Submission to Department of Planning & Environment
WestConnex – New M5
Environmental Impact Statement
November 2015
Application Number SSI 14_6788

Introduction

The National Roads & Motorists' Association (NRMA) comprises more than 2.4 million Members across New South Wales (NSW) and the Australian Capital Territory (ACT). For more than 90 years, NRMA has represented the interests of motorists in relation to traffic management and road safety.

NRMA welcomes the opportunity to provide this submission to the NSW Department of Planning and Environment in response to the WestConnex New M5 Environmental Impact Statement (EIS).

NRMA strongly supports completing the missing links in Sydney's motorways to create a connected and functional motorway network. We support WestConnex and our intention with this submission is to make it an even better project.

The New M5 will be a major addition to this network, and when joined with the proposed WestConnex Stages 1 and 3, will provide a continuous motorway link between the M4 and M5 motorways. By improving travel times and travel time reliability, it can make a positive difference to the way people move around the motorway network.

NRMA's key concern highlighted in our submission to the M4 East project was how the proposed three lane tunnel would be at capacity not long after the full WestConnex project is proposed to open to traffic. In contrast, the section of the New M5 between Arncliffe and St Peters has been designed to cater for five lanes in each direction (initially to be marked as two lanes in each direction) to cater for future growth and connections.

The main focus of this submission is on addressing the predicted significant traffic diversion to roads surrounding the M5 East, since these impacts do not appear to have been adequately addressed by the EIS.

Comments and Queries

NRMA has outlined in this submission a number of key recommendations for consideration by the NSW Department of Planning & Environment and by the Proponent. We would welcome the opportunity to discuss this submission with the Proponent and with the Department to assist the Department in undertaking its assessment.

Comments and queries on this document may be directed to:
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Making WestConnex work for road users and the surrounding communities

The fundamental issues for WestConnex are how well it will work for traffic and how well it will be perceived by road users and the wider community.

The EIS for the New M5 indicates the New M5 and the associated new toll on the M5 East will lead to a large reduction in traffic using the M5 East (a 40% reduction from 116,000 vehicles per day to 69,000 vpd in 2021). This will make a very positive difference to the operation of the M5 East.

Unfortunately, this positive benefit is offset by the large increase in traffic diverting to surface streets (a 35% increase in traffic on Stoney Creek Road through Bexley).

This will significantly increase congestion on the designated detour route for the M5 East (Marsh and Wickham Streets and Forest and Stoney Creek Roads) and will inevitably lead to traffic intrusion into local streets, restricting freedom of travel and resulting in other impacts for the adjacent communities.

Some level of toll avoidance is to be expected, however, the very high level of traffic diversion to surface streets is a strong indication that the New M5 does not serve many trips currently taken via the M5 East, and that many motorists will not perceive the proposed tolls on the New M5 and the new toll on the M5 East as representing value for money.

For those motorists who need to continue to travel in the M5 East corridor, the options will be to either pay a new toll to use the M5 East, or to divert to the surrounding streets. This is presumably the reason for the significant increase in congestion the EIS predicts on the parallel surface streets.

Importantly the significant increase in traffic and travel times on parallel surface streets to the M5 East means the traffic and community implications for this section of WestConnex are very different to those affecting both the M4 widening and the M4 East projects. In contrast to the predicted 35% increase on roads such as Stoney Creek Road as a result of the New M5 and the new toll on the M5 East, the predicted traffic volume changes on the majority of Parramatta Road as a result of the M4 East are relatively small.

This indicates a need to adopt a different approach with the New M5 to that taken for the previous WestConnex projects.

One of the five ‘core’ project objectives identified in the EIS Appendix G, Section 2.1 is to “Relieve road congestion so as to improve the speed, reliability and safety of travel in the M5 Motorway corridor, including parallel arterial roads”.

The EIS predicts that large volumes of traffic will divert to arterial roads through Bexley and Arncliffe, inevitably also leading to traffic intrusion into local streets. This, is a strong indication that the current project does not satisfy this ‘core’ project objective.

Given the propensity to overestimate traffic volumes on recent Australian toll roads, it is feasible the EIS may actually under-estimate the level of toll diversion.

The high level of traffic predicted to divert to the surrounding streets is a significant concern and the EIS appears to offer little in the way of solutions to address the associated congestion, road safety, noise and air quality issues that will affect the users of these roads, and the adjacent communities.

In stark contrast, however, to the predicted impacts on the surface routes, the EIS predicts the performance of the existing M5 East (in terms of speed, journey reliability, road safety and air quality) will significantly improve.

The EIS states that "a network and corridor optimisation approach" will be adopted "to manage delay and queuing impacts at critical intersections" on the surrounding network.

Realistically, the predicted congestion is not something that may be resolved by 'tweaking' traffic light operations or installing 'Local Area Traffic Management' measures, such as speed humps, in local streets. Although not identified in the EIS because of the restricted geographical scope of the project study area, intersections such as Forest Road / Stoney Creek Road / Bexley Road / Harrow Road on the M5 East detour route already fail and operate at Level of Service 'F'.

It is hard to contemplate, or to convey, what adding 35% additional traffic actually means in terms of delays and queue lengths to intersections that are already operating at Level of Service 'F'.

One way perhaps to try to comprehend what this large increase in traffic will mean for congestion is to consider the opposite effect of how much lighter traffic becomes as a result of a 5 – 10% reduction in traffic during school holidays (depending on the holiday).

It is difficult to understand how intersections operating at Level of Service 'F' can be optimised any further without adding major and costly works to the project scope, such as increasing the number of lanes, grade separating the traffic movements via under or overpasses, removing all parking, or bypassing congestion hot spots such as Bexley, altogether.

The EIS response is simply that an "*operational traffic review* would be conducted 12 months following commencement of operation *to confirm the operational traffic impacts of the project on surrounding roads and major intersections*" (New M5 EIS Volume 1B, Section 9, Traffic & Transport, Page 9-150).

In the absence of any tangible measures identified in the EIS to manage this increase, and in order to mitigate the adverse impacts, there appears to be a pressing need to reconsider the proposed toll prices for cars and trucks. Reducing the proposed toll levels so as to encourage motorists to not divert to surface streets has the most potential to encourage motorists to instead use the M5 East and the New M5.

Summary of Recommendations

We have outlined in this submission a number of key recommendations for consideration by the Department of Planning and Environment, and by Roads & Maritime Services as the Proponent. We would welcome the opportunity to discuss this submission with the Department and to respond to any queries the Department may have.

We are pleased that many of the recommendations in NRMA's 'WestConnex: Getting it Right' report appear to now have been embraced by the WestConnex project, such as improved tunnel lighting to reduce fatigue, improve safety and add interest to the tunnel journey, and avoiding steep uphill and downhill grades. A copy of this report is included in 'Appendix A' to this submission.

The NRMA report also highlighted the need to ensure that WestConnex represents value for money for motorists. It identified the main overriding objective for the WestConnex project as being long term effective traffic management, not lowest cost or revenue maximisation. The preceding section of this submission and the following recommendations are focused on achieving this objective.

We are pleased the New M5 has been designed to cater for five lanes in each direction (initially marked as two lanes in each direction) between Arncliffe and St Peters, presumably to provide for future growth and new connections.

This contrasts with one of the key concerns highlighted in NRMA's submission to the WestConnex M4 East EIS, specifically how the proposed three lane M4 East tunnel would be at capacity not long after the full WestConnex project opens to traffic.

Example of existing traffic congestion on the southbound exit from the two lane M5East main tunnel at Bexley North in the PM peak.

The main issue highlighted in this new submission to the WestConnex New M5 is the significant traffic diversion to surface streets around the M5 East, primarily as a result of the new toll proposed for the M5 East. It seems that this will have the opposite effect to that envisaged in NRMA's 'WestConnex: Getting it Right' report that envisaged opportunities to revitalise roads such as Forest and Stoney Creek Roads through Bexley.

A summary of NRMA's further recommendations are provided below. This is followed by more detailed information in relation to each recommendation.

Recommendation 1
The Proponent shall provide a critical analysis of traffic predictions versus actual traffic volumes on previous Australian motorway projects opened over the last 10 years, and an explanation of how this has been taken into account in predicting traffic volumes for the WestConnex M4 East project.

Recommendation 2
The Proponent shall present the results of stress testing the project design and tolling assumptions against high, medium and low traffic projections

Recommendation 3
The Proponent shall provide details of the toll sensitivity testing that was used to inform the toll choice modelling, the survey outcomes of drivers' willingness to pay tolls, and details of how this affected the model results

Recommendation 4
The Proponent shall confirm whether the traffic modelling for 2031 assumed there would no longer be 'Cashback' for private motorists using the M5 West motorway.

Recommendation 5
The Proponent shall reconsider the proposed tolls and the level of toll escalation on the M5 East and New M5 with the aim of significantly reducing the predicted traffic increase and associated impacts on surface roads, particularly around Bexley and Arncliffe.

Recommendation 6
The Proponent shall establish an independent toll agency with the ability to decrease or increase tolls for the New M5 and M5 East within a cap to encourage efficient operation and the best use of the project by motorists, and to oversee rebates to motorists for poor motorway performance

Recommendation 7
The proponent shall instigate measures to encourage trucks to utilise the M5 East and the New M5 in order to minimise diversion to the surface streets and to reduce the impacts on the surrounding road network and adjacent communities.

Recommendation 8
The Proponent shall integrate 'park and ride' into the project scope, potentially similar to the underground 'Domain' carpark so as to enable the surface to be used by the local community. This would enable consideration of a future fast, direct public transport link from the end of the New M5 at St Peters into Sydney airport.

Recommendation 9
The Proponent should provide noise attenuation measures for residences in proximity to roads such as Marsh and Wickham Streets, and Forest and Stoney Creek Roads, in order to offset the increase in noise associated with the increase in traffic predicted to use these roads, both during construction and operation of the project.

Recommendation 10
The Proponent shall expand the detailed study area and reporting in the Traffic & Transport Assessment to include the Forest Road / Stoney Creek Road and Canterbury Road corridors to enable a proper assessment of the congestion and road safety impacts and opportunities associated with these corridors and the surrounding road network.

Recommendation 11
The Proponent shall ensure that breakdown lane widths outside the tunnel are 3 metres wide in order to safely accommodate broken down vehicles and their occupants, and to provide adequate separation from live traffic for emergency and maintenance workers, and incident responders.

