Australian Government

BUILDING OUR FUTURE

NSW GOVERNMENT

Woolgoolga to Ballina Pacific Highway upgrade

Bridge over the Clarence River at Harwood

December 2019

New bridge over the Clarence River at Harwood

The Australian and NSW governments are jointly funding the Woolgoolga to Ballina Pacific Highway upgrade. Transport for NSW, Pacific Complete and its contractor partners are working together to deliver the project.

IN THIS UPDATE

An historic journey

Completing the new bridge over the Clarence River at Harwood is a significant milestone for the Woolgoolga to Ballina Pacific Highway upgrade. The project team has been honoured to deliver this important and iconic structure for the local community and road users.

To thank the community for their patience and support during its construction, Transport for NSW planned to hold a community day at the new bridge before it opened to traffic.

Safety of the community will always be our highest priority while building the Woolgoolga to Ballina Pacific Highway upgrade. With severe bushfires affecting local areas, the difficult decision was made to postpone and then ultimately cancel the community day.

Cancelling the event meant that resources would remain available for the emergency services efforts to fight the bushfires and protect homes. It also helped minimise health impacts to the community and our workers due to poor air quality and reduced congestion on the Pacific Highway and local roads.

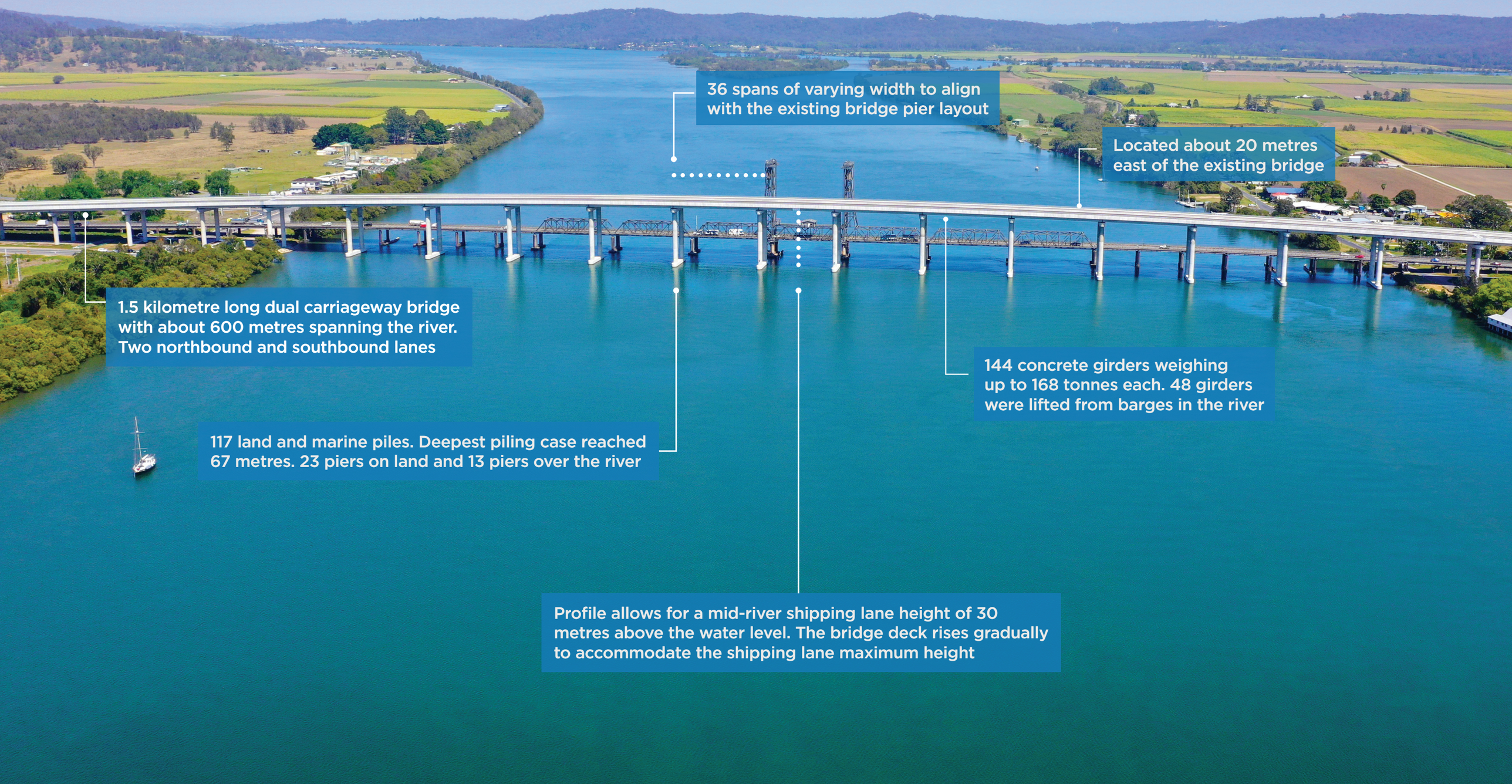
Transport for NSW is grateful for the overwhelming support and understanding from the community following the decision.

