Achievements in road and maritime infrastructure projects
Pacific Highway upgrade from Frederickton to Eungai
(Completed mid 2016)
Cover photograph
Football fans on the Albert 'Tibby' Cotter Walkway

Acknowledgements
Prepared and compiled by the Roads and Maritime Services Centre for Urban Design with contributions from project teams across the organisation. Photographs courtesy of Roads and Maritime unless otherwise indicated.
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There has never been a more exciting time to be involved in road and maritime infrastructure in NSW. Better infrastructure means less time commuting and more time spent productively at work, home or with family.

Everywhere you look in NSW there is action on the ground and this book focuses on the excellent work of Roads and Maritime Services and highlights the quality of projects completed and sets a benchmark for future work.

I am proud of what we have achieved; the new ferry wharfs for commuters and tourists, Pacific Highway upgrades in northern NSW, Princes Highway upgrades, essential pedestrian bridges for safe crossings and new roads in Western Sydney. We need to continue this excellent work and get more outstanding and well-designed projects completed in the future.

The historic investment in infrastructure by the NSW government means more work, more jobs, better cities and most importantly it means great business and economic confidence for our state.

The projects in this book demonstrate we are focused on doing the job right for the people of NSW and for generations to come.

The Hon. Duncan Gay MLC
Minister for Roads, Maritime and Freight
Roads and Maritime Services is proactive in its efforts to deliver high-quality infrastructure and first-rate projects for all communities throughout NSW.

This latest edition of Achievements in Road and Maritime Infrastructure Projects is testament to the significant body of work recently finished and highlights the major improvements in road and maritime safety.

Our organisation maintains its focus to work to integrate engineering and urban design to ensure all of our projects are sensitive to the landscape and environmental settings.

We have great examples of quality design and construction in this book that responds to the needs of the economy, nearby communities, environment and the travelling public.

Achievements in Road and Maritime Infrastructure Projects is an opportunity to recognise the efforts of staff and contractors who have contributed to the planning, design and construction of Road and Maritime projects.

We trust you will take inspiration from the projects showcased in this publication and we look forward to many more editions.

Peter Duncan AM
Chief Executive
Roads and Maritime Services
The Tintenbar to Ewingsdale section of the Pacific Highway upgrade is approximately 17 kilometres in length starting at the northern end of the Ballina bypass at Ross Lane and extending to the Ewingsdale interchange. Opening in December 2015, the project provides a motorway route along the hinterland and through the St Helena ridgeline in a short tunnel to avoid a deep cutting scarring the landscape. The old winding route remains to provide a local connection to towns and villages.

The tunnel design retains as much of the hillside topography as possible, extending under the natural ridgeline. A crisp white finished portal provides an elegant tunnel entrance. North of the tunnel a clear noise wall allows views of Cape Byron.

The tunnel interiors are formed in smooth concrete and painted in an abstract pattern which draws inspiration from the surrounding agricultural landscape.

South of the tunnel the highway takes a flowing alignment through the topography and agricultural lands with simple refined bridges, rounded cuttings and native planting, all in accordance with the Pacific Highway Urban Design Framework, before seamlessly connecting to the Ballina Bypass.
The view toward Cape Byron is seen through the transparent noise wall.

St Helena Tunnel northern portals

St Helena Tunnel interior
Camden Valley Way / South West Sydney

Completed: 2015

Camden Valley Way is a primary arterial road linking the Hume Highway, M7 and M5 interchange at Prestons, near Liverpool with Camden, Narellan and Harrington Park in Sydney’s south west.

The previous two-lane road has been upgraded to a four lane divided road with a wide vegetated median. A three metre wide, off-road shared pedestrian/cyclist path has been provided along the western carriageway with provision for this to be replicated on the east. The upgrade supports regional growth and connectivity in the South West Priority Growth Area. Bus priority and easy access from the corridor to the new South West Rail Link station at Leppington greatly improve Camden Valley Way’s value for users of public transport.

Despite its situation in an area undergoing rapid residential and industrial development, the project maintains the essential qualities of the corridor and the sense of place imparted by the rural driving experience through a cultural and heritage landscape. The carriageways have been independently graded in various locations; either to allow existing mature trees to be retained in a widened median or to improve the alignment’s fit with the surrounding landform.

The project allows appreciation of the many cultural heritage items over its length including the Sydney Water Supply Canal and Gledswood and Raby estates. Views and vistas from the corridor have also been retained. Towards the project’s southern end, a small section of shared path is constructed on the road’s historic alignment and the main carriageways have been moved to the east.
Looking across the northbound carriageway and shared path towards remnant trees in the median.
The Albert ‘Tibby’ Cotter bridge provides a safe pedestrian route to the stadiums.

Moore Park, Centennial Parklands is one of Sydney’s key cultural precincts with the Sydney Cricket Ground, Allianz Stadium, The Entertainment Quarter and Fox Studios attracting over 6 million visitors and 1.5 million spectators and event patrons each year.

The need for a safe, direct route across Anzac Parade through the parklands has been recognised for some time and included in the master plans for the area since 2002. It is also the first part of the cycleway connection to the Sydney CBD from the east, in the NSW Long Term Transport Master Plan.

Moore Park is on the State Heritage Register and is a well loved area of open space in the city. Anzac Parade is one of the city’s finest boulevards and home to a stately avenue of Moreton Bay fig trees. In response to this context, Roads and Maritime worked with the Government Architect and specialist architects to develop a bridge design addressing the landscape and heritage of the area as well as the various stakeholder needs. An integrated urban design and engineering approach was adopted aimed at producing design excellence and minimising environmental impacts.

The bridge is located at an opening in the fig tree avenue, requiring removal of only two significant Moreton Bay fig trees on Anzac Parade. It is aligned with the Devonshire Street route to Central Railway Station. The CBD light rail project is improving this connection with a new pedestrian bridge over the Eastern Distributor, also aligned with the walkway.

With a fluid, light, sculptural form, the bridge celebrates the journey into the sports and entertainment precinct. The design of the bridge elements, with slender spans and elegant piers, helps to integrate it sensitively into the landscape. The helical ramps onto the bridge respect the parkland by minimising the extent of land used while ensuring a gentle slope for walking.

