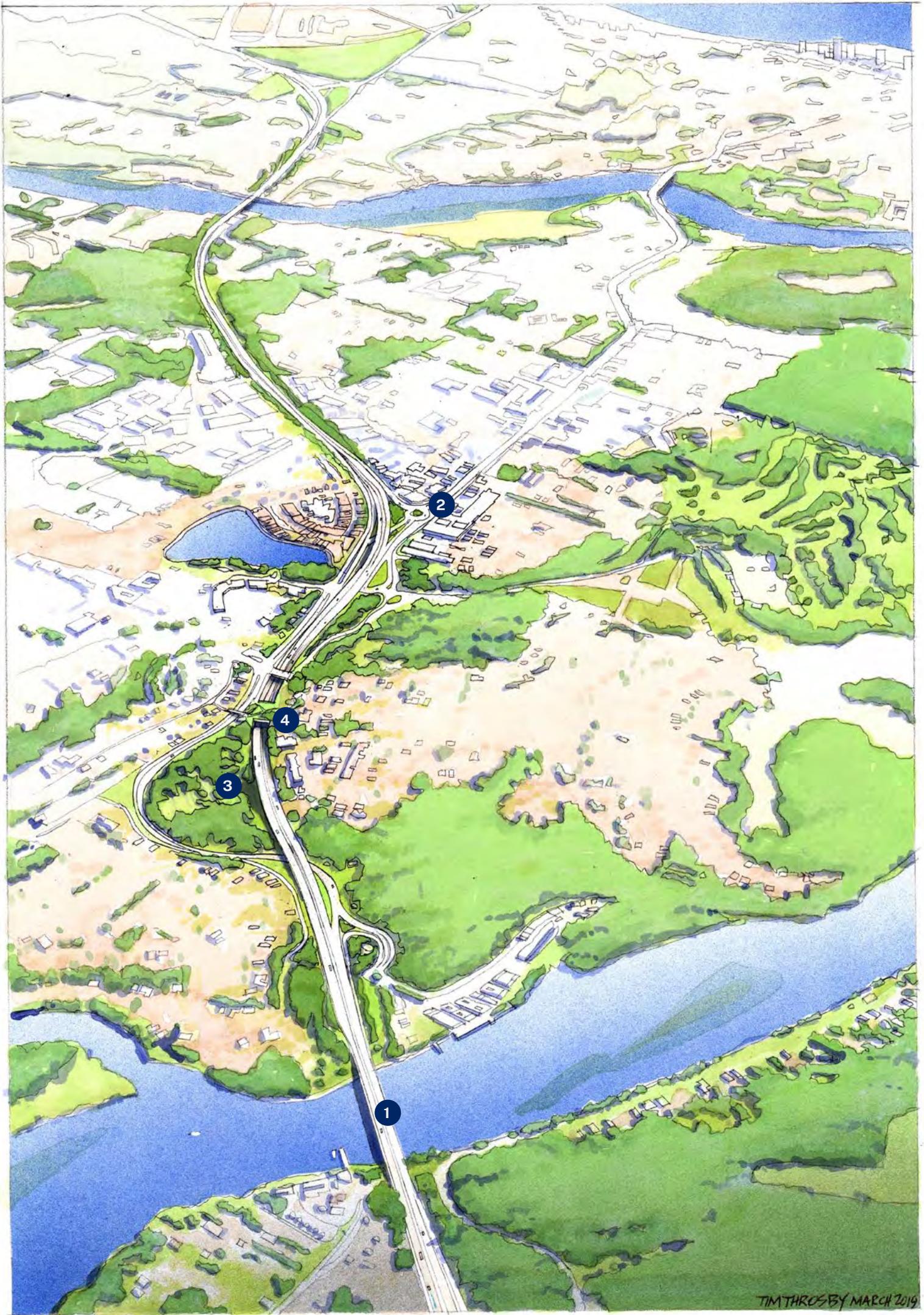
The 2.5km six-lane divided highway runs from Barneys Point Bridge (1) across a central valley to the southern end of the Tweeds Head bypass. It replaced the existing narrow and congested section of the Pacific Highway through hilly suburban areas that had poor horizontal and vertical alignment and high crash rates, leaving the old route to function as a local arterial and thereby changing the road hierarchy.

The project is characterised by improved and increased area connections including a new northern interchange (2) that connects with commercial and retail precincts; the overhead electricity poles and power liners were relocated

away from the interchange. There are connections to, from and across the new highway for local traffic, cyclists and pedestrians. A 330 metre viaduct with clear noise walls is designed to cross the valley, which is revegetated and incorporates interpretation of cultural heritage on the valley floor. (3) A dramatic cutting on curvature has been made through Sexton Hill with elegant lines, feature lighting and high quality finishes. It is formed to avoid a notch in the skyline and has a distinctive gateway effect.

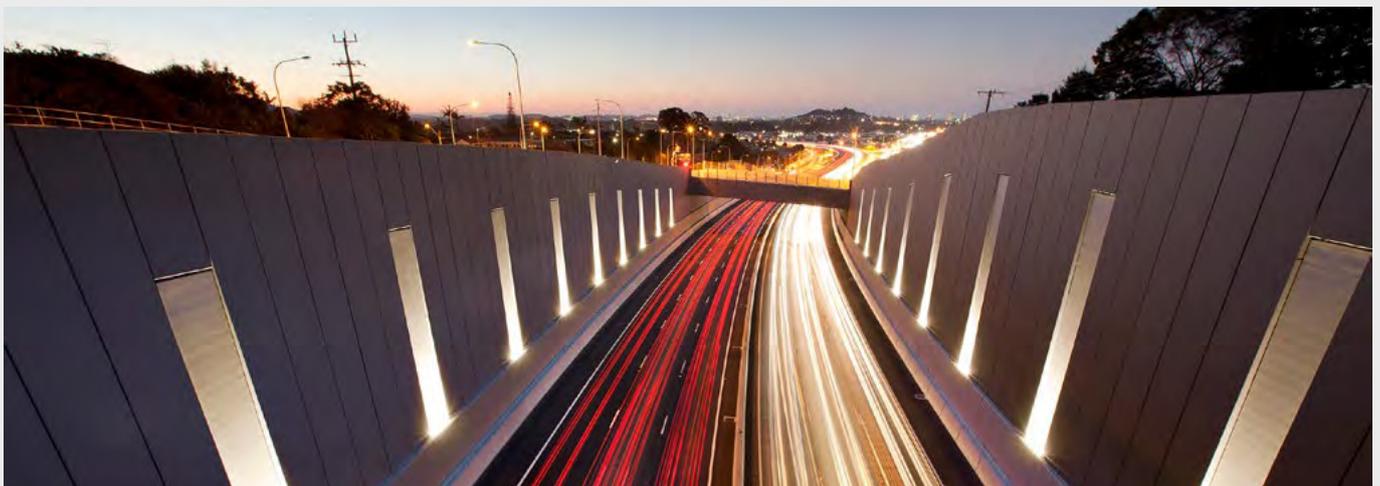
Wilson Park (4 and picture below) has been reshaped and improved to become a focal neighbourhood park atop a new land-bridge, which forms a green connection between east and west Banora Point. The experience in movement on the highway includes views through the main cutting and from the viaduct of the Pacific Ocean and Gold Coast depending on the direction of travel, together with transitions from urban areas to rural and estuarine landscapes. There is extensive use of acrylic, see through, noise attenuation. The project's design process involved a professional alliance contract and strong collaboration with Tweed Shire Council and the business and Aboriginal community in particular resulting in a transformation of the entire area.







The Tweed Heads entrance from the Pacific Highway marked by pine trees, palms and a refined road infrastructure utilising dark tinted concrete panelling contrasting with the road parapet and breaking down the impact of the walls.



The Banora Point cutting from the land-bridge looking north to the Gold Coast. The retaining walls extend beyond the original surrounding ground plane to neatly provide the noise walls. Lighting is integrated into the walls to break down their expanse and create a night-time effect.



The view from the land-bridge looking south. The viaduct noise walls are clear acrylic to allow views and light and minimise visual impacts from properties.

Appendix A

Roads and Maritime case studies in Beyond the Pavement 2014

The following case studies demonstrate the application of urban design principles to selected Roads and Maritime projects in practice. Besides representing past achievements in urban design there are some lessons and considerations that can be drawn from these case studies recognising that no project is necessarily perfect and that projects are invariably subject to planning, political, engineering, budgetary and time constraints affecting urban design outcomes. In hindsight one can always do better.

The Urban Design Roads and Waterways team carries out urban design evaluations on the larger or more complex projects, first, to assess and document the extent to which the delivered project meets or exceeds the urban design requirements set out in the scope of works and captured in the project Deed (the project that was 'purchased') and, second, to identify urban design issues that may have arisen, for example, as a result of departures from the agreed design and specifications, for whatever reason — cost cutting, technical, unforeseen community impacts. The Centre also tracks the urban design performance of projects over time and helps to deal with new challenges. On the whole the case study projects are excellent examples of urban design and would not have turned out well, or have even been approved, without an urban design approach.

Something to be recognised is that projects take time to mature especially regarding their landscape design and public domain improvements set out in the urban design scope of works. The Eastern Distributor in Sydney took over a decade to become a major greening of the city project. Albury Bypass and the M7 were affected by a long period of drought but are now well landscaped corridors, as are many Pacific Highway upgrade projects and the Parramatta to Liverpool Transit-way (the latter took many years to reach its full patronage as it became better known by the community and now functions as a public transport spine with a strong identity, alternative to the car). Urban design evaluation upon project opening and as generally captured in this appendix of case studies can therefore be premature since it represents a single point in time and not a project's life into the future. As projects become fully vegetated and their public domain developed they become increasingly integrated into their context, visually attractive and publicly active. It should always be demonstrated that a project has the preconditions to mature in this way.



1999



2008

There are invariably continual modifications to a project once built. Such modifications can be designed well in keeping with the original concept or be can visually jarring and clumsy. A well designed modification is the interesting throw screens added to the Eastern Distributor foot bridges in Surry Hills which appear as a thought about part of the original project. Importantly, they were done by the original urban designers who were part of the contract team and kept the integrity of the project's design.

Materials do not always perform as intended. On the M7 we have learnt that glass noise attenuation panels however tough are subject to unforeseen vandalism and now specify the use of acrylic as the best see-through solution. Sandstone, a material that fits well into the context of Sydney can, if used in smooth cut blocks or panels, be subject to vandalism and graffiti vandalism. Using it in a rough-hewn stone pitching form like in the Blue Mountains makes it durable and very rarely tagged.

Thus, a project is seldom complete but continually in the making as a result of changes to it as well changes to the corridor such as urban development and traffic. A project therefore needs to be inherently resilient to change.