To celebrate the completion of the new bridge, please enjoy this small collation of images and details about how it was designed and built.

Headstocks almost complete

Key statistics

The new bridge over the Clarence River at Harwood is the highest and longest crossing in the Woolgoolga to Ballina Pacific Highway upgrade. It is about 20 metres east of the existing bridge, 1.5 kilometres long and four lanes wide. The new bridge will provide a safer road for motorists, eliminate the need for highway traffic to be stopped when the existing bridge lifts for vessels on the river and will support regional development. Work on the new bridge began in 2016.



History

The first bridge at Harwood was opened to traffic in 1966 and replaced the last ferry connection on the Pacific Highway.

The first bridge over the Clarence River at Harwood is a steel, seven-span truss bridge with a central vertical lift span which allows ships and watercraft to navigate the Clarence River.

It is the longest bridge of its type in New South Wales, in a series of steel truss bridges designed and built in the 1960s.

The new bridge has been designed to retain the much admired heritage of the existing bridge, with aligned piers and height that reflects the height of the existing bridge's lift bridge.

The existing bridge will experience reduced traffic as a result of the Pacific Highway traffic being moved onto the new bridge which will extend it's life.

It will continue to be an important structure for the community after the upgrade opens, maintaining local connectivity and providing access to the Pacific Highway northbound on ramp at Harwood.

Terminology

Steel truss bridge
Type of bridge which derives its strength from diagonal/triangular bracing.

Superstructure
All bridge components above the foundations, including girders and concrete deck.

Post tensioning
Technique to reinforce concrete using steel tendons to introduce compressive stress. This enables a girder to span a greater distance and carry more load.

U girder
A large concrete beam.

Cast in situ deck slab
A deck that is assembled or "cast" on site rather than prefabricated in a factory.

Opening of the Harwood bridge in 1966

Design

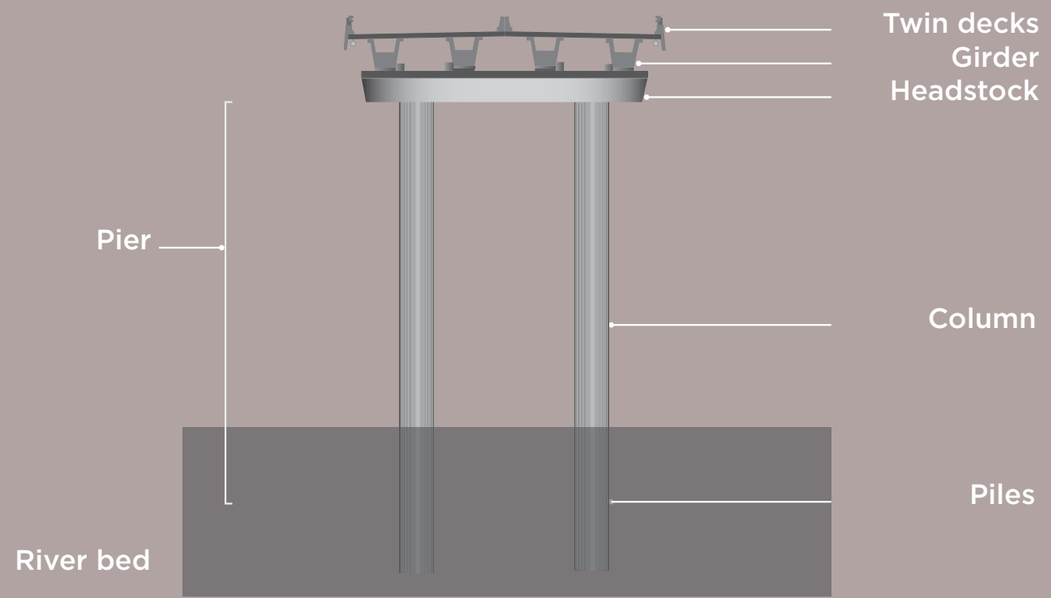
A uniform superstructure solution was adopted for the full length of the new bridge which consists of post-tensioned twin U girders with a cast in situ deck slab.