Recommendation 12
The Proponent shall investigate options for grade separation of traffic lanes, along with measures to remove right hand on and off ramps in order to improve traffic flow and road safety between King Georges Road and Bexley Road

Recommendation 13
The Proponent shall ensure all features of a managed (smart) motorway are included within the project scope and are operational on opening of the Project

Recommendation 14
No advertising shall be permitted within the WestConnex / M5 East lease area both during construction and operation

Recommendation 15
The Proponent shall ensure the New M5 is designed and operated to minimise both the number of times and the duration it is closed for maintenance

Recommendation 16
The scope for the New M5, including the city-bound approach to the existing M5 East tunnel should incorporate the world's best systems and designs to stop over-height vehicles, and vehicles carrying dangerous goods from attempting to enter the tunnels.

Recommendation 17
The Proponent shall consult with road user groups such as NRMA in regards to the detailed tunnel design features

Recommendation 18
The Proponent shall publish the operational requirements for the motorway in regards to identifying, responding to and clearing incidents, such as crashes and breakdowns.

Recommendation 19
The Proponent shall publish detailed information each month in regards to the performance of the motorway. This must include details of traffic volumes both on the mainline motorway and by ramp, incident data including numbers of crashes and breakdowns, the duration of these incidents and the response times for dealing with these incidents.

Recommendation 20
The Proponent shall ensure the capacity of the M5 East and New M5 detour routes are not reduced.

Recommendation 21
The Proponent shall ensure the lane widths on detour routes are sufficiently wide to safely cater for large trucks, including petrol tankers that are not permitted in the tunnels, so as to minimise the potential for conflict with other vehicles and vulnerable road users, such as cyclists and pedestrians.

Recommendation 22
The Proponent shall install a continuous line of profiled line marking [raised markings] as an edge line outside the tunnels to delineate the traffic lanes from the road shoulder and provide both a visual and audible alert to any motorist deviating from the carriageway. This will improve safety for anyone using the road shoulder, such as broken down vehicles, or maintenance workers, and will improve delineation, particularly at night and in wet weather.

The following recommendations specifically relate to the <u>Construction Phase</u> of the project

The EIS states the project would generate 2.7 million cubic metres of spoil, all of which will be moved by truck. This is 300,000 cubic metres more than the M4 East's 2.4 million cubic metres of spoil. The cumulative impacts on traffic and road safety during the multiple construction phases of the WestConnex and NorthConnex projects have not been assessed.

Recommendation 23
The Proponent shall prohibit all spoil truck movements associated with the Project to outside the AM and PM weekday, and weekend road traffic peaks

Recommendation 24
The Proponent shall apply additional safety features to improve road safety associated with the operation of trucks on the project. Examples of appropriate safety features could include front / side / rear under-run protection and speed control

Recommendation 25
The Proponent shall reassess the proposed spoil routes for the project

Recommendation 26
The Proponent shall ensure that the Construction Traffic Management Plan restricts the use of compression braking by spoil trucks, particularly on steep sections of roads such as Bexley Road between Forest Road and Kingsland Road South

Recommendation 26
The Proponent shall ensure that the project Construction Traffic Management Plan requires all spoil trucks associated with the Bexley North south construction area to use the kerbside lane when travelling on Bexley Road westbound between Barnsbury Grove and Shaw Street.

Recommendation 27
The Proponent shall extend the crash guardrail adjacent to the kerbside westbound lane at the Bexley North railway overpass further towards the intersection with Shaw Street and install crash protection for pedestrians on the footpath between the bus stop to the east of this location and the intersection with Shaw Street

The Proponent shall also provide crash protection for pedestrians on the footpath adjacent to the kerbside westbound lane of Bexley Road approaching Shaw Street.

Further information relating to NRMA's recommendations

Recommendation 1

The Proponent shall provide a critical analysis of traffic predictions versus actual traffic volumes on previous Australian motorway projects opened over the last 10 years, and an explanation of how this has been taken into account in predicting traffic volumes for the WestConnex M4 East project.

Robust traffic projections are a critical input to WestConnex, not just in terms of predicting the amount that will be collected from motorists in tolls, but in terms of design issues such as the numbers of traffic lanes on the motorway and on the entry and exit ramps, and in terms of the changes that may be feasible on surface roads, such as new bus and bicycle lanes.

One of the challenges for WestConnex is to demonstrate to the public the steps that have been taken to address the accuracy of traffic modelling. This is particularly important given that recent Australian toll road projects appear to have consistently over-predicted the amount of traffic that will use these projects. If this tendency to overestimate occurs on the New M5 then the high level of traffic diversion to the surrounding streets predicted in the EIS may actually be much worse.

The EIS contains a significant amount of information in relation to traffic modelling, however, the analysis does not appear to include an evaluation of modelling undertaken for previous toll road projects, the lessons learnt and an explanation of how the WestConnex modelling has addressed these issues.

Recommendation 2

The Proponent shall present the results of stress testing the project design and tolling assumptions against high, medium and low traffic projections

As demonstrated by recent toll road projects, traffic modelling is far from an exact science. The strategic model used for WestConnex assists in undertaking a metropolitan level analysis and modelling broad network changes, but in spite of the limitations of strategic modelling, the EIS presents the results as if they are absolute traffic figures.

We believe it would also be useful to present the traffic modelling in terms of high, medium and low projections and to report the results of sanity checking, or stress testing the project design and tolling assumptions against each of these scenarios.

Recommendation 3

The Proponent shall provide details of the toll sensitivity testing that was used to inform the toll choice modelling, the survey outcomes of drivers' willingness to pay tolls, and details of how this affected the model results

The EIS contains very limited information in regard to tolling or project financing. This makes it difficult to objectively assess whether the proposed tolls for traffic using WestConnex are appropriate and whether the predicted traffic volumes will be achieved.

We would like to see details of the toll sensitivities used to determine the proposed toll levels and traffic projections. The EIS indicates the toll choice model was adjusted to match observed patronage on existing toll roads, but does not report on this, or provide an analysis of the sensitivity of road users to paying multiple tolls whilst travelling from one toll road to another, for example, from the M7 to the M5 and then onto WestConnex.

Toll levels can have a major effect on the distribution of traffic using the toll road compared to traffic using alternative routes. As shown by recent Australian toll road projects, road users are very sensitive to different toll levels. The high level of predicted toll diversion from the New M5 and from the M5 East to the surrounding surface streets appears to reinforce this concern.

It would be useful for information to be provided on the toll sensitivity testing in relation to the proposed truck toll at three times the car multiplier, including the outcomes of consultation both the large road haulage companies and also with single vehicle owner / operators of vehicles who will be required to pay the truck toll.

Recommendation 4

The Proponent shall confirm whether the traffic modelling for 2031 assumed there would no longer be 'Cashback' for private motorists using the M5 West motorway.

Users of the M5 West / M5 East and the M5 West / WestConnex New M5 corridors will pay separate tolls to travel on each of these roads, since unlike the M4 / WestConnex M4 East corridor, the proposed WestConnex toll cap is not integrated with the M5 West. Whilst private users of the M5 West will continue to have the option of claiming cashback on the M5 West until the current concession ends in December 2026, there is currently no commitment to retain cashback after this date and it is unclear what has been factored into the traffic modelling in the New M5 EIS.

Recommendation 5

The Proponent shall reconsider the proposed tolls and level of toll escalation on the M5 East and New M5 with the aim of significantly reducing the predicted traffic increase and associated impacts on surface roads, particularly around Bexley and Arncliffe.

One of the five core project objectives identified in the EIS Appendix G, Section 2.1 is to "Relieve road congestion so as to improve the speed, reliability and safety of travel in the M5 Motorway corridor, including parallel arterial roads".

The project in its current form does not appear to have achieved this core objective, as evidenced by the large increase in traffic diverting to arterial roads through Bexley and Arncliffe, also leading to traffic intrusion to local roads.

Furthermore, indications that WestConnex toll prices will be permitted to increase at greater than the rate of inflation are likely to compound the diversion to surrounding streets.

Recommendation 6

The Proponent shall establish an independent toll agency with the ability to decrease or increase tolls for the New M5 and M5 East within a cap to encourage efficient operation and the best use of the project by motorists and to oversee rebates to motorists for poor motorway performance

NRMA's recent report 'Keeping Sydney Moving, delivering Better Road & Motorway performance, May 2015 recommends a new approach to setting road tolls, focusing on the whole road network performance;

It recommends that IPART or a similar authority should oversee negotiations for new tollway contracts or any extension of toll way concessions – this includes reinvesting surplus profits above and beyond the contract for the benefit of commuters.

Further information in regards to this recommendation may be viewed here:

See NRMA report 'Keeping Sydney Moving, Delivering Better Road & Motorway Performance' May 2015:
http://www.mynrma.com.au/images/About-Education/Keeping_Sydney_Moving.pdf

See NRMA calls for toll rebates for congestion:
http://www.mynrma.com.au/get-involved/advocacy/news/nrma-calls-for-toll-rebates-for-congestion.htm

Recommendation 7

The Proponent shall instigate measures to encourage trucks to utilise the M5 East and New M5 in order to minimise diversion to the surface streets and to reduce the impacts on the surrounding road network and adjacent communities.

The high level of traffic diversion from the existing M5 East is an indication the proposed truck multiplier at three times the car toll may be too high to encourage owner operators of trucks hauling containers to and from Port Botany.

Consideration should be given to reducing tolls during off-peak periods to encourage trucks use the project, helping to reduce the impact on residents and surrounding businesses, such as through Bexley, when trucks divert to the surrounding streets.

Consideration should also be given to potential measures such as those employed on the NorthConnex project that require trucks to use NorthConnex as opposed to Pennant Hills Road.

Recommendation 8

The Proponent shall integrate 'park and ride' into the project scope, potentially similar to the 'Domain' underground carpark so as to enable the surface to be used by the local community. This would enable consideration of a future fast, direct public transport link from the end of the New M5 at St Peters into Sydney airport.

Traffic delays associated with travel to and from Sydney airport are a regular occurrence that impact on Marsh Street and the M5 East. They are not just limited to the 'traditional' AM and PM weekday peaks, but also include Saturday and Sunday mornings, in particular.

Over the recent Christmas / New Year and Australia Day holidays, the NSW Transport Management Centre advised that the M5 East eastbound off-ramp to Marsh Street would be closed when traffic conditions are particularly heavy.

The New M5 EIS does not currently resolve these issues, however, there are indications that WestConnex may be extended in the future into the airport, although it is unclear what this would mean for traffic congestion within the airport precinct.

Including a park and ride site within the project scope to integrate with a future public transport link would provide additional travel options, potentially introducing new opportunities to provide a public transport link to the south, possibly via West Botany Street, and connections through to the Inner West or South East Light Rail projects.