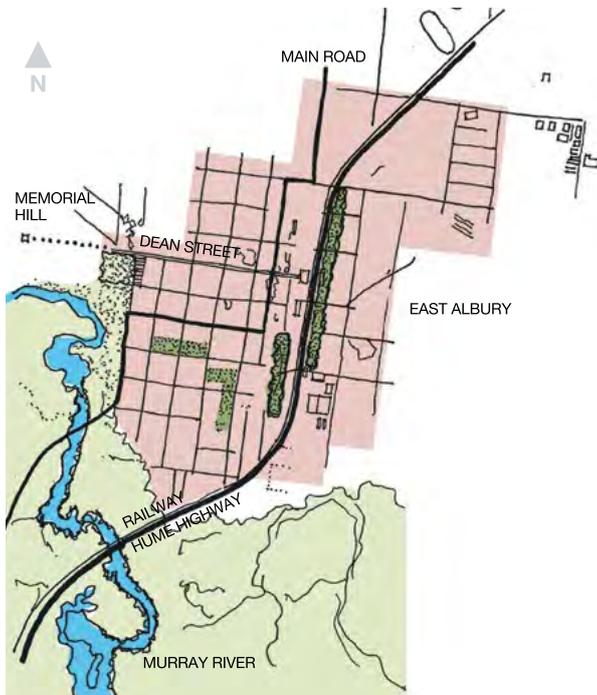
Case study

Contributing to urban structure and revitalisation

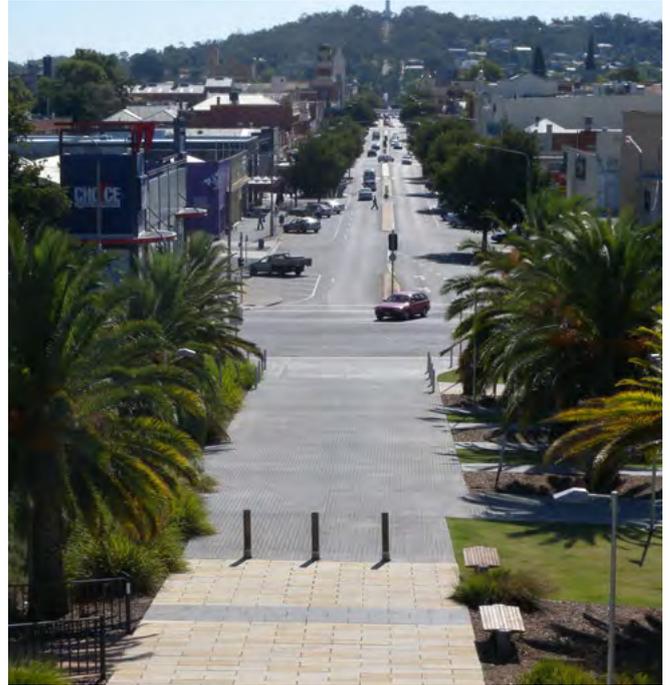
Hume Freeway Project, Albury–Wodonga

The NSW section of the freeway was planned and designed adjacent to the rail line through Albury. As such, it replaces a previously unused and derelict area with a high speed road and rail corridor that fits in with the original grid layout of the town. Through traffic on the bypassed main route through the town was reduced, creating improved amenity and opportunities for urban revitalisation.

Concept plan



The new road along the rail corridor (horizontal north-south axis in picture) lies perpendicular to Dean Street (vertical east-west axis in picture) and fits with the grid structure of Albury.



The east-west Dean Street axis runs from Memorial Hill to this plaza which connects with the Dean Street cable-stay pedestrian bridge. This design has revitalised the east end of the street.



With a wide shared cycle and pedestrian path into town, and strong architectural connections, the north-south linear park in East Albury has revitalised a former derelict strip of land by the railway.



The approach from the north with the Dean Street cable-stay pedestrian bridge and old railway station and yards in view. The terraced retaining walls and noise walls align with the town grid and complement the station.

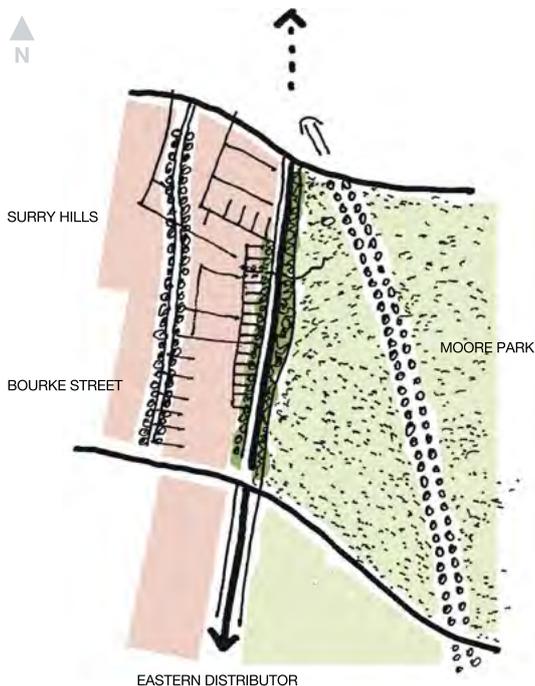
Case study

Fitting with the built fabric

Eastern Distributor, Sydney

The Eastern Distributor motorway provides a link between the Cahill Expressway at Woolloomooloo and Southern Cross Drive in Sydney from the airport. As well as extensive tunnelling under the city, the motorway is grade separated through the Moore Park precinct at Surry Hills and forms a vastly different footprint to the original engineering design. It leaves the existing urban fabric intact. Lowering the motorway in an open cut reduces noise and visual impacts, ensures continuity of the street and pedestrian networks and improves the design and outlook of the surrounding park and housing. The architecture and landscape of the project was designed to complement the area and build upon the character and quality of the public domain.

Concept plan



An architectural model was prepared to demonstrate the benefits of an integrated engineering and urban design solution.



The depressed motorway is hidden from the houses and park. Its retaining walls minimise its footprint and are designed to complement the form of the Victorian terraced houses of Surry Hills.



The motorway set into a cutting protects South Dowling Street from noise and visual impacts and allows it to act as a service road for residents. The road has been retrofitted into a pleasant landscaped street with parking.



Adjoining land and streets, like Bourke Street, have undergone a renaissance. With traffic impacts removed and additional traffic management in place, a better street life and development opportunities have occurred.



As shown in this elevation, the existing built form is considered and the motorway designed to fit into the character of Surry Hills, with the pillars of the retaining walls reflecting the design of the terraces.

Case study

Connecting modes and communities

Liverpool to Parramatta Transitway, Bonnyrigg

The Liverpool to Parramatta Transitway is a 31 kilometre bus route with 21 kilometres of dedicated bus lanes, two 'park and ride' facilities and 35 bus stations. It connects a string of suburbs and centres between Liverpool and Parramatta providing clean, fast and safe public transport. The bus station at Bonnyrigg is situated adjacent to the shopping centre car park. It is well connected with shared paths to the south and north and with a local road connection since local bus services run alongside the transitway. Precincts such as Bonnyrigg are attracting developer interest focussed around bus stations. A shared bicycle and pedestrian path runs along the entire length of the transitway.

Concept plan



The dedicated transitway has a major bus station at Bonnyrigg town centre which forms part of a larger station precinct design.



The northbound and southbound bus stops, platforms and shelters are aligned on either side of a shared path axis connecting the shopping area to the housing areas, places of worship and public open space to the west.



Cyclist facilities are provided as well as ramps and steps for ease of access. The bus station is clearly marked with signage and planting. Robust surface materials have been used.



The Liverpool to Parramatta Transitway provides quick connections from the small shopping and business areas at Bonnyrigg to the larger facilities at Prairiewood at the next stop and on to Parramatta. Bus stations have a distinctive architectural design, however transparent plastic products should in future be used instead of glass to reduce the opportunity for breakage.

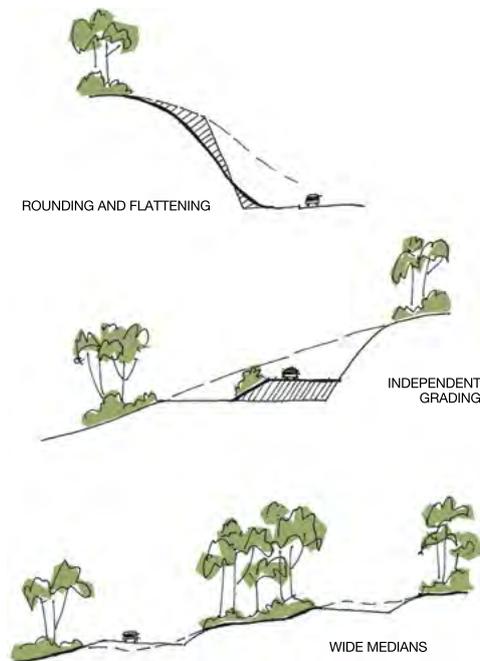
Case study

Fitting with the landform

Pacific Highway Upgrade Projects

The Pacific Highway corridor traverses the landscape between the Pacific Ocean and the Great Dividing Range. It travels nearly 700 kilometres between Newcastle and Tweed Heads and crosses wide rivers, skirts valleys, meanders across wide plains and undulates over ridgelines and hills. It is a vast program and the constraints of integrating the individual project earthworks with the natural topography have produced some lessons in fitting roads into the landform.

Concept sections through the landform



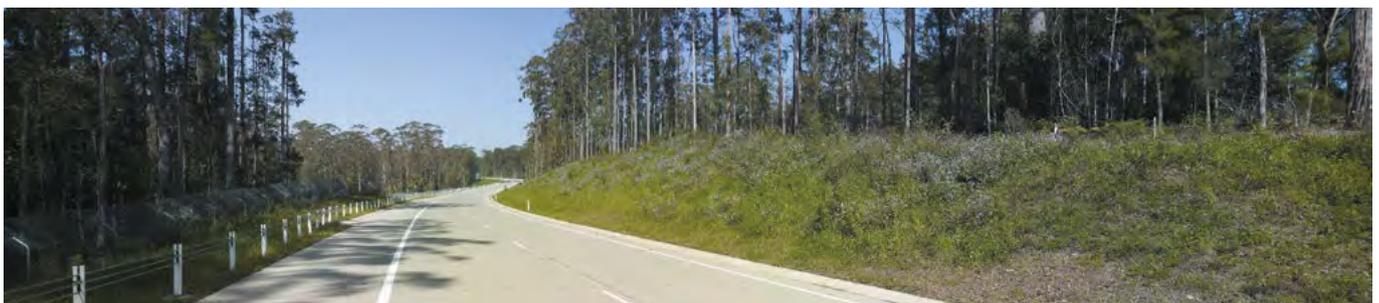
Karuah to Bulahdelah: Rounding off and grading out the slopes to 1:4 create an almost seamless integration with the natural slopes.



Karuah Bypass: Independently grading the carriageways helps minimise earthworks, provides a more interesting journey and reduces the wide terraced effect of roads on hillsides. Note the gentle gradient of the embankment.



Yelgun to Chinderah: Avoiding cutting through spurs and aiming for saddles and valleys reduces earthworks and creates a more flowing, responsive alignment.



Bonville upgrade: Extra wide medians and independent grading allows the retention of woodland, helps fit the road into the topography and landscape, avoids headlight glare and provides better opportunities for wildlife crossing.

