

Marrickville Council Submission – M4 East Environmental Impact Statement

Marrickville Council opposes the WestConnex project, incorporating the M4 East extension that is the subject of the present EIS. In September 2015 Council reaffirmed its “absolute opposition to the WestConnex project” at which time it also called for the immediate release of a business case and environmental impact statement for the proposal.

This submission responds to the M4 East EIS, currently on public exhibition, and evaluates the justification for the current project (as part of the broader WestConnex project) as well as the mitigation and management measures proposed and the level to which the identified impacts of the project have been addressed.

The main conclusions of this submission are:

- That the EIS does not justify that the significant expenditure proposed on transport improvements benefits the broader community including public transport users, pedestrians cyclists and communities generally and that the benefits for toll paying motorists indicated in the EIS are also dubious.
- There has been no real analysis on the assessment of alternatives to the M4 East undertaken in the EIS and that all of the alternatives that have been considered are assessed in isolation of integrated solutions.
- The EIS has assumed that all sections of WestConnex (with the possible exception of the Western Harbour Tunnel) are completed by 2031. If all sections are not completed simultaneously the traffic flowing from the M4 East will have adverse impacts on the inner west and central Sydney.
- To properly evaluate the WestConnex project there needs to be an over-arching EIS for the entire project, i.e. Stages 1, 2, 3, the Southern Gateway and The Sydney Gateway; possibly also the Northern and Southern extensions.
- The EIS itself acknowledges that the forecasted peak traffic patterns appear to be counter intuitive – westbound in the morning peak and eastbound in the afternoon peak. When compared to recent traffic trends in Sydney this outcome is hard to comprehend. The EIS explanation of this outcome is contrived and complicated and a more likely explanation is a miscalculation in the transport modelling.
- The EIS does not explain how toll levels and people’s perception of tolls changes into the future. Given the impacts this can have on existing surface roads and the recent toll road failures in Sydney this appears a significant omission.
- The EIS is not very detailed in relation impacts from other components of the project such as the M5 extension/expansion and M4-M5 link and this shortcoming hides further impacts that would be experienced through the Marrickville LGA (i.e. M4 and M5 extensions without the M4-M5 link). Even with the 2031 ‘do something’ case which includes all the Westconnex stages, there is still little detail on the impact on the roads south of Parramatta Road.
- The EIS must identify the likely impacts of induced traffic on residential streets in the LGA, by means of an appropriate local area traffic management study, and mitigate those impacts by LATM works. The study should include post implementation reviews to identify and address any unforeseen impacts.
- The transport model used by the M4 East EIS does not include public transport assignment or public transport demand forecasting. Due to the lack of a mode split process in the transport modelling, the competing disbenefits of traffic congestion and rail crowding have not been tested for the EIS.
- The implications of increased bus traffic along Parramatta Road into the Sydney city centre are not addressed by the M4 East EIS. How the central city road network will deal with increased bus traffic is unknown.
- The absence of a long term modelling (for example 2041) from the M4 East EIS means that any longer term traffic or socioeconomic impacts are not being identified, mitigated or monitored.

- The 'worst case' assessment presented in the Air Quality Assessment does not consider the maximum emission rates (in g/s); hence the worst case scenario is not in fact considered.
- The health impact assessment should be reviewed to include a comprehensive assessment of the health impacts, in consultation with affected people and communities, to identify positive impacts and better mitigation measures for negative impacts.
- The EIS does not satisfy the Director-General's Requirements "*consideration of the WestConnex Urban Revitalisation Project*" as evidenced by the location of the Powells Creek M4 on-ramp at the centre of a place that is earmarked for major urban amenity transformation in the Homebush Precinct under the Parramatta Road Urban Transformation Strategy.
- No pedestrian and cycling report has been included in the EIS on the basis that the M4 East would operate in parallel with Parramatta Road. Cycling is a viable transport option and it should reasonably be expected that the EIS would evaluate the strategic opportunities for providing cycleway and pedestrian transportation to create connectivity and integrate with the surrounding communities.
- The economic impact assessment in the EIS does not provide justification for the proposal as it lacks a comprehensive assessment of the impacts, based on detailed modelling, cost/benefit analysis, inclusion of opportunity costs and a business case.
- The social impact assessment needs to be reviewed to include a comprehensive assessment of the social impacts, in consultation with affected people and communities, to identify positive impacts and better mitigation measures for negative impacts.
- No scoping of the population groups who will potentially be affected undertaken – apart from the people whose land will be acquired (referred to as properties rather than people in the report) and a few social infrastructure (the people who use the social infrastructure are not mentioned,)
- No direct consultation has been carried out with the people and population groups who will be directly affected (had they been appropriately identified) – it would have been useful to ask them what they needed to manage the impacts on their lives
- The investigation undertaken and outlined with respect to contamination could only be considered a Preliminary Site Investigation as per the Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA 2011). The scale of the proposal, lack of information about past activities, and known presence of contamination and contaminating processes over the entire project site warrant a Detailed Site Investigation prior to approval, and not deferred to a later stage.
- There are significant gaps and inadequacies in the methodology used and assessment of biodiversity impacts.
- Commentary should be included on the comparison of car versus public transport emissions and how the NSW Long Term Transport Master Plan objective to grow the proportion of travel by sustainable modes such as public transport is being addressed.
- The EIS does not adequately address the impact of the project on future climate change. This project must be considered with reference to Australia's commitment to emissions reduction and Ecologically Sustainable Development as outlined in the Protection of the Environment Administration Act 1991 (NSW) and the Environment Protection and Biodiversity Conservation Act 1999.