The bridge structure consists of twin U girders with decks that support each carriageway.

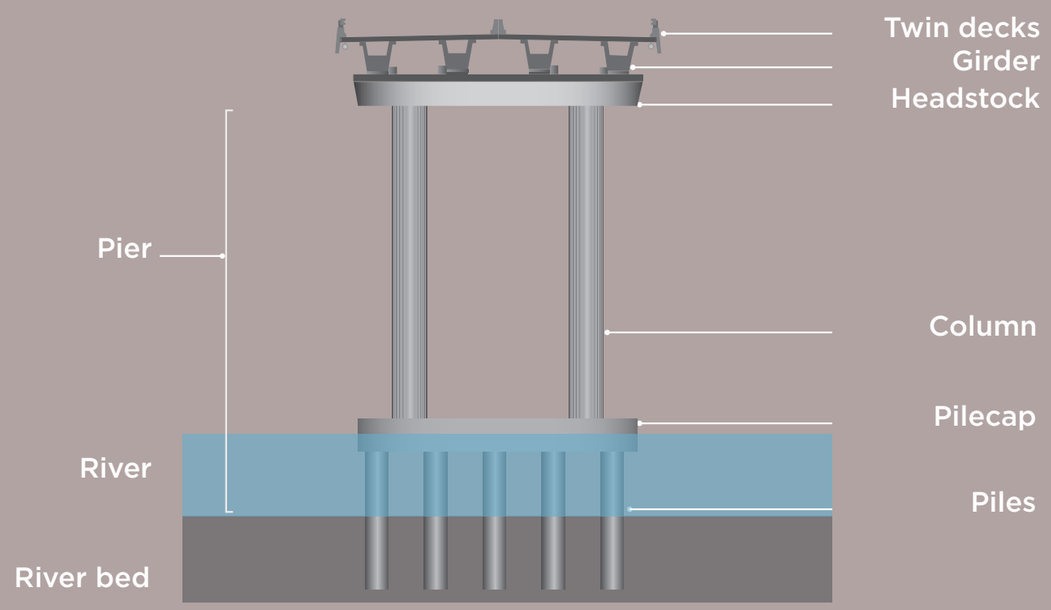
On the approach spans over land, the twin decks are supported by a single reinforced concrete headstock on two circular piers. Each pier is supported by a pile.