Recommendation 9

The Proponent should provide noise attenuation measures for residences in proximity to roads such as Marsh and Wickham Streets, and Forest and Stoney Creek Roads, in order to offset the increase in noise associated with the increase in traffic predicted to use these roads, both during construction and operation of the project.

Residents along these routes are already subject to high traffic noise for sustained periods and whenever the M5 East is closed, particularly at night. These noise impacts will be increased during the construction and operational phases of the project.

According to the RMS website a noise assessment is not mandatory but instead only recommended for development alongside Stoney Creek Road between King Georges Road and Kingsgrove Road, and is not required at all on Stoney Creek Road between Kingsgrove Road and Forest Road at Bexley.

A noise assessment is not mandatory but instead is recommended for development between Stoney Creek Road and the Princes Highway and on Wickham Street between Princes Highway / Forest Road and West Botany Street.

Source: http://www.rms.nsw.gov.au/documents/about/environment/noise-reduction/traffic-volume-maps-sepp/traffic-volume-maps-map-15.pdf

Recommendation 10

The Proponent shall expand the detailed study area and reporting in the Traffic & Transport Assessment to include the Forest Road / Stoney Creek Road and Canterbury Road corridors to enable a proper assessment of the congestion and road safety impacts and opportunities associated with these corridors and the surrounding road network.

The study area identified within the Traffic & Transport report is very limited in its size.

The study area for the Traffic and Transport assessment is predominantly focused on the existing M5 Motorway corridor and on the surface road network around the St Peters interchange as shown in appendix G to the EIS, Figure 3.

This appears to be why the impacts on road safety and intersection performance on roads such as Forest and Stoney Creek Roads through Arncliffe and Bexley, Bexley and Harrow Roads and on

Canterbury Road, and opportunities to improve cycle and pedestrian amenity through these areas have largely been ignored by the EIS.

It is critically important to expand the study area to include in particular the Forest / Stoney Creek Road corridor due to the large congestion impacts and since this is the detour route designated by Roads & Maritime services for use whenever there is an incident in the M5 East. It is also the designated route for dangerous goods vehicles such as petrol tankers, and for over height vehicles that are not permitted in the M5 East and New M5 tunnels.

Recommendation 11

The Proponent shall ensure that breakdown lane widths outside the tunnel are 3 metres wide in order to safely accommodate broken down vehicles and their occupants, and to provide adequate separation from live traffic for emergency and maintenance workers, and incident responders.

The EIS states the existing M5 East motorway shoulders will be narrowed to accommodate the changed lane configuration but does not provide any assessment of the impact this will have on road safety.

The NSW Government's Breakdown Safety Strategy (September 2012) was developed in response to a fatality on the Hume Highway near Mittagong where it was found the breakdown lane was too narrow to accommodate a broken down vehicle.

Action Item 4 from the Strategy states RMS will continue to install 3m wide shoulders on high speed roads, wherever possible.

Recommendation 12

The Proponent shall investigate options for grade separation of traffic lanes along with measures to remove right hand on and off ramps in order to improve traffic flow and road safety between King Georges Road and Bexley Road

The New M5 EIS contains very limited information on how the motorway section between King Georges Road and Bexley Road is intended to operate as a result of the project.

There are existing issues that currently contribute to the poor performance of this section and whilst the New M5 proposes additional lanes, it does not resolve the friction and associated congestion and road safety issues associated with the high level of merging and weaving through this section.

NRMA's 'WestConnex Getting it Right' report (See Appendix 'A' to this submission) highlighted the traffic flow and road safety issues associated with left to right merges and with right hand on and off-ramps.

The existing city-bound weave between King Georges Road and Bexley Road, and the right hand off-ramp to Bexley Road (and to Kingsgrove Road in the out-bound direction) contributes to traffic congestion and road safety issues. This traffic will now have to also weave across traffic heading for the New M5. The project does provide additional lane capacity through this area but does not resolve the merging / weaving issues.

For traffic entering at King Georges Road and departing at Bexley Road, the weave will seemingly be significantly more difficult as a result of the project due to the need to weave across additional traffic lanes.

Having said this, the high level of toll diversion away from the M5 East will presumably reduce the amount of traffic needing to make this weave. Conversely, however, it will increase traffic travelling through local areas on streets such as Stoney Creek Road / Forest Road, Moorefields Road, Vanessa Street / Kingsgrove Avenue, Morgan Street / Kingsgrove Road / Shaw Street, increasing the congestion and road safety issues on these roads

Making the New M5 / M5 East merges and weaves work safely and efficiently is preferable to pushing traffic onto adjacent roads. The EIS contains no proposals, to grade separate some of these traffic movements, either via underpasses or overpasses.

Instead the project will extend the available queuing area by increasing the number of lanes between King Georges Road and the tunnel entry and exit points. Unfortunately this will not resolve these design issues that in the long term, as now, will impact on congestion and road safety.

We note that the EIS for the WestConnex King Georges Road interchange contained minimal information in relation to upstream and downstream traffic movements or traffic volumes. This made it impossible to determine how the interchange would function in relation to the new and existing M5 East, and for NRMA to provide objective comments. Accordingly this is the first opportunity for NRMA to query what has been proposed for this section.

The New M5 EIS indicates the project will do nothing to improve the current poor performance of the King Georges Road interchange, revealing the interchange fails (Level of Service F) both with and without the project (Volume 1B, section 9 Traffic & Transport, Page 9-129).

Including instead within the New M5 project scope the grade separation of some of the traffic movements in this area may be the best way to resolve at least some of these issues. A similar change was made to the eastern end of the Cross City Tunnel in a Supplementary EIS by shifting surface traffic destined for Neild Avenue from Bayswater Road to a new ramp from Ward Avenue (albeit that there was insufficient room in this instance to remove the right to left merge at the bottom of the ramp).

Realistically, removing some of this traffic by commencing the New M5 to the south of the King Georges Road interchange may have been the best, albeit more costly option.

For some reason the EIS states that proposed works planned by Roads & Maritime Services to be undertaken separate to the WestConnex project for the intersections of King Georges Road with Stoney Creek Road and with Broadarrow Road (separate to the WestConnex project) “would likely contribute to improved performance of the King Georges Road Interchange”.

It does not, however, provide any justification for this statement and with Stoney Creek Road being 1.5km away from the King Georges Road interchange, it is difficult to understand how this will improve the operation of the King Georges Road interchange.

Recommendation 13

The Proponent shall ensure all features of a managed (smart) motorway are included within the project scope and are operational on opening of the Project

Actively managing the New M5 will be critical to keeping traffic moving. The EIS indicates many of the features of a smart or managed motorway will be provided as part of the project, such as widened on-ramps "to support the future implementation of a smart motorway solution" (EIS Volume 1A, Section 5.8.7).

However, it does not provide confirmation that the full system will be implemented as part of the project and will have the ability to be operational when the project opens to traffic.

NRMA was disappointed that neither the recent M2 or M5 widening upgrade projects incorporated smart motorway features to help keep traffic moving into the future and to manage the motorways as a network, rather than as isolated links. We are pleased the New M5 will provide many of the features required to actively manage traffic on the motorway, but are concerned the New M5 EIS, just like the M4 East, does not commit to funding the full implementation of smart motorway operations and ensuring the motorway is able to be actively managed on opening.

Additionally, we continue to raise concerns that the motorway management system being developed by RMS may not perform as well as the tried and tested system used on Victoria.

The M4 Smart Motorway EIS identified travel time improvements of up to 25 per cent in peak period travel times as a result of implementing the smart motorway management system. It did not, however, provide any detailed analysis to show how this will be achieved by the M4 Smart Motorway management system, the impact on traffic waiting to access the motorway, or any analysis on whether adopting the system used in Victoria and being rolled out in Queensland, would produce better results for motorists. NRMA supports WestConnex having an active managed motorway system and continues to recommend that Transport for NSW commissions an independent assessment to seek the best system for road users and NSW taxpayers.

Recommendation 14

No advertising shall be permitted within the WestConnex lease area both during construction and operation

On previous toll road projects such as the Cross City and Lane Cove Tunnels, advertising signs were specifically prohibited as part of the conditions of approval for these projects.

NRMA considers that permitting advertising signs and structures would introduce an unnecessary road safety issue. NRMA's 'WestConnex: Getting it Right' report highlighted the importance of minimising the number of crashes and distractions on the motorway in order to keep traffic moving, improve safety and minimise the number of times that traffic diverts to surrounding streets.

The dangers of distraction are highlighted on the NSW Centre for Road Safety website, as follows:

“Driving is a complex task. Anything that takes your mind or eyes off the road, or your hands off the wheel, not only compromises your safety, but that of everyone else on the road.

Being distracted increases your chances of having a crash. It slows down your reaction times and puts you in danger of failing to see hazards such as traffic lights, stop signs or other road users, including pedestrians and cyclists.”

Given these dangers and the increasing use of electronic billboards to attract the attention of road users, we believe there should be a specific planning condition prohibiting advertising signs and structures within the New M5 and M5 East corridors.

Recommendation 15

The Proponent shall ensure the New M5 is designed and operated to minimise both the number of times and the duration it is closed for maintenance

NRMA’s ‘Decongestion Strategy – 10 Ways to Relieve Sydney’s Traffic Headache’ revealed that the M5 East motorway was closed 72 times for planned maintenance and 45 times for unscheduled maintenance between July 2009 and July 2010. During these closures traffic is redirected to surrounding streets,

The M5 East EIS does not contain any details on the numbers of times the road will be permitted to close for maintenance. There is an opportunity to include these requirements within any future planning approval for the project. This would help to drive innovation in the design, construction, operation and maintenance of the project, and help to minimise the impact of closures on road users and the surrounding communities.

Recommendation 16

The scope for the New M5, including the city-bound approach to the existing M5 East tunnel should incorporate the world’s best systems and designs to stop over-height vehicles, and vehicles carrying dangerous goods from attempting to enter the tunnels.

This issue was identified in NRMA’s ‘WestConnex: Getting it Right’ report (See ‘Appendix A’ to this EIS submission, Recommendation ‘2a’). These include heavy vehicle diversion lanes, pull over bays, and active systems, for example, the ability to broadcast safety messages to warn drivers approaching the tunnel.

The increased tunnel height proposed for the New M5 is a very positive initiative. It does, however, add another level of complexity for drivers and for road operators and may potentially even lead to an increase in the numbers of over-height vehicles incidents in Sydney’s existing tunnels if drivers were to inadvertently assume all tunnels are the same height.

In order to mitigate this, NRMA recommends the New M5 and M5 East should incorporate the best systems and warning signs, backed by the Proponent making available good information using a variety of mediums for drivers of these vehicles.

