Submission No 33

INQUIRY INTO ROAD TOLLING REGIMES

Organisation: Transurban-WestConnex

Date Received: 23 May 2021

Transurban

NSW Legislative Council

Inquiry into Road Tolling Regimes

Portfolio Committee No 6
Transport and Customer Service

23 May 2021

WestConnex

Supporting NSW economy

$35.8B

in economic benefits over 30 years[1]

>$13B

invested into Sydney's motorway network by Transurban and partners since 2013

Value for customers[2]

Up to **56 minutes**
travel-time savings on afternoon peak westbound M4

60%
increase in travel-time savings on M5 East

40%
reduction in crashes on M5 East

75%
of toll road users believe toll roads provide a more direct route

Approximately **290**
incidents managed per week on our network

<$10
average weekly consumer customer spend

What Sydneysiders are saying about toll roads

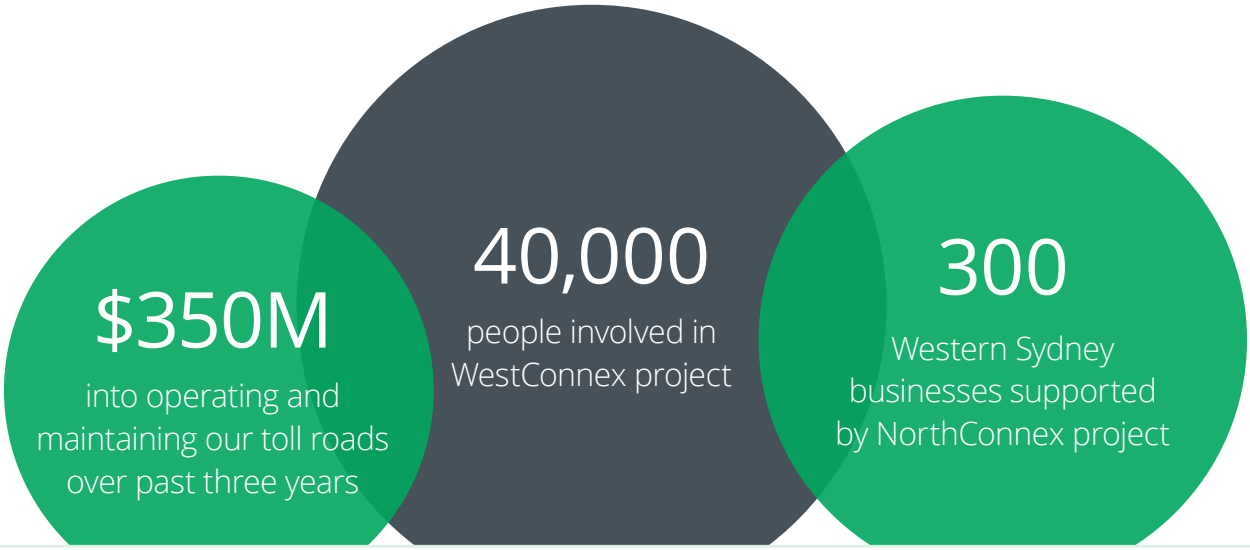
The incident response crew even helped us change our tyre, right before a rainstorm hit. It was the end of their shift and they went over and above to make sure we were safe.

NorthConnex customer

It took me 14 minutes from Wattle Street Haberfield to Cumberland Highway Greystanes. Never thought I would see this in my lifetime.

M4 customer

1. Benefits of toll roads accelerated delivery by the private sector. Economic Contribution of Sydney's Toll Roads. KPMG, May 2021
2. Survey conducted by JWS Research in April 2021 of 1,000 residents in Greater Metropolitan Sydney



Community benefits

6,000
trucks removed from Pennant Hills Road daily through NorthConnex project

275,000
people supported through community grants

70km
of pedestrian and cycle paths delivered through major projects

18ha
of open space delivered through WestConnex project

25,000
students supported by road safety educator Blue Datto

Within minutes of our tyre bursting, the (incident) response team were there to help.

NorthConnex customer

I save 15 minutes of my life on a Sunday single trip from Homebush to Ashfield exit. Now please build a time machine so I can go back in time to recover lost hours in traffic and cost prior to this tunnel being built.

M4 customer

Transurban welcomes the opportunity to respond to this inquiry because at its heart, the discussion is about how we can continue to deliver benefits to our customers and our communities through the toll roads we develop and operate.

Our detailed submission presents case studies and the latest data to explore how Sydney's toll road network provides safer, faster, and more reliable journeys. Transurban is proud of our track record in developing and operating toll roads in partnership with government for more than 20 years.

Our purpose—to strengthen communities through transport—drives us to be part of the communities in which we operate and invest in our operations and surrounding neighbourhoods both now and in the future.

Michele Huey
Transurban Group Executive, NSW

WestConnex is Australia's largest infrastructure project and central to our vision to better connect people and businesses across New South Wales (NSW) .

The continuous 33km motorway network will be the spine of the city's road network, helping motorists move around Sydney safer, easier and faster, while delivering a major economic boost by creating thousands of jobs. The first two stages of WestConnex are now operational, and customers are experiencing significant travel time savings on the M4, M8 and M5 East. The full benefits of WestConnex will be realised once the M4-M5 Link Tunnels open in 2023, with further connections to Rozelle Interchange and Sydney Gateway soon after.

WestConnex is not just about roads, it is delivering an additional 18 hectares of open space for the community, more than a million trees, shrubs and plants, as well as 23km of new and improved cycle paths and walkways for local neighbourhoods to enjoy.

Andrew Head
CEO, WestConnex

Terms of reference

	SECTION WHERE ADDRESSED
1. An updated review of the tolling regimes in place on different roads and an explanation for the differences between each	Section 2, and Appendix 1 and 2
2. The total paid by drivers for the WestConnex toll road over the life of its contract, and the extent to which this represents value for money	Section 1 and 3
3. The impact, and the geographical distribution of the impact, of toll costs on NSW drivers and on productivity	Section 1 and 3
4. The extent of toll relief provided in NSW and whether it is adequate	Section 3
5. Opportunities to increase transparency for the public, particularly over how tolling contracts are negotiated and varied, and the extent to which tolls are paid	Section 2 and Appendix 4 *(2017 submission, Section 3)*
6. The rationale for allowing higher than CPI increases on certain tolls, and for the truck toll being set at three times the toll for car traffic	Section 1, 2 and 3
7. The ability or otherwise of trucking businesses to afford increases in tolling charges and the extent or otherwise of their ability to pass this through	Section 1 and 3
8. Opportunities to increase the assurance to the public that tolling arrangements represent the fairest possible outcome, including the appropriateness of involving an independent agency such as Independent Pricing and Regulatory Tribunal (IPART) in the determination of tolls and their escalation	Appendix 4 *(2017 submission, Section 5)*
9. The long-term impact on government finances as a result of toll roads being wholly or partly operated by non-government entities	Section 1 and 2
10. Consideration of the impact of direct or debt financing of road projects, including what would have been the impact on regional road projects of the direct financing of WestConnex	Section 2
11. Any other related matter	Section 4, 5 and 6

Executive summary

When the Economist Intelligence Unit releases its Global Liveability Index every year, Sydney invariably ranks among the top cities in the world for quality of life.

In 2019 it was judged the third most liveable city in the world, rising from fifth the year before in the list of 140 cities.

It is a ranking we, residents of this city, would expect. Sydney is one of the world's great cities – rich with history, and opportunities.

But its success has not come without big decisions and investments. Those decisions have helped make the most of this city, which has gradually sprawled from the harbour to the mountains and beyond and become home for almost 5.5 million people.

Governments' and the private sector's ability to partner and work together have played a key role in creating the Sydney of today and the quality of life it offers its citizens.

Over the past 30 years, governments, both Coalition and Labor, have partnered with the private sector to deliver around $25 billion worth of road infrastructure to help create connections that make moving around Sydney more efficient, predictable and safe.

Transurban, along with its partners, have contributed more than $13 billion into Sydney's motorway network since 2013. These funds have gone towards projects such as NorthConnex and WestConnex that have given people and businesses new and faster ways to move around. Our investment has also gone towards upgrading existing roads such as the M2 and M5 to cater for ever increasing amounts of traffic.

The injection of private sector capital has eased pressure on public budgets and allowed government to direct their funds into other priority areas such as schools and hospitals, as well as public transport services that are so critical to complement the roads network, and give consumers a choice about their mode of travel.

It has also allowed much-needed road infrastructure to be built sooner than may have been possible if publicly funded.

Elsewhere in the world, in particular Japan, the United States of America and China, governments have relied on similar user-pays toll roads as a mechanism to generate revenue that can be spent on other public priorities. In Spain almost 20% of motorways are tolled roads.

In research, commissioned by Transurban, KPMG estimates the total economic benefits from the accelerated delivery of toll roads by the private sector to be $35.8 billion over the 30 years to 2046.

In that time, businesses and freight users can expect to realise an estimated $11.8 billion in benefits through travel-time savings, reliability gains and reduced vehicle operating costs. Personal users stand to gain $9.4 billion in similar benefits.

In our submission we feature a number of case studies that bring to life the value of toll roads to individual motorists, who each rely on the network for different reasons.

KPMG's analysis also estimates the wider economic outcomes from Sydney's toll road network to be $14.5 billion in benefits from improved access and connections to employment centres, supporting businesses, job seekers and consumers. An average of 5,300 full-time jobs are expected to be created annually over the next 30 years.

Transurban entered the Sydney market almost 20 years ago and some of our

current contracts with governments extend to 2060. We are here for the long term and that is firmly top of mind in all that we do.

That is why we see this inquiry as an opportune time to consider ways that we can further enhance the value that Sydney's toll roads create for customers, the community and our partners in government. We discuss these ideas in sections called "Fresh Thinking" throughout our submission. They are summarised on the right.

Above all, we consider there is an opportunity for a pragmatic look at Sydney's tolling regimes, which have evolved over the years and become a variety of tolling methods and subsidies. A fairer, more equitable, and efficient system would be the foundation of any discussion on reform.

We sincerely hope the process identifies new areas for collaboration and partnership to improve Sydney's toll road network and look forward to further discussions with the Transport and Service Committee.

Working in partnership with government, we will continue to ensure Sydney maintains its global status as one of the most enviable places to live and work.

FRESH THINKING

This inquiry has provided us with a unique opportunity to discuss, with all sides of politics, reforms to improve the sector for customers' benefits.

Network-wide tolling reform for pricing consistencies *(pp 21)*

Decision-point signage to inform motorists choice *(pp 25)*

Consolidated toll notices to reduce customer charges *(pp 45)*

Ventilation optimisation trial to support NSW Government's net-zero commitment *(pp 50)*

About Transurban

As one of the world's largest toll road developers and operators, our business is to keep cities moving and get people where they want to go as quickly and safely as possible.

Since opening CityLink in Melbourne in 1999, our company has grown to include 21 toll roads in Australia, the United States and Canada. We have 5.5 million customers in Australia, while in North America over 3.3 million drivers choose our roads for faster, safer and more reliable trips.

In addition to our operating assets, we have seven projects in development or delivery in Australia and the United States including the M4-M5 Link Tunnels in Sydney and West Gate Tunnel in Melbourne. Our Australian projects will provide vital alternatives to busy and often congested city roads and remove truck traffic from local neighbourhoods. Our projects in the US will extend our Express Lanes network, which operates alongside free lanes, in northern Virginia and into Maryland.

Over the past two decades we have built a track record of partnering with governments to successfully deliver and manage key road infrastructure, but have also been recognised for developing innovative solutions to improve the safety and efficiency of transport networks.

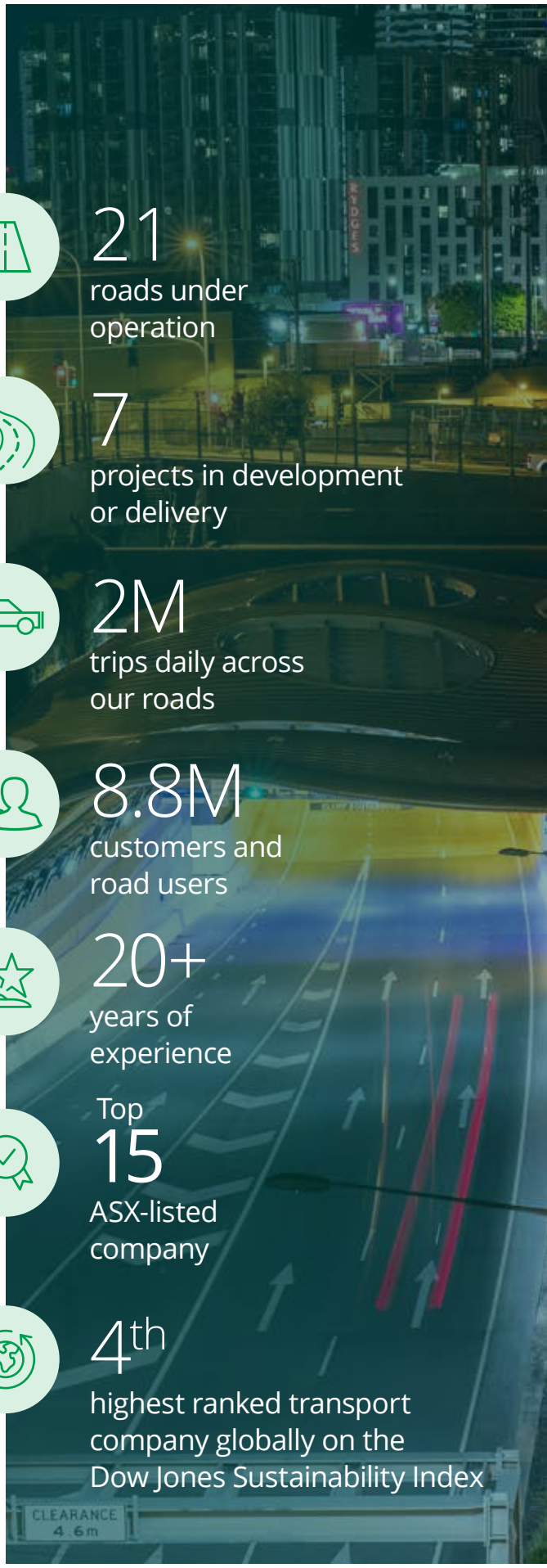
Our purpose—to strengthen communities through transport—underpins all that we do. From our traffic control room operators who monitor our roads 24/7, to our traffic planners who interrogate travel data to forecast where congestion hot spots could be in a decade's time, our team is focused on making travel easier now and in the future.

However, we recognise that motorways are part of a broader integrated transport system with public transport and active transport links all essential to creating efficient transportation networks in cities.

As an Australian-owned and operated company listed on the Australian Securities Exchange, Transurban represents one of the most significant infrastructure investment opportunities available to Australians. Our largest shareholder, UniSuper, manages the retirement savings of more than 450,000 education sector workers.These people, like all our investors, share in the success of our business.

We employ more than 2,500 people across Australia, as well as tens of thousands of people through the delivery of projects. We foster an engaged and diverse workforce that prides itself on making a significant and lasting contribution to the cities and communities in which we operate.

We also continuously challenge ourselves in the way we respond to social and environmental issues, and invest in both to create social inclusion and manage our environmental impacts. Success for us means we achieve our purpose and create real and lasting benefits for all our stakeholders.



1996
- Transurban listed on ASX

1999
- CityLink, Melbourne opens to traffic

2005
- Acquisition Hills M2 Motorway, Sydney
- Westlink M7 opens to traffic

2007
- Acquisition Eastern Distributor and M5 South West, Sydney

2010
- Acquisition Lane Cove Tunnel, Sydney

2012
- 495 Express Lanes, Greater Washington Area, USA opens to traffic

2014
- Acquisition Cross City Tunnel, Sydney
- Acquisition Queensland Motorways
- 95 Express Lanes, Greater Washington Area, USA opens to traffic

2016
- Acquisition AirportLinkM7, Brisbane

2018
- Acquisition A25, Montreal Canada
- Acquisition WestConnex, Sydney

2019
- M4 Tunnels, Sydney open to traffic
- 395 Express Lanes, Greater Washington Area, USA, open to traffic

2020
- M8 opens to traffic
- NorthConnex opens to traffic

The Transurban story in NSW

Over the past 20 years, Sydney has grown and changed at an accelerated pace, with the population increasing by more than one million people in this period alone. Major infrastructure is needed to support the way we move and keep us connected, and Transurban has played an integral part in delivering vital missing links to make us better connected than ever before.

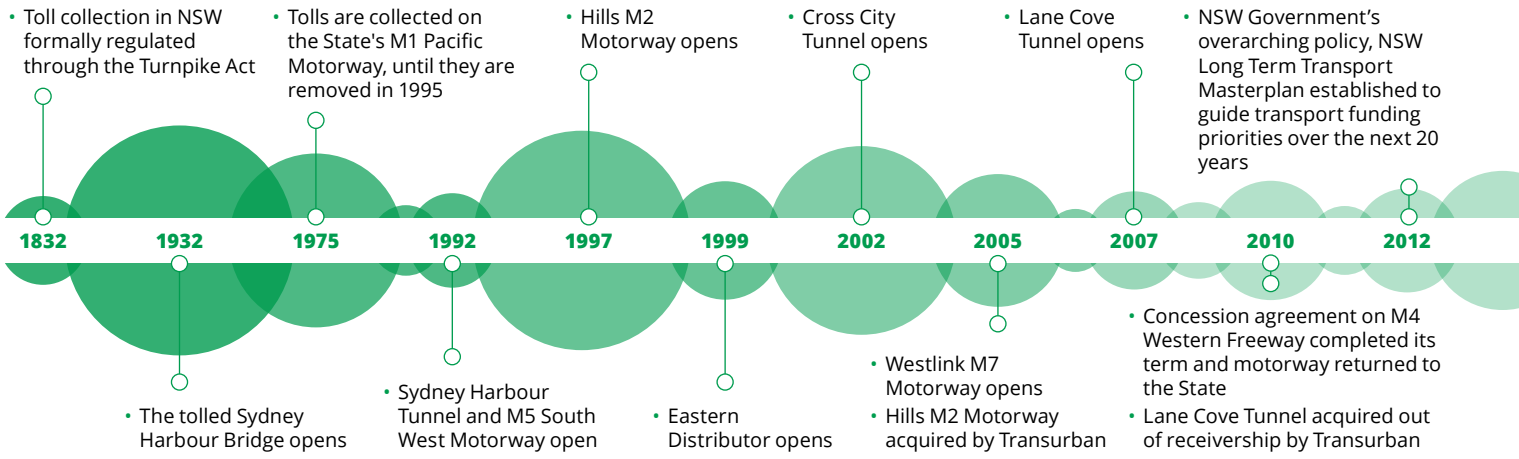
Transurban's NSW story started with our partnership to deliver the Westlink M7, which opened to traffic in 2005. Since then, we have been planning, building and operating toll roads that have been game-changers for Sydney's motorists. We have interests in 10 roads across Sydney and employ over 1,000 people across multiple locations.

Working with our partners and the NSW Government, we have delivered NorthConnex and continue to deliver WestConnex. We have also made significant investments in our assets including widening the M5 South West and M2 to help ease congestion as our city continues to grow. Supporting thousands of jobs throughout construction, these projects help strengthen the NSW economy, and support productivity by moving people and freight around our city, faster and more reliably.

More than 900,000 trips are made daily on our roads and through our tunnels. These trips are being monitored 24/7 by our traffic control operators to ensure that the motorway is safe and reliable for our customers. Our incident response crews assist any motorist in need and return the motorway to its free-flowing conditions.

Whether it is saving up to 40 minutes on a journey along the M2 in the evening peak, or 23 minutes for customers travelling westbound along the M5 South West in the morning, our roads are saving customers valuable time.

Transurban's story is reflected in Sydney's story – and we are more than just a roads company. Given our long-term concessions with government, we strive to ensure that we are part of the local communities where we operate. Whether it is partnering with the Salvation Army to teach people in Western Sydney how to drive or supporting over 25,000 NSW students to take part in Blue Datto's 'Keeping Safe' road safety program, we aim to deliver on our purpose – to strengthen communities through transport.



10
operating assets

Approximately
140 km
of lanes across NSW (including WestConnex)

225,000
hours average workday travel-time savings[1]

Approximately
290
incidents managed per week

$350M[2]
invested in operations and maintenance over the past 3 years

Approximately
1,330
employees working for Transurban NSW and WestConnex

2014
- Cross City Tunnel acquired out of receivership by Transurban

2014
- The Government approves principles for tolling Sydney's motorways to be used as a guide for future tolling decisions

2015
- Construction commences on the first stage of WestConnex, the M4 widening

2017
- WestConnex M4 widening project opens

2018
- Sydney Transport Partners acquires 51% of WestConnex

2019
- WestConnex M4 tunnels open

2020
- WestConnex M8 Motorway opens. M5 East integrated into the WestConnex network
- NorthConnex opens

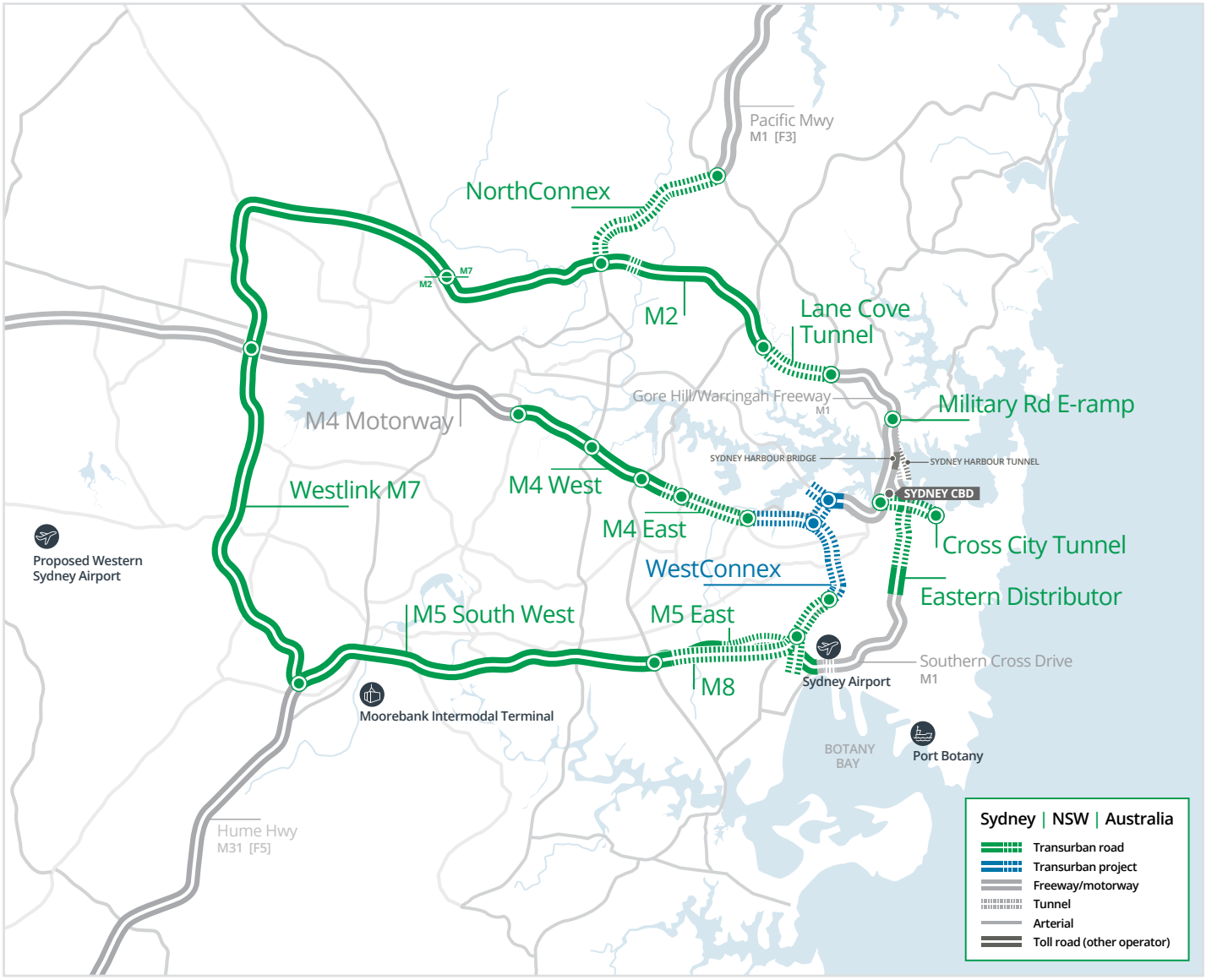
2023
- WestConnex M4-M5 Link Tunnels due to open

2024
- WestConnex Rozelle Interchange due to open

2026
- M5 South West concession becomes part of the WestConnex network

1. Average workday travel-time savings in hours from July 2020 to December 2020. Source: TomTom data
2. Total operations and maintenance spend on all NSW toll roads in which Transurban has an interest in between FY19 and FY21 (actual and forecast)

Figure 1. Sydney's strategic road network



TRANSURBAN OWNERSHIP NSW

M5 South West

Ownership
100%
Concession ends
2026[1]

M2

Ownership
100%
Concession ends
2048

Lane Cove Tunnel

Ownership
100%
Concession ends
2048

Cross City Tunnel

Ownership
100%
Concession ends
2035

Eastern Distributor

Ownership
Transurban (75.1%),
IFM Investors (14.4%),
UniSuper (10.5%)

Concession ends
2048

Westlink M7

Ownership
Transurban (50%),
QIC Global Infrastructure (25%), Canada Pension Plan Investments (CPP) (25%)

Concession ends
2048

WestConnex
(M8, M4, M5 East)

Ownership
Transurban (25.5%)
NSW Government (49%)
AustralianSuper (10.46%)
CPP Investments (10.46%)
Tawreed (4.59%)

Concession ends
2060

NorthConnex

Ownership
Transurban (50%),
QIC Global Infrastructure (25%),
CPP (25%)

Concession ends
2048

1. M5 South West will form part of the WestConnex M5 concession once the current concession expires in December 2026, through to December 2060. During that period Transurban's ownership will be 25.5% based on its current ownership proportion in WestConnex

WestConnex: keeping Sydney moving

WestConnex is the largest and one of the most ambitious single road projects in Australia's history and in just over 10 years, 40% of Sydney's population is expected to live within five kilometres of this network.[1]

Its 33 kilometres of new and improved motorways and tunnels provide motorists with a continuous, traffic-light-free motorway network, connecting Sydney's west and southwest suburbs with the CBD, Sydney Airport and Port Botany. It also provides for future projects linking the north shore and northern beaches.

The first two stages of WestConnex, the New M4 Tunnels and the M8 are open and have transformed previously congested corridors, improved travel times and connectivity for motorists and freight.

The full benefits of WestConnex will be realised when the M4-M5 Link Tunnels open in 2023, which will provide the missing link between the M4 and M8 and connections to the Rozelle Interchange and Sydney Gateway, currently under construction. WestConnex also connects to future projects including the Western Harbour Tunnel and the M6.

The NSW Government chose Transurban and its co-investors, Sydney Transport Partners, to be its partner in delivering and operating WestConnex when it sold a 51% stake in the project in 2018.

Tunnelling is more than 90% complete on the M4-M5 Link Tunnels, which has continued throughout government-imposed lockdowns due to the pandemic, ensuring workers remain at work. The project has helped create tens of thousands of jobs, many for locally based workers in western Sydney.

Transurban has an extensive community consultation program, which engages with the community through every stage of the project, both face-to-face, and through digital and printed communications.

Each year we engage a research agency to track sentiment towards WestConnex projects and assets. The 2020 report shows significant improvement in positive community sentiment across broader Sydney as well as the WestConnex project and feeder areas. More than 2,000 people were surveyed and across Greater Sydney positive sentiment towards WestConnex increased from 56% in 2019 to 68% in 2020 (Figure 2).

This has been achieved through delivering significant travel-time savings for motorists, new and enhanced open spaces including parks and cycleways and building strong relationships with our local communities.

Sydney Transport Partners

Transurban Group	**25.5%**
Australian Super 2.4M members Australia's largest industry superannuation fund. $200B of member savings (as of 31 December 2020).	**10.5%**
Canada Pension Plan Investment Board C$476B of retirement savings under management (as of 31 December 2020) Canada's national pension plan ranks among the world's 10 largest retirement funds.	**10.5%**
Tawreed Wholly-owned subsidiary of Abu Dhabi Investment Authority. ADIA is a public institution established by the Government of Abu Dhabi in 1976 as an independent investment institution.	**4.6%**

1 In 2031, based on Deloitte Access Economics estimates and Transurban's own internal estimates and assessments.

2024
expected project completion

Up to 40mins
total travel-time savings Parramatta to Sydney Airport[1]

52
traffic lights bypassed[2]

23km
new and upgraded cycle and shared paths

18ha
of new open space including parks and recreational facilities

More than 1M
trees and shrubs planted

40,000
people involved in the project to date

1. Parramatta to Sydney Airport once project is completed. WestConnex Updated Strategic Business Case, November 2015
2. Ibid

Figure 2. WestConnex sentiment turnaround

Section 1:
Supporting a strong NSW economy

NSW is Australia's largest economy, accounting for around a third of national output, with most of this driven out of Sydney. Almost a third of all Australians call Sydney home.[1]

Many factors underpin Sydney's prosperity and contribute to its enviable liveability, one of which is the expansive multi-modal transport networks that connect people and businesses across the city.

While decades of strong population growth have put a strain on Sydney's road and rail networks, there is no denying they still serve as the backbone of the economy. Within this, toll roads play a vital role in facilitating orbital trips around the city, especially for the freight sector.

In independent research, commissioned by Transurban, KPMG estimated that Sydney's toll road network will create $35.8 billion in economic benefits over 30 years due to its accelerated delivery by the private sector (Figure 3).

Businesses and freight users will realise an estimated $11.8 billion in benefits through travel-time savings, reliability gains and reduced operating costs. Personal users stand to gain $9.4 billion in similar benefits, KPMG estimates.

Figure 3. Total economic contribution of accelerated toll road delivery in Sydney over 30 years (2016–2046)

BENEFITS TO ALL USERS	PRESENT VALUE OVER 30 YEARS
Benefits to business and freight users	**$11.8B**
Travel-time savings	$10.5B
Vehicle operating cost savings	$0.7B
Travel-time reliability benefits	$0.6B
Benefits to personal users	**$9.4B**
Travel-time savings	$8.8B
Vehicle operating cost savings	$0.4B
Travel-time reliability benefits	$0.2B
Other benefits	**$0.1B**
Environmental externalities	$0.1B
Total direct benefits	**$21.3B**
WIDER ECONOMIC BENEFITS	
Agglomeration economies	$13.2B
Labour market deepening	$0.4B
Increased output under imperfectly competitive markets	$0.9B
Total wider economic benefits	**$14.5B**
Total benefits	**$35.8B**
Productivity benefits	**$25.0B**
ECONOMIC IMPACT ANALYSIS	
Gross State Product	$2.5B (average annual)
Gross State Product per capita	$300 per person (average annual)
Jobs	5,300 FTE (average annual)

Source: KMPG analysis (monetary values presented in 2021 dollars, real terms and 7% discount rate).

Furthermore, the toll road network will contribute an estimated $14.5 billion in wider economic benefits by significantly improving access to economic centres and increasing participation in the labour market. The construction of Sydney's toll roads is a major generator of jobs and the consequent travel-time savings and reliability gains boost participation in the labour market.

KPMG estimates Sydney's toll roads and planned capital expansion will generate Gross State Product (GSP) of $64.5[2] billion over the 30 years between 2016 and 2046, or $2.5 billion on average per year. It expects this will lead to annual average job creation of approximately 5,300 full-time equivalent positions over the 30-year period.

WestConnex and NorthConnex have both generated thousands of jobs and the stimulus provided by these projects has been especially important during COVID-19. Despite stagnating population growth, the gridlock looks set to continue. Research commissioned by Transurban found that 8% more people in Sydney intended to use private vehicles every day even once the immediate risk of COVID-19 had passed.[3] Toll roads help alleviate network-wide congestion, diverting through-traffic from local and arterial roads and on to free-flowing managed motorways. In 2020 motorists in Sydney were saving 225,000 hours in travel time every workday by using Transurban's toll roads compared to alternate routes.[4]

1 Transport for NSW, About the NSW Economy, available: www.treasury.nsw.gov.au/nsw-economy/about-nsw-economy, accessed 6 May 2021

2 GSP expressed in present value terms discounted at 7%.

3 Survey conducted by Nature in January 2021, of 3,308 residents across Sydney, Melbourne and Brisbane

4 Average workday travel-time savings in hours from July 2020 to December 2020. Source: TomTom data

The value of Sydney's toll road network

KPMG has estimated that over the next 30 years, Sydney's toll roads will deliver an average of $5.6 billion in annual economic, social, and environmental benefits to all road users—when it compares the real-world development of the network to a hypothetical version of Sydney in which they didn't exist.

KPMG has prepared a counterfactual analysis which isolates the impact of the toll road network on how people, freight and businesses move around Sydney to a scenario where the only toll roads are the Harbour Tunnel, Eastern Distributor and Sydney Harbour Bridge.

$5.6 billion[1] economic benefits annually for next 30 years

$3.6 billion annual benefits for all road users

Toll roads help make the entire road network more efficient and reliable. All road users benefit with faster travel times, more reliable journeys and lower fuel consumption and vehicle operating costs.

$2 billion
for all trucks and freight operators
including $35 in economic benefits for every trip that uses a toll road

$1.6 billion
for all car users
including $10 in economic benefits for every trip that uses a toll road

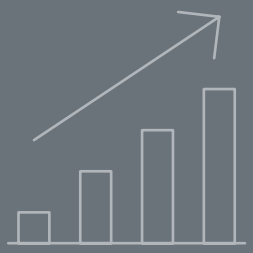
$2 billion annual benefits connecting communities and businesses

Toll roads improve access and connections to employment centres supporting businesses, job seekers and consumers as well as improving market outcomes.

$1.8 billion
business efficiency
Agglomeration economies with business productivity boosted by better access and connections

$63 million
increased labour supply
Improved access to employment markets for job seekers

$153 million
more goods, services
More efficient transport lowering barriers to competition, increasing supply of goods and services



Economic growth for next 30 years

Productivity improvements, and network capital expansions contribute to the total market value of goods and services supporting job creation and improving personal welfare.

$7.3 billion
Gross State Product (GSP) average annual increase

$890
GSP per person average annual increase

12,000 jobs
average annual increase

Saving fuel, reducing emissions

130 million litres
Reduced fuel consumption annually

10.7 million tonnes
Greenhouse gas (GHG) emissions saved, valued at $500 million over 30 years

1. KMPG analysis (all dollar values are reported in present value terms using Infrastructure Australia recommended real discount rate of 7%).

Job creation

Sydney's toll road network brings businesses and knowledge centres closer together by improving connections and access.

Reliable and shorter commuting times also encourage job participation, particularly for people juggling caring responsibilities or other commitments.

KPMG's analysis has found Sydney's toll roads will create an average of 5,300 full-time equivalent jobs annually over the next 30 years.[1]

For example, to date, more than 40,000 workers have been involved in delivering WestConnex, boosting job opportunities across a range of industries. The project will create an estimated more than $20 billion in benefits to the state[2], with around 2,000 contracts signed with NSW subcontractors and suppliers.

More than 40% of the 8,000 workers involved in the M4-M5 Link Tunnels, which are currently being constructed, are from Western Sydney. Around 450 contracts, worth more than $950 million, have been signed with NSW subcontractors and suppliers on that project.

Over the project lifespan, WestConnex is creating 500 apprenticeships. Our M4 and M8 delivery partners established the WestConnex Training Academy at Homebush in partnership with providers such as TAFE NSW.

The academy focuses on quality, recognised training for workers including Aboriginal and Torres Strait Islanders, women, young people and school leavers, Western Sydney residents and people with disabilities. This training is continuing with similar programs offered on the M4-M5 Link Tunnels project.

Benefits for freight industry

Around 80% of freight in Greater Sydney is moved by road and the current and planned toll road network provides critical connections to ports, airports and intermodal terminals.

The toll road network provides considerable benefits for heavy vehicles in terms of increased safety, reduced fuel consumption, greater travel-time reliability, smoother travel and less wear and tear on the vehicle, which all contribute to overall operational costs savings.

KPMG has estimated $4.3 billion in travel-time cost savings for trucks across the greater Sydney network over 30 years as a result of the toll roads being built (Figure 4).

Additionally, the NSW Freight and Ports Strategy estimated that a 1% increase in freight efficiency saves the national economy $1.5 billion.[3]

Figure 4. Truck travel times—with and without toll road network[4]

GREATER SYDNEY ROAD NETWORK TRAVEL TIMES	2021	2036	2046
Number of truck trips - annual	**0.4B**	**0.5B**	**0.6B**
Without modern motorways			
Vehicle hours traveled (VHT) - annual	0.2B	0.2B	0.3B
Average trip time (min)	24.7min	29.0min	32.1min
Travel time cost ($) - annual	$8.7B	$13.1B	$16.8B
With modern motorways			
Vehicle hours traveled (VHT) - annual	0.1B	0.2B	0.2B
Average trip time (min)	20.5min	22.0min	23.9min
Travel time cost ($) - annual	$7.2B	$9.9B	$12.5B
Difference between with and without			
Difference in average trip times (min)	**4.2min**	**7.0min**	**8.2min**
Travel time cost savings ($)	**$1.5B**	**$3.2B**	**$4.3B**

1 KPMG report, Economic contribution of Sydney's toll roads. May 2021
2 WestConnex Updated Strategic Business Case November 2015
3 Transport for NSW, 2013
4 Source: Traffic modelling output and KPMG analysis (monetary values presented in $2021, real terms and undiscounted).
5 Source: TfNSW guideline and KPMG analysis. Note: monetary values presented in $2021, real terms, and undiscounted

Vehicle operating cost savings

Using toll roads and avoiding stop/start traffic offers significant operating cost savings for all motorists.

Key cost savings are in fuel consumption, repair and maintenance, tyre wear and vehicle capital costs.

KPMG has estimated that businesses and freight operators stand to save around $700 million vehicle operating costs over the next 30 years through the use of toll roads, while personal users will save around $400 million over that period (Figure 3).

Figure 5 shows that as travel speeds increase and stop-start travel decreases, operating costs decline significantly.

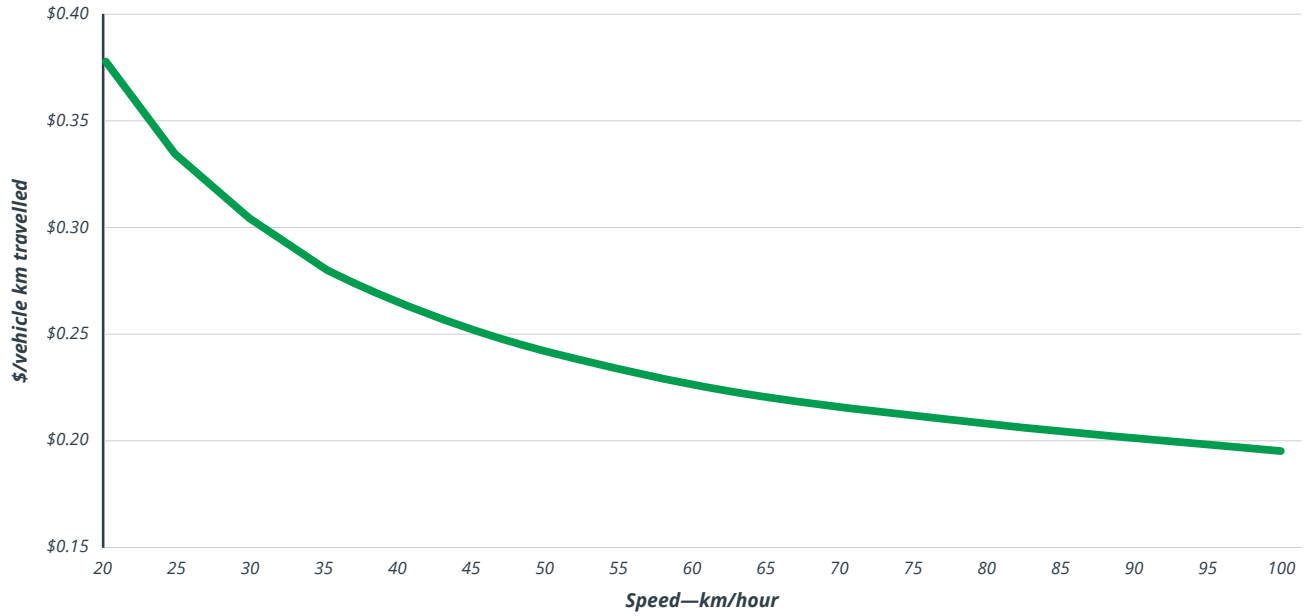
Reducing environmental impacts

Transport emissions are linked to the amount of fuel consumed and free-flowing motorways offer significant savings in GHG emissions.

KPMG has estimated that the community could benefit from $0.1 billion in terms of reduced GHG emissions, over the next 30 years.

Our own modelling shows that on average our customers saved between 30-50% in fuel and GHG emissions per trip compared to alternate routes (See Pages 48-49).

Figure 5. Vehicle cost curve—$ per vehicle kilometre travelled[5]



Section 2:
The evolution of Sydney's toll roads

Sydney's toll road network – critical for the efficient movement of freight and passenger traffic— is the achievement of successive NSW governments and their support for private financing funded by user-pays models.

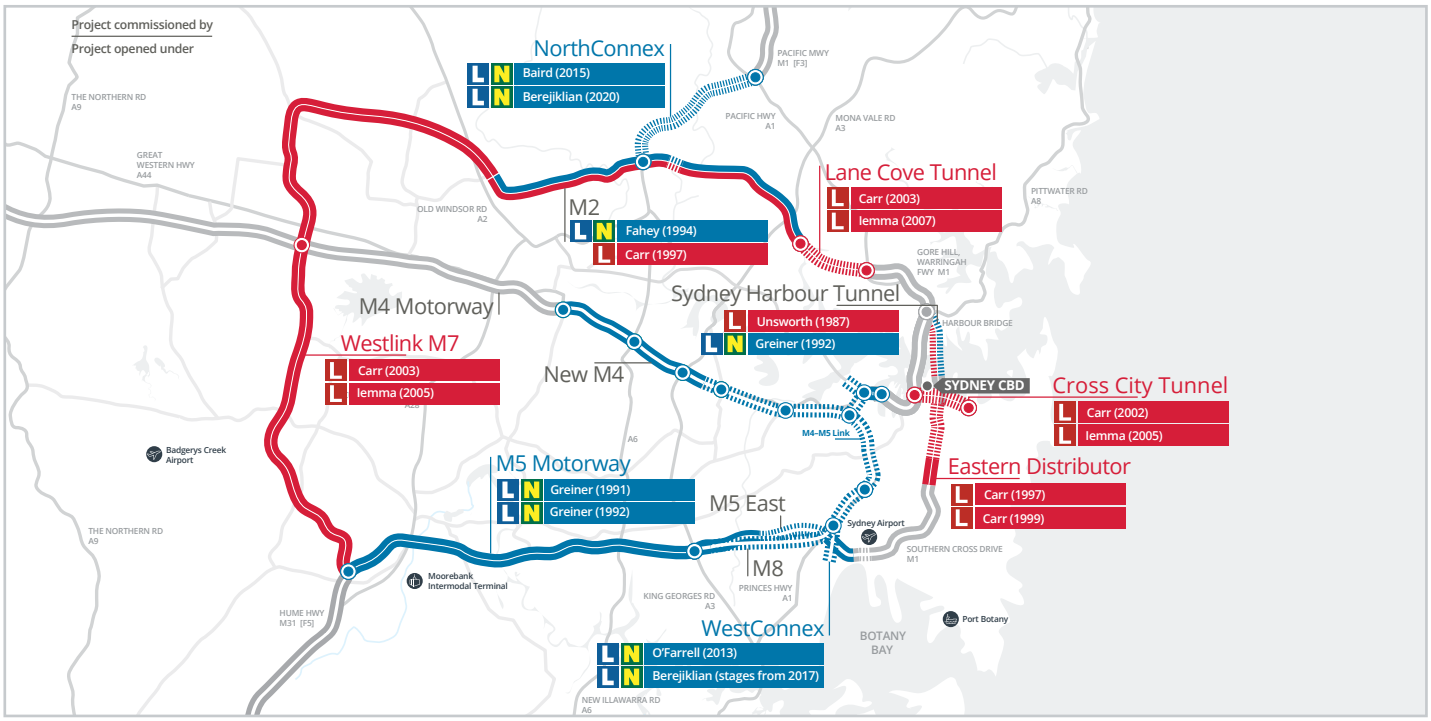


Figure 6. Bipartisan development of Sydney toll roads

Planning for what is now the Sydney orbital road corridor began almost 60 years ago under the "County of Cumberland scheme" and the network – as well as motorway upgrades – have been largely completed using the Public Private Partnership (PPP) model.

These PPPs have taken many forms from traditional build-own-operate-transfer and design-construction-own-operate models to more recent development partnerships or a model such as WestConnex where the government sold a majority stake in the project to fund further construction.

In recent years, governments have sought other approaches to identify good ideas and fast-track projects through the Unsolicited Proposal Framework. Delivery of NorthConnex, regarded as a critical missing link in Sydney's orbital network, was accelerated by more than a decade using this funding model.

The commissioning and delivery, as well as the long-term operations, of this large-scale infrastructure often spans multiple governments, both federal and state, giving the private sector the opportunity to collaborate with different sides of politics.

PROJECT	COMMISSIONING GOVERNMENT*	OPENED
Sydney Harbour Tunnel	Unsworth Labor (1987)	Greiner Liberal National (1992)
M5 South West	Greiner Liberal National (1991)	Greiner Liberal National (1992)
M2	Fahey Liberal National (1994)	Carr Labor (1997)
Eastern Distributor	Carr Labor (1997)	Carr Labor (1999)
Cross City Tunnel	Carr Labor (2002)	Iemma Labor (2005)
Westlink M7	Carr Labor (2003)	Iemma Labor (2005)
Lane Cove Tunnel	Carr Labor (2003)	Iemma Labor (2007)
NorthConnex	Baird Liberal National (2015)	Berejiklian Liberal National (2020)
WestConnex	O'Farrell Liberal National (2013)	Berejiklian Liberal National (stages from 2017)

*Government at project financial close

2.1 Benefits of private sector involvement

Governments' and the private sector's ability to partner and work together to create city-shaping infrastructure has been critical to the prosperity and liveability of Sydney.

PPPs have proven a powerful tool for incentivising the private sector to achieve the best outcomes for their government partners, customers, the community, investors and ultimately the city's transport networks.

The private sector has also proven to be a strong force for driving efficiency and innovation in design, construction and operations and for its comprehensive community and stakeholder engagement programs.

With private sector taking on the construction and patronage risk, governments have been able to deliver the infrastructure, while freeing up their balance sheet for other priorities such as health, education and public transport services (Figure 9).

NSW has benefitted from almost $25 billion[1] worth of road infrastructure delivered through PPPs since the Sydney Harbour Tunnel opened almost 30 years ago.

Since 2013, Transurban and its partners have injected more than $13 billion (Figure 7) into Sydney's motorway network, from upgrading existing assets to delivering new infrastructure that fundamentally changes the way people move around the city.

In 2018, Transurban and its partners purchased a 51% stake of WestConnex for $9.3 billion, of which $7 billion has been directed towards the NSW Government's Generation Fund (NGF).

A sovereign wealth fund, the NGF helps lower State debt and supports the State's credit rating while funding community initiatives. Since its inception in 2018, the NGF has grown to $11.3 billion and almost $25 million has been invested into 248 local community projects across NSW. This fund would not have been possible without asset recycling and the partial sale of WestConnex.

1 Ernst & Young: The economic contribution of Sydney's toll roads to NSW and Australia, 2008 and Transuban and partners' investment

Figure 7. Transurban's investments in NSW

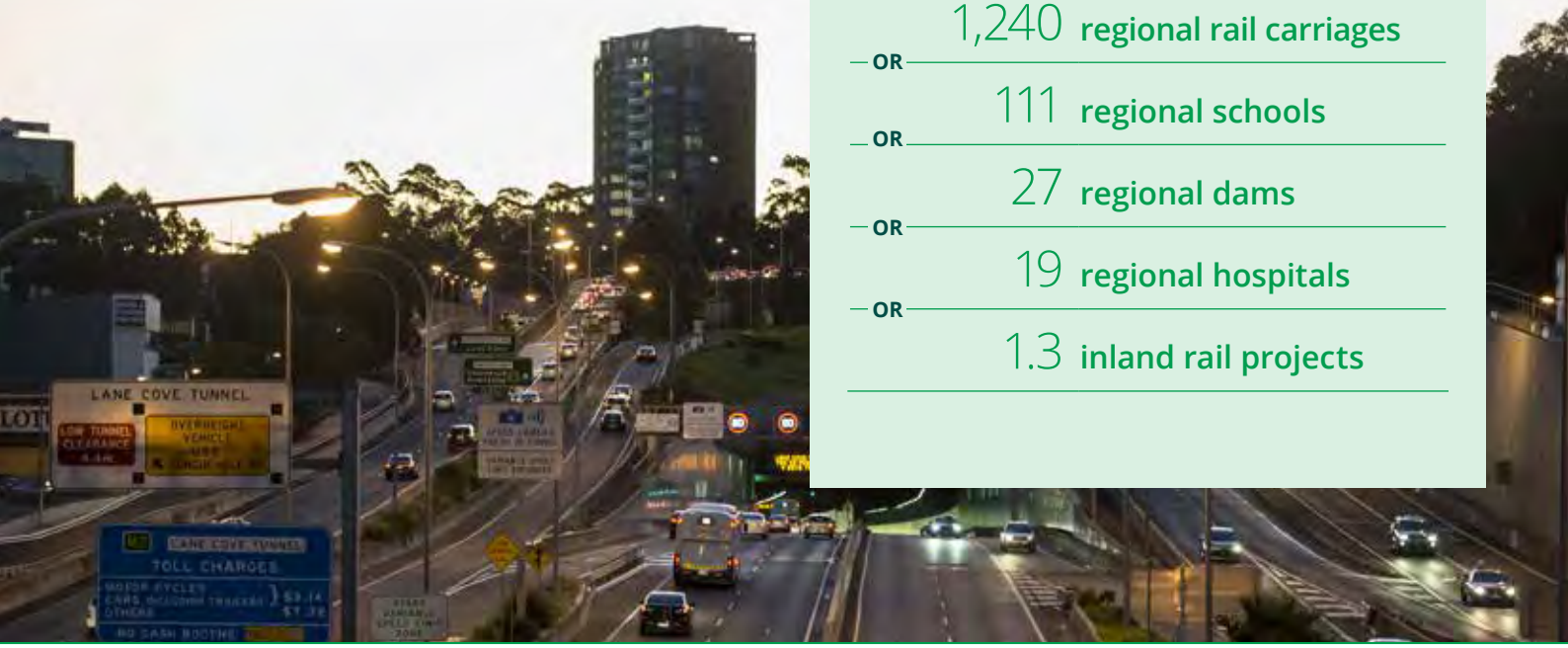
$13.36B* **invested**

- $550M M2 Upgrade
- + $400M M5 South West Widening
- + $2.98B NorthConnex
- + $105M M2 Integration
- + $22M Lane Cove Road Ramp
- + $9.3B WestConnex

*Transurban and its partners', investments since 2013

$13.36B could fund

- 2,903 inner-city rail carriages
- OR 1,240 regional rail carriages
- OR 111 regional schools
- OR 27 regional dams
- OR 19 regional hospitals
- OR 1.3 inland rail projects



2.2 Toll contracts and tolling regimes

Each road is governed by a concession deed, which is the contract between the NSW Government and the successful private sector participant.

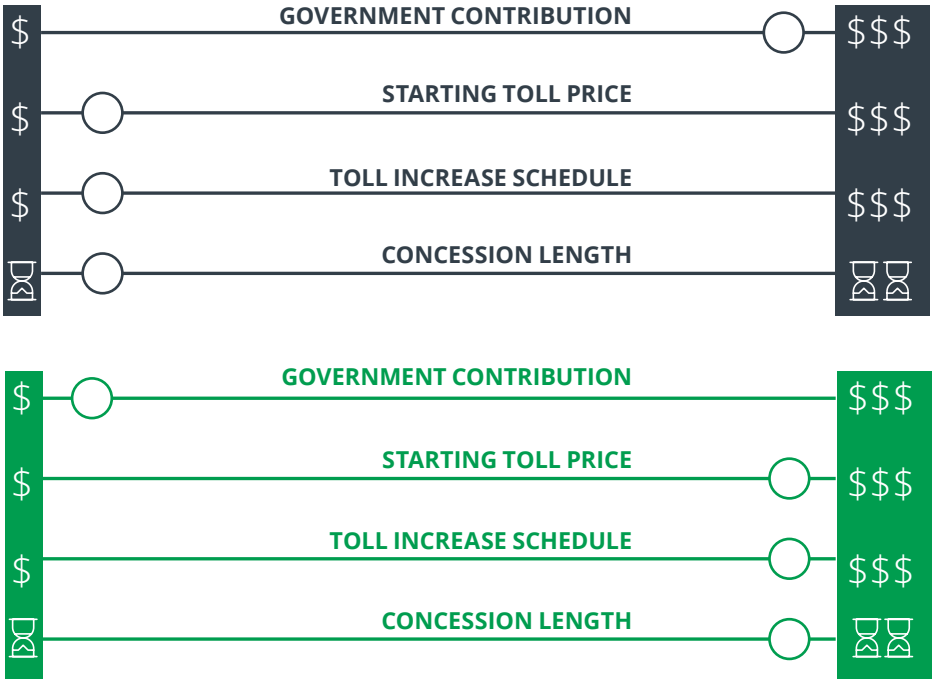
The deed dictates the commercial arrangements for the ownership and operation of each road and sets out the concession term and tolling regime including toll prices and escalation.

Toll price increases essentially smooth the costs of constructing, operating, and maintaining the toll road over the full concession period. Concession deeds are agreed before construction commences and some years before a road opens or before the road is acquired.

In setting the initial toll price and escalation rates, the government decides how to best meet the objectives of funding the project and provide a value-for-money toll proposition that will make paying the toll attractive to motorists through travel-time savings and reliability.

This value proposition is critical in determining appropriate pricing levels.

Figure 8. Major factors governments consider in establishing concession deeds



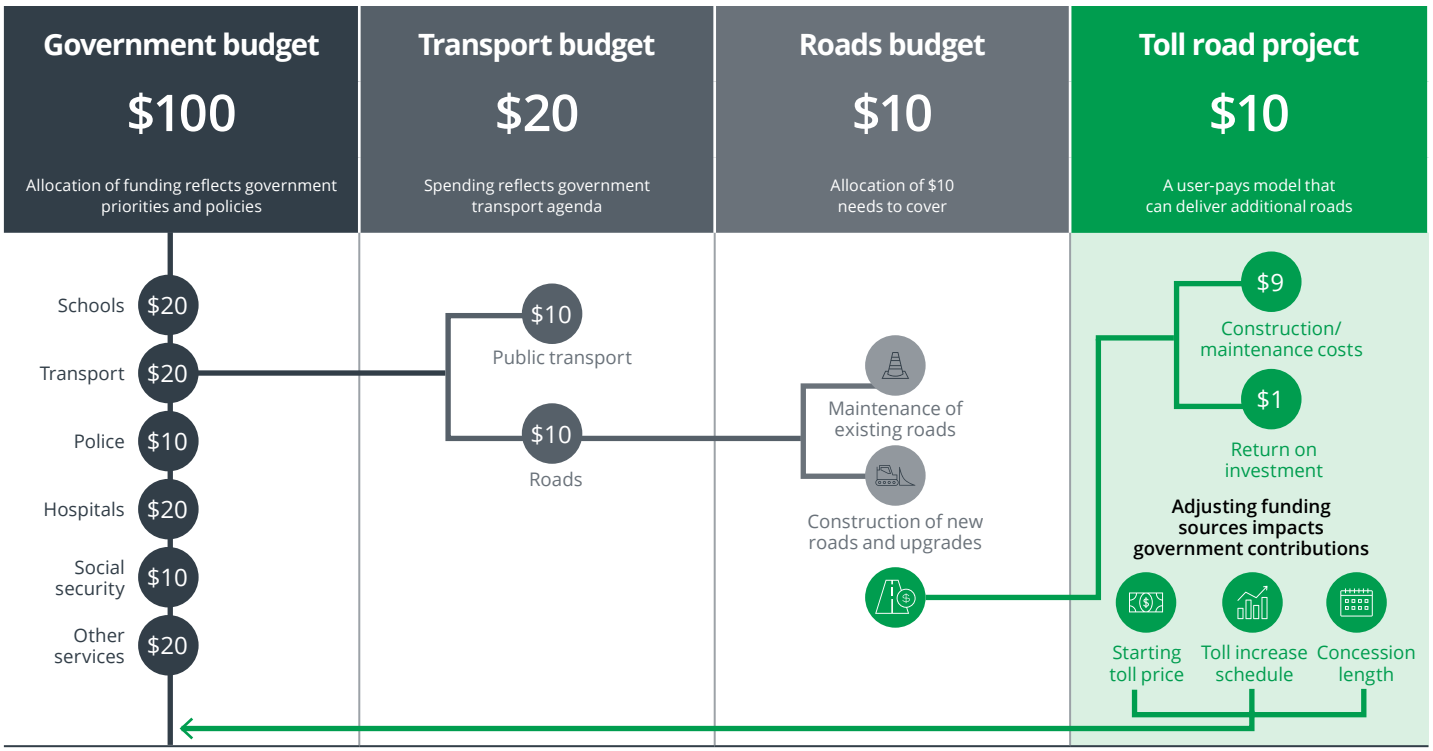
For example, if tolls are set too high, not enough motorists will use the road to maximise the project benefits.