Between September 2015 and February 2016 approximately 125,000 people crossed the walkway. This equates to an average of approximately 900 people per day.

The bridge is named after Albert ‘Tibby’ Cotter, an Australian fast bowler and ANZAC who was killed in action during World War I.
Sports fans on the walkway

The Albert ‘Tibby’ Cotter walkway at night
The highway alignment maintains views of the surrounding landscape.

The Princes Highway upgrade at Gerringong was officially opened by the Premier for NSW, the Minister for Roads, Freight and Maritime and the Kiama MP in August 2015.

This 7.5 kilometre project is the first completed stage of the three part upgrade of the Princes Highway between Gerringong and Bomaderry, and includes two new interchanges providing access to Gerringong and Gerroa.

Located in the gently rolling landscape of the NSW South Coast, the upgrade of the Princes Highway provides highway users a rich driving experience and connection to the natural landscape and the constant interaction of ocean and beaches, rocky headlands, narrow coastal plains, escarpments and coastal ranges.

A new incrementally launched bridge at Fern Street has replaced a railway level crossing and provides a much improved connection into Gerringong. The new bridge offers road users an elevated view across the Rose Valley and Omega Flat, enhancing the sense of entry into town.

The southern town access at Belinda Street was also upgraded with a new interchange featuring refined and textured retaining walls and a highway overbridge.

The project’s integrated landscape design enhances the new distinguished town entrances, and throughout the project assists in blending the new highway formation with the gentle slopes of the local landform. At Rose Valley Road in the north of the project, impact on two iconic and locally significant fig trees and the Renfrew Park property was avoided through innovative design, with consequent improvements in local road connectivity and access.

Throughout the project the design has sensitively responded to its highly prized landscape setting including the constant presence of the Illawarra Escarpment which unites the local community, tourists and other highway users with its majestic scenery.
View south toward Gerringong and the new Omega Bridge over the railway line
The second stage of the Newell Highway bypass of Moree is a 1.8 kilometre long connection on the eastern side of Moree, running between and parallel to Gosport Street and the rail line. The southern end forms the new gateway to Moree.

The bypass strategically separates heavy vehicles from the town centre without travellers losing access to the town’s amenities and services. Parking for trailers and caravans is located near the Moree Spa, and connection from the town main street to the rail station through the central neighbourhood is improved by including bus and car set down, a shaded park with new seating and lighting, and streetscape chosen to both complement the character of Moree and improve the safety at crossings and intersections.

The success of the design is the integration of appropriately-scaled elements to create an attractive and valued space in the town. The Moree ANZAC Memorial, opened by the Governor of NSW in 2016, commemorates the centenary of ANZAC and remembers the sacrifice of more than 200 service men and women from the Moree district who died in World War I. The memorial is located in the ANZAC Centenary Park that is adjacent to the Moree Bypass. Kurrajong trees in the park symbolise the men of the 1916 recruitment drive known as the ‘Kurrajong March’ and are representative of their hardiness and will to survive.

The new park also celebrates Moree’s Aboriginal culture and provides information on the nearby historic Moree Artesian Spa Baths, Victoria Hotel and Moree Railway Station.
ANZAC Centenary Park – Aboriginal artworks left foreground

Heritage Precinct – Pergola, interpretation, seating
New bus stop on the highway integrated into the commuter rail interchange

Great Western Highway Upgrade / Bullaburra
Completed: 2015

The opening of this project through the village of Bullaburra marked the completion of the Great Western Highway upgrade to a four lane road between Emu Plains and Katoomba. The NSW Government invested $569 million since 2011 into this important upgrade, $75 million of which procured the Bullaburra upgrade.

Bullaburra is one of the smaller community settlements to be found along the spine of the Great Western Highway as it winds its way along the ridgelines of the Blue Mountains. The project continued the successful urban design approach adopted throughout the highway upgrade, guided by the Great Western Highway Urban Design Framework. The design responded with sensitivity to the particular characteristics and needs of this Blue Mountains village community.

Improvements to the community’s interaction with the highway, including enhancing local road connectivity, expanding safe pedestrian and bicycle facilities, and providing well located local bus stops were of prime importance in this project. The built outcome demonstrates the careful integrated planning and design process, and features a well landscaped corridor which will grow to strengthen the natural landscape qualities of Bullaburra and its location within the Blue Mountains.

An existing railway commuter carpark was relocated to the southern side of the highway and linked into the local road network. The car park was designed with additional spaces and surrounded with substantial tree planting to integrate with the local setting.

Pedestrian connectivity to the station across the highway has been upgraded through the addition of a pedestrian bridge with ramps and stairs, directly linking the community and the new car park safely with the rail station.
Pedestrian bridge at the railway station
The visual experience of using road and maritime infrastructure is an important design consideration which applies both day and night. Lighting also serves to emphasise the architectural qualities of structures and create a distinctive aesthetic effect.

The night-time qualities of our projects are considered at an early stage and where appropriate feature lighting is designed into the project. Developments in lighting and the establishment of LEDs as energy efficient light sources have allowed lighting to be considered as a low running cost, low maintenance element that has benefits in making the journey more interesting, improving way finding and reducing monotony for road users. A good example of this approach is on the M7 where the walls and bridges are decoratively lit up to provide a visual experience at night. In the case of tunnels there are also benefits in terms of making the journey more interesting and providing clearer way finding.

Lighting can also serve to turn our bridges and structures into a canvas for celebrations. For example the Sydney Harbour Bridge is used during the Vivid Sydney Festival as a highlight of the event. LEDs can be digitally changed to any colour and the Gladesville Bridge’s 50th anniversary and designation with an International Engineering Heritage Marker took advantage of this technology. Portable LED spotlights created a lighting effect that subtly changed colour 50 times across a 60 minute period to reflect the years since opening.