Recommendation 17

The Proponent shall consult with road user groups such as NRMA in regards to the detailed tunnel design features

We are pleased the urban design and lighting concepts appear to have adopted NRMA's recommendations for improved lighting and tunnel features outlined in our 'WestConnex: Getting it Right' report (see Appendix A to this submission) as a way to reduce fatigue, improve safety and add interest.

Typically the EIS represents the final stage where the community may make detailed comments in relation to a project. We believe there is an opportunity for Transport for NSW, through its agency, Roads & Maritime Services as the client agency for the WestConnex motorway, to demonstrate its commitment to putting the customer at the centre of everything it does through ongoing consulting with road user groups in regards to the tunnel design features.

As outlined in the recommendations from the Inquiry into the Roads and Traffic Authority's response to an accident on the F3 Freeway near Jolls Bridge on 12 April 2010, "NRMA (and others) have propositions gathered from their community inter-actions and community consultation. Transport NSW and the RTA could do no worse than to listen to the community through these representative groups.

Doubtless, any community-based debate and consultation will evoke different points of view on different issues and consensus may not always be possible. To not engage in the debate in the first instance is a grave misjudgement. Ultimately, it is the community and groups like the NRMA who seek to aid road and traffic management, and their knowledge and commitment ought not to be discounted."

Recommendation 18

The Proponent shall publish the operational requirements for the motorway in regards to identifying, responding to and clearing incidents, such as crashes and breakdowns.

Publishing this data will provide road users with transparency in regards to these key aspects of the toll road operator's obligations. In conjunction with the proposed recommendation below, it will ensure there is a key focus on the road user as the customer and will help to limit the impact of these incidents on surrounding streets.

Recommendation 19

The Proponent shall publish detailed information each month in regards to the performance of the motorway. This must include details of traffic volumes both on the mainline motorway and by ramp, incident data including numbers of crashes and breakdowns, the duration of these incidents and the response times for dealing with these incidents.

Detailed traffic and incident data is difficult to obtain for existing Sydney toll roads. This makes it difficult to establish how well the road is performing and whether the operator is complying with its contractual requirements.

We believe there is an opportunity for Transport for NSW, through its agency, Roads & Maritime Services as the client agency for the WestConnex motorway, to demonstrate its commitment to putting the customer, in this case the road user, at the centre of everything it does by publishing regular, detailed information in regards to the performance of the motorway.

As well as the congestion impacts, the level of safety (including the potential for secondary crashes) is largely dependent on the motorway operators and the people performing rescue services.

NRMA's Decongestion Strategy highlighted how traffic jams on busy motorways can build at the rate of 1.5 kilometres per minute. When something does go wrong in the New M5, the M5 East, or on other sections of WestConnex, it has the potential to quickly create 'gridlock' across Sydney, severely impacting on people's lives and on businesses.

This recommendation by NRMA is intended to encourage both design innovation in order to keep traffic moving and reduce the number of crashes and breakdowns, as well as improved management of these incidents when they do occur.

Recommendation 20

The Proponent shall ensure the capacity of the M5 East and New M5 detour routes are not reduced.

The predicted high level of traffic diversion away from the M5 East, in addition to the high number of times the existing M5 East is closed for maintenance and for incidents, all highlight the need to improve, not reduce the amount of capacity on the adjacent routes.

It is critical the New M5 / M5 East detour routes maintain sufficient capacity to cater for the high traffic volumes that will be diverted to the surrounding streets, whenever WestConnex is closed.

The EIS indicates bus priority measures are being considered by RMS but provides no detail and NRMA has been unable to source any more information from RMS on this issue.

The M5 East is currently Sydney's longest road tunnel. When combined with the other sections of WestConnex, the New M5 will comprise the longest road tunnel in Australia. Driving through

WestConnex will be a new experience for Sydney's motorists. With mistakes by motorists contributing to 95 per cent of crashes, the challenge is to make it a good experience.

Whilst Sydney's existing road tunnels generally have a reasonable safety record, the longer the tunnel, the greater the likelihood of an incident, such as a crash or breakdown somewhere in the tunnel. NRMA's studies also show that the busier Sydney's motorways get, the more crashes occur.

When a big incident occurs on a surface motorway, like the M5 West, traffic is generally allowed to continue along the motorway and leave at the last exit prior to the incident. However, when these types of incidents occur in tunnels, the whole tunnel is typically closed and traffic, both private and public on the surrounding surface streets and adjacent motorways slows to a crawl. This is why NRMA has put forward recommendations that aim to ensure WestConnex is designed and operated to minimise the number and duration of crashes and breakdowns.

Recommendation 21

The Proponent shall ensure the lane widths on detour routes are sufficiently wide to safely cater for large trucks, including petrol tankers that are not permitted in the tunnels, so as to minimise the potential for conflict with other vehicles and vulnerable road users, such as cyclists and pedestrians

Recommendation 22

The Proponent shall install a continuous line of profiled line marking [raised markings] as an edge line outside the tunnels to delineate the traffic lanes from the road shoulder and provide both a visual and audible alert to any motorist deviating from the carriageway. This will improve safety for anyone using the road shoulder, such as broken down vehicles, or maintenance workers, and will improve delineation, particularly at night and in wet weather.

The following recommendations specifically relate to the Construction Phase of the project

The EIS states the project would generate 2.7 million cubic metres of spoil, all of which will be moved by truck. This is 300,000 cubic metres more than the M4 East's 2.4 million cubic metres of spoil. The cumulative impacts on traffic and road safety during the multiple construction phases of the WestConnex and NorthConnex projects have not been assessed.

Recommendation 23

The Proponent shall prohibit spoil truck movements in the AM and PM weekday, and weekend road traffic peaks

NRMA is concerned the proposal for all spoil to be removed by truck will increase congestion and have an impact on safety on some of Sydney's busiest road corridors, particularly during the AM and PM weekday, and weekend peaks.

It is unclear why the EIS states that "feasible and reasonable management strategies would be investigated to minimise the volume of heavy vehicle [spoil] movements at night" from the Marsh Street construction compound when the same requirement has not been applied to the other construction compounds.

The EIS Appendix G, Section 7.4.2.2 Table 47 states the Marsh Street / M5 East Motorway interchange operates at Level of Service (LoS) B in the AM peak and LoS C in the PM peak and that this will be unchanged during the construction phase of the Project.

In reality, extensive delays are experienced at this intersection due to heavy traffic volumes, and the need for the two right turn lanes of traffic from Marsh Street to merge to a single lane within the outbound M5 East tunnel on-ramp, before merging again with the two full lanes of traffic coming from Southern Cross Drive. The back of queue regularly extends for a considerable distance around Qantas Drive, which has not been acknowledged by the simplistic LoS analysis and also into the M5 East city-bound in the AM peak weekday and weekend peaks.

The mid-block performance for Marsh Street indicate that between the M5 East and Flora Street it will operate beyond or close to capacity during the AM peak hour (See in EIS Volume 2B, Appendix G, Section 7.4.2.3). Table 48 indicates similar issues for Wickham and West Botany Streets. Tables 58 and 59 also indicate similar issues in relation to the St Peters construction compound. The EIS does not offer any solutions to any of these issues, such as prohibiting spoil movements during the peak hours.

In terms of minimising the impact on traffic, permitting spoil removal at night is preferable to moving spoil during peak periods, providing appropriate noise attenuation measures are put in place to reduce noise impacts on adjacent residents, as previously recommended by NRMA in this submission.

Recommendation 24

The Proponent shall apply additional safety features to improve road safety associated with the operation of trucks on the project. Examples of appropriate safety features could include front / side / rear under-run protection, video monitoring and speed control.

We believe the NSW Government has an opportunity to take a very proactive step forward in road safety by requiring contractors on its projects to use only vehicles fitted with the best level of safety technology available.

In London, a 'Safer Lorry Scheme' has recently been introduced to ensure that only trucks with a certain level of safety equipment fitted will be allowed on London's roads.

The London scheme was introduced in response to construction vehicles being involved in a disproportionate number of fatal collisions involving cyclists and pedestrians.

The scheme requires vehicles over 3.5 tonnes to be fitted with:

a) Class V and Class VI mirrors to give the driver a better view of cyclists, pedestrians and other vehicles
b) Side guards to protect cyclists and other vehicles from being caught under the wheels of trucks in the event of a collision
c) Proximity sensors to help identify other road users in blind spots. For more information on the type of technology that is available on the market see:

http://www.backwatch.co.uk/
http://www.backwatch.co.uk/products/blindspot-detection-system/

We believe similar measures should be required as part of any conditions of approval for the WestConnex project.

NRMA also believes the Government should require that all new vehicles, and any new classes of vehicle that are permitted to carry spoil as part of the WestConnex project should be fitted with:

d) Autonomous Emergency Braking (AEB)
e) Electronic Stability Control (ESC)

The EIS indicates that higher productivity vehicles will be permitted to carry spoil for the project, meaning that bigger vehicles with more mass and momentum will be travelling on Sydney's roads.

AEB has been a compulsory fitment to heavy vehicles in the European Union since 1 November 2015. With the majority of Australian truck manufacturers being owned by European manufacturers, the technology will be well known to these companies and this should make it easier to transfer this technology to trucks operating in NSW.

In addition, we would like to see the following:

f) Side and rear under-run protection on rigid trucks. This would represent a positive safety initiative to protect light vehicle occupants.

The following weblink identifies the safety issues associated with underrun:
http://www.iihs.org/iihs/news/desktopnews/new-crash-tests-underride-guards-on-most-big-rigs-leave-passenger-vehicle-occupants-at-risk-in-certain-crashes

In terms of truck and dog trailers, the rear wheels typically provide under-run protection but there are opportunities to improve side under-run.

g) All vehicles associated with the project should be required to be marked with retro-reflective strip or contour markings to enhance road and workplace safety by making the vehicle more conspicuous and by delineating its size and length

This is a very low cost safety initiative that can dramatically reduce the potential for crashes involving heavy vehicles.

The Australian Trucking Association, together with industry representatives, has developed an advisory procedure to provide a best practice guide to heavy vehicle visibility.

The advisory recommends the use of retro-reflective strip or contour markings to delineate the length and size of the vehicle, as well as using reflective graphics and corporate logos to increase visibility.

For more information on the ATA guide, see:
http://www.truck.net.au/resource-library/heavy-vehicle-visibility-advisory-procedure

The other issue is to ensure the construction vehicles are washed regularly to ensure the markings are clearly visible.