If tolls are set too low or are not escalated at a high enough rate, government face the prospect of a larger funding gap that would need to be made up through a greater contribution (Figure 8).

Each funding source—starting toll price, toll escalation/increase schedule and concession length—can be adjusted up or down depending on the initial government contribution.

Lower tolls and escalation and a shorter concession would require greater government contribution, meaning less public funding for other essential services (Figure 9).

Figure 9. Delivering NSW services – private sector funding compliments government budgets



This is a fictitious example to illustrate the various factors considered

2.3 Tolling methods

Three different forms of tolling operate across Sydney's motorway network (Figure 10) reflecting the different approaches of commissioning governments.

Some toll roads were developed under a fixed rate structure, with other roads implementing distance-based tolls.

In 2014, the NSW Liberal Government approved a broad set of principles (Figure 11) to guide future tolling decisions on Sydney's motorway network.

Appendix 1 outlines the tolling and concession arrangements for Transurban's toll roads.

Figure 10. Sydney tolling methods

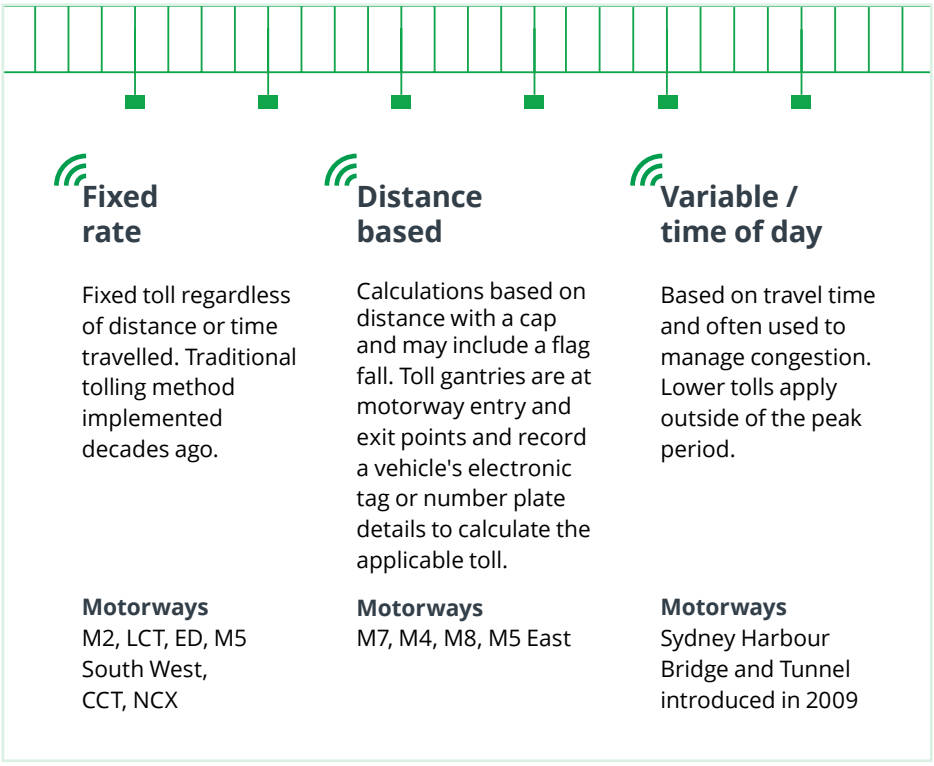
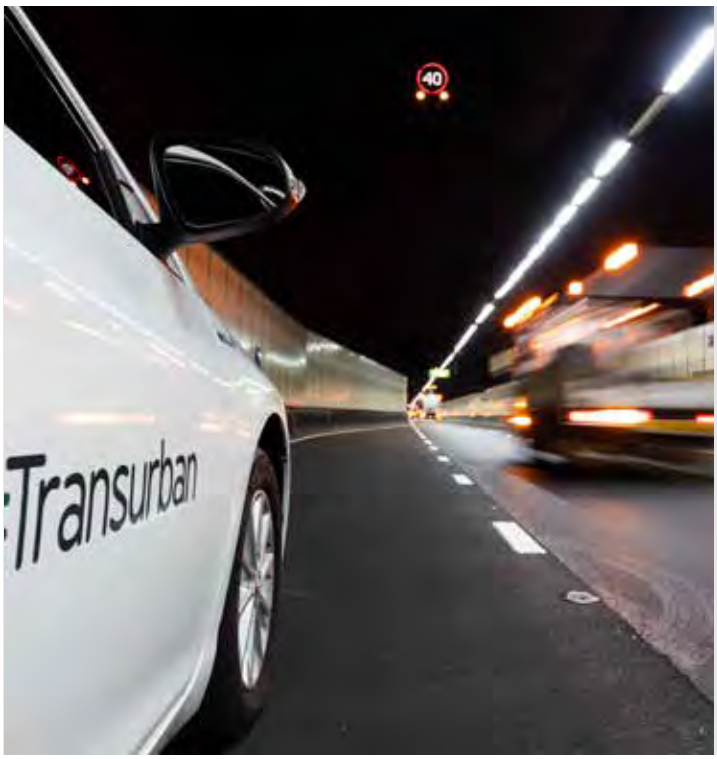


Figure 11. NSW Government's road tolling principles

1. New tolls are applied only where users receive a direct benefit.
2. Tolls can continue while they provide broader network benefits or fund ongoing costs.
3. Distance-based tolling for all new motorways.
4. Tolls charged for both directions of travel on all motorways.
5. Tolls charged reflect the cost of delivering the motorway network.
6. Tolls take account of increases in expenses, income and comparable toll roads.
7. Tolls will be applied consistently across different motorways, to the extent practicable, taking into account existing concessions and tolls.
8. Truck tolls at least three times higher than car tolls.
9. Regulations could be used so trucks use new motorway segments.
10. Untolled alternative arterial roads remain available for customers.



Private sector risk

The risks in large-scale infrastructure are significant and have resulted in some highly publicised failures including the Cross City Tunnel and Lane Cove Tunnel where the projects failed to meet their patronage forecasts. While private investors bore the risk – and the losses – taxpayers benefitted with delivery of and access to improved networks and new, world-class roads and tunnels. More recently, the impact of COVID-19 on traffic levels as a result of government-mandated restrictions was significant, again highlighting the risk borne by the private sector.

Transurban believes private-sector operators with stewardship of the roads they build and manage are best placed to estimate network traffic, to understand operations and maintenance costs and to bear the project risk. They have a vested interest in the asset's ongoing success and providing value for customers, clients and investors.

Australia's transport funding at the crossroads

Globally the shift to an electrified transport future is well underway, spelling the imminent demise of a fuel-sales-based road funding system.

Electric vehicles are predicted to make up to 10% of global passenger vehicle sales by 2025, rising to 58% in 2040[1] and government policies are accelerating the shift particularly in Europe and the US.

Transitioning the national fleet to zero-emission vehicles (ZEVs) is an important step towards a more sustainable future but it will present challenges to government budgets as revenue from fuel excise diminishes, and they contend with how ZEV owners will pay for their road usage.

The Victorian Government is planning to establish a road-user charge for electric vehicles, with the NSW Government also announcing consideration of similar plans in the long term.

While the uptake of ZEVs in Australia has lagged behind other comparable countries, increasingly fuel-efficient vehicles have already made a significant dent on revenue streams. Fuel excise currently contributes more than 55% of Australia's total road-related revenue;[2] however, this revenue source has been decreasing steadily (Figure 12).

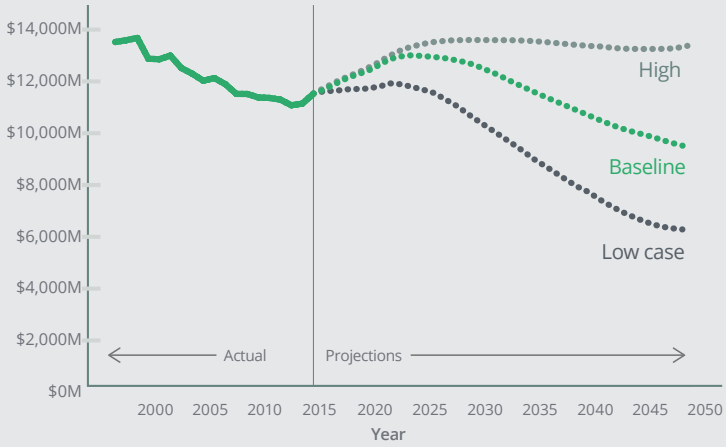
A road-user charging system that replaced all current charges such as fuel excise, registration and associated costs has been recommended by a range of bodies including the Productivity Commission and Infrastructure Australia.

Such a system offers a sustainable funding solution and a direct link between use and the cost of constructing, maintaining and operating road infrastructure. A road usage charge system would also help to address inherent inequities where drivers with less fuel-efficient vehicles currently pay more at the petrol pump.

To compensate for reduced fuel excise funds, state governments have progressively increased vehicle registration fees. This also presents equity challenges with infrequent and low-demand motorists subsidising frequent, high-demand motorists.

Any new system would need to provide protections for vulnerable and disadvantaged community members; and consider differences between geographical zones; and urban and regional road users to ensure it does not become a form of regressive tax. The success of road-funding reform would be heavily dependent on an effective and integrated transport planning approach that takes into account people's access to genuine and affordable transport alternatives.

Figure 12. Australia's declining fuel excise revenue3



Putting it to the test

In 2016, Transurban completed Australia's first practical study to examine drivers' preferences and awareness when it comes to road funding in Australia. The results of the almost 18-month long study indicate a user-pays system could work in Australia and generate a sustainable funding source to meet our future infrastructure needs.

It showed that participants were open to trying a more direct and transparent way of paying for their road use and that the different charging options tried by participants did not impede their usual driving behaviours.

A series of attitudinal surveys over the course of the study also showed a significant swing in participants' preference from the current system, which they initially knew little about, to a user-pays model. By experiencing a different way of paying for their road use, participants could see the benefit of a direct and transparent user-pays model over the current system of opaque fees and charges.

Most importantly, direct feedback from the study's 1,635 participants suggested Australians are open to discussing user-pays as a viable alternative to the current system.

changedconditionsahead.com

1. Electric Vehicle Outlook 2020, Bloomberg New Energy Finance
2. Bureau of Infrastructure, Transport and Regional Economics, Australia Infrastructure Yearbook, 2015
3. Source: Transurban analysis; Bureau of Infrastructure, Transport and Regional Economics, Australia Infrastructure Yearbook 2015; CSIRO (Report for the NTC), Projecting future roads transport revenues 2015–2050, May 2015

2.4 Toll prices for freight

In Sydney, large vehicles pay between two-to-three times the car toll, depending on the road.

The higher tolls for large vehicles, in part, reflect the greater value these vehicles derive from the time savings and also the extra costs involved in safely accommodating them on the road.

Sydney's toll road network has been purpose-built for freight vehicles, providing considerable benefits including increased safety, reduced fuel consumption, greater travel-time reliability, smoother travel and less wear and tear on the vehicle, which all contribute to overall operational costs savings (see Section 1).

Toll road design incorporates special features, such as suitable pavement depth and grades, tunnel ventilation and breakdown bays, to accommodate these vehicles, which increases the overall project cost. For example, the M7 was constructed at significant cost using continuously reinforced concrete pavement.

Further additional costs are incurred in the design of tunnel infrastructure to cater for these vehicles. For instance, more gradual inclines are required for trucks, which lengthens the amount of tunnelling, as reflected in the NorthConnex tunnel design.

Modern tunnels are also being built with a taller clearance than they once were to reduce the risk of overheight vehicles colliding with tunnel infrastructure. For example, the Eastern Distributor and Cooks River Tunnel are 4.4 metres high but all new tunnels – including the M4, M8 and NorthConnex – are built to 5.1 metres.

Aside from the extra construction costs the higher tolls also take into account the impact heavy vehicles have on the road infrastructure, which is over five times greater than light vehicles[1], and the additional space they take up on the road.

Heavy vehicles are likely to be commercially owned and operated with those businesses claiming the costs of tolls as a tax deduction. This means the effective vehicle multiplier is less than 3.[2]

1 Transport for NSW, Economic Parameter Values Version 2.0, June 2020

2 NSW Government Response. Inquiry into Road Tolling in NSW 2017

FRESH THINKING

Network-wide toll reform

The variations in existing tolling methods and subsidies across the Sydney network are the product of decades of toll road development in the city dating back to the Sydney Harbour Bridge almost a century ago.

Since then, the delivery of new and enhanced toll roads and their tolling regimes have reflected the considerations taken by the government in office at the time. Most recent toll roads have been distance based, a method which the current government has committed for future tolled motorways.[1]

Different tolling regimes, along with government subsidies and toll cashback for some motorists, (see page 24) have led to inequities with some drivers spending more per kilometre of travel than others. For example:

$23.75

34km trip from Hornsby to Opera House at 5pm (NorthConnex + M2 + Lane Cove Tunnel + Sydney Harbor Bridge)

$8.52

34km trip from Seven Hills to Opera House at 5pm (WestConnex M4 including tunnels)

With more toll roads planned to be delivered over the next decade, an opportunity for a fresh and pragmatic look at tolling regimes could be considered to ensure greater equity and a simpler proposition for customers. Options could include distance based and capped tolling regimes similar to tolling on WestConnex and the M7.

Transurban welcomes the opportunity to engage with policymakers to consider potential changes to the tolling regimes and needs of all stakeholder groups, in order to deliver a fairer and better outcome for customers and communities.

1 See Figure 11, page 19

Section 3:
Delivering value to customers

Sydney's toll road network delivers motorists significant travel-time savings, safer journeys and more reliable travel.

3.1 Toll road customers

Linkt is Transurban's retail brand, providing customers with convenient options to pay for toll travel. Most Linkt customers use toll roads infrequently. In a recent survey conducted by JWS Research on behalf of Transurban, only 4% of respondents identified as commuters who use toll roads more than once a day.[1] This is supported by earlier market research, which found that the most common reasons for using toll roads were for travel relating to shopping, social and recreational activities (42%), see Figure 14.

Roads and motorways naturally appeal for such trips as they provide the most direct route and are generally quicker than taking public transport.

Across our toll roads, 16% of trips are related to commuting for work or study (noting many respondents would not use toll roads for this purpose every day), while 19% of trips are made for social purposes and 13% for travelling to holiday destinations (Figure 14).[2]

Infrequent toll road use is reflected in the average amount of money spent on toll roads by Linkt Sydney customers. Between March 2019 and February 2020 22% of Linkt Sydney customers with personal consumer accounts, and 16% with commercial accounts, made no trips on toll roads and paid $0 in tolls.

Of the Linkt customers that did travel between March 2019 and February 2020 the average motorist travelling in a personal vehicle (consumer account) spent $9.52 per week, with 74% spending $10 or less a week. Those with commercial accounts spent $89 per week, with 88% spending $100 a week or less (Figure 3).

We have chosen to look at data between March 2019 and February 2020 as it excludes COVID-19 impacts on customer travel and is therefore a more accurate representation of customer spend. The data excludes dormant customer accounts.

Figure 13. Average weekly Linkt customer spend on tolls – consumer and commercial accounts for the period March 2019 to February 2020

Consumer

Average weekly spend	$9.52
Average yearly spend	$495
% spending <$10 per week	74%
% spending <$20 per week	86%
% spending <$50 per week	97%
% spending >$100 per week	0.4%

Commercial

Average weekly spend	$89
Average yearly spend	$4,628
% spending <$10 per week	49%
% spending <$20 per week	62%
% spending <$50 per week	78%
% spending >$100 per week	12%

Figure 14. Reasons for toll road use

1 Survey conducted by JWS Research in April 2021 of 1,000 residents in Greater Metropolitan Sydney

2 Transurban commissioned research across general population of greater metropolitan Melbourne, Sydney and Brisbane, December 2016. Respondents were asked for specific reasons why they travelled on toll roads

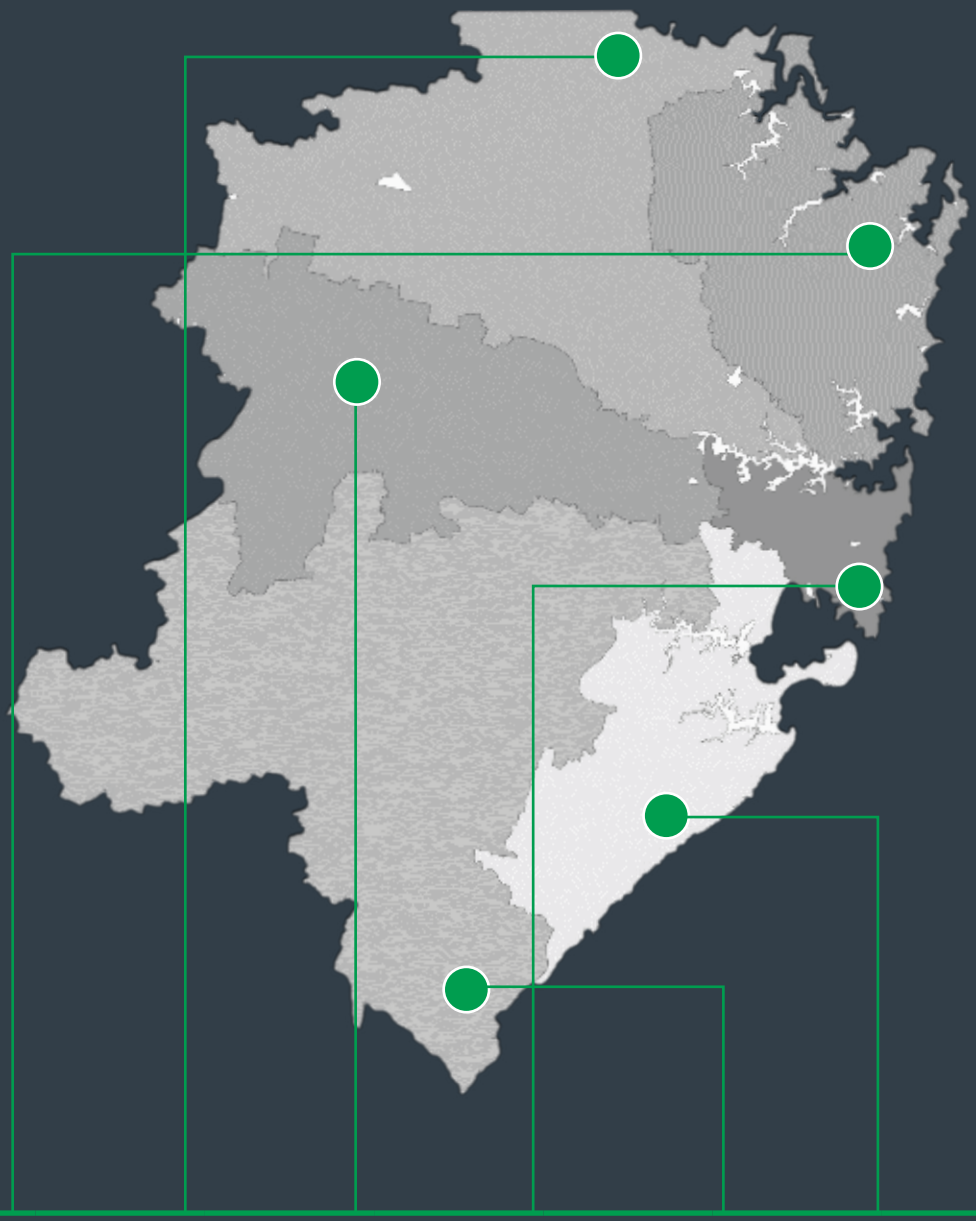
Regional analysis

We have segemented Greater Sydney into seven districts to demonstrate regional differences for active private and commerical account holders

In terms of average weekly spend, 8% of personal consumer account customers in the North West spend over $50 a week, compared to 2% in the South. However, across all regions between 74 to 88% of customers spend less than $20 per week.

Similarly 17% of commercial customers from the North West spend $100 or more compared to 9% from the Inner and Southern suburbs. Across all regions between 62 to 82% of commercial customers spend $50 or less a week.

It is clear that a higher percentage of customers in the North West and South West and West spend above $20 per week on tolls compared to other suburbs. This is in part due to the location of the toll roads providing the option for customers in those areas to conveniently cross the city and/or travel into the CBD.



Consumer Commercial

	NORTH	NORTH WEST	WEST	INNER SYDNEY	SOUTH WEST	SOUTH	REST OF NSW
% SPEND < $10PW	65%	56%	62%	67%	61%	76%	93%
	42%	29%	26%	42%	29%	52%	74%
% SPEND < $20PW	83%	74%	79%	84%	78%	88%	97%
	60%	44%	39%	59%	43%	66%	84%
% SPEND < $50PW	96%	92%	95%	97%	94%	98%	99.6%
	81%	67%	62%	80%	65%	82%	92%
% SPEND > $100PW	0.4%	1.2%	0.6%	0.3%	0.6%	0.2%	0.03%
	10%	17%	23%	9%	19%	9%	4%

Government-funded rebate schemes

A number of NSW Government-funded programs are available to motorists to reduce the costs of tolls or allow motorists to reclaim tolls paid.

M5 South West Cashback Scheme

This scheme allows eligible drivers to claim back tolls for trips on the M5 South West Motorway, excluding GST and other fees. The scheme applies to vehicles registered in NSW for private, pensioner or charitable use. The Carr Labor Government introduced the M4/M5 Cashback scheme in 1997. Refunds for the M4 have now expired.

In the 2019-20 financial year, more than 27.3 million trips across approximately 338,000 accounts were claimed under the scheme, adding up to more than $119 million in benefits.

Registration rebate

Started in 2018 by the Berejiklian Government, this scheme provides free vehicle registration for drivers who have spent $1,352 or more on tolls in the previous financial year (an average of $26 a week). Drivers who spend $811 or more during the previous financial year (an average of $16 a week), are eligible for half-price registration.

The scheme came into effect on 1 July 2019 and more than 360,000 customers have benefitted from the scheme with more than 207,000 drivers receiving free registration and the rest getting half price registration.

Large recreational vehicle toll rebate scheme

Drivers towing caravans, boats and horse floats are eligible for cheaper tolls to bring the cost in line with regular cars. The rebate is the difference between the Class B and the Class A toll and applies to private use vehicles only. The rebate is capped at eight tolled trips per monthly billing period.

Class B vehicles are charged a higher toll as they are typically trucks or heavy vehicles, whereas Class A vehicles are typically cars and motorcycles. The scheme applies to all of Sydney's toll roads, with the exception of the Sydney Harbour Bridge and Sydney Harbour Tunnel which has a single toll for all vehicles. The rebate was introduced by the Berejiklian Government in June 2020 and as at December 2020, 484 claims had been paid, totalling approximately $36,000.

3.2 Choice for motorists

In 2019, we launched Linkt Trip Compare, a toll calculator provided on the Linkt website, which allows motorists to compare the costs and benefits of using a tolled route versus the alternate untolled route.

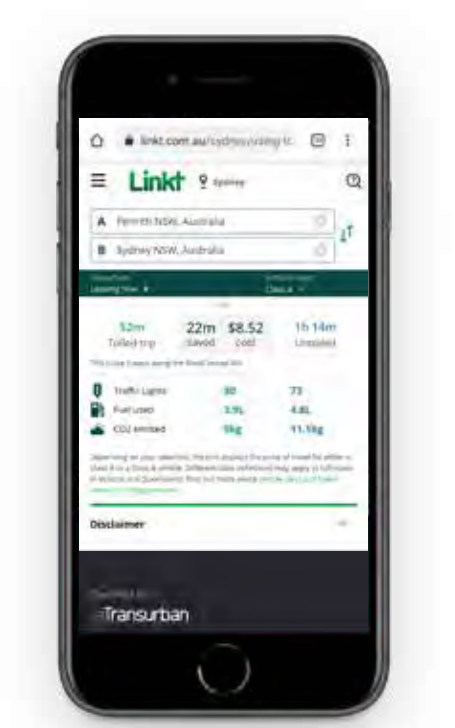
The user enters their origin and destination and is provided with information on the cost of the toll along with estimated travel-time and fuel savings.

It's a simple tool that allows people to assess the value of using a toll road to make a more informed choice about how they travel.

In addition to Linkt Trip Compare, navigation tools like Google Maps, Waze or TomTom provide information to customers about their route options, but up until recently these third party apps did not include information on toll prices, which made it hard for customers to weigh up their options. Waze now includes toll pricing in its app.

While most people have access to a computer or smartphone, it can't be taken for granted that everyone has access. Transurban is aware of digital exclusion and the disadvantage this can cause.

To address this and further support motorists in making informed choices about how they travel, we are exploring the use of on-road signage.



FRESH THINKING

Decision-point signage

To help motorists make an informed decision about their travel, we undertook a pilot in Melbourne, which provided information about travel times on the CityLink toll road compared to the alternate route.

Two travel-time signs were installed at key locations before entrances to CityLink displaying real-time travel times to destinations comparing CityLink with the free alternative route.

Toll price information was not included on the sign under advice that too much information could distract motorists.

Customer feedback from the trial was very positive as they found the information displayed to be valuable in deciding whether or not to take the tolled route or the free alternative route while on the move.

Some of the key findings were:

- Almost 70% of people said they would use the sign to inform future travel choices, and about 40% said the signs helped inform their travel choice on the spot.
- While customer feedback indicated the information was useful, some suggested the signage design could be improved.
- Other feedback included expanding the signage to more locations, additional promotion of the initiative so drivers knew to look out for them and adding more information such as the cost of a trip and whether ramp signals were active.

Transurban would be open to a discussion with NSW Government to adopt a similar approach in NSW to provide customers with more data to inform their travel choices when using the motorway network.

This approach could include decision-point signage at key locations leading towards M8/M5 East, or M1 leading towards NorthConnex and Pennant Hills Road.

3.3 Quicker, reliable travel

In 2019, Sydney ranked 86th out of 416 cities on the TomTom Traffic Index, which measures congestion, above cities such as Singapore, Hong Kong, Shanghai and Berlin. Sydney's congestion index level was 33%, which meant that people spent an average of five days and 18 hours stuck in rush hour traffic every year.

This is time that could have otherwise been spent at work, leisure or with family and friends. Even with the impacts of COVID-19, Sydney's congestion index was 28% in 2020 and lost time in traffic equated to four days and 16 hours.[1]

The broader economic impact of congestion is discussed in Section 1, but of equal relevance is the value of lost time on individual motorists, either financial loss, or related to health and wellbeing.

Toll roads provide motorists with the option to save time. As outlined in Figure 15, peak travel-time savings on Transurban's Sydney toll roads range from between 7 to over 55 minutes, depending on the length and location of the road. Not only are these roads quicker and more reliable than alternate routes, they also connect to form a ring around the city providing motorists with a network that is greater than the sum of its parts.

Businesses who use toll roads to make deliveries or attend jobs provide the clearest example of the value of these travel-time savings. As in Case study 1, a freight operator may choose to use a toll road over an alternative route because the total operational cost savings outweigh the cost of the toll, as well as the business being able to take on more work and be more productive due to time saved.

Depending on the vehicle, operational costs per hour of travel can range from between $37 for a light commercial truck to $108 for a B-Double truck (Figure 16). Beyond time saved, the free-flowing conditions on tolled motorways mean that heavy vehicles can avoid the stop-start driving conditions on alternative routes, which can cost around $1 in fuel for every stop.[2]

The travel-time savings and reliability of Sydney's toll roads play an important role in supporting many industries, but especially freight and delivery.

A survey conducted by Transurban in August 2020 found that 48% of people were doing more online shopping since the COVID-19 pandemic, and half of those expected to continue shopping that way.[3] Even before the pandemic, the World Economic Forum predicted that demand for last-mile delivery will soar by 78% in the next decade, leading to the number of delivery vehicles in the top 100 cities to increase by 36%.[4]

When it comes to passenger travel, most people use toll roads occasionally for trips relating to shopping, social and recreational activities (Section 3.1, Figure 14). The value of the travel-time saved is therefore much more difficult to quantify but no less real.

Take Case study 3 for example, by using the WestConnex M4 to get to a holiday destination the customer is able to save 56 minutes in travel-time and start their holiday sooner.

In June 2020, Transport for NSW (TfNSW) published economic parameter values for common benefits and costs in transport. It recommends that $17.72 per person, per hour be used to calculate the value of travel-time savings for private vehicles. Using this figure, the net benefit to the motorists in Case study 3 of using a toll road over the non-tolled alternative route would be around $27.07.

Figure 15. Table of peak customer savings by asset – April 2021

ROAD	DIRECTION	TRAVEL-TIME SAVING (MINUTES)	AM / PM
Cross City Tunnel	EB	9	PM (3PM)
	WB	11	PM
Eastern Distributor	NB	18	PM
	SB	24	AM
Lane Cove Tunnel	EB	9	PM
	WB	8	PM
M2	EB	30	PM
	WB	40	PM
M5 South West	EB	27	PM
	WB	23	AM
M5 East	EB	15	AM
	WB	19	PM
M7	NB	34	PM
	SB	32	AM
M4	EB	30	PM
	WB	56	PM
M8	EB	16	PM
	WB	20	PM
NCX	NB	8	AM
	SB	9	PM

1. TomTom Traffic Index, Sydney full-year historical traffic data
2. Transport for NSW, Economic Parameter Values Version 2.0, June 2020 – calculated by multiplying 'Fuel consumption per stop (Litres)' for heavy trucks by average price per litre for diesel (average diesel price from NRMA Weekly Fuel Report, 12 April 2020)
3. Survey conducted by Nature in July 2020, involving 4,500 respondents from Sydney, Melbourne and Brisbane in Australia; Greater Washington Area, USA; and Montreal, Canada
4. World Economic Forum. The Future of Last-Mile Ecosystem, January 2020

Case study 1

Value of travel-time savings to Sydney's freight operators

Trucking Company T owns and operates a fleet of articulated trucks out at Ingleburn Industrial Precinct. Its business is to pick up freight from Port Botany and take it to Ingleburn for processing, packaging and redistribution. The business operates between 6am and 8pm. The table below outlines the one-way costs and benefits to the business of using the tolled route versus the untolled route. Each one-way trip delivers a net benefit of $29.61 to Company T, excluding additional vehicle operating cost benefits. In addition, the time saved by using the tolled route would allow it to make 14 one-way trips each workday (factoring in dwell time), compared to around nine via the untolled route, thereby making the company 56% more productive.

Cost / benefit tolled route

$36.34[1]	34mins[2]	49	17 litres	$29.61
toll paid	saved, saving $43 in value of travel time[3]	traffic lights avoided	of diesel saved, saving approximately $22.95 in fuel (assuming a diesel price of $1.35 per litre)[4]	net benefit to Company T excluding additional vehicle operating cost benefits

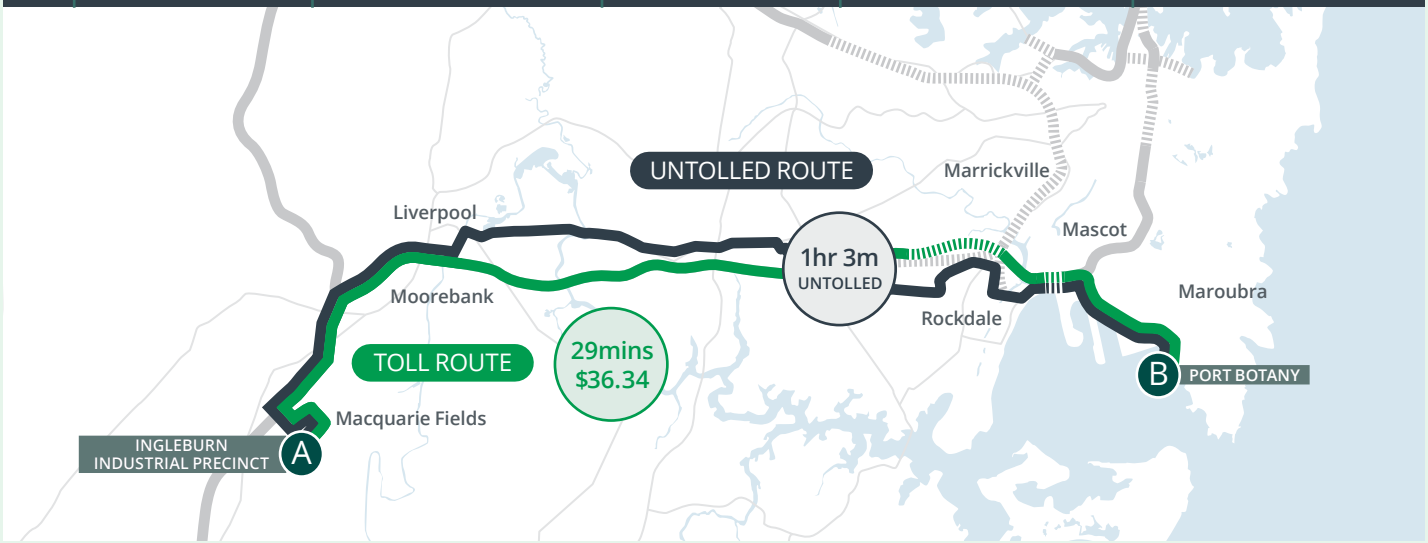


Figure 16. Value per hour of travel-time on urban roads for freight operators[5]

1. Total toll for Class B vehicle using the M5 South West Motorway and M5 East Motorway, as at April 2021
2. Travel-time savings based on TomTom data for average workday in April 2021
3. Transport for NSW, Economic Parameter Values Version 2.0, June 2020
4. NRMA Fuel Report 10th May 2021, Diesel price (month average)
5. Transport for NSW, Economic Parameter Values Version 2.0, June 2020 – figures calculated by adding 'Value per occupant ($/per person-hour)' to 'Urban Freight ($/vehicle-hour multiplied by average occupancy rate) and rounding to the nearest dollar

Case study 2

Value of travel-time savings to working parents

A working parent who works in Macquarie Park is running late to pick up his child from a Blacktown childcare, which charges $1 per minute in late fees. If he leaves just before 5.30pm on a Monday and takes the M2 and M7 tolled route he will arrive at 6pm, spending $10.44 on tolls, while saving approximately $37 in late fees and 1 litre in petrol. The net benefit of using the tolled route is $39.03, excluding additional vehicle operating cost benefits.

TOLL ROUTE

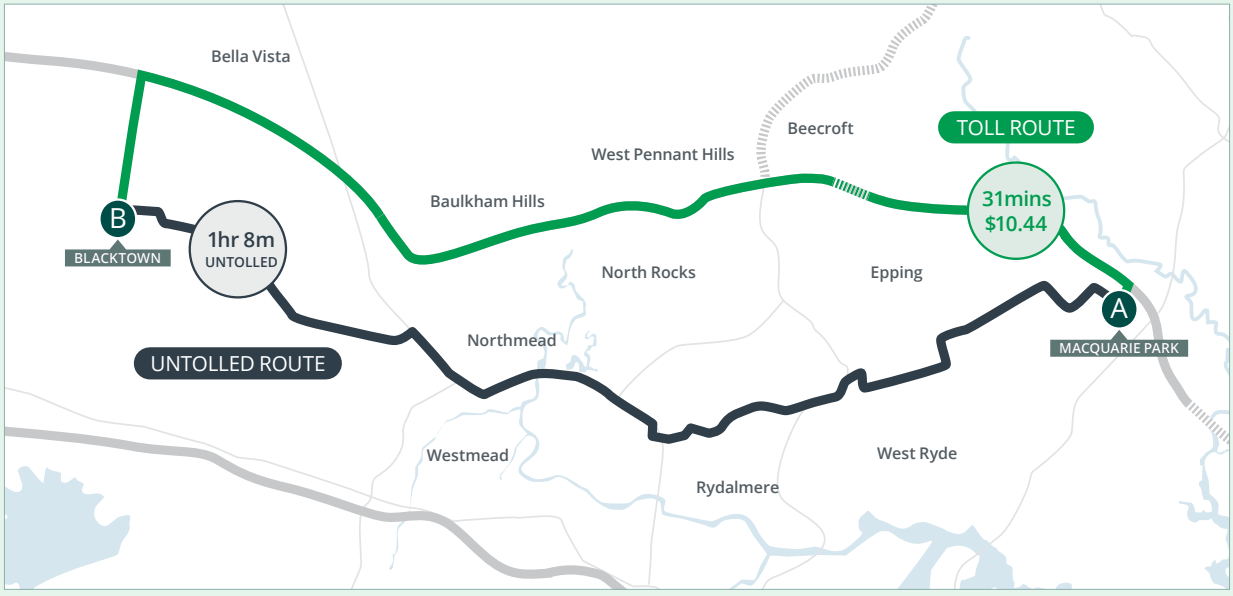
$10.44

Travel time	Traffic lights	Fuel consumed
31 mins	12	2 litres

UNTOLLED ROUTE

$0

Travel time	Traffic lights	Fuel consumed
68 mins	41	3.1 litres



COST / BENEFIT TOLLED ROUTE

$10.44
toll paid[1]

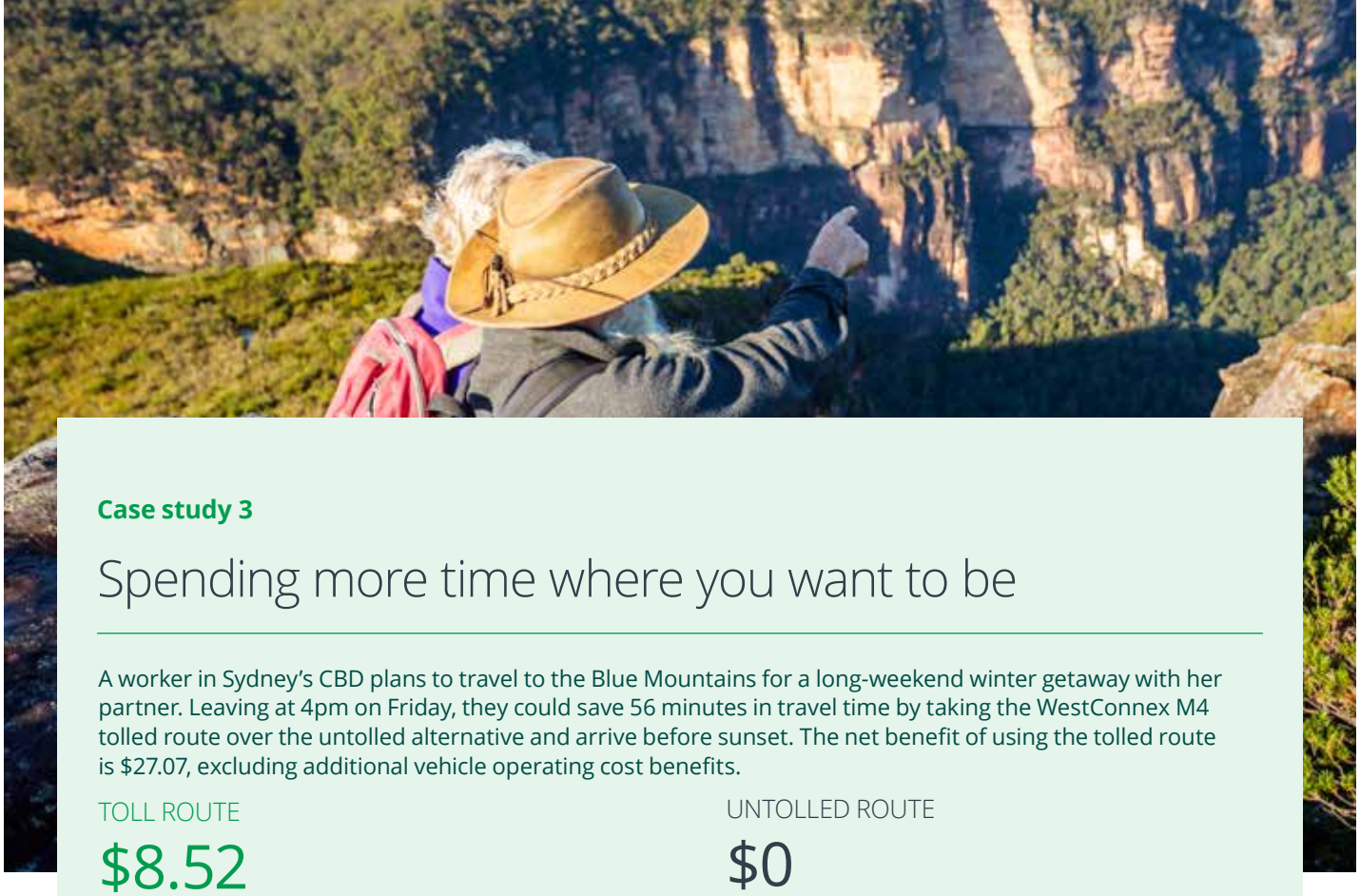
37mins
saved, equating to $37 in late fees, and $10.93 in value of travel time[2]

29
traffic lights avoided

1.1 litres
of petrol saved, saving approximately $1.54 in fuel costs (assuming an unleaded price of $1.40 per litre)[3]

$39.03
net benefit excluding additional vehicle operating cost benefits

1. Total toll for Class A vehicle using the M2 Motorway and the Westlink M7 Motorway, as at April 2021
2. Transport for NSW, Economic Parameter Values, Version 2.0, June 2020
3. NRMA Fuel Report 10th May 2021, Unleaded91 price (month average)



Case study 3

Spending more time where you want to be

A worker in Sydney's CBD plans to travel to the Blue Mountains for a long-weekend winter getaway with her partner. Leaving at 4pm on Friday, they could save 56 minutes in travel time by taking the WestConnex M4 tolled route over the untolled alternative and arrive before sunset. The net benefit of using the tolled route is $27.07, excluding additional vehicle operating cost benefits.

TOLL ROUTE

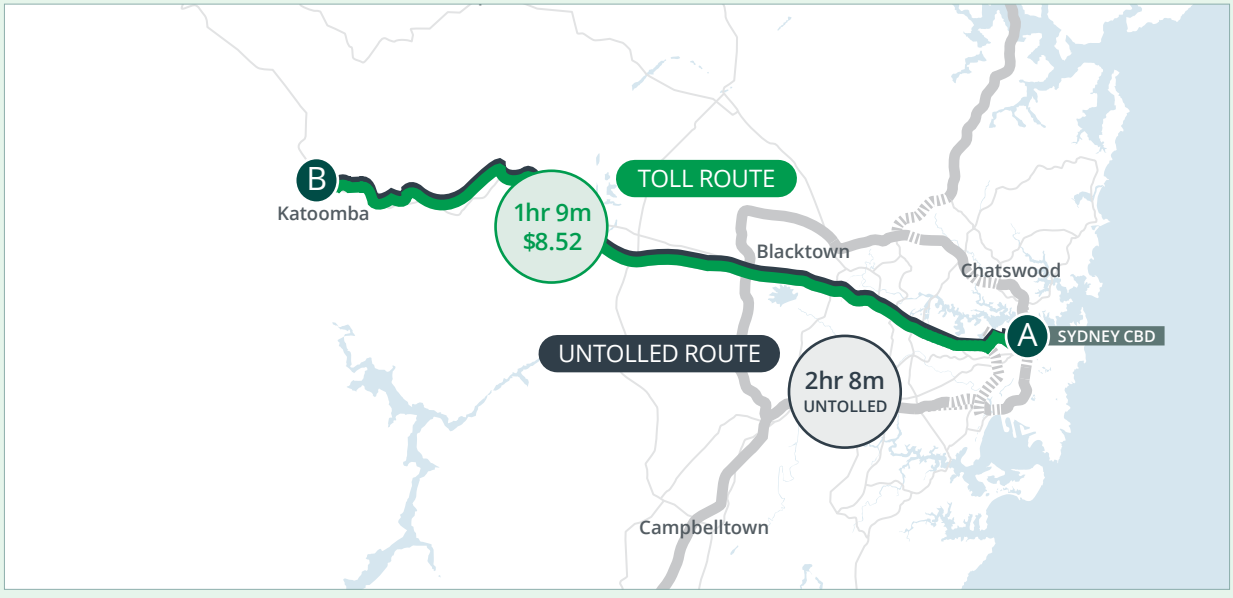
$8.52

Travel time	Traffic lights	Fuel consumed
115 mins	40	7.7 litres

UNTOLLED ROUTE

$0

Travel time	Traffic lights	Fuel consumed
171 mins	78	9.5 litres



COST / BENEFIT TOLLED ROUTE

$8.52
$8.52[1] (or $4.26 per person)

56mins
$33.07 in value of travel-time saving[2]

38
traffic lights avoided

1.8 litres
of petrol saved, saving approximately $2.52 in fuel costs (assuming an unleaded price of $1.40 per litre)[3]

$27.07
net benefit excluding additional vehicle operating cost benefits

1. Total toll for Class A vehicle using WestConnex, as at April 2021
2. Transport for NSW, Economic Parameter Values, Version 2.0, June 2020
3. NRMA Fuel Report 10th May 2021, Unleaded91 price (month average)

3.4 Customers' views on the value of toll roads

In a recent survey conducted by JWS Research on behalf of Transurban, most frequent users believe that toll roads provide a more direct route than alternatives, saving them time and making their travel time more predictable, see Figure 17.[1]

Transurban's Voice of Customer (VoC) Program, which analyses around 250,000 pieces of feedback from our Australian customers each year also provides comprehensive metrics to gauge customers' on-road experience.

It measures a Net Promoter Score (NPS) and Customer Satisfaction (CSAT) over time by collecting and analysing feedback via a post-trip survey sent to account customers after a single trip on a Transurban-owned asset.

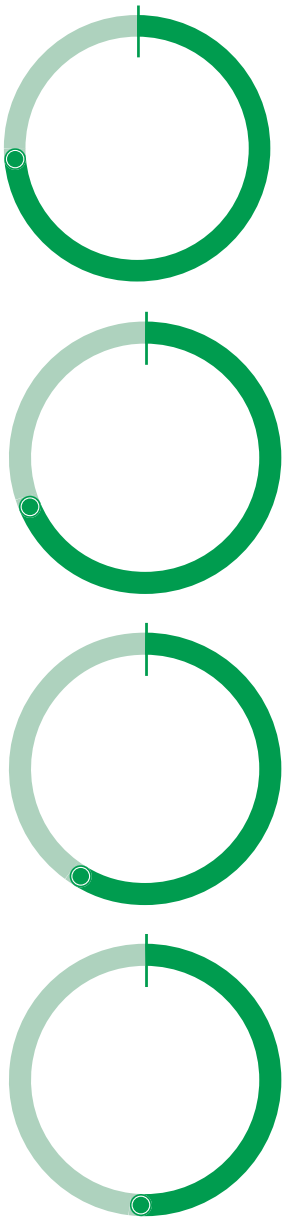
NPS is a measure of a customer's willingness to recommend a product or service to family and friends. It measures consumer advocacy on a scale between 0 to 10. Customers scoring between 0 to 6 are classified as detractors, 7 to 8 as passive, and 9 to 10 as promoters. The overall score is calculated by subtracting the percentage of promoters from detractors with a range between - 100 to 100.

As seen in Figure 18, Transurban's NPS for on-road experience has been steadily rising from early 2018. As of March 2021, NPS was +11.

An NPS above 0 means the majority of customers surveyed feel positively about their experience on Transurban roads. The aim is to continue to see the score increase over time.

Based on customer feedback from VoC, the openings of NorthConnex, which has an NPS score of +42, and WestConnex tunnels appear to have driven a positive increase in advocacy due to travel-time saved and limited congestion on these roads.

Figure 17. Sydney motorists' attitudes to toll roads—daily or frequent users



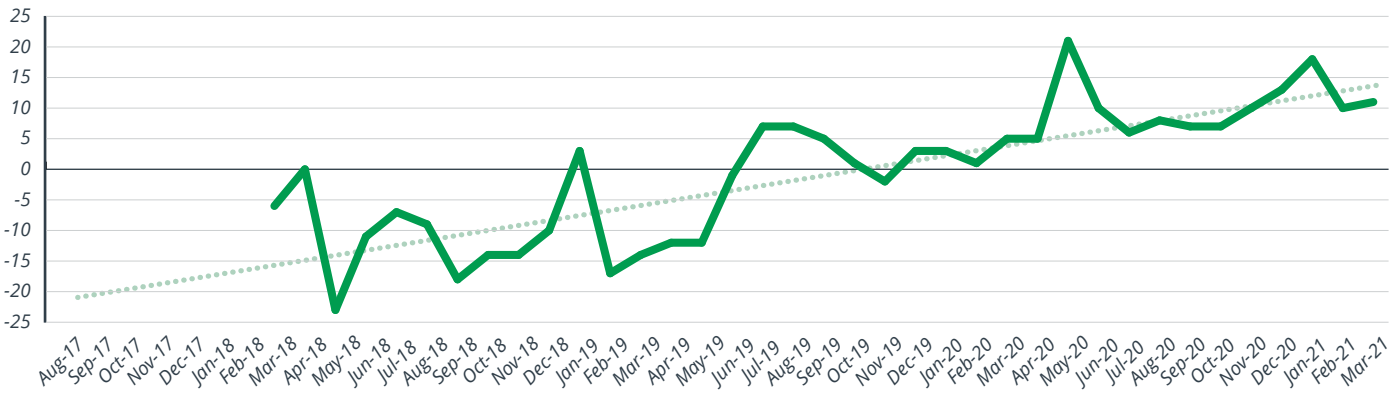
75%
believe toll roads provide a more direct route than alternatives

70%
believe toll roads save them travel time

60%
believe travelling on a toll road enables them to better predict the time it will take to get to their destination

52%
believe they save between 30 to 45 minutes on their commute by taking toll roads instead of alternative routes

Figure 18. Net Promoter Score for on-road experience, from March 2018 to March 2021



1 Survey conducted by JWS Research in April 2021 involving 1,000 residents in Greater Sydney

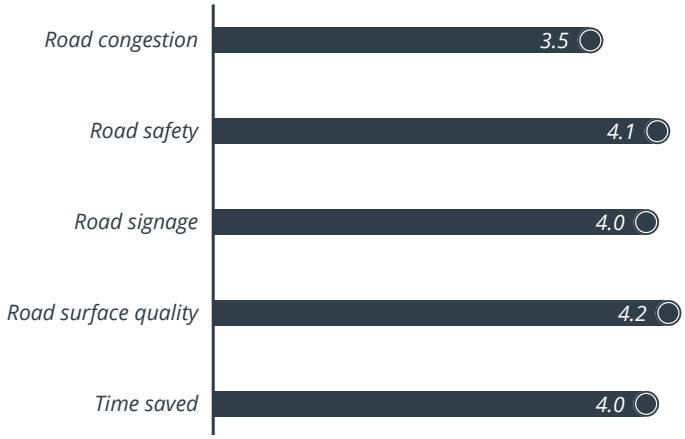
Customer satisfaction—the on-road experience

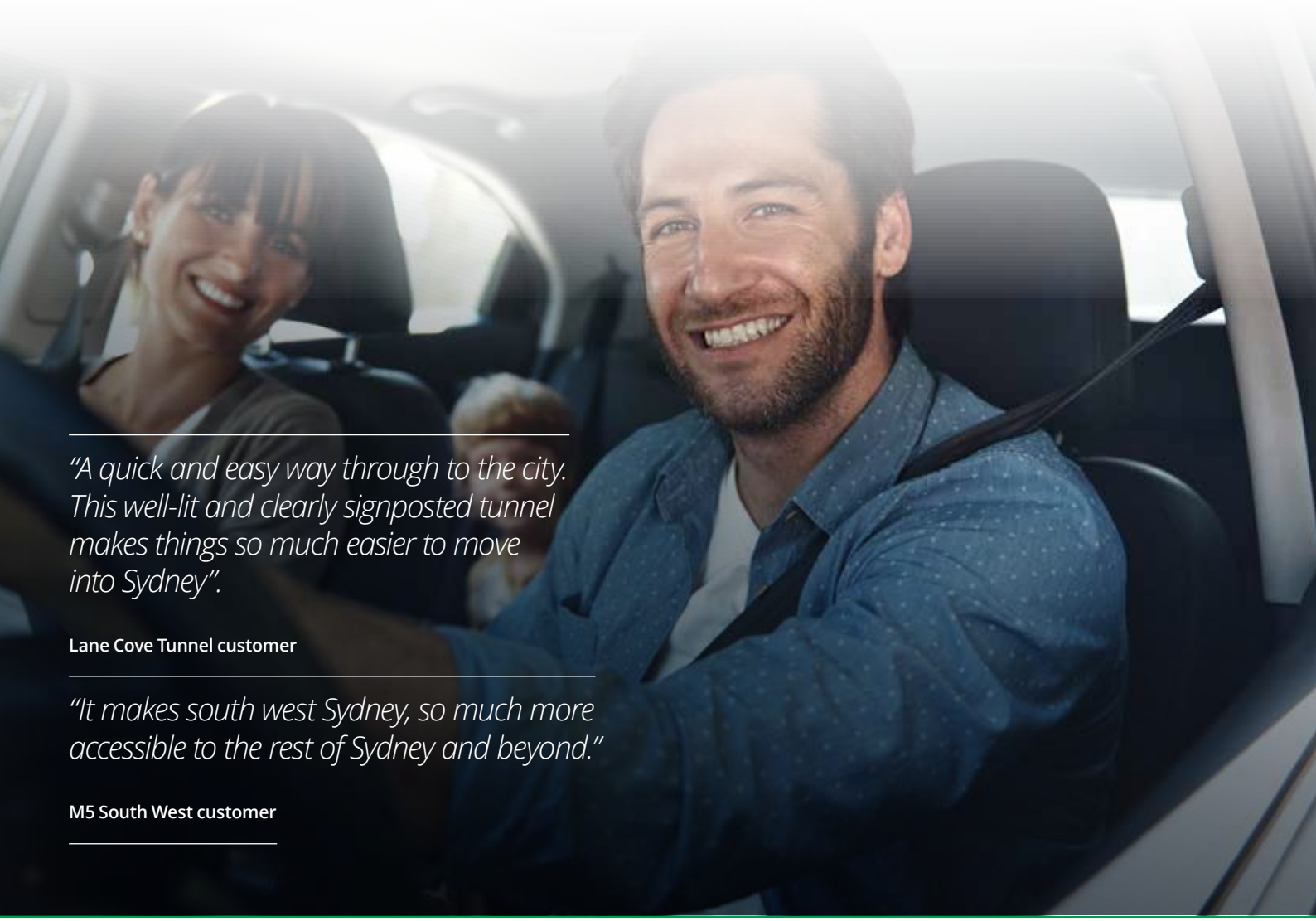
Customer satisfaction, or CSAT, is a measure of how satisfied customers are with key on-road factors during their trip on a toll road. Customers are asked to rank satisfaction for each factor on a scale of 1 to 5, with 1 being 'Very Dissatisfied' and 5 being 'Very Satisfied'.

The overall score is calculated as an average score between 1 to 5. These factors are road congestion, road safety, road signage, road surface quality and time saved. Average customer responses to each of these factors for the six months to March 2021 are shown in Figure 19.

Satisfaction towards congestion – while high by industry standards – is lower than the other factors, which is largely due to the experience of congestion undermining the benefits of using a toll road during peak periods. For example, if a customer travels on a Transurban toll road in peak hour and encounters congestion they are likely to feel dissatisfied with their experience despite the fact they will have experienced some of the highest travel-time savings possible and avoided heavier congestion throughout the wider network. In this case the customer is unlikely to factor in the congestion they would experience if they had travelled via an alternate route into their calculation of value and satisfaction.