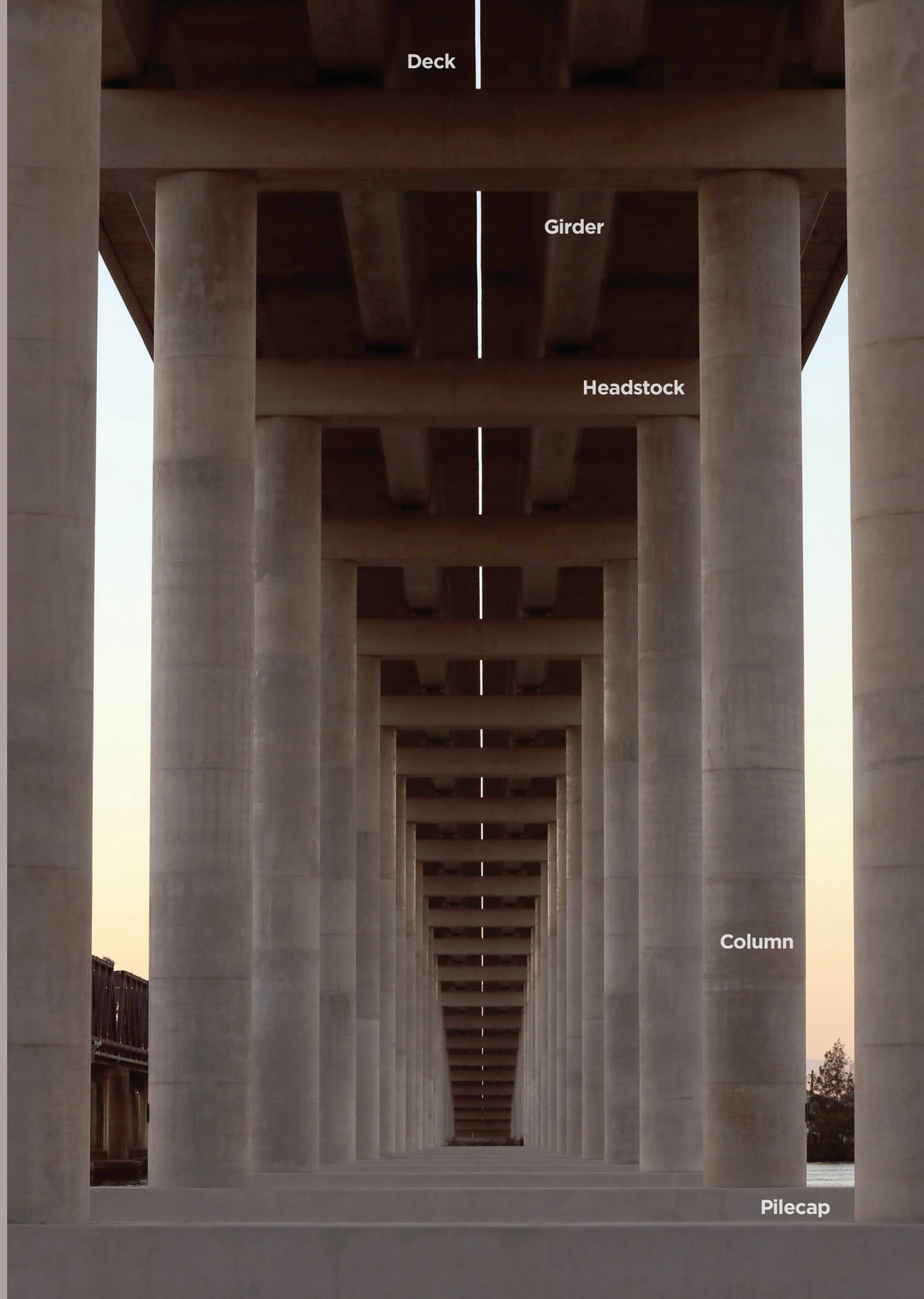
On the river spans, the twin decks, headstock and piers are supported by a pile cap with a line of piles. The pier locations closely match those of the existing Harwood bridge and are designed to be slender to improve viewing opportunities.

Cross section over land



Cross section over river





How was the bridge built?

Building the new bridge involved a number of steps including carrying out driven and bored piling on land and in the river, pouring concrete for the piles, lifting bridge building components into place, asphalting and bridge finishing work including installing guard rails.

Piling work on the foundations for the new bridge started in 2017. Land cranes and support vehicles moved materials from the land to a temporary jetty on the river.

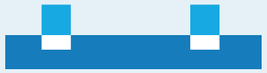
Marine vessels then transferred the materials from the temporary jetty to the main barges on the water. The barges supported cranes which were used to insert piles into the river.