Case study

Responding to natural pattern

Yelgun to Chinderah Pacific Highway upgrade

The Yelgun to Chinderah upgrade in the Northern Rivers area of NSW was planned and designed to avoid and minimise impacts on the local ecology and agricultural land uses. The road footprint is minimised as far as possible with steep cuttings and the alignment closely skirts the canefields and woodland on the edge of the valley. A tunnel under Cudgen Road was built to preserve the wooded ridge line and habitat corridors. With these measures the natural landscape and ecological patterns have been protected, impacts minimised and a better design outcome produced.

Concept plan



The upgrade skirts the edge of the canefields and woodland, avoiding disruption of the natural vegetation patterns.



The upgrade is located in the flatter land, avoiding the ecologically valuable ridges and woodlands.



The Cudgen Road tunnel allows the wooded ridge line and wildlife corridor to cross the road and extend down to the edge of the Tweed River. Native planting and seeding is provided to revegetate the edges of the portal. Use of gabion facing is suitable for the natural context.

Case study

Incorporating heritage and cultural contexts

Upgrade of Great Western Highway at Leura

The Great Western Highway generally follows the original explorers route over the Blue Mountains. The corridor is tightly constrained following ridgelines and bounded by steep wooded slopes. By necessity the rail corridor and the towns of the Blue Mountains are also located on this ridge. Leura is one of the towns of the Blue Mountains that attracts many visitors due to its natural and historic character. Upgrading the highway at Leura required some innovative design approaches including a wide landbridge, preserving the ridgeline and safeguarding the curtilage of the historic ruins of the Chateau Napier hotel.

Concept plan



To help understand the complex three dimensional qualities of the project and to demonstrate the design thinking to the community, a model was built illustrating the key aspects of the project.



The historic and attractive mall through Leura extends past the rail station and crosses the highway on a landbridge.



The gentle ruins of the historic hotel Chateau Napier are protected and provided with an appropriate sandstone boundary adjacent to the road. With the landscaped roundabout, centred on the landbridge, this forms an integrated precinct.



The pleasant, sweeping geometry of the underpass continues the ridge line. The design draws a distinction between the new road and the older town, providing an attractive outcome overall.

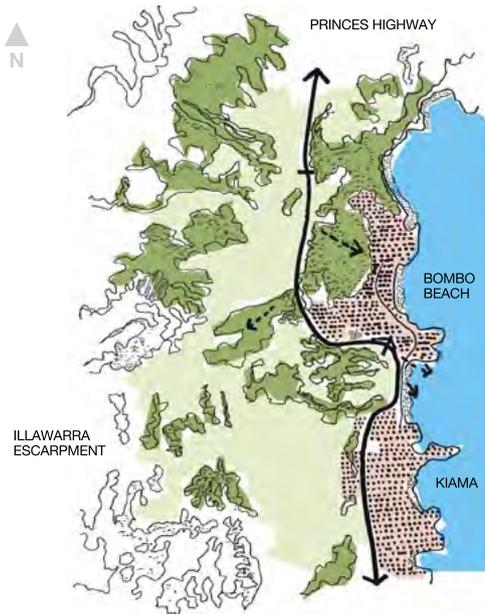
Case study

Designing roads as an experience in movement

North Kiama Bypass

The North Kiama Bypass upgrade of the Princes Highway is approximately 10 kilometres long yet traverses a diverse landscape that includes agricultural lands, industrial areas, woodland, river valleys and hill tops. The views are also diverse including the Illawarra escarpment, the Pacific Ocean and the town of Kiama. The project has been designed to capitalise on these aspects. It provides an appreciation of the area for the road user and also a sequence of events – through distinctive bridges, rest areas, cuttings and noise walls.

Concept plan



The bridges and barriers are designed to allow panoramic views of the Illawarra escarpment.



The occasional noise wall has had input from local artists with textures, which represent local tree species.



The arched bridge and rock cuttings frame views of the Pacific Ocean.



The approach to Kiama takes in views of Kiama itself, the Pacific Ocean and the beach at Bombo. The alignment of the edge of the quarry provided opportunities to steepen cuttings. Local dry stone walling was used at many locations on the project.

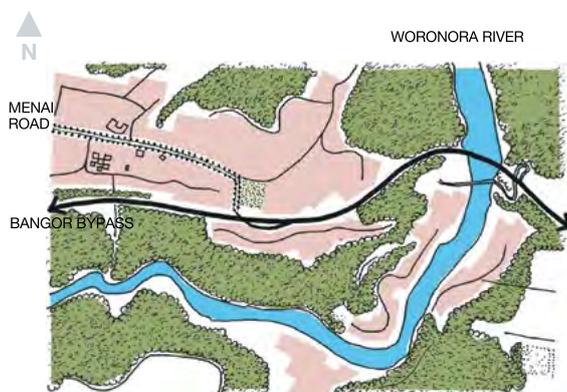
Case study

Creating self-explaining road environments

Bangor Bypass

The Bangor Bypass in southern Sydney was designed and built to link the existing high speed arterial across Woronora Bridge to Alford's Point Road. In so doing it bypassed the stretch of Menai Road through Bangor with its busy pedestrian orientated environment of schools, residential areas and shopping activity. Being designated a major arterial, the bypass had to be designed to accommodate heavy traffic at speeds up to around 80–90 km/h with appropriate road curves, setbacks and clear zones. Menai Road, on the other hand, was no longer required as a major road. Measures were taken to transform its appearance to that of a more local route. Car parking bays were created, the road was narrowed, footpaths were improved and the landscape enhanced to create a more pleasant environment conducive to safer driver behaviour.

Concept plan



The function of the Bangor Bypass as a major arterial road is clear. While drivers would feel comfortable travelling at certain speeds, the particular sight distances and setbacks would make motorway type speeds feel uncomfortable. The whole project has been designed to clearly give the appearance of a major road.



Menai Road, formerly a much busier road, has been transformed to suit its new purpose for local traffic and pedestrian access to shops, schools and housing and to encourage cycling. The design is simple, low cost and easily maintainable.



Bangor Bypass (left) contrasts with Menai Road (right). Both clearly indicate their function and both would make drivers uncomfortable exceeding the applicable speed limits.

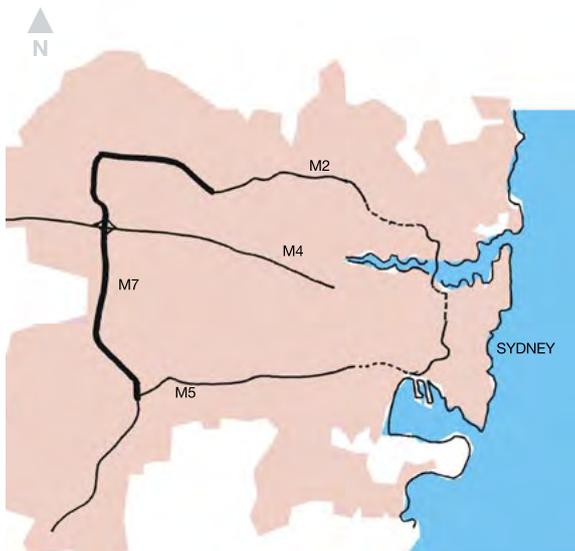
Case study

Achieving integrated and minimal maintenance design

M7 Motorway

The M7 Motorway forms a major 40 kilometre section of the Sydney Orbital Motorway Network. It was designed by an integrated engineering and urban design team with full control over the detailed design and implementation. The resulting project is coordinated and unified in all its elements. The multitude of bridges are organised into a hierarchy of design types. Materials with high quality finishes are used throughout. The project is a good example of the repeated use of bold elements which provides a powerful architectural effect, a strong sense of place and facilitates repair and maintenance.

Location of M7 within the Sydney Orbital Motorway Network



Clear walls always overlap solid walls and primary colours are used to emphasise different character zones along the M7 Motorway. Experience is showing that laminated and toughened glass would be best substituted by transparent plastic products in future.



Precast concrete noise walls are designed to serve different purposes and suit different locations. These panels, at a location close to the road, are repetitive and easy to replace. Overpainting is carried out in the event of graffiti vandalism.



The design of the 40 kilometre shared path is unified with the rest of the project and built with durable materials such as this concrete decking over a creek.



All vehicular bridges have similar properties in terms of coordinated lighting locations, spill-through abutments, tapered safety screens and night lighting. Names of overbridges are neatly integrated with principal designs.



Appendix B

A short global and historical perspective of urban design in relation to road and other transport infrastructure

The planning and design of roads and streets has long been a matter of importance to city and state. Roads and streets are major determinants of built form. They affect daily life and the ongoing vitality of the nation. They are also fixed corridors around which buildings and other land uses come and go. Consider for example the longevity of the Roman roads of Europe or the public places and markets that have existed for centuries around the crossing points of highways.

Perhaps the most notable contribution of road and street planning and design to a city was in Paris in the 1860s. Georges-Eugene (Baron) Haussmann administered the rebuilding of much of the city. His grand vision included twelve great boulevards radiating from the Arc de Triomphe, of which the Champs Elysees is the most famous. In London, Edinburgh and Bath similar grand city rebuilding projects were led by the architects John Nash, John Wood and James Craig respectively. Now UNESCO World Heritage sites, these developments were categorised by the axial grids of streets and avenues with crescents and circuses bounding gardens and parks. In Vienna the Ringstrasse Boulevard was laid out integrating transport infrastructure, architecture and green space in a true city shaping project.

In Australia, only fifty years later, a similar process began with architect and landscape architect Walter Burley Griffin winning a competition for the design of Australia's new capital city – Canberra. Griffin designed the city around interconnected grand avenues laid out to offer vistas of the city and the landscape and create distinctive precincts. The principles he established govern the development of the city today.

Greater industrialisation and the advent of the mass produced car in the 1930s added a new type of road to the rural and urban environment – the motorway. In response to concern about how these vast artefacts affected city and countryside, designers such as Lawrence Halprin, Ian McHarg, Kevin Lynch and Sylvia Crowe were some of the first to write about these new roads. They provided great insight into the analysis and understanding of context

(McHarg), road form and architecture (Halprin), the landscape of roads (Crowe) and the imageability of the road (Lynch).

In Australia landscape architects began to become engaged with road design starting with Peter Spooner who influenced the shaping of the Sydney to Newcastle Freeway and Bruce McKenzie working on the Gore Hill Freeway in Sydney and the Great Western Highway in the Blue Mountains.

At the same time the grandeur of bridge engineering was rediscovered through, for example, the work of Christian Menn, Robert Maillart and Eugene Freysinnet; in truth bridge aesthetics always had a strong voice (see the publication *Bridge Aesthetics*).

In the 1950s Colin Buchanan wrote about the pressures of the car and its roads on our towns and cities in his book *Traffic in Towns*. This stimulating the debate – which is still going today – about how the two may be reconciled.

A quarter of a century later, urban design as a process of guiding city design and reuniting design and engineering, began to be spoken about. Jonathan Barnett introduced the concept of urban design as public policy in his work with the Urban Design Group at the New York City Planning Department and written up in 1982 in his book *An Introduction to Urban Design*.