Figure 19. On-road satisfaction average between October 2020 to March 2021



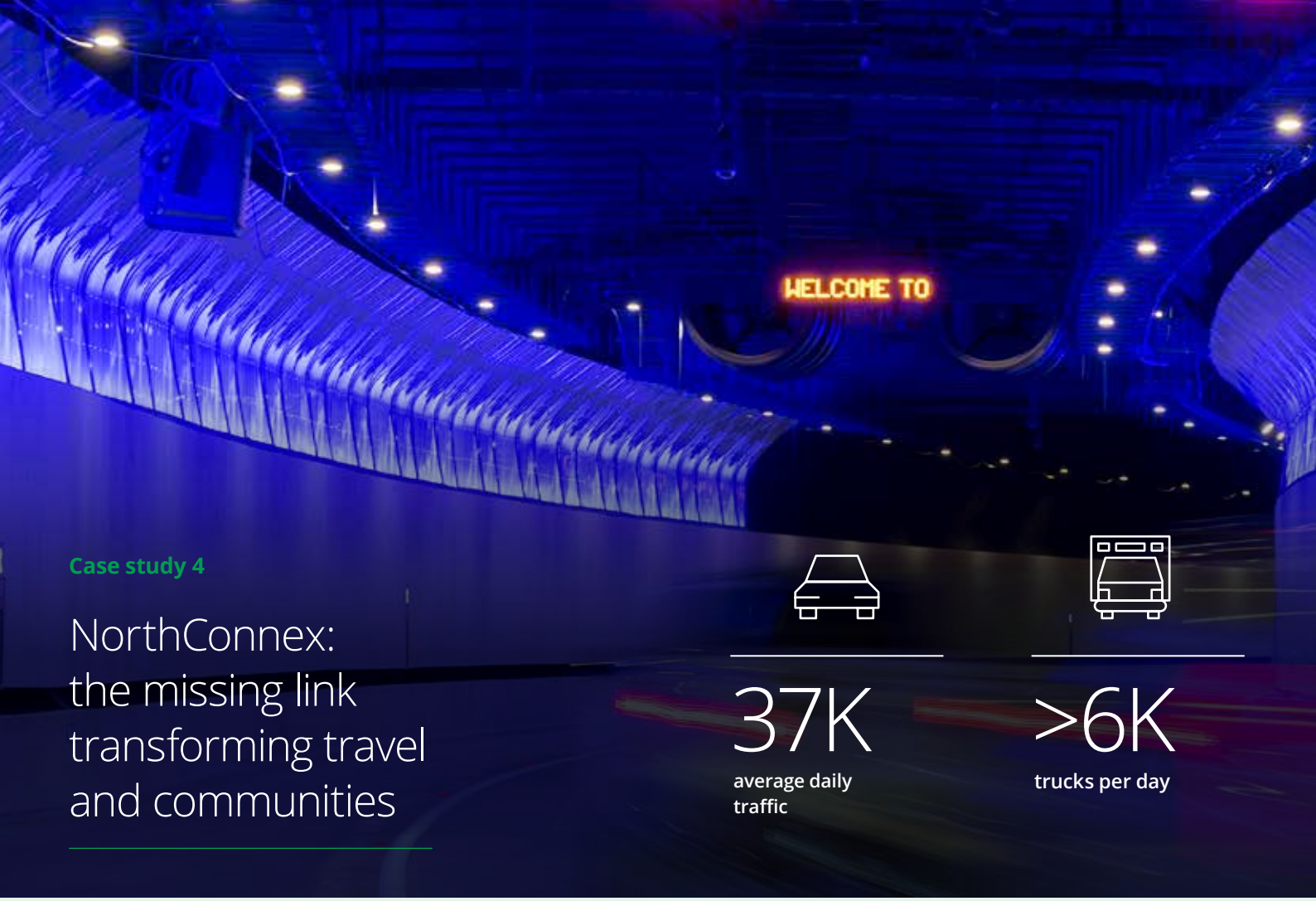


"A quick and easy way through to the city. This well-lit and clearly signposted tunnel makes things so much easier to move into Sydney".

Lane Cove Tunnel customer

"It makes south west Sydney, so much more accessible to the rest of Sydney and beyond."

M5 South West customer



Case study 4

NorthConnex: the missing link transforming travel and communities

37K
average daily traffic

>6K
trucks per day

The $3 billion NorthConnex tunnels have transformed the way motorists, commuters, freight and logistics move around Sydney's north-west. It has quickly become an integral part of Sydney's motorway network, addressing one of the city's most critical transport challenges.

Sydney's newest tunnels – which opened in October 2020 – created the much-needed 'missing link' in the National Highway route, providing a bypass to the perennially gridlocked Pennant Hills Road.

The first transport project to come out of the NSW Government's Unsolicited Proposals process, NorthConnex is an excellent example of governments and the private sector working together to fast-track a project to create huge benefits for the community and road users.

A partnership between the Federal and NSW governments, TfNSW, Transurban and its WestLink M7 partners, the twin 9km tunnels connect the M1 Pacific Motorway and the M2 Motorway.

Innovative design, built for the future

Australia's deepest tunnels have been built with innovative and sustainable design features to cater for future traffic growth.

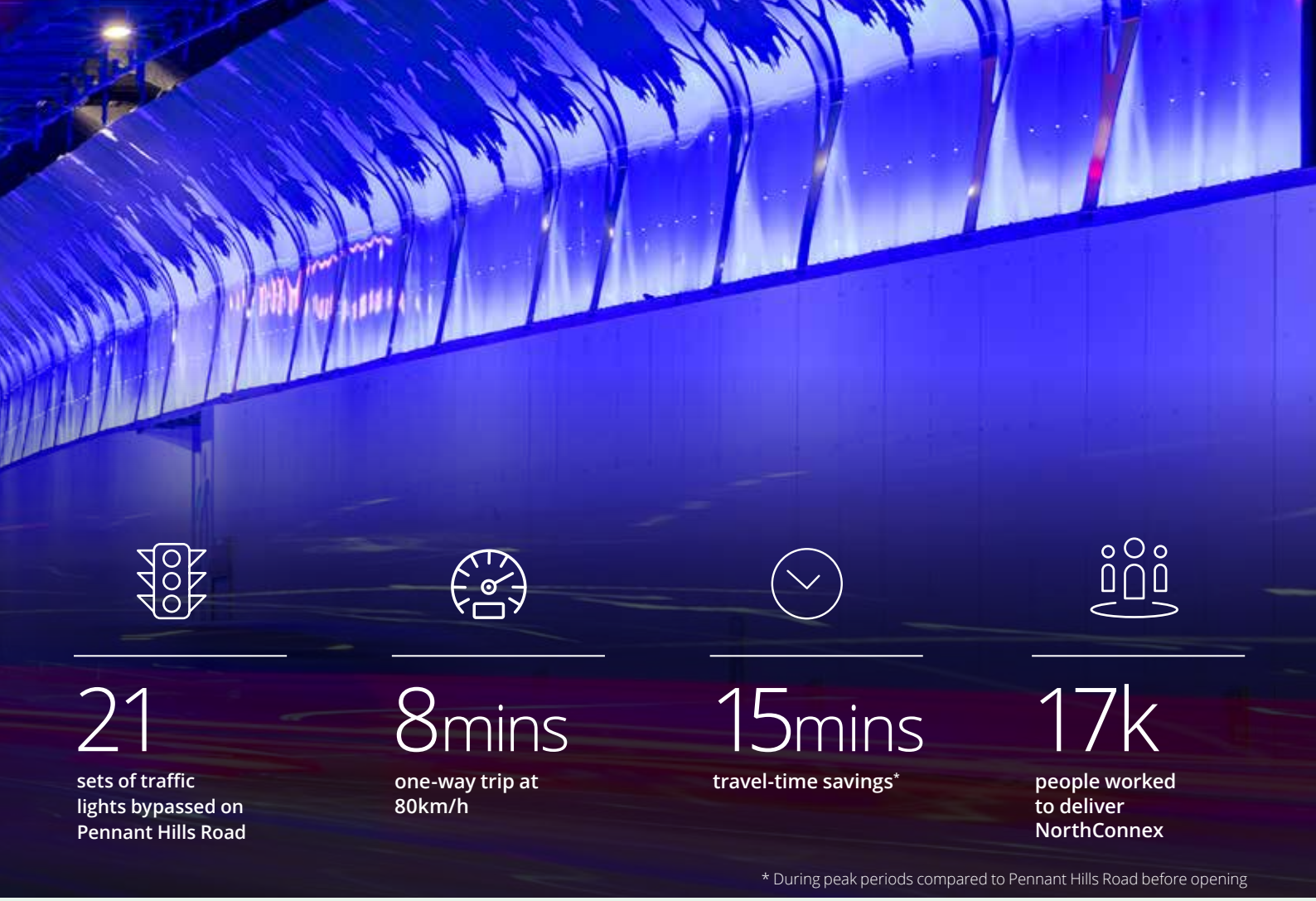
The project has received a "leading" rating for infrastructure sustainability design – the highest possible – from the Infrastructure Sustainability Council of Australia.

Design features include:

- tunnels wide enough for three-lane capacity in each direction (currently operating as two)
- a 5.1 metre tunnel height clearance making it one of the tallest tunnels in Australia, reducing the likelihood of incidents with over-height vehicles and improving the efficiency of the tunnel's ventilation
- a smoother and flatter road gradient for trucks and freight, compared with the sharp corners and hills on Pennant Hills Road, allowing vehicles to maintain normal travel speed, resulting in better fuel efficiency, reduced emissions and less need for lane changing for motorists
- a total LED light solution, reducing carbon emissions by an estimated 83,000 tonnes over the life of the tunnels
- variable speed drive fans which adjust the fan speed based on the number of vehicles travelling through the tunnel. They are expected to provide energy savings of 44%.

In an Australian first, the tunnels feature innovative lighting displays to keep drivers alert and focused as they travel through one of the longest road tunnels in the country. Each lighting display has been placed strategically along the tunnel alignment to ensure drivers remain engaged and aware of their surroundings, but not distracted.

The lighting is the result of research into driver behaviours, conducted in partnership with the University of NSW, Austroads and the project sponsors TfNSW and the Federal Government.



21
sets of traffic lights bypassed on Pennant Hills Road

8mins
one-way trip at 80km/h

15mins
travel-time savings*

17k
people worked to deliver NorthConnex

* During peak periods compared to Pennant Hills Road before opening

Creating jobs

NorthConnex has been a major driver of employment, with more than 17,000 people involved throughout construction, including more than 1,500 workers from the Central Coast. Around 300 businesses from the Western Sydney area contributed to the project, creating significant opportunities for local suppliers and contractors.

The NorthConnex Training Hub ran more than 12,700 training sessions, equivalent to more than 87,000 hours of training.

It helped create pathways for the next generation of workers, providing on-the-job training and education across a range of areas including civil construction, mobile plant operation, emergency and crisis management, financial acumen, leadership and cultural heritage awareness.

The training hub was part of a $10 million investment in training across the entire NorthConnex project.

Giving streets back to the community

A one-way trip on Pennant Hills Road is now 33% faster – with more than 6,000 heavy vehicles a day moved into the tunnel and away from local streets.

For local communities that means less noise and improved safety in their neighbourhood.

Air quality modelling also predicts that NorthConnex will improve air quality along Pennant Hills Road by up to 38% with fewer trucks on the road.[1]

Construction of the tunnel also paved the way for transformation and regeneration opportunities in the local area. More than one million cubic metres of excavated shale and sandstone material from tunnelling was used to fill the former Hornsby Quarry. It has laid the foundations for Hornsby Shire Council to transform the site into a $50 million community recreation facility described as the "Centennial Park of the north".

"This is a real partnership between Transurban, the State Government and the Federal Government and also the Community."

NSW Premier Gladys Berejiklian

1 NorthConnex Environmental Impact Statement - Section 7.3 Air Quality Part 2 page 505, July 2014

3.5 Safer travel

Every day motorists rely on Transurban's Sydney roads and tunnels for safe travel, making more than 930,000 trips across the network.[1]

State-of-the-art safety and traffic management technology and 24/7 monitoring, ensure motorists' journeys are as safe as possible, controlling conditions such as speed limits and lane closures. We also have rapid incident response crews ready to deploy to the scene to ensure safe management of incidents.

In FY19, Transurban responded to approximately 290 incidents a week across our assets in NSW.[2] Our incident response crews clear an incident within a few minutes, working with first responders if the incident is serious to manage traffic flow and ensure the safety of motorists.

This all contributes to Transurban's roads being safer to drive on than similar roads. Analysis by Melbourne's Monash University Accident Research Centre (MUARC) in 2017/18 found that the crash rates for our NSW roads were 68% lower compared to like roads.

Flow-on benefits

Not only are Transurban's toll roads safer, they can also improve the safety of surrounding roads. This is because of the link between congestion and road crashes. By reducing traffic volumes on the surrounding road network, our toll roads ease congestion and improve safety performance on these local roads.

For example, when the NorthConnex tunnel opened in October 2020, there was a marked improvement in congestion on the surface roads above NorthConnex, including Pennant Hills Road and the connecting side streets. As shown in Figure 20 and 21, travel on Pennant Hills Road is now 24% to 33% less congested following the opening of NorthConnex, with 24% fewer vehicles using Pennant Hills Road each workday in the two months post-opening, compared to the two months prior.[3]

The impact of less congestion improving road safety along Pennant Hills Road is illustrated in Figure 22. The map uses data by Compass IOT to show nearmiss incidents along Pennant Hills Road pre- and post-NorthConnex opening. Near-miss incidents are recorded when a vehicle loses traction from a sudden high-force brake or turn. It is clear from the map that the number of near-miss incidents along Pennant Hills Road and side streets have reduced since the opening of NorthConnex.

Case study 5

Research partnership to improve road safety

Our commitment to road safety extends beyond our everyday operations. We invest in research and development that has the potential to improve safety outcomes for motorists across Australia.

In 2020 Transurban entered into a second three-year partnership with Neuroscience Research Australia (NeuRA) to continue our support for its research into road safety.

NeuRA's research program has focused on reducing motorcyclist pelvic injuries, addressing child safety in cars, and improving older driver and passenger protection.

This research has already identified potential improvements for child seats, which the Australian Standards Committee is in the process of reviewing, while new protective equipment for motorcyclists may help improve rider safety.

Research findings from these projects will inform policy, regulation and standards as our transport system transforms through technology aimed at improving the safety of all road users, but which also presents risks in human interaction and reliance.

transurban.com/neura

1 Transurban March Quarter 2021 Update

2 This includes incidents on the M2 Motorway, Lane Cove Tunnel, Eastern Distributor, Cross City Tunnel, M5 South West, M7 Motorway and the M4 Motorway (between Parramatta and Homebush). The M8 Motorway and NorthConnex are not included as these became operational in 2020, and the M5 East is not included as Transurban only assumed ownership in May 2020. FY19 data has been used instead of FY20 data to remove COVID-19 impacts to traffic

3 Transport for NSW, Average Daily Traffic Count, Station ID: 74090, accessed via the online Traffic Volume Viewer

Figure 20. Pennant Hills Road north-bound average speeds pre- versus post-NorthConnex[1]

Figure 21. Pennant Hills Road average speeds pre- versus post-NorthConnex opening[2]

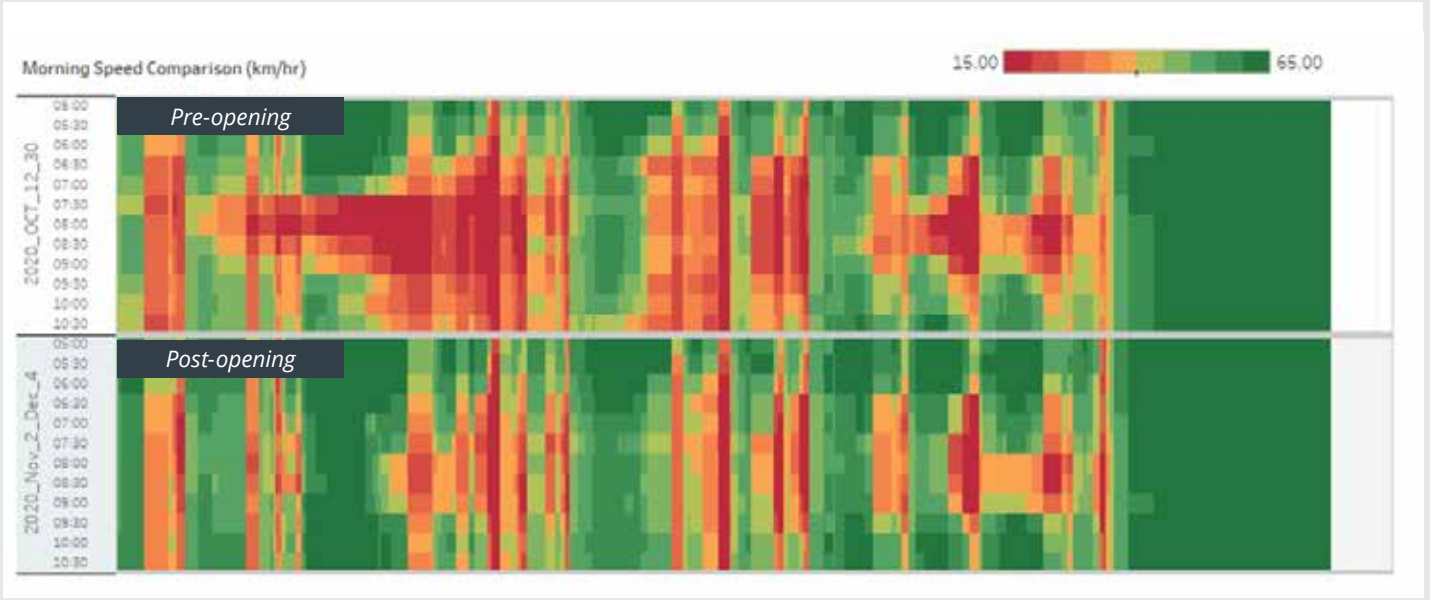


Figure 22. Pennant Hills Road near-miss incidents, pre- versus post-NorthConnex opening[3]

1 TomTom Congestion data, comparing the two months before opening to the two months after opening
2 TomTom Congestion data, October 2020 versus November 2020
3 Compass IOT data

Case study 6

Cleveland Street off-ramp

Transurban's monitoring of the network observed that queuing on the Cleveland Street off-ramp from the Eastern Distributor would cause congestion to spill back on to the motorway and significant delays on the connected arterial network. This led to erratic and last-minute manoeuvres by motorists and turbulent traffic flow, often reducing the busy inner-city motorway down to one lane and causing delays throughout the inner-city suburbs of Waterloo and Surry Hills.

In July 2017, Transurban and TfNSW began a six-month trial, which closed the off-ramp. In the lead up to the trial, we worked with TfNSW to undertake thorough traffic modelling, road safety audits and community engagement, which resulted in the decision to trial the off-ramp closure.

Since the off-ramp closure, weekday motorway speeds have improved by 5%, while weekend journey speeds on local roads have improved by 6%.

Aside from smoother traffic flow and travel reliability, the closure has also increased safety on the motorway and amenity on the local streets for the inner city. The off-ramp remains closed due to the success of the trial.

Pre Trial (typically between 10am - 3pm) **During Trial** (between 10am - 3pm)

Looking north at South Dowling St and Eastern Distributor (near Crescent St)

Case study 7

M7/M2 proactive speed trial

The M7 Motorway experiences regular workday morning eastbound congestion at the M2 Motorway interface near the Abbott Road merge, often extending back to Norwest Boulevard – a distance of four kilometres – and impacting motorists' safety and travel-time reliability.

To address the problem Westlink M7, which is 50% owned by Transurban, trialled an innovative smart motorway solution using real-time traffic data and Variable Speed Limit Signs to proactively reduce speeds from 100km/h to 80km/h just before the onset of congestion.

The six-month trial began in 2018 and aimed to smooth traffic flow and reduce sudden speed drops to improve road safety and travel reliability. In the 18 months before the trial, this section of the M7 saw 12 crashes. During the trial, no crashes were observed. The smoother traffic flow also reduced the duration of congestion by approximately 10 minutes and queue lengths by about 500 metres.

Given the success of the trial in improving safety and reliability outcomes for motorists on the M7 Motorway it was determined dynamic speed management continue as part of regular operations.

3.6 Investing in the network

The traffic and safety performance of Transurban's roads can impact surrounding roads and vice versa.

Transurban works closely with the NSW Government on short and long-term network planning and invests significantly in operations and maintenance to ensure toll roads remain a safe and reliable part of the broader road network.

Data and analytics are central to Transurban's approach. By combining external sources of data – such as TomTom traffic data measuring average speeds – with data collected from Transurban's roadside Intelligent Transport Systems (ITS), we are able to identify trends in traffic congestion both on and off the motorways as well as safety hot spots.

This data captures the average speed on Sydney toll roads at different times of the day, which can be compared year-on-year. This provides new opportunities to more effectively manage the motorway as a whole. This is shared with government to ensure that investment decisions can be made with the most accurate information.

Solutions may range from new roads to physical road widenings and upgrades such as the M2 Upgrade and the M5 South West Widening Project, or involve smaller network optimisation enhancements or smart motorway technology solutions, see Case studies 6 and 7.

Figure 23. Solution—Congestion resolved

Average speeds in Sydney have been steadily deteriorating during peak periods on certain sections of the orbital network. The charts highlight the positive impact that the opening of the M8 Motorway in 2020 had on average speeds on the M5 South West heading into the city during the AM peak.

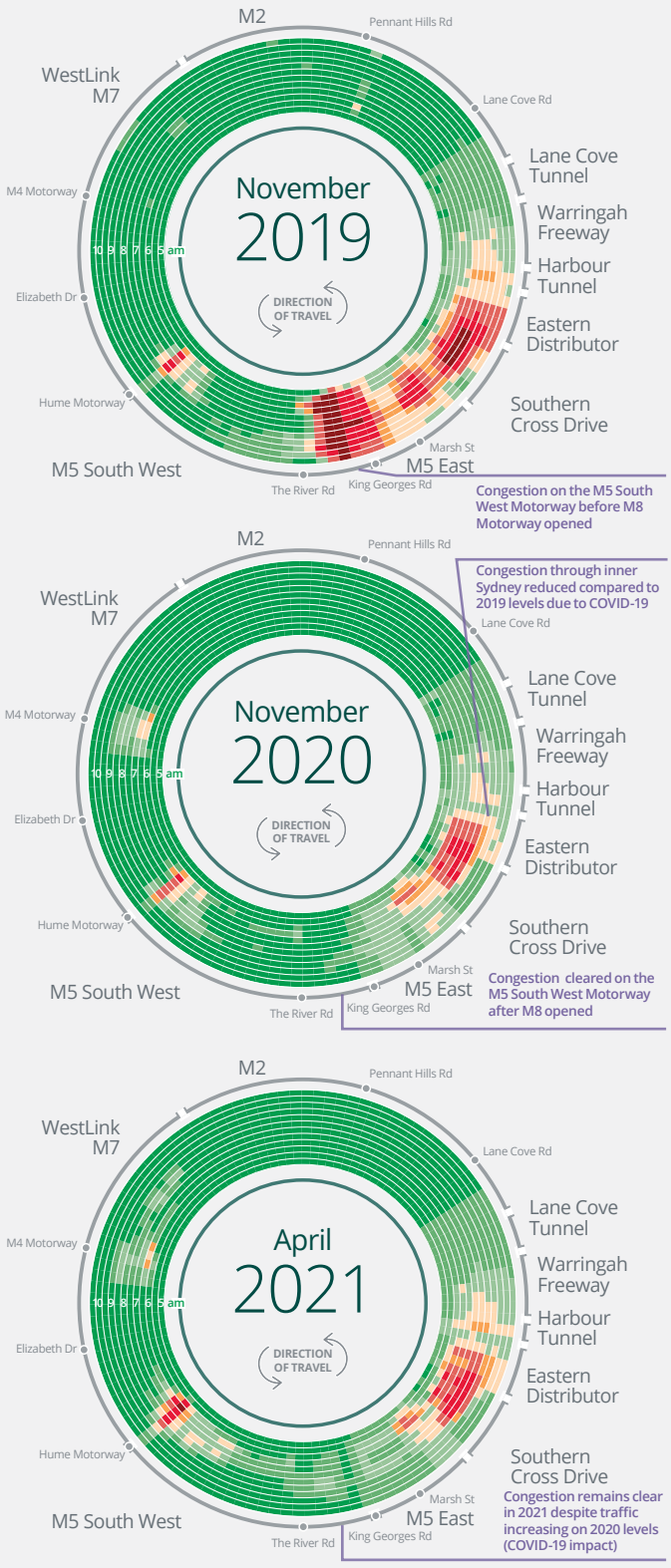
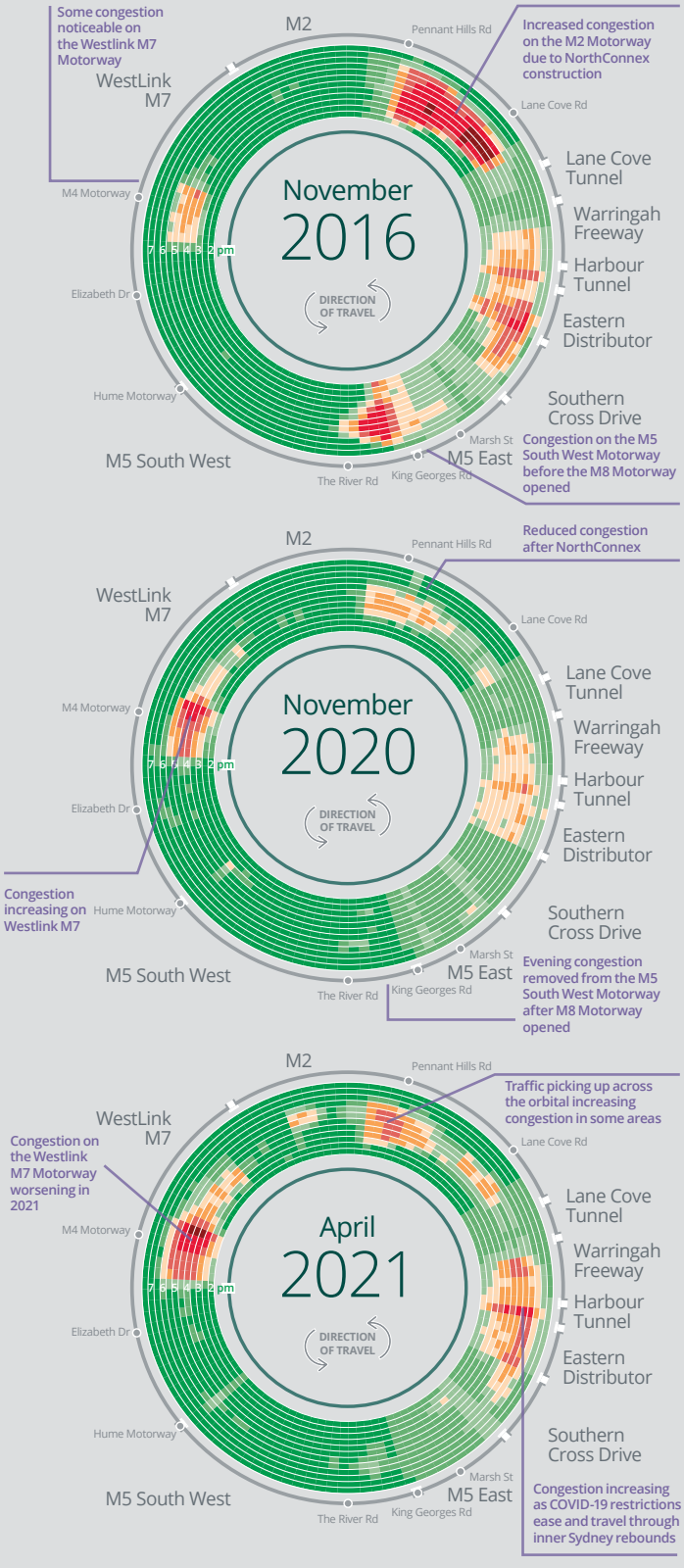


Figure 24. Challenges—Congestion puts pressure on the network

Congestion on the Westlink M7 Motorway increased between 2016 and 2021 during the PM peak. This is an issue Transurban is currently working on with TfNSW to address ahead of the opening of the M12 Motorway that connects Western Sydney Airport to the M7.



Speed Legend

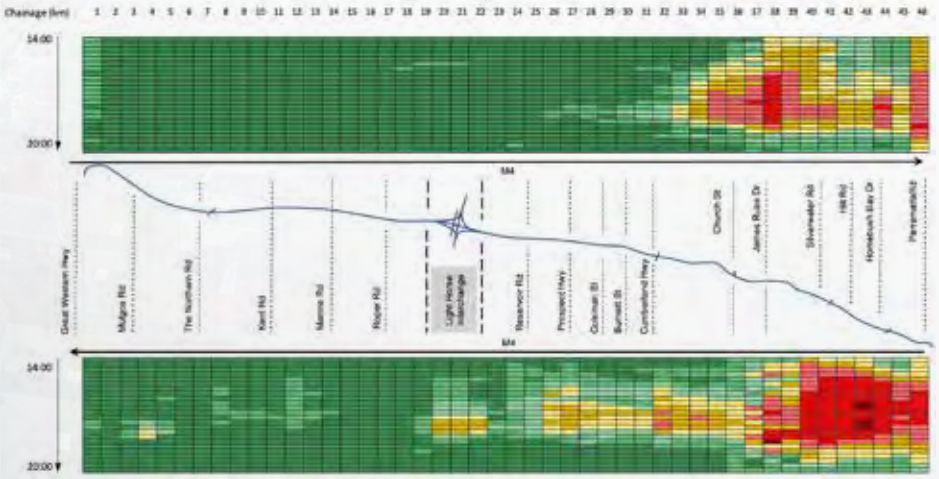
Kph	0-20	20-30	30-40	40-50	50-60	60-70	70-80	>80

Source: TomTom congestion data

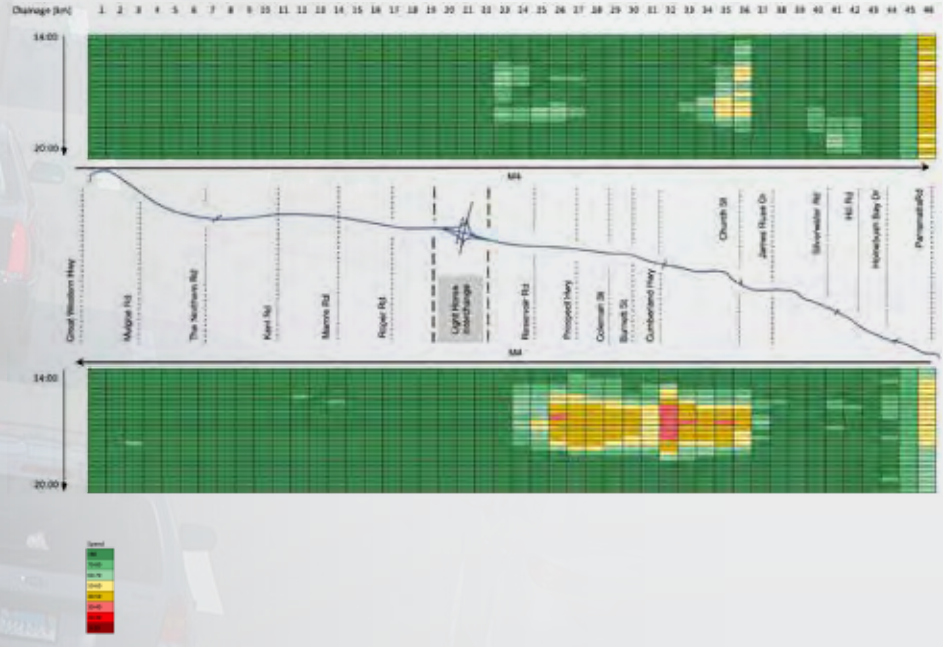
The heat maps below (Figure 25) show the immediate impact of the widening of the M4 Motorway – completed as part of WestConnex – on congestion after it opened to traffic in July 2017. The 7.5km M4 Widening formed part of the first stage of the WestConnex project.

Figure 25. Congestion on the M4 Motorway before and after widening

November 2015—PM peak before widening



November 2020—PM peak after widening



Source: TomTom congestion data

Peak travel-time savings

30mins

return trip

Travel speeds up by

60%

Crashes down by

40%

Invested over

$4.7m

to upgrade technology, safety equipment and maintenance facilities

Case study 8

M5 East: faster, safer travel

Used by around 100,000 motorists every day, the M5 Motorway corridor is a major passenger, commercial and freight route, which provides a vital connection between south-western Sydney and the CBD, Sydney Airport and Port Botany.

Since opening in 2001, the M5 East has been one of the city's busiest motorways but, from the outset, operated at capacity with some of the slowest travel times of any motorway in Sydney.

During peak traffic times, average speeds were down to around 40km/h, creating significant congestion and unreliable travel times for tens of thousands of motorists and freight who relied on the motorway.

The opening of the WestConnex M8 in July 2020 has addressed this transport challenge by doubling capacity of the corridor to four lanes in each direction and halving travel times on the M5 East. Motorists are enjoying smoother, safer journeys and productivity has improved for businesses and freight vehicles.

A toll was applied to the M5 East when the M8 opened reflecting the significant benefit thousands of motorists are experiencing on both tunnels.

While some motorists are choosing to use the toll-free alternative route, the full benefits of the newly tolled corridor won't be realised until the WestConnex and Sydney Gateway projects are complete.

Travel-time savings

Drivers are saving up to half an hour a day on a return trip on the M5 East and average travel speeds have doubled.

A one-way trip using the 5.5km M5 East used to take up to 18 minutes. The same trip now takes around 8 to 9 minutes during peak traffic times.

Average travel speeds along the existing M5 corridor have improved by almost 60%—from 45 to 71 kilometres per hour.

A trip from Campbelltown to the Sydney airport via the M5 East used to take around one hour. Motorists are now saving around 20 minutes on the same trip compared with this time last year, and around 35 minutes compared with the toll-free alternative.

The maximum toll cost for a one-way trip on the M5 East is $7.23 for cars and motorbikes and $21.70 for heavy vehicles.[1]

A safer journey

Since the M8 opened, crashes on the M5 East have also dropped significantly, down by more than 40%, a result of less traffic and smoother traffic flow in the tunnels. Incidents involving over-height vehicles entering the tunnel have dropped by almost half, meaning motorists are spending less time stuck in gridlock while the incident is cleared.

Investing in operations

Since Transurban began operating the M5 East in May 2020, we have invested more than $4.7 million to upgrade technology, safety equipment, and maintenance facilities to bring the tunnels in line with the rest of the WestConnex network.

This includes:

- $2.5 million to replace the original water treatment plant, which was commissioned more than 20 years ago
- $1.5 million to upgrade the Emergency Telephone and Fire Emergency Telephone Systems and replacing more than 300 phones throughout the motorway control centre and tunnel
- a security upgrade of the M5 East to an electronic key entry system and
- upgrading the in-tunnel PA system.

Further projects are planned next financial year with an additional $2.4 million allocated to:

- replace more than 25 in-tunnel cameras
- upgrade tunnel ventilation fans
- replace fire pumps
- drainage and electrical upgrades.

1 Toll, as at April 2021

Operations and maintenance

To keep our roads running smoothly, Transurban invests heavily in the operations and maintenance of each asset. This includes everything from maintaining a 24/7 incident response service on every road, to resurfacing works and technology equipment upgrades.

Across Transurban's NSW assets, $350 million will have been spent on operations and maintenance between FY19 and FY21.[1] This helps ensure the roads flow smoothly, which reduces wear and tear on customers' vehicles.

The freight industry relies on our roads and heavy vehicles have a greater impact than light vehicles.

Figure 26 shows that while the road damage cost caused by light vehicles is 4.39 cents per vehicle kilometre, the damage caused by B-doubles is over five times the cost at 25.23 cents per vehicle kilometre.

Our roads and tunnels are also far from just concrete and bitumen and have sophisticated intelligent transport systems installed.

Roadside technologies such as, lane-use management systems, variable speed limit signs, CCTV cameras, automatic incident, height and occupancy detection systems work together to help get the best out of a motorway.

All this is integrated into a central traffic management system that can apply traffic management plans, and in the future will be increasingly automated and coordinated with connected and automated vehicles.

Figure 26. Road damage cost[2]

VEHICLE TYPE	UNIT COSTS (CENTS / VKT)
Cars and motorcycles	**4.39**
Rigid truck	**5.48**
Light rigid (LCV)	4.39
Medium rigid	10.08
Heavy rigid	15.14
Articulated trucks	**18.70**
4 or less axles	14.91
5 axles	16.57
6 or more axles	19.32
Combination vehicles	**24.85**
Rigid 3 axle plus trailer	16.45
Rigid 4 axle plus trailer	25.61
B-double	25.23
Double road train	28.39
B-triple	35.63
Buses	**8.25**
2 axle light bus	4.39
Rigid bus	10.22
Articulated bus 3 axle	11.66
Special purpose vehicles	**13.75**
Sub-total: Light Vehicles	4.39
Sub-total: Heavy Vehicles	15.08
Total: All Vehicles	**5.09**

1 Total operations and maintenance spend on all NSW toll roads in which Transurban has an interest, between FY19 and FY21 (actual and forecast)
2 Transport for NSW, Economic Parameter Values Version 2.0, June 2020

Case study 9

Ensuring all systems are go

As one of the longest and deepest tunnels, NorthConnex is equipped with the country's smartest and most sophisticated safety and operational systems designed to manage motorway performance which is critical to operations.

These systems can detect issues which may impact the tunnel such as traffic volumes, speeds, ventilation, air quality, over-height vehicles and incidents, and are used by our operators and incident crews who monitor the motorway 24/7.

Regular maintenance closures take place on a quarterly basis, usually during the night when traffic volumes are lower so as to minimise disruption to our road users. Tunnel ventilation, jet fans, emergency equipment, surveillance including cameras, fire detection systems including water sprinklers and traffic management systems are tested under a range of scenarios to ensure everything is operating as it should by up to 100 workers during the closure.

NorthConnex tunnel technology

Full mobile phone coverage in Australia's deepest tunnel (up to 90 metres underground)

Digital radio break-in communication systems

Vehicle sensors and barriers at the tunnel entries to stop over-height and prohibited vehicles from entering the tunnel

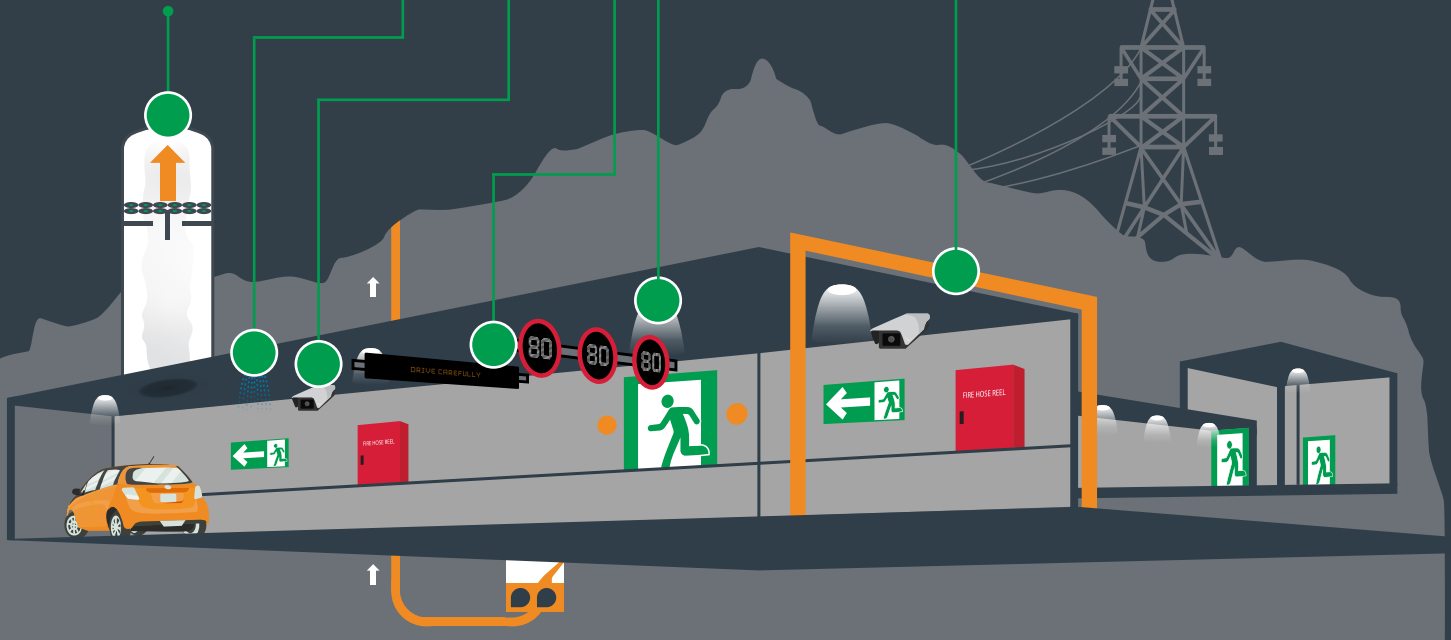
5,000 LED lights

Almost 400 electronic signs in the tunnel including Variable Message Signs (VMS), speed signs and traffic management signs

850 cameras provide 100% CCTV coverage. This includes stopped vehicle detection cameras to alert of potential incidents

The water sprinkler system provides 100% coverage of the tunnel. Each water deluge zone is around 24 metres and water can flow up to thousands of litres per minute

Tunnel ventilation including two ventilation outlets, 142 roof mounted jet fans and more than 60 air monitoring devices



3.7 Listening to our customers

When people choose Transurban roads, they expect faster, more reliable and safer trips than alternative routes offer, as well as exceptional customer experience.

We continually find new ways to listen, understand our customers' needs, and reflect on what we can do to improve the travel experience. We're also continuing to invest in new systems and technology to keep ahead of the pace of innovation and ensure our customers can engage with us across a range of platforms.

Continuous improvement

Through our Voice of the Customer listening program, we analyse around 250,000 pieces of feedback from our Australian customers each year.

Our customer service approach has earned us consistently positive Net Promoter Scores (an industry measure of customer advocacy) in NSW (Figure 29).

Listening and acting on customer feedback has helped us to increase customer satisfaction, reduce the number of complaints we receive and enhance our products and services to improve the overall experience on and off our roads. Results of customer feedback about our on-road performance are in Section 3.4.

Recent improvements made to our customer service channels as a direct result of customer feedback include:

- increasing functionality on our digital platforms to give customers even greater ability to self-service
- providing customers who contact our call centre with an option to receive proactive notifications to help them manage their accounts, including SMS links to our digital platforms to complete self-service transactions
- improving webchat on our Linkt website to make it easier for customers to get answers quickly and extra support to complete tasks. With more customers needing help outside of regular business hours due to impacts from COVID-19, this feature was especially valuable.

In NSW, continuous improvement of our digital channels has seen customer calls decrease while digital interactions trend upwards.

Resolving customer enquiries

With 1.3 million customer accounts in NSW, Transurban is focused on resolving customer enquiries quickly and effectively.

Our Linkt customer service teams are based both in Australia and abroad, with the more complex customer queries and complaints directed to our Customer Resolutions teams in Australia to resolve.

We have a policy of first-contact resolution, closing out around 98% of NSW customer calls in the first contact. Our focus through this process is to resolve queries and complaints in a fair and reasonable way that avoids the need for further escalation.

Importantly, once a matter is resolved, the team provides feedback to the business around key learnings and insights, ensuring opportunities for continuous improvement are captured and actioned.

Our Customer Resolutions team is held to a high standard, with the team independently certified as compliant with the AS ISO 10002—2014 Complaint Handling Standard, and certified by the Customer Service Institute of Australia.

Supporting our customers in difficult times

We work closely with customer and community advocates to identify ways to remove customer pain points and stop people accumulating toll road debt unnecessarily. Simple initiatives such as proactively notifying customers about outstanding toll invoices and requesting they update their account information have contributed to customer complaints being halved over the past six years.

Nonetheless, we recognise that some people have difficulty managing their toll payments, so our Linkt Assist team is in place to provide tailored support for customers going through tough times.

This confidential support can include things like more time to pay for toll road travel, ongoing payment plans and advising state enforcement groups and other toll road operators of a person's situation (with their consent).

"Outstanding customer service and support...

Linkt ensured that due to my unseen financial circumstances I was looked after. "

Customer feedback, 2020[5]

Since launching in 2019, the Linkt Assist program has expanded to include multi-lingual educational resources co-designed with The Salvation Army financial counsellors.

We have also worked with the community legal and financial counselling sectors nationally to design new guidelines to support customers experiencing family violence.

Extra support during COVID-19

Whether it's bushfires or a global pandemic, the last few years have demonstrated that anyone can experience vulnerability at any time, and practical financial support can really help when a crisis hits.

Since the start of the pandemic, Transurban has provided more than $10.1 million worth of travel to more than 40,000 people as part of our toll credit program.

We know many people will still need support after the COVID-19 risk subsides, so toll credits are now part of our expanded Linkt Assist support program, to cover essential travel for people facing hardship.

Figure 27. Digital interactions NSW customers

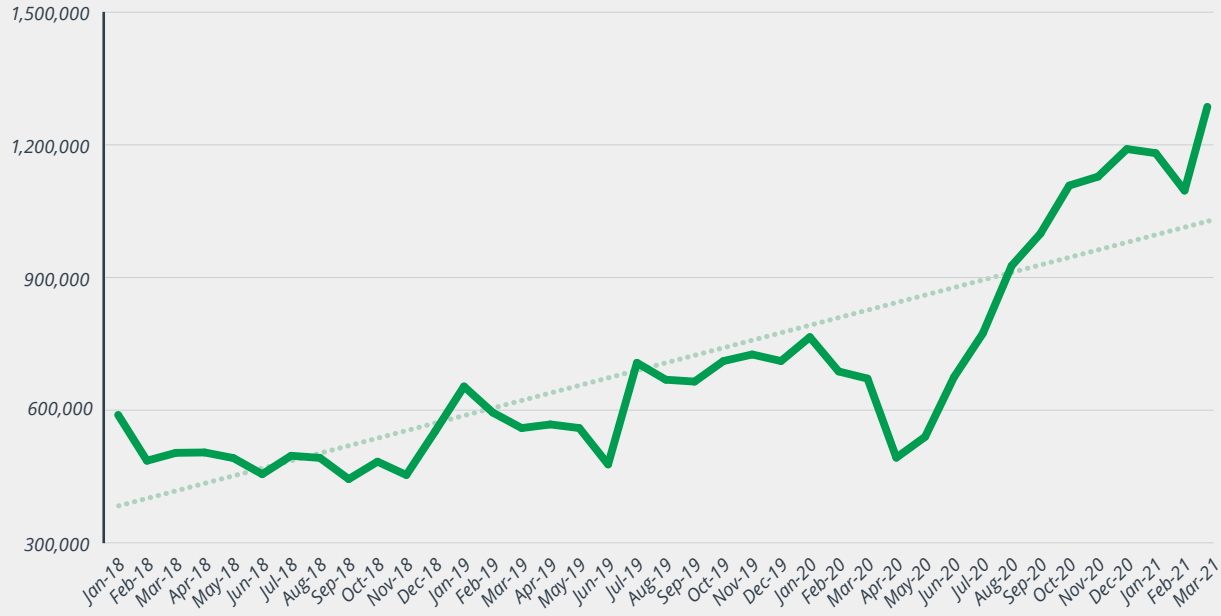


Figure 28. Answered calls NSW

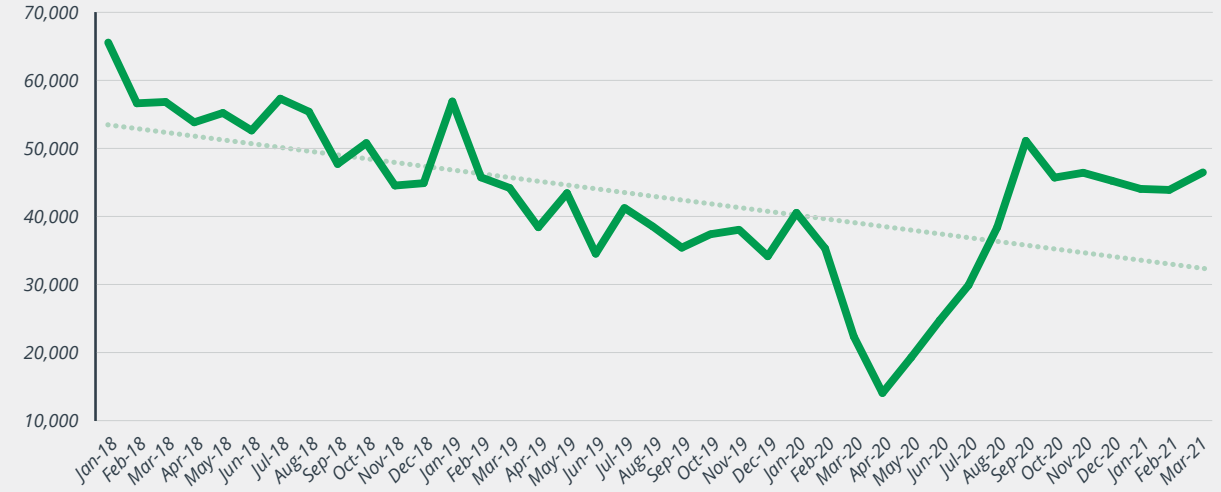
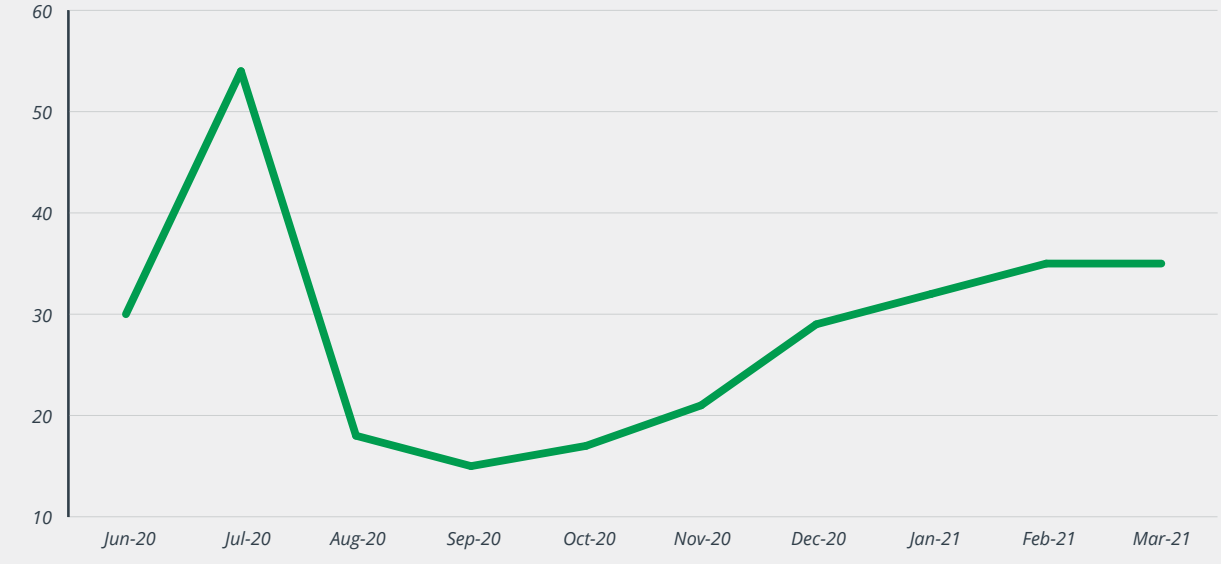


Figure 29. NPS Contact Centre NSW customers



Case study 10

Helping customers stay out of debt

Most drivers have a 'set and forget' experience when it comes to paying for toll road travel, however occasionally customers travel without a valid payment arrangement in place and fail to respond to toll notices. Until recently a customer needed to needed to travel on a NSW toll road 10 times without a valid payment arrangement in place (without responding to toll notices) before Transurban could send a request to TfNSW for contact details. This meant drivers could accrue significant toll debt – and miss opportunities to access our Linkt Assist hardship support services – before the debt recovery process commenced. Working with TfNSW and the NSW Privacy Commissioner, we improved this process by allowing TfNSW to provide a person's contact details to Transurban after only one unpaid toll notice.

Early notification means we can now understand a customer's personal situation and arrange payment before debt collection activities commence, avoiding additional costs and anxiety. Early awareness also encourages customers to avoid incurring further charges by ensuring they have an arrangement in place for future travel. And to ensure people keep their debts at a manageable level, debt recovery activities now commence if a driver fails to respond to three toll notices for the same road.

Case study 11

LinktGO

While most customers opt to have a toll account, some prefer to pay for their tolls without an ongoing commitment.

Our solution is LinktGO, an innovative way for people to pay for their toll travel. The app uses a phone's GPS, plus geo-fencing along Australian toll roads, to know when a driver has entered and exited a toll road—so people can travel without a tag.

Using LinktGO, customers pay trip-by-trip, with trip details and associated costs displayed in near real-time and prompts to indicate when payment is due. Trips are recorded even if the phone battery dies or data connection is lost.

Since launching in late 2017, LinktGO has been downloaded more than 300,000 times and has processed over 3 million trips.

The app is highly rated in both the App Store at 4.7/5 and Play Store at 4.5/5, and has won 14 awards for product innovation, product design, and customer experience innovation.

Case study 12

Linkt Assist 360

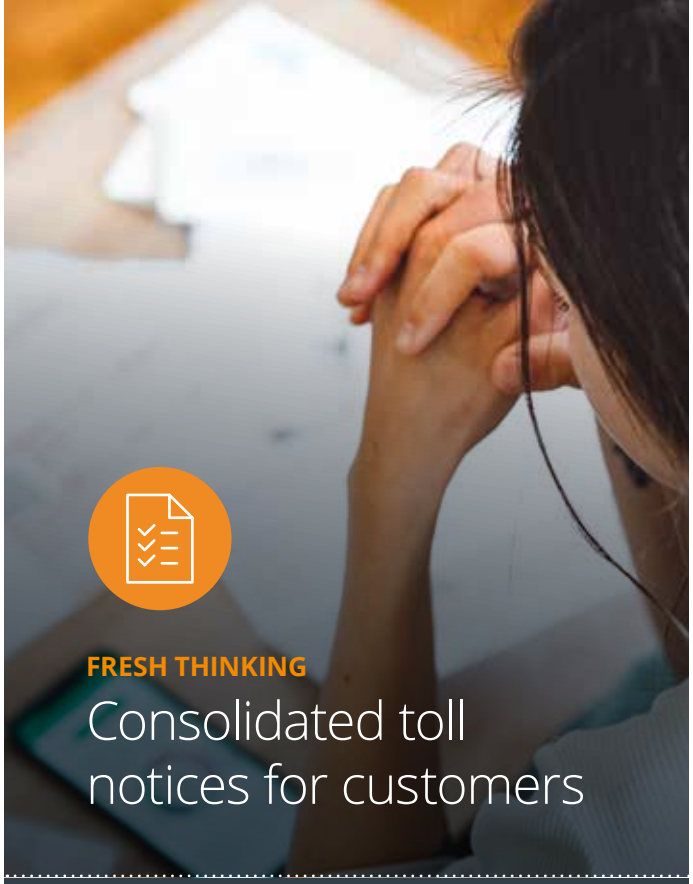
With the continuing economic impacts of COVID-19, Transurban has partnered with Good Shepherd to help Linkt customers in need, to access a wide range of additional support services, through an extended program called Linkt Assist 360.

The program recognises that the most vulnerable Linkt Assist customers are often dealing with issues far more serious than toll debt.

The partnership between Transurban and Good Shepherd means these customers will now be offered personalised, comprehensive support to restore their emotional and financial wellbeing.

The support may include financial counselling, family violence, mental health or homelessness support.

Good Shepherd is a trusted independent provider of community services, and part of a global network spanning more than 70 countries. Good Shepherd has been working with the community for over 200 years to help people feel safe and take control over their own lives through connecting people to a coordinated and diverse range of services to meet their, and their family's needs.



FRESH THINKING

Consolidated toll notices for customers

NSW has the highest rate of 'no arrangement' toll road travel in Australia, with 29 million toll notices issued for Transurban's NSW roads each year.

Under current concession deeds, a motorist who travels on a NSW toll road without a valid payment arrangement in place, or with a suspended account, receives a single toll notice for every trip taken.

This creates a poor customer experience that wastes paper, time and money, with a cost recoverable administration fee of $10 for each toll notice, increasing to $20 for subsequent reminder notices.

These fees are significantly discounted to $1.10 and $2.20 respectively for customers who transfer their toll debt over to a retail account, however data shows us that many customers with suspended accounts use this fee discount as an incentive to top up their overdrawn accounts once they receive a toll notice, rather than keep up to date with payments. This means that toll road operators absorb much of the administrative cost of issuing toll notices.

Transurban proposes to consolidate toll notices, so a customer only receives one toll notice for three days of travel across the Sydney network. As part of this change, the fee discount would also be removed, to encourage customers to stay out of debt and ensure toll road operators recover toll notice costs.

This change will be fairer for customers, reduce the confusion that comes with receiving multiple toll notices and bring NSW into line with the toll notice process in Victoria and Queensland.

Section 4:
More than roads—investing in communities

Partnerships

We invest in partnerships to support and strengthen communities, including:

- KARI Foundation Indigenous Driver Program
- Engineers Australia STEM-focused education
- Neuroscience Research Australia (NeuRA) Road Safety Centre
- Salvation Army's Drive.