The first permanent pile for the new bridge was successfully driven in April 2017. The test pile had four steel pile casings welded together and was vibrated and hammered about 65 metres into the ground. The test pile confirmed the data from the geotechnical investigations and confirmed the piling depths required to build the bridge.

The pile passed through marine clay and gravel and into a harder layer of rock at about 65 metres. The test pile is one of 117 permanent piles for the bridge.

Steps to build the new bridge

1. Piles inserted into land and in the river and filled with concrete



2. Building components cast at precast yards, transported to site and lifted into place

3. Concrete poured to create the bridge carriageway
4. Asphalt layed over the concrete carriageway
5. Finishing work including white line marking and guard rail installation

Above: Barge delivering a girder for installation

Far left: Bridge under construction showing the temporary jetty on the north shore of the Clarence River and a barge mid-river

Left: Worker completing a girder in the precast yard

The importance of piling

Piling is the first stage for building a bridge and creates a solid foundation for the structure. Piling transfers the weight of the structure deeper into the ground.

Piles are large columns generally made from reinforced concrete or steel. Inserting piles into the ground can take between one to two days to complete depending on the length and size. They can vary in length depending on the ground conditions and are driven or bored into the ground using a combination of cranes, piling rigs and vibrating hammers.

A combination of driven and bored piles were used to install 117 piles, which were required to support the 36 bridge piers of the new bridge.

Bridge components

Many large precast concrete components including headstocks and bridge girders were needed to build the bridge.

A pilecap connects the piles in the river to the columns and bridge structure above.

Girders are concrete beams that support the bridge carriageway – 144 were installed in total, which included transporting 44 of the girders across the bridge at night and lifting 48 from barges in the river. The highest, at 30 metres above the river, was successfully installed in mid-2018.

The section of the bridge over the water was built with the use of various marine vessels and a number of temporary work platforms mounted to the piers as they were built.

Top: Final girder being transported for lifting | Bottom: Piling in the Clarence River

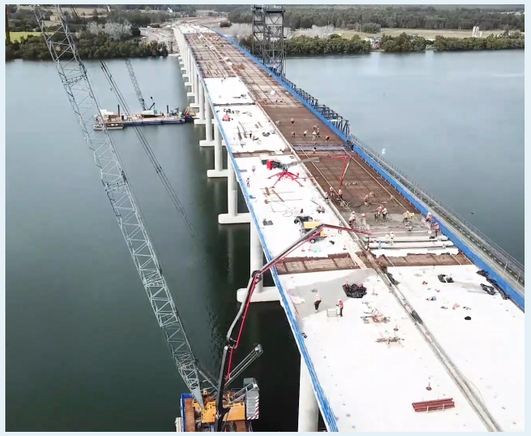
Paving

Paving is the last major construction activity before a road can open to traffic. It's one of the more visible elements of the upgrade and benefits road users by providing a smoother and more reliable journey.