By the 1990s, highways organisations around the world had started to take urban design more seriously. In Europe aesthetics became a significant factor in the awarding of major new private road and motorway contracts. In England, the Highways Agency published the *Good Roads Guide* which is still part of the UK Design Manual for Roads and Bridges. In Scotland the Scottish Executive developed the *Roads, Bridges and Traffic* in the Countryside initiative with subsequent publications on fitting roads, designing with nature and traffic calming. In NSW the *Roadscape Manual* was developed and published with the aim to 'conserve and enhance the natural, cultural and aesthetic values of road corridors'.

Sydney to Newcastle Freeway mid 1960s
(image from The Roadmakers)



In the United States the idea of context sensitive design started to develop. A workshop titled 'Thinking Beyond the Pavement' was organised by the Maryland State Highway Administration in 1998. The name 'Beyond the Pavement' was subsequently used by Roads and Maritime in 1999 for its first urban design guideline.

“But even on highways whose primary function is the carriage of goods and people, visual form is of fundamental importance and can be shaped without interfering with traffic flow.”

The View from the Road, Appleyard, Lynch and Myer 1964

In the current century urban design understanding has developed and improved. It has become a key tool in ensuring sustainable, liveable and productive cities and places (see Creating Places for People, Australian Federal Urban Design Protocol). It is becoming ingrained in transport organisations and is an important part of how roads authorities throughout the world go about their business and obtain community and stakeholder approval. Transport's 'Beyond the Pavement' is a model locally. There is the New Zealand Urban Design protocol of which the New Zealand roads authority is a signatory. Victoria is known for its exciting approach to the design of Melbourne's motorways.

There is still scope for further development and integration. Urban design has great potential as a tool of governance in terms of improving quality of life and economic wellbeing and achieving best value for money. Its strength lies in its ability to make sure that the 'whole is greater than the sum of the parts' both in terms of collaboration within the building professions and the built outcomes they produce.

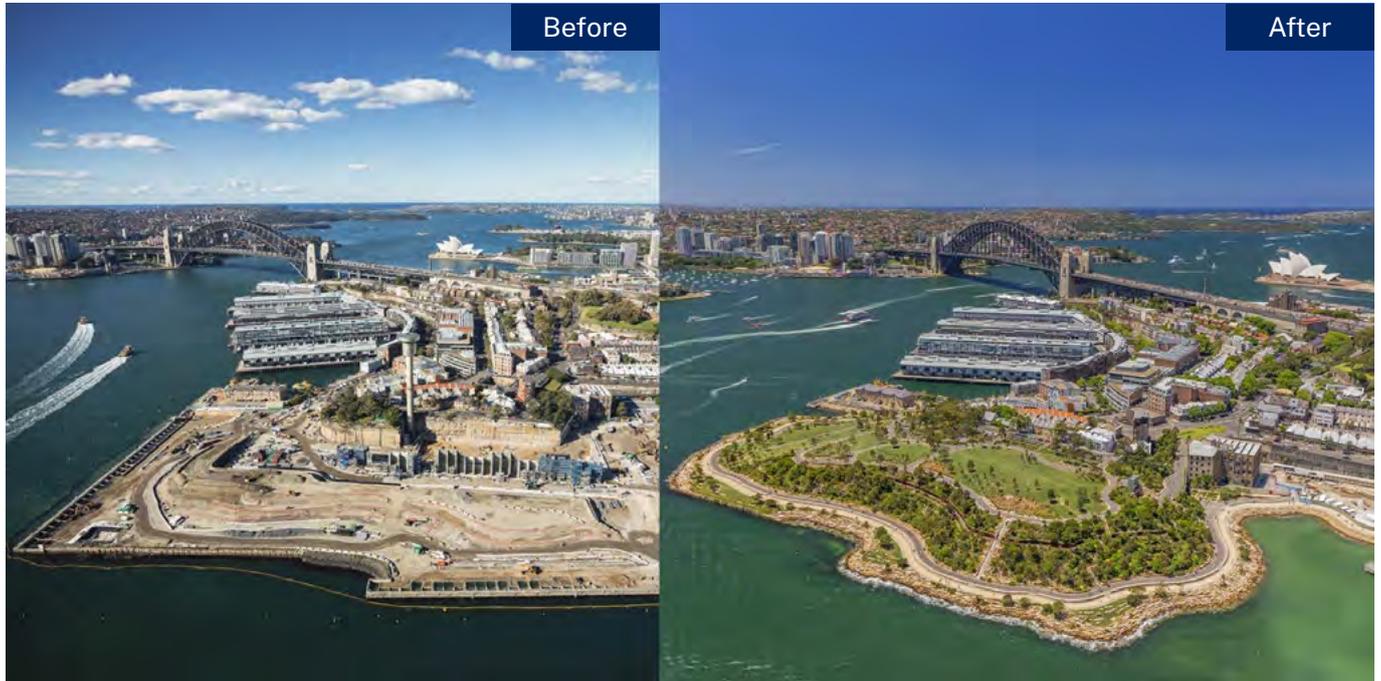
The following projects from around the world have been gathered to provide a small indication of what urban design can accomplish. They are intended to be inspirational and illustrate the scope of what can be achieved or aspired to.

Ranging from the positive effects of urban infrastructure renewal to projects offering unique solutions to fitting infrastructure into the built and natural environment, they are examples that highlight the beautiful and functional outcomes from the designers of today.

It is important to note that not all of these examples are case studies to aim for in our day-to-day work. Some of the locations and political contexts have dictated special outcomes. Urban design is often about practical outcomes that in many situations go largely unnoticed.

Barangaroo Reserve

Sydney



Barangaroo Reserve 2013–2018 (Photo Barangaroo Delivery Authority)

Barangaroo Reserve recreates the original Sydney harbour headland and contributes to the greening and restoration of the peninsulas in this part of the harbour.

It was designed by a collaboration of landscape architects and urban designers from Australia and the United States including Johnson Pilton Walker, Tract and PWP Landscape Architecture working with horticulturist Stuart Pittendrigh and soil scientist Simon Leake.

It is a substantive and important work of landscape architecture and civil engineering winning many global and local awards. It recreates the original landform by incorporating land-bridging over a vast exhibition hall and the shaping of bluffs and headlands from excavated material. Sandstone won from the project recreates in block form an accessible water's edge following the original coastline – the harbour wave action softening and eroding the blocks to a unique appearance. Soils were created from site material and the planting uses native harbourside species mixes in accordance with the local microclimate and aspect of the new indented coastline.

It is an exemplar project in terms of contributing to Green Infrastructure and Connecting to Country through its re-establishment of original landforms.

BP Pedestrian Bridge

Chicago, USA (2004)

Frank Gehry's first ever bridge design connects Chicago's Millennium Park to Daley Bicentennial Plaza in a unique, sinuous alignment that offers pedestrians magnificent waterfront, parkland and Chicago skyline views.

The bridge is clad in brushed stainless steel panels, with the fluid, sculptural shape allowing for universal access and an experience in motion for the pedestrian.

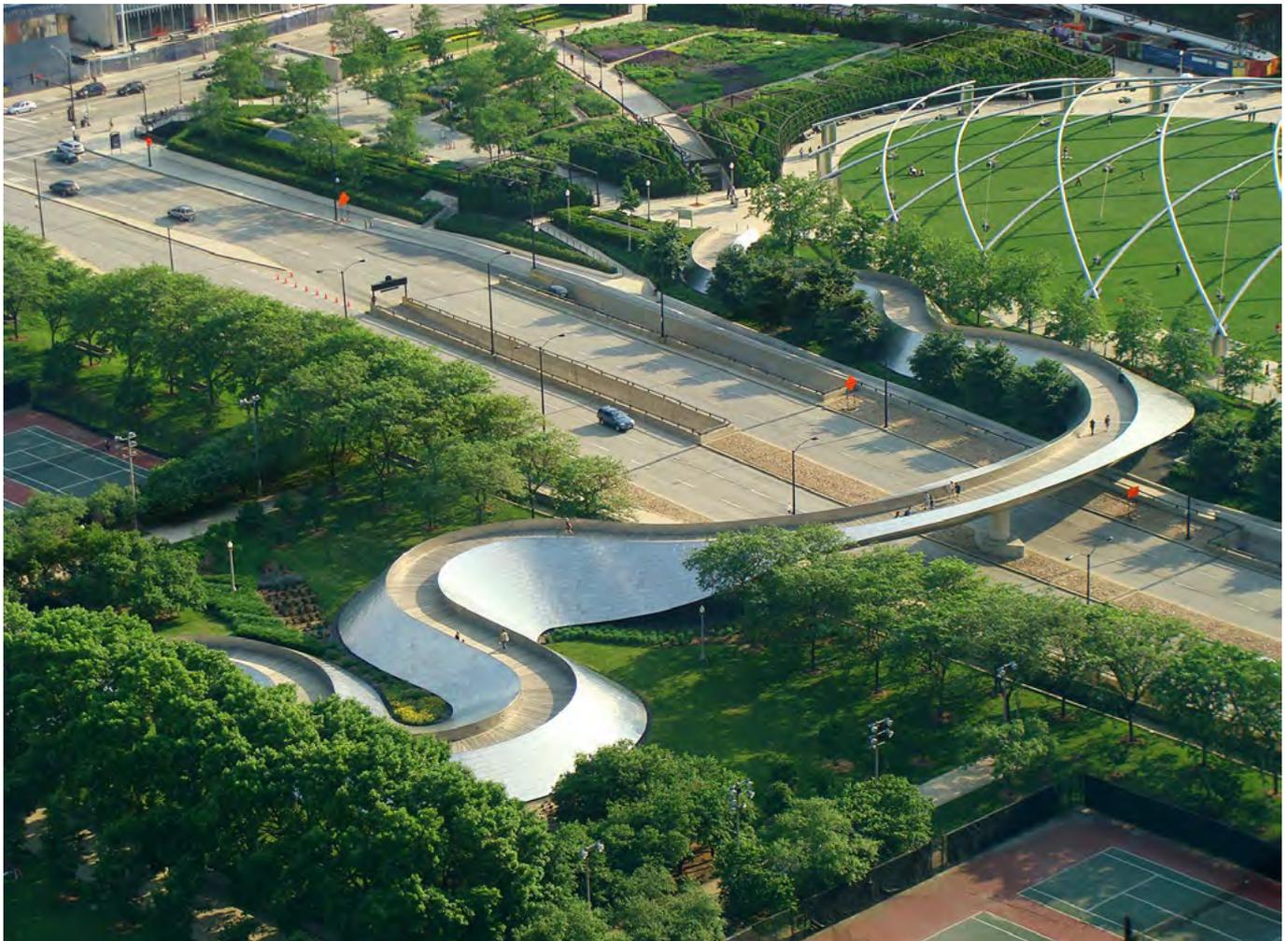


Urban design: Frank Gehry

Photography: Mariliel

Urban design: Frank Gehry

Photography: Torsodog



Buffalo Bayou Promenade

Houston, Texas, USA (2009)