Lighting is being utilised increasingly to improve the journey experience, improve way finding at night, improve the user friendliness of bridges and tunnels and create attractive compositions in appropriate settings.
Princes Highway Upgrade / South Nowra
Completed: 2014

This upgrade was constructed to improve safety and reduce the number of crashes over a 6.3 kilometre length of the Princes Highway south of Nowra, as well as reduce local traffic congestion. The design consists of portions of duplicated carriageway, widening and intersection treatments, as well as improvements for cyclists and pedestrians.

The change between an urban environment nearer to Nowra and a more rural character further south is marked by preserving a mature row of spotted gums in the median of the widened road. As well as marking this change, the row of gums helps give identity to a light industrial area which straddles the highway and would have otherwise detracted from the visual quality of the area.

The southernmost section of the upgrade was designed to maintain the existing highway’s quality of a sinuous highway set amongst farmland and eucalypt forest which is characteristic of much of the Princes Highway to the Victorian border.
The upgraded highway with spotted gums in the median
The 1.8 kilometre Shortland to Sandgate project forms the northern extent of the Newcastle Inner City Bypass.

Although relatively short, the project takes in a number of features which make this an interesting route from the road user’s perspective. The road descends from a ridge at its northern extent across the Main Northern Rail Line and a tributary of Ironbark Creek. Adjacent to the north east is the historic Sandgate Cemetery. Hunter Wetlands Centre, a regionally significant ecological and educational facility, sits to the west. The southern extent joins onto a previously completed stage of the bypass at a new bridge under Sandgate Road.

Existing vegetation is primarily grazing land with groups and lines of natives and introduced trees. This combination of relatively flat land with trees generally blocks long distance views, however on the higher areas panoramic views above the trees are available. New bridges cross the creek tributary and the railway line.

The intersection at the Pacific Highway at the northern extent is marked by a grove of Araucaria trees, which reflect the cultural planting in Sandgate Cemetery. The retaining walls in the project are articulated with texture and oxide to add interest. Terraced areas behind the retaining walls at the southern limit of work at the underpass beneath Sandgate Road have created flatter ground to increase the amount of planting possible. As the project passes over watercourses and the Main Northern Railway Line, low planting and open barriers are used to allow views of the landscape.
Bridge over the Ironbark Creek tributary

Sandgate Road underpass
The Sapphire to Woolgoolga project is a 25 kilometre upgrade of the Pacific Highway to a four lane divided highway from just north of Coffs Harbour to Arrawarra Beach Road on the northern approach to the coastal village of Woolgoolga. The project also provides a continuous alternative local road between Sapphire and Woolgoolga for local traffic. The completion of the upgrade has resulted in improved road safety, uninterrupted highway traffic flow and easy access on and off the highway for local traffic at five interchanges.

Whilst most of the project was built on the previous Pacific Highway alignment, the northern one-third of the project deviates substantially inland forming a bypass of Woolgoolga.

The design responds to three distinct character zones identified along the route that can be classified into the following:

- **Coastal** – from the start of the route up to the Sapphire Interchange, dominated by the presence of the Pacific Ocean either through direct views or the implied presence of the Ocean due to its close proximity to the coast line.

- **Rural / Suburban** – from the Sapphire Interchange to the start of the bypass at South Woolgoolga, characterised by the presence of residential development in association with natural and agricultural systems.

- **Forest** – from the start of the bypass to the end of the project route at Arrawarra, characterised by the steepest terrain of the corridor, intensive agricultural production (predominantly bananas and blueberries) and forested landscapes.

Whilst a consistent approach to urban design elements ensures the unity of design within the project and Pacific Highway upgrades in general, the design of noise barriers, walls and vegetation treatments reflects the natural context and unique communities along the highway.
The coastal zone characterised by the presence of the Pacific Ocean.
The alignment through the Sugarloaf Range

The 40 kilometre Hunter Expressway delivers a four-lane motorway link between the M1 Pacific Motorway, near Seahampton and the New England Highway, west of Branxton. One of the largest infrastructure projects ever undertaken in NSW, the Hunter Expressway provides significant improvements in travel time and safety for motorists travelling in this part of the Hunter region.

Heading west from the M1, travellers encounter pristine bushland through the mountainous Sugarloaf Range. Views from viaducts into the bushland alternating with cuttings up to 30 metres deep characterise this part of the project. The motorway emerges from the Sugarloaf Range onto the Buchanan floodplain, a broad valley with expansive views both sides of the corridor fringed by eucalypt forest.

Further west, more bushland in a gentle undulating topography is experienced before a high point is reached near Allandale, where panoramic views to distant mountain ranges are visible in both directions. The Spotted Gum Forest east of Branxton, and Black Creek lowlands and river, mark the point where the motorway rejoins the existing New England Highway.

The project pioneered a method of revegetation in which seed and mulch-rich soil was returned immediately to finished batters. This has resulted in successful re-establishment of native vegetation without the need to purchase the quantity of seed which would traditionally be required.

Winner of the ‘2013 Australian Engineering Excellence Award’ and a finalist in the ‘Building Infrastructure’ category of the 2014 Premier’s Public Sector Award.
Rest area near the Buchanan floodplain

‘Portal’ bridge design
The signs have proved to be of interest to road users and informative of the local area.

Working with Destination NSW, Roads and Maritime designed and built a new signage structure model for highway road users and local communities.

The signage uses two sculptural and distinctive curved forms placed back to back for stability. The curved forms provide enough space for information about the local area and the highway as well as shelter from the elements when reading the information. The design is a refined expression of both structural necessity and sculptural form with no superfluous elements.

The rest area signs are being progressively implemented in rest areas along the Pacific Highway. They are placed in prominent positions and their design ensures they can be easily spotted from the road and therefore help encourage drivers to stop and rest. Roads and Maritime and Destination NSW work together to provide historic, geographic and recreational information about the local area. Information about the highway route, road safety and Aboriginal heritage of the area are presented in a clear attractive style, colour coded for consistency.
On the Pacific Highway, the signage provides a sequential mapping and description of the Pacific Coast's landscape, history, and communities.
A helix was welded to the cable sheath to prevent rain water forming a drip line which has been causing uplift and movement in the cables.