WestConnex's partnership with Western Sydney road safety educator the Blue Datto Foundation has enabled more than 25,000 students to participate in its award-winning road safety program, 'Keeping Safe' —ensuring vital education remains accessible to young people who are some of the most at-risk on NSW roads.

Open spaces

In Sydney where green space can be limited, WestConnex is providing more than 18 hectares of new and revitalised open space, and planting around 1 million new plants along the project corridor.

Almost 6,000 homes are now within a 10 minute walk of Ismay Reserve, a previously unused corridor in Sydney's west which has been transformed into a popular new public recreation space.

An artist-designed playground at Simpson Park in St Peters and a pocket park with active transport links in Haberfield have also provided new open spaces for local families and residents in Sydney's inner west to enjoy.

Cycleways

Around 70 kilometres of pedestrian and cycle paths will be delivered as part of the WestConnex, NorthConnex and M7 motorways.

In 2020, the Campbell Street Green Link was extended via a new toll-free bridge as part of the WestConnex M8, providing a new shared path connection between St Peters and the growing Mascot precinct. It also integrates with the Bourke Street cycleway linking previously limited connections and improving cyclist's safety.

Riders in Sydney's north-west are benefiting from a new elevated cycleway and underpass on the M2 cycleway, built as part of NorthConnex. It separates riders from motorway traffic to provide safe travel around NorthConnex and its connections with the M2.

Grants

Over the past five years, almost 360 community grants of up to $10,000 each have been awarded to local organisations across Sydney, from Hornsby to Beverly Hills.

The grant programs support local initiatives and projects that benefit communities along our motorway corridors and provide lasting outcomes for communities.

These have directly impacted more than 275,000 people to date and have helped deliver a range of legacy projects, including STEM and sports equipment for schools, education programs, new facilities to assist people living with disabilities, sustainability initiatives and heritage restoration projects.

Public art

WestConnex Canal to Creek public art program showcases 18 commissioned artworks, enhancing new and existing parklands between Beverly Hills and St Peters.

Featuring artist-designed playgrounds, large-scale murals and immersive lighting installations, a writer's walk and contemporary sculpture, the art trail will leave a cultural legacy for the community to enjoy.

Canal to Creek to classroom

Inspired by its public art program, WestConnex and Transurban have developed an interactive education arts portal for high school students, which aligns with the NSW curriculum.

The portal enables students to engage with 360 degree imagery of the Canal to Creek artwork, learn directly from acclaimed artists about how their works were created and access other interactive resources.

WestConnex partnered with the Visual Arts Design Educators Association (VADEA) to deliver the initiative, which Co-President Nicole DeLosa said has ensured public art is accessible to students, no matter where they live.

"We believe that the WestConnex Public Art Portal is one of the most innovative and exciting educational experiences we've seen. The portal delivers a truly relevant and unique approach to interact with these commissioned artworks in a relevant and engaging way,"

Nicole DeLosa
Co-President VADEA

Section 5: Decarbonising transport

In line with the NSW Government's commitment, Transurban has a clear decarbonisation strategy in place to help us reach net-zero emissions by 2050.

Our decarbonisation strategy spans everything from designing, building and powering our roads to advocacy and education about how to reduce GHG emissions and fuel while driving (Figure 30).

On average our customers save between 30-50% in fuel and GHG emissions per trip compared to alternate routes.

Our Sustainability Policy is aligned to the United Nations Sustainable Development Goals most relevant to our business, in particular the growth and liveability of cities where we operate.

We have had a climate change strategy in place since 2012 and have developed a detailed understanding of climate-related threats and opportunities and their impact on our operations, asset deterioration and life-cycle planning.

Our GHG reduction targets comprehensively cover scope 1, 2 and 3 emissions and have been externally validated by the Science Based Targets initiative in line with climate science.

Figure 30. Transurban's decarbonising strategy

Our approach to achieving net-zero emissions

Design

Designing and building all of our Australian projects to achieve a rating of "Excellent" or above under criteria set by the Infrastructure Sustainability Council of Australia.
For example: Reducing inclines in road and tunnel designs to limit engine labouring and restoring and regenerating sites next to our roadways.

Construction

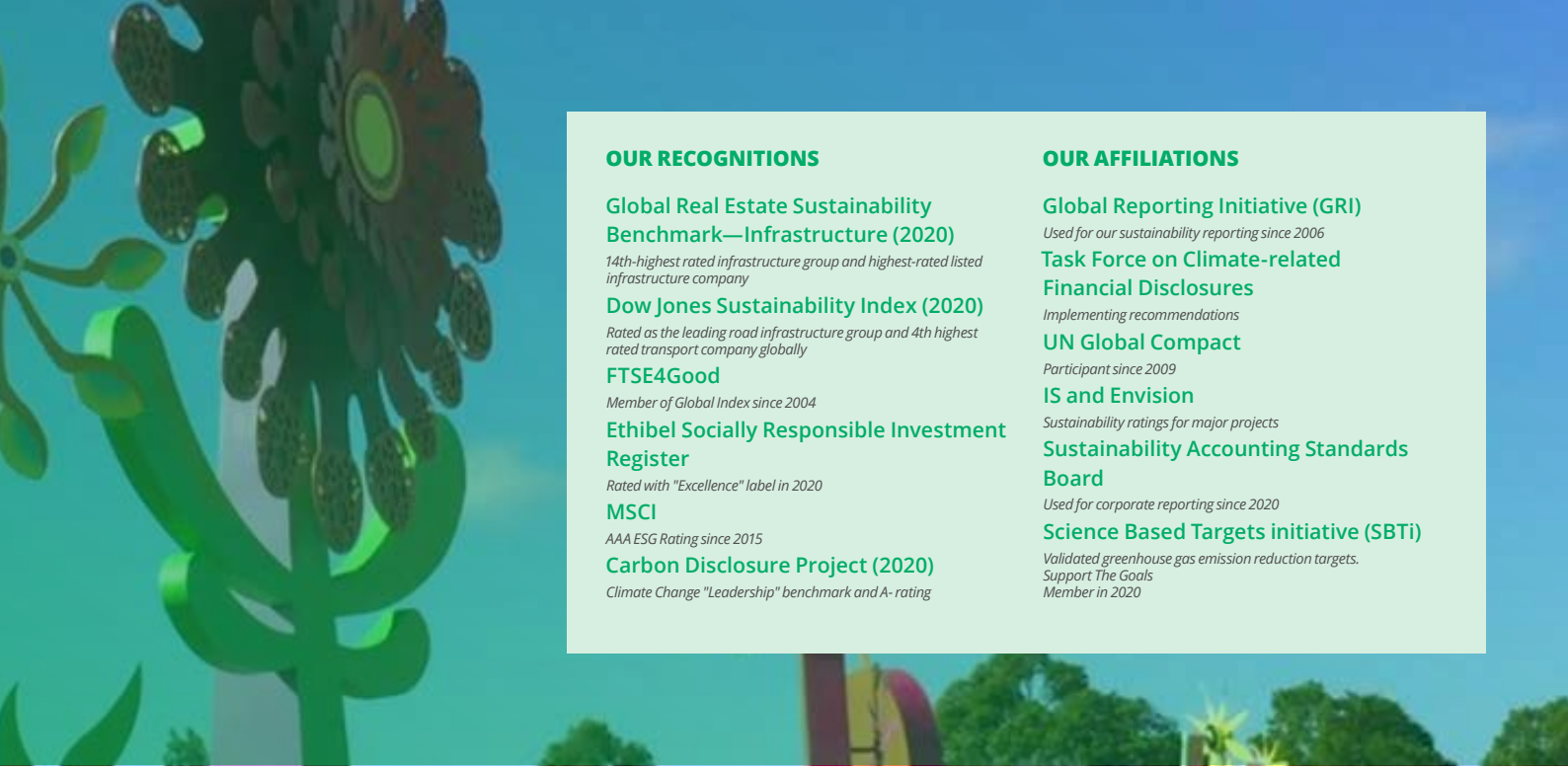
Rethinking the way we design and construct assets to reduce direct fuel consumption, increase renewable energy and use low-carbon materials.
For example: partnering with leading Australian climate change think tank, Beyond Zero Emissions, to set ambitious targets to reduce carbon emissions from cement production; supporting the 'circular economy'; protecting biodiversity and minimising potable water use.

Operations

Reviewing and updating the way we operate our assets to reduce energy demand and GHG emissions.
For example: Power Purchase Agreements with wind farms in regional NSW to provide renewable energy; transitioning to low-energy LED lights (Eastern Distributor, the M5 East and South West and the M2); installing solar energy on control rooms and trialling plant breathing walls on the M2 and Eastern Distributor to test their ability to improve air quality.

Customer emissions

Educating customers about fuel-efficient driving and advocating for and supporting the uptake of zero-emission vehicles (ZEVs).
For example: using smart motorway technology to create more free-flow travel; setting contractor targets for fuel efficiency; awareness programs to address barriers to ZEV uptake and promoting our Trip Compare online tool which provides real-time information about travel time, fuel consumption and GHG emissions for trips on our tolls roads versus alternate routes.



OUR RECOGNITIONS

Global Real Estate Sustainability Benchmark—Infrastructure (2020)
14th-highest rated infrastructure group and highest-rated listed infrastructure company

Dow Jones Sustainability Index (2020)
Rated as the leading road infrastructure group and 4th highest rated transport company globally

FTSE4Good
Member of Global Index since 2004

Ethibel Socially Responsible Investment Register
Rated with "Excellence" label in 2020

MSCI
AAA ESG Rating since 2015

Carbon Disclosure Project (2020)
Climate Change "Leadership" benchmark and A- rating

OUR AFFILIATIONS

Global Reporting Initiative (GRI)
Used for our sustainability reporting since 2006

Task Force on Climate-related Financial Disclosures
Implementing recommendations

UN Global Compact
Participant since 2009

IS and Envision
Sustainability ratings for major projects

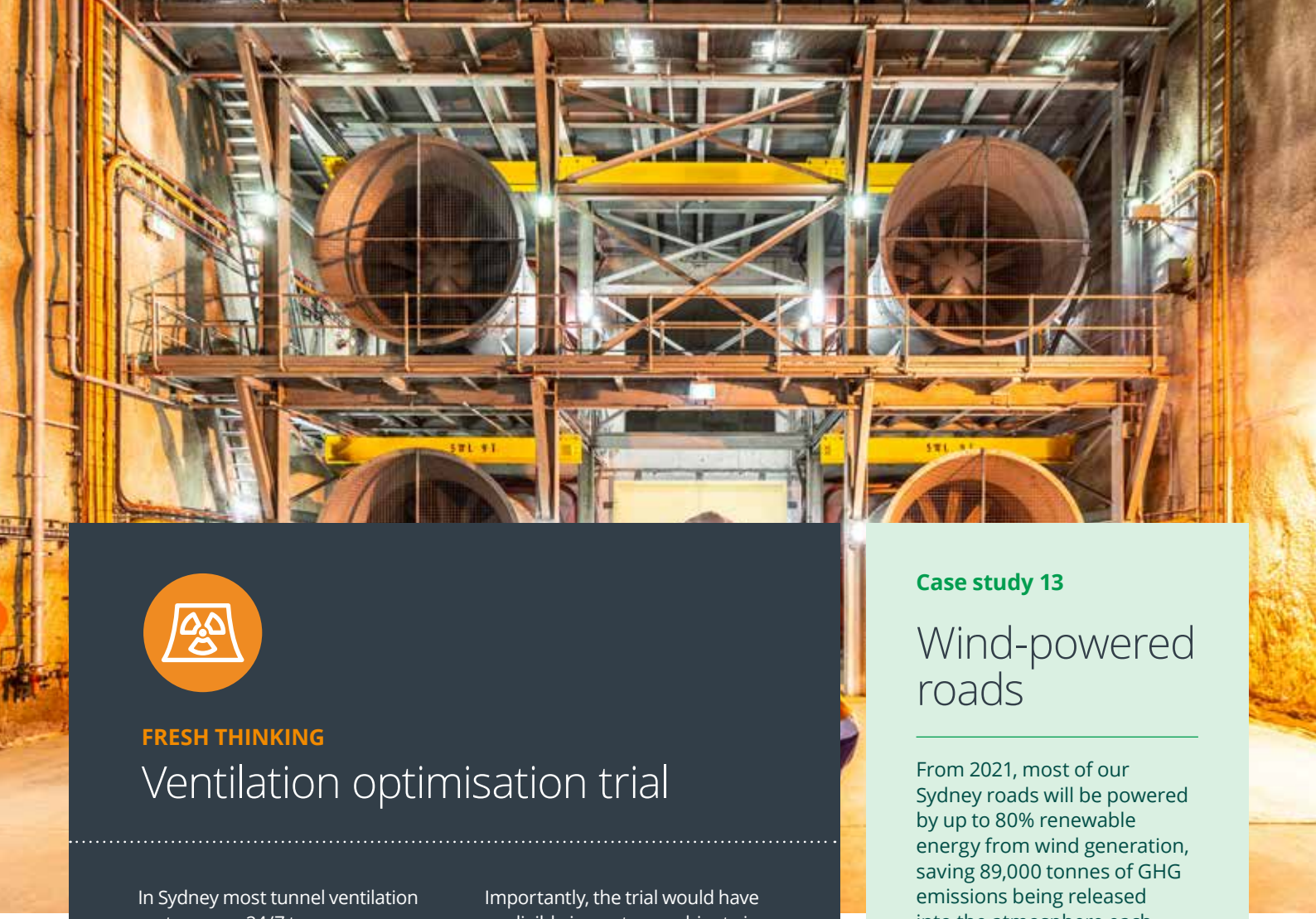
Sustainability Accounting Standards Board
Used for corporate reporting since 2020

Science Based Targets initiative (SBTi)
Validated greenhouse gas emission reduction targets.
Support The Goals
Member in 2020

Figure 31. Table of peak customer savings, travel-time and fuel/emissions savings, by asset—April 2021

ROAD	TRAVEL[1]	TIME SAVING[2]	AM / PM	PASSENGER VEHICLES			LCV[4]			HCV[5] (RIGID)			HCV[5] (ARTICULATED)		
				Fuel saved (L)	GHG saved[3]	Savings %	Fuel saved (L)	GHG saved[3]	Savings %	Fuel saved (L)	GHG saved[3]	Savings %	Fuel saved (L)	GHG saved[3]	Savings %
Cross City Tunnel	EB	7.3	PM	0.22	0.63	45%	0.34	1.15	54%	0.81	2.20	42%	1.85	5.02	37%
	WB	5.9	PM	0.17	0.67	45%	0.23	1.10	54%	0.75	2.03	42%	1.73	4.70	36%
Eastern Distributor	NB	21.6	PM	0.56	1.06	34%	0.97	2.30	49%	1.54	4.18	35%	3.99	10.86	35%
	SB	27.6	AM	0.76	1.56	45%	1.14	2.90	56%	1.92	5.24	42%	4.82	13.12	43%
Lane Cove Tunnel	EB	8.6	PM	0.29	0.66	26%	0.52	1.40	39%	1.11	3.02	30%	3.60	9.80	39%
	WB	6.1	PM	0.20	0.55	18%	0.36	1.06	26%	0.76	2.06	20%	1.98	5.38	18%
M2	EB	34.3	AM	1.13	2.38	42%	1.90	4.47	53%	3.66	9.96	43%	13.19	35.89	56%
	WB	39.0	PM	1.27	2.96	42%	2.08	5.53	55%	4.08	11.09	45%	13.32	36.24	54%
M5 South West	EB	37.5	PM	1.25	2.10	42%	1.64	3.42	48%	2.85	7.74	39%	12.85	34.98	59%
	WB	28.2	PM [2pm]	0.96	1.85	39%	1.49	3.35	46%	2.76	7.52	37%	12.02	32.71	58%
M5 East	EB	16.3	AM	0.56	1.23	46%	0.91	2.35	58%	1.91	5.19	48%	5.85	15.91	53%
	WB	20.5	PM [3pm]	0.68	1.43	46%	1.07	2.67	56%	2.06	5.59	46%	5.16	14.05	46%
M7	NB	46.5	PM	1.15	1.80	25%	2.25	4.76	40%	3.04	8.27	26%	14.24	38.77	46%
	SB	38.2	AM	0.98	1.82	24%	1.83	4.58	38%	3.01	8.19	25%	14.28	38.88	46%
M4	EB	29.5	PM	0.92	2.11	48%	1.45	4.02	60%	2.96	8.06	48%	9.06	24.65	55%
	WB	40.3	PM	1.21	3.62	59%	1.78	5.63	66%	3.75	10.21	52%	9.97	27.14	58%
M8	EB	18.3	PM	0.58	1.21	43%	0.94	2.33	55%	1.79	4.87	43%	6.19	16.85	53%
	WB	23.4	PM	0.72	1.45	47%	1.13	2.73	58%	2.04	5.55	46%	6.68	18.17	54%
NCX	NB	8.6	AM	0.26	0.52	26%	0.41	0.95	35%	0.79	2.15	27%	3.76	10.22	43%
	SB	9.3	AM	0.28	0.63	30%	0.45	1.20	41%	0.99	2.68	32%	4.24	11.54	46%

1 Direction of travel | 2 Travel-time saving (minutes) | 3 GHG emissions saved (kgCO2e) | 4 Light Commercial Vehicles | 5 Heavy Commercial Vehicles



FRESH THINKING

Ventilation optimisation trial

In Sydney most tunnel ventilation systems run 24/7 to ensure zero portal emissions, even during periods of low traffic. This means that, at night, we are required to use more electricity, and in turn generate more GHG emissions, than should otherwise be required to maintain local community air quality.

Ventilation systems account for up to 70% of the energy needed to operate road tunnels, so reducing the time they run would have huge environmental benefits. Transurban proposes a trial on one tunnel to allow portal emissions during periods of low traffic flow (such as overnight) and where there is negligible impact to ambient air quality. This simple change could improve the energy efficiency of tunnels across Sydney by up to 14%, delivering substantial energy and GHG savings, in keeping with the NSW Government's commitment to achieve net-zero emissions by 2050.

Importantly, the trial would have negligible impact on ambient air quality. While independent experts typically consider an incremental change of up to 1 in 100,000 particulate matter ($^{PM}2.5$) risk level negligible,[1] Transurban proposes to apply an even more conservative, 1 in 500,000 change in $^{PM}2.5$ risk level. This approach safeguards local air quality while still delivering on NSW Government's energy and GHG reduction objectives. In addition to existing air quality monitoring, additional monitoring is proposed for the trial to confirm the general validity of the modelling and that portal emissions can occur without causing an adverse impact on human health.

The case for allowing tunnel portal emissions will only get stronger as people continue to upgrade to low-and zero-emission vehicles, making ventilation systems that were designed decades ago potentially surplus to requirements in the modern era.

1 Capon, A & Wright, J 2019, 'An Australian incremental guideline for particulate matter (PM2.5) to assist in development and planning decisions', Public Health Research & Practice

Case study 13

Wind-powered roads

From 2021, most of our Sydney roads will be powered by up to 80% renewable energy from wind generation, saving 89,000 tonnes of GHG emissions being released into the atmosphere each year. That's the equivalent to powering nearly 20,000 Australian homes with wind power.

The Sapphire and Bango wind farms in regional NSW will provide the renewable energy to power the Eastern Distributor, Cross City Tunnel, M2, Lane Cove Tunnel, WestConnex M4 and both the existing M5 East Motorway and the recently opened WestConnex M8.

Electricity usage currently represents 97% of Transurban's total emissions across all markets, the bulk of which is used to power lighting on our roads, tunnel ventilation systems and the operation of traffic management centres.

The NSW Power Purchase Agreements are helping us meet our commitment to achieve net-zero GHG emissions by 2050.

Section 6:
Future transport trends

The way people move around cities is changing, with new transport technologies and mobility options offering greater convenience and personalised choices.

Transurban recently commissioned research to better understand how people see themselves moving around cities after the pandemic risk has passed. The research informed our reports, Urban Mobility Trends from COVID-19, released in August 2020 and February 2021.

The research showed that while most people expect to do most of of their work back in the workplace, they're also seeking flexible work arrangements so they can continue enjoying greater work/life balance and avoid daily peak-period commutes.

Transurban's traffic data shows that making small changes to the way we travel can have a big impact on transport networks, helping spread the peak travel periods and flattening out the congestion curve.

For example, in Sydney, a motorist travelling towards the city on the M2 could save 10 minutes if they delayed their trip until after 9am (Figure 32).

While on the M7, motorists would save around 12 minutes travelling around 6pm instead of 4.30pm when many tradespeople or students are travelling home.

If taken up as a regular part of working life, flexible work could improve the capacity of all modes of transport, but if we return to our pre-COVID-19 routines the negative consequences will be just as impactful.

Mobility as a Service

While the focus to date has been on creating greater convenience for consumers, new community expectations around public health could serve to refocus the role of Mobility as a Service (MaaS) applications.

Ride-hailing and ride-sharing services, multi-modal transport platforms and transport-on-demand apps are already giving people greater certainty, choice and convenience in how they travel, and we continue to see the number of proponents in this market increase.

Across Australia, MaaS apps are already incorporating car parking and bicycle facilities into their offerings and this will become increasingly important as greater numbers of people drive or ride to work. Contactless payments for transport services, like that available in Transurban's LinktGo, are also a benefit.

Connected and autonomous vehicles

With connected and automated vehicles (CAVs) offering significant potential to improve safety and traffic flow, Transurban continues to work with a network of industry partners to pave the way for their safe introduction.

In 2018, Transurban partnered with TfNSW to test CAVs on all kinds of road conditions, including regional roads and Sydney's busiest motorways.

Trial data was captured via an Australian-first, purpose-built app that tracks, records and measures all interactions between CAVs and road infrastructure.

The collective findings are helping vehicle manufacturers, road operators and governments prepare road infrastructure to support automated vehicles, as they become more common on Sydney's roads.

Figure 32. Weekday travel-time savings—AM peak, M2

NOVEMBER 2019 TRAVEL-TIME DATA

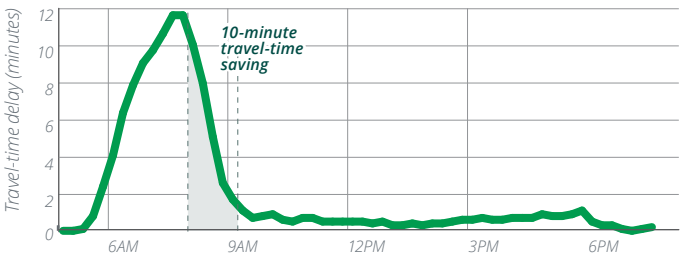
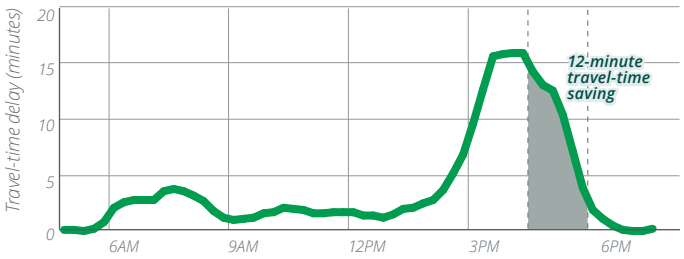
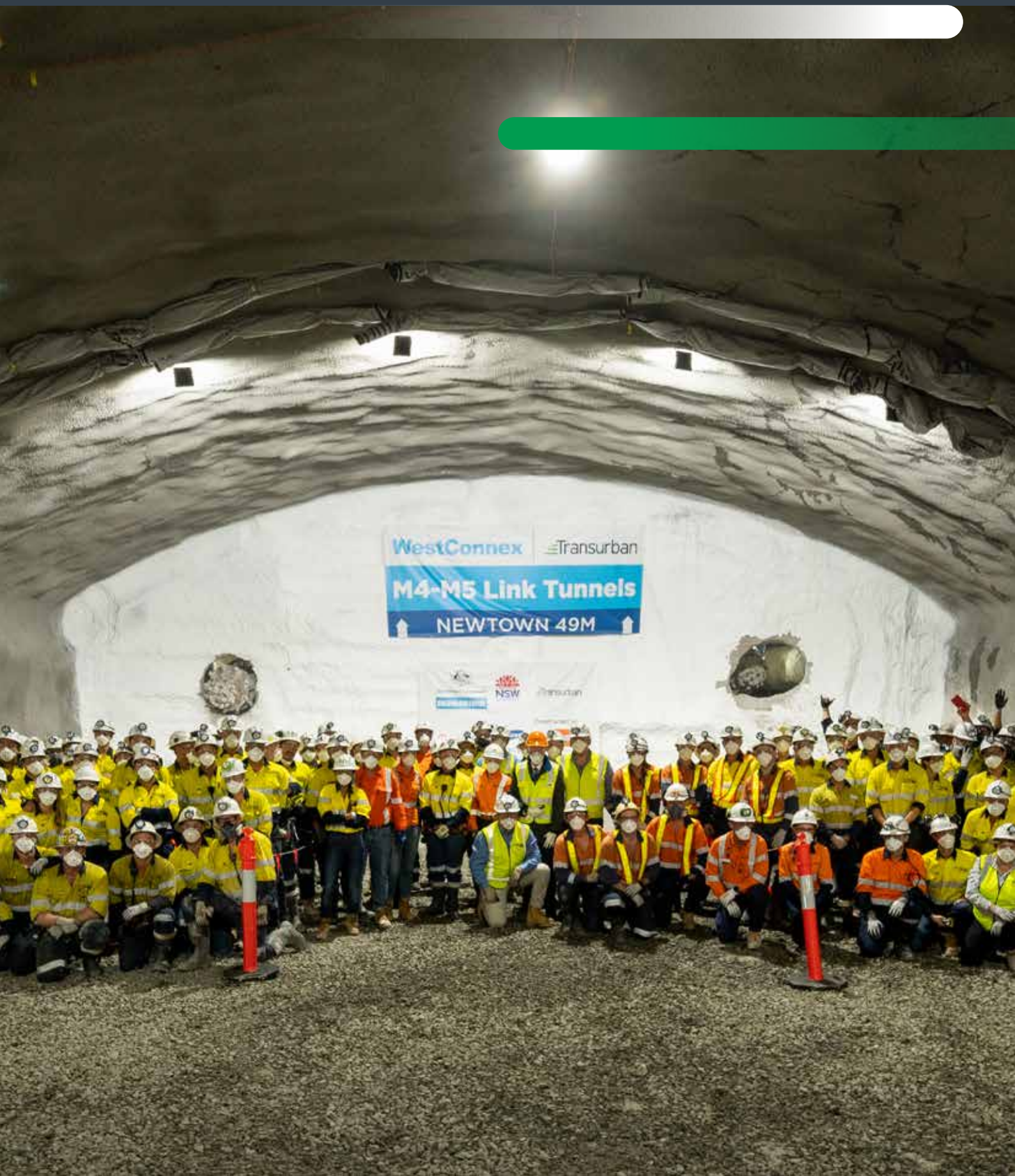


Figure 33. Weekday travel-time savings—PM peak, M7

NOVEMBER 2019 TRAVEL-TIME DATA



Appendices



Appendix 1—
Tolling arrangements in place on Transurban-operated roads

OVERVIEW	M5 South West	M2	ED	M7	NCX	LCT	CCT
Opening date	August 1992	May 1997	December 1999	December 2005	October 2020	March 2007	August 2005
Cost to build	$380M	$644M	$680M	$1,540M	$3B	$1,142M	$680M
Date Transurban commenced operating the asset	June 2007	June 2005	June 2007	December 2005	October 2020	August 2010	June 2014
Concession end date	December 2026	June 2048	July 2048	June 2048	June 2048	June 2048	December 2035
PHYSICAL DETAILS							
Length (total)	22km	21km	6km	40km	9km	3.8km	2.1km
Length (surface)	22km	20.5km	4.3km	40km	–	0.2km	–
Length (tunnel)	–	0.5km	1.7km	–	9km	3.6km	2.1km
Lanes	2x3	2x3	2x3 2x2 some sections	2x2	2x2	2x2 2x3 some sections	2x2 2x3 some ramp sections
OWNERSHIP							
Transurban	100%	100%	75.1%	50%	50%	100%	100%
Other			14.4% IFM Investors 10.5% UniSuper	25% CPP Investments 25% QIC Limited	25% CPP Investments 25% QIC Limited		
TOLLING							
Large vehicle multiplier	3x	3x	2x	3x	3x	Min 3x	2x
Toll charge	Flat rate	Flat rate	Flat rate (northbound) Untolled (southbound)	Distance based	Flat rate	Flat rate	Flat rate

OVERVIEW	M5 South West	M2	ED	M7	NCX	LCT	CCT
Current toll charges—CLASS A* *As of 1 April 2021*	$4.88 each way	$8.20 North Ryde (mainline) $4.10 Pennant Hills Road/NCX $2.90 Windsor Road $2.42 Lane Cove Road on-ramp $4.09 Herring and Christie Roads	$8.29 (northbound only)	$0.4204 cents/km capped at $8.41	$8.20 each way	$3.44 main tunnel $1.72 Military Road	$5.93 main tunnel $2.80 Sir John Young
Current toll charges—CLASS B* *As of 1 April 2021*	$14.64 each way	$24.59 North Ryde (Mainline) $12.30 Pennant Hills Road $8.70 Windsor Road $7.27 Lane Cove Road on-ramp $12.29 Herring and Christie Roads	$16.58 (northbound only)	$1.2611 cents/km capped at $25.23	$24.59 each way	$11.51 main tunnel $5.76 Military Road E-Ramp	$11.86 main tunnel $5.60 Sir John Young Crescent
Tolling adjustment schedule	Escalated quarterly by quarterly Sydney CPI. The toll cannot be lowered as a result of deflation.	Escalated quarterly by the greater of quarterly CPI or 1%.	Escalated quarterly by the greater of a weighted sum of quarterly AWE and quarterly CPI or 1%.	Escalated or de-escalated quarterly by quarterly CPI.	Escalated quarterly by the greater of quarterly CPI or 1%.	Class A tolls escalate quarterly by quarterly CPI. class A tolls cannot be lowered as a result of deflation. Class B tolls escalate quarterly by the greater of quarterly CPI or 1%.	Tolls escalate quarterly by quarterly CPI. The toll cannot be lowered as a result of deflation.

Appendix 2—
WestConnex tolling structure

OVERVIEW	M4	M8	M5 EAST	M4-M5 LINK	ROZELLE INTERCHANGE
Opening date	1992 May	2020 July	2001 December	Projected 2023	Projected 2023* *NSW Govt. estimate*
Cost to build	$4.3B	$4.3B	$800M	$3.2B	$4B
Date Transurban commenced operating the asset	July 2017	July 2020	May 2020	–	–
Concession end date	December 2060	December 2060	December 2060	December 2060	December 2060
PHYSICAL DETAILS					
Length (total)	14km	11km	10km	7.5km	5km
Length (surface)	8.5km	2km	5.5km	–	–
Length (tunnel)	5.5km	9km	4.5km	7.5km	5km
Lanes	2x4 West, 2x3 East	2x2	2x2	2x4	n/a
OWNERSHIP*					
Transurban	25.5%	25.5%	25.5%	25.5%	25.5%
NSW Government	49%	49%	49%	49%	49%
AustralianSuper	10.5%	10.5%	10.5%	10.5%	10.5%
CPP Investments	10.5%	10.5%	10.5%	10.5%	10.5%
Tawreed Investments Limited	4.5%	4.5%	4.5%	4.5%	4.5%
TOLLING					
Large vehicle multiplier	3x	3x	3x	3x	3x
Toll charge* *As of 1 April 2021*	Distance based	Distance based	Distance based	Distance based	Distance based
Current toll charges—CLASS A	$1.42 flagfall + rate of $0.5266 per kilometre Maximum toll $8.52	$1.42 flagfall + rate of $0.5266 per kilometre Maximum toll $7.23	$1.42 flagfall + rate of $0.5266 per kilometre Maximum toll $7.23	–	–
Current toll charges—CLASS B	$ 4.27 flagfall + rate of $1.5798 per kilometre Maximum toll $25.58	$ 4.27 flagfall + rate of $1.5798 per kilometre Maximum toll $21.70	$ 4.27 flagfall + rate of $1.5798 per kilometre Maximum toll $21.70	–	–
Tolling adjustment schedule	Tolls escalate annually by the greater of CPI or 4% to December 2040; the greater of CPI or 0% per annum to concession end.	Tolls escalate annually by the greater of CPI or 4% to December 2040; the greater of CPI or 0% per annum to concession end.	Tolls escalate annually by the greater of CPI or 4% to December 2040; the greater of CPI or 0% per annum to concession end.	Tolls escalate annually by the greater of CPI or 4% to December 2040; the greater of CPI or 0% per annum to concession end.	Tolls escalate annually by the greater of CPI or 4% to December 2040; the greater of CPI or 0% per annum to concession end.

*Ownership % may not add up to 100% due to rounding

Appendix 3—
Glossary

ADT	Average Daily Traffic
AWE	Average Weekly Earnings
CCT	Cross City Tunnel
CPI	Consumer Price Index
D&C	Design and Construct
ED	Eastern Distributor
EIS	Environmental Impact Statement
GSP	Gross State Product
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
IS	Infrastructure Sustainability rating scheme administered by ISCA
ISCA	Infrastructure Sustainability Council of Australia
ITS	Intelligent Transport Systems
LCT	Lane Cove Tunnel
LTI	Lost Time Injury
M5	M5 South West Motorway
M7	Westlink M7
M2	Hills M2 Motorway
M4	WestConnex M4 Motorway
M8	WestConnex M8 Motorway
NCX	NorthConnex
NSW	NSW
O&M	Operations and Maintenance
PPP	Public Private Partnership
RICI	Road Injury Crash Index—serious road injury (an individual transported from, or receives medical treatment, at scene) crashes per 100M vehicle km travelled
RMS	Roads and Maritime Services
Roam	Tolling brand
Roam Express	Tolling brand
TMC	Traffic Management Centre

Appendix 4—
NSW Inquiry 2017

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Transurban

NSW Legislative Council

Inquiry Into Road Tolling

Transurban Submission

28 February 2017

Transurban's ne

Commuters

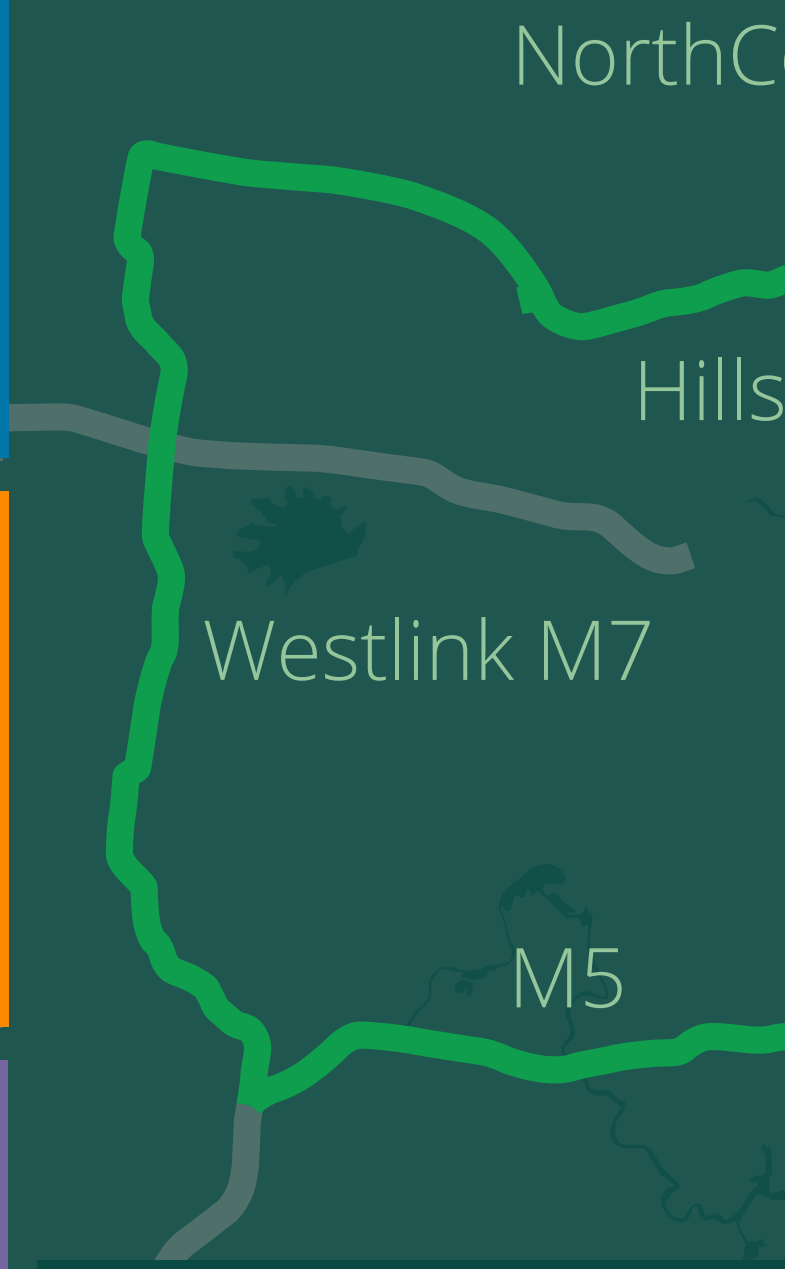
- Travel-time savings across the network including up to 25 minutes westbound on the M5 in peak periods
- 30% quicker incident clearance time than government guidelines
- $4.2 billion travel-time savings*
- $2.5 billion vehicle operating cost savings*

Economic

- Business/productivity benefits—$7 billion*
- Household benefits—$7 billion*
- Gross State Product—$9.5 billion*

Government

- $3.3 billion investment in Sydney network by Transurban and partners over six years†
- Accelerated project delivery—M1–M2 link (NorthConnex) brought forward 10 years
- A partner focused on network outcomes
- Full regulatory control of pricing



Transurban's network footprint in Sydney means we take a holistic view of the operation and development of the road network as a whole, rather than focusing on a single toll road.

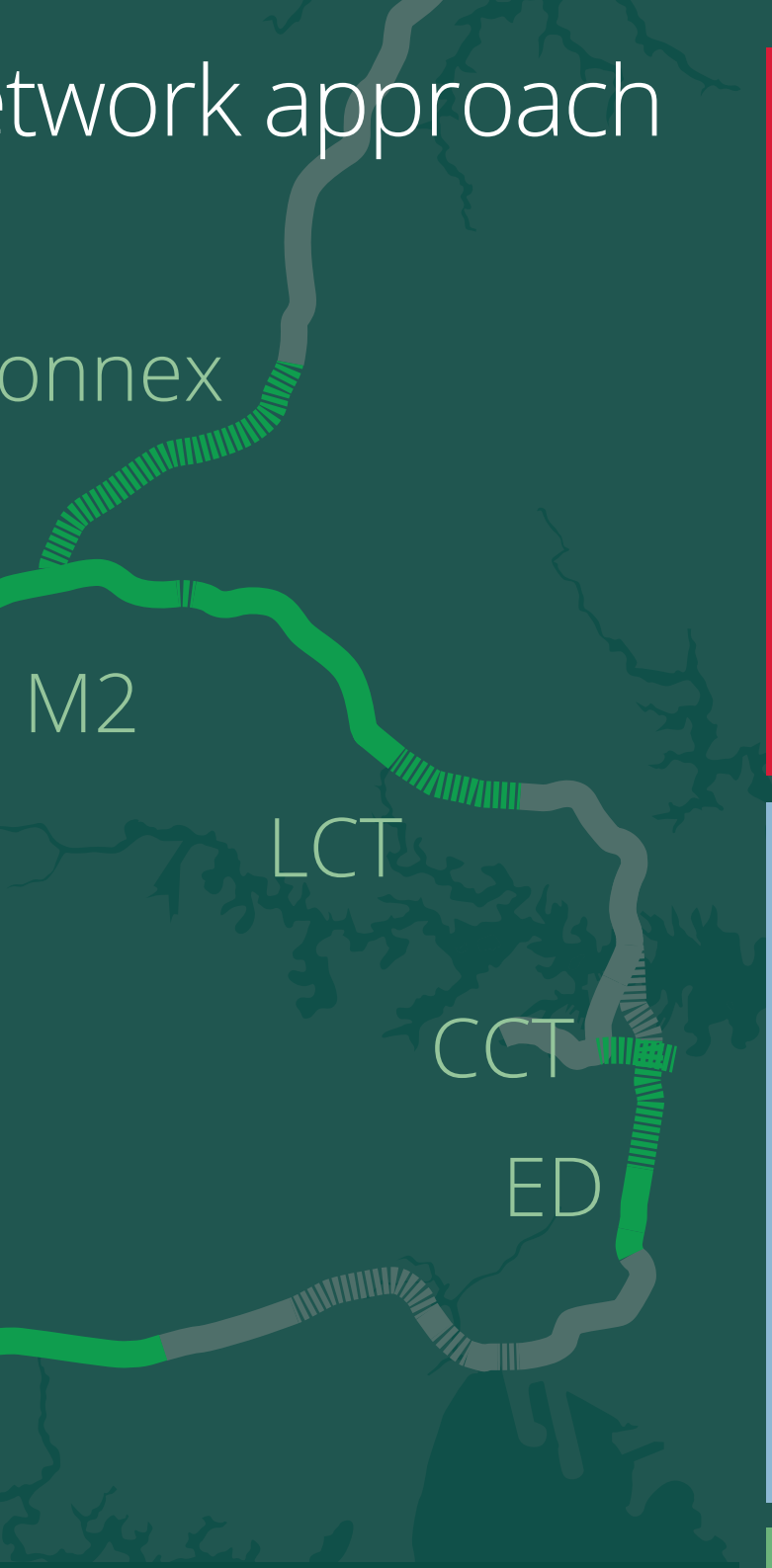
Our focus is on enhancing the efficiency and safety of the network for the benefit of all NSW motorists and to meet the needs of Sydney's growing population.

By considering the overall traffic flow around the network in alignment with government priorities, rather than just the traffic on a single toll road,

*Benefits over 10 years , KPMG, 2015

†M2 and M5 upgrades and NorthConnex

twork approach



we seek opportunities to reduce overall congestion both on and off our network of toll roads.

Our network-wide insights allow us to pinpoint the areas that are starting to experience strain, analyse the cause and implement actions that ensure the best possible experience for motorists.

We also understand the impact an incident can have beyond its immediate location so we are committed to continuing to achieve best-in-class roadside operations and incident response.

Freight

- Travel-time savings across the network including up to 15 minutes using Hills M2 and Westlink M7 northbound in evening peak, reducing operating costs by up to $95 per hour
- NorthConnex travel-time savings estimated at up to 15 minutes
- Travel-time and operating savings $2.8 billion over 10 years*

Community

- Training and up-skilling for 300 employees working on NorthConnex project
- Public art and roadside regeneration project at Macquarie Park
- Project to transform disused Hornsby Quarry into a public park
- Bushland regeneration project in Hornsby Shire to plant 17,000 native species

Investors

- Significant infrastructure investment opportunity for Australian investors
- 70% of Transurban security holders are Australian
- 20% of Transurban security holders are from NSW

Contents

Terms of Reference

	SECTION WHERE ADDRESSED
1. A review of the tolling regime in place on different roads and an explanation for the differences between each	Section 3 Appendix 1
2. The process for determining how tolls are set for all types of vehicles, the length of tolling concession periods, the rationale for extending these concession periods and opportunities to increase transparency for the public, particularly given the absence in some instance of any competitive process	Section 3 Section 4
3. How tolling contracts are negotiated and varied and opportunities to increase public scrutiny and accountability of the negotiations that take place between private tolling companies and the NSW Government	Section 3
4. The rationale for allowing higher than CPI increases on certain tolls	Section 3
5. The extent of any consultation undertaken with the trucking industry before changes are made to tolling regimes	Section 3
6. The appropriateness of involving the Independent Pricing and Regulatory Tribunal (IPART) in the determination of tolls and their escalation, given the involvement of IPART and other such independent regulators in setting public transport fares and other services such as electricity transmission and distribution charges	Section 4
7. Opportunities to increase the assurance to the public that tolling arrangements represent the fairest possible outcome	Section 1 Section 2 Section 6
8. An examination of road tolling arrangements in overseas jurisdictions	Section 4

Executive Summary

Freedom of movement directly impacts quality of life and the economic productivity of a city. Sydney's toll road network provides tangible evidence, having delivered billions of dollars in economic benefits to the city through the efficient movement of people, goods and services. Indeed, KPMG has estimated that over a 10- year period, Sydney's toll road network has delivered more than $14 billion in economic, social and environmental benefits to the city.

These benefits mean travel-time savings, reliability gains and reduced vehicle operating costs for households and businesses.

There are also environmental benefits from demonstrated reductions in vehicle emissions from more efficient movements on the network. Improved access to economic centres has generated city-wide benefits with thousands of additional jobs created through increased economic activity.

Sydney's toll road network, and by extension, these benefits, could not have been realised without the effective partnering of the public and private sector. The current network represents more than $9 billion of investment, of which the private sector has contributed 80 per cent. The involvement of the private sector has substantially accelerated this investment, delivering the associated benefits many years ahead of when they might otherwise have been achieved. The most recent example is the NorthConnex project, where Transurban and its partners worked with the New South Wales (NSW) Government to deliver this $3 billion project an estimated 10 years earlier than anticipated if the government had not involved the private sector.

The benefits that have come from private-sector participation go well beyond the initial project, with the Public Private Partnership (PPP) model proven to deliver ongoing investment into the network. In recent years, Transurban and its partners have invested approximately $1 billion to upgrade the Hills M2 and the M5 corridors with further investment into technology, operations and maintenance to enhance network efficiency. The risk transfer away from the public sector has also been shown to be real and effective, as demonstrated by the Cross City Tunnel and Lane Cove Tunnel projects. In both instances the under performance of the project against the initial owners' expectations led to significant losses to the private sector, however the city still benefitted from the delivery of these major pieces of infrastructure and government was protected from the downside risks.

The involvement of the private sector at the procurement phase of projects has also led to positive outcomes, as demonstrated most recently through the NorthConnex project. Not only were the procurement time-frames significantly fast-tracked, but the value for money was evidenced by the fact that the final project scope was effectively a future-proofed design. This was achieved by driving innovation from the contractors through the tender process, without exceeding the budget expectations around the project.

Successful partnering between the public and private sectors to deliver toll-road projects in Sydney extends back a number of decades, and the model for private sector participation is considered one of the most advanced and effective in the world. The concession agreements provide the regulatory framework governing the operation of the respective roads, with clear and

Sydney motorists share their views on toll roads

"They (toll roads) are better roads. They're generally a good quality road. Good access, multiple lanes."

Parramatta motorist

"Not enough of them, the missing links, when you want to leave Sydney to the north, you get ejected at Pennant Hills Road, why are there these missing links?"

Sydney motorist

"I don't even consider the cost, if it's the quickest direct route, I'll take it."

Parramatta motorist

"(Toll roads are) safer. You look at people, they are damn tired, doing the commute every day. I've seen a few times when people have drifted off, that's a consideration of mine."

Sydney motorist

Source: JWS research report, February 2016

transparent pricing arrangements set at the commencement of the concession. Beyond the initial agreement there is no pricing flexibility in the concession. Any revision to pricing requires a renegotiation of the concession agreement, and the only circumstances in which this has taken place has been in the context of major enhancements and upgrades to the network. In NSW, the unsolicited proposals process provides a clear framework through which the private sector can work with the public sector to develop unique projects in a transparent and equitable way, creating value for NSW.

In setting the initial pricing for a given asset, the government requirements determine the regime that best meets the funding needs of the project, while at the same time providing a value-for-money toll proposition for motorists. This is based on factors such as the travel-time savings delivered by the project. In considering the commercial arrangements, of which the toll prices are one of the critical elements, a range of factors need to be considered including the:

- value the project delivers for the community
- complexity of the project, which impacts the design and delivery costs
- ongoing operations and maintenance costs, and
- forecast levels of traffic.

The private sector's involvement in the delivery and management of road infrastructure has traditionally been fragmented in Australia. To ensure the liveability and productivity of Sydney, individual pieces of infrastructure have been procured through different private operators. In recent years, Transurban has extended its network footprint in Sydney mostly by acquiring projects that did not meet their original private sector forecasts. This has brought considerable strategic alignment with government in how Transurban develops and operates the network, for the benefit of all NSW motorists. This leads to a focus in seeking opportunities to reduce overall congestion both on and off our network of toll roads. This has further enhanced the benefits that can be derived from the privately-operated portions of Sydney's road network while NSW maintains contractual and legislative control over pricing.

The government's ability to continue to work with the private sector to deliver major road infrastructure projects will be critical to Sydney's continued economic prosperity and success in the years and decades ahead. Having established a PPP model that is the envy of the world, and with growing and diverse requirements on the public purse, the need to continue to harness this delivery model is critical. Sydney is Australia's busiest and most congested city with congestion costs around $6.1 billion annually—equivalent to annual losses of more than $1,500 per Sydneysider—and forecast to increase to around $12.6 billion per year by 2030.[1] The public and private sectors must continue to work together to address this problem.

1 Australian Government, BITRE, Traffic and congestion trends for Australian capital cities, 2015

Sydney motorists' attitudes to toll roads

75%
believe toll roads provide a more direct route

69%
believe toll roads save them time

54%
believe toll roads make their lives easier

56%
believe toll roads create less wear & tear on their car

Source: GFK research report, 2015

About Transurban

Transurban's NSW toll road network in numbers

6
operating assets

$9B
nominal construction in NSW network

$1.3B§
project pipeline

479 km
total lane kilometres managed by Transurban

2.5B kms
travelled by drivers on our roads in FY16

>700,000
trips per workday

155,000 hrs
travel-time saved per workday

1,750
Transurban NSW employees and contractors

7,700
incidents managed annually*

§ Transurban share

** Hills M2, Lane Cove Tunnel, Cross City Tunnel, and Eastern Distributor.*

Transurban has expanded both nationally and internationally to become a leading developer, operator and long-term concessionaire of toll roads since its establishment in 1996.

We have built a track record of partnering with governments to successfully deliver and manage key road infrastructure, and are recognised for developing innovative and effective transport solutions to meet the needs of growing cities.

In NSW, alongside our equity partners, we have interests in six toll roads in Sydney's orbital network—Hills M2, Westlink M7, M5 Motorway, the Eastern Distributor, Lane Cove Tunnel and Cross City Tunnel. These roads are among the city's busiest commuter and freight routes with more than 700,000 trips recorded every workday.

To achieve our vision to strengthen communities through transport, we understand that we must take a big picture view of our roads and the transport networks in which we operate to provide smarter, safer, and more sustainable ways for people to travel.

Our long-term concessions with governments create a strong incentive for us to actively manage these roads with a view to not only meet today's needs, but the future needs of communities.

Our NorthConnex tunnel project in northern Sydney is an example of how we have taken a proactive approach to address one of the city's most notorious transport bottlenecks with an innovative design that caters for future traffic growth.

We are working with the NSW Government to construct the $3 billion tunnel, which will link the M1 Pacific Motorway at Wahroonga to the M2 Motorway at West Pennant Hills. NorthConnex will bring the community significant benefits in terms of travel-time savings and reliability as well as completing the new national freight route linking the east coast of Australia.

NorthConnex was recently named by the Infrastructure Sustainability Council of Australia as the nation's highest-rated road project to date. The recognition exemplifies our commitment to achieving industry-leading outcomes in sustainability.

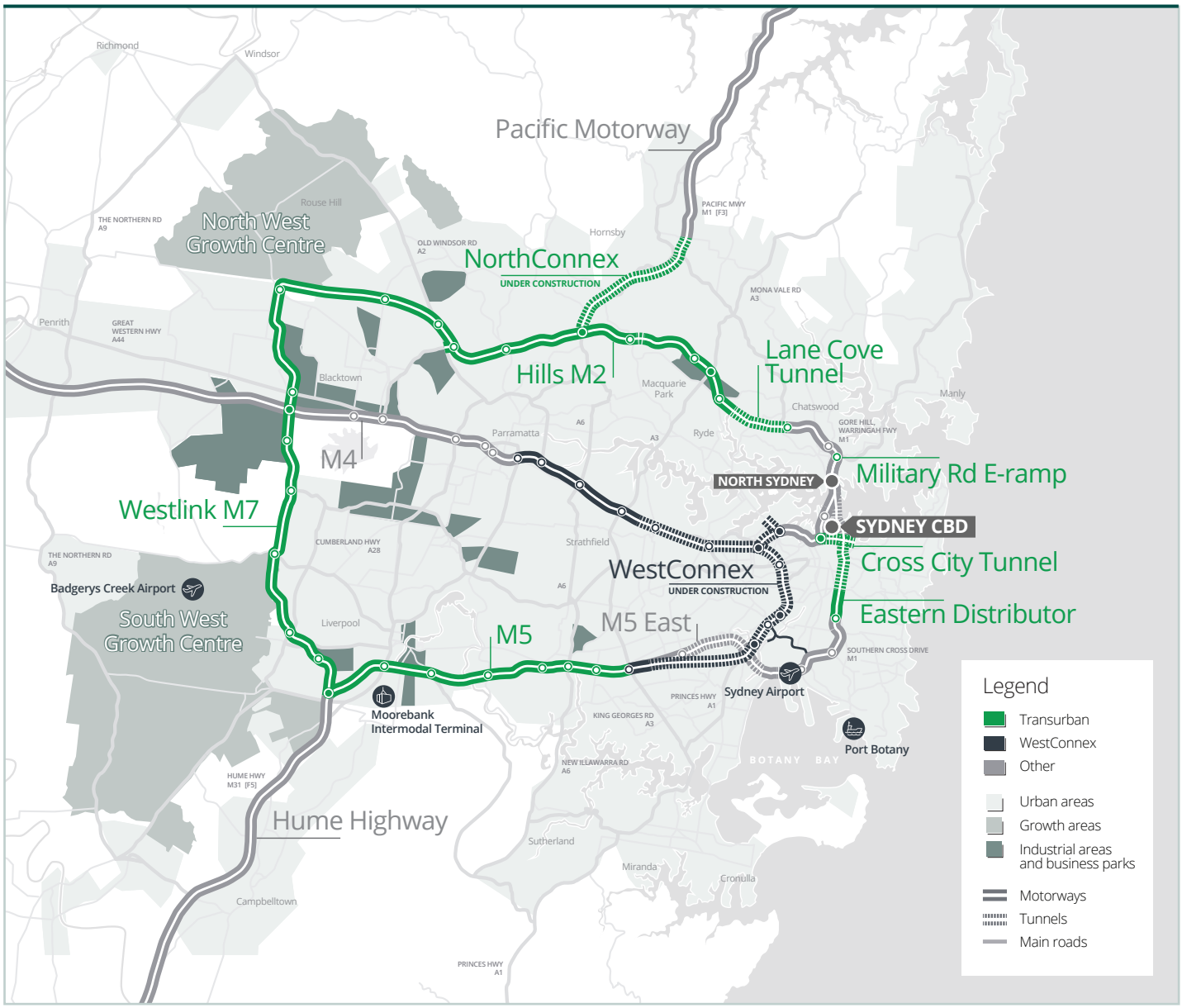
Last year we were included in the Dow Jones Sustainability Index World Leadership listing and we were recently awarded the Industry Mover Sustainability Award 2017 for the Transportation and Transportation Infrastructure sector, which further recognises our commitment to sustainability.

Transurban represents one of the most significant infrastructure investment opportunities available to Australian investors. Seventy per cent of our security holders are Australian superannuation funds and individual security holders, while 20 per cent are based in NSW.

We directly employ more than 1,100 people across Australia, with 24 per cent based in our NSW business. In addition, our construction projects create thousands of jobs. For example, NorthConnex will create 8,700 jobs over the life of the project.

Our aim is to foster an engaged and diverse workforce that can make a significant and lasting contribution to the cities and communities in which we operate.

The Sydney Strategic Road Network



TRANSURBAN OWNERSHIP			
Hills M2	100%	**Eastern Distributor**	Transurban (75.1%), IFM Investors and UniSuper own the remaining 24.9%
Lane Cove Tunnel	100%	**M5 South West***	Transurban (50%), Hastings Funds Management, IFM Investors and AMP Capital own the remaining 50%
Cross City Tunnel	100%	**Westlink M7§**	Transurban (50%), QIC Global Infrastructure and Canada Pension Plan Investment Board each own 25%

** M5 South West operated by Interlink Roads*

§ Westlink M7 operated by Northwestern Roads Group

Section 1:
Economic Benefits of Toll Roads

Sydney's toll road network is critical to the movement of freight and passengers, and underpins economic growth and social connectivity.

Infrastructure NSW identified the Orbital Network (many sections of which are tolled), the M4, Parramatta Road, the F6 corridor and the missing link now known as NorthConnex as comprising the Sydney Strategic Road Network. This has been highlighted as the most important transport network in the state.[2]

Much of the toll-road network has been delivered through partnerships between government and the private sector. Without private sector investment, delays in these projects would have negatively impacted the state's economy and its communities.