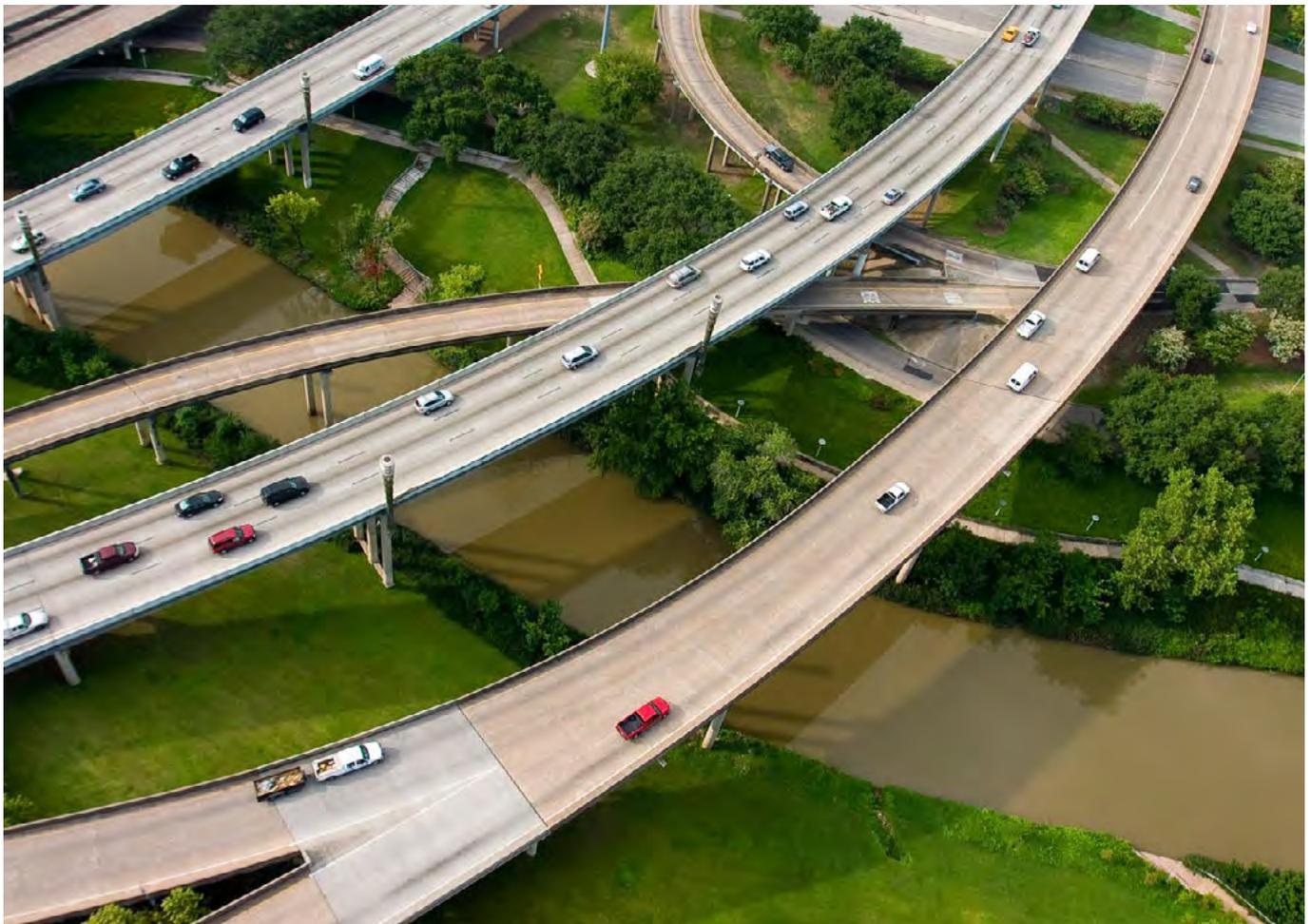
The Buffalo Bayou Promenade has connected Houston's CBD to the river park through a once forgotten city space. The promenade runs beneath 15 different bridges, and is undeniably an urban park beneath the moving city above.

The urban park has provided a prominent gateway to the city, and created 23 acres of parkland for Houston's inner city.



Urban design: SWA

Urban design: SWA



Calder Woodburn Rest Area

Victoria, Australia (2008)

As winners of an invited architectural competition by VicRoads, the designers of the Calder Woodburn Rest Area have taken the design of a humble toilet block and created a memorable placemark point for motorists on the Calder Woodburn Memorial Avenue.

The design employs standard construction techniques, which minimised building time, labour and costs, as well as using low maintenance and durable materials.

By taking a fresh approach to the design of a rest area through a competition, the result has been a well designed, uplifting structure that has become a recognised placemark encouraging motorists to take time to rest, while positively affecting the broader approach to road and rest area design.



Urban design: BKK Architects

Photography: John Gollings



Cap-Rouge Memory Wall

Quebec, Canada (2012)

The Cap-Rouge Memory Wall is a high quality example of retaining wall design and material selection, which avoids a standard, monotonous engineering solution.

The design conveys the history of the site through a written, artistic expression, which adds an extra level of detail and experience to the project.

Although the panelling is irregular and stepping, the design is appealing as it creates an even rhythm with a consistent material palette and theme, visually tying together all the elements of the design.



Urban design: Plania

Photography: Pierre Joosten



Cheonggyecheon Stream Restoration Project

Seoul, South Korea (2005)

From the mid twentieth century, the area around the border of Seoul's Jongno-gu and Jung-gu districts became over-populated and the Cheonggyecheon Stream became polluted. The waterway was gradually covered over, and by the mid 1970s an elevated highway was built above it.

In 2003, the Seoul Metropolitan Government initiated the Cheonggyecheon Stream Renovation Project, an extensive urban renewal project where the dilapidated highway was removed, the stream rehabilitated and an expansive linear urban park was created for the community.

The project is a model for eco cities around the world. More than 75 percent of waste material was reused for park construction and stream rehabilitation, with the project now a leading tourist destination in Seoul.



Urban design: Seo Ahn Total Landscape Architecture

Urban design: Seo Ahn Total Landscape Architecture



Craigieburn Bypass

Victoria, Australia (2005)

The Craigieburn Bypass is well known for the series of sculptural noise walls, that have become a sequence of events and experiences for motorists entering and exiting Melbourne.

Two types of noise walls reflect the different context they represent. Approaching from the north, a sinuous, undulating ribbon of weathered steel becomes a gateway and an experience of leaving the rural grasslands with framed views of the city ahead.

Further ahead, a continuous, rotating swathe of striking blue poles and acrylic sandblasted panels, combined with a nightly light installation, reflect the city's expanding urban fringe to its east.



Urban design: TCL with TZG and Robert Owen
Photography: John Gollings



High Line New York

Manhattan New York City United States



High Line New York 2018

The High Line in New York is a linear public space and active transport corridor that makes use of the original and now disused freight line running along the western side of Manhattan Island and servicing the port.

The design of the High Line incorporates a range of public spaces cleverly designed around the original industrial heritage and rail infrastructure. It is a linear park that provides good walking connectivity through the city, good views of the city fabric and streets and a range of places to stop relax and work.

Its popularity and necessity for queuing to use the public space is a good indicator of the lack of supply of public space in cities.

It is an excellent example of the adaptive reuse of existing built fabric. The promenade Plantain in Paris preceded the High Line which also repurposed a disused goods line above the street level. A number of similar projects around the world have been initiated inspired by the success of the High Line for example the Goods Line in Sydney.

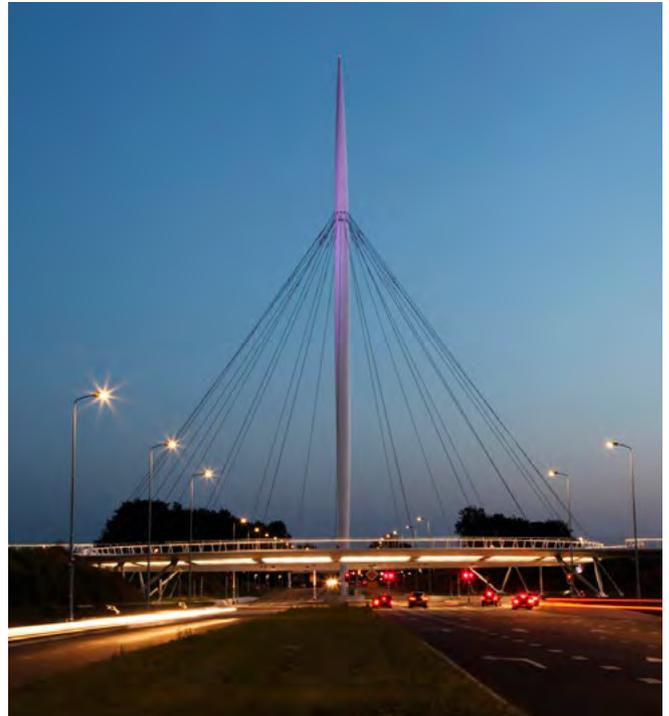
The Hovenring

Eindhoven, the Netherlands (2012)

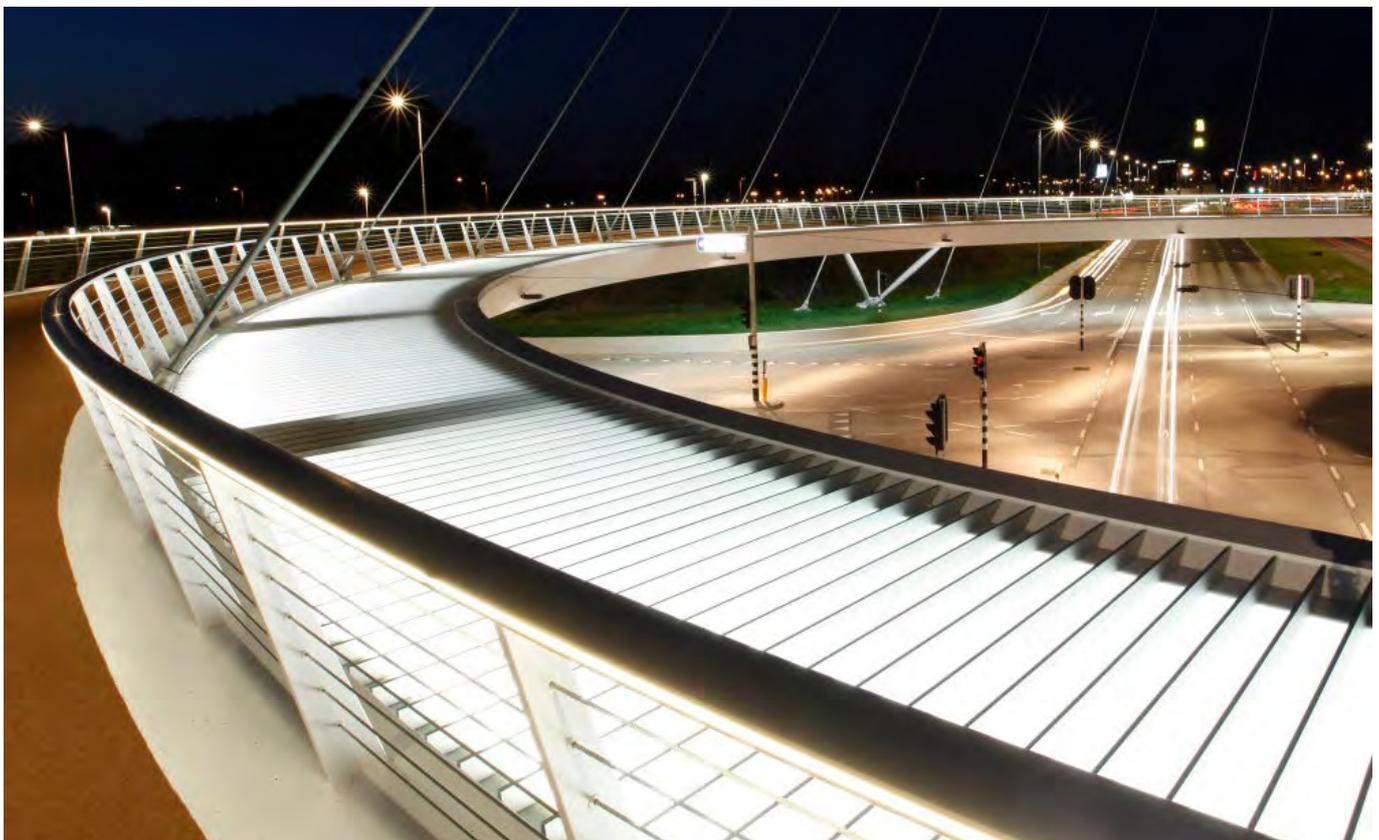
The 'Hovenring' is the world's first suspended roundabout bicycle path, allowing motorised vehicles and bicycles to be separated completely at an intersection on the busy A2 Motorway in Eindhoven, the Netherlands.