The ANZAC Bridge is one of a small number of large cable stay bridges around the world. Opened in 1995 it is a dramatic Sydney landmark and vital connection for Sydney. Like many of the early cable stay bridges it suffered from instability in the cables as a result of low wind conditions with rain. A rivulet of water under the cables created a wing-like effect that caused uplift and movement – an undesirable outcome reducing the durability of the bridge.

The strengthening project fixed this condition securing the bridge for the future. Using a robotic system, a helix was welded to the cable covering to ensure the drips and rivulets do not collect in a line. Damping systems were attached to the base of the cables to absorb any movement damaging the footings. Improved pedestrian fencing, access for maintenance and routine cable replacement work was also carried out.

The success of this project was dependent on how well the work was designed so that the bridge remained a high quality Sydney icon. Engineers and urban designers worked together to design and select the best options that were in keeping with the character of the bridge. Photomontages were produced to demonstrate the proposed work to the local community. The new fence is an example of this attention to detail with tapered posts and ends, and an infill mesh coloured and designed to allow unimpeded views of the harbour.
The new fence was designed to fit into the existing bridge aesthetic with tapered posts and an unobtrusive mesh allowing views from the structure.

The upgrade work has been designed to ensure the bridge remains an iconic structure and retains its connection to the city.
Commuter Wharf Upgrade Program / Sydney

Ongoing

Around 14.7 million trips are made on the Sydney Harbour ferry network every year. There are 47 commuter wharves in Sydney Harbour and the Parramatta River. The Wharf Upgrade Program aims to modernise wharves and represents a new approach to ferry infrastructure.

The new wharves, developed from the prototype constructed at Milsons Point, are architect designed and purpose built to provide a sophisticated public space for commuters and tourists. Optimising the vistas available at wharf locations on Sydney Harbour is a major factor in design considerations. Comfort and functionality are of paramount concern in the design, ensuring adequate space and amenity is provided to patrons. Generously proportioned ramps and pathways facilitate easy passenger flow.

The new designs allow for the use of dual gangways to reduce dwell times at wharves as well as providing wheelchair access, hearing loops for the hearing impaired, aids for visual impairment, improved customer information and the new Opal ticketing system. Value for money was provided through the selection of materials that minimise ongoing maintenance costs.

Since 2010 the Commuter Wharf Upgrade Program has delivered new wharves at Milsons Point, Neutral Bay, Rose Bay, Balmain (Thames Street), Huntleys Point, Mosman Bay, Balmain East, Cremorne Point, Drummoyne, Sydney Olympic Park, and Pyrmont. Further wharf upgrades will be progressively delivered in the coming years.
The Central Coast Highway provides an important connection between Gosford and The Entrance and also between the beach suburbs and hinterland. The project improves safety and capacity along a 4.4 kilometre section of highway between Carlton Road and Ocean View Drive. The road was widened from a single undivided carriageway to two lanes and a bus/parking lane in each direction separated by a central median, to match recently upgraded adjacent sections of the highway.

This section of the Central Coast Highway was recognised as having a very attractive rural character, travelling through a landscape dominated by numerous tall trees, large gardens and yards, and rural-residential land use. The design of the upgrade aimed to reflect this character by:

- Identifying the most significant trees or tree groupings that contributed high quality value to the corridor and assess strategies to minimise impacts on them
- Varying horizontal and vertical alignments of the two carriageways as well as the median width to create a more informal character to the highway
- Including meandering pedestrian and shared paths to maximise retention of trees and to provide an informal path character
- Introducing a planted median where possible; helping to minimise the apparent scale of the road.

Materials and finishes were chosen to reinforce the rural character of the road corridor. Sandstone blocks and exposed aggregate concrete replicated existing retaining walls, fence styles and plant palettes, developed to retain the spatial structure and character of the existing highway.
Low sandstone retaining walls were used to protect the roots of existing trees being retained.

The highway upgrade at Brooks Hill, with a split carriageway and retaining wall to achieve a better fit of the project with topography.
The motorway winds through the Sydney bushland landscape.

The Hills M2 motorway underwent an upgrade by the M2 operator Transurban between January 2011 and August 2013. New lanes were added to the existing motorway to provide increased transport capacity on the Sydney Orbital and better connections to the city.

New ramps were built to improve connectivity and the tunnel was widened. New noise walls were also installed, bridges were widened and seven hectares of bushland were revegetated.

A new design approach in accordance with Roads and Maritime urban design policy needed thoughtful and innovative consideration. The project proved challenging as it was an alteration and addition to an existing piece of infrastructure. This created a need to minimise impacts on road users and the community during construction.

A fresh style was decided for the noise walls, tunnel, and shotcrete stabilisation to draw the eye away from the existing walls and shotcrete and to frame the surrounding bushland.

Orange noise walls with clean, neat lines promote the greenery of the corridor and draw the eye away from the older walls. Dark grey walls were used at the top of cuttings to blend into the shadows of the bushland.

A new curved portal, increased internal space and fresh white panels provide a more comfortable, safe and attractive tunnel experience.

The bridges are perhaps the most innovative pieces of work, cleverly utilising cables and tensioning systems to sustainably extend and reuse the existing structures rather than replace them.
A combination of walls were used in contrasting colours which has given the corridor a ‘lift’ in its appearance.

Sandstone has been kept as a final finish to the cuttings, the dark walls visually recede.
A new town entry and highway marker sign installed at Tarcutta, marking the halfway point between Sydney and Melbourne.

Completion of the Tarcutta and Woomargama bypasses and opening of the Holbrook bypass in August 2013 completed the 808 kilometre Hume Highway duplication. After almost five decades of work the Hume Highway is transformed from an unsafe single carriageway into a modern four lane dual carriageway linking Sydney and Melbourne.

The selection of the bypass routes at each town was the result of extensive environmental investigations, consideration of community feedback and consultation with the local councils.

Each bypass demonstrates well integrated engineering and urban design principles leading to a context sensitive result, continuing the design quality exemplified by the recently completed projects south of Wagga Wagga.

This included several bridges over local creeks and flood zones, well graded cuttings and new highway formations blending in with the local landform.