By applying the right policy framework, long-term planning and judicious use of private sector expertise, Sydney's toll road projects have addressed genuine accessibility needs, reduced travel times, improved travel-time reliability and created a smoother flow of traffic across the entire road network. The high volumes on the motorways show how heavily people and businesses rely on that road network for access around Sydney.[3] Each day the toll road network carries a significant portion of the city's passenger trips and the bulk of the freight task. It acts as a feeder and distributor of other transport modes (including rail, sea and air), providing Sydney with a more integrated transport system.[4] By enhancing access and transport connections, toll roads have also supported the development of growth corridors and the establishment of new commercial precincts and communities.

KPMG has estimated that the toll road sector has contributed $14 billion in economic, social and environmental benefits and increased gross state product (GSP) by $9.5 billion over 10 years (Figure 1).[5] Overall, the annual economic benefit of toll roads in NSW has been estimated at $1.9 billion (Figures 2 and 4). Approximately $1.3 billion of the total benefits are derived by toll-road users due to reduced travel times, reduced vehicle operating costs and improved travel-time reliability. Additionally, the toll-road network has significantly improved access to economic centres (Figure 3).

Relieving traffic congestion and improving traffic flow also has significant environmental benefits. Our analysis of travel time and fuel efficiency data confirm that using Transurban's routes in free-flow traffic situations produces less greenhouse gas emissions per kilometre than using an alternative route along arterial roads. Our roads are designed and operated to keep traffic flowing. An environmental review of the M5 South West Widening Project estimated a 30–40 per cent reduction in customer greenhouse gas emissions as a result of improvement in travel times and improved driving conditions. KPMG modelling estimated that toll roads generated $72 million in environmental benefits over a 10-year period.

2 Infrastructure NSW, The State Infrastructure Strategy 2012-32

3 Infrastructure Partnerships Australia, Urban Transport Challenge: Driving reform on Sydney's roads, 2009

4 Ibid

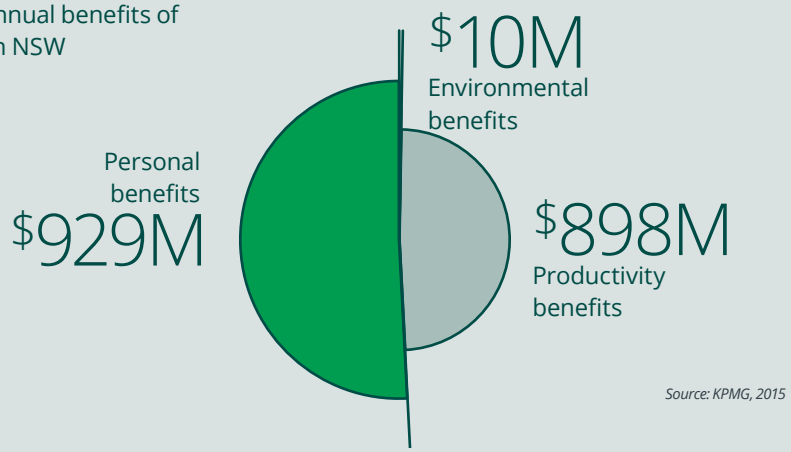
5 KPMG, Economic Contribution of Australia's Toll Roads, 2015

Figure 1: Economic contribution of NSW toll roads over 10 years

Business	$7B	of direct benefits in business productivity from vehicle operating cost savings, travel-time savings, reliability gains and wider economic gains
Households	$7B	of benefits to individuals in the form of personal travel-time savings, reliability gains and vehicle operating cost savings
Environment	$72M	of greenhouse gas emissions savings
Economy	$9.5B	of benefits to GSP due to improvements in direct business productivity
Jobs	1,200	direct and indirect jobs created due to improved business productivity
GSP	$1,260	increase per person in GSP

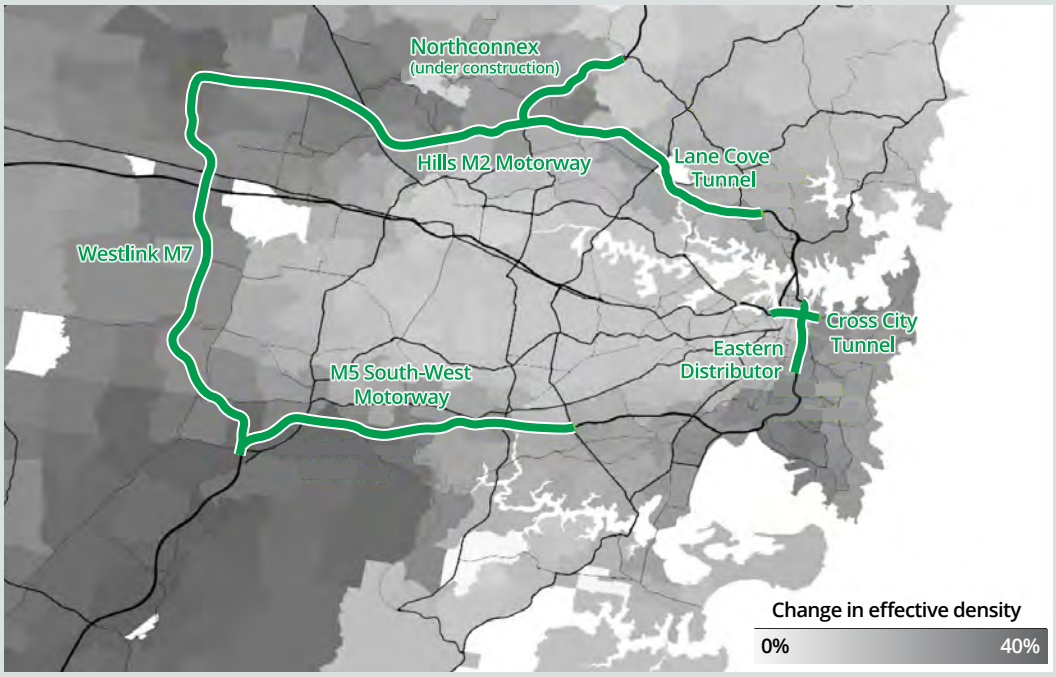
Source: KPMG, 2015

Figure 2: Annual benefits of toll roads in NSW



Source: KPMG, 2015

Figure 3: Improved access to economic centres



Increase in business-to-business economic density

40%
increase in south-west greater Sydney due to M5 South West and Westlink M7

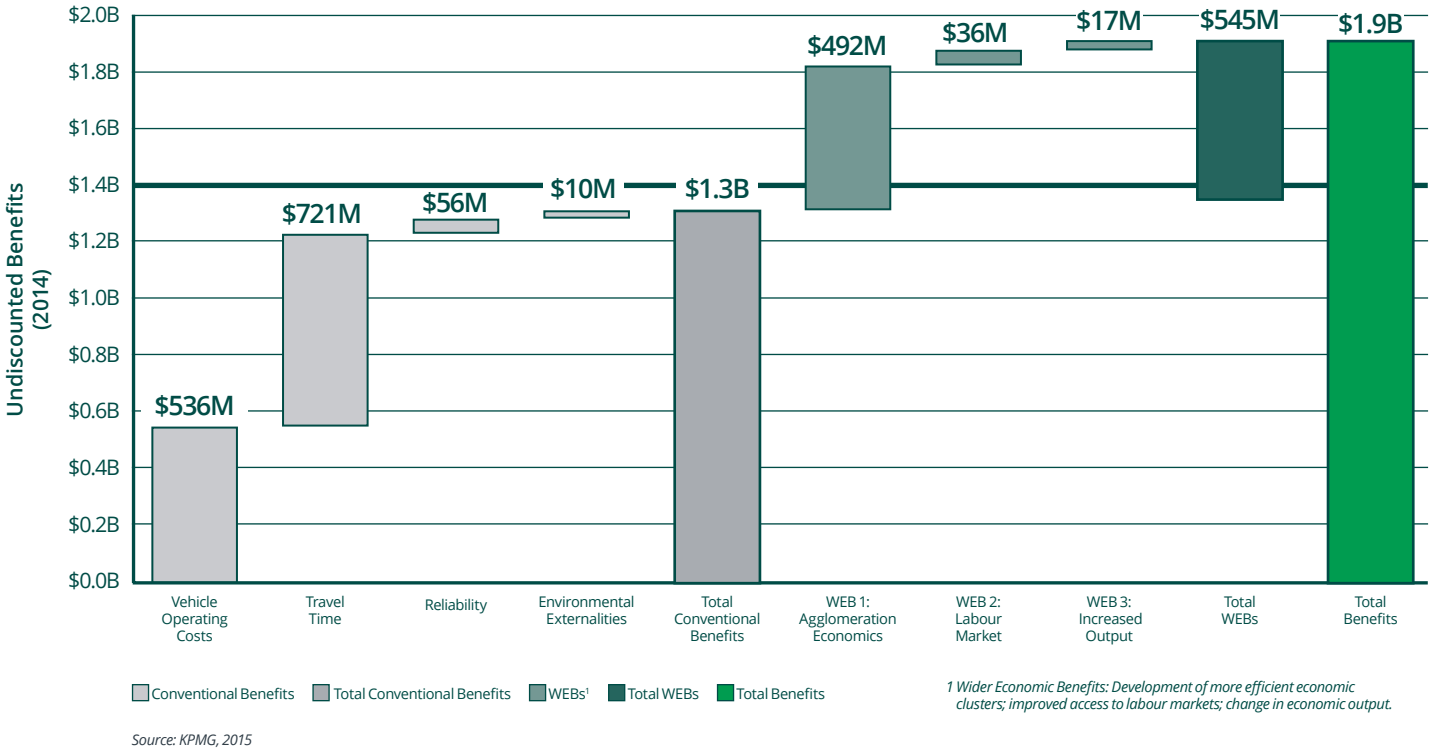
25%
increase along the Westlink M7 from Prestons to Baulkham Hills

20–30%
increase in south-east due to Eastern Distributor and Sydney Harbour Tunnel

Source: KPMG, 2015

Source: KPMG, 2015

Figure 4: Annual benefits of toll roads in NSW



1 Wider Economic Benefits: Development of more efficient economic clusters; improved access to labour markets; change in economic output.

Source: KPMG, 2015

Personal users
(over a 10-year period)

$4.2B
travel-time savings

$0.3B
travel-time reliability benefits

Source: KPMG, 2015

M5 West Widening project

Cost
$400M

Capacity increase
50%

Travel-time savings up to
25 mins
westbound in peak times

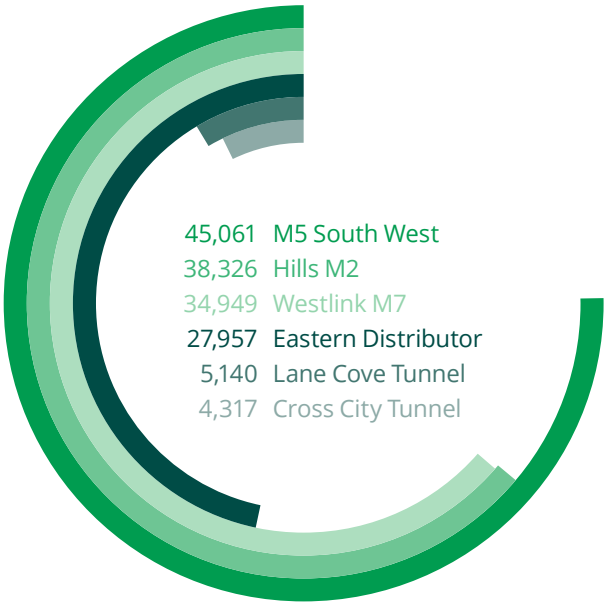
Direct User Benefits

Central to the value that toll roads offer users is travel-time savings. This is the amount of time users save by choosing the tolled route over untolled alternatives. Toll-road projects are designed to create efficient routes that reduce travel times for users while optimising safety. For example, the NorthConnex project in northern Sydney is expected to provide up to 15 minutes of travel-time savings as motorists will be able to avoid 21 sets of traffic lights on the alternate route between the Hills M2 and the M1 Pacific Highway.

Transurban's existing NSW toll road network offers ongoing value for users with significant travel-time savings provided across all of our road assets (Figure 5).

For example, on average every work day motorists save 155,750 hours collectively across the toll road network.[6]

Figure 5: Hours saved daily[3]



These travel-time savings translate into direct benefits for households and freight. KPMG estimates that these amount to $4.2 billion for individuals over a 10-year period.

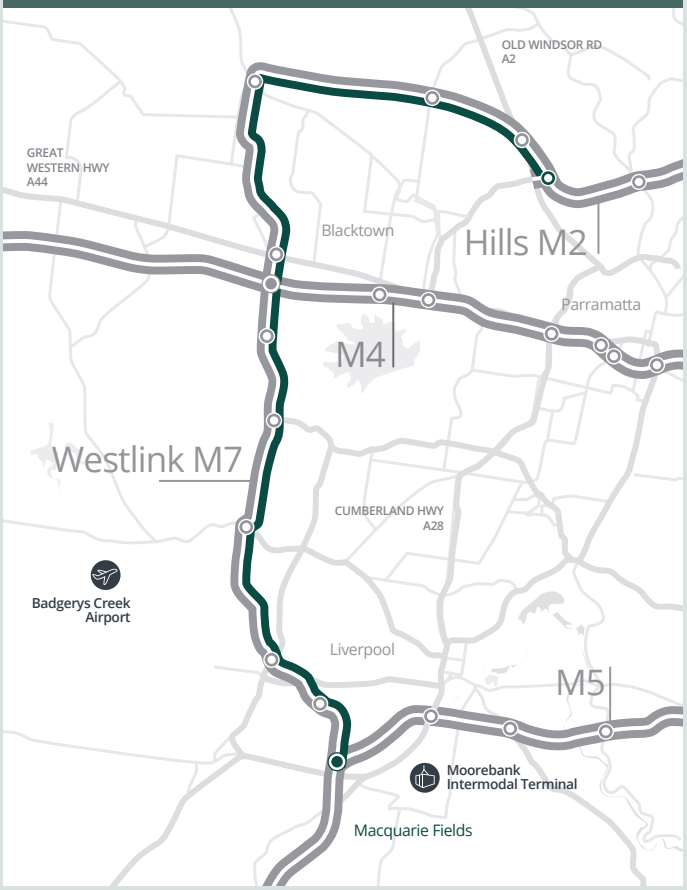
As Sydney's population grows, so does demand for our roads. To ensure service levels remain high, we undertake major upgrade projects in partnership with the NSW Government and others. The $400 million M5 West Widening in south-west Sydney increased the motorway's capacity by 50 per cent, adding a third lane in each direction. Since its completion in December 2014, motorists have benefitted from up to 25 minutes in travel-time savings. For the average workday commuter this amounts to an extra four hours a week that could be better spent with family, community and sporting involvement, or other recreational pursuits.

6 Average workday time savings (May 2016)

Case study one

A tradesperson heading to a job travels southbound on the M7 to Macquarie Fields in the morning peak hour rather than taking the alternative untolled route.

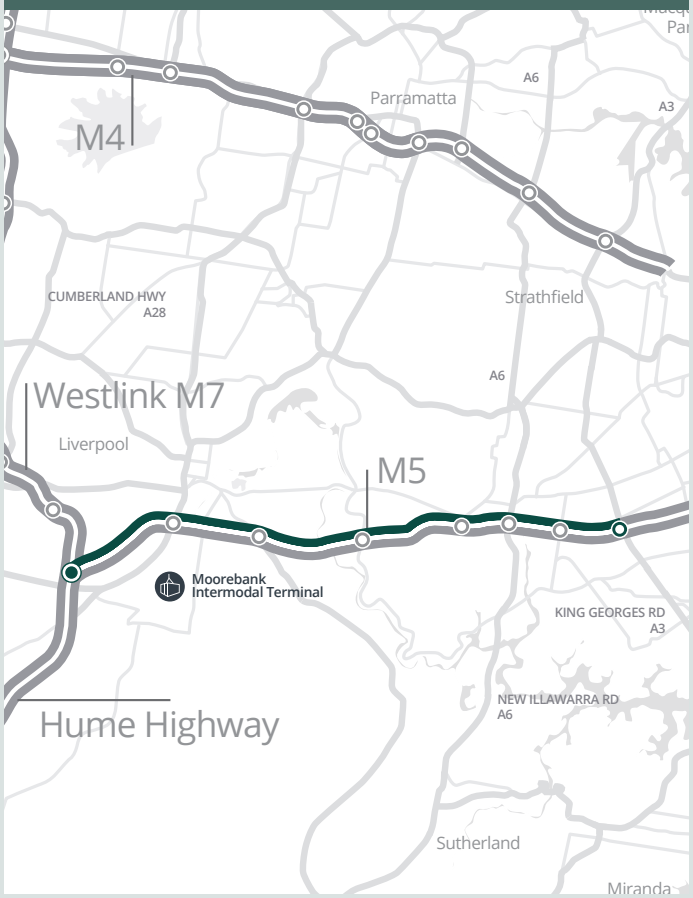
32 minutes	$53	$7.85	$28
Estimated time saving	Tradeperson's hourly rate	Maximum toll	Potential productivity gain



Case study two

A working parent living in Sydney's south-western suburbs is running late picking up their children from a child care centre, which charges $1 per minute in late fees, and takes the M5.

25 minutes	$4.57	$25
Estimated time saving	Estimated toll	Saving in late fees



In Sydney the value of time savings for the average car being used for private travel is assumed to be $21.20 per hour, based on typical occupancy rates and the value of time per occupant based on figures used for economic appraisal of transport investments. Time savings for cars being used for business purposes are valued higher at $53.30 per hour.

Value of travel time on urban roads

VEHICLE TYPE	OCCUPANCY RATE	VALUE PER OCCUPANT ($/PERSON-HOUR)	IMPLIED VALUE (PER VEHICLE-HOUR)
Car—private	1.4	$15.14	$21.20
Car—business	1.1	$48.45	$53.30

Source: Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013.

Business & freight users (over a 10-year period)

$1.2B
travel-time savings

$0.1B
travel-time reliability benefits

$1.5B
vehicle operating cost savings

Source: KPMG, 2015

Benefits for the Freight Industry

Sydney's toll road network is comprised of motorways that have been purpose built to support the freight industry. The network provides considerable benefits for heavy vehicles in terms of increased safety, reduced fuel consumption, greater travel-time reliability, smoother travel and less wear and tear on the vehicle, which all contribute to overall operational costs savings.

At a Sydney network level, the benefits to business and freight users have been estimated to be $2.8 billion (over 10 years). This includes $0.1 billion in travel-time reliability benefits, $1.2 billion in travel-time savings and $1.5 billion in vehicle operating costs savings, which results in material financial outcomes for freight operators. Additionally, the NSW Freight and Ports Strategy estimated that a one per cent increase in freight efficiency saves the national economy $1.5 billion.[7]

For freight operators, reduced travel time can result in lower costs associated with fuel and wages. Travel on the toll road network also improves safety by reducing the number of times trucks have to stop for traffic lights. Transport for NSW publishes values of time and operational cost savings for freight. This has indicated that in urban traffic conditions one hour saved is worth $45 for a heavy rigid truck, $74 for an articulated truck and $95 for a B-Double to the operator.[8] These are 2014 figures and escalation in wages since this time would underpin higher figures today.

For example, a truck travelling northbound through Sydney from the Hume Highway at Glenfield to the start of the M1 at Wahroonga using the old Cumberland Highway currently takes anywhere from one to two hours during the evening peak period on a Friday. Alternatively the same truck choosing Westlink M7 and Hills M2 would take between 50 and 80 minutes (Figures 6 and 7). This represents potential time savings of up to 40 minutes and in dollar terms this translates to time and cost savings ranging from $30 for a rigid truck to $63 for a B-Double (more than double the toll outlay for these two motorways).

Value of time and operational costs savings for freight operators of up to $95 per hour

Most of the uncertainty and delay in travel time that remains in this vital freight corridor exists in the eight kilometre stretch along Pennant Hills Road where accidents and breakdowns are frequent. Once NorthConnex is completed in 2019, it is expected that a truck would be able to complete a peak-hour trip through Sydney from Glenfield to Wahroonga in only 40 to 50 minutes.

Freight operators using NorthConnex will avoid 21 sets of traffic signals between the Pennant Hills interchange at the Hills M2 Motorway and the M1 Pacific Motorway interchange at Wahroonga. When compared to the travel time on Pennant Hills Road without the project, NorthConnex is expected to offer travel-time savings of up to 15 minutes in 2019, and up 25 minutes in 2029.[9] Thus by choosing NorthConnex, freight operators will achieve operational savings (time and cost) of up to $24 for each B-Double trip in 2019 and $40 in 2029 (in real terms).

Transurban's investment in the Sydney network over two decades since the early 2000s has produced significant productivity benefits for freight operators and also created less frustrating driving conditions for large vehicle drivers. Heavy vehicles can largely avoid travelling in suburban streets, enhancing the liveability of those areas. Without this investment from Transurban, its partners and the NSW Government, the Cumberland Highway would still be the main thoroughfare for trucks passing through Sydney. Travel times and reliability would have continued to deteriorate to levels significantly worse than they are today.

7 Transport for NSW, 2013b

8 Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013

9 NorthConnex EIS Volume 6, Appendix K

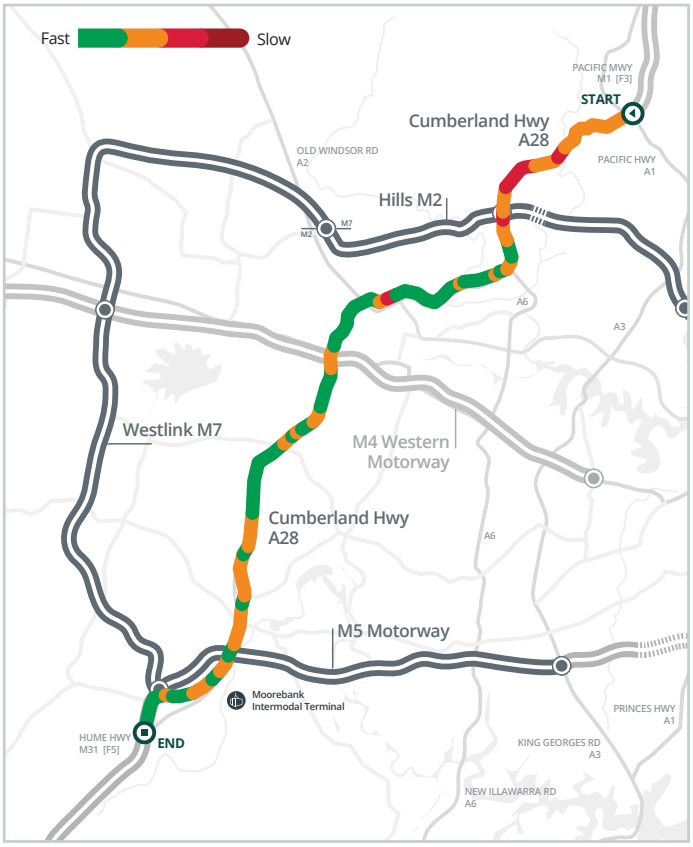


Figure 6: Northbound non-tolled route can take up to two hours during evening peak periods

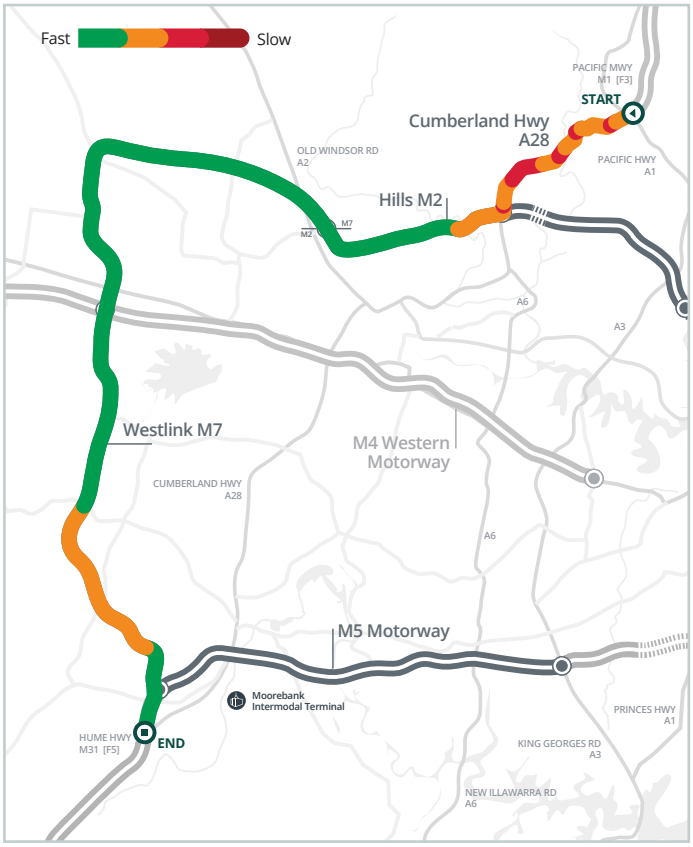


Figure 7: Time saved using northbound tolled route (M2 and M7) during evening peak reduces operational costs by up to $95 per hour

Figure 8: Value of travel time on urban roads for freight operators

Rigid Trucks	Total hourly operation cost
Light commercial—2 axle / 4 tyre	$33.73
Medium—2 axle / 6 tyre	$34.12
Heavy—3 axle	$44.98
Articulated Trucks	
4 axle	$62.12
5 axle	$71.14
6 axle	$74.26
Combination vehicles	
B-Double	$94.94

Source: Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013. Transurban calculated based on source document.

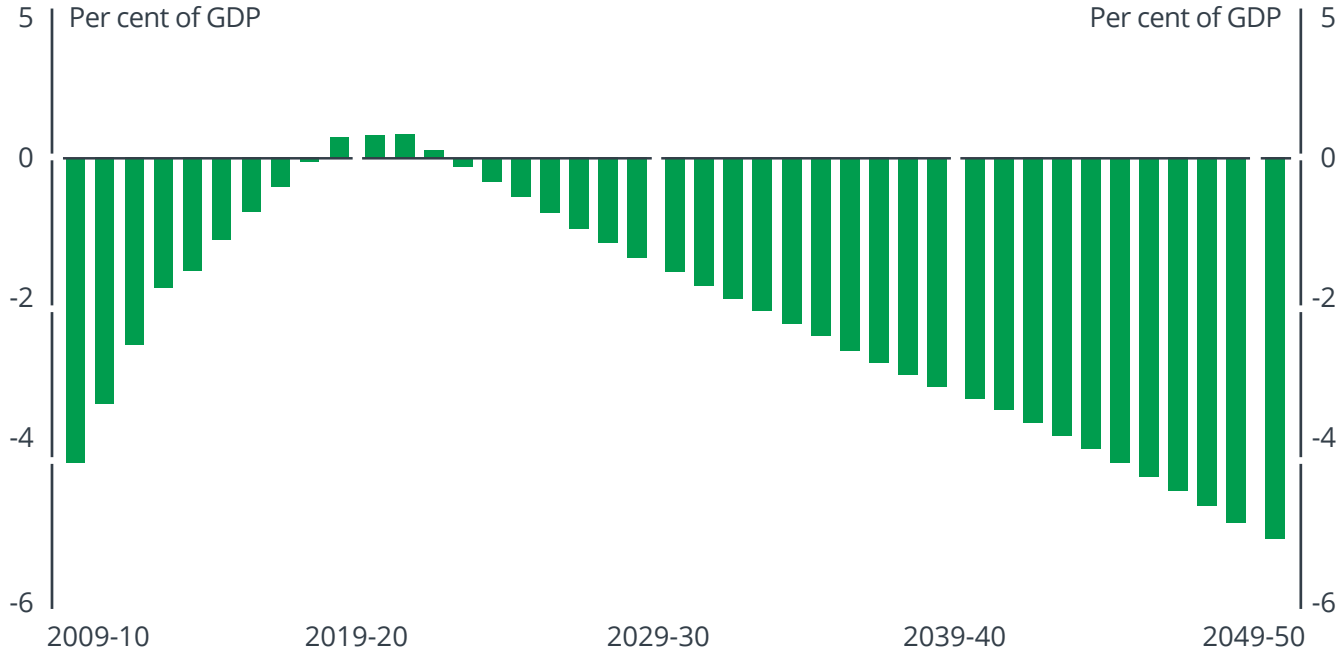
Section 2:
Benefits of Private Sector Involvement in Transport Infrastructure

Australia has been a world-leading proponent of public-private partnerships with an estimated $52 billion[10] of investment over the past 10 years to address the growing backlog of transport infrastructure projects.

The injection of private sector capital and expertise into major projects has allowed governments and communities to benefit from critical infrastructure without government taking on the risk or financial burden (Figure 9). It has allowed governments to free up their balance sheets for social infrastructure and other priorities at a time when they are facing competing funding demands.

Roads are overwhelmingly the most popular form of transport in Sydney, catering for more than 90 per cent of travel (Figure 10). It is estimated that by 2031–32, Sydney will need to accommodate 2.3 million more daily car trips.[11] However, demands on government funding, have meant less than half of the transport budget is allocated for roads.[12]

Figure 9: Significant fiscal pressure ahead for governments



Source: Deloitte Access Economics, 'An Intergenerational Report for the States', incorporated within the BCA Submission to the 2011 Tax Forum, October 2011.

10 Infrastructure Partnerships Australia analysis, 2017

11 Infrastructure NSW, The State Infrastucture Strategy, 2012-32

12 Ibid

Figure 10: Moving around Sydney

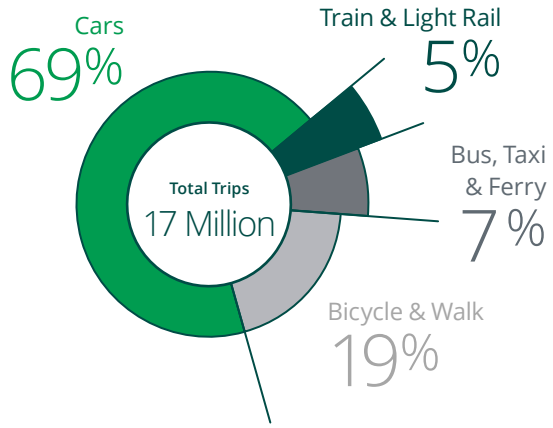
Each week there are over 17 million passenger journeys across Sydney.

69% of trips are by car

93% of travel is on roads

48% of transport budget is for roads

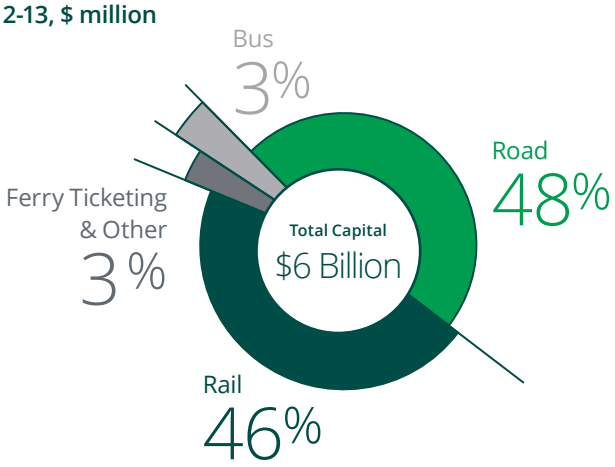
Mode share:
Average weekday trips (2010)



Road vs non-road:
Average weekday trips (2010)

Note: Road does not include bicycle or walk trips

Funding share to mode:
2012-13, $ million

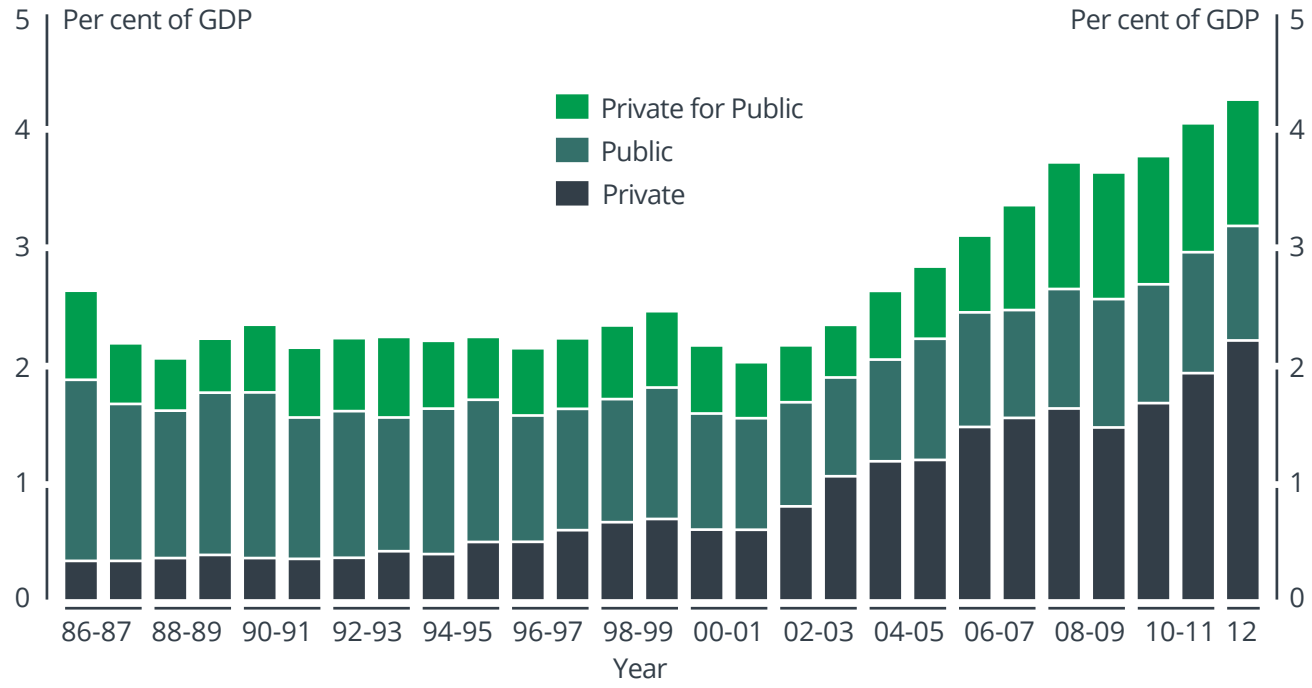


Source: NSW Government; NSW Bureau of Transport Statistics; cited in Infrastructure NSW, The State Infrastructure Strategy 2012-2032

"Increasing use of outsourcing and divestment are a feature of modern government service delivery and can deliver lower cost with greater innovation. In general, private sector-led projects are delivered closer to time and budget than public-sector led projects."

Infrastructure NSW
State Infrastructure Strategy
2012–2032

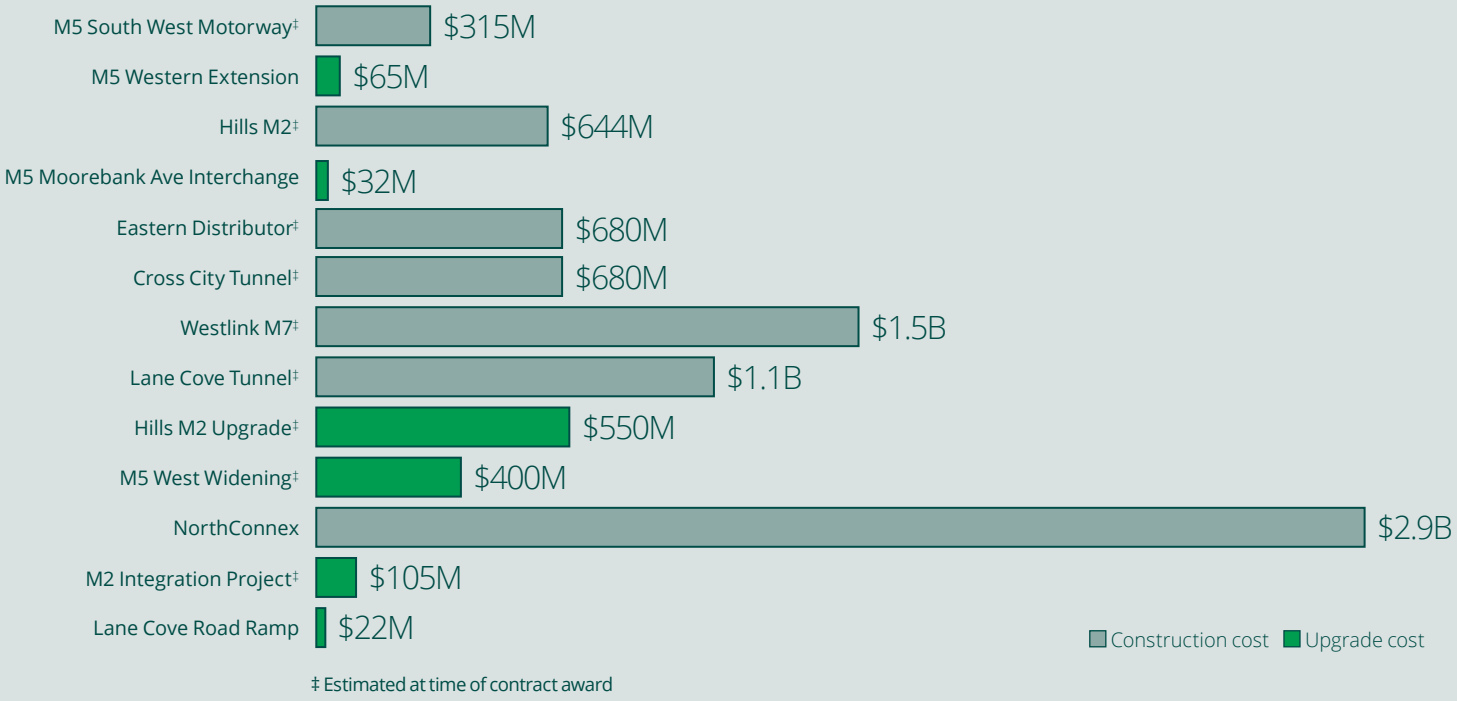
Figure 11: Total infrastructure investment in Australia



Source: ABS cat. no. 5204.0, 8762.0 and Business Council of Australia (BCA).

Substantial increase in infrastructure spend has been supported by greater contributions from the private sector.

Figure 12: Investment in Transurban-operated road network



‡ Estimated at time of contract award

NSW has been a leader in the use of PPPs to deliver toll road projects with eight motorways and tunnel projects opened to date.[13] PPPs have allowed the government to provide tangible outcomes for the community, while transferring the significant patronage risk to the private sector and freeing the public balance sheet for other priorities.

Westlink M7, which opened in late 2005, is widely regarded as a "best practice" PPP.[14] The motorway was procured by the NSW Government with the construction and ownership risks transferred to the private sector. Transurban is a 50 per cent shareholder in Westlink M7. The motorway, which opened eight months ahead of schedule, provided a vital missing link in the Sydney Orbital network and has played a major role in the economic development of adjoining areas, including the development of transport and logistics industries around Eastern Creek.

Transurban's current Australian development pipeline represents approximately $9 billion and includes funding of five critical infrastructure projects in NSW, Victoria and Queensland, which enables those governments to focus on non-economic infrastructure and social investment. Transurban and its partners will fund $6.8 billion of this pipeline, with the remainder coming from governments (Figure 13).

In NSW, Transurban and its partners have invested approximately $1 billion to enhance Hills M2 and M5 West motorways over the past five years. These investments and network enhancements have been negotiated and agreed with the NSW Government.

This has been achieved through adjustments to tolling levels and extensions to concession agreements. These projects have significantly improved the traffic flows and travel times on the broader network, providing direct economic benefits to the city with minimal direct capital investment by the government.

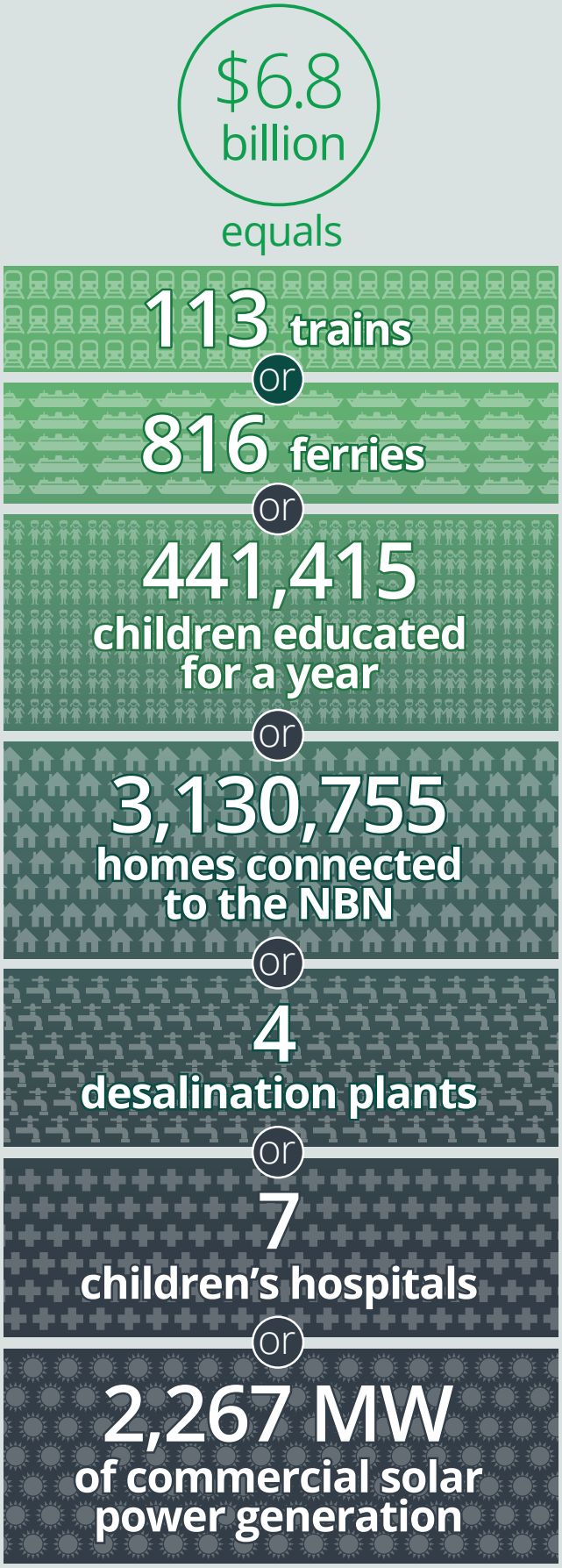
Our project to provide another missing link in the network, NorthConnex, which connects the M2 with the M1 Pacific Highway, represents a further multi-billion dollar investment from Transurban and its partners. This project has also been a model for collaboration between the NSW Government and Transurban (and its partners), leading to a reduction in the government funding commitment required for this project.

The project will offer motorists significant benefits in terms of travel-time savings and create more efficient movement of state and national freight.

This PPP procurement model allows the flexibility to continually enhance the network throughout the concession period and, importantly, provides the motivation for the private sector to do so.

Figure 13: Private sector contribution

Transurban and its partners' current financial contribution to infrastructure projects in Australia.



13 Infrastructure Partnerships Australia, Urban Transport Challenge: Driving reform on Sydney's roads, 2009

14 Australian Government, Department of Infrastructure and Transport, Infrastructure Planning and Delivery: Best Practice Case Studies, December 2010

Risk Allocation

Private sector involvement in a new project transfers the construction and patronage risk away from governments.

The risk is significant, with well-documented failures in the sector.

Failure of projects such as the Cross City Tunnel (Figure 14) hold lessons for investors and government alike. However, in spite of public controversy, such projects also show the value of risk transfer gained through a PPP model. The use of PPPs protects taxpayers from the impact of overly optimistic patronage forecasts. Private investors lost equity when the project failed to meet its patronage forecast—however, taxpayers continued to benefit from access to a world-class tunnel.

Transurban believes that private sector operators that are long-term stewards of the roads are best placed to estimate network traffic, understand operations and maintenance costs and bear the project risk. They have a vested interest in its ongoing success and value for customers, clients and investors.

There is strong evidence that the discipline, project governance and risk arrangements instilled through a PPP arrangement improves their cost and time performance over traditionally procured projects.

A 2007 study[15] found that non-PPP projects had cost overruns of 14.7 per cent compared with only 1.2 per cent for PPPs. Time performance was even greater with non-PPP projects being delivered 23.5 per cent behind time while PPPs have been delivered 3.4 per cent ahead of their construction schedule (on a value weighted average).

There was also evidence to suggest PPPs were more transparent than traditionally procured projects—with more publicly available data on the PPP projects.

Procurement and Project Delivery

Incentivised to achieve the best outcomes for its government partners, communities, customers as well as its investors, the private sector has a proven track record of driving efficiency and innovation in design, construction and operation as well as comprehensive community and stakeholder engagement.

Private sector investment has allowed infrastructure projects to be accelerated by years and sometimes decades, allowing governments to deliver value and benefits to the community sooner.

NSW's 2012 State Infrastructure Strategy originally scheduled development of the M1-M2 link (now NorthConnex) for a 10 to 20 year time frame. Through Transurban's unsolicited proposal to the NSW Government, the project has been brought forward by more than a decade with completion scheduled for 2019. The project's flexible approach to procurement fast-tracked the bid process with tenders received in December 2013 and a preferred design-build contractor selected in March 2014.

The flexible approach to procurement also produced a practical design solution to meet the growing transport needs in Sydney's northern suburbs.

Regardless of the procurement methodology, (traditional procurement PPP or unsolicited proposal), road construction is always competitively tendered. On NorthConnex, for example, $2.7 billion of the $3 billion project consisted of a design and construct contract that was competitively tendered by Transurban (and partners) and RMS working in partnership. Competition for road construction projects remains intense as evidenced by NorthConnex, WestConnex and projects interstate such as Gateway Upgrade North in Queensland.

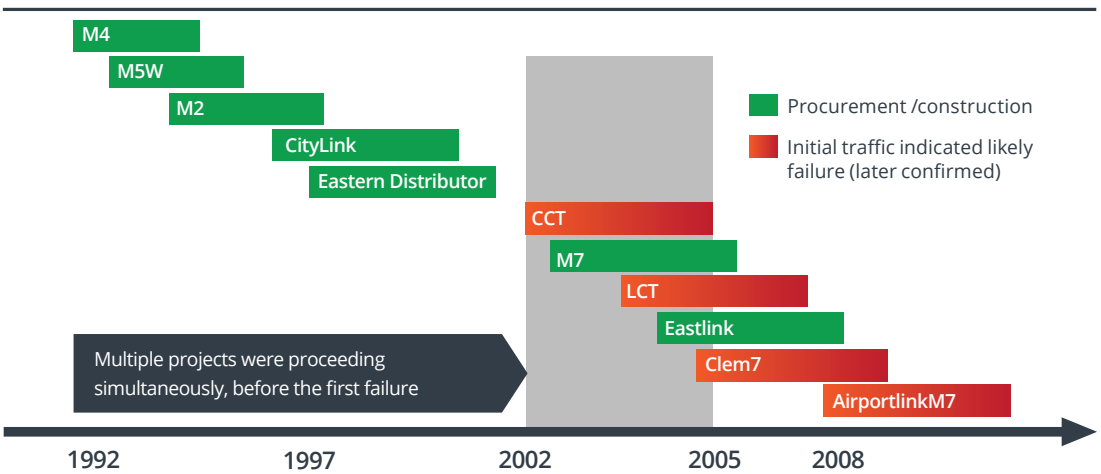
15 Infrastructure Partnerships Australia, Performance of PPPs and Traditional Procurement in Australia, 2007

Figure 14: Between 1992 and 2008 most major projects were funded as demand-risk PPPs

PROJECT	% COST FUNDED BY PRIVATE SECTOR
M4	100%
M5W	100%
M2	100%
ED	100%
CCT	100%*
M7	100%*§
LCT	100%*

** Does not include business consideration fee paid to the NSW Government in addition to fully funding the road.*

§ Additional funding provided by the Federal Government to support costs associated with connecting roadworks.



Case Study

Private Sector Excellence in Project Delivery

NorthConnex is an excellent example of the private sector working with government to fast-track a project that will address one of Sydney's most critical transport challenges.

The missing link between the M1 and the M2 had been high on the agenda of road transport planners for more than a decade, with estimated costs of the project around $4 billion in 2008.

In March 2012 Transurban delivered the state's first unsolicited motorway proposal since its three-stage process was launched in January 2012. It was the first greenfield NSW motorway project to be borne out of an unsolicited process since the Sydney Harbour Tunnel in 1986.

The unsolicited proposal process allowed for a collaborative approach to refining the funding mix, providing an acceptable return to the private sector while achieving project objectives including transport network outcomes and value for money for road users.

Working in partnership with government, Transurban and partners were able to fast-track the development of the project through commercial agreements, procurement of the design and construction and environmental approvals for a cost of $3 billion.

Streamlined procurement

Transurban and the NSW Government went to the design and construction market together with an innovative approach to tendering that set a $2.65 billion design and construction budget cap as a condition for the project to proceed.

The process was not overly prescriptive and allowed bidders to bring their best ideas forward, with guidance provided through interactive sessions. Bid costs were kept lower by avoiding the need for excessive bid documentation.

The tender designs were guided by:

- mandatory functional requirements, "must haves"
- scope of works and technical criteria, the base document which tenders could innovate and change
- an illustrative scheme design, which communicated key project parameters
- tender baseline conditions of approval, and
- a summary of community consultation outcomes.

This approach allowed requirements to be clearly understood while promoting innovation. The process has produced an outstanding tunnel design which is future proofed, with a wider cross-section and more height for trucks than existing tunnels.

Skilling NSW

NorthConnex Hub is a dedicated facility designed to provide training and certification in high-demand skill areas for 300 employees working on the project.

The hub is part of a $10 million investment in training across the whole NorthConnex project.

Up to 90 trainees and apprentices as well as other employees are being trained in courses including civil construction, mobile plant operation, emergency and crisis management, financial acumen, leadership and cultural heritage awareness.

The tender process also fast-tracked the bid time frames to just 16 weeks, further reducing bidding costs.

The planning approval process ran in parallel to procurement, allowing the Environmental Impact Statement (EIS) to accurately reflect the design and construction design, rather than a generic reference design that may change after planning approval. This was a good outcome for the community, ensuring no major 'surprise' design changes once the project had received planning approval. The parallel processes also allowed construction to start approximately one year quicker than the traditional procurement process.

Project delivery

PPPs are the most efficient and effective way to deliver large-scale projects with complex stakeholder relationships and interfaces with other infrastructure. By having 'skin in the game' for the construction, operation and equity phases, Transurban is incentivised to deliver projects on-time and on-budget.

The commercial interest in the safe delivery of the project, as well as the same reputational concerns with government and other stakeholders, combined with Transurban's ability to be flexible and nimble throughout the construction phase promotes innovation and leads to positive outcomes such as using the spoil from tunnelling to transform the disused Hornsby Quarry into a public park.

Creating jobs for NSW

The high levels of infrastructure investment in NSW and the specialised nature of tunnelling have led to skills shortages. The project delivery team has met this challenge through a $10 million investment in training, including a "NorthConnex Hub" classroom and training facility. More than 8,700 jobs will be created over the life of the project.

Delivering safely

Health, safety and the environment are key focuses for Transurban and are instilled in the NorthConnex project. The Transurban project team works closely with the design and construction contractor and RMS to be an industry leader.

NorthConnex is a 24-hour operation with an average daily peak workforce of 1,500 construction staff. It is a high-risk environment that requires stringent project controls as workers tunnel 24 hours a day, seven days a week, building on operational motorways as well as carrying out a large civil works program.

Despite these challenges, NorthConnex has an extremely strong safety record with a current Recordable Injury Frequency Rate of around five. The project has also achieved three million work hours completed without a Lost Time Incident as at December 2016.

Customer-focussed, long-term operational approach

In addition to the customer focussed, long-term design improvements delivered as part of the innovative tendering process, Transurban's long-term interest in the successful, efficient and safe operation of the motorway promotes ongoing innovation. The project's commercial structure allows it to be responsive and nimble in driving this innovation through to the delivery phase.

For example, once operational, NorthConnex will be the first new tunnel in Australia to use digital radio. In addition to helping to future-proof the infrastructure and ensure road users can access the technology from their vehicles, this will allow important safety messages to be more effectively communicated directly to motorists as they travel through the tunnel.

Sustainability

NorthConnex has been independently recognised for its sustainable approach to design. In late 2016, the project achieved a 'Leading' Infrastructure Sustainability Design rating by the Infrastructure Sustainability Council of Australia. To date NorthConnex is one of only six projects, and the only motorway, in Australia to receive this rating. The team is now focused on achieving a 'Leading' operational rating.

The Transurban project team is also exploring opportunities to incorporate more sustainable technology into the design. NorthConnex will be the first tunnel in Australia to switch to LED lighting, drastically reducing electricity consumption and maintenance impacts during operation.

NorthConnex is committed to leaving a lasting legacy in the community. So far the project has reduced the need to clear more than 1.3 hectares of vegetation, delivered presentations to over 1,300 school children and responded to more than 800 vehicles incidents/accidents along the alignment.

The project is working with RMS and Hornsby Council to help in the transformation of the disused Hornsby Quarry into a thriving public parkland. The project team identified an opportunity to assist Hornsby Council to achieve its goal of creating a new community space by helping to fill the old quarry site with around one million cubic tonnes of spoil from the NorthConnex tunnels. This innovation benefits the local community, and also helps to reduce truck movements and improve the project's environmental outcomes.

NorthConnex has demonstrated the benefits that Transurban can offer as an operator of assets and leader of a private consortium to build new infrastructure. This multifaceted ability has enabled the project team to manage the complex interface with new tunnel construction, the upgrade to the Hills M2 motorway and managing the needs of road users and public transport on the motorway and the wider road network.

Operational Excellence and Customer Service

As a long-term owner and operator, the efficient and safe operation of our toll road networks are central to our value proposition.

Health, safety and environment

Safety is our highest priority and we have sophisticated systems, practices and targets in place to ensure we offer the safest possible experience for drivers on our roads.

Compared to the broader network, the serious injury rate per 100 million vehicle kilometres travelled on Transurban's roads is 50 to 80 per cent below comparable state averages on the broader network.

In what is considered a leading form of measurement on road networks, we benchmark our historical road safety performance using a Road Injury Crash Index (RICI), measuring the frequency of serious road injury crashes on our networks.

In FY16, the RICI across all Transurban assets was 4.58 injury crashes per 100 million vehicle kilometres travelled.

Traffic control centres monitor road conditions and safety for each asset, while response teams provide rapid response in the event of a crash, traffic disruption or other incidents.

Some of the key ways in which we seek to manage and improve road safety include:

- effective road design and traffic management
- road safety audits
- monitoring of road safety statistics including crashes, breakdowns and other on-road incidents, and
- promoting public awareness of road safety issues and education campaigns.

Reliable network—incident clearance

Rapid and effective response to any incidents on our roads is fundamental to ensuring and minimising traffic disruptions, which can affect the broader network.

Transurban's in-house response teams are well below the target response time for clearing incidents on Sydney roads with accident clearance times on the motorways 30 per cent quicker than the Traffic Management Centre target clearance times.

Enhancing customer service

Transurban is committed to continuously improving the products and service we offer our customers (Figure 15). We have a Customer Engagement Program, which aims to increase our understanding of customers' expectations. We have identified a number of opportunities to enhance our customer service through face-to-face consultation, call centre evaluation, market research and customer data analysis.

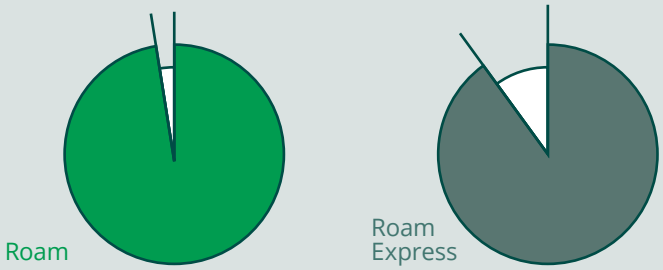
We also continue to develop our products, particularly in the mobile space, as more than half of our customers now access their accounts on mobile devices.

Some of the initiatives we are planning or have under way in the NSW market include:

- investigations into a tagless product in NSW. With the assistance of video tolling, the new product will allow more infrequent users to travel the roads and pay as they go
- iOS and Android apps to allow customers to manage their accounts on the go including checking their balance and updating account information, and
- significantly improved digital experience with reduced data fields to streamline account management on line.

Figure 15: Customer service performance (FY16)

First call resolution

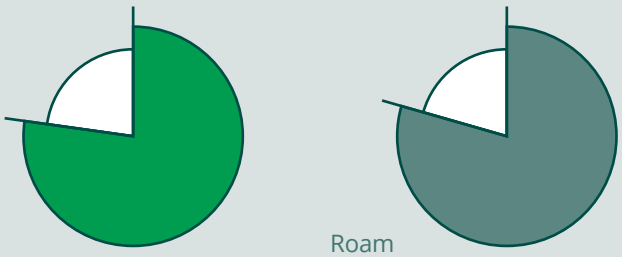


Roam
97.6%

Roam Express
90%

Grading of service—target 70%

Percentage of calls answered within a specified timeframe.