As the performance of the previous vehicular roundabout diminished due to the development of a nearby housing estate, designers developed a solution to separate traffic and bicycles that did not involve an underpass or level-crossing.

The 70 metre high circular cable-stayed bridge sits at the entrance to Eindhoven and Veldhoven, with the high quality infrastructure piece forming an impressive placemaker for the 'city of lights' both day and night, with lighting on the pylon and integrated into the deck.



Urban design: Bridge, urban and lighting design by ipv Delft, www.ipvdelft.nl



I-70 Glenwood Canyon upgrade

Colorado, USA (1992)

The Glenwood Canyon project, as part of the Interstate Highway System, is considered an unparalleled piece of environmentally sensitive engineering. The design enhances the natural surroundings, minimises environmental impacts and focuses on the experience of the motorist.

The separated and terraced roadways with cantilevered bridges allow uninterrupted views for motorists while maintaining unrestricted flora and fauna access to the adjacent Colorado River.

The Glenwood Canyon Recreation Trail, running the entire length of the canyon, as well as four dedicated rest areas and river launching sites are a result of the public involvement period and provide extensive opportunities for cyclists and pedestrians.



Urban design: Colorado Department of Transportation



Kings Avenue Overpass

Canberra, Australia (2011)

The design of the King's Avenue Overpass reflects its location at a gateway location within the Parliamentary Triangle in central Canberra.

The context-sensitive design reinforces the vista between Parliament House and the Australian War Memorial and is memorable for its sweeping, elegant nature and refined level of design and detailing.

The design features programmable LED lighting that can incorporate a number of colours for ceremonial or celebratory occasions.



Urban design: Johnson Pilton Walker



Madrid Rio

Spain (2005–2011)

After a long standing plan to reconnect Madrid's city neighbourhoods to the Manzanares River, a sunken motorway and linear parkland has transformed the life of the city with increased public open space and a rejuvenation in urban development.

The scale of the project is immense. A section of the M30 ring road running parallel to the Manzanares River is now underground, resulting in an area 10 kilometres long, with the surface space redesigned as a series of parks, allowing the public to re-engage with the once hidden river. The project includes 17 new walkways and 25,000 new trees.



Burgos & Garrido, Porras La Casta, Rubio & A-Sala and West 8
© Municipality of Madrid

Burgos & Garrido, Porras La Casta, Rubio & A-Sala and West 8 © Municipality of Madrid



National Tourist Routes Program

National Tourist Routes in Norway (2005)

The National Tourist Routes project of the Norwegian National Road Administration aims to provide a unique driving experience in spectacular natural surroundings.

As part of a tourism and economic generator, the routes are marketed as a combined attraction and motorists are able to experience the history and character of each route, traversing mountain, fjord, heathland and coastal landscapes along their journey.

Architects and designers were engaged to design spectacular viewpoints with service buildings, car parks, furniture, paths and art to enhance the experience of the stunning Norwegian landscape.



Urban design: Saunders and Wilhelmsen
Photography: Steinar Skaar

Urban design: 3RW Sixten Rahlff

Photography: Jarle Wahler



Passeig García Farià

Barcelona, Spain (2004)

As part of the urbanisation of the Besòs coast, the Garcia Farià linear park connects the Poblenou Park and the Diagonal Mar Park, two large waterside public spaces in Barcelona. It runs along the Ronda Litoral coastal road (below) and offers expansive seaside views and an entrance to the beach.

At more than one kilometre long and 40 metres wide, the park occupies the remaining space between roads and is located over a large underground parking area.

By creating a false topography, the design has allowed for greening of the parkland and a sense of drama to a once flat and lifeless pavement.



Urban design: Ravetlat Ribas

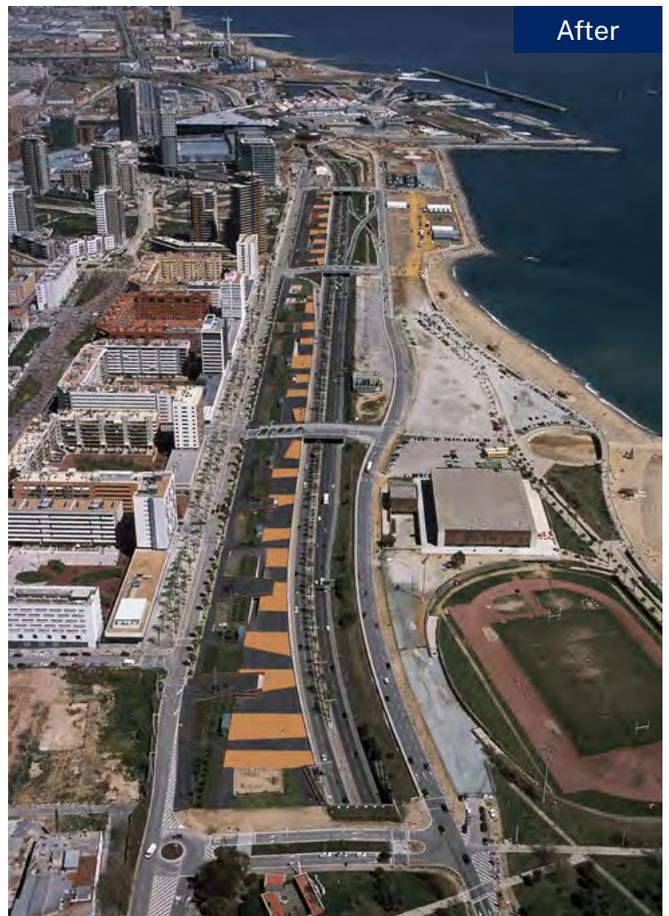
Photography: Roger Casas

Photography: Marti Llorens

Urban design: Ravetlat Ribas



Before



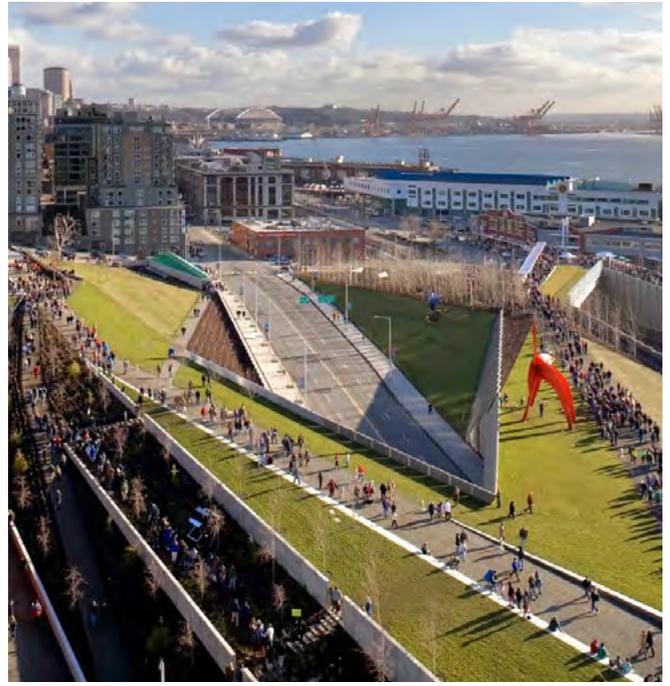
After

Seattle Art Museum: Olympic Sculpture Park

Seattle, Washington, USA (2007)

In Seattle, an undeveloped industrial brownfield site was transformed by a constructed topography that has bridged the infrastructure corridors of the city, and reconnected the urban core to a revitalised waterfront.

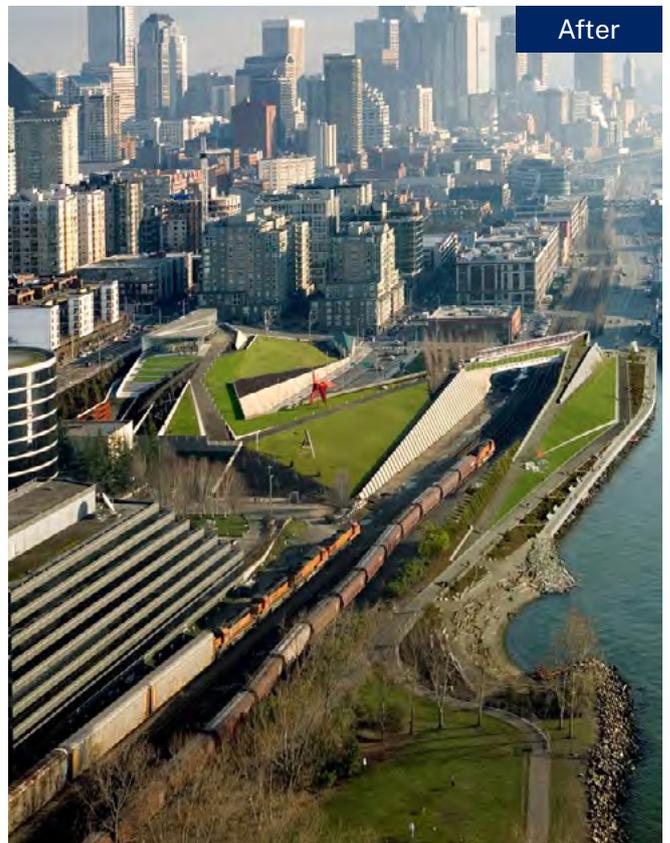
The design is of an undulating landscape of art and culture that rises over existing infrastructure and can be considered a model for new urban parklands. Landscape has been used to reconnect an urban edge that was once separated by train tracks and an arterial road, and now offers continual connection to the waterfront below.