The design of major interchanges and intersections at either end of the bypasses considered the driving experience as well as the important issue of town access to support the local community and economy. Signature elements such as town markers, signage and feature landscape design have emphasised the presence of the towns.

The three bypass projects were part of the Hume Highway duplication program, funded by the Australian Government.

- **Tarcutta**: opened to traffic in November 2011, is around 7 kilometres long, constructed to the west of the town
- **Woomargama**: opened to traffic in November 2011, is around 9 kilometres long and constructed to the west of the village
- **Holbrook**: opened to traffic in August 2013, is around 9.5 kilometres long, built to the west of Holbrook.

Hume Highway Duplication / Southern Town Bypasses

Completed: 2013
Several new highway bridges and local road bridges were designed and constructed, ensuring a commitment to aesthetics is both cost effective and elegant.

Context sensitive design results from integrated engineering and urban design principles, minimising environmental impacts and delivering a high quality road user experience.

The Main Street within the bypassed towns benefit from the removal of heavy vehicles with improvements to amenity.
The simple elegant design of the bridges over the Myall River is sensitive to the river landscape and views from the town.

Located between Bulahdelah and the edge of Alum Mountain and spanning the Myall River, the 8.6 kilometre bypass of Bulahdelah opened in June 2013 after three years of construction.

Two access points to the town of Bulahdelah at the north and south of the project help ensure good connections for road users and a safe place to stop with facilities. Four crossings of the highway, one via a steel truss pedestrian bridge at the mining heritage park, provide access to scenic Alum Mountain, the Bulahdelah Courthouse and the Myall River house boats.

The project utilises the elegant Pacific Highway bridge type with tapered wall style piers, spill through abutments and integrated safety screens. The south Bulahdelah access bridge incorporates a sensitive memorial flower motif designed in collaboration with community members.

A number of site issues were overcome including unstable rock, acid sulphate soils, endangered species and sensitive European and Aboriginal heritage.

With its extensive landscape, simple unobtrusive noise walls, refurbished park, good views and elegant bridges, the bypass is a sensitive addition to the highway and a major safety and environmental improvement to the town.
The truss bridge for the access pathway up Alum Mountain was designed in keeping with the industrial and mining heritage of the mountain and forms a milestone on the Pacific Highway.

A memorial flower motif was integrated into the Bulahdelah access bridge fence design.
Flooding of the Macleay River during construction demonstrates the need for the long bridge.

Pacific Highway Upgrade / Kempsey Bypass
Completed: 2013

This 14.5 kilometre section of the Pacific Highway upgrade was built as part of the Australian Government’s Building Australia Fund. To maximise the benefits to the Australian economy, the project was split into two contracts – Kempsey Bypass and the Macleay River crossing. Roads and Maritime managed the design with both contractors and ensured a consistency of style and quality based around the Pacific Highway Urban Design Framework so that the two projects seamlessly integrated.

The bypass section of the project includes bridges, earthworks and landscape that continue the Pacific Highway themes of simplicity, elegance and a lush landscape. The Macleay River Bridge at 3.2 kilometres is the longest river crossing on the Pacific Highway and the longest bridge in Australia at the time of its completion. It was built as a 99 span girder bridge and the simple repetition of well resolved details creates an attractive outcome for the bridge as a whole. The bridge is so long that the vertical piers at either ends of the bridge are measurably out of parallel due to the curvature of the earth.

The project is respectful and sensitive to the landscape and the towns of Kempsey and Frederickton. It provides an attractive road user experience with high quality elements and good views. Its impact on the towns is limited by landscape and mounding, the latter in place of more intrusive noise walls.

A section of new river bank along the Macleay River frontage and a boat ramp was built in Frederickton as part of the project, improving access to the river.

Winner of the ‘Building Infrastructure’ category of the 2013 Premier’s Public Sector Award.
Overbridge on the bypass section replicates the Pacific Highway ‘family’ of bridges.

The Macleay River Bridge

View of the approach to the Macleay River Bridge
The Tuggerah interchange provides access to Tuggerah and Wyong from the M1 Pacific Motorway. These important centres on the NSW Central Coast have experienced a high level of growth, with decreased performance and safety at the interchange. The interchange has also become popular as an informal site for commuters carpooling to Newcastle and Sydney.

The project scope included a northbound ramp onto the M1 beneath the existing bridge abutment, a roundabout on Wyong Road to improve the performance of southbound traffic and a 50-space paved carpark to the north-west of the interchange.

The solution required careful consideration to the three-dimensional resolution of walls and batters in the new design.

The existing character of the interchange is formed from a mix of tall remnant and semi-mature native forest and cleared grazing land, with forest covered ridgelines to the south and west. The solution aimed to use the existing vegetation as much as possible as a backdrop to the design, and provide welcome shade to the commuter car park.
The carefully considered retaining wall against the northbound carriageway of the M1 Pacific Motorway
The upgraded highway pictured between remnant spotted gums and Gulaga

The upgrade of the Princes Highway at Victoria Creek improves a narrow and winding section of the highway, aims to reduce the crash rate, and increase the road efficiency.

This is a highly scenic area of the NSW south coast comprising predominately undulating agricultural land with remnant vegetation dominated by spotted gums and regularly occurring water courses. Gulaga, the largest peak on the NSW south coast, is a prominent backdrop to the project.

The design incorporates innovative solutions to minimise the extent of cut and fill embankments which would have otherwise occurred because of the area’s underlying topography and geometric constraints. At the northern end of the project, rock cuttings were stood up vertically to create a gateway into the creek valley for southbound travellers. Farmland was leased and returned to the landowner after earthworks were complete and the ground rehabilitated. This allowed a greater amount of adjacent productive agricultural land to be retained and helped the road fit into its setting.

The upgrade is more prominent from Central Tilba, a nearby popular tourist destination, than the former Princes Highway alignment. The design includes false cuttings and uses vegetation to limit the impact this increased prominence would otherwise have on the village's character.
The upgraded highway crossing the Victoria Creek valley.