Photo of truck and dog trailer without retro-reflective strip or contour markings

h) We also believe road safety associated with the significant spoil operations for the New M5 may be enhanced through a planning condition requiring spoil trucks associated with the project utilise:

Driver and outward facing on-board cameras that are G force and driver activated, along with remote monitoring. There are many types of on-board camera systems available, for example see: http://www.iae-services.com.au/drivecam-in-vehicle-driver-safety-risk-management-camera-system.html

This would appear to be a relatively easy contractual requirement as this is a technology that can be retrofitted. These cameras have the additional benefit of providing evidence to show when a truck has been involved in a crash through no fault of the driver.

i) A variety of speed warning, monitoring and control systems are available that can alert the driver when travelling over the speed limit, remotely monitor and report on instances when this occurs, and also physically limit the maximum speed of the vehicle to the posted speed limit.

Including these within any planning condition of approval for the project would help to monitor driver and vehicle behaviour and ensure that workplace safety for drivers and vehicles associated with the construction of the New M5 project extends beyond the construction sites to also encompass the public road network.

Recommendation 25

The Proponent shall reassess the proposed spoil routes for the project

The restricted area of the study area that is also the identified previously in this submission has also limited the assessment of the spoil truck routes. For example, the EIS does not contain any assessment of the impact of the Bexley Road south operations on the key intersections of Stoney Creek Road and Forest Road, Forest Road and Bexley Road, and Bexley Road and Slade Road.

Image showing existing traffic congestion at Bexley North railway overpass close to the proposed WestConnex construction sites.

Whilst the actual volume of spoil trucks may be low when compared to existing traffic volumes, when intersections are already failing to cope with the existing demands and operating at LoS F, the addition of spoil trucks will undoubtedly increase congestion.

The EIS indicates B-double trucks and other high productivity vehicles will be used to haul spoil. These vehicles have restricted manoeuvrability, evidenced by how existing B-double trucks currently straddle both lanes at intersections such as Stoney Creek Road / Forest Road, and Wickham and West Botany Streets, city-bound.

The proposed spoil routes will require spoil trucks to do the same in order to turn from Forest Road to Bexley Road. Additionally it should be noted that these vehicles are slow to take off from a standing start. Since the EIS predicts nearly one truck every two minutes will travel via these routes in the AM and PM peaks, they will significantly affect the performance of these intersections, adding to congestion.

The EIS does not explore any options that would enable spoil to be transferred via means other than by road from the Bexley Road south construction compound to the Bexley Road North compound. This would enable trucks to return via the M5 East, thereby avoiding the congestion and road safety issues outlined above.

The EIS does not acknowledge that the M5 East is closed multiple times every year for both planned and unplanned maintenance and during incidents. This will necessitate spoil trucks diverting along with all the other tunnel traffic to surface streets, increasing traffic congestion along the diversion routes of Forest, Stoney Creek and King Georges Road, none of which have been assessed in the traffic and transport report.

An NRMA Freedom of Information request in 2010 revealed the M5 East was closed 72 times for planned maintenance and 45 times for unscheduled maintenance between July 2009 and July 2010, far more than any other road tunnel in Sydney.

Recommendation 26

The Proponent shall ensure that the Construction Traffic Management Plan restricts the use of compression braking by spoil trucks, particularly on steep sections of roads such as Bexley Road between Forest Road and Kingsland Road South

Compression braking noise travels long distances along main roads and side streets, particularly at night when background noise levels are lower. The use of compression braking should be restricted to minimise impacts on nearby residents and businesses.

Recommendation 27

The Proponent shall ensure that the project Construction Traffic Management Plan requires all spoil trucks associated with the Bexley North south construction area to use the kerbside lane when travelling on Bexley Road westbound between Barnsbury Grove and Shaw Street.

This recommendation is intended to enhance road safety by minimising conflict between spoil trucks and other road users. It will ensure that spoil trucks are in the correct lane for entering the construction sites well in advance prior to entering the construction sites.

By removing any temptation for drivers of spoil trucks to travel in Lane Two as a means of bypassing the existing traffic queues in the kerbside lane, it will avoid the need for these trucks to:
(a) Undertake a right to left merge into the kerbside lane to avoid right turning traffic into Barnsbury Grove (including a large amount of school traffic) and;
(b) Attempt the very difficult right to left merge into the kerbside lane on the approach to Shaw Street in order to avoid right turning traffic in Lane 2 turning into Slade Road.

Recommendation 28

The Proponent shall extend the crash guardrail adjacent to the kerbside westbound lane at the Bexley North railway overpass further towards the intersection with Shaw Street and install crash protection for pedestrians on the footpath between the bus stop to the east of this location and the intersection with Shaw Street

The Proponent shall also provide crash protection for pedestrians on the footpath adjacent to the kerbside westbound lane of Bexley Road approaching Shaw Street

(a) This recommendation is intended to provide protection for pedestrians on the footpath from errant vehicles associated with the large number of lane changing movements on the westbound approach in Bexley Road to the Shaw Street intersection. It will have the additional benefit of deterring pedestrians travelling to and from the Bexley North railway station from the current unsafe practice of trying to cross Bexley road in two stages by propping on the narrow central median island on the overpass.

The above Image reveals how the guardrail does not extend back to Shaw Avenue. The image also shows the narrow central median island that pedestrians use as a two stage crossing of Bexley Road.

(b) The recommendation to also provide crash protection for pedestrians on the footpath adjacent to the kerbside westbound lane of Bexley Road approaching Shaw Street is to improve safety due to the large numbers of vehicles making late right to left merge lane changing manoeuvres at this location and the high potential for spoil trucks to be involved in conflicts with these vehicles and to mount the footpath. Vehicles have previously left the road, crossed the footpath and crashed into shops at this location.

Example showing pedestrian light pole that has been hit on the Bexley Road footpath approaching Shaw Street and the proposed WestConnex construction site at Bexley North. The low hedge provides no protection for pedestrians using the footpath and errant vehicles changing lanes at this location have previously crashed into the adjacent pizza shop.

Appendix A - WestConnex: Getting it Right

WestConnex: Getting it right

NRMA's recommendations for:
New ways to keep WestConnex moving
New ways to minimise crashes and breakdowns
New ways to manage crashes and breakdowns
Celebrating tunnel infrastructure

July 2014

About The National Roads & Motorists' Association

The National Roads and Motorists' Association (NRMA) comprises 2.5 million Members in NSW and the ACT. For more than 90 years, NRMA has represented the interests of motorists, delivering better results for our Members by lobbying for better roads, increased road infrastructure funding, new ways to manage congestion and improve safety, fairer licensing for older and younger drivers, better value petrol prices, greener motoring and much more.

Background to this Report

This Report identifies a number of relatively low cost ways to improve the design and operation of WestConnex and particularly its road tunnels.

The design and approval process for road tunnels understandably has a large focus on traffic modelling, fire and life threatening safety issues, and managing construction impacts such as noise and impacts to road users. Within this context, however, new ways to improve traffic flow and road safety have not always been given the attention they deserve.

NRMA strongly believes that WestConnex must learn from past mistakes. The recommendations and ideas in this Report are not meant to be exhaustive, but we believe they can contribute to making a positive difference for road users, and form the basis for generating other ideas.

Comments and Queries

All comments and queries about this report may be directed to:

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Introduction

WestConnex is one of the most important transport infrastructure projects undertaken by the NSW Government in a generation. Not since the construction of the Sydney Harbour Bridge in the 1920s and 1930s has an infrastructure project had such potential to shape and influence Sydney's long term future and economic sustainability.

Just like the Sydney Harbour Bridge, it is crucial that the NSW Government and the WestConnex Delivery Authority ensure that WestConnex is designed to stand the test of time.

At approximately 13 kilometres long, the WestConnex Stage 1 tunnel between the M4 and St Peters will be the longest road tunnel in Australia, three times the size of Sydney's M5 East tunnel.

It is just one of an unprecedented number of proposed new road tunnels to be dug under Sydney. The WestConnex and NorthConnex tunnel projects combined will add an extra 26 kilometres (a 73% increase) to the existing 15 kilometres of major road tunnels. More tunnels are also currently being considered as part of the WestConnex extension to Victoria Road, for the F6 extension and for the Military / Spit Road corridor on the North Shore.

At 33 kilometres, WestConnex is the largest of a group of toll road projects proposed by the NSW Government to help keep Sydney moving. Once completed, it will provide important connections between Western and Southern Sydney, Sydney Airport and Port Botany, as well as with the Western Distributor and the North Shore.

It will help to deliver significant economic and social benefits for Sydney through faster and more reliable travel times, helping to relieve chronic congestion problems in Western and South Western Sydney on the M4 and M5 motorways. It will help in overcoming the sharp divisions between the west and east of Sydney, and will help fuse Sydney into a single housing and labour market.

WestConnex will also help to revitalise Parramatta Road, which has suffered from chronic traffic congestion, as well as creating opportunities to revitalise other roads, such as Forest and Stoney Creek roads through Bexley, and sections of the Princes Highway.

Over a number of years, NRMA has strongly advocated for the construction of WestConnex and the other missing links in Sydney's motorway network. Following NRMA's *Seeing Red on Roads* campaign in the lead up to the 2011 NSW State Election and the Australian Automobile Associations (AAA) *Demand Better Roads* campaign during the 2013 Federal Election, the NSW and Australian Governments announced a combined $3.3 billion commitment to allow construction of the first stage of WestConnex to begin in 2015.

NRMA is a strong supporter of WestConnex and welcomed the decision of the NSW and Australian Governments to commit funding towards its development. However, it must be noted that NRMA's support for WestConnex is not unconditional.

NRMA has clearly expressed to the NSW Government that it is crucial that it gets the planning right to ensure that WestConnex delivers value for money for motorists and caters for future growth. It is crucial that WestConnex provides a future proofed and lasting infrastructure solution, and the recommendations contained in this Report are intended to benefit motorists by helping to guide the development of WestConnex and future motorway projects.

Recommendations

Recommendation 1: New ways to keep WestConnex moving

NRMA recommends the NSW Government ensures that the WestConnex motorway is designed to keep traffic moving, both now and into the future.

The challenge, particularly with the WestConnex tunnels, is to get the design right up front, as there are limited opportunities to fix any problems once the motorway is open to traffic.

WestConnex must adopt new thinking in the way it is designed and operated.
The main overriding objective for the WestConnex project must be long term effective traffic management, not lowest cost or revenue maximisation.

This means that WestConnex must:

(a) Have sufficient traffic lanes to cater for foreseeable future demand;

It is crucial that the NSW Government and the WestConnex Delivery Authority ensure that like the Sydney Harbour Bridge, WestConnex is designed to stand the test of time.