Urban design: Weiss Manfredi



Before



After

Appendix C

Design methodology: advice for urban designers

Much of the urban design input into projects flows from the private sector, working to standards set in contract documents and in accordance with this publication. Some innovation and freedom in the development of urban design solutions is encouraged. It is, nonetheless, important that projects are guided by a rigorous and transparent urban design methodology.

When such methodology is lacking urban design can appear overly subjective and theoretical, impractical and even confused. This section sets out a preferred method of approach. It in no way prevents creativity but means, for example, that where preconceived design ideas are proposed, they should be tested as to urban design outcomes and performance themes (set out in Section 1).

General urban design methodology

Design is developed in increasing detail from the initial strategic work, through the development stages and then into detailed design. By the time detailed design occurs the scope of a project is pretty well set. The potential scope for urban design input into a project is most open at the strategic stage.

Within each stage, as can be seen from the loop-back arrows in the below diagram, design is not strictly sequential and linear; it is by nature a cyclical and iterative process.

The contextual analysis starts broadly and hones in on more detail. It informs the vision and objectives of the project which help refine the focus of analysis. The vision and objectives are consistent but develop in more detail through each stage with the addition of detailed principles. Design informs assessment and assessment improves design — the positive feedback loop becoming more detailed through each stage of work.

1. Appreciating transport role

A project's transport purpose and objectives — the role that the road will play in an area and as part of a network — must be clearly articulated by the project team. If possible, this should occur at the outset, prior to beginning contextual analysis. There needs to be an appreciation by the whole design team, including consultant urban designers, of the project's intended purpose, function and scope, scale and road design standards.

2. Contextual analysis: analysing local character and community functioning

Analysis of context is fundamental to all urban design.

The analysis and understanding of context is the foundation of a good design outcome and must occur at each stage of a project. The purpose of such an analysis is to develop a full understanding of the character and functioning of a place or the places impacted by a project. Any project should start with an analysis of context; the characteristics of the landform, the nature and quality of the built, natural and community environments through which the road passes, and how these environments function for communities.

Identification of values

It is important not to just go through the checklist of contextual issues, but rather to understand the values of the area, what it is about the area that is appreciated, and what in that area is important to protect and respect. The objectives for the design will naturally flow from this work.

Landscape character and visual impact assessment as a design tool

Landscape character and visual impact assessment is usually a specific environmental assessment requirement of the approval authority, but should not be carried out in isolation. It is only one part of a project's environmental assessment in terms of urban design.

As with all other factors, the landscape character and visual impact assessment of a project must be an integrated part of the whole design process, though it can be recorded objectively as a clearly identifiable component of the overall assessment.

With the visual importance of a project in mind, design can in fact contribute to the quality of the built environment, rather than create a visual blight that requires additional mitigation treatments.

Visual impact assessment is often carried out by specialist urban designers, usually landscape architects who adopt well accepted methodologies and techniques.

Identification of urban design opportunities

Urban designers need to identify and assess not only contextual constraints, but also opportunities that could inform road design. For example, urban designers can be aware of future development plans and anticipated future movement levels and patterns, as well as current and future opportunities associated with the corridor's public domain, and future and current opportunities for the provision and integration of different modes of movement, including road-based public transport, cycling and walking.

Consultation on analysis

Contextual analysis should ideally be discussed with communities and stakeholders early in a project's consultation process. This can add useful local knowledge and insights to the work. There should be agreement and discussion on the following issues:

- ▶ That the analysis represents a clear statement of existing conditions.
- ▶ That the values placed on key attributes of the place such as views, landscape quality and special places or buildings are in accordance with community views.
- ▶ The ways in which the proposed road is likely to change the existing character of the place.
- ▶ The Aboriginal cultural background and story of the area

Documentation of analysis

At each project stage contextual analysis should be properly documented; this is so that it captures the strategic issues and can contribute to the project's environmental assessment, as described in Section 2.2.6: Integrate urban design with environmental assessment and project approval (p22).

Do not 'reinvent the wheel'

Contextual analysis must not repeat the work of other disciplines and should be cross-referenced to the work of other disciplines. It should contain only that information which will affect the project's urban design outcome.

Fit for purpose analysis

Although the analysis of context is an essential part of the design process, it needs to be kept in perspective. Too often, analysis is overly detailed and complicated, and effort is expended that is not required for the problem at hand. Many urban designers fall into the trap of 'analysis paralysis' — pursuing analysis that is interesting but not particularly relevant to a project's design. Sometimes urban designers simply follow their own design interests irrespective of their necessity, for example, by vastly expanding the heritage and history component of the context for its own sake, which can be very tempting. All of this can lead to unnecessary escalations in project time and cost.

Analysis should be tailored to the size and complexity of the project and the nature of its setting. Small projects may only require a basic review of the location. Large projects (and corridor urban design frameworks) that cut across a range of environments may require a systematic analysis of the structure and character of areas, broken down into layers and character zones. Analysis should be strategic, i.e. analysis should only be developed to the level that informs the key aspects of design at each project stage.

Judgement is required and urban designers should be held to the overall urban design cost estimate which is inclusive of analysis, unless there is a change in scope to the project.

3. Vision, objectives and principles

Once the vision and objectives – the desired direction of design – have been understood and agreed upon, the design principles for realising them can be worked out. These design principles can then generate, or be translated into, concept design work for the project.

Vision

A project's vision is essentially a statement of the desired future character based on both the contextual analysis and consideration of the project's transport purpose; how we want the road to function, to look and to fit into its built, natural and community environment, and how we want the road to contribute to the future of the corridor.

Objectives

Urban design objectives articulate what it is that needs to be done to achieve a project's vision. They are a response to the constraints and opportunities drawn from the contextual analysis, the transport purpose and requirements of the project, and community expectations, and they govern the overall quality of the outcome. Objectives should be broad and few in number – there should be no more than five or six key urban design objectives for any project, under which a wider range of principles can be developed.

Design principles and criteria

Urban design principles in general link a project's vision and associated urban design objectives to its concept design development. The purpose of these principles is to develop a high level urban design response to the urban design objectives by setting down the broad design approach, ideas, composition themes and design guidelines which will define both the proposal and further design development. Urban design principles for the whole project and parts of a project should be worked out and described by means of concise text and images.

The development of specific urban design criteria can be a useful means to measure how well urban design objectives are being met and to test a range of options and design solutions.

4. Design development

Concept design translates the urban design principles into a site-specific and integrated urban design and engineering solution. There may well be different design solutions that meet the stated urban design principles and criteria. The concept design process should nonetheless lead to a preferred solution.

Although urban design is only one of many inputs to design and engineering considerations, it is important that there is an integrated process in which engineers and urban designers work together.

Link between concept design development and environmental assessment

Understanding the link between concept design development and environmental assessment is critical to sound urban design methodology. Environmental assessment is not a separate process which occurs subsequent to a proposed design. The key constraints of the topography and landform, and the built, natural and community environment should be identified as a design constraint in the first instance. In this way concept design can fundamentally 'mitigate out' the potentially undesirable impacts of a project proposal, leaving only residual impacts to be dealt with. There should be clear mitigation design proposals for any such envisioned residual impacts.

5. Implementation

Once a preferred concept design is accepted and approved, the work can proceed to implementation. Implementation (and the necessary design refinements it entails) should remain aware of and build upon all that has gone before so that the concept design is carried through and delivered 'on the ground'.

The process of implementation should:

- ▶ Be a joint effort between engineers and designers incorporating urban design principles.
- ▶ Be an appropriate response to the type of contract.
- ▶ Involve a continuing interface between the designers and the construction contractors or teams, and involve continuing review and decision making by the contract managers with suitable advice from the Urban Design Roads and Waterways team. It is important that these consultations be carried out on all design variations.

For further information refer to the *Guidelines for landscape character and visual impact assessment*.

Appendix D

Connecting with Country: Urban Design Considerations and Principles

The ambition of Connecting with Country is that everyone who is involved in delivering government projects will adopt the following commitment: Through our projects, we commit to helping support the health and wellbeing of Country by valuing, respecting, and being guided by Aboriginal people, who know that if we care for Country — it will care for us.

Connecting with Country Government Architect NSW

Design

The depth and richness of the living culture and heritage of the Aboriginal peoples of Australia can have a profound influence on our projects. No longer is this seen as interpretation but an influence on design at all levels from planning to management of the asset. For example how we think about working with the landscape, our respect for it and learning from natural processes and traditional management techniques and how it is shaped and finished to represent culture and stories of the Aboriginal nations of Australia. In the provision of road and waterway infrastructure it is encouraged that a broader — urban design — approach to connecting with Country is taken, that is collaborative from the outset.

Features and attributes of the area that may influence the design include, but are not limited to:

- ▶ Spiritual stories of the creation of the landscape.
- ▶ Customs, traditions and practices of local communities.
- ▶ The soils, its seeds and the plants that grow in it.
- ▶ Relatively recent cultural stories and experiences
- ▶ Iconic Aboriginal people
- ▶ The landform and natural features and their significance in the lives of the Aboriginal peoples who lived, or are currently living, in the area
- ▶ The seasons, the climate and the endemic flora and fauna
- ▶ Historical events, both positive and negative, that took place within the site or wider.

Aboriginal culture can be acknowledged in a project in a number of ways:

- ▶ Walking on Country at the start of a project, ceremonies to acknowledge work and pay respect.
- ▶ Talking with elders and knowledge holders to understand Country and the experiences and stories behind it.
- ▶ Aboriginal artists and designers involved in the design of the project
- ▶ Place-naming (eg Yandhai bridge)
- ▶ the design of the landscape and selection of plant species
- ▶ selection of materials
- ▶ orientation of structures and paths
- ▶ interpretive signage
- ▶ embedded artwork (integrated into the forms and materials of the infrastructure)
- ▶ standalone public artwork (sculpture, painting and other art)
- ▶ Other forms of interpretation as part of the construction and operation of the project including creative expressions through art, music, literature, dance, and food.

Process

In the design integration of Aboriginal knowledge and cultural heritage, it is important that the process is funded, inclusive and ensures local engagement. The following principles should be used as a guide and addressed in projects. To be culturally safe Transport should always include Aboriginal staff.

1 Allocate appropriate funding

All transport projects have the opportunity to acknowledge the original people of the lands that we build upon. Objective 6 – Connecting to Country and incorporating heritage and cultural context specifically highlights this. There is a need to secure funding for this work – for consultation, workshops, payment for experts in the field and for the work itself. Depending on the approach, some interpretation forms may fall within the standard scope, for example interpretation through the landscape design and plant selection of a project.

2 Start with listening and talking

The appropriate method of delivery will vary from project to project, but it is important to speak to the Aboriginal experts, the Elders, and find out about Country. The team needs to agree on the approach at an early stage as this will influence the form and extent of consultation to demonstrate a deep understanding of best practice consultation, local engagement, specialist engagement and community/political engagement.