Rock cuttings forming the northern gateway.
Epping Road Pedestrian Bridge / Marsfield

Completed: 2012

Built as part of the Roads and Maritime Pedestrian Bridge Program, this arched bridge over Epping Road at Marsfield, aims to improve safety and access for Epping Boys High School students and local residents.

At 3.6 metres wide and 41 metres long with ramps and stairs built on each side, the bridge provides a wide shared thoroughfare for pedestrians, cyclists and persons with mobility aids and prams. Motorists benefit from a more steady flow of traffic through this section of Epping Road.

The ramp access is short and relatively flat, making the most of this steeper section of Epping Road. The ramps connect to the existing Vimiera Road cycleway and the future Epping Road cycleway.

The arched form of the bridge – the result of the design team responding to community consultation – avoids a central pier in the road and mirrors the arch of the Sydney Harbour Bridge seen in the distance when travelling towards the city.

The environment surrounding the bridge has been planted with trees and shrubs. Feature lighting ensures an attractive landmark at night.
The project considered both the bridge design and landscape design, to help integrate the bridge into the surrounding environment.

Epping Road was closed during the night to allow the bridge structure to be craned into place.
Pacific Highway Upgrade / Banora Point
Completed: 2012

The 2.5 kilometre upgrade to the Pacific Highway between Barneys Point Bridge and the southern end of the Tweed Heads bypass provides a direct and safer connection between NSW and Queensland. The upgrade is a gateway experience to NSW, and includes the approach to the northern coastal river crossings that characterise the Pacific Highway.

Features of the project include:

- Replacing the existing narrow highway through hilly suburban areas with a six-lane divided carriageway
- Improved and increased local connections for local traffic, cyclists and pedestrians
- The reshaping and enhancement of Wilson Park to become a focal neighbourhood park atop the new landbridge
- A 330 metre viaduct over a revegetated valley with interpretation of cultural heritage through stone terraces and bush tucker species
- A new northern interchange connecting commercial and retail precincts with both highway and local traffic.

The design of the Banora Point upgrade provides an attractive travel experience for highway and local route users alike, with day views of the Pacific Ocean when heading south, views to the exciting skyline of the Gold Coast heading north, and dramatic roadside lighting and finishes through the main cutting and over the viaduct. The design allows an appreciation of the landscape setting through which the road passes and provides a transition from the urban area to rural and estuarine landscapes.

The Banora Point upgrade project was jointly funded by the Australian and NSW Governments.
View north through the main cutting

Valley floor under the viaduct; the heritage terraces are to the left of the picture
Great Western Highway Upgrade / Lawson
Completed: 2012

The opening of stage two of the Great Western Highway upgrade through Lawson, named after the great explorer William Lawson, marked the culmination of over a decade of planning and design for this complex project.

Early options for the project included a full town bypass, however after extensive consultation with the community, council, land owners and local stakeholders, a high quality solution was found allowing the continuation of retail along the highway frontage, preservation of several heritage buildings and culturally important sites, while minimising impacts on the local residents.

A highly innovative idea was also delivered through realignment of 600 metres of the Main Western Railway Line, allowing both highway and rail line an optimum alignment along the narrow Blue Mountains ridge.

A true mark of the project’s success is evident in the careful integration with the township fabric and preservation of key characteristics of Lawson. Several historically and culturally significant properties were adjusted or re-established on their sites and restored, including the Lawson Baptist Church, heritage listed school house ‘Tahla’ and the Mechanic’s Institute.

The new highway and railway alignment improved access to local services while preserving the three mid-1800s to mid-1900s railway bridge crossings and heritage listed Sydney Rock, a place where travellers can view the coast. Remnants of the brickwork parapets of the second bridge over the railway have been cleverly incorporated into a feature landscape area.

The upgrade through Lawson’s retail centre, was also the catalyst for council’s reconstruction of the village centre. The project maintains the village’s presence on the highway, including a new parallel service road and relocation of highway fronting shops.

A new design for Douglass Square at Honour Avenue was prepared in consultation with council complementing the War Memorial and the site’s sense of history. Remnants of Thomas Mitchell’s roadwork uncovered during construction were faithfully reconstructed and placed on permanent display within Douglass Square.

Improvements to local road access and enhancement of the pedestrian and cycle network are additional highlights of this project that has been well received by the community.
Characteristic colours of the railway heritage and natural bushland are reflected in the new railway infrastructure.

The project included realignment of 600 metres of railway line, an innovative solution that improved access to local services while preserving historic railway bridge elements.

A new design for Douglass Square complements the War Memorial at Honour Avenue.

The new highway alignment avoided impact on heritage listed Sydney Rock.

Characteristic colours of the railway heritage and natural bushland are reflected in the new railway infrastructure.
Materials and characteristics of new elements were carefully designed to fit with the local area, and two service roads were constructed for safer access to properties.

This project opened to traffic in September 2012 marking the final stage of the upgrade through Wentworth Falls.

A highlight of the drive through this part of the Blue Mountains is the undulating carriageways parallel to the Western Railway, progressively revealing aspects of the village and highlighting the rolling local landform. This highway formation also helped minimise impacts on residential properties along the narrow road corridor while maximising opportunities for landscape design.

The project’s urban design approach reinforces the existing character of the village centre and enhances the major traffic entry point to the village at Station Street. The streetscape of mature exotic trees and shrubs between Dalrymple Avenue East and Dalrymple Avenue West contributes strongly to the character of Wentworth Falls, emphasising the unique cultural landscape characteristics individual to each village throughout the Blue Mountains. The landscape design is reinforced by exotic ‘signature’ planting and an avenue of trees on either side of the Highway, integrating with the existing mix of native and exotic vegetation which provides a variety of foliage colours, especially during autumn.

A variety of retaining wall solutions were cleverly designed to reflect local area characteristics. Two service roads were constructed for safer access to properties, as well as a network of pedestrian and cycle pathways linking with the village precinct and continuing the network along the Great Western Highway.
The undulating highway alignment fits well with the rolling local landform and provides an interesting road user experience.