With tunnels typically costing four times as much as surface roads, and with motorists paying tolls to travel on WestConnex, it is imperative WestConnex is designed and operated to keep traffic moving both now and into the future.

If the severely congested M5 East tunnel had been built with three lanes instead of two, it reputedly would have added just $100 million to the $800 million cost – a massive difference compared with the current proposal to go back and construct a new tunnel.

(b) Be actively managed like the Monash Freeway in Melbourne, to minimise congestion and ensure that high traffic flows and travel time reliability can be maintained;

The days of pumping more traffic into a motorway system to join the back of a queue of stationary traffic are over. Allowing motorways to operate like car parks in peak periods just when we need them most should no longer be an option.

NRMA's Decongestion Strategy[i] revealed how the Victorian roads agency, VicRoads, has led the world in the development of motorway management systems. Sydney motorists continue to suffer from the 'business as usual' approach to managing motorways – neither of the recent upgrades to the M2 or the M5 motorways have embraced these systems.

In contrast, these motorway management systems will be operating on every freeway in Melbourne within the next five years, consistently maintaining high traffic flows in peak periods and enabling these critically important roads to be operated as a network, instead of as isolated links.

NRMA continues to have concerns that the 'in-house' system being considered by Transport for NSW for WestConnex will not perform as well as the tried and tested Melbourne system. Motorists paying to use WestConnex should have the best motorway management system.

(c) Ensure that entry and exit ramps and merge points are designed and operated to minimise motorway disruption and enhance safety;

WestConnex needs to make it easier and safer for motorists to merge with the main tunnel by extending the merging area within the tunnel on-ramps. This should be coupled with improved warning signs, road markings, and tunnel lighting to make it obvious where the merge takes place for both merging traffic and for traffic already in the main tunnel.

A previous NRMA report has revealed that two thirds (66%) of crashes on Sydney's motorways may be attributed to merge related issues[ii].

In stark contrast to travelling in tunnels, motorists travelling on surface motorways can usually see traffic about to join the motorway as it travels along the entry ramp. In response, motorists both on the ramp and those already on the motorway are able to adjust their speed and the gap between their vehicle and any vehicle in front.

In tunnels, however, traffic often appears from behind a tunnel wall to merge with very little warning. This has clear implications for both traffic flow and road safety, but in spite of this, tunnel on-ramps continue to be designed in the same way as surface motorways, with the same amount of distance provided for traffic to travel parallel to each other before merging[iii].

(d) Avoid right hand on-ramps (such as the Cross City Tunnel to Eastern Distributor southbound ramp). Right to left merges are very difficult for drivers, particularly for truck drivers, resulting in both congestion and road safety issues;

(e) Avoid right hand off-ramps (such as the M5 East city bound off-ramp to Bexley Road). These contribute to congestion and impact on safety as they require slower vehicles to travel in the right hand lane to access the off-ramp. The M5 East issue is exacerbated by the left to right weave across the motorway resulting from traffic entering the M5 East at King Georges Road to exit at Bexley Road;

(f) Consider the implications for traffic flow when choosing locations for speed cameras; Motorists braking at speed cameras can cause 'shock-waves' to travel back (or forward) along the tunnel, causing congestion and increasing the potential for rear end crashes by requiring other motorists to also brake);

(g) Avoid steep uphill and downhill gradients as these can cause traffic to travel at different speeds, disrupting traffic flow. Grades can also contribute to the formation of shockwaves where the disruption travels forwards or backwards along a motorway causing traffic to grind to a halt for no apparent reason.

Without a real horizon to guide motorists in tunnels, both uphill and downhill grades can be difficult for motorists to perceive. Opportunities should be explored to orientate tunnel wall panels or use patterns on these panels to help illustrate when the road is going up or downhill.

Recommendation 2: New ways to minimise crashes and breakdowns

The main WestConnex tunnel will stretch over 13 kilometres from the end of the M4 motorway to the Princes Highway at St Peters. It will be the longest road tunnel in Australia, three times longer than Sydney's longest existing tunnel - the M5 East. Driving through WestConnex will be a new experience for Sydney's motorists. With mistakes by motorists contributing to 95 per cent of crashes, the challenge is to make it a good experience.

Whilst Sydney's existing road tunnels generally have a reasonable safety record, the longer the tunnel, the greater the likelihood of an incident, such as a crash or breakdown somewhere in the tunnel. NRMA's studies also show that the busier Sydney's motorways get, the more crashes occur.

When a big incident occurs on a surface motorway, like the M4, traffic is generally allowed to continue along the motorway and leave at the last exit prior to the incident. However, when these types of incidents occur in tunnels, the whole tunnel is closed and traffic on the surrounding surface streets and adjacent motorways slows to a crawl. WestConnex must be designed to minimise the number of crashes and breakdowns.

This means WestConnex must:

(a) Have the world's best systems and designs to stop over-height vehicles, and vehicles carrying dangerous goods from attempting to enter the tunnels. These include heavy vehicle diversion lanes, pull over bays, and active systems, for example, the ability to broadcast safety messages to warn drivers approaching the tunnel;

(b) Use innovative lighting and design to guide drivers safely through the tunnel, to keep drivers alert, and to reduce fatigue and tiredness;

The design of tunnels can positively or negatively influence driver's feelings and actions including stress, panic and speed.

Tunnels can be monotonous for drivers due to their form (e.g. few intersections, one way flow). Fatigue or tiredness in drivers in tunnels is more prevalent. Truck drivers can experience these effects more than drivers of other vehicles due to the large distances involved whilst in transit.

Whilst drivers must not be unduly distracted by tunnel designs, there is the potential for different lighting colours and images to be projected to guide drivers, maintain interest and reduce fatigue. Potentially lighting could also be tailored to different times of the day.

Lighting could also be used to highlight the location and radius (tightness) of curves, green and red lighting could be used to alternately reinforce to motorists when an off-ramp is open or closed.

New forms of lighting are being used in Scandinavian tunnels, and the 'Vivid Sydney' festival[iv] has provided a flavour of what can be achieved with modern lighting. Some examples from overseas tunnels are provided later in this report.

(c) Avoid locating drainage pits along the wheel path of driver's vehicles; Observations by NRMA from the M5 East 'Cooks River' Tunnel in Sydney reveal that drivers appear to be uncomfortable travelling across these pits located in the right hand lane, causing some drivers to shift their vehicle position to the left to avoid the uneven ride across the pits. This places their vehicle much closer to vehicles in the adjacent lane, with consequent implications for traffic flow and road safety;

(d) Reduce the mass of signs facing drivers as they approach tunnels; At 200 metres out from the tunnel, motorists are preparing and lining themselves up for entering the tunnel. They are generally not focused on signs, other than looking for speed limit signs, and are unable to read and respond to the existing mass of signs;

For example, NRMA has queried why RMS, unlike VicRoads, requires three static signs associated with electronic variable speed limits. Reducing sign clutter was another recommendation from NRMA's Decongestion Strategy[v].

(e) Give national and international ITS experts and companies the freedom to recommend the systems and devices that should be used on WestConnex. This will help RMS and the TMC to identify and capture innovations;

RMS and the TMC have traditionally specified the devices and systems that should be included on private motorways. This approach can stifle innovation and limit private sector technology experts and providers from specifying what may well be better, or more cost effective technology.

This recommendation will help avoid the situation where RMS and the TMC failed to act on NRMA's previous suggestions and instead specified 20th Century technology on the recent M2 and M5 motorway upgrades.

This led to electronic variable message signs being installed that can only display amber text messages (instead of installing 21st Century signs that can display colour pictures of traffic signs along with text), along with fixed speed limit signs instead of variable speed limit signs.

NRMA has previously highlighted to RMS the benefits of installing picture VMS on the basis that "a picture tells a thousand words", helping motorists to recognise, process and respond quickly to information displayed on these signs. If picture VMS had been installed on the M2 and M5 upgrades it would also have helped road users who find word comprehension difficult, including people for whom English is a second language, have dyslexia, or other literacy deficiencies.

(f) Seek to positively influence driver behaviour by making sure motorists are aware that their actions are being captured on CCTV.

Recommendation 3: New ways to manage incidents and their impacts

Today, the M4 is Sydney's busiest motorway, carrying over 170,000 cars and trucks. More NRMA Members break down on the M4 than on any other road in metropolitan Sydney. Studies show that even a vehicle stopped in a breakdown lane can reduce the carrying capacity of a road by 250 vehicles per hour, as motorists slow when they drive past[vi].

Over the last ten years, NRMA has helped over 40,000 stranded motorists on the M4, coordinated from NRMA's Sydney Operations control centre strategically positioned next to the M4 / WestConnex at North Strathfield. Quickly responding and clearing incidents will be even more important for incident responders when WestConnex becomes operational.

As well as the congestion impacts, the level of safety (including the potential for secondary crashes) is largely dependent on the motorway operators and the people performing rescue services.

NRMA's Decongestion Strategy[vii] highlighted how traffic jams on busy motorways can build at the rate of 1.5 kilometres per minute. When something does go wrong on WestConnex it has the potential to quickly create 'gridlock' across Sydney, severely impacting on people's lives and on businesses.

To help address this, NRMA has identified a number of ways to better manage these incidents and their impacts when they do occur.

This means that WestConnex must:

(a) Include rigorous and detailed analysis about how traffic will be managed efficiently and how incidents will be minimised. This information should be made public in the same way that Environmental Impact Assessment information is made public;

(b) Ensure the detour routes maintain sufficient capacity to cater for the high traffic volumes that will be diverted to the surrounding streets, whenever WestConnex is closed. For example, new bus lanes proposed on Parramatta Road will need to be suspended during major incidents;

(c) Ensure the lane widths on detour routes are wide enough to safely cater for large trucks, including petrol tankers that are not permitted in the tunnels, so as to avoid conflict with other vehicles and vulnerable road users, such as cyclists and pedestrians;

(d) Be designed to minimise the number of times it is closed for maintenance;

NRMA's Decongestion Strategy revealed that the M5 East motorway was closed 72 times for planned maintenance and 45 times for unscheduled maintenance between July 2009 and July 2010[viii].

(e) Be designed to enable incident responders to deliver rapid response during traffic incidents such as crashes and breakdowns; For example, incident response vehicles, including heavy tow trucks, must be strategically positioned at either end of the tunnels and at key entry and exit points;

(f) Take a network wide approach to clearing incidents by enlisting help from private WestConnex incident response teams to quickly clear traffic incidents both upstream and downstream from the WestConnex entry and exit points;

Whilst these locations are outside the traditional 'lease' area controlled by private motorway operators, it would make sense to involving the WestConnex operators in the incident response on these roads, given the proximity and potential to cause congestion on WestConnex, added costs for motorists, and the impact on toll revenue for the operator. It would also help to avoid any delays in the Transport Management Centre responding to incidents.