3 Take a walk on Country

Walking on Country is an invaluable way to meet and talk with Aboriginal people and to hear about Country. It is also highly valuable in design terms to understand the three dimensional qualities of an area, its character and sensory qualities and the special places. This will improve built outcomes and save time and money.

4 Capitalise on the value of workshops

Workshops are important to achieve meaningful engagement with Aboriginal communities, designers and experts. Adequate time should be provided for conversations and discussions and also explorations of ideas and design solutions.

5 Integrate with Beyond the Pavement

Aboriginal input to projects should be carried out in accordance with Beyond the Pavement so that it is integrated with input from other disciplines, meshed into the project phases and addresses the Transport criteria for safety, cost effectiveness and sustainability.

Glossary

Aesthetics

Relating to the sense of the beautiful or the science of aesthetics, that is, the deduction, from nature and taste, of rules and principles of beauty.

Arterial roads

The main or trunk roads that make up the majority of the State Road Network for which Transport is responsible. These range from higher speed arterials that have a greater level of access control, to lower speed arterials that have a higher degree of property access and are more conducive to supporting parking and commercial and community activity.

Beyond the pavement

Term applied to the need for road engineers to think more sensitively about the context (the cultural, natural and built surrounds) of the infrastructure they plan and design.

Clear zone

The area that begins at the outer edge of the lane next to the shoulder of the road and extends for a set distance. This zone is available for emergency use by errant vehicles. (Road Design Guide, Glossary of Terms, December 1989).

Connectivity

The degree to which streets join with each other — allowing community and modal integration.

Context

The surrounding setting and systems that influence, and are influenced by, a project or place.

Cost-effectiveness

Refers in this document to infrastructure investment and design that, within budget constraints, provides value for money for the community and meets its economic and transport objectives. The former relates to such things as connectedness, access and convenience to public transport, community safety, the architectural quality of the infrastructure and improved public domain. The latter relates to the efficient and safe movement of people, goods and services.

Country

A nation. The landscape. A tract of the Earth's surface.

Country with a capital C means the traditional land of First Nation's people. It has physical and spiritual qualities, natural and built characteristics and systems and cultural practices, stories and a complex long history.

Curtilage

The land area around a bridge, building or any structure or object which is essential to the value, function and enjoyment of that object. For example, a heritage building and the surrounding buildings and trees that relate to it and that form an entire setting.

Design development

The concept design stage of a project.

Design structure

Design structure in relation to the built environment is “an organising principle through which parts and pieces are brought together into a unified shape and form.” — Dober, 1969.

Footpath

An area open to the public that is designated for pedestrians or has one of its main uses for pedestrians (from NSW Bicycle Guidelines).

Footprint

The scale, extent or mark a road makes on the land in relation to its surroundings.

Frangible

Planting or structures which break under the impact of a motor vehicle.

Freeways and motorways

Fast, high volume, access controlled roads of large scale that primarily link regional hubs and cities. A motorway is simply a tolled freeway, usually under private ownership for a set period of time (the 'concession period').

Guidelines

These are a series of requirements, objectives, principles and processes which define a policy. At another level, guidelines may also be specific criteria, models, principles and rules for the design, selection and use of standard roadside components (such as noise walls) and also major elements of a project (such as bridges).

Historic roads

Roads having historic importance in terms of their construction, period in history and provision of access to environments that are part of our culture and history. The historic road movement in the USA is an attempt to recognise and preserve such roads.

Impact

Influence or effect exerted by a project or other activity on the natural, built and community environment. For example, visual impact refers to the impact on views and landscape impact refers to the impact on landscape character.

Landform

The type and shape of terrain, usually including topography, geological characteristics, coastlines, rivers and water bodies.

Landscape

A tract of land. Also taken to mean a prospect or piece of scenery or land, which includes buildings, villages, towns and cities and infrastructure as well as the environmental, vegetative and ecological elements contained within.

Landscape character

The aggregate of built, natural and cultural aspects that make up an area and provide its unique sense of place. Landscape in this context is taken to include all aspects of a tract of land — the built, planted and natural topographical and ecological features.

Legibility

How recognisable or 'readable' an environment through which a road passes is, or how visible elements of the road such as bridges or interchanges are. This visibility can be enhanced by good design.

Local roads

Roads that have a low speed limit, have a small footprint, serve local communities and should be conducive to walking and cycling.

Mode

A type or method of movement — including trucks, cars, buses, bikes and pedestrian — applicable to road corridors.

Natural pattern

The overall character created by the natural forms, materials and processes in the environment. It is the product of geology, terrain, weather, water and living organisms.

Permeability

The degree to which streets allow pedestrians and cyclists to take short cuts and select alternative route options.

Place

A 'Place' is an area of the landscape of any size, that has a certain unique quality relating to the natural, built, cultural or community context, with a clear identity and 'sense of place'.

Places can exist within other places, such as town or village centres; precincts; or destinations that attract and encourage people to congregate and interact.

Public domain

The community's public space, functionally and visually.

Security

The degree to which people walking or cycling are perceived, or perceive themselves, to be safe from personal attack.

Shared path

A pathway used for both cyclists and pedestrians, usually located on the side of the road.

Streets and boulevards

A street in urban design terms is not only for cars and parking but is a three-dimensional space for strolling, shopping, meeting and cycling. It has a substantial community 'street life' character. A boulevard is a special form of street defined by its greater width, buildings and substantial trees that line it and can be a major element of city structure.

Sustainability

Considering present and future needs and costs.

Surveillance

Overlooking of streets, laneways, pedestrian bridges and open space areas by people either using these spaces or within adjacent buildings. Surveillance generally improves security.

Self-explaining roads

Roads which signify through their appearance, their purpose, the safe speed to travel.

Transport interchange

A station or other transport node that offers transferability between modes – such as train, bus, taxi and ferry. These stations usually act as a regional or urban hub of high density development.

Transit-oriented development

Urban development that is of a higher density and mixed use, providing high patronage levels within walking distance of public transport, primarily rail and bus.

Urban design

The process and product of designing human settlements, and their supporting infrastructure, in urban and rural environments.

Urban design vision

An expression of the desired outcome – what we would like a corridor or project to be like physically, functionally and visually.

Urban design objectives

The particular ends that need to be pursued to achieve the vision. Objectives govern subsequent principles.

Urban design principles

These are the design rules and processes by which the objectives will be realised and which inform a project's design. Different designs may equally satisfy the same set of objectives and principles.

Urban design policy

This is the direction and course of action to be followed to achieve the urban design outcomes that Transport wants from its infrastructure projects.

Urban design strategy

This is a high-level and critical approach to urban design. An urban design strategy defines an urban design vision and urban design directions to guide the future development of a road corridor. It includes key strategies and measures that need to be taken to implement the vision, which may take the form of an action plan. Potentially, it provides the basis for future road infrastructure planning and design, how this might relate to the planning and design of adjacent urban development, and how both might relate to different systems and modes of transport.

Urban design framework

This sets down a consistent design approach and forms the basis for a project's design. It should be included in the project's environmental assessment. An urban design framework may be prepared for an entire corridor or a specific project. It typically includes: a contextual analysis of the area through which a road passes; an urban design vision statement for the road; key objectives to meet the vision; and principles by which the objectives can be met and the vision delivered. It may also include guidelines for the design of specific components and elements of the project.

Urban design master plan

This involves a similar process to the preparation of an urban design framework but the end product is more of a 'blueprint', or over-arching scheme, to be implemented, and for which future, more detailed designs are to be carried out. It typically contains a complete layout for a corridor or project, and plans for the individual precincts that make it up. It can be a plan in its own right and so may or may not be preceded by an urban design framework.

Water-sensitive urban design

A sustainable approach to the design of stormwater drainage systems that can be incorporated into project design. This approach integrates natural systems such as open swales, bio-infiltration and wetlands with the public domain in a constructed environment to improve stormwater quality and management.

Other urban design references and further reading

Appleyard, D., Lynch, K. and Myer, J: *The View from the Road*, MIT Press, 1964.

Barnett, J: *An Introduction to Urban Design*, Harper and Row, 1982.

Calthorpe, P: *The Next American Metropolis*, Princeton Architectural Press, 1993.

Calthorpe, P: *The Urban Network: A New Framework for Urban Growth*, December 2002 (revised).

Crowe, S: *Landscape of Roads*, Architectural Press, 1960.

Diamond, R.S, Kassel, B.G: *A History of the Urban Underground Tunnel (4,000 BCE – 1900 CE)*.

Department of Infrastructure, Planning and Natural Resources with Roads and Traffic Authority of NSW: *Planning Guidelines for Walking and Cycling*, DIPNR, December 2004. http://www.planning.nsw.gov.au/plansforaction/pdf/guide_pages.pdf

Dober: *Environment Design*, VanNostrand Rheinhold, 1969.

Forsyth, A and Southworth, M: *Cities Afoot – Pedestrians, Walkability and Urban Design*, in *Journal of Urban Design*, Vol. 13, No. 1, February 2008.

Freestone, R: *Designing Australian Cities*, UNSW Press, 2007.

Gehl, J: *SF Streets Blog.org (Cities for People: The Safe City)* 2011.

Interpreting Heritage Places and Items Guideline; NSW Heritage Office, 2005

ipv, *Brief Dutch Design Manual for Bicycle and Pedestrian Bridges*, June 2015

Jacobs, A: *Great Streets*, MIT Press, 1993.

Jacobs, A et al: *The Boulevard Book*, MIT Press, 2002.

Johnson, C: *Shaping Sydney*, Hale & Iremonger, 1999.

Lynch K, and Appleyard, D: *Sensuous Criteria for Highway Design*, in Banjoree, T and Southwarth, M (eds), *City Sense and City Design: Writings and Projects of Kevin Lynch*, MIT Press, March 1995.

Maryland Department of Transportation (DOT): *Thinking Beyond the Pavement, A National Workshop on Integrating Highway Development with Communities and the Environment Conference*, Baltimore, State Highway Administration, 1988.

McHarg, I.L: *Design with Nature*, The Natural History Press, 1969.

McKenzie, B: *Design with Landscape*, Bruce McKenzie Design, 2011.

Mc Andrews, Carolyn and Marshall, Wesley, *Livable Streets, Livable Arterials?*, JAP:A Vol.84No.1, Winter, 2018

National Cooperative Highway Research Program: *NCHRP Synthesis 373, Multidisciplinary Teams in Context-Sensitive Solutions, A Synthesis of Highway Practice*, Transportation Research Board, Washington D.C. 2007 http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_373.pdf

Scottish Executive: *Designing Places – a policy statement for Scotland*, ISBN: 0 7559 0037 5, 2001, p7. <http://www.scotland.gov.uk/library3/planning/dpps-00.asp>

The Roadmakers, A history of Main Roads in New South Wales, DMR 1976

The Scottish Office: Fitting Roads, December 1997.

Disclaimer: all links to Transport guidelines and technical documents are correct at time of printing.

© **Transport for NSW**

For further enquiries

www.transport.nsw.gov.au

June 2023

TfNSW 23.073 ISBN 978-1-922875-80-8