The network of shared pedestrian and cycle pathways link with the village centre and connect to local streets.
The upgraded highway pictured through Glenugie State Forest looking north to Grafton

Located around 15 kilometres south of Grafton, the Glenugie section of the Pacific Highway Upgrade Program was completed in 2013. Seven kilometres long, the upgrade was built alongside the existing highway, through the Glenugie State Forest, making use of the old carriageway alignment. Over 42 hectares of revegetation stabilised the road batters, repaired the forest and created a high quality ecological and landscape outcome.

An innovative approach to revegetating this amount of land was needed. Learning from findings on other projects, such as Nowra to Nerriga (Main Road 92) and Coopernook to Herons Creek (Pacific Highway), an approach was developed that would utilise the existing seed bank in the soils of the Glenugie forest.

Topsoil was stripped back during construction and carefully stored to ensure the seeds within the soils remained viable and the soil undamaged. Soil was stored in the location from where it was stripped, reducing haulage and ensuring local vegetation characteristics were maintained.

After the construction of the pavement, the subsoils were ripped and topsoils respread on the newly formed batters. In the warm moist forest microclimate, new seedlings began to sprout within weeks, and thrive without competition from weeds. A cost effective, fit for purpose, endemic landscape has begun to develop which is naturally suited to its location and will need almost no maintenance to mature and evolve.

The project outcome and application of this methodology has been documented and will be applied to future projects.

Winner of the 2013 Australian Institute of Landscape Architects NSW Award for Land Management.
Natural forest regeneration and vegetated batter stabilisation from endemic seed bank and site-won materials fit the upgraded highway into the landscape.
The scale and weathering of the sandstone cutting matches the existing freeway whilst retaining and adding to the landscape buffer for the residences above.

The Cammeray bus layover provides parking for around 30 buses waiting to access the CBD for commuters during the afternoon peak. The layover improves bus reliability and avoids unnecessary bus travel on local streets or buses parking inappropriately.

The layover makes use of a wider section of the Warringah Freeway. Additional space was created by excavation into the existing sandstone cutting and the use of the landscaped verge. As part of the project, the opportunity was taken to provide a new separated cycleway along the edge of Cammeray Golf Course.

The project was designed to respect the character of the Warringah Freeway. Completed in the 1960s, the freeway is notable for its sandstone cuttings and stone block work as well as the predominantly native landscape design. It is an important gateway to North Sydney, the Sydney Harbour Bridge, CBD and beyond.

The cuttings are either left in a natural cut sandstone state or where stabilisation is necessary, sensitively in-filled with sandstone block work. The driver facilities are inset into the cutting reducing their impact. Sandstone block work has been used around the base of the facility to reflect the local North Sydney vernacular. The sandstone block work retaining wall at the top of the cuttings – also a hallmark of the Warringah Freeway design – was removed, stored and replaced at the end of the project.

Planting of native gums and swathes of native grasses on the cutting and verge helps integrate the project into the area. Planting of semi-mature Melaleuca quinquenervia alongside the golf course helps create a buffer for the golfers and a stately row of trees along the freeway.
The natural sandstone cutting with blockwork in-fill reducing the impact of the driver facilities.

New plantings of native grasses and trees under mature trees planted for the original freeway retain the leafy character of the road corridor and integrate the project into the area.
The upgrade of the five kilometre route between Bolwarra and East Maitland provides a more convenient connection between farmland and the communities of Bolwarra and Largs on the north of the Hunter River. The project has provided an alternative crossing point between Maitland to the east and Morpeth to the west, reducing congestion on Maitland’s Belmore Bridge and reducing traffic impacts on the heritage Morpeth Bridge.

Work included widening the existing narrow rural roads, providing a two metre sealed shoulder for cyclists and local traffic improvements to integrate the project into the urban environment of East Maitland.

Harry Boyle Bridge is the centrepiece of the project – a 350 metre long, 12 span concrete crossing of the Hunter River. It was designed to fit simply and elegantly into the rural landscape, in which the river and surrounding fertile floodplain are the dominant features. The graceful, slight curve of the bridge sits sensitively within the floodplain and the concrete provides an interesting contrast with the natural tones of the lush pastoral surrounds.

Third Crossing of the Hunter River / Maitland
Completed: 2011
View of the Harry Boyle Bridge

Harry Boyle Bridge sitting within its floodplain context
Roads and Maritime is committed to serving the boating community, and for more than 10 years has delivered improved boating facilities state-wide under a grants initiative now titled the Better Boating Program. This program which started in 1998 has provided more than $35 million in grants to more than 600 boating facility projects across NSW.

From small works such as upgraded dinghy storage racks to large boat launching facilities with dual access ramps, pontoons and car trailer parking, Roads and Maritime is working with partners including councils to fund dozens of projects every year.

This work directly benefits boating groups with the delivery of safer and more convenient access to our wonderful waterways. Those benefits also flow on to local communities and businesses.

The aim of the Better Boating Program is to provide waterways infrastructure for the boating community and improve public access to waterways. Benefits include better access for people with disabilities, safer public wharves, which may be used in conjunction with ferries, and opportunities to encourage and promote maritime precinct developments.
McLeans Beach boat ramp, Deniliquin completed 2009

Hawkesbury Esplanade pontoon, Sylvania Waters completed 2008

Bobbin Head pontoon completed 2008

Greenwell Point boat ramp, Shoalhaven completed 2009
Pacific Highway Upgrade / Ballina

Completed: 2011

The $640 million Ballina bypass project is jointly funded by the Australian and NSW governments. The 12 kilometre dual carriageway extends from south of Ballina at the intersection of the Bruxner and Pacific highways to north of Ballina at the intersection of Ross Lane at Tintenbar.

Due to the soft soil conditions in the area, the foundations of the road have had to be compressed over several years to create a stable footing for the road. While this has created some outstanding innovations in soft soil engineering it has meant the project has had to be staged over several years.

Due to these complexities the project was designed and built by an alliance between designers, constructors and the roads authority. A high performing team was brought together to produce an outstanding product for road users and the community.

The road alignment skirts valleys and rounds hillsides through the undulating Ballina countryside. It provides fine views of the verdant north coast landscape punctuated by the elegant clean lines of the river bridges, viaducts and walls along the way.