Roam
77.4%

Roam Express
79.5%

Customer satisfaction (out of 5)

Roam 3.9 stars

Roam Express 4 stars

Technology Investment

On our foundation asset, CityLink in Melbourne, Transurban pioneered the implementation of one of the first fully electronic tolling systems in the world, minimising congestion by collecting tolls at motorway speed.

As we acquired interests in a number of Sydney toll roads, this method was extended across the portfolio, both to greenfield development and in progressive conversion of existing toll roads in the Sydney network.

We continue to actively manage our assets (Figure 16) by investing in technology such as lane-usage management systems and ramp metering to improve traffic throughput, travel speeds, reliability and safety for drivers. On our US Express Lanes assets, we have introduced dynamic tolling to manage traffic flow and customers are realising travel-time savings of up to 40 minutes a day.

Smart motorway technologies use real-time information to evaluate traffic conditions and actively manage demand on the asset.

In Melbourne, the Monash–CityLink–West Gate corridor incorporates a freeway management system to enhance traffic flow and safety along the corridor. The coordinated ramp metering alone has increased throughput by 5 to 20 per cent during congested periods.

Smart motorway technologies have the potential to improve efficiency and safety across the Sydney network. While smart motorway projects are planned for the M4 and WestConnex as well as Transurban's NorthConnex tunnel project, there are opportunities for further implementation.

NorthConnex will feature a range of technologies (Appendix 3) to ensure the best and most sustainable outcomes for our customers and government partners.

Investing in innovation

Transurban is committed to investing in innovative projects that help address challenges in the transport and infrastructure areas. Through our Transurban Innovation Grants program we offer grants of up to $100,000 to universities and research organisations to fund projects in these areas.

The University of Newcastle in NSW was awarded the 2015 grant to trial a revolutionary, new material in road safety barriers. The team is working on a material that is stronger and lighter and could have the ability to better cushion collision impacts.

Our 2016 Innovation Grant was awarded to RMIT University in Melbourne to trial cutting-edge technology to determine whether noise cancellation and transformation can create meaningful impacts for residents who live near motorway sound walls.

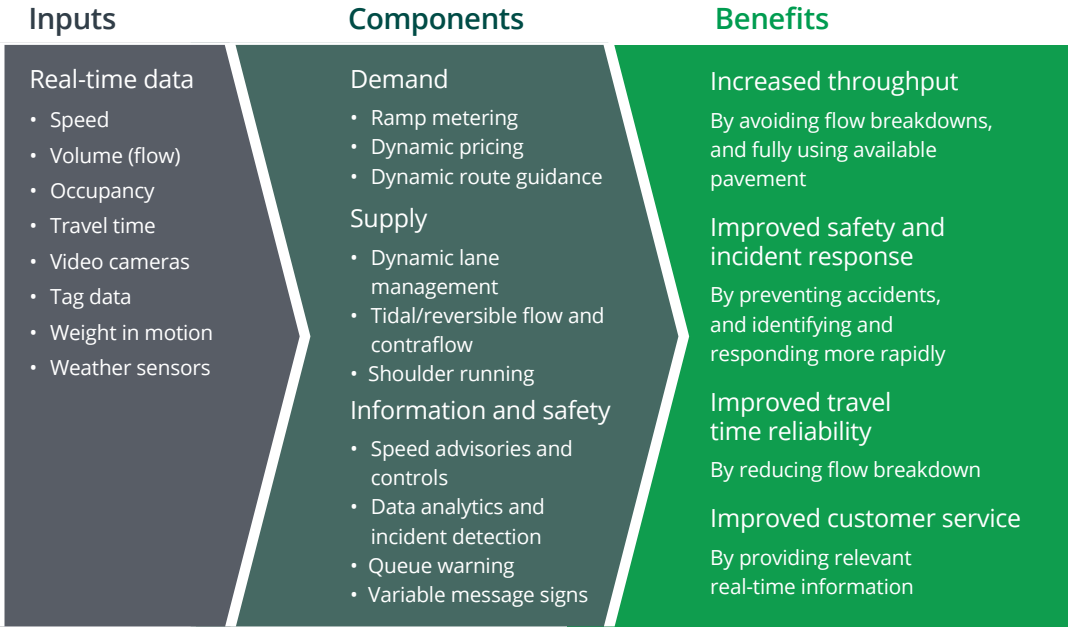
The team at RMIT, in partnership with the University of Technology, Sydney, will investigate the management of the motorway noise through acoustic treatment, using noise cancellation and transformation technologies.

The project will be conducted at two trial sites, the M2 in NSW and CityLink in Victoria—with nearby residents invited to participate in the trials and provide feedback to determine the feasibility and effectiveness.

Noise management along motorways is a global issue, particularly in densely populated urban areas. This research seeks to address this issue by testing this unique technology.

The project will be completed by June 2017.

Figure 16: Active traffic management



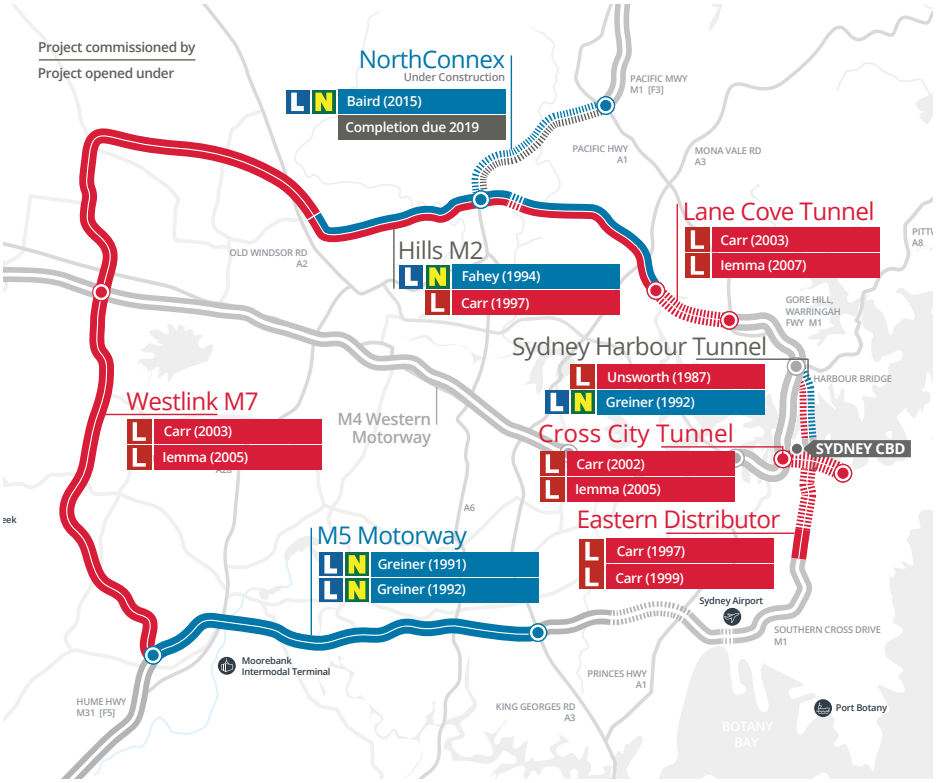
Section 3:
Sydney's Toll Road Network—A Bipartisan Achievement

For 30 years, successive NSW Governments have been implementing the Roads 2000 Plan which mapped the development of an orbital road corridor for Sydney.

The plan has largely been completed mainly due to the delivery of assets through privately financed toll roads.

Central to the successful development of the network has been bipartisan support for innovative private financing funded by 'user-pays' models (Figure 17). Most of NSW's tolled motorways were developed through PPPs on Crown land under long-term concessions. This model has provided Sydney with a motorway-grade, free-flowing road network that connects economic and residential growth areas. As industry organisations such as Infrastructure Partnerships Australia have recognised, these motorways play a "critical role in reducing travel times and alleviating congestion in Australia's most heavily populated city."[16] Further information about the development of Sydney's toll road network is provided in Appendix 2.

Figure 17: Example of bipartisan support for the user-pays model across the toll road network



PROJECT	COMMISSIONING GOVERNMENT*	OPENED
Sydney Harbour Tunnel	Unsworth Labor (1987)	Greiner Liberal National (1992)
M5 South West Motorway	Greiner Liberal National (1991)	Greiner Liberal National (1992)
Hills M2	Fahey Liberal National (1994)	Carr Labor (1997)
Eastern Distributor	Carr Labor (1997)	Carr Labor (1999)
Cross City Tunnel	Carr Labor (2002)	Iemma Labor (2005)
Westlink M7	Carr Labor (2003)	Iemma Labor (2005)
Lane Cove Tunnel	Carr Labor (2003)	Iemma Labor (2007)
NorthConnex	Baird Liberal National (2015)	Expected (2019)

** Government at project financial close*

16 Infrastructure Partnerships Australia, Urban Transport Challenge: Driving reform on Sydney's roads, 2009

Concession Arrangements

Historically PPPs for toll road projects have been based on concession/project deeds that regulate the commercial arrangements for the ownership and operation of individual road assets. The deeds were originally negotiated by the NSW Government, the successful private sector bidder and the NSW bureaucracy in accordance with protocols and guidelines set by the government. Each toll road is governed by its own concession deed.

Transurban entities hold seven concession deeds with the NSW Government as outlined in Figure 18. We partnered with government and others to construct the Westlink M7 and NorthConnex and negotiated the concession terms with government. In addition, we acquired the M5 South West, Hills M2, Eastern Distributor, Lane Cove Tunnel[17] and Cross City Tunnel[18] once they were fully operational and are bound by the concession terms that were originally negotiated between the project developer and government. Specific terms can be renegotiated for augmentation and improvement projects.

In considering the commercial arrangements, government considers a range of factors including:

- the value the project delivers for the community and how it helps progress its transport priorities
- complexity of the project—tunnel projects require more capital outlay than open road projects (eg NorthConnex will cost five times more to construct per kilometre than Westlink M7 in today's dollars)
- the project design and associated delivery costs
- operation and maintenance costs, and
- forecast levels of traffic.

There are three key financial levers available to government including the concession length, initial toll prices and the toll price escalation schedule. Beyond these main value sources, government would have to consider reducing the cost of the project through agreeing a reduced scope or an increased government financial contribution. These options and impacts are discussed is the following sections.

Traffic forecasting—what's taken into account

- Land-use forecasts and their geographic distribution
- Socio-demographic breakdowns
- Road network characteristics and planned changes
- Mode share patterns and usage
- Income levels and distribution

17 Acquired post receivership

18 Acquired post receivership

Figure 18: Transurban's concession agreements with NSW Government

CONCESSION AGREEMENTS	M5	M2	ED	M7	NCX	LCT	CCT
TRANSURBAN OWNERSHIP	50%	100%	75.1%	50%	50%	100%	100%
OPENING DATE	August 1992	May 1997	December 1999	December 2005	Expected 2019	March 2007	August 2005
DATE TRANSURBAN ACQUIRED AN INTEREST IN OR COMMENCED OPERATING THE ASSET	June 2007§	June 2005	June 2007	December 2005*	Expected 2019+	August 2010	June 2014

§ *M5 operated by Interlinks Roads*

* *M7 operated by Northwestern Roads Group*

\+ *NorthConnex to be operated by Northwestern Roads Group*

Case Study

Overconfidence in Traffic Forecasting

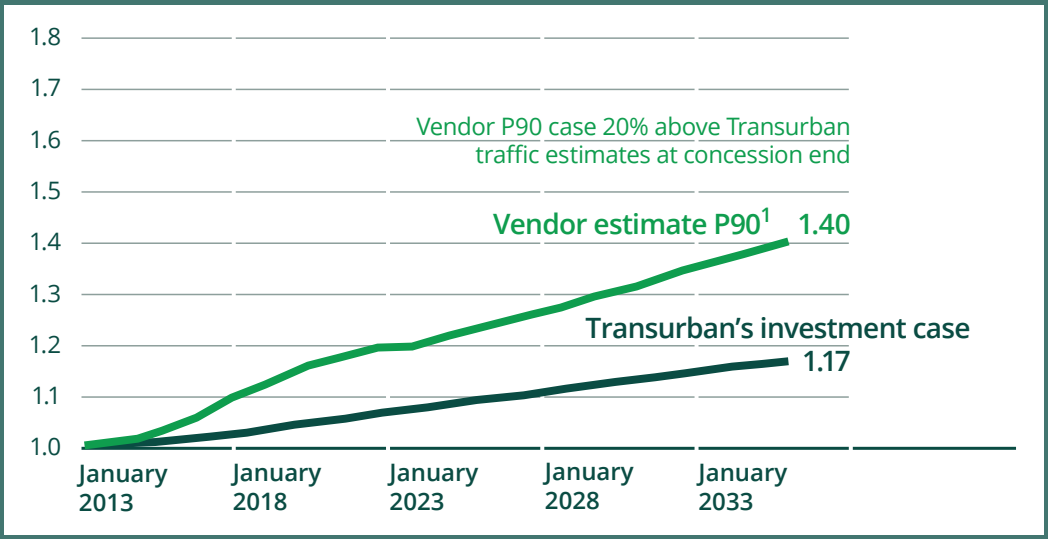
Private sector involvement in the delivery of toll roads has protected government and taxpayers from a number of poor outcomes over the past decade.

In Sydney, the two notable examples are the Cross City Tunnel and the Lane Cove Tunnel. In both instances the initial traffic levels substantially underperformed expectations (Figure 20), resulting in the assets being placed into receivership and ultimately acquired by Transurban.

In examining the potential causes for over confident traffic forecasting there are a range of factors at play. A misalignment of interest between potential fees that financial sponsors and contractors stood to gain upfront from winning a project is one factor that is believed to have contributed to aggressive traffic modelling for these projects. Groups with a long-term approach to owning and operating this infrastructure are considered to have a stronger alignment of interest in ensuring accuracy of traffic forecasts over the life of concession. The complexity of traffic modelling stems from the extensive range of variables that underpin the outcomes (ie supply/demand/capacity/time value of money). Assuming small upside on individual inputs compounds exponentially in aggregate forecasts.

Transurban continues to observe the potential for aggressive bidding in asset sale processes in recent years. In particular, vendor forecasts that have been put forward on a number of projects are substantially above the traffic estimates that Transurban has assumed for those projects. For those lacking the requisite expertise to assess this critical component of a project there is a heightened risk of assuming an overly aggressive traffic forecast. Figure 19 below demonstrates one such example that Transurban has experienced in an asset sale process it was involved in.

Figure 19: Traffic comparison—Indexed



1. P90 case assumes 90% probability of meeting or exceeding forecast

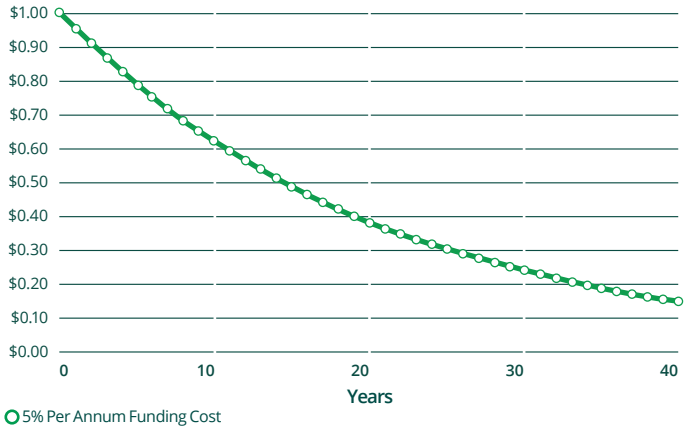
Figure 20: Traffic comparison—forecast vs actual

ROAD	OPENING DAILY VOLUME (ORIGINAL OWNER FORECAST)	OPENING VOLUME (DAILY ACTUAL)
Cross City Tunnel	85,000	27,000
Lane Cove Tunnel	104,786	44,420

Determining the Length of the Concession

To create a commercially viable project that is attractive to the private sector, the capital and ongoing operational and maintenance costs of the project need to be able to be recouped. Therefore, the lower the initial toll rate and/or future toll escalation rate, the longer the concession agreement length and/or the higher the contribution required from government. However, there is a limit to how much value longer concession terms can contribute to the funding mix due to the impact of time value of money. The more long dated the cashflow, the lower it is valued in today's dollars (Figure 21).

Figure 21: Current worth of one dollar received over a 40-year concession period



Setting Toll Prices

Time savings weighed against time value of money considerations are critical in determining the appropriate pricing points for a project, and this directly impacts the value proposition for motorists. If tolls are set too high, not enough users will use the road to maximise the project benefits. If tolls are set too low or are not escalated at a high enough rate, government may face the prospect of a large funding gap (that may need to be met through increased taxes). In Sydney, the value of time savings for the average car being used for private travel is assumed to be $21.20 per hour, based on typical occupancy rates and value of time per occupant based on figures used for economic appraisal of transport investments.[19] Time savings for vehicles being used for business purposes are valued higher at $53.30 per hour.[20]

The concession deeds set out the toll prices that can be charged by the road operator and are determined at the time of negotiation and sometimes years prior to opening of the project. In setting the initial cost and escalation rates, the government decides on a regime to best meet the objectives of funding the project and providing a value-for-money toll proposition that will make paying the toll attractive to motorists.

Sydney offers examples of differences in the implied value of tolls, reflecting the approaches of commissioning governments. For example, the current toll for cars in the 2.1 kilometere Cross City Tunnel is $5.47, which is more costly than the implied cost of the NorthConnex tunnel, which in today's dollars would be $6.89 for nine kilometres. Tolls on NorthConnex, currently being constructed, present a stronger implied value of time savings offered to users of that road due to the other funding sources that supported the project. Adjustments to the adjacent M7 concession and a government contribution bridged a significant portion of the value for NorthConnex, which meant only one third of the project value was modelled to come from the tolls on the new tunnel itself.

Figure 22: Transurban's concession agreements with NSW Government

	M5	M2	ED	M7	NCX	LCT	CCT
OPENING DATE	August 1992	May 1997	December 1999	December 2005	Under Construction	March 2007	August 2005
COST TO BUILD	$380M	$644M	$680M	$1.54B	$3B	$1.14B	$680M
REMAINING CONCESSION PERIOD‡	10 years	31 years	31 years	31 years	28 years§	31 years	19 years
CONCESSION TO END	December 2026	June 2048	July 2048	June 2048	June 2048	June 2048	December 2035

‡ As at 31 December 2016
§ Concession period from expected opening date late 2019

19 Transport for NSW, Principles and Guidelines for Economic Appraisal of Transport Investment and Initiatives, 2013

20 Ibid

Tolling Arrangements for Freight Vehicles

Each concession deed also includes tolling arrangements for large vehicles that are intended to capture the provision made to accommodate these vehicles on the motorway (Figure 24).

The specific tolling mechanism is called a "large vehicle multiplier" as large vehicles using the NSW toll road network pay between two-to-three times the car toll depending on the road asset.

The higher tolls for large vehicles in part reflects the greater value they derive from the time savings provided by the tolled network. Figure 8 (page 15) outlines the total hourly operating costs for various classes of large vehicles, and shows that operating costs are around three times and up to five times the cost of the average car. This implies that at current levels, large vehicles derive at least the same amount of value as cars based on their operating costs.

The higher tolls for large vehicles also reflect the greater impact they have on the road infrastructure. However, the current tolls charged for large vehicles do not accurately reflect these costs.

The wear-and-tear to road infrastructure caused by one articulated truck has been estimated to equal that of 6,000 cars.[21] Comparatively, the tolling charges for these vehicles are currently set at two to three times the car toll charge. Currently every workday we record more than 70,000 truck trip transactions across the toll roads we operate in Sydney; so the scope of the maintenance task borne by the private sector is evident.

Finally, the road design also incorporates special features, such as suitable pavement depth and grades, tunnel ventilation and break-down bays, to accommodate these vehicles, which increases the overall project cost. Large vehicles also occupy a greater proportion of road capacity. There are significant additional costs incurred in the design of tunnel infrastructure that is specifically derived from the freight industry. For instance, more gradual inclines are required for trucks, which lengthens the required amount of tunnelling, and this is demonstrated in the design of the NorthConnex tunnel. For the M7, a continuously reinforced concrete pavement was constructed at significant cost.

Figure 23: Tolling arrangements currently in place for cars across Transurban-operated assets

	M5	M2	ED	M7	NCX	LCT	CCT
TYPE OF TOLLING	Flat rate	Flat rate	Flat rate (Northbound), untolled (Southbound)	Distance based	Flat rate	Flat rate	Flat Rate
CURRENT TOLL CHARGES (CARS)	$4.57 Each way	$6.89 North Ryde	$6.95 NB only	39.24¢ cents/km capped at $7.85 after 20km	Same as M2 (North Ryde) toll point	$3.21 Main tunnel	$5.47 Main tunnel
		$3.44 Pennant Hills Rd				$1.61 Military Rd E-Ramp	$2.58 Sir John Young Cr
		$2.43 Windsor Rd					
		$2.04 Lane Cove Rd					
		$3.44 Herring & Christie Rds					

Figure 24: Tolling arrangements currently in place for large vehicles across Transurban-operated assets

	M5	M2	ED	M7	NCX	LCT	CCT
LARGE VEHICLE MULTIPLIER	3x	3x	2x	3x	3x	3x	2x
CURRENT TOLL CHARGES (CLASS B)	$13.70 Each way	$20.65 North Ryde	$13.90 Northbound only	$1.1772 per km capped at $23.55	Same as M2 (North Ryde) toll point	$9.67 Main tunnel	$10.93 Main tunnel
		$10.32 Pennant Hills Rd				$ 4.83 Military Rd E-Ramp	$5.16 Sir John Young Cr
		$7.30 Windsor Rd					
		$6.11 Lane Cove Rd					
		$10.32 Herring & Christie Rds					

21 Mid-North Weight of Loads Group analysis, 2017

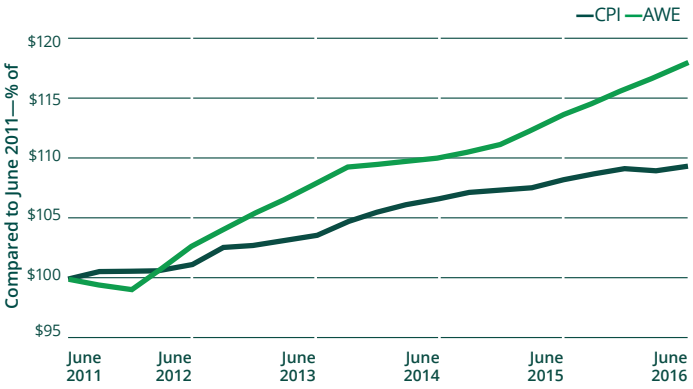
Increasing Toll Prices

Increasing tolls at a rate that is comparable to the rate at which users' wages and willingness to pay increases means that lower tolls can be charged in the early years of a concession. Traffic volumes are still ramping up and the travel time savings are not as large as in later years when population and employment growth lead to increased congestion and larger time savings for motorist using the motorway than the untolled alternative route.

If tolls were escalated at a lower rate, there would be a funding gap that would either need to be made up through government contributions, longer concessions or higher initial tolls. Higher initial tolls may not be fair to users of the motorway in the early years of a concession because they would be getting lower travel times savings and have less ability to pay the higher tolls than motorists using the road later in its life.

As discussed in the *Direct User Benefits* section, the key benefits toll roads provide are travel-time savings and reliability. The best proxy to measure the value of time is the rate at which the earnings for workers increase. Average Weekly Earnings (AWE) is a more direct connection between time and money for individuals than the Consumer Price Index (CPI), which measures the price inflation of a basket of various goods and services of which transport is one of only 11 major groups. Figure 25 shows how AWE has grown in Australia in comparison to CPI over the last five years (June 2011 to June 2016). AWE has increased 18 per cent (3.4 per cent CAGR) in this period whereas CPI has increased by 9.4 per cent (1.8 per cent CAGR).

Figure 25: AWE and CPI increases over five years



Notifying Customers of Changes to Toll Charges

The timing of the quarterly toll adjustments is harmonised across the NSW toll road network. To ensure customers are aware of the change and know where to access the new prices, every quarter we undertake a series of communication activities. We submit communication strategies to RMS one month in advance of the toll price change. Following approval of the strategy we roll out communications across on road (via variable message signs) and online (via Roam and Roam Express website updates) channels for a two-week period.

Figure 26: Tolling adjustment schedule

M5	Escalated quarterly by quarterly CPI. The toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased.
M2	Escalated quarterly by the greater of quarterly CPI or 1%.
ED	Escalated quarterly by the greater of a weighted sum of quarterly AWE and quarterly CPI or 1%.
M7	Escalated or de-escalated quarterly by quarterly CPI.
NCX	Escalated quarterly by the greater of quarterly CPI or 1%.
LCT	Escalated quarterly by quarterly CPI for cars and the toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased. Escalated quarterly by the greater of quarterly CPI or 1% for trucks.
CCT	Escalated quarterly by: the greater of quarterly CPI or 0.9853% (equivalent to 4% per annum) to June 2012; the greater of quarterly CPI or 0.7417% (equivalent to 3% per annum) to June 2018; quarterly CPI to concession end.

Changes to Concession Terms

Over the past six years, Transurban and its partners have invested or committed approximately $3.3 billion to upgrade and expand the toll road network through upgrade projects. These have significantly enhanced capacity and safety across the motorway corridor, resulting in improved travel times and traffic flows across Sydney's broader network. This was achieved with minimal direct capital investment by the government.

These investments and network enhancements were negotiated and agreed with the NSW Government as a substitute for direct capital contributions by the government. Doing so has in effect expanded the pool of value sources available to the NSW Government.

This has enabled two major road enhancements projects to be undertaken and brought the delivery of NorthConnex forward by more than a decade, benefitting the community sooner than originally planned. These projects are discussed below.

Hills M2 Upgrade

In 2007, Transurban put forward a proposal to widen the Hills M2 Motorway. The upgrade involved building an extra lane in each direction between Windsor Road at Baulkham Hills and Lane Cove Road to improve traffic flow and reduce congestion for motorists; and additional entry and exit ramps to provide access to the motorway for users.

A combination of funding sources was negotiated for the $550 million project, including a one-off toll increase of around eight per cent upon completion of the project, and extending the concession period by four years.

M5 West Widening Project

A project to widen the M5 West Motorway was completed in December 2014, which added an additional lane in each direction across the entire length of the motorway. The project also included the installation of variable message signs, up to 18 kilometres of noise walls, and a new operations management control system at Hammondville.

The project added 50 per cent more capacity to a corridor servicing some of Australia's most vital infrastructure, including Sydney Airport, Port Botany and growing industrial, commercial and residential areas.

The funding mix for the $400 million project included a concession extension of an additional 3.3 years to 2026, and increasing the truck toll multiplier from 2.2 times to 3 times increased incrementally over two years. There was no change to the toll charge for cars as a result of the project. The project also included a $50 million NSW Government contribution (predominately towards the cost of noise walls and other noise mitigation measures).

NorthConnex

Transurban partnered with Westlink M7 major shareholders to lodge a successful unsolicited proposal to build NorthConnex, a nine kilometre twin tunnel linking the M1 Pacific Motorway at Wahroonga with the Hills M2 Motorway at Pennant Hills. The NSW and Federal Governments are contributing up to $405 million each towards the cost of construction of the $3 billion project.

The remainder of the cost is funded by Transurban and Westlink M7 shareholders. The funding mix includes:

- tolling on NorthConnex once it has opened, which will be consistent with toll charges on the Hills M2 Motorway main toll point
- changes to the tolling for large vehicles on the M7 Motorway, Lane Cove Tunnel and Hills M2, and
- concession extensions on Westlink M7 and Hills M2 motorways, and Lane Cove Tunnel.

Process Transparency

The Unsolicited Proposal Framework (UPF) was adopted by the NSW Government in 2012 as a set of guidelines facilitating private sector engagement with the State Government. It comprises a three stage assessment process that guides the evaluation of unsolicited proposals from the private sector, clarifying and streamlining the avenues through which non-government bodies can engage with service delivery and infrastructure development in NSW. Importantly, the framework provides clear steps for the assessment of a project that provides consistency, rigour and transparency.

The process requires the private sector to demonstrate how it can help government deliver on its priorities effectively. It has a number of tests for the private sector around the proposed project's uniqueness and the value it could bring to the state. A probity advisor is appointed to monitor and report to the chair of the steering committee during the assessment process. Two of the five roles of the probity advisor are 'obtaining value for money' for tax payers and 'maintaining accountability and transparency.' Furthermore, all decisions relating to unsolicited proposals are considered by the Cabinet Infrastructure Committee which further safeguards taxpayers' interests.

Since its introduction, the UPF has become a proven method used by a number of consecutive governments to encourage the private sector to bring forward innovative and unique ideas. As at June 2016, 118 proposals had been submitted to government. Of these, five are progressing. NorthConnex was the first road infrastructure project to commence construction under the framework.

Contract summaries for all NSW road infrastructure projects are publicly available.

Engaging the Freight Industry

Transurban values it customers and a key part of Transurban's role is to ensure that we regularly engage with our key account holders to better understand their needs and improve our services to them. In fact 10 of our top 20 customers are fleet-leasing companies such as Leaseplan, Toll and Australia Post.

Part of our engagement includes biannual strategic review meetings where we meet one-on-one with our key account holders and discuss their requirements and how we can better assist them. These biannual one-on-one meetings have been occurring for the past eight years and it is through this collaboration that we are able to inform them on any upcoming toll changes and better service the needs of our key account holders.

In addition to these meetings there is regular communications by Transurban to our key account holders through quarterly market updates and one-on-one meetings when requested.

NorthConnex Engagement

Transurban, in partnership with the NSW Government, has undertaken substantial engagement with the freight industry around the NorthConnex project, given the associated changes to truck tolls on the M7 that were agreed as a part of the funding arrangements for that project.

Representatives from Transurban and the NSW Government met with representatives of the freight industry on two occasions to brief them on the NorthConnex project and its funding model. The meetings were held in March and August 2014 and were chaired by the Chief Executive of RMS as part of the Road Freight Industry Council meeting.

The August workshop attendees were briefed on the key components of the funding model to deliver NorthConnex by extending the Westlink M7 concession and the gradual introduction of a heavy vehicles toll multiplier on the M7 motorway. Briefing the industry at this session provided organisations with the opportunity to prepare a submission to the NorthConnex EIS which went on display in late 2014.

Further to this engagement, stakeholder letters were sent in February 2015 outlining the changes over the two-year period. Other forms of engagement in February 2015 included electronic message signage on the motorways, website updates and a media release.

During construction and prior to opening, Transurban will continue to engage with the freight industry to outline the benefits, timing and opportunities associated with a traffic light-free connection through Sydney.

Section 4:
How Tolling Works

Transurban pioneered multi-lane, free-flow tolling on CityLink in Melbourne in the late 1990s and have continued to develop technologies at the forefront of the industry.

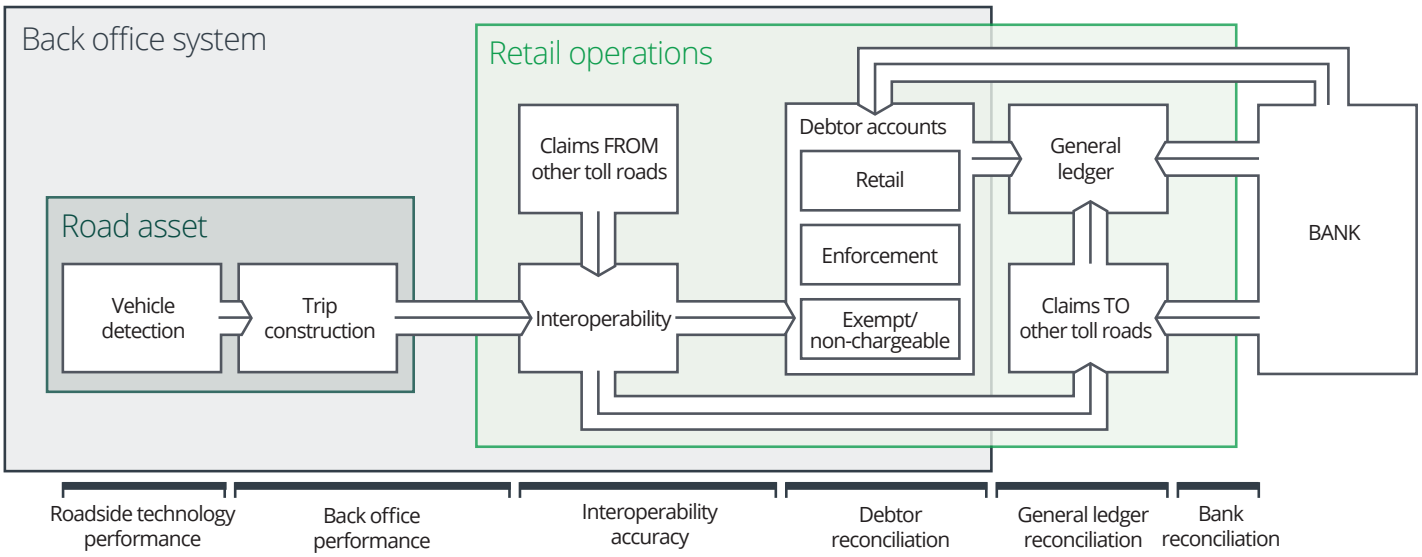
Every workday more than 700,000 trips are made across our NSW road assets. Each trip is recorded by sophisticated roadside equipment and processed through our state-of-the-art back-office tolling system (Figure 27). This complex and sophisticated process generates approximately 2.6 terabytes of data each month.[22] This amount of data provides regular intelligence on travel patterns and movements across the network.

Tolling system intelligence

As an example, in one month, for trips made across the Eastern Distributor, Lane Cove Tunnel, Cross City Tunnel and Hills M2 Motorway our tolling system captured and processed:

- 17.5 million vehicles images
- 9.7 million vehicle detections
- 8.4 million tag detections
- 8.1 million tag trips, and
- 935,000 video matched transactions.

Figure 27: Toll Transaction Processing Chain



22 Includes Hills M2 Motorway, Eastern Distributor, Lane Cove Tunnel and Cross City Tunnel

Tolling Innovation—Express Lanes, USA

Transurban's dynamically priced 495 and 95 Express Lanes in Northern Virginia, in the USA, offer an example of how the public and private sectors have applied innovative thinking and technology to tackle peak-hour gridlock on two of the country's most congested highways. At the same time they have addressed policy issues for stakeholders.

Prior to the Express Lanes projects being operational, the Capital Beltway was ranked in the top three worst commutes with 194 hours of congestion a week. Since opening in the 1960s, traffic has increased by more than 600 per cent on some stretches. The Virginian Government had planned a traditional highway expansion but was forced to abandon plans after significant public opposition due to residential acquisitions and prohibitive costs.

Transurban and its partners proposed an alternative solution under the Public Private Transportation Act—to build four new dynamically tolled Express Lanes next to the eight existing freeway lanes. The proposal largely used the existing footprint, reducing the impact on the local community and transferring the risk to the private sector. The project also included the replacement of $260 million worth of ageing bridge infrastructure.

The 495 Express Lanes opened in late 2012 and delivered the area's first major expansion of interstate capacity in over 40 years. The 95 Express Lanes opened late in 2015 and adjoined the 495 Express Lanes to create a network of managed motorways around the busy Washington D.C. area.

Based on a sophisticated algorithm, the toll-price increases and decreases depending on traffic density and ensures a minimum average speed of 55 miles per hour and 45 miles per hour for the 95 and 495 Express Lanes respectively.

The Express Lanes offer motorists with three choices:

- travel on the regular lanes that run alongside the Express Lanes for free
- pay to use the Express Lanes – where they can rely on minimum speed, or
- car pool or take the bus and get to travel on the Express Lanes for free.

The creation of the Express Lanes has addressed long-standing gridlock on a section of the East Coast's busiest transport corridor and the Washington DC region now has a facility that provides reliable and faster travel times. For example, during peak periods, traffic speeds on the 95 Express Lanes are on average 40 per cent higher than in the adjacent general purpose lanes. The lanes encourage car pooling and predictable travel times mean buses can meet their schedules. Travel times have also improved on the regular lanes as commuters take advantage of the new options and capacity.

Figure 28: Benefits of Express Lanes in the Greater Washington area

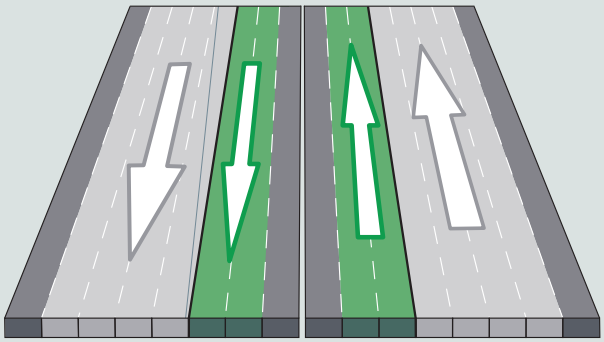
3 in 4
drivers say the Express Lanes benefit the DC area

>30%
of trips on the 95 Express Lanes were toll free for high occupancy vehicles or exempt in 2016

35-40 min*
saved per day on an average commute between Quantico and Alexandria using the Express Lanes

** from April to June 2015*

What are Express Lanes?



General Purpose Lanes | 495 Express Lanes configuration | General Purpose Lanes

Section 5: Regulatory Environment

The tolling sector is heavily regulated in NSW through concession agreements with government.

As noted in Section 3, toll charges and increases are set under each concession deed by government in the initial contract stage of a project. Each toll road is governed by its own concession deed, the terms of which (including pricing) are determined on the basis of the particular features of that project, and independently of any other toll road. For this reason, it is immaterial to the terms of any concession deed as to whether the owner/operator is a concessionaire for any other toll road assets or projects (in NSW or elsewhere).

As has been acknowledged by the Australian Competition and Consumer Commission (ACCC) in a number of previous merger assessments, each toll road operates as a separate, discrete and independent business that must be operated strictly in accordance with the terms of its concession deed. This is evidenced, in practical terms, by the relevant toll road concessionaire:

- having no pricing power
- operating a toll road that constitutes the supply of a service within a distinct geographic area by reference to a particular origin and destination with no capacity to influence alternative routes or modes of transport, and
- operating a toll road that is not influenced or affected by pricing on any other toll road (eg the northern corridor M2 motorway does not 'compete' against the southern corridor M5 or Eastern Distributor for patronage).

Although subject to very different regulatory regimes (Figure 29), an analogy can be drawn with electricity distribution network providers. Access to, and pricing of, electricity distribution is determined by the Australian Energy Regulator under the National Electricity Rules. Although the process and body undertaking the determination is different, the outcome is the same for toll roads where pricing is set by government through the concession agreements.

We note that the recent *Harper Competition Policy Review 2015* did not raise any concerns about competition in the toll road industry, rather it focused strongly on road pricing reform, which Transurban supports.

Development of new toll roads

In considering the construction of a new road project, the NSW Government has multiple delivery options available that can be adopted to best deliver value for money based on the specific circumstances. These range from a traditional PPP; State delivery in collaboration with private D&C contractors; government tender of the concession; or unsolicited proposals as a few examples.

Toll road concessions in NSW are highly sought after and there has always been significant competition to acquire these assets whether it is through direct tender for the greenfield concessions or as secondary sales of brownfield assets. The market interest in toll road concessions has been demonstrated by recent transactions both in Australia and internationally. Infrastructure Partnerships Australia's recent *Perpetual Infrastructure Investment Report* (2016) highlighted that roads were voted as the single most attractive infrastructure asset class by investors.

Figure 29: Regulatory environment across industry sectors

	CONCESSION DEEDS	INDEPENDENT REGULATION	LIGHT-HANDED MONITORING
EXAMPLE INDUSTRIES	Toll roads	Utilities including electricity, water, gas	Airports, railway and some ports
PRICING FREEDOMS	Australian tolls fixed from date of concession with defined escalation. Other charges are set out in concession deeds, legislation or agreed with client (cost recovery)	Prices reset periodically (around every five years) to allow agreed return hurdles to be met based upon a regulated asset base	Price monitoring by the ACCC. Commercial arrangements with users renegotiated periodically
CUSTOMER CHOICE	Road users have alternatives including non-tolled roads and other modes of transport	Choice at retailer level but monopolies around distribution infrastructure	Limited alternatives for consumers and users (airlines, shipping lines)

The long-term economic benefit to a bidder for a toll road concession is tied to the exclusive right granted by the State to the concessionaire to operate that toll road under the terms of the concession deed and related legislation. That exclusive right is not affected by the ownership or operation of other toll roads. Each bidder (regardless of whether it has an interest in another toll road concession or is a potential new entrant) will assess the bidding opportunity by reference to economic and financial factors and criteria relevant to that toll road concession.

Regardless of the procurement methodology used, road construction is always competitively tendered. On NorthConnex, for example, $2.65 billion of the $3 billion project consisted of a D&C contract that was competitively tendered by Transurban and RMS working in partnership. Competition for road construction projects remains intense as evidenced by NorthConnex, WestConnex, Gateway Upgrade North, Western Distributor and various other road construction projects Transurban is currently involved in.

Expansion of existing roads

The existing owner of a toll road (as the holder of the exclusive concession for that toll road) can practically negotiate or in some cases be directed by the government to upgrade/ improve that existing road. This has occurred several times in Australia and is common place overseas. This is an excellent way for government to enable improved services for road users through the existing owner investing further in the toll road. These upgrades are often to improve road capacity and undertaken whereby the government does not need to invest taxpayer money into capital improvements and the design, construction and delivery risk is taken by the toll road owner.

Acquisition of toll roads

If toll roads are developed by government for sale to the private sector at a later date (such as the WestConnex project), then the private sector participates in a formal competitive sale process to secure the concession rights for the toll road. Sale processes for toll roads attract significant private sector interest and are highly competitive, which results in excellent bid prices. These sale processes are subject to scrutiny by the ACCC as well as FIRB and the ATO (as required). The rights acquired by the successful bidder are documented in a written concession deed, including the tolling regime set out by government.

Operations and maintenance

Operations and maintenance services are procured from a range of providers. There is significant competition and benchmarking around efficiency both in Australia and overseas. This is forecast to continue across both operations and maintenance.

Tags and passes (retail back office)

Tags, passes and their associated back office services are not profitable endeavours for toll road owners. At best, they cover their costs. Industry roaming arrangements are based on the fundamental requirement for interoperability and, to ensure that outcome, are agreed amongst all operators along similar (and often standard) commercial arrangements.

Toll collection systems

Tolling systems are provided by a number of local and international companies. Over 90 per cent of the NorthConnex project cost was competitively tendered, which is standard practice for these types of procurements. Tolling systems can be provided by companies like Transurban and others on a fee-for-service basis or delivered as a bespoke system, such as the one being developed for WestConnex. There are many options and providers of these services. This area is also likely to drastically change over the next decade with new technology offering many different alternatives and providers for toll collection.

Enforcement

In NSW, approximately 94 per cent of customers travel on toll roads with a valid arrangement for payment of tolls within the required time-frame.

While the tolling enforcement regime is regulated through the concession agreements that apply to each road, Transurban has a number of initiatives in place to give drivers information about tolling and payments processes and prevent and resolve any issues before they escalate.

We aim to improve the efficiency and value of tolling accounts by:

- proactively notifying customers when there are issues with their account (eg when they have a low balance)
- converting more road users into account holders to simplify services and reduce fees, and
- encouraging customers with multiple accounts to merge these into a single account.

Where a customer has a Roam or Roam Express retail account and does not have money on the pre-paid account at the time of travel, we provide extensive notifications to the customer to avoid a toll notice being issued.

Where a trip remains unpaid, RMS issues a toll notice on behalf of the motorways and the motorway issues two written notices to drivers to encourage them to pay outstanding tolls.

This ensures we strike a fair and reasonable balance for the vast majority of our customers who do the right thing and pay on time.

Transurban has a first-time forgiveness program where the fee is waived if a customer has an account and it is the customer's first toll invoice.

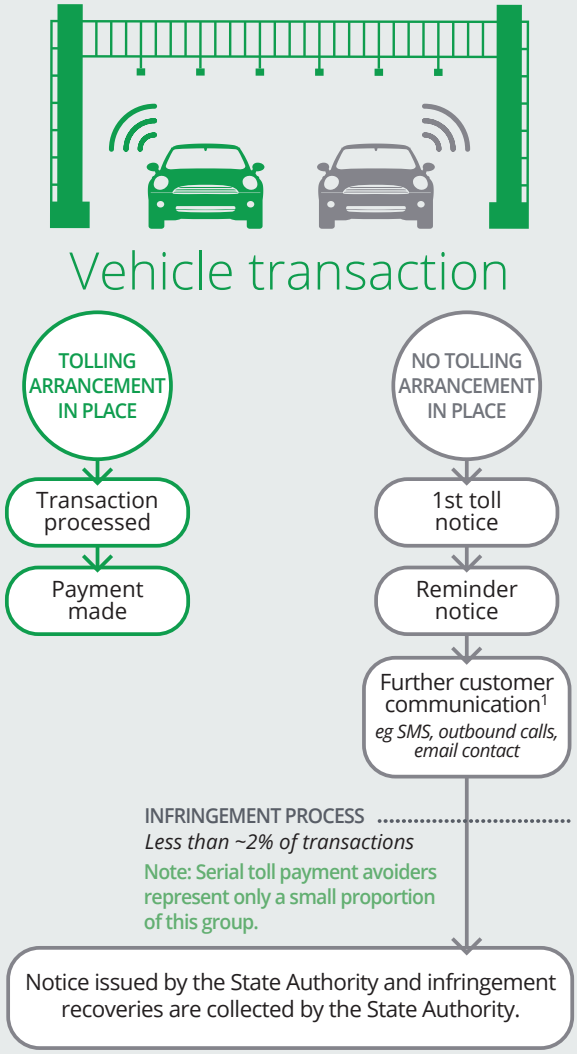
We also have a financial hardship policy for customers who are finding it difficult to settle any payments. For those who haven't made any travel arrangements with us, in the first instance, we also waive the toll invoice fees if an account is opened.

Through enhanced digital communication services, we can more effectively notify customers about any unpaid tolls.

Regulation in NSW allows for the registered vehicle owners' details to be provided under certain circumstances only (NSW vehicle, 10 or more trips outstanding).

Figure 30: Enforcement process

Most motorists use NSW toll roads without incurring fees and charges.



1. Where legislation allows and information is available

Section 6:
Alignment with Government Priorities

At Transurban we are focused on keeping traffic flowing to ensure our cities' productivity and liveability. This is our core focus and we have spent 20 years' understanding how we can better assist governments manage traffic flow across major urban centres.

We see Sydney's freeways and arterial roads operating as an interconnected network that connects people and freight with where they need to be. Some of these roads we operate and others are operated by RMS or local councils. However, as we and these other road operators readily understand, what happens on one part of the network can affect people travelling on other parts—even those that are many kilometres away.

For this reason, we work to ensure the whole network operates safely and efficiently, rather than just optimising our own motorways at the expense of other sections of the road. This aligns our interests with that of government and the community.

To keep Sydney moving we believe in taking a holistic view of the operation and development of the broader road network in ways that create value for governments and benefits for road users. This leads us to seek out opportunities that reduce overall congestion both on and off our toll road assets in a way that a passive investor would not.

As a long-term owner and operator, we are incentivised to get the best outcomes for our customers, government and the communities in which we operate. Section 2 of this submission contains key examples of how we deliver on this objective through:

- strategic investment in the network through upgrade and construction projects
- applying our expertise in road operations to manage traffic flow across our toll roads assets
- delivering technology solutions that enhance road operations, traffic flow and the experience of our customers.

Striving to be the partner of choice for the NSW Government underpins how we think about day-to-day road operations, customer service and strategic planning for Sydney's roads (refer to examples on page 40).

This is what differentiates Transurban from others investing in the toll road network. We regularly look beyond what is contractually required in our concession deeds to be a true partner for government.

Transurban's strategy is to be the partner of choice with governments providing effective and innovative urban road infrastructure utilising core capabilities

Network planning / forecasting

Community engagement

Development / delivery

Technology

Operations

Customer engagement

Finding new ways to engage and partner with government

Monitoring travel time trends—gathering and sharing data

With the help of TomTom data, we have been monitoring travel time and speed data in NSW since 2009. This data captures the average speed on Sydney toll roads at different times of the day, which can be compared year-on-year. This provides new opportunities to more effectively manage the motorway as a whole. This information is shared with RMS to ensure that investment decisions can be made by government with the most accurate information.

For example, Figure 31 shows that congestion across Sydney has been steadily increasing over the years. The charts also highlight when the Hills M2 Motorway Upgrade and M5 South West projects were completed (August 2013 and December 2014 respectively), which added more capacity to the network. As the charts show, since those projects, traffic has been increasing, however we attribute that to the current NorthConnex project. Data analytics such as these provide better understanding and allow for better decisions, clearer priorities and the ability for real-time management of the road network.

This insight allows the areas of the network that are starting to experience strain to be pinpointed; perform analysis of the cause; and implement actions that ensure the best possible experience for our customers.

Working with RMS to reduce congestion on and off motorways

A collaborative group has been established between Transurban and RMS with the mandate to plan for improvements on and off toll roads to alleviate congestion on the overall Sydney network. Called the 'Journey Enhancement Team', Transurban and RMS are each contributing significant resources, capability and data to this working group.

Establishing network-based reporting on KPIs—increasing visibility of our performance

Transurban initiated network-based KPI reporting, which provides visibility into the performance of the toll roads we operate beyond what is contractually required and set ourselves stretch targets to help improve overall congestion beyond our toll roads. After consultation with both the Transport Management Centre (TMC) within Transport for NSW and RMS, Transurban now provides a quarterly performance report which addresses KPIs that are directly aligned with those of RMS and the TMC. This interest and willingness to align our reporting with government has been positively received as it allows it to report on the operation of the broader road network.

Applying technology to manage congestion

Transurban has been a global leader in implementing the latest smart transport technology on its assets interstate and overseas to improve their efficiency and safety. This experience and capability allows us to look for opportunities where technology can be applied to enhance transport networks.

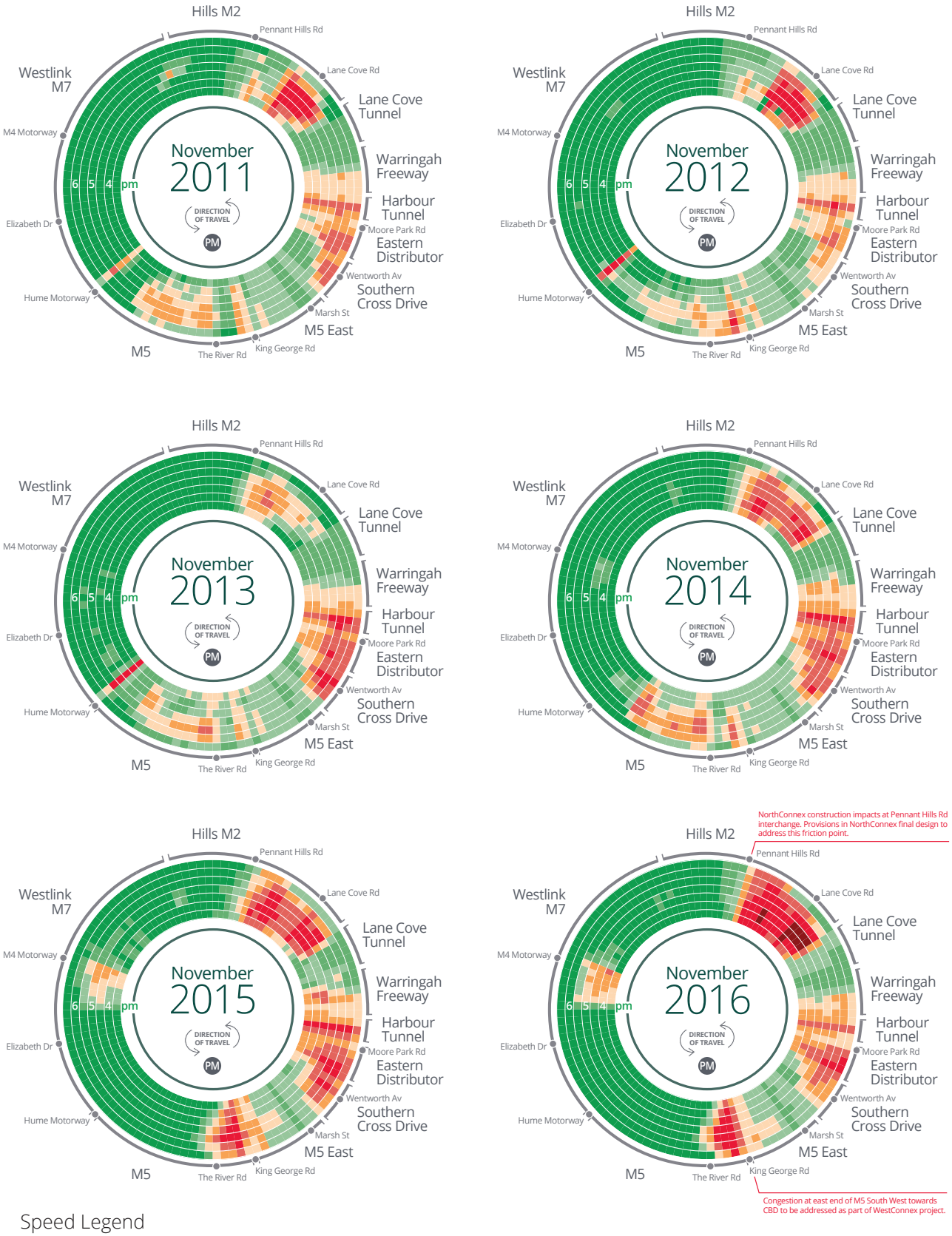
We worked with RMS and technology manufacturers to develop, test and implement state-of-the-art electronic speeds signs on the Eastern Distributor. These signs are used to manage incidents, congestion and worker safety on the motorway by adjusting speeds to match the conditions. This is the first time the electronic speed signs have been used in NSW. Embedded with smart functionality, in the future the signs will become part of the Smart Motorways system.

We have also assisted RMS to implement real-time travel information across the network. Road users can now see the time it will take them to travel to various landmarks and connection points in real-time via overhead electronic message signs, which allows them to make decisions about their journey with accurate information.

Commitment to continuous improvement

Transurban is committed to continuously improving our services, operations and the way we engage with government. Recently we initiated a "health check" in collaboration with RMS where a series of stakeholder interviews identified the areas Transurban could improve how we assisted and worked with government. Led by an independent expert, this activity demonstrated the excellent collaboration between RMS and Transurban. As a result, a number of actions were identified to enhance our ongoing engagement to improve outcomes for road users. This exercise has enabled thoughtful conversation and will be repeated annually to provide an ongoing assessment of the ways in which Transurban can support government.

Figure 31: Monitoring friction points across the Sydney toll-road network



Appendix 1— Tolling Arrangements in Place on Transurban-Operated Roads

OVERVIEW	M5	M2	ED	M7	NCX	LCT	CCT
OPENING DATE	August 1992	May 1997	December 1999	December 2005	Under Construction	March 2007	August 2005
COST TO BUILD	$380M	$644M	$680M	$1,540M	$3B	$1,142M	$680M
DATE TRANSURBAN COMMENCED OPERATING THE ASSET	June 2007	June 2005	June 2007	December 2005	Expected 2019	August 2010	June 2014
REMAINING CONCESSION PERIOD	10 years	31 years	31 years	31 years	28 years*	31 years	19 years
CONCESSION END DATE	December 2026	June 2048	July 2048	June 2048	June 2048	June 2048	December 2035
PHYSICAL DETAILS							
LENGTH (TOTAL)	22km	21km	6km	40km	9km	3.8km	2.1km
LENGTH (SURFACE)	22km	20.4km	4.3km	40km	–	0.3km	–
LENGTH (TUNNEL)	–	0.6km	1.7km	–	9km	3.6km	2.1km
LANES	2x3	2x3	2x3 2x2 some sections	2x2	2x2	2x2 2x3 some sections	2x2 2x3 some ramp sections
OWNERSHIP							
TRANSURBAN OWNERSHIP	50%	100%	75.1%	50%	50%	100%	100%
TOLLING							
LARGE VEHICLE MULTIPLIER	3x	3x	2x	3x	3x	3x	2x
TOLL CHARGE	Flat rate	Flat rate	Flat rate (Northbound) Untolled (Southbound)	Distance based	Flat rate	Flat rate	Flat rate
CURRENT TOLL CHARGES— CLASS A (CARS)	$4.57 each way	$6.89 North Ryde	$6.95 (Northbound only)	$0.3924 cents/km capped at $7.85 after 20km	Same as M2 (North Ryde) toll point	$3.21 Main tunnel	$5.47 Main tunnel
		$3.44 Pennant Hills				$1.61 Military Rd	$2.58 Sir John Young
		$2.43 Windsor					
		$2.04 Lane Cove					
		$3.44 Herring and Christie Rds					

OVERVIEW	M5	M2	ED	M7	NCX	LCT	CCT
CURRENT TOLL CHARGES —CLASS B (TRUCKS)	$13.70 Each way	$20.65 North Ryde	$13.90 (Northbound only)	$1.1772 cents/km capped at $23.55	Same as M2 (North Ryde) toll point	$9.67 Main tunnel	$10.93 Main tunnel
		$10.32 Pennant Hills Rd				$4.83 Military Rd E-Ramp	$5.16 Sir John Young Cres
		$7.30 Windsor Rd					
		$6.11 Lane Cove Rd					
		$10.32 Herring and Christie Rds					
TOLLING ADJUSTMENT SCHEDULE	Escalated quarterly by quarterly CPI. The toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased.	Escalated quarterly by the greater of quarterly CPI or 1%.	Escalated quarterly by the greater of a weighted sum of quarterly AWE and quarterly CPI or 1%.	Escalated or de-escalated quarterly by quarterly CPI.	Escalated quarterly by the greater of quarterly CPI or 1%	Escalated quarterly by quarterly CPI for cars and the toll cannot be lowered as a result of deflation, however, until inflation counteracts the deflation the toll cannot be increased. Escalated quarterly by the greater of quarterly CPI or 1% for trucks.	Escalated quarterly by: the greater of quarterly CPI or 0.9853% (equivalent to 4% per annum) to June 2012; the greater of quarterly CPI or 0.7417% (equivalent to 3% per annum) to June 2018; quarterly CPI to concession end.