For example, under this proposal, incident response crews based at the existing M5 East control centre overlooking Marsh Street would be able to respond to crashes and breakdowns on Marsh Street, or in the airport tunnel, both of which are outside the current lease area but directly affect traffic travelling to and from the M5 East.

(g) Resolve the perverse situation where key incident responders, such as the Transport Management Centre (TMC), Roads & Maritime Services, NRMA and the emergency services, are required to pay tolls in order to keep Sydney moving;

As an example, today on the M5 motorway and adjacent roads, the NRMA, along with the TMC and emergency services help to keep Sydney moving by providing 24/7 response to traffic incidents. In spite of this, each of these organisations (other than emergency service vehicles displaying flashing blue lights) are required to pay tolls.

Traffic incidents are unplanned events that reduce road capacity. A 2007 Austroads report showed how they "can have significant impacts on roadway system operations, and hence road users and the community. Within major urban areas, incidents are a major contributor to traffic congestion" [ix].

NRMA has previously highlighted the issue of incident responders paying tolls with Transport for NSW and the TMC. Unfortunately the opportunity to resolve this issue was not taken during the contract negotiations for the recent M2 and M5 motorway upgrades. This issue must be addressed.

(h) Provide travel time information to motorists, along with much greater access to CCTV camera images and ensure that motorists are aware that their driving behaviour is being observed whilst travelling on WestConnex.

Recommendation 4: Celebrate Tunnel Infrastructure

Sydney's bridges, such as the Harbour and Anzac Bridges, are celebrated as iconic structures and engineering marvels.

By their nature, tunnels are hidden away from view, but this should not mean tunnels and their facades can be ignored. NRMA believes that there are real opportunities to improve motorist's experiences in road tunnels and to celebrate tunnel infrastructure.

The following examples from around the world reveal what is possible for WestConnex.

Image 1.1 – Image of the Södra länken motorway, Stockholm, Sweden

Image 1.2 – Image of a private car park tunnel, London, United Kingdom[x]

Image 1.3 – Image of a private car park tunnel, London, United Kingdom[xi]

Image 1.4 – Example of traditional tunnel lighting Lane Cove Tunnel, Sydney, Australia[xii]

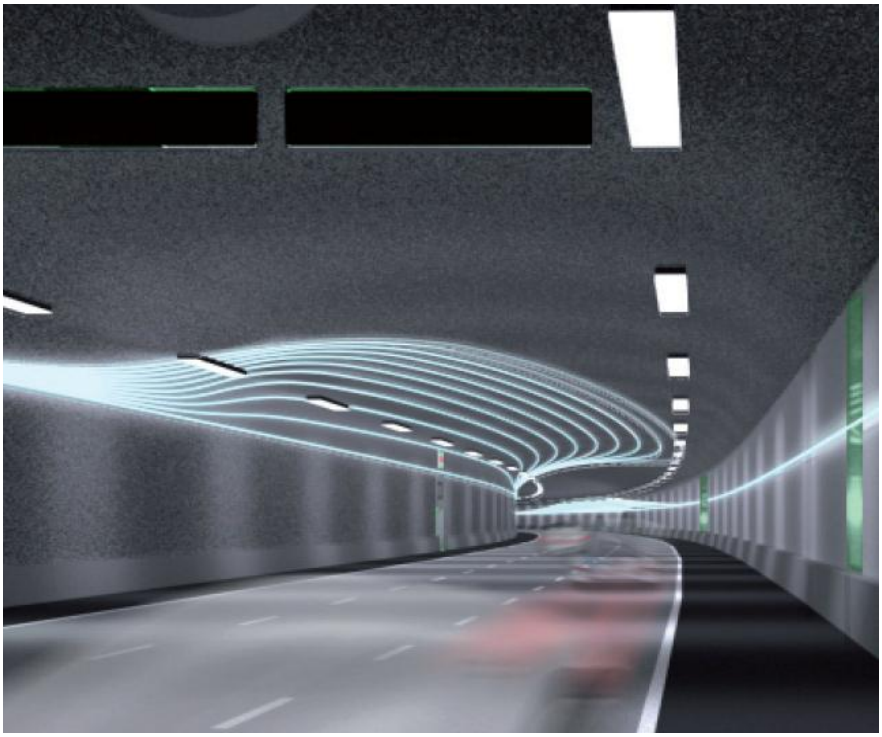

Image 1.5 – Concept design from the Stockholm bypass project (a new 21kilometres motorway with 18 kilometres of tunnels), Stockholm, Sweden[xiii]

Supporting Information

WestConnex is one of the largest road infrastructure projects ever undertaken in Australia. Not since the construction of the Sydney Harbour Bridge has a single infrastructure project had the capacity to influence the long term future and prosperity of Sydney. WestConnex is the next step in providing a truly connected motorway network in Sydney.

Based on figures provided by the NSW Government in the *NSW Long Term Transport Master Plan* Sydney's population is expected to grow from 4.3 million to around 5.6 million by 2031[xiv], with a majority of this growth occurring in the North West and South West Growth Centres. It is estimated by the NSW Department of Planning and Infrastructure that these areas will see a significant increase in population with over 181,000 homes expected to be built over the next 25 to 30 years[xv].

It is therefore critical that WestConnex is appropriately designed and constructed to ensure the safe and efficient movement of traffic in the long term, having particular regard to the expected future population growth and demand in the North West and South West Growth Centres.

It is arguable that many of the previous road infrastructure projects undertaken in Sydney in recent times have failed to consider a long term vision and have instead focused on the immediate or short term. Failure to anticipate or acknowledge future population growth and demand for road usage in Sydney has led to the construction of major road transport infrastructure projects that have reached capacity shortly after completion, causing lengthy delays and eventually necessitating difficult and expensive upgrades.

The opening of the two lane M5 East in December 2001 provides a good example of a project that failed to adequately address or anticipate future capacity issues due to increased road usage and Sydney's continued population growth. Soon after opening, the M5 East was already operating near capacity and today congestion extends across much of the day.

The M5 East sought to improve access between South Western Sydney, Sydney Airport and Port Botany, and the CBD, and aimed to reduce traffic congestion, improve traffic flow and remove heavy vehicles from local roads. These are not dissimilar to the planned goals for WestConnex.

Currently, 95,000 vehicles per day use the M5 East tunnel, many of these being heavy vehicles[xvi]. RMS has stated that congestion on the M5 East negatively impacts on access to Sydney Airport and Port Botany, hurting Sydney's economic productivity and competitiveness[xvii].

These statistics support the conclusion that the M5 East, while also partly a victim of its own success, failed to adequately address capacity issues during the planning and design phase. Many lessons have been learnt from the design, public consultation and operation of the M5 East and from the subsequent Cross City and Lane Cove Tunnels, but as NRMA's recommendations in this Report reveal, there are a large number of other issues that also need to be considered for WestConnex.

Designing the WestConnex Stage 1 Tunnel – M4 to St Peters

The longest of the WestConnex tunnels, between the M4 and St Peters, will be 13 kilometers in length, making it the longest road tunnel in Australia, and one of the longest road tunnels in the world. It is therefore important that the tunnel is designed to allow for the efficient movement of traffic and to ensure the number of incidents and closures to the tunnel are minimised.

The main WestConnex tunnel will also be Sydney's longest road tunnel, more than three times the length of M5 East tunnel, which is currently Sydney's longest road tunnel. The graph below provides a comparison of the proposed WestConnex tunnel with other tunnels currently in operation in Sydney.

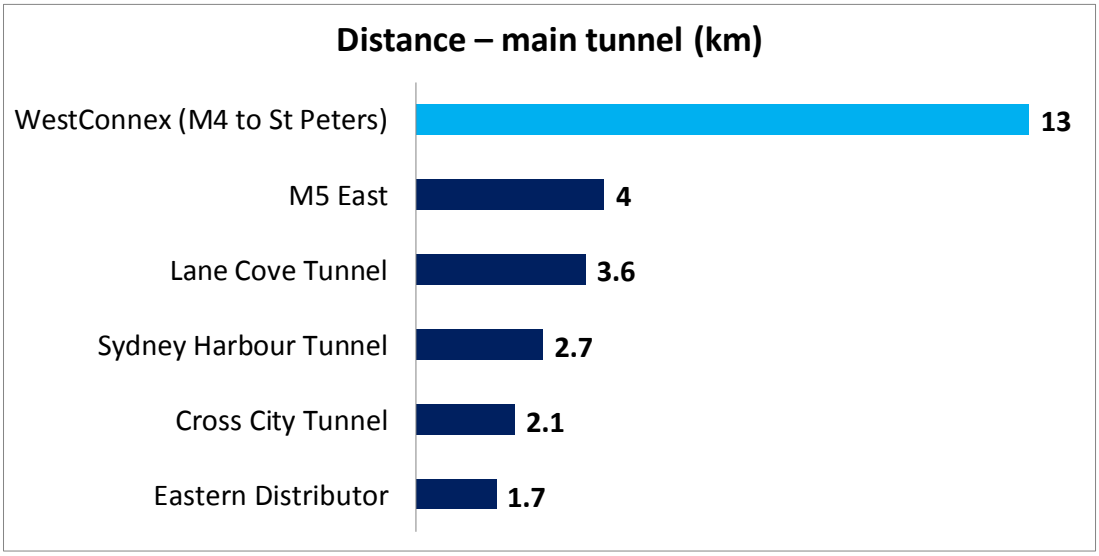

Figure 1.1 – Comparison of WestConnex with other road tunnels in Sydney

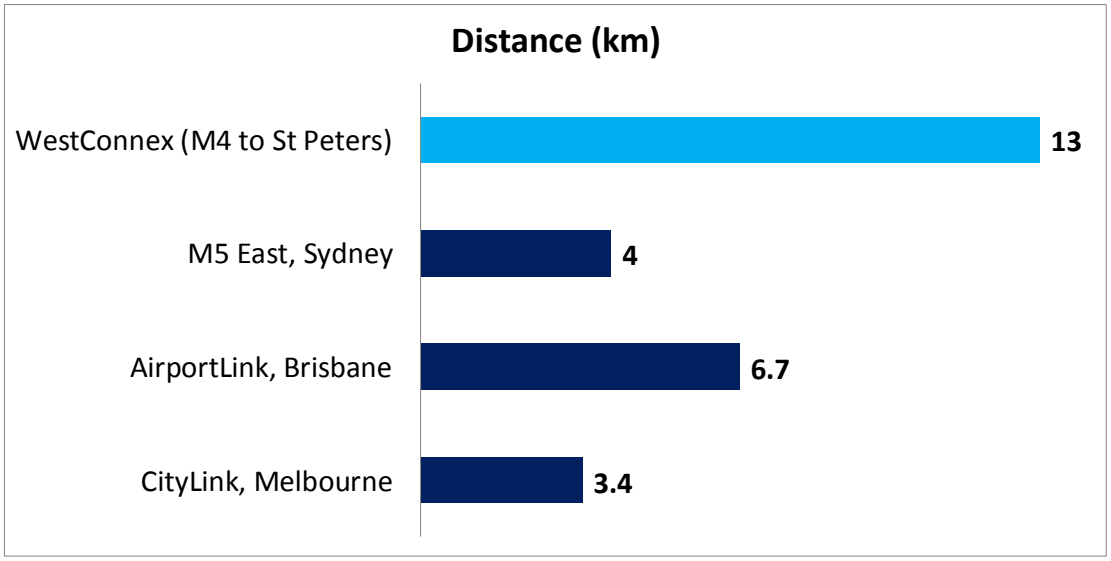

Figure 1.2 – Comparison of WestConnex with other existing road tunnels in Australia