The Teven Road interchange landscape has been designed in collaboration with the Ballina Shire Council, Bundjalung and Jali artists, elders and Nunbahging traditional owners. The design celebrates the traditional view of Ballina as a place of plenty, with a strong connection to the water. The idea of journey and camp sites is also represented. Colours, textures, materials and plants have been selected to reflect local characteristics.
Native woodland planted on the Hume Highway and maturing rapidly

Vegetation is a vital component of the transport corridors of NSW. Just some of its many benefits include: adding character and interest to roads and streets; screening traffic and improving views; providing habitat; providing shade; minimising erosion on road verges, cuttings and embankments; and absorbing carbon dioxide.

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.

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 Pacific Highway, or avenues of honour such as on Remembrance Driveway (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.

Although roadside 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. Weeding, watering and thinning needs to be carried out regularly.

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 landscape of the Eastern Distributor creates a green setting for the urban motorway.
Roads and Maritime is adopting a new way of working, reflecting a more modern approach to office environments. Activity Based Working (ABW) is an approach which recognises that through the course of any working day, people have a number of different work activities to complete – some require high levels of concentration and some require high levels of collaboration. This approach provides staff and teams the freedom to choose different types of work settings to suit different types of work activities. It involves a modernised physical environment with high quality technology and innovative workspaces that support flexible, mobile working.

This new approach has been successfully implemented at many government and private sector workplaces in Australia and around the world including NSW Department of Premier and Cabinet, NSW Treasury, Sydney Metro, Telstra, Macquarie Bank, Microsoft, CBRE, Commonwealth Bank and Westpac, among others. It drives organisations to be more reflective of the way people want to work, embrace advancements in technology and is designed to promote collaboration in the workplace.

Roads and Maritime is adopting this approach progressively across our offices in NSW. Rozelle, Parramatta and Milsons Point were the first to be implemented, with Wagga Wagga and Newcastle following soon afterward. In moving the corporate office to Milsons Point, Roads and Maritime has refurbished the viaduct space on Ennis Road under the north approach to the Sydney Harbour Bridge. The heritage qualities of the 80 year old structure have been respected in the upgrade and the ideas of the innovative bridge engineering, the skills and toil of the workers and the contribution of the bridge to Sydney have been core to the heritage conservation plan and incorporated into the renovation.

The outcome has created a more modern, agile and solutions-driven workplace.
Collaborative work spaces
– Argyle Street, Parramatta

Collaborative work spaces
– Ennis Road, Milsons Point
Artwork on the piers of the Lachlan Road bridge at Cowra

Creative solutions / NSW road network

Ongoing

Roads and Maritime recognises the highly visible role that roads and bridges play in the built environment. Roads and Maritime strives to create projects that not only effectively fulfil their transport role but also contribute to the liveability of cities and regions. The work of artists helps to create distinctive and meaningful places and Roads and Maritime has engaged their services on many projects around the state.

Generally artistic input is integrated into the design of a project and its elements. For example noise walls and retaining walls are occasionally designed with artistic motifs and texture, which as well as improving the appearance of the walls, helps create a landmark and also – very practically – helps deter vandalism. The City West Link walls are a good example of this approach.

Artistic input can also be provided through individual pieces of art such as paintings or sculpture. For example the red poles at the junction of the M4 and M7 motorways are part of the Light Horse Interchange place marking concept. These are coloured the red of Flanders poppies, and wires bunched at their crown symbolise the distinctive emu feathers worn by the Australian Light Horsemen in their slouch hats. Sculpture can also mark a border crossing or recognise the unique character of a town or an area.

Roads and Maritime engages with communities, local authorities and other government departments to contribute to artistic projects through funding or enabling work or simply supporting the installation of artworks on Roads and Maritime land. A good example of this has been our involvement in the tree sculptures under the Western Distributor viaducts in Ultimo – helping improve the setting for the local community and assisting council with the design and installation of the sculptures.
Roads and Maritime contributed to the ‘Aspire’ sculpture and its setting in Ultimo, Sydney.

The M7/M4 interchange includes fig trees, red poles and a 55 metre red central light pole to commemorate the Australian Light Horse Brigade.

The design of the Lizard Tree bridge on the Hume Highway near Wagga Wagga sought artistic inspiration from the surrounding landscape.

The noise walls on the City West Link in Sydney were designed with a local artist.
A number of detailed guidelines, dealing with specific urban design issues, have been produced as a suite of documents by the Roads and Maritime Services Centre for Urban Design.

‘Beyond the Pavement urban design policy, procedures and design principles’ is the Centre for Urban Design’s overarching urban design policy. It is supplemented by various guideline documents on specific areas of work such as bridges, noise walls, landscape, water sensitive urban design and shotcrete.

The ‘suite’ aims to create a set of reference documents to achieve good design and illustrate successful outcomes that are aesthetically pleasing, durable, sustainable and value for money.

The suite of documents includes:
- Beyond the Pavement: Urban design policy procedures and design principles
- Bridge Aesthetics: Design guidelines to improve the appearance of bridges in NSW
- Landscape design guideline: Design guidelines to improve the quality, safety and cost effectiveness of road corridor planting and seeding
- Noise wall design guideline: Design guidelines to improve the appearance of noise walls in NSW
- Shotcrete design guideline: Design guidelines to avoid, minimise and improve the appearance of shotcrete
- Water Sensitive Urban Design: Applying water sensitive urban design principles to NSW transport projects.

Further guidelines will be developed as required.

Ultimately the goal of the guidelines is to improve road and maritime projects and, through them, our towns and cities.

Awards

Beyond the Pavement: Urban design policy procedures and design principles:
- Australia Award for Urban Design 2010
- Australian Institute of Landscape Architects (AILA) National Landscape Architecture Award 2010.

Noise Wall design guideline: Design guidelines to improve the appearance of noise walls in NSW:
- Australian Institute of Landscape Architects (AILA) NSW Research and Communication Award in Landscape Architecture Commendation 2007.
Silver City Highway upgrade at Shannons Creek, included a 1.5 kilometre airstrip to support the Royal Flying Doctors Service in western NSW (Completed July 2015)