* Concession period from expected opening date late 2019.

Appendix 2— Development of the NSW Toll Road Network

The extent of private sector involvement has typically been dependent on market conditions and appetite for risk by the private sector and funding constraints on government. The combination of funding sources and timing of private sector involvement in transport infrastructure projects has varied in NSW over the last twenty years. Approaches have included:

- Government undertakes the development and funding of the project on their balance sheet (eg WestConnex).
- Governments partner with the private sector using a PPP model, where government leads the development of a concept design, obtains planning approval and then runs a procurement process with the private sector to design and construct the motorway based on their preferred design and tolling concept. A consortium is selected to fund, design, construct and operate the motorway for a fixed period of time. Most existing tolled motorways in the NSW network were created using this model.
- The private sector provides a proposal to fund and deliver an identified government motorway through the Unsolicited Proposal Framework. A competitive procurement model in partnership with the government provides best value for money. This acts to accelerate the delivery of infrastructure projects that may have taken longer to procure due to funding constraints on state budgets (eg NorthConnex).

A brief summary of the development of Sydney's toll road assets is provided below.

Sydney Harbour Tunnel

Unsworth Labor Government received an unsolicited proposal from the private sector in 1985. The tunnel was approved just prior to the change of government in 1987 and proceeded under the new Greiner Liberal Government despite their initial opposition and opened in 1992.

M5 South-West

Put out for tender in 1989 under the Greiner Liberal Government and built as a build-own-operate-transfer project. It opened to traffic in 1992. A widening project was started in June 2012 and completed in December 2014; funded by concession changes agreed between the operator Interlink (50 per cent Transurban) and the O'Farrell Coalition Government.

M5 South-East Tunnel

The M5 South East began construction in 1998 under the Carr Labor Government and was opened in 2001. It was originally planned with the intention of being tolled, however this changed during the development phase and this section remains untolled. The current WestConnex project includes a duplication of the M5 East tunnels and both the existing and new link will be tolled after completion.

Hills M2

The contract was signed by the Fahey Coalition Government and the private sector in 1994 and opened to traffic in 1997 by the Carr Labor Government. A widening project was undertaken in 2011 and completed in August 2013; funded by concession changes agreed between the operator, Transurban, and the Keneally Labor Government.

M4 Western Motorway

Originally constructed in several stages as the F4 Western Freeway between the late 1960s and the mid-1980s, however a lack of funding resulted in the Wran Labor Government halting plans to construct the final stage between Mays Hill and Prospect in 1985. In December 1989, work to construct this stage began as a build-own-operate-transfer project. In return for funding construction StateWide Roads, the consortium awarded the contract to build the stage, was given permission to toll the section between James Ruse Drive and Silverwater Road as traffic volumes on this section were significantly higher than between Mays Hill-Prospect and would allow a shorter toll period with lower tolls. The concession held by StateWide Roads ended on 15 February 2010, with operation of the motorway returned to the Roads and Traffic Authority and the toll removed. The toll is due to be reinstated on the M4 as part of the WestConnex project.

Eastern Distributor

Financial close for the Eastern Distributor was reached in August 1997 and it opened to traffic in December 1999 under the Carr Labor Government.

Cross City Tunnel

The Cross City Tunnel reached financial close in December 2002 and opened in August 2005, under the Iemma Labor Government. The tunnel has been acquired out of receivership twice. In 2007, RBS, EISER and Leighton bought the road out of receivership. It went into receivership again in September 2013 when Transurban acquired it for $475 million. The Cross City Tunnel has provided an excellent example of the difficulty of predicting traffic volumes. The current vehicle numbers using the Cross City Tunnel are approximately 34,000 per day, considerably lower than the 'up to 90,000' vehicles per day by 2006 predicted by the Cross City Tunnel original owners.

Lane Cove Tunnel

Lane Cove Tunnel reached financial close in December 2003 and opened to traffic in March 2007 under the Iemma Labor Government. The tunnel went into receivership in January 2010 and was acquired by Transurban in May 2010 for $630 million. Traffic forecasts inaccurately predicted traffic volumes with opening volumes less than half predictions.

Westlink M7

Developed by the Howard Liberal Government and Carr Labor Government and the private sector in 2003. It opened to traffic in December 2005.

NorthConnex

First road infrastructure proposal to be procured through the NSW Government's Unsolicited Proposal Framework. The proposal was submitted in March 2012 and progressed by the O'Farrell Liberal Coalition Government. The project reached financial close under the Baird Liberal Coalition Government in January 2015 and is currently under construction. It is expected to open late-2019.

Appendix 3—
NorthConnex Technology

FEATURE	DESCRIPTION	EFFICIENCY IMPACT?	NETWORK EFFICIENCY BENEFITS	ITS RELATED?	UNIQUE?	SAFETY RELATED?
Ramp metering capability	Ability to control timing and flow of traffic entering the tunnel from the on-load ramps – based on observations and traffic data.	Yes	Optimum flow, reduced accident number and severity	Yes	Unique for NSW tunnels	Yes
Tunnel closure system	Coordinated system for effective and safe tunnel closure including management of vehicle movement / diversion	Yes	Effective management of closures would minimise queuing in tunnel	Yes	No	Yes
Future proofing for consolidation of operation	NCX Control Centre has provisions for coordinated operation of NCX and WM7 (from one control room)	Yes	Coordinated traffic operation	Yes	Yes for NSW	Yes
Automatic video incident detection system	Best practice incident detection system—rapid detection optimises response time	Yes	Most effective incident detection	Yes	No	Yes
Electronic signs	Best practice traffic management and driver communication signs	Yes	Most effective traffic management	Yes	Integrated speed and lane usage signage implemented on ED	Yes
CCTV / Digital video management system	Best practice infrastructure to monitor and manage traffic	Yes	Most effective traffic management Integrated with TMC video	Yes	No	Yes
Traffic monitoring	Best practice infrastructure to monitor and manage traffic eg induction loops	Yes	Most effective traffic management Provides traffic data to TMC via Centre to Centre for Smart Motorway Management	Yes	No	Yes
Digital radio rebroadcast	Best practice radio communication	Yes	Most effective traffic management	Yes	Early adopter, only Sydney Harbour Tunnel has digital audio broadcasting	Yes
Public address system (PA)	Best practice PA communication	Yes	Most effective traffic management	Yes	No	Yes
Ventilation system	Jet fan and axial fan operation (with variable speed drives), simple vent outlet arrangement optimising piston effect from vehicles	Minimise power consumption	Optimise traffic management	Yes	No	Yes
Aesthetic lighting/ enhanced urban design features	Enhances driver attention, reduces accident number and severity	Minimises closures	Optimise operation	No	Unique for NSW tunnels	Yes
Simplified/ sympathetic road alignment/ geometry	Slight vertical grades only, simple merge and diverge geometry	Optimum fuel efficiency, reduced accident number and severity	Optimise operation	No	No	Yes

FEATURE	DESCRIPTION	EFFICIENCY IMPACT?	NETWORK EFFICIENCY BENEFITS	ITS RELATED?	UNIQUE?	SAFETY RELATED?
LED lighting	Enhanced visuals due to broader spectrum (white light), improved video performance	Yes, reduced power consumption	Optimise operation	No	Unique for NSW tunnels	Yes
Surface road truck regulation	Improving efficiency/safety of surface routes	Yes	Optimise operation	Yes	Unique for NSW tunnels	Yes
Best practice incident management features eg breakdown lane, emergency vehicle crossovers, incident response bays	Operations coordinated through Intelligent Transport System (ITS)/ data collection	Yes	Optimise operation	Yes	No	Yes
Over height vehicle detection/ diversion system	Best practice systems to identify and manage over height vehicles	Yes	Most effective traffic management	Yes	No	Yes
State of the art control room with disaster recovery site	Best practice control and incident room facilities	Yes	Most effective traffic management	Yes	No	Yes
TFNSW Transport Management Centre – Centre to Centre Interface	Whole of network coordinated management (ED and M2)	Yes	Coordinated traffic operation	Yes	No	Yes
Readiness for Managed Motorways	Whole of network coordinated management	Yes	Coordinated traffic operation	Yes	Yes for NSW	Yes
Power—highly resilient and reliable supply	Critical equipment, plant and system operation is reliable	Yes	Surety of operation	Indirectly	No	Yes
Best practice fire system including fire detection, independent water supply and separate hydrant and deluge mains	Components and overall system are best in class and ensure rapid detection and effective reaction	Yes	Rapid return to service	Indirectly	Yes	Yes
Dangerous goods vehicle detection and identification	Best practice systems to identify and manage dangerous goods vehicles	Yes	Most effective traffic management	Yes	Yes for NSW	Yes
Others	Speed cameras Smoky vehicle cameras	Yes	Coordinated traffic operation and enforcement	Yes	No	Yes

Source: NorthConnex Project Team

Appendix 4— Glossary

ADT	Average Daily Traffic
AWE	Average Weekly Earnings
CCT	Cross City Tunnel
CPI	Consumer Price Index
D&C	Design and Construct
ED	Eastern Distributor
EIS	Environmental Impact Statement
FY16	Financial Year 2015–2016
GSP	Gross State Product
HOT	High Occupancy Toll
HOV	High Occupancy Vehicle
IS	Infrastructure Sustainability rating scheme administered by ISCA
ISCA	Infrastructure Sustainability Council of Australia
ITS	Intelligent Transport Systems
LCT	Lane Cove Tunnel
LTI	Lost Time Injury
M2	Hills M2
M5	M5 South West Motorway
M7	Westlink M7
NCX	NorthConnex
NSW	New South Wales
O&M	Operations and Maintenance
PPP	Public Private Partnership
RICI	Road Injury Crash Index—serious road injury (an individual transported from, or receives medical treatment, at scene) crashes per 100 million vehicle km travelled
RMS	Roads and Maritime Services
Roam	Tolling brand
Roam Express	Tolling brand
TMC	Traffic Management Centre

Australia

Melbourne (head office)

Level 23
Tower One, Collins Square
727 Collins Street
Melbourne
Victoria 3000

Sydney

Level 9
1 Chifley Square
Sydney
New South Wales 2000

Brisbane

7 Brandl Street
Eight Mile Plains
Brisbane
Queensland 4113

Mailing address

Locked Bag 28
South Melbourne
Victoria 3205

Phone +61 3 8656 8900

Fax +61 3 8656 8585

United States of America

Greater Washington Area
6440 General Green Way
Alexandria VA 22312
United States

Phone +1 571 419 6100

Email corporate@transurban.com

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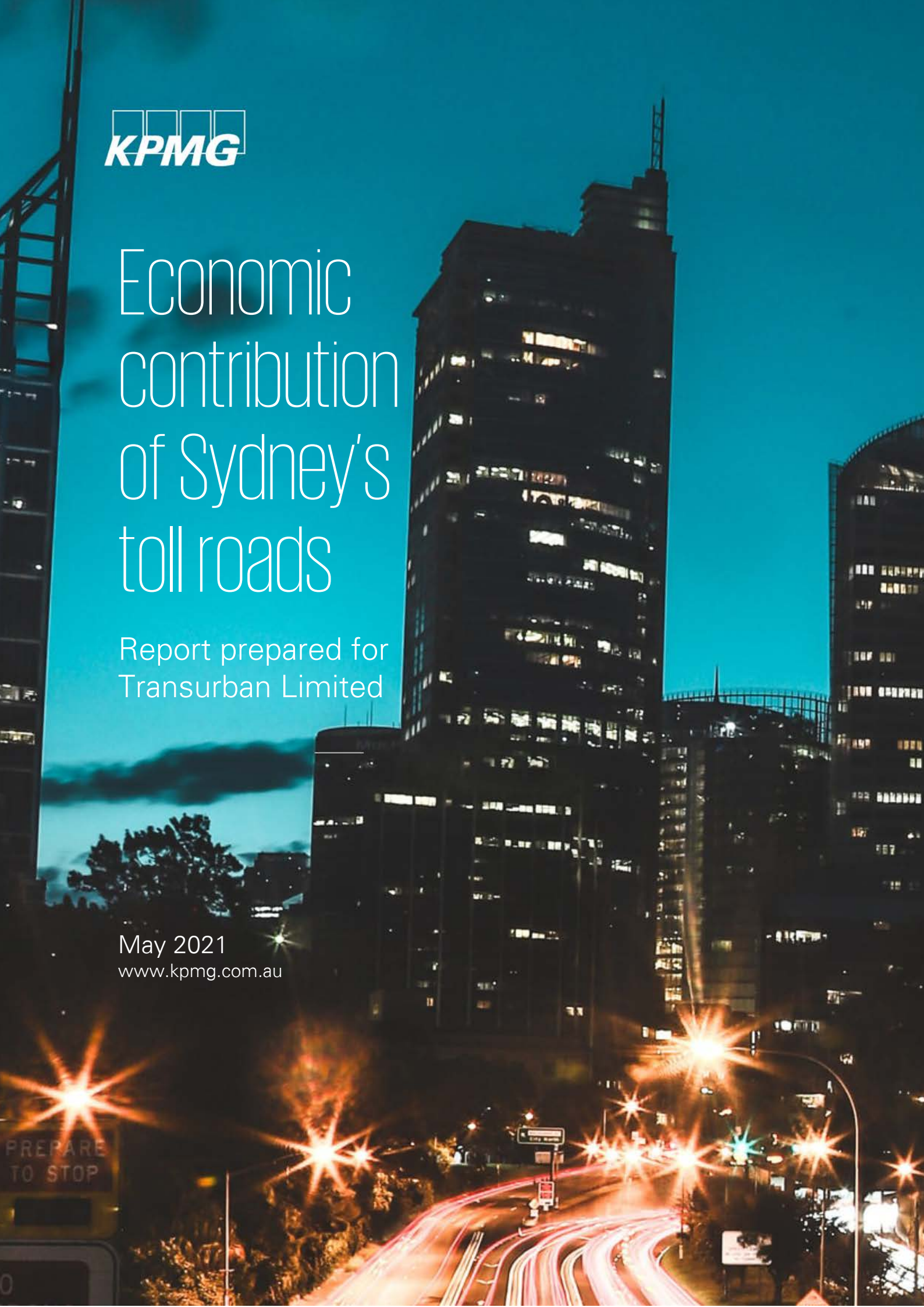
Appendix 5—
KPMG report



KPMG

Economic contribution of Sydney's toll roads

Report prepared for Transurban Limited

May 2021

www.kpmg.com.au

Important notice

If you are a party other than Transurban, KPMG owes you no duty (whether in contract or in tort or under statute or otherwise) with respect to or in connection with the attached report or any part thereof; and will have no liability to you for any loss or damage suffered or costs incurred by you or any other person arising out of or in connection with the provision to you of the attached report or any part thereof, however the loss or damage is caused, including, but not limited to, as a result of negligence.

If you are a party other than Transurban and you choose to rely upon the attached report or any part thereof, you do so entirely at your own risk.

Limitations

The responsibility for determining the adequacy or otherwise of our terms of reference is that of Transurban.

The services provided under our engagement letter ('Services') have not been undertaken in accordance with any auditing, review or assurance standards. Any reference to 'audit' and 'review', throughout this report, is not intended to convey that the Services have been conducted in accordance with any auditing, review or assurance standards. Further, as our scope of work does not constitute an audit or review in accordance with any auditing, review or assurance standards, our work will not necessarily disclose all matters that may be of interest to Transurban or reveal errors and irregularities, if any, in the underlying information.

In preparing this report, we have had access to information provided by Transurban and publicly available information. We have relied upon the truth, accuracy and completeness of any information provided or made available to us in connection with the Services without independently verifying it.

Any findings or recommendations contained within this report are based upon our reasonable professional judgement based on the information that is available from the sources indicated. Should the project elements, external factors and assumptions change then the findings and recommendations contained in this report may no longer be appropriate. Accordingly, we do not confirm, underwrite or guarantee that the outcomes referred to in this report will be achieved.

We do not make any statement as to whether any forecasts or projections will be achieved, or whether the assumptions and data underlying any such prospective financial information are accurate, complete or reasonable. We will not warrant or guarantee the achievement of any such forecasts or projections. There will usually be differences between forecast or projected and actual results, because events and circumstances frequently do not occur as expected or predicted, and those differences may be material.

Our reporting date corresponds with a period of significant volatility in global financial markets and widespread macro-economic uncertainty. In light of the emergence and spread of COVID-19, this volatility and uncertainty could persist for some time. The assumptions set out in our report will need to be reviewed and revised to reflect any changes which emerge as a result of COVID-19. As a result of the continued uncertainty in relation to the impact of COVID-19, our work may not have identified, or reliably quantified the impact of, all such uncertainties and implications. If the assumptions provided by Transurban on which this report is based are subsequently shown to be incorrect or incomplete, this could have the effect of changing the findings set out in this report and these changes could be material. We are under no obligation to amend our report for any subsequent event or new information.

Executive Summary

Sydney's modern tolled motorway network is estimated to contribute **$5.6 billion** in economic benefits for all road users on average per year over the next **30 years***

Smoothing traffic flows

Sydney's modern motorways ensure the entire road network is efficient and reliable. Everyone – including those who do not use toll motorways – will benefit from shorter travel times, more reliable journeys, lower fuel consumptions and vehicle wear and tear. On average, over the next 30 years these savings are expected to amount to **$3.6 billion per year***.

Business and freight road users

On average, a trip undertaken by a business or freight user on Sydney's modern toll motorway network contributes around **$35 per trip** in economic benefits (estimated for 2021).

All commercial vehicle operators benefit from an efficient road network and the total benefit on average per year is **$2.0 billion*** over the next 30 years.

Car users

On average, a trip undertaken by a personal user on Sydney's modern toll motorway network contributes around **$10 per trip** in economic benefits (estimated for 2021).

The average annual benefit for all cars in Sydney is estimated at **$1.6 billion*** per year over the next 30 years.

Bringing people and businesses together

Development of Sydney's modern toll motorways lowers transport costs which generates a range of benefits to business, job seekers and consumers of **$2.0 billion per year*** on average over the next 30 years.

Business efficiency (agglomeration)

Sydney's modern toll motorways enhance the accessibility and connectivity of employment centres around the city, which facilitates increased formal and informal interaction. The agglomeration benefit is worth **$1.8 billion*** on average per year over the next 30 years.

Increased labour supply

An efficient road network with improved commuting times improves access to job markets for those seeking employment. Better connecting people and jobs will generate benefits of **$63 million*** on average per year over the next 30 years.

More goods and services

More efficient transport lowers barriers to competition and will increase the supply of goods and services worth **$153 million*** on average per year over the next 30 years.

Fostering economic growth

Productivity improvements and further network capital expansions will contribute to total market value of goods and services supporting jobs creation and improving personal welfare.

GSP generated over the next 30 years on average:
$7.3 billion per year*

Total increase in **GSP per person** on average:
$890 per year*

Jobs supported over the period on average:
12,000 per year*

Saving fuel and reducing emissions

Toll road usage is reducing fuel consumption **by 130 million litres per year**.

Fuel savings reduce emissions by **10.7 million tonnes** valued at **$500 million*** over 30 years.

* Results shown in the Executive Summary relate to the comparison of Scenario 3 and 1 discussed in the report. Unless otherwise stated, all dollar values shown are in present value terms using a real discount rate of 7 per cent.


PREPARE TO STOP
NO DANGEROUS GOODS IN TUNNEL
LOW CLEARANCE 4.4m

Contents

May 2021

Document Classification: KPMG Public

1. Introduction

1.1 Scope of work

KPMG was engaged by Transurban to assess the economic contribution of the toll motorway network in Sydney, including for toll motorways which are planned to be developed. The economic assessment estimates the benefits for all road users on the Greater Sydney road network.

To estimate the economic contribution of Sydney's toll road network, we have applied three economic modelling techniques including:

- traditional cost-benefit analysis (CBA) techniques to measure economic benefits for all road users
- wider economic benefits (WEBs) modelling to estimate additional economic benefits such as agglomeration
- economic impact assessment using computable general equilibrium (CGE) modelling to estimate the macroeconomic impacts at a state level.

As is typical for economic assessments, all three modelling techniques derive benefits and impacts by comparing a set of generalised costs estimated at a road network wide level. That is, the analysis focusses on typical average users and does not explicitly account for the specific circumstances of individuals or businesses. All underlying economic parameter values used in the modelling align with best practice appraisals in Australia and are sourced from two key relevant Australian guidelines:

- Transport for NSW "Economic Parameter Values" published in June 2020
- Australian Transport Assessment and Planning Guidelines "PV2 Road Parameter Values" published in August 2016.

To estimate the economic contribution of the toll motorways on the Greater Sydney road network, two scenarios were developed to provide an upper and lower bound estimate, which assume:

- Upper bound: where no tolled motorways are built, to estimate the economic contribution of Sydney's modern tolled motorway network
- Lower bound: where the delivery of tolled motorways is delayed, to estimate the economic benefit of delivering Sydney's modern tolled motorway network as it was planned.

They were compared to the Greater Sydney road network with its current and future toll motorways in place. Importantly, both counterfactual scenarios are hypothetical and do not represent a view or prediction of alternative road network layouts. More specifically, the intention of these scenarios is to isolate the impact the toll road network has on how all road users, people, freight and business move around Greater Sydney's road network. Results presented in this report should be interpreted as providing a range of upper and lower bound estimates.

1.2 Report structure

The remainder of this report is structured as follows:

- **Section 2** describes Sydney's motorway network, its benefits and recent impact of COVID-19.
- **Section 3** provides an overview of the techniques used to model the economic contribution and the scenarios underpinning the results.
- **Section 4** assesses the direct road user economic benefits.
- **Section 5** assesses the Wider Economic Benefits (WEBs).
- **Section 6** assesses the economic impact using Computable General Equilibrium (CGE) modelling.
- **Section 7** provides a summary of the overall economic contribution results.

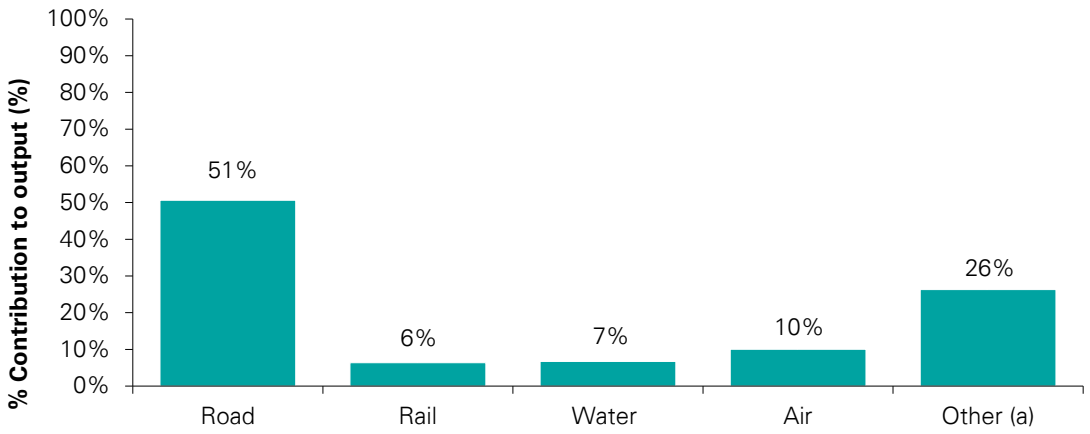
2. Context and background

Transport underpins practically every aspect of daily domestic and economic life; connecting workers to their jobs, materials to construction and manufacturing – and connecting our export economy and households to global supply chains, markets and products.

In 2015 – 2016, transport contributed $122.3 billion, or 7.4 per cent of Australian Gross Domestic Product (GDP), twice that of the U.S. and Canada.[1]

Figure 1 below shows road transport supporting the largest contribution to overall transport mode output; with air and rail at 10 and six per cent only.

Figure 1: Total Output of Australian Transport Modes



Source: Australian Bureau of Statistics (ABS) (2018) [2]
(a) Includes other modes of transport, as well as Postal, courier pick-up and delivery services; Transport support services; and Warehousing and storage services as identified in Australian and New Zealand Standard Industrial Classification (ANZIC) Division I.

Greater Sydney's economy represents some 23.05[3] per cent of the national economy and 71.78 per cent of the NSW economy[4], meaning that the economic value of road transport infrastructure in Sydney is likely to be very high.

[1]Department of Infrastructure, Regional Development and Cities (2018) Australian Transport Economic Account Factsheet p. 1
[2]Australian Transport Economic Account: An Experimental Transport Satellite Account 2018, Australian Bureau of Statistics, accessed 27 April 2021, <https://www.abs.gov.au/statistics/economy/national-accounts/australian-transport-economic-account-experimental-transport-satellite-account/latest-release>
[3]Australian National Accounts: State Accounts, 2019-20 financial year | Australian Bureau of Statistics (abs.gov.au), accessed 13 Maty 2021, <https://www.abs.gov.au/statistics/economy/national-accounts/australian-national-accounts-state-accounts/2019-20>
[4]Greater Sydney | economic profile, id community, accessed 13 May 2021, <https://economy.id.com.au/sydney/gross-product?BMID=40>

The NSW Government has funded major investments into new motorways, recognising the enhanced safety, sustainability and capacity needed to serve growth across Sydney's wider transport network.

The ongoing development of Sydney's motorway network is a key enabler for a range of city-shaping initiatives including:

- Western Sydney Airport
- The Greater Sydney Region Plan: '*a metropolis of three cities,'*
- The Future Transport Strategy 2056, including the creation of *'City shaping corridors, city serving corridors and centre serving corridors*.[5]

2.1 Do tolls accelerate network expansion?

Transport infrastructure projects, like motorways, metros or suburban railways are inherently large, complex and expensive, typically requiring large budget allocations to fund new projects, atop existing priorities in transport and across other areas of government service delivery.

The development of modern Public Private Partnership (PPP) models from the 1990s saw a visible acceleration in the construction of transport infrastructure in Sydney. These models allowed private investors to raise the large sums needed to develop each motorway network, risking their initial investment against the long-term revenue from tolls. This approach transferred all costs and financial risks to investors, to be repaid by motorists via tolls – not taxpayers via the budget

Subsequently, the NSW Government has used a mix of concession extensions to allow investors to finance the cost of expanding existing motorways; and used a publicly financed delivery model to construct WestConnex – but is seeking to recover its investment through the staged sale of a majority and two minority stakes – again seeing toll revenues sustain private investment.

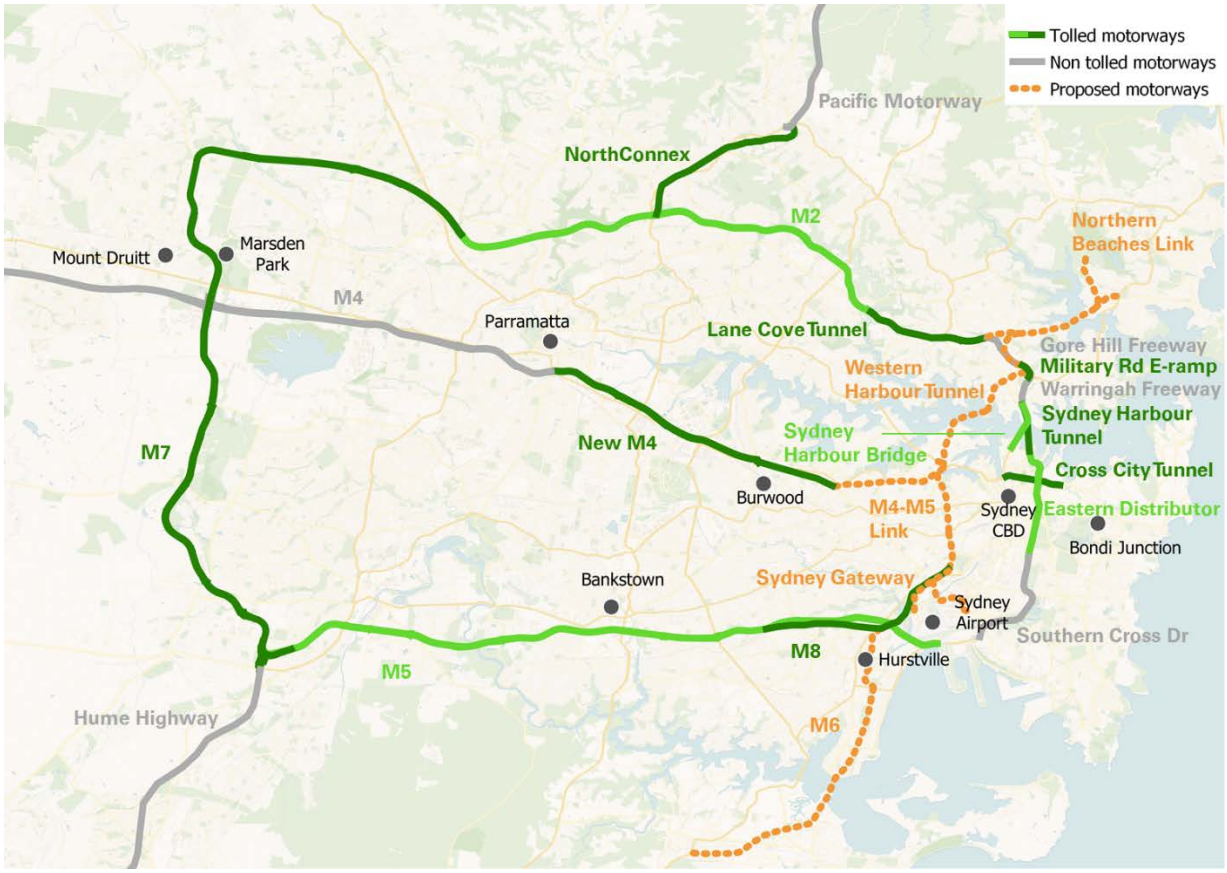
Tolls have created the cash flows needed to deploy private investment in public assets, extending the capacity of the NSW Government to renew Sydney's wider transport network and to fund wider community priorities, like public hospitals, schools and public transport.

[5] Transport for NSW, Future Transport Strategy 2056, p. 34

2.2 Sydney's Modern Motorway Network

Figure 2 below shows Sydney's modern motorway network, which spans some 187 kilometres. Five additional motorways will open in the coming seven years, seeing Sydney's network at 234 kilometres of new and expanded free-flow motorways.

Figure 2: Sydney's Existing and Planned Motorway Network, 2021



Source: KPMG map using Open Street Maps data

The economic assessment contained in this report includes an assessment of the economic benefits across the entire Greater Sydney road network. Table 1 below lists the tolled motorways included in the economic assessment.

Table 1: Sydney's tolled road network, including planned toll roads.

Toll Road	Concession End Date	Open (Year)
Sydney Harbour Bridge		1932
Sydney Harbour Tunnel	2022	1992
M5 West	2026	1992
Hills M2 Motorway	2048	1997
Eastern Distributor	2048	1999
M5 East Motorway	2060	2001
Cross City Tunnel	2035	2005

Toll Road	Concession End Date	Open (Year)
M7 Motorway	2048	2005
Lane Cove Tunnel	2048	2007
Military Road E-Ramp	2048	2007
WestConnex (WCX) M4 (Stages 1a/1b)*	2060	2019
WCX M8 (Stage 2)	2060	2020
NorthConnex	2048	2020
WCX M4-M5 Link (Stage 3)	2060	Est. 2023
Rozelle Interchange	2060	Est. 2023
Western Harbour Tunnel	N/A	Est. 2026
Beaches Link	N/A	Est. 2028

**M4 was tolled in the 1990's through to 2010 then tolled once completion of WCX Stages 1a and 1b*

2.3 The role of motorways in Transport

Motorways sit at the apex of the road network, offering higher speed, higher capacity corridors to move people and goods faster, across longer distances.

2.3.1 Motorists

Motorists make up the vast majority of motorway trips, of average around 80 to 90 per cent of journeys on motorways are for personal travel in cars[6].

An effective motorway network provides means for people to connect to work, education, social and recreational opportunities. Development of Sydney's motorway network over the long term has contributed to decreased congestion and reduced travel times, thereby increasing mobility across the Sydney network.

2.3.2 Freight and business journeys

Motorways provide for the effective movement of goods and services across Sydney, with around 10 to 20 per cent of total demand estimated for freight vehicles[7].

Key segments of Sydney's motorway network are recognised as nationally significant 'key freight routes' including the: M4; M7; M5; and M2[8], which is further strengthened by the NorthConnex.

Around 80 per cent of freight movements in Greater Sydney are undertaken by road[9]. The current and planned motorway network will strengthen the connection of ports, airports and intermodal terminals, by improving freight efficiency and easing traffic on local roads.

[6] Transurban ASX release, March Quarter 2021 Update, 15 April 2021 and KPMG Analysis
[7] Transurban ASX release, March Quarter 2021 Update, 15 April 2021 and KPMG Analysis
[8] Inquiry into National Freight and Supply Chain Priorities, Supporting Paper No. 4 Analysis of Capital City Key Freight Route Performance (2018) Commonwealth of Australia Pp. 7-8
[9] NSW Freight and Ports Plan, Part 2: The State of Freight, accessed 14 May 2021, https://www.transport.nsw.gov.au/projects/strategy/nsw-freight-and-ports-plan-0/part-2-state-of-freight#The_Greater_Sydney_freight_network

2.3.3 Motorways and COVID-19

COVID-19 initially saw a collapse in transport volumes across all modes, reflecting the lock-down of non-essential workers and other restrictions on movement. But motorway volumes have recovered much faster than other modes, suggesting a mode shift toward roads as people seek to adhere to capacity restrictions on public transport.

Throughout 2020, COVID restrictions led to a greater take-up of online purchases, with online sales figures growing 65 per cent[10]. Whilst purchasing online reduces the number of trips a household makes, the delivery of purchased products and consequently, trips by delivery vehicles (usually a Light Commercial Vehicle (LCV) or small rigid truck) have subsequently increased.

Courier pick-up and delivery services in Australia are expected to experience revenue growth of 5.8 per cent in the current year, driven by growth in online shopping and demand for parcel delivery services[11]. Postal and freight services such as Australia Post have responded to this increase in demand and concurrent decline in letter volumes by investing heavily into the growing parcel delivery market, highlighting the importance of maintaining an efficient road network over the long-term.[12]

The increase in road traffic volumes following the easing of COVID restrictions contrasts with the slower increase in public transport patronage, where volumes remain about 60 per cent of pre-COVID levels[13]. One response contributing to increased traffic volumes has been the deployment of additional buses on the road network to assist with social distancing.

Many commuters who chose to travel to office locations have shifted their mode of travel to road vehicles, and while this may be temporary, it does highlight the importance of having effective mode choices.

Over the long-term, the COVID-19 pandemic is unlikely to have created a decrease in congestion as traffic volumes return to normal, and the role of motorways to ease congestion across the entire road network will remain critical.

[10] Australia Bureau of Statistics (ABS) (2021) Online Sales, January 2021 – Supplementary COVID-19 Analysis
[11] Courier Pick-up and Delivery Services in Australia, IBISWorld, accessed 28 April 2021 https://my.ibisworld.com/au/en/industry/i5102/about
[12] Postal Services in Australia, IBISWorld, accessed 28 April 2021, https://my.ibisworld.com/au/en/industry/i5101/industry-at-a-glance
[13] Public Transport Patronage – Top Level Chart, Transport for NSW, Accessed 22 April 2021 < https://www.transport.nsw.gov.au/data-and-research/passenger-travel/public-transport-patronage/public-transport-patronage-top-level>

3. Economic modelling

Modelling the economic contribution of the modern motorway network requires the development of scenario/s which isolate and exclude Sydney's tolled motorways.

We have chosen to develop two counterfactual scenarios, one where much of the modern motorway network is not developed at all and a second in which the motorway network's development is materially slowed in the absence of toll revenues.

Using two alternate scenarios provides us with an upper and lower bound against which to model the benefits to all road users provided by Sydney's contemporary motorway network. To inform our analysis, detailed traffic modelling was provided by Transurban for each of the scenarios and estimated over a 30-year period. Transurban provided modelling of Sydney's whole road network and key statistics including travel times, average speeds and distances travelled for all trips (and by trip purpose). Each of the scenarios modelled are outlined in Table 2.

Table 2: Overview of modelling scenarios and traffic modelling assumptions.

#	Scenarios	Key Assumptions in Traffic Modelling	Investment (capital and operating costs)
'Greater Sydney road network without tolled motorways'			
1	Assumes that Sydney has not developed a modern motorway network. It presents the higher bound of economic modelling results	Toll-road network consists only of the Harbour Tunnel, Eastern Distributor and Sydney Harbour Bridge. Travel occurs using Sydney's existing suburban and arterial roads.	No investment (capital or operating) in future toll roads
'Greater Sydney road network with delayed delivery of tolled motorways'			
2	Forming the lower bound of our modelling results, this scenario assumes delayed delivery of the motorway network.	In the absence of funding capacity provided by tolls, delivery of motorways is substantially delayed.	Delayed delivery of the toll road network by 15 years for NorthConnex, WestConnex M4, M8, M4-M5 Link. This scenario assumes that there is no Western Harbour Tunnel or Beaches Link

#	Scenarios	Key Assumptions in Traffic Modelling	Investment (capital and operating costs)
'Greater Sydney road network with tolled motorways'			
3	Sydney's tolled motorway network occurs as planned. Scenario 3 is compared to Scenario 1 and 2 separately to estimate the incremental economic benefits and impacts.	The current and future Sydney toll road network occurs as planned	Delivery of NorthConnex, WestConnex M4, M8, M4-M5 Link, Western Harbour Tunnel, Beaches Link

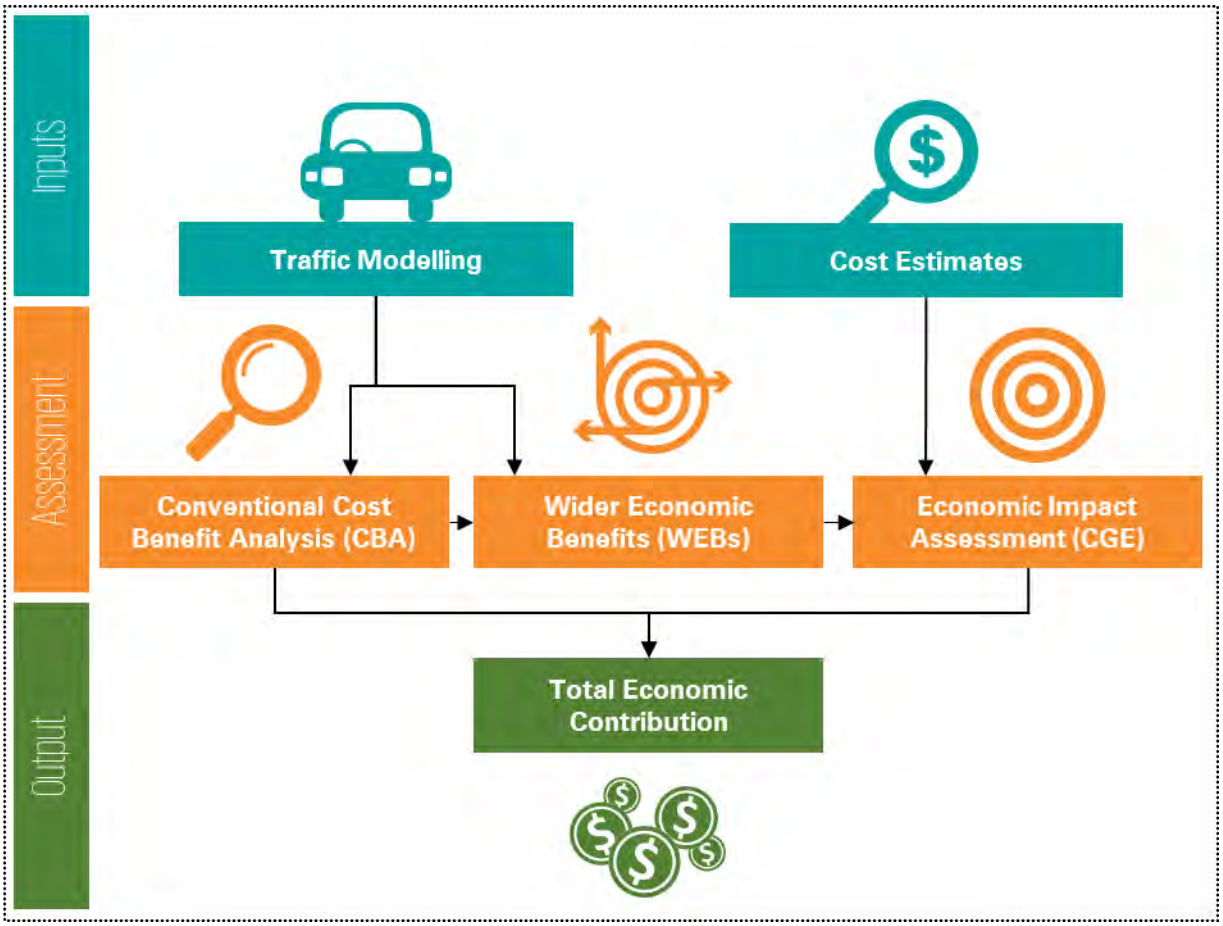
To describe the scenarios further, as an example, under Scenario 1, it is assumed that the WestConnex M4 would not be opened. Under this scenario traffic would have to use existing surface roads. Under Scenario 3, traffic would have the choice to use WestConnex M4.

Using these scenarios and the outputs of the traffic modelling has allowed us to model the contribution of Sydney's motorway network for all road users using three techniques:

- traditional Cost-Benefit Analysis (CBA);
- Wider Economic Benefits (WEBs) assessment; and
- economic impact assessment using Computable General Equilibrium (CGE) modelling.

The framework for our assessment is shown in the figure below:

Figure 3: Economic Assessment Frameworks



Analysis of the results provided through each economic assessment technique are discussed in the following sections.

4. Economic benefits

Sydney's motorways are the high capacity 'arteries' which sit at the apex of the overall arterial and suburban road network. For all motorists, freight, the community and business users alike, motorways provide a range of direct economic benefits including:

- Travel time savings through increased road network capacity;
- Improved travel time reliability;
- Vehicle operating cost (VOC) savings; and
- Environmental benefits for the community.

It is important to note that Sydney's motorways directly benefit a wide array of stakeholders, on and off the tolled motorways. For example, each motorist that chooses a motorway for a trip, is not congesting local suburban and arterial roads, creating room for local journeys; while each consumer may ultimately pay less for their grocery items, if the time and operating cost of freight deliveries are less.

This section outlines key assumptions and applies a traditional Cost Benefit Analysis technique to measure the direct economic benefits provided by Sydney's modern motorway network for all road users.

4.1 Travel time savings

Reductions in travel times are a fundamental benefit offered by transport network investments, including motorways. We have applied the values to travel time, by user type and trip purpose, from the relevant TfNSW guidance.

KPMG has used the outputs of the traffic modelling to model the economic benefit provided by faster journey times by modelling the change in vehicle-hours travelled for trips under each of the scenarios, using the values shown below.

Table 3 Value of time by vehicle type and trip purpose

	Value of time per person hour ($/person-hr)	Average vehicle occupancy	Value of time per vehicle ($/vehicle-hr)	Value of freight time ($/vehicle-hr)*
Car - personal trip	$18.66	1.41	$26.31	-
Car - business trip	$60.54	1.06	$64.17	-
Light commercial vehicle	$31.64	1.19	$37.65	$1.70
Heavy commercial vehicle	$33.38	1.19	$39.72	$46.87

*Source: Transport for NSW (TfNSW) guideline and KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted. *value of freight time refers to the economic value of the goods being transported*

4.2 Travel time reliability benefits

Journey time reliability is another direct benefit offered by motorways. Research has consistently shown that unpredictable journey times see road users' factor in the potential delay, causing economic costs through wasted time.

At a conceptual level, Sydney's motorway network improves overall road network reliability by providing additional road capacity and route choices, versus the scenarios without or with delayed development of motorways.

We have applied the United Kingdom Department for Transport's methodology to quantify the time saved through increased travel time reliability on road networks, which are then monetised using the same values of time provided above.

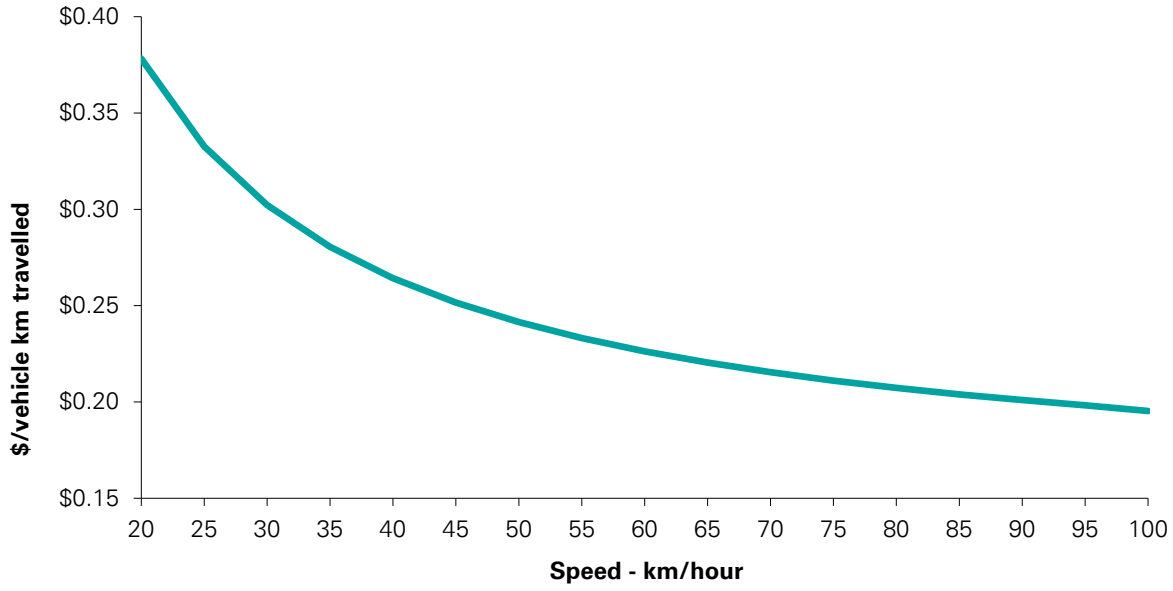
4.3 Vehicle operating cost savings

As the arteries of the broader road transport network, Sydney's modern, free-flowing motorway network offers significant additional capacity thereby enabling lower operating costs to motorists on and off the motorways. Vehicle operating costs will be reduced due to higher operating speeds and smoother traffic flows. The key components of vehicle operating costs include:

- Fuel and oil consumption;
- Repair and maintenance;
- Tyre wear; and
- Vehicle capital costs.

The calculation of vehicle operating cost is based on estimation techniques provided by TfNSW. Vehicle operating costs vary by the speed of the vehicle. As shown below, vehicle operating costs significantly reduce when there is less 'stop start' travel.

Figure 4: Vehicle cost curve – $ per vehicle kilometre travelled



Source: TfNSW guideline and KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted.

4.4 Reduction in environmental externalities

Behind stationary energy, transport is the second largest emitter of greenhouse gases and a major contributor to particulate pollution impacting air quality. Transport's emissions are linked to the amount of fuel consumed by vehicles. The following emissions were quantified in the analysis:

- Carbon dioxide (CO2);
- Nitrous oxide (N2O);
- Methane (CH4);
- Carbon monoxide (CO);
- Oxides of nitrogen (NOx);
- Particulate matter (PM10); and
- Non-methane volatile organic compounds.

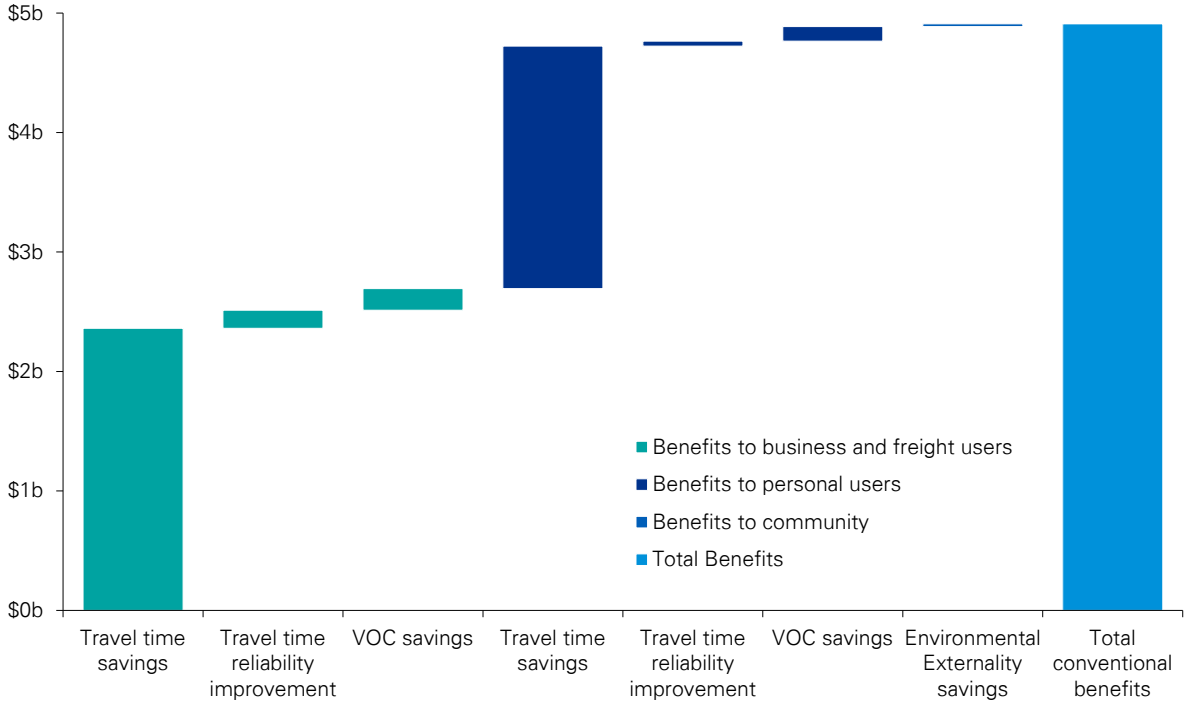
Calculating environmental benefits has much in common with VOCs described above, noting that emissions are a factor of fuel consumed – which in turn, is affected by overall network performance.

4.5 Direct economic benefits of Sydney 'with' and 'without' tolled motorways

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 1 "Greater Sydney road network without tolled motorways"

Figure 5 below shows the direct benefit in 2021 by benefit stream and user type, showing direct annual economic benefits of circa $4.9 billion; $2.7 billion (55 per cent) to business and freight users and $2.2 billion (44 per cent) to personal users and the remaining 1 per cent consisting of environmental and externality benefits.

Figure 5: Annual direct economic benefits for all road users (2021) – Scenario 3 compared to Scenario 1



Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted. Note: this is a single year figure and not comparable to the annual average estimates which are presented in discounted terms

On a per trip basis, the results show that the modern motorway network economic contribution is around $15 per trip on average for all toll motorway trips in 2021, $35 per trip on average for business and freight trips and $10 per trip on average for personal leisure trips.

The direct economic benefits delivered by the tolled motorways in Sydney on all road users over the next 30 years are summarised in Table 4. The direct economic benefits of Sydney's modern tolled motorway network are around $109.8 billion in present value terms. These benefits have been calculated using the Australian Transport Assessment and Planning (ATAP) and TfNSW recommended discount rate of 7 per cent.

Of the total direct benefits, approximately $60.8 billion (55 per cent) are derived by business and freight users; with $48.5 billion of benefits absorbed by personal users of the motorway network.

Travel time savings represent the majority of benefits to both business and freight, as well as personal users of the network.

The remaining $0.5 billion, less than 1 per cent, is attributable to reductions in greenhouse gas emissions, savings, enjoyed by the broader community.

Table 4: Direct economic benefits for all road users over 30 years (2016 to 2046) – Scenario 3 compared to Scenario 1

Direct benefits for all road users	Present value over 30 years
Benefits to business and freight users	**$60.8 bn**
Travel time savings	$53.4 bn
Travel time reliability benefits	$3.6 bn
Vehicle operating cost savings	$3.8 bn
Benefits to personal users	**$48.5 bn**
Travel time savings	$45.0 bn
Travel time reliability benefits	$1.0 bn
Vehicle operating cost savings	$2.6 bn
Other benefits	**$0.5 bn**
Environmental externalities	$0.5 bn
Total conventional benefits	**$109.8 bn**

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and discounted at 7%.

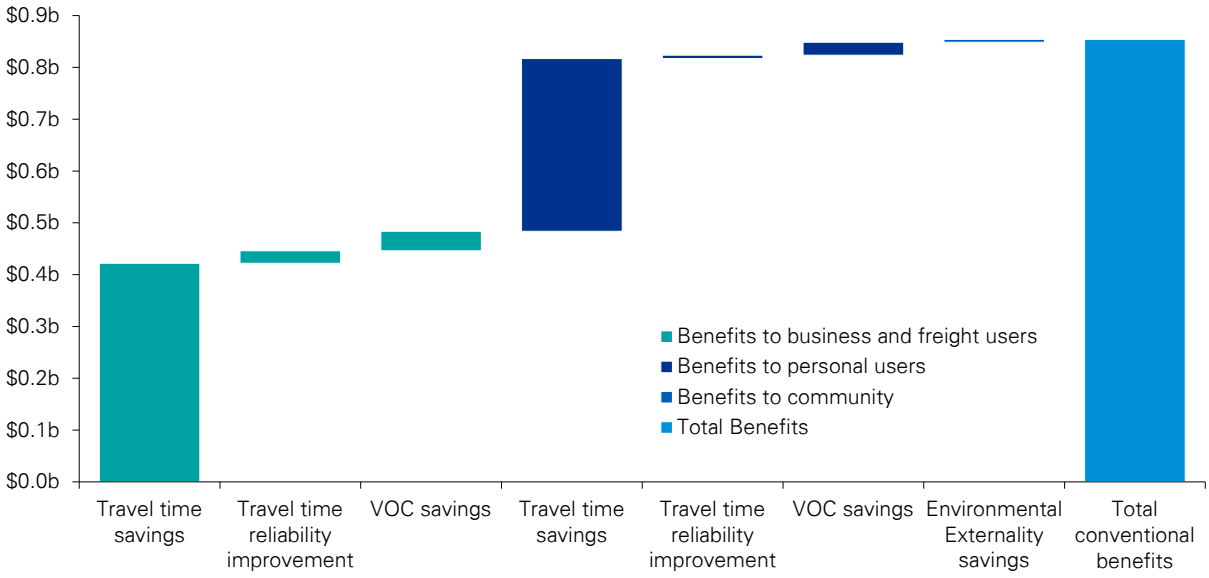
4.6 Direct economic benefits of faster delivery of tolled motorways

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 2 "Greater Sydney road network with delayed delivery of tolled motorways"

This section presents the estimated direct benefits of the accelerated delivery of toll motorways in Sydney. The analysis was conducted by comparing the cost of travel using the current developed (and planned) toll motorways against a simulated scenario where the toll road network was delayed in delivery (for example due to lack of funding in absence of the user funding contribution).

Figure 6 below shows the direct benefit in 2021 by benefit stream and user type, showing direct annual economic benefits of circa $0.9 billion.

Figure 6: Annual direct benefits of accelerated delivery of toll roads for all road users in Sydney (2021) – Scenario 3 compared to Scenario 2



Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted. Note: this is a single year figure and not comparable to the annual average estimates which are presented in discounted terms

The direct economic benefits delivered by the accelerated delivery of toll roads in Sydney were estimated and summarised in Table 5. Over a 30 year time period, the direct economic benefits of accelerated delivery of toll motorways in Sydney have been estimated at around $21.3 billion in present value terms, which highlights the importance of accelerated delivery.