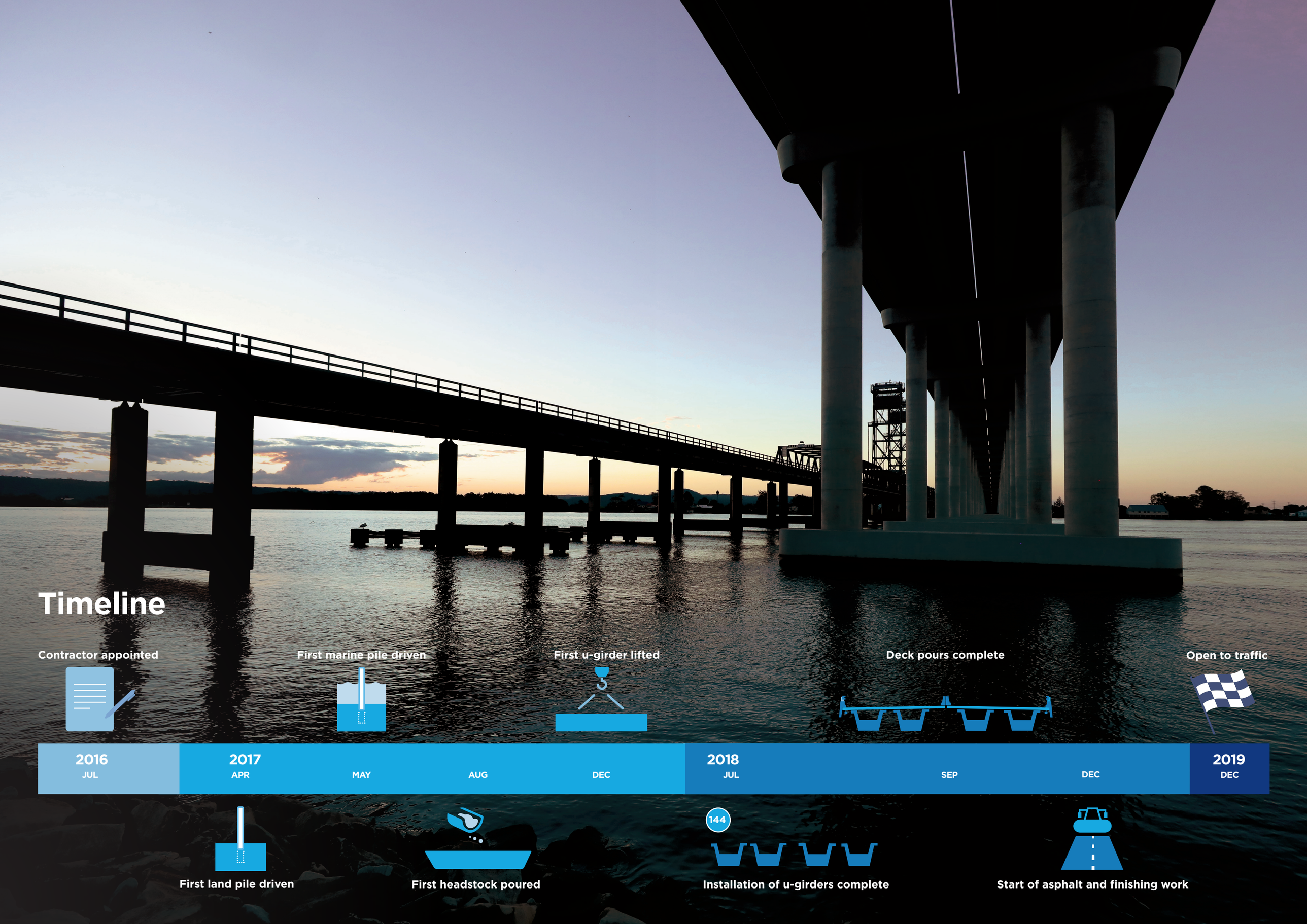
Between Woolgoolga and Ballina, 78 per cent of pavement will be built using rigid concrete pavement and the remaining 22 per cent will be constructed using flexible asphalt pavement.

We used about 3,400 tonnes of asphalt to build the new bridge over the Clarence River at Harwood.

Paving - step by step



Top to bottom: Aerial view of concrete being poured to create the bridge deck | Close up of concrete pump | Aerials of asphalt placement


Timeline
Contractor appointed
First marine pile driven
First u-girder lifted
Deck pours complete
Open to traffic
2016
JUL
2017
APR
MAY
AUG
DEC
2018
JUL
SEP
DEC
2019
DEC
144
First land pile driven
First headstock poured
Installation of u-girders complete
Start of asphalt and finishing work

Thank you

Thank you to the community whose patience and support has been instrumental to the delivery of this important piece of infrastructure and to everyone who has been involved in the construction of the new bridge over the Clarence River at Harwood.

Thank you also to everyone who has shared their stories and images about the evolution of the river crossing at Harwood.

Contact us:

Contact us at any time:

1800 778 900 (toll free)

W2B@pacificcomplete.com.au

pacifichighway.nsw.gov.au

PO Box 546, Grafton NSW 2460

Transport for NSW
76 Victoria Street, Grafton NSW 2460

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