Incorporating the longest road tunnel ever built in Australia, the WestConnex tunnels will require the world's best systems and designs embedded into the project to facilitate the efficient flow of traffic and provide a safe road environment for motorists. Taking the traditional approach to tunnel design and simply replicating the design of previous tunnel projects is unlikely to be sufficient for mega projects like WestConnex.

In constructing WestConnex, it is important that lessons are learnt from previous projects like the M5 East to ensure compromises are not made to critical elements of the design such as on and off ramps. It will also be important to ensure basic errors such as the construction of steep grades and right hand on and off ramps are not repeated in the design of WestConnex.

Incidents involving overheight and heavy vehicles

A key aim of WestConnex is to provide quicker and more reliable trips between Western Sydney, the Sydney Airport and Port Botany to assist freight movements[xviii].

Sydney motorists know all too well the congestion associated with overheight vehicles that illegally attempt to enter the city's major road tunnels. Nearly every month, overheight vehicles are caught on the approach to tunnels, blocking traffic and causing extensive delays. As recently as 14 November 2013, an overheight vehicle caused significant damage to the M5 East tunnel during the morning peak, causing long and frustrating delays for motorists[xix].

Heavy vehicle drivers travelling through Sydney's other major road tunnels are subject to height restrictions[xx]. However many operators of heavy vehicles are either ignorant of these requirements or choose to take risks and simply ignore warning signs placed on the approach to the tunnels.

In an attempt to address this issue, the NSW Government has already signaled its intention to ensure the WestConnex tunnels are constructed higher than existing tunnels, but the WestConnex tunnels will also need to be equipped with advanced technologies and solutions to deter overheight vehicles from entering and potentially damaging the WestConnex tunnel.

The importance of managed motorways

For many years, NRMA has raised concerns about the reluctance of RMS to embrace the concept of managed motorways. A managed motorway approach seeks to use integrated technologies to manage the road network to reduce travel times, improve reliability and increase road safety[xxi].

In May 2011, NRMA released a comprehensive strategy titled *Decongestion – 10 ways to relieve Sydney's traffic headache*[xxii]*. The Decongestion Strategy* noted that up to 25 per cent more capacity could be achieved from Sydney's existing motorways by simply changing the way they are managed, and by adopting proven technology[xxiii].

NRMA strongly believes that all new or upgraded motorways in NSW should incorporate an electronic freeway management system. Indeed, the ARRB Group has stated that the implementation of such systems 'should be considered whenever a new urban motorway is to be built or upgraded[xxiv]'.

Considering the high costs involved in building Sydney's motorway network, it makes sense to ensure that traffic using the network is properly managed using the latest and most advanced technologies. NRMA is disappointed that RMS failed to incorporate managed motorway principles and new technologies in either the M2 or M5 motorway upgrades. Trying to retrofit the devices and widened ramps will not only be costly, but also difficult to construct now that additional traffic resulting from the widening will need to be contended with.

The failure of RMS to embrace managed motorways for these upgrades is in stark contrast to the approach adopted by VicRoads in upgrading and managing Melbourne's road network. Melbourne's Monash Freeway uses intelligent transport systems such as information, communication and control systems to manage traffic flows, including motorway entry, lane use and driving speeds[xxv].

VicRoads' adoption of managed motorways has delivered a 50 per cent improvement in travel times and a 50 per cent reduction in crashes on the Monash Freeway[xxvi]. Following on from this success,

the intention is for every freeway in Melbourne incorporates the same managed motorway technologies within the next five years. Queensland is now also implementing the Victorian system

NRMA believes that RMS must follow the lead of their counterparts in Melbourne and Brisbane and adopt the managed motorway principles in the design and operation of WestConnex. NRMA continues to have concerns that the 'in-house' system being considered by Transport for NSW for WestConnex will not perform as well as the tried and tested Melbourne system. Motorists paying to use WestConnex should have the best motorway management system.

Managing tunnel closures

The longer the tunnel, the greater the likelihood of unplanned incidents such as a crash or breakdown occurring somewhere in the tunnel. At 13 kilometres and more than three times the length of the current M5 East tunnel, this statement is particularly relevant for the main WestConnex tunnel. It is likely that the entire tunnel will be forced to shut down whenever a serious accident occurs within the tunnel. Therefore any serious incident within any of the WestConnex tunnels is likely to quickly result in traffic gridlock across the Sydney motorway and surrounding road network.

NRMA notes that following the release of NRMA *Decongestion Strategy* in 2011, the NSW Government adopted NRMA's recommendation to clear major road incidents on Sydney roads within 4 hours. This target has been included within *NSW 2021* as a target to help reduce travel times by improving the efficiency of the road network during peak times[xxvii]. It is crucial that the Transport Management Centre, the private motorway operators and emergency services meet this critical target when unplanned incidents occur on WestConnex.

To ensure the WestConnex tunnels remain resilient and adaptive in the event of major unplanned incidents, NRMA believes that the NSW Government must continue to pursue new ways to manage incidents. The NSW Police response to the NSW Government adopting the target clearance time has been very successful and has resulted in more crash investigators being sent to major incidents, and to Operation Freeflow where highly visible Police vehicles have been stationed on Sydney's motorways.

This Operation has helped to slash Police response times to motorway incidents on average from 18 to 6 minutes and importantly has helped to change driver behaviour leading to a 25% reduction in the number of crashes.

The overwhelming success of visible policing indicates that it is important to let motorists know that they are being watched whilst travelling on WestConnex and particularly within the tunnels.

NRMA has also recommended elements of the UK's CLEAR initiative[xxviii], such as using 3D laser scanning to quickly gather evidence at crash scenes can also help to reduce delays for road users.

Additionally, it is important that WestConnex is designed to ensure that detour and exit routes for the motorway have sufficient capacity to cater for vehicles that are unable to access the tunnels such as overheight vehicles and B-double petrol tankers. This will be particularly important should a major incident occur within the WestConnex tunnel, as all traffic will be required to these surface detour routes, mixing with petrol tankers and overheight trucks.

In such an event, NRMA believes that proposed bus lanes on Parramatta Road would need to be suspended and opened up to general traffic until the incident or breakdown is cleared by the emergency services and traffic is back to normal.

Innovative design to improve tunnel safety

Driving through lengthy road tunnels can quickly become tedious for motorists, with drivers experiencing greater levels of fatigue and tiredness. Clearly the longer the tunnel, the greater the likelihood of unplanned incidents such as a crash occurring somewhere in the tunnel.

This is particularly relevant for the longest of the WestConnex tunnels. This tunnel will be approximately 13 kilometres in length, double the length of Brisbane's Airport Link road tunnel. Not only will this make it the longest ever built in Australia, but it will also be one of the longest road tunnels built anywhere in the world.

As previously noted, the consequence of a major crash or incident in the WestConnex tunnel has the potential to cause gridlock across Sydney. Therefore it is important that the WestConnex tunnels are designed to minimise the number of unplanned incidents that could potentially close the tunnel for significant periods of time.

Traditionally, Sydney's road tunnels have been designed and constructed with a number of safety features to assist motorists in the event of a major incident. These include emergency broadcasts, electronic message boards, flashing lights to guide motorists to emergency exits, fire extinguishers and emergency phones located at least every 60 metres, and 24 hour CCTV monitoring[xxix].

While it is expected that these safety features will be included in the design of the WestConnex tunnels, NRMA believes that due to the unprecedented length of the main tunnel, the NSW Government should consider incorporating best practice designs similar to those found in Scandinavian countries to keep drivers alert, and to guide them safely through the tunnel.

Tunnel design in Scandinavia

Some of the longest road tunnels in the world are located in Scandinavia. To help motorists safety navigate these long tunnels, Scandinavian road authorities have incorporated new technology solutions such as the use of innovative lighting displays in their design to make the driving experience safer for motorists.

The Lærdal Tunnel in Norway is 24 kilometres in length and is currently the longest road tunnel in the world, taking approximately 20 minutes to drive the length of the tunnel. Construction of this innovative tunnel commenced in 1995 and it opened to traffic in 2000, before Sydney's M5 East tunnel that opened in 2001, and well before Sydney's subsequent Cross City and Lane Cove Tunnels.

Image 1.6 – Image of the Lærdal Tunnel, Norway

Image 1.7 – Image of the Lærdal Tunnel, Norway

Given the significant length of the Lærdal Tunnel, the Norwegian Public Roads Administration (NPRA) designed the tunnel to ensure that motorists had a pleasant driving experiencing, incorporating new ideas to attempt to break the monotony of the long below ground trip[xxx].

Image 1.6 above provides an example of the innovative approach undertaken by the NPRA in designing the Lærdal Tunnel. The tunnel is divided into four sections and includes three 30 metre diameter halls, similar to that of Image 1.6 above.

The NPRA used simulators to determine the best lighting levels to use in the tunnels. As shown by Image 1.7 above, the main tunnel is lit white, with blue and yellow lighting used within the three caves, giving motorists the impression of a sunrise[xxxi]. The lighting in the caves are meant to break the routine for motorists, providing a refreshing view and allowing drivers to take a short rest from the perceived monotony of the tunnel.

It would not be difficult to incorporate new lighting designs within the WestConnex tunnels to enhance the driving experience for motorists, keeping motorists alert and providing a safer road environment which may assist in reducing the number of accidents within the tunnel.

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