Table 5: Direct benefits for all road users of accelerated toll road delivery Sydney over 30 years (2016 to 2046) – Scenario 3 compared to Scenario 2

Direct benefits for all road users	Present value over 30 years
Benefits to business and freight users	**$11.8 bn**
Travel time savings	$10.5 bn
Travel time reliability benefits	$0.6 bn
Vehicle operating cost savings	$0.7 bn
Benefits to personal users	**$9.4 bn**
Travel time savings	$8.8 bn
Travel time reliability benefits	$0.2 bn
Vehicle operating cost savings	$0.4 bn
Other benefits	**$0.1 bn**
Environmental externalities	$0.1 bn
Total conventional benefits	**$21.3 bn**

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and discounted at 7%.

4.7 Disaggregated results – benefit for all car users

Table 6 shows the traffic modelling of average travel times across all roads in the Greater Sydney road network, for all car users. Without modern motorways (Scenario 1) average network travel times are around 16.3 minutes per trip in 2021. Average travel times were estimated to increase to 19.3 minutes in 2036 and to 21.1 minutes in 2046.

With modern motorways (Scenario 3), average network travel times are 2.2 minutes less in 2021, 4.1 minutes less in 2036, and 4.8 minutes less in 2046 for all car trips across the overall Greater Sydney road network.

Table 6: Average car trip travel time for all road users in the Greater Sydney road network – Scenario 3 compared to Scenario 1 (undiscounted)

Greater Sydney road network travel times	2021	2036	2046
Number of car trips - annual	2.4 bn	2.9 bn	3.2 bn
Scenario 1 – without modern motorways			
Vehicle hours travelled (VHT) - annual	0.7 bn	0.9 bn	1.1 bn
Average trip time (min)	16.3 min	19.3 min	21.1 min
Travel time cost ($) – annual	$20.8 bn	$29.6 bn	$35.7 bn
Scenario 3 – with modern motorways			
Vehicle hours travelled (VHT) - annual	0.6 bn	0.7 bn	0.9 bn
Average trip time (min)	14.1 min	15.2 min	16.2 min
Travel time cost ($) - annual	$18.0 bn	$23.2 bn	$27.3 bn
Difference between Scenario 3 and 1			
Difference in average trip times (Min)	**2.2 min**	**4.1 min**	**4.8 min**
Travel time cost savings ($)	**$2.9 bn**	**$6.4 bn**	**$8.4 bn**

Source: Traffic modelling output and KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted.

4.8 Disaggregated results – benefit for all freight trips

Table 7 shows the traffic modelling of average travel times across all roads in the Greater Sydney road network, for all freight users. Those are mainly freight trips conduced in heavy vehicles ranging from rigid trucks to B-doubles and some larger vehicles on certain parts of the road network.

Without modern motorways (Scenario 1), average network travel times are around 24.7 minutes per trip in 2021. Average travel times were estimated to increase to 29.0 minutes in 2036 and to 32.1 minutes in 2046.

With Sydney's modern motorway network in place (Scenario 3), average network travel times are 4.2 minutes less in 2021, 7.0 minutes less in 2036, and 8.2 minutes less in 2046 for all truck trips across the overall Greater Sydney road network.

Table 7: Average truck trip travel time for all trucks on the overall Greater Sydney road network – Scenario 3 compared to Scenario 1

Greater Sydney road network travel times	2021	2036	2046
Number of truck trips - annual	0.4 bn	0.5 bn	0.6 bn
Scenario 1 – without modern motorways			
Vehicle hours travelled (VHT) – annual	0.2 bn	0.2 bn	0.3 bn
Average trip time (min)	24.7 min	29.0 min	32.1 min
Travel time cost ($) – annual	$8.7 bn	$13.1 bn	$16.8 bn
Scenario 3 – with modern motorways			
Vehicle hours travelled (VHT) - annual	0.1 bn	0.2 bn	0.2 bn
Average trip time (min)	20.5 min	22.0 min	23.9 min
Travel time cost ($) - annual	$7.2 bn	$9.9 bn	$12.5 bn
Difference between Scenario 3 and 1			
Difference in average trip times (Min)	**4.2 min**	**7.0 min**	**8.2 min**
Travel time cost savings ($)	**$1.5 bn**	**$3.2 bn**	**$4.3 bn**

Source: Traffic modelling output and KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted.

4.9 Illustrative examples based on selected trips

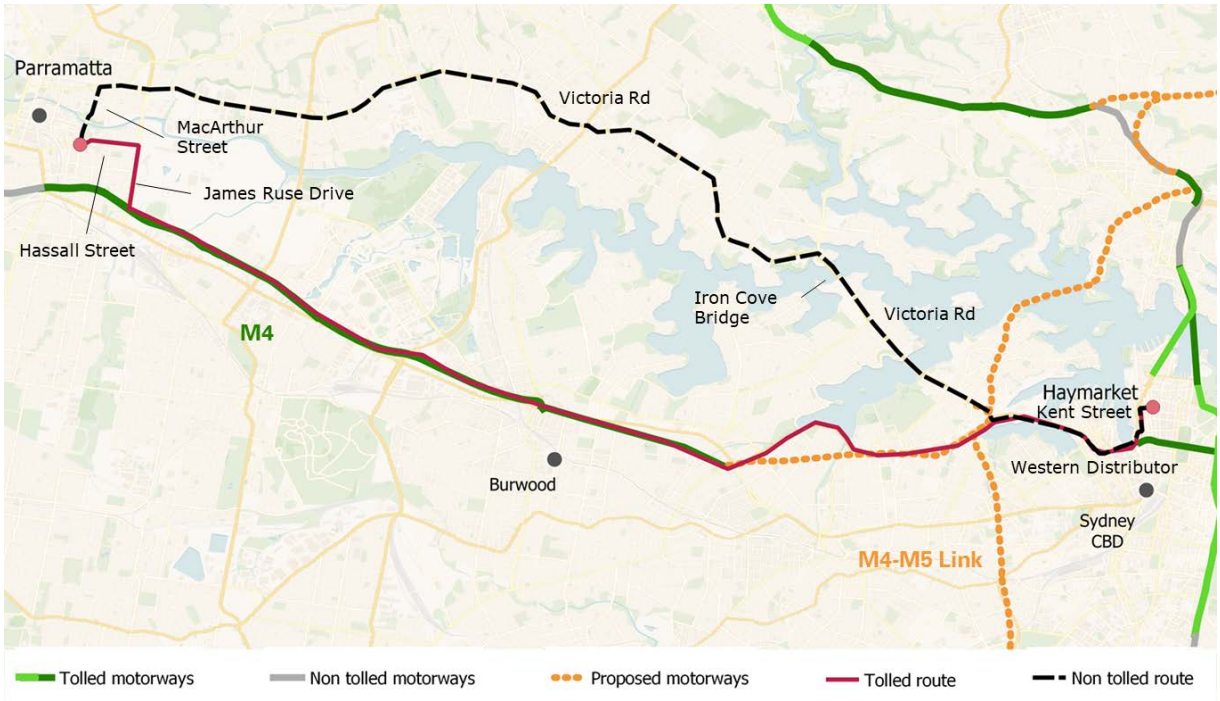
The illustrative examples provide an overview of the difference between trips made under Scenario 1 and Scenario 3. These examples are based on traffic modelling of selected routes, based on average network speeds and average travel times in the modelled AM peak for 2021. These examples show how the economic contribution modelling was undertaken.

Example commuter trip (Parramatta to the CBD)

Figure 7 shows the example routes for a commuter travelling from Parramatta to the CBD:

- **With tolled motorways scenario (red line):** Starts on Hassall Street, enters the M4 via James Ruse Drive, arriving at the CBD via the Western Distributor.
- **Without tolled motorways scenario (black dashed line):** Starts on Hassall Street, traversing Victoria Road and the Western Distributor to arrive at the CBD.

Figure 7: Example commute trip routes from Parramatta to the CBD



Source: Open Street Maps data

The key differences under Scenario 3 and 1 are shown in the table below. This shows that a commuter saves on average more than half an hour per trip between Parramatta and the CBD, compared to a scenario where Sydney's motorways do not exist.

Table 8: Example car trip from Parramatta to the CBD under Scenario 3 and 1 – modelled AM peak 2021

	Scenario 3 – with modern motorways	Scenario 1 – without modern motorways	Benefit
Distance (km)	23.8 km	23.9 km	0.1 km
Average travel time (min)	45.8 min	79.4 min	33.5 min
Average fuel consumption (L)	2.8 L	3.4 L	0.7 L

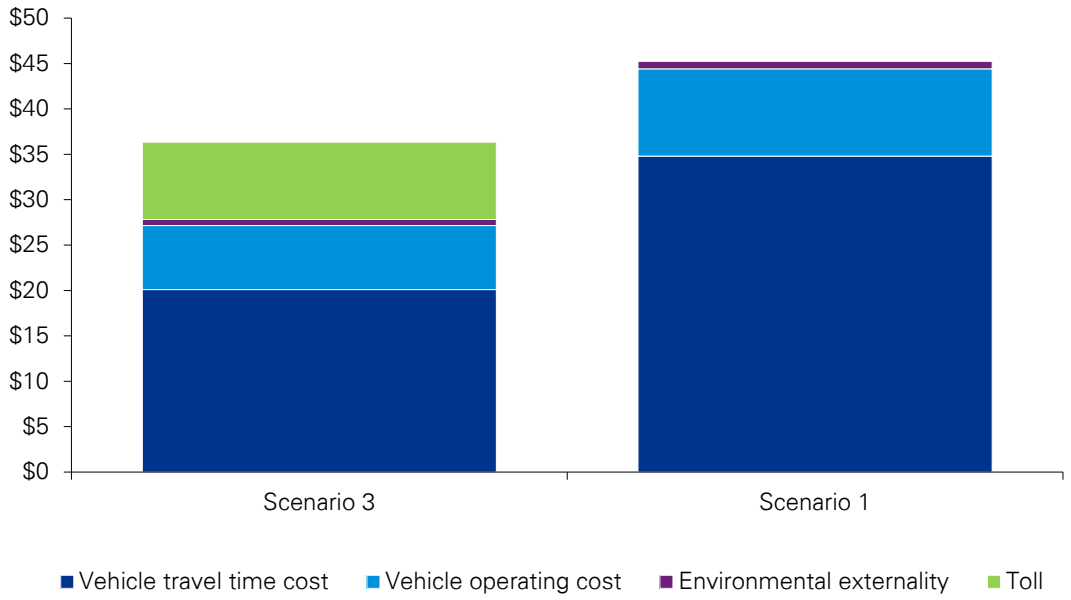
Source: Traffic modelling output and KPMG analysis. Note: The purpose of this example is to show how the economic contribution modelling was undertaken.

Figure 8 shows the average cost breakdown on the two routes. The total travel costs include:

- the financial cost for the car driver including vehicle operating costs and toll charges, and
- the economic costs including the cost of time for the driver and passenger (assuming average vehicle occupancy of 1.4) and environmental externality costs of emissions.

The estimated overall travel costs from Parramatta to the CBD was estimated to be around $36 using the M4 under Scenario 3 and $45 using the Victoria Road under Scenario 1.

Figure 8: Cost comparison for an example car trip from Parramatta to the CBD – Scenario 3 compared to Scenario 1 – AM peak



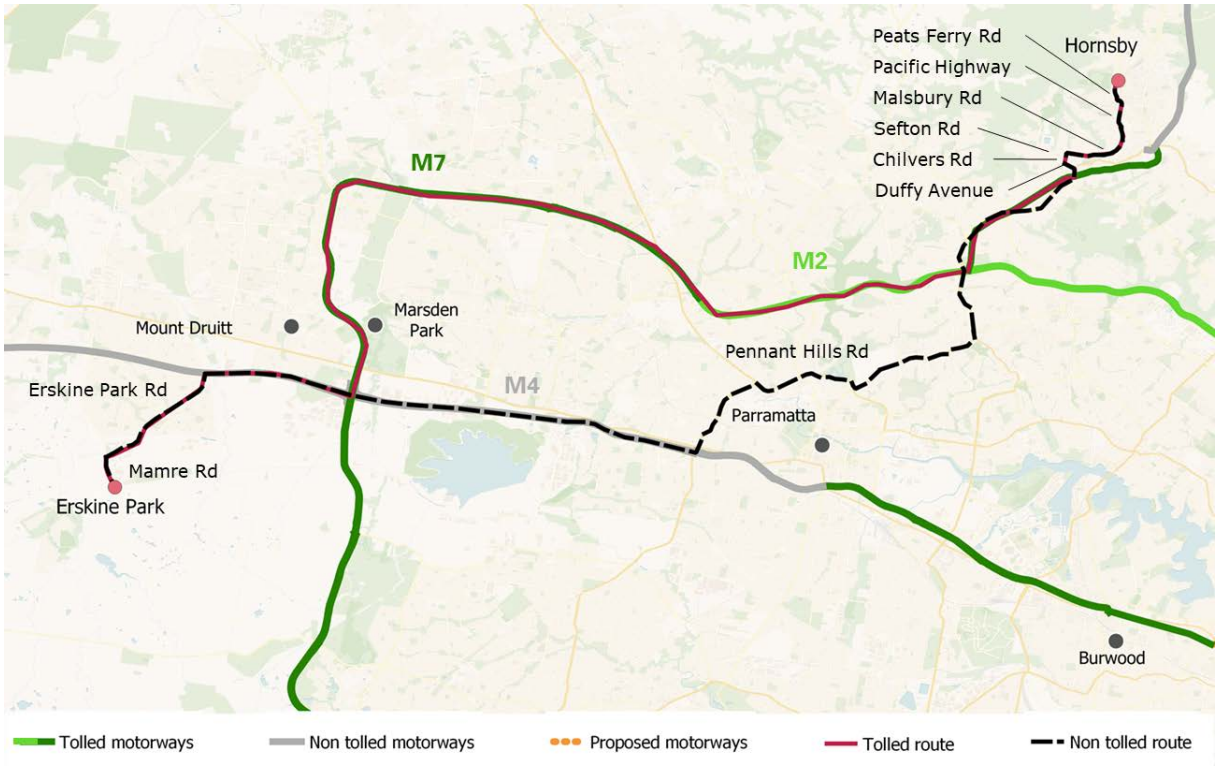
Source: Traffic modelling output and KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted. Costs were estimated based on a comparison of Scenario 3 to 1. The purpose of this example is to show how the economic contribution modelling was undertaken.

Example freight trip (Erskine Park to Hornsby)

Figure 9 shows an example route for a freight truck travelling from the Erskine Park area to Hornsby:

- **With tolled motorways scenario (red line):** Commences from Erskine Park Road, using M7, M2 and the newly completed NorthConnex with an estimated distance of around 49 kilometres.
- **Without tolled motorways scenario (black dashed line):** Commences from Erskine Park, using the non-tolled M4 section and Pennant Hills Road, with an estimated distance of some 42 kilometres.

Figure 9: Example freight trip routes from Erskine Park to Hornsby



Source: Open Street Maps data

The key differences under Scenario 3 and 1 are shown in the table below. This shows that a truck saves on average more than 50 minutes per trip between Erskine Park to Hornsby, compared to a scenario where Sydney's motorways do not exist.

Table 9: Example freight trip from Erskine Park to Hornsby under Scenario 3 and 1 – modelled AM peak 2021

	Scenario 3 – with modern motorways	Scenario 1 – without modern motorways	Benefit
Distance (km)	48.8 km	42.3 km	-6.6 km
Average travel time (min)	48.8 min	99.9 min	51.1 min
Average fuel consumption (L)	21.7 L	41.0 L	19.3 L

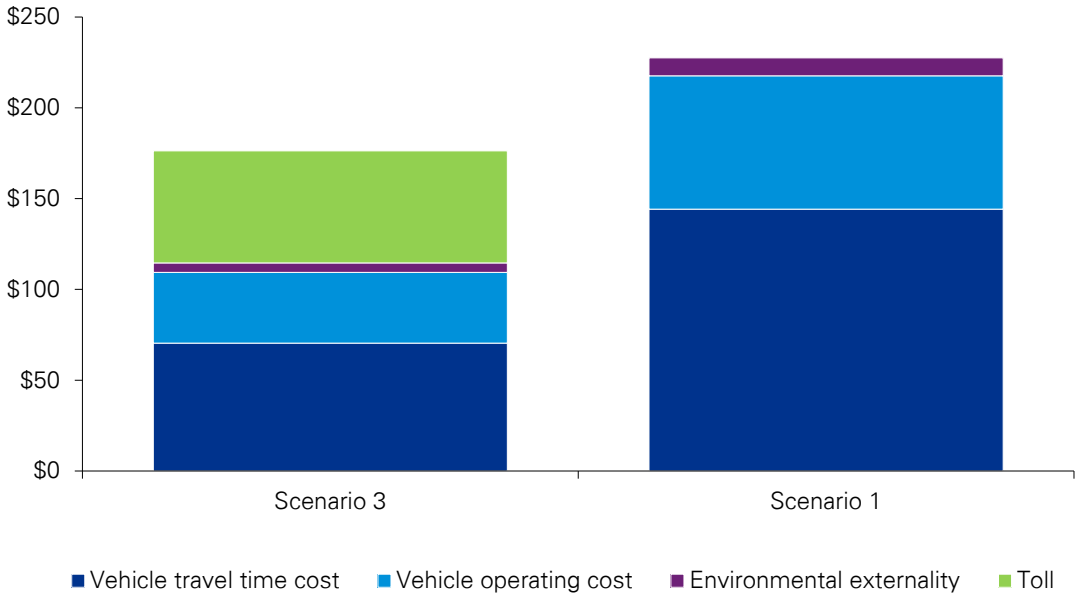
Source: Traffic modelling output and KPMG analysis. Note: The purpose of this example is to show how the economic contribution modelling was undertaken.

Figure 10 shows the cost breakdown of the above routes carried out by freight trucks. The total travel costs include:

- the financial cost for the truck operating including vehicle operating costs and toll charges, and
- the economic costs including the cost of time for the driver and passenger (assuming average vehicle occupancy of 1.1) and the economic value of the freight being transport (freight value of time), as well as environmental externality costs of emissions.

The estimated overall travel costs for the example truck travel from Erskine Park to Hornsby was estimated to be around $176 using the tolled motorway under Scenario 3 and $228 using the non-tolled route under Scenario 1.

Figure 10: Cost comparison for an example truck trip from Erskine Park to Hornsby – Scenario 3 compared to Scenario 1 – modelled AM peak 2021



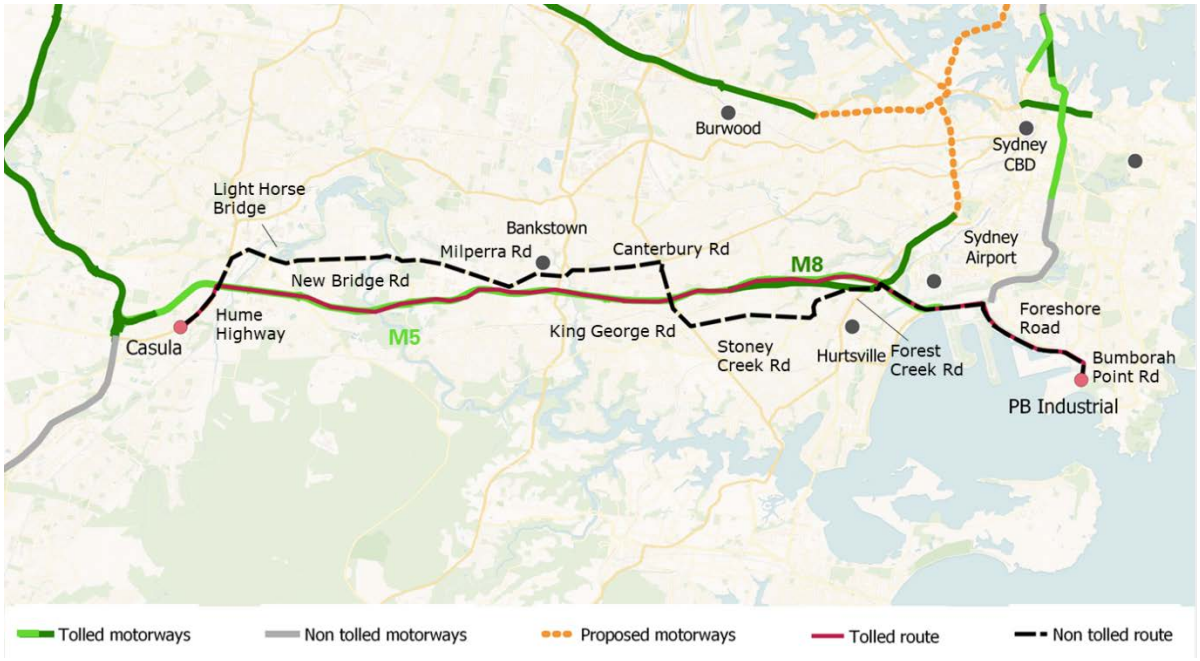
Source: Traffic modelling output and KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted. Costs were estimated based on a comparison of Scenario 3 to 1. The purpose of this example is to show how the economic contribution modelling was undertaken.

Example freight trip (Casula to Port Botany)

Figure 11 shows an example route for a freight truck travelling from Casula to Port Botany:

- **With tolled motorways scenario (red line):** Takes the M5 and Foreshore Road with an estimated distance of around 35 kilometres.
- **Without tolled motorways scenario (dashed black line):** Stoney Creek Road, Forest Road, General Holmes Drive, M1 to Foreshore Road with an estimated distance of around 39 kilometres.

Figure 11: Example freight trip routes from Casula to Port Botany



Source: Open Street Maps data

The key differences under Scenario 3 and 1 are shown in the table below. This shows that a truck saves on average around 55 minutes per trip between Casula to Port Botany, compared to a scenario where Sydney's motorways do not exist.

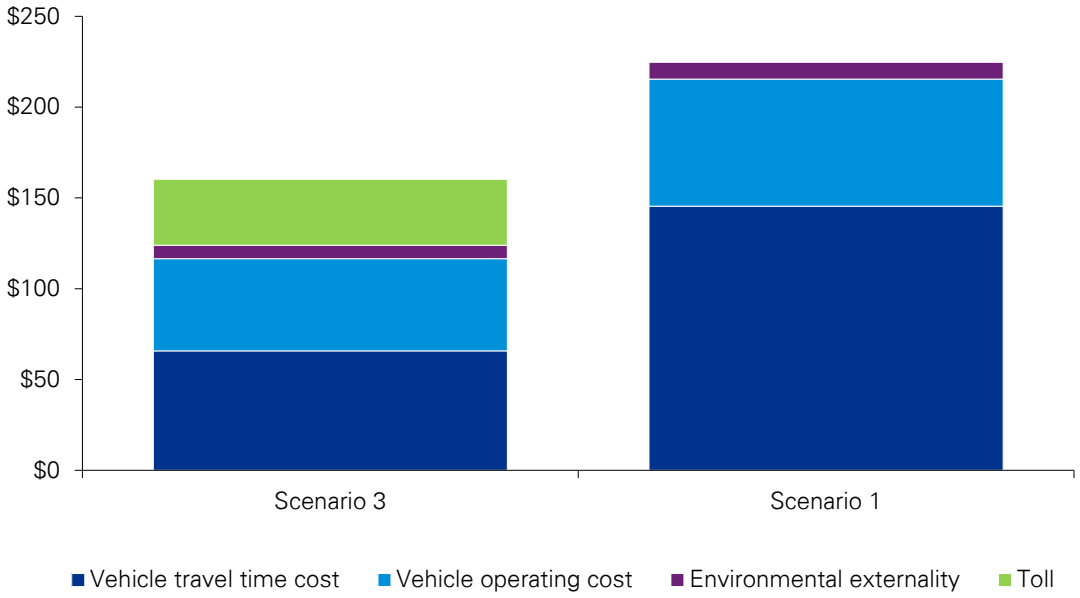
Table 10: Example freight trip from Casula to Port Botany under Scenario 3 and 1 – modelled AM peak 2021

	Scenario 3 – with modern motorways	Scenario 1 – without modern motorways	Benefit
Distance (km)	34.9 km	38.9 km	3.9 km
Average travel time (min)	45.6 min	100.8 min	55.2 min
Average fuel consumption (L)	30.5 L	38.5 L	8.0 L

Source: Traffic modelling output and KPMG analysis. Note: The purpose of this example is to show how the economic contribution modelling was undertaken.

Figure 12 shows the cost breakdown of the above routes carried out by freight trucks. The estimated overall travel costs for the example truck travel from Casula to Port Botany was estimated to be around $160 using the tolled motorway under Scenario 3 and $225 using the non-tolled route under Scenario 1.

Figure 12: Cost comparison for an example truck trip from Casula to Port Botany – Scenario 3 compared to Scenario 1 – modelled AM peak 2021



Source: Traffic modelling output and KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and undiscounted. Costs were estimated based on a comparison of Scenario 3 to 1. The purpose of this example is to show how the economic contribution modelling was undertaken.

5. Wider economic benefits

Beyond a tradition Cost Benefit Analysis approach sits a range of 'real world' imperfections which see the price and marginal social cost of transport diverge. This sees an array of additional benefits or costs created beyond the range captured in the direct benefit assessment.

These additional sources of impacts are commonly referred to as Wider Economic Benefits (WEBs). These benefits are most relevant to significant transport and urban (re)generation projects and typically refer to changes in the productive capacity of the economy. As with other transport modes, Sydney's modern motorway network allows a more efficient transmission of goods and skills across the NSW economy; and to the global markets beyond.

The toll road network improves access between places, which in effect, brings businesses and knowledge centres closer together. This will result in a number of wider economic benefits including:

- Agglomeration economies;
- Labour market deepening; and
- Output change in imperfectly competitive markets.

5.1 Agglomeration economies

Agglomeration economies refer to benefits that flow to firms and workers located in close proximity. Agglomeration economies arise from economies of scale and scope. The toll road network reduces the time and cost of travel. By lowering costs, toll roads enhance the accessibility and connectivity of employment centres and facilitate increased formal and informal interaction. The measure for these improvements in interaction is increasing 'effective density'.

In this context, effective density can be understood as a measure of access to opportunities, for instance, typical jobs, which is quantified using a measure of travel impedance (i.e. generalised cost, time or distance of travel). Higher effective density leads to firms enhancing their productivity through input sharing, knowledge and technological spill overs and output sharing, the principal source of agglomeration economies in the modern economy.

The resulting agglomeration impacts are measured as changes in Gross Value Added (GVA) for all industries. The change in GVA by industry (for each origin) is mainly driven by the percentage change in productivity between the project scenarios which reflects the rate of change in business-to-business effective density. Change in effective density is the mechanism through which agglomeration impacts are transmitted through changes in transport network performance delivered by the toll roads.

5.2 Increased labour supply benefits

Labour market deepening benefits arise from increased participation in the labour market (WEB2a): increased labour supply).[14] Toll roads reduce network travel times and improves travel time reliability, which in turn encourages job participation (e.g. less burdensome to get to and from work, especially for people with caring responsibilities) and allows greater accessibility to better matched jobs. While benefits are typically measured as increased (income) tax revenue, labour market deepening has a strong social component as it grows the pool of potential jobs individuals can choose from and thus is grows participation rates and ultimately job satisfaction.

Increased labour supply benefits (WEB2a) are based on the theory that in choosing whether to take up work, individuals trade off the perceived benefit of the potential wages with the perceived disbenefit of commuting. A reduction in commuting costs can impact the supply of labour, either by increasing the number of people who choose to work (e.g. an increased participation rate) or by increasing the number of hours worked by those already working. This can be alternatively described as an increase in the labour supply at the extensive and intensive margin respectively. The welfare benefit is the additional tax revenue received by the Government, which is a combination of taxes on labour (income and payroll tax) as well as tax on the additional output created by businesses.

Increased labour supply benefits are quantified by estimating the change in the average daily generalised cost of commuting due to the transport improvement for different areas of the city. The perceived benefit of working (measured in dollars) for each area is defined as the average daily wage minus the average daily generalised cost of commuting. A reduction in the generalised cost of commuting translates to an increase in the perceived benefit of working.

5.3 Output increase in imperfectly competitive markets

Transport costs act as a barrier to competition and therefore help to maintain imperfect competition. In imperfectly competitive markets firms are incentivised to sell less output at higher prices than they would in a perfectly competitive market. Toll roads reduce transport costs which can enhance the ability for firms to produce goods at a lower cost, therefore generating additional consumer surplus due to the existence of the price-cost mark-up.

[14] There is also WEB2b which arises from existing workers switching to more productive jobs. WEB2b is excluded in this assessment as it is associated with land use changes which is not considered to be significant between the project scenarios.

5.4 Results

As summarised in the table below, the incremental wider economic benefits for Sydney were estimated to be $60.4 billion (Scenario 3 compared to Scenario 1). Agglomeration benefits account for around 90 per cent of the total wider economic benefits. Estimated at $53.9 billion, this shows the significant importance of the toll motorway network to the productivity of all business in Sydney by bringing those businesses closer together.

Table 11: Wider economic benefits (WEBs) - 2016 to 2046

Wider economic benefits	Scenario 3 compared to Scenario 2 (delayed delivery)	Scenario 3 compared to Scenario 1 (without modern motorways)
Agglomeration economies	$13.2 bn	$53.9 bn
Labour market deepening	$0.4 bn	$1.9 bn
Increased output (imperfectly competitive markets)	$0.9 bn	$4.6 bn
Total wider economic benefits	**$14.5 bn**	**$60.4 bn**

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and discounted at 7%.

6. Economic impact

The direct and wider economic benefits focus on the effects directly associated with the toll road network. Economic impact modelling adds another layer to this analysis by estimating its contribution to total market value of goods and services including direct and indirect (or flow-on) effects as well as employment.

6.1 Measuring economic impact

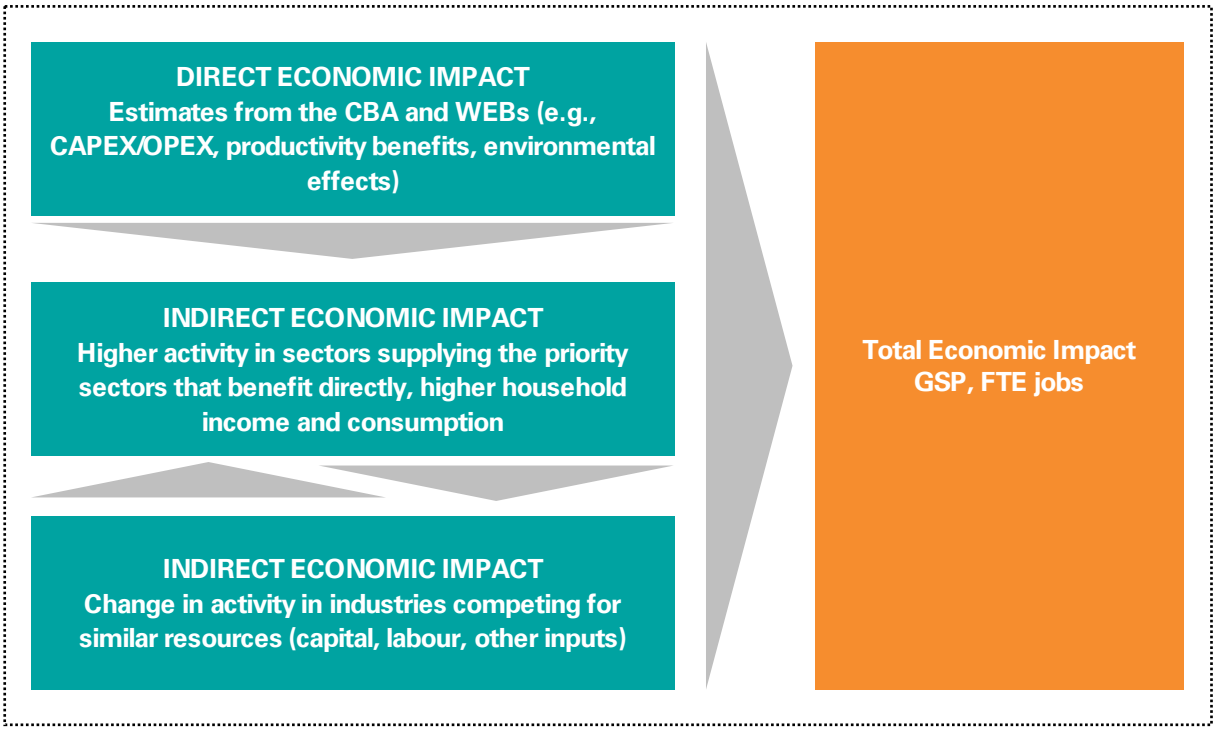
Economic impacts measure the broad effects on the economy. Thus, the total economic impact of the toll road network is measured in terms of gross state product (GSP) – a standard metric for the total market value of goods and services produced in an economy. This is equivalent to gross national expenditure (i.e., sum of household consumption, government consumption and investment) plus (international and interstate) exports of goods and services less (international and interstate) imports of goods and services. GSP measures the total market value of goods and services produced in an economy. This metric includes all taxes and subsidies raised on economic activity in an economy. While individual taxes and subsidies distort the allocation of resources in an economy, higher GSP is consistent with higher net tax revenue, and vice versa.

This study uses the KPMG-REG model to estimate the economywide impacts of Sydney's toll road network. KPMG-REG is a multi-regional, dynamic CGE model; it is a bespoke proprietary model developed by KPMG. As each state and territory is modelled as a separate economy, KPMG-REG is ideally suited to determining the impact of a region-specific project or change. The model contains explicit representations of intra-regional, inter-regional and international trade flows based on regional input-output data and includes detailed data on State and Federal Governments budgets and debt.

In assessing the economic impact of Sydney's toll roads, results of a counterfactual scenario are compared against that of a business-as-usual (or baseline) scenario. The baseline represents an estimate of how the size and structure of how the New South Wales economy will evolve in the absence of Sydney's toll roads. For the counterfactual scenario, the direct impacts (costs and benefits) of Sydney's toll roads are quantified outside the model based on the CBA and WEBs described above. The direct impacts are then implemented as shocks, which are translated into the model as the first-round effects of project. Then the second-round flow-on effects are captured via the model's input-output linkages subject to economy-wide and international resource constraints. By comparing the scenario results to the baseline, KPMG-REG quantifies economic impacts such as GSP and employment. The results are presented in percentage and dollar change (present values) terms, and full-time equivalent employment.

Figure 13 illustrates this process. Further detail on the KPMG-REG model and the modelling of the direct benefits are provided in Appendix 1.

Figure 13: Flow of economy-wide impacts in the KPMG-REG model



Source: KPMG diagram

6.2 Economic impact of the modern motorways

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 1 "Greater Sydney road network without tolled motorways"

The toll motorway network drives NSW GSP, employment and wages. Our analysis shows that the investment in its expansion, through construction (see Figure 2) over the next 20 years will increase labour demand and decrease the unemployment rate, which in turn accelerates (real) wage growth.

Aggregated over the assessment period, the toll motorways and its planned capital expansions will generate GSP of $189.1 billion in present value terms discounted at 7 per cent or close to one fifth of NSW's current annual GSP. Annualised over the assessment period this translates to an average GSP contribution of the toll road network of $7.3 billion per year. Taking the population of NSW of just under 8.2 million, on a per capita basis across NSW, this is equivalent to $890 per person per year. These GSP increases are expected to be associated with average annual job creation of approximately 12,000 FTEs over the assessment period.

Table 12: Economic impacts of toll motorways in Sydney – Scenario 3 compared to Scenario 1

Economic impacts	Economic impacts
State-wide NSW economic outputs	
Gross state product	$7.3 bn (average annual)
Gross state product per capita	$890 per person (average annual)
Jobs (FTE)	12,000 FTE (average annual)

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and discounted at 7%.

As the vast majority of this economic growth is associated with productivity improvements, it can be expected that they will continue well beyond the assessment period as the network continues to support Sydney's economy.

6.3 Impact of the accelerated delivery

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 2 "Greater Sydney road network with delayed delivery of tolled motorways"

While less pronounced than the above, NSW also significantly benefits from the accelerated delivery of toll motorways. Our analysis shows that the investment in its expansion, through construction (see Figure 2) over the next 20 years will increase labour demand and decrease the unemployment rate, which in turn accelerates (real) wage growth.

Aggregated over the assessment period, the toll motorway network and its planned capital expansions will generate GSP of $64.5 billion in present value terms discounted at 7 per cent. Annualised over the assessment period this translates to an average GSP contribution of the toll motorway network of $2.5 billion per year. Taking the population of NSW of just under 8.2 million, on a per capita basis, this is equivalent to $300 per person per year across NSW. These GSP increases are expected to be associated with average annual job creation of approximately 5,300 FTE over the assessment period.

Table 13: Economic impacts of toll road network in Sydney – Scenario 3 compared to Scenario 2

Economic impacts	Economic impacts
State-wide NSW economic outputs	
Gross state product	$2.5 bn (average annual)
Gross state product per capita	$300 per person (average annual)
Jobs (FTE)	5,300 FTE (average annual)

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and discounted at 7%.

7. Summary of results

7.1 Economic contribution of the toll motorways

Our analysis has estimated the economic contribution of the Sydney toll motorway network. The scenarios tested provide a range for the economic contribution the toll motorway network has on all road users and the broader economy in NSW. Results should be interpreted as providing a range of upper and lower bound estimates.

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 1 "Greater Sydney road network without tolled motorways"

The overall economic contribution of the toll motorway network includes the direct benefits, wider economic benefits as well as the state-wide macroeconomic impacts. A summary of the economic contribution on average each year is shown in the table below.

Table 14: Economic impacts of toll road network in Sydney – Scenario 3 compared to Scenario 1

Economic contribution	Average annual
Direct economic benefits	$3.6 bn (average annual)
Wider economic benefits	$2.0 bn (average annual)
Economic impacts (GSP)	$7.3 bn (average annual)
Jobs (FTE)	12,000 FTE (average annual)

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and discounted at 7%.

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 2 "Greater Sydney road network with delayed delivery of tolled motorways"

A summary of the economic contribution on average each year when comparing Scenario 3 and 2 is shown in the table below.

Table 15: Economic impacts of toll road network in Sydney - 'With toll roads' scenario compared to the 'delayed delivery of toll roads' scenario

Economic contribution	Average annual
Direct economic benefits	$0.7 bn (average annual)
Wider economic benefits	$0.5 bn (average annual)
Economic impacts (GSP)	$2.5 bn (average annual)
Jobs (FTE)	5,300 FTE (average annual)

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and discounted at 7%.

7.2 Disaggregated summary of results

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 1 "Greater Sydney road network without tolled motorways"

The overall economic contribution is summarised in Table 16. It was estimated that the long term economic benefit over 30 years of the toll motorway network is around $170.1 billion including $109.8 billion of direct benefits and $60.4 billion of WEBs using a discount rate of 7 per cent.

Table 16: Total economic contribution over 30 years (2016 to 2046) – Scenario 3 compared to Scenario 1

Benefits to all road users	Present value over 30 years
Direct economic benefits	
Benefits to business and freight users	**$60.8 bn**
Travel time savings	$53.4 bn
Travel time reliability benefits	$3.6 bn
Vehicle operating cost savings	$3.8 bn
Benefits to personal users	**$48.5 bn**
Travel time savings	$45.0 bn
Travel time reliability benefits	$1.0 bn
Vehicle operating cost savings	$2.6 bn
Other benefits	**$0.5 bn**
Environmental externalities	$0.5 bn
TOTAL DIRECT BENEFITS	**$109.8 bn**
Wider economic benefits	
Agglomeration economies	$53.9 bn
Labour market deepening	$1.9 bn
Increased output under imperfectly competitive markets	$4.6 bn
TOTAL WIDER ECONOMIC BENEFITS	**$60.4 bn**
TOTAL BENEFITS	**$170.1 bn**
Productivity benefits	**$114.6 bn**
Economic impact analysis	
Gross State Product	$7.3 bn (average annual)
Gross State Product per capita	$890 per person (average annual
Jobs	12,000 FTE (average annual)

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and 7% discount rate.

Scenario 3 "Greater Sydney road network with tolled motorways" compared to Scenario 2 "Greater Sydney road network with delayed delivery of tolled motorways"

The overall economic contribution when compared to Scenario 2 is summarised in Table 17. It was estimated that the total economic benefits for the accelerated delivery of toll motorways are around $35.8 billion including $21.3 billion of direct benefits and $14.5 billion WEBs using a discount rate of 7 per cent.

Table 17: Total economic contribution of accelerated delivery of toll roads in Sydney over 30 years (2016 to 2046) – Scenario 3 compared to Scenario 2

Benefits to all road users	Present value over 30 years
Direct economic benefits	
Benefits to business and freight users	**$11.8 bn**
Travel time savings	$10.5 bn
Travel time reliability benefits	$0.6 bn
Vehicle operating cost savings	$0.7 bn
Benefits to personal users	**$9.4 bn**
Travel time savings	$8.8 bn
Travel time reliability benefits	$0.2 bn
Vehicle operating cost savings	$0.4 bn
Other benefits	**$0.1 bn**
Environmental externalities	$0.1 bn
TOTAL DIRECT BENEFITS	**$21.3 bn**
Wider economic benefits	
Agglomeration economies	$13.2 bn
Labour market deepening	$0.4 bn
Increased output under imperfectly competitive markets	$0.9 bn
TOTAL WIDER ECONOMIC BENEFITS	**$14.5 bn**
TOTAL BENEFITS	**$35.8 bn**
Productivity benefits	**$25.0 bn**
Economic impact analysis	
Gross State Product	$2.5 bn (average annual)
Gross State Product per capita	$300 per person (average annual
Jobs	5,300 FTE (average annual)

Source: KPMG analysis. Note: Monetary values presented in $2021 price year, real terms, and 7% discount rate.


PREPARE TO STOP
NO DANGEROUS GOODS IN TUNNEL
LOW CLEARANCE 4.4 m
CAHILL TUNNEL
NO DANGEROUS GOODS IN TUNNEL
LOW TUNNEL CLEARANCE 4.4m
DETOUR

Appendices

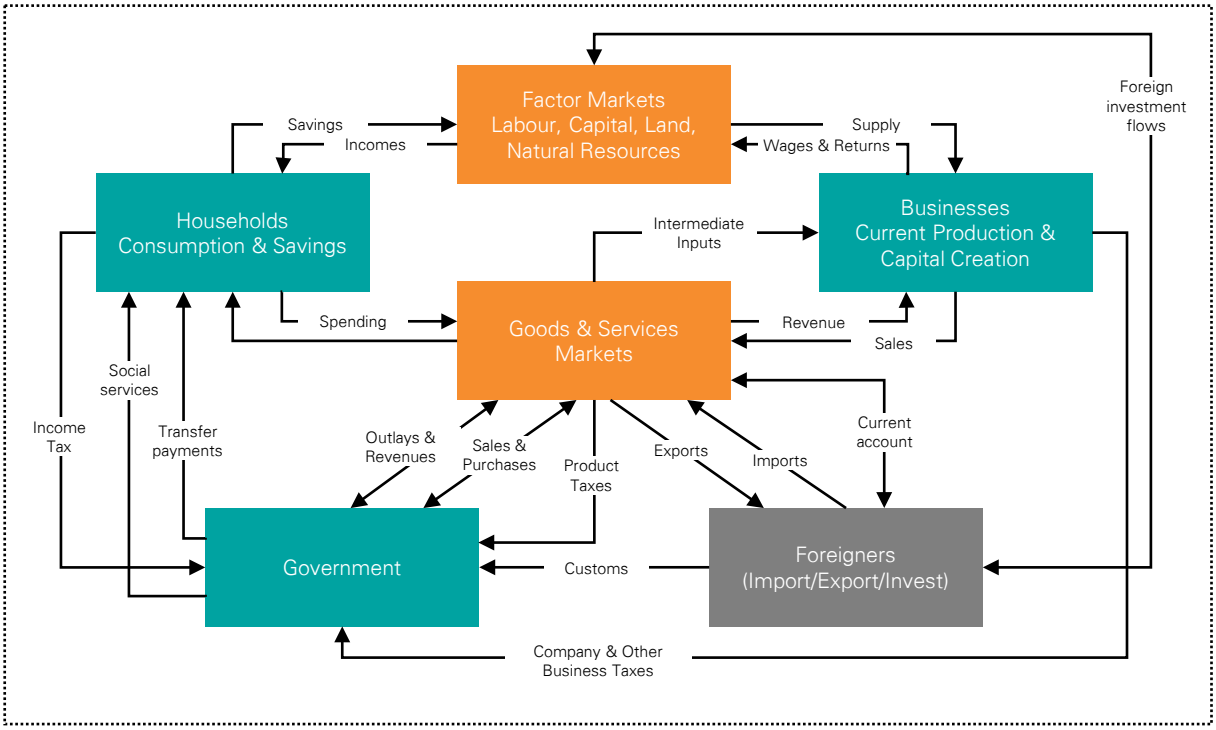
Appendix 1: The KPMG-REG model

The economic impacts of the Sydney toll road network have been modelled using KPMG's in-house economic model (KPMG-REG), a detailed regional computable general equilibrium model of the Australian economy. KPMG-REG is specifically designed for the analysis of regional projects as it explicitly captures

- linkages between industries within and between regions;
- flows of income stemming from jobs and profits supported by industry activity within each region; and
- relationships between the government sector and the rest of the economy.

The KPMG-REG model represents the economy as a system of interdependent economic agents and thus is capable of tracing and quantifying the impact of the transport project from one sector to another. Figure A1 shows a stylised representation of the transmission channels through which the impact of the Sydney toll road project affects the whole economy.

Figure 14: System of interdependent economic agents



Economic theory is used to specify the behaviour and market interactions of economic agents in KPMG-REG. Defining features of the theoretical structure include:

- optimising behaviour by households and businesses in the context of competitive markets with explicit resource constraints and budget constraints;
- the price mechanism operates to clear markets for goods and factors, such as labour and capital, i.e., prices adjust so that supply and demand are equal; and
- marginal costs are equal to marginal revenues in all economic activities.

The model combines data from input-output tables, labour force surveys and other sources with the model theory to quantify sophisticated behavioural responses such as:

- price and wage adjustments driven by resource constraints;
- household spending and government spending and taxing adjustments driven by budget constraints; and
- allowance for input substitution possibilities in production (e.g., allowing the combination of labour, capital, and other inputs required for production to vary in response to relative price changes).

KPMG-REG takes a 'bottom-up' approach to multiregional modelling. In each region, economic agents decide on the allocation of labour, capital and land to different productive activities. The cost structure of firms in each sector, the composition of investment goods, the endowments and preferences of households and the level and composition of public expenditures are all region-specific. Regions are interdependent via bilateral flows of goods and services between regions and with the rest of the world. These bilateral trades are facilitated in the model via a detailed specification of transport margins for goods.

The dynamic features of KPMG-REG are built on the premise that economic adjustment to economic shocks takes place over a period of years with the economy demonstrating much greater flexibility in the long-run than in the short-run. A core dynamic feature is the accumulation of capital. Investment behaviour is industry-specific and is positively related to the expected rate of return, which depends on the growth rate of the capital stock. The capital growth rate is determined by investment in the previous year less capital depreciation.

Another dynamic feature of KPMG-REG is the lagged adjustment process in the labour market. The wage rate adjusts gradually over time to changes in labour market conditions. This relationship is calibrated using coefficients estimated by the NIGEM macroeconomic model. In the long-run the wage rate adjusts so that the unemployment rate reaches its long-run equilibrium level. Workers are somewhat mobile across regions in response to changes in real wage rate relativities.

Other lagged adjustment processes relate to the stock of government debt and net foreign liabilities. Government debt accumulates depending on the evolution of the budget balance. Typically, the ratio of government debt to GDP is assumed to vary in the short-run but stabilise in the long-run. Stabilisation is typically achieved via the adjustment of the income tax rate. Net foreign liabilities as a share of GDP can also vary in the short run depending on the behaviour of household saving rate. The household saving rate is endogenous and responds to a consumption function that is a lagged function of income, wealth and the number of consumers who are liquidity constrained; these effects are calibrated using coefficients estimated by the NIGEM macroeconomic model. This form of consumption function exhibits consumption smoothing over time. In the long-run household consumption and the household saving rate adjust so that net foreign liabilities stabilise as a share of GDP.

KPMG-REG shocks representing Sydney's toll motorways

The first set of shocks is designed to capture the direct economic impacts of the project's investment costs. The capital expenditure and operating expenditure are implemented in the model as annual investment shocks to the road passenger and freight sectors.

The second set of shocks is designed to capture the operational benefits of the Sydney toll roads. There are three types of benefits estimated from the CBA:

1) Travel time savings,
2) Travel time reliability benefits, and
3) Vehicle operating cost savings.

These benefits accrue to three groups of beneficiaries:

1) Business users,
2) Freight users, and
3) Personal users.

Business travel time savings and travel time reliability benefits are assumed to be devoted to work. The *business* travel benefits are implemented as labour-saving and input-saving productivity improvements for firms in the service sectors, which predominantly use cars and other light vehicles. Freight travel time savings and travel time reliability benefits are assumed to accrue to firms in non-service industries, which predominantly use trucks or other heavy vehicles. These *freight* travel benefits are translated into input-saving productivity improvements. Personal travel time savings and travel time reliability benefits are assumed to increase leisure time. These *personal* savings/benefits are implemented in KPMG-REG as an exogenous increase in welfare derived from leisure for households.

Reductions in vehicle operating costs are modelled as reductions in consumption of Petrol Products and Motor Vehicles and Repairs by service sectors (business users), non-service industries (freight users), and households (personal users).

The wider economic benefits (WEB) of the project are also captured in KPMG-REG. WEB1 (agglomeration) contributes most of the benefits while WEB2a (move to more productive jobs) makes a small contribution to the benefits. This is because proximity effects (reductions in travel times) are large relative to labour market effects (i.e., relocation of workers to more productive jobs). KPMG also estimated the WEB3 benefits, but these are not implemented here. This is because these benefits arise from imperfect competition in product markets and this is not consistent with the assumption of perfectly competitive markets in KPMG-REG. The WEB1 and WEB2a inputs are represented in the CGE model as labour productivity improvements.

Appendix 2: Note to Readers

For readers of this report it should be noted that in 2015 KPMG prepared a report for Transurban on the economic contribution of all toll motorways in Australia. This report however focusses on toll motorways in Sydney. This report has also applied a different approach to the development of the scenarios used to model the economic contribution. Therefore, results of this report are not intended to be compared to the 2015 report.

Some key differences between the two reports include:

- This report has modelled three scenarios consisting of the Greater Sydney road network with and without toll motorways and a delayed toll motorway delivery scenario of 15 years.
- The 2015 report considered the delayed delivery of the toll network under 5, 10 and 30 year scenarios.
- The 2015 report did not compare the Sydney road network with and without toll motorways.
- A major difference between the reports is that in 2015 the benefit estimate was based on toll road users only. This report considers the benefits to all road users.
- The evaluation period for the analysis in the 2015 report was 10 years while this report has adopted a longer time period of 30 years.
- Forecasts undertaken in 2015 are different to forecasts undertaken for this report. For example, population growth and economic growth forecasts have all changed since 2015 and are different to forecasts made today.
- The price basis was $2014 in the 2015 report while the price basis in this report is $2021.
- All economic parameter values have changed since the 2015 report and the best practice guidance material has been updated.
- The 2015 report did not account for the economic impact resulting from the construction of the toll motorways.

These factors explain the difference in the results and should therefore not be compared given the changes in modelling assumptions and scenarios.

Appendix 3: Glossary

Acronym	Term
ABS	Australian Bureau of Statistics
ATAP	Australian Transport Assessment and Planning
ANZIC	Australian and New Zealand Standard Industrial Classification
BITRE	Bureau of Infrastructure, Transport and Research Economics
BN	Billion
CAPEX	Capital Expenditure
CBA	Cost-Benefit Analysis
CGE	Computable General Equilibrium
CH4	Methane
CO2	Carbon Dioxide
CO	Carbon Monoxide
COVD-19	The COVID-19 disease.
FTE	Full Time Equivalent
GDP/GSP	Gross Domestic Product/Gross State Product
GVA	Gross Value Added
HCV	Heavy commercial vehicle
KFRs	Key Freight Routes
KPMG-REG	A multi-regional, dynamic CGE model of the Australian economy.
LCV	Light Commercial Vehicle
NIGEM	NIGEM macroeconomic model.
N2O	Nitrous Oxide
NPV	Net Present Value
NSW	New South Wales
OPEX	Operating Expenditure

Ox	Oxides of Nitrogen
PM10	Particulate Matter
U.S.	The United States of America
TfNSW	Transport for NSW
Tkm	Tonne kilometres
UK	United Kingdom
VHT	Vehicle Hours Travelled
VOC	Vehicle Operating Cost
WCX	WestConnex
WEBs	Wider Economic Benefits
WEB1	Agglomeration economies
WEB2	Increased labour supply benefits
WEB3	Increased output due to imperfect competition

Appendix 4: Lists

List of Tables

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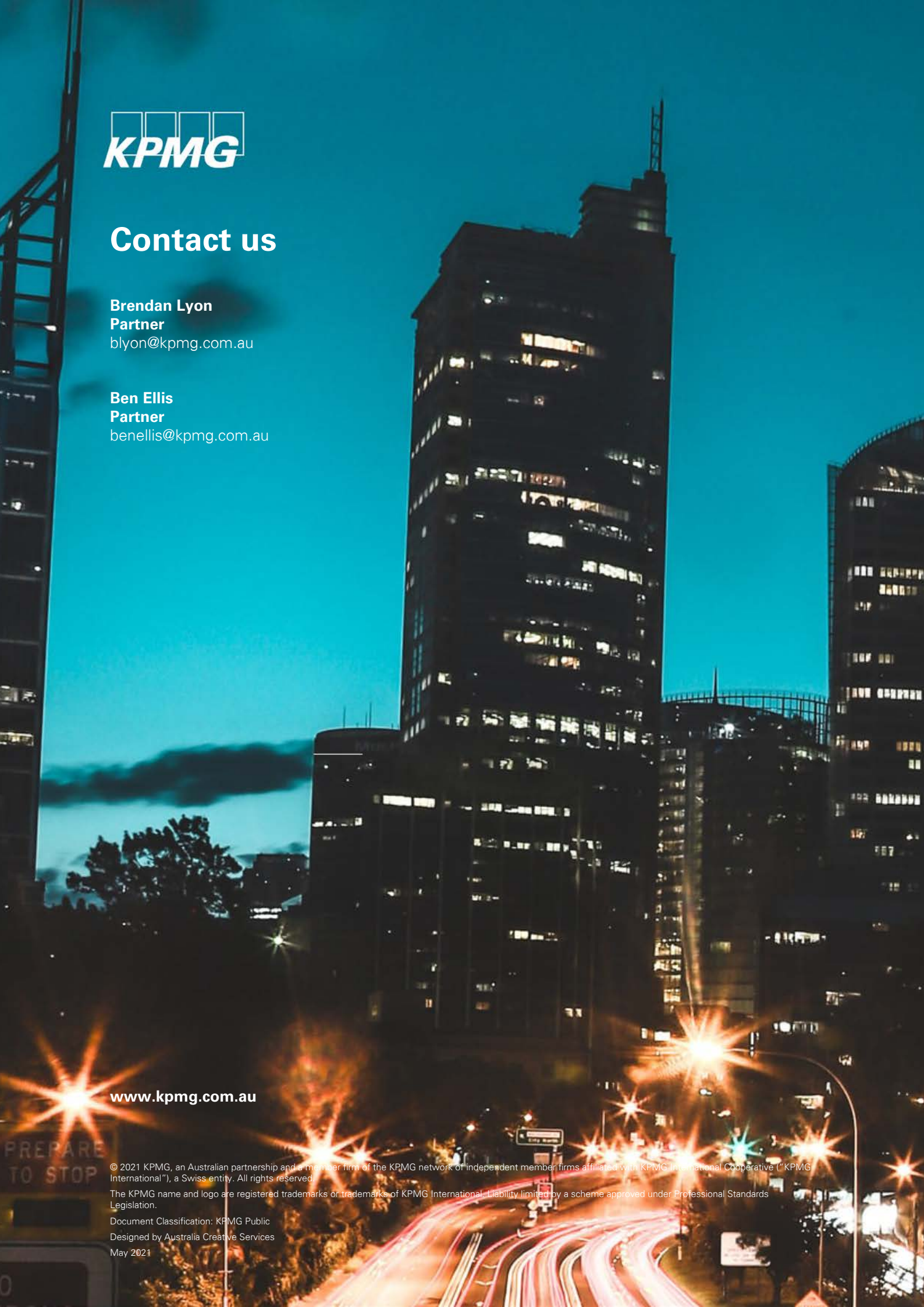

Contact us

Brendan Lyon
Partner
blyon@kpmg.com.au

Ben Ellis
Partner
benellis@kpmg.com.au

www.kpmg.com.au

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Transurban

Contact details

Michele Huey
Group Executive, NSW
mhuey@transurban.com

Level 9
1 Chifley Square
Sydney
NSW 2000

transurban.com