It is evident based on the evaluation in this submission that the decision to proceed with WestConnex was made prior to a thorough assessment of whether or not the project was the best way to manage Sydney's transport needs in the context of the role that WestConnex is intended to serve. Moreover, it is evident that the role of the EIS for this project has been limited to an assessment of impact and mitigation measures that could be applied as opposed to a genuine consideration of alternatives to the proposal. For these reasons the project is and has been flawed from inception and should not proceed based on the assessment within the EIS.

Council's submission finds that the project has no basis to proceed and recommends that alternatives to the M4 East should be further evaluated, including:

- Expansion of the new Metro:
 - from Bankstown to Parramatta and Epping/Macquarie Park

- from Parramatta to CBD via Ryde/Drummoyne and/or Strathfield/Olympic Park
- from Strathfield/Burwood north to Macquarie Park and southeast to Green Square/Airport and Randwick/Bondi Junction
- New road connection from Port Botany to M5 to enable better dispersal of freight from port; upgrade A3/A6 for freight heading north
- Increased services along Western Rail Line
- Improved connections to stations along Airport/Revesby line including park and ride options at major stations; increase frequency of services along this line
- New stations on the Airport Line in the Green Square area
- New and improved bus or light rail connectivity/priority along Parramatta Road; investigate light rail
- Expansion of growing light rail network
- Light rail network for Parramatta City

The specific focus of a revised approach to WestConnex would ideally be based on the following principles:

- Creating healthy built environments by encouraging people to walk, cycle and recreate more and use active transport.
- Improving equity – pursuing an outcome that does not destroy one person's amenity to improve someone else's amenity – that is not equitable.
- Actually committing to helping people to manage the changes (in their lives), rather than leaving it at suggestions (this help should be thought out and planned for implementation with the start of any project).

The submission has been organised to correspond to the chapter sequence within the EIS. Where a chapter is not addressed the submission has not made any comments concerning that issue.

Chapter 4 - Project development and alternatives

Strategic alternatives to WestConnex and the M4 East are outlined in this chapter. Options analysis using rigorous consultation and assessment is the best known means to determine a strategy to manage the traffic capacity and demand under baseline and projected conditions. This has not been undertaken and should have been prior to the EIS.

The assessment of alternatives in the EIS is based on qualitative alternatives. No comparison has been made using rigorous assessment to demonstrate the performance of these alternatives in quantitative forms.

The strategic alternatives that are presented are piecemeal strategies and no hybrid alternatives were considered and analysed (i.e. combination of private and public transport, such as road and rail infrastructure).

In contrast, the WestConnex strategy was presented considering the entire scheme (i.e. works to be undertaken in Stages 1, 2 and 3). This suggests that the best option has been predetermined with Chapter 4 and its interpretation designed to convey the WestConnex as the best proposition.

Strategic alternatives should have been presented using consistent criteria and analysis. Therefore, the process for assessing alternatives to the Project is fundamentally flawed, given that the objectives against which any alternative is assessed are the WestConnex Project objectives rather than overarching objectives focussed on resolving Sydney's current transport issues; *"Alternatives to the Project were considered based on the extent to which they could meet the Project objectives"*. As a result, none of the alternatives considered could ever as closely match the Project objectives as the Project itself; *"there are no feasible strategic transport alternatives that would meet needs for travel in this corridor and address project objectives as effectively as WestConnex"*.

Further to the above, it is noted that the original objective was to provide enhanced access between the growing areas of the west and the Port Botany/Sydney Airport precinct, but at present

(without the Sydney Gateway element, which is not currently within the project scope and only briefly mentioned in the EIS) WestConnex provides direct access to neither the Port nor the Airport. Furthermore, where assumptions are made regarding potential improved travel times to the Airport/Port, these are completely dependent upon the completion of Stage 3 and Sydney Gateway and there is currently no firm commitment to any such construction taking place.

The EIS, in order to assert its claim that the Project is the best way forward, suggests that key customer markets have been identified (for this project) as being highly dispersed and long distance passenger movements – this is:

- a) Contradictory to the NSW Transport Master Plan¹ for this corridor; the TMP identifies Parramatta to CBD as a strategic corridor. Funnelling vehicles through the M4 & M4 East will result in traffic congestion occurring closer to the CBD and also greater demand for car parking in the CBD. Dense urban centres do not physically have the space for continuous growth in the numbers of vehicles entering.
- b) Incongruous with the Initial Need for the Project as set out in 3-11 of the EIS² - This states that the overarching key driver for this Project is the growth Sydney is expected to see in the coming decades. Specifically, employment growth is expected to be predominantly in the eastern half of Sydney (Global Economic Corridor) whilst population growth is expected to be stronger in the west. This will increase the demand for travel between population in the west and employment opportunities in the east. Growth is also expected in other centres along the corridor between these two growth zones, such as Lidcombe, Burwood and Olympic Park. Therefore, a mass transit system would be the most appropriate way to address the main objective of the project. Similarly, the secondary driver for the project in this (regional) context, namely the demand for freight movement, between the airport and port to the west would be better accommodated by improved freight corridors instead of a road network that will be congested with commuter traffic into the CBD.

As noted previously, little detailed investigation has actually taken place within the EIS concerning the alternatives to the project – the EIS contains no description of any public transport alternatives that could be considered, only dismissive remarks that public transport cannot address the objectives set for this Project (objectives with a pre-determined focus, as per above); alternative road projects that are considered are rather insignificant in the context of the Project itself.

In addition, no consideration in the EIS has been given to the possibility of implementing numerous alternatives simultaneously – all are considered in isolation, which is highly unlikely to happen in reality, particularly given that several of the alternatives are stated as being complementary to other, larger projects

Furthermore, much of the justification for the dismissal of considered alternatives is unsound, apparently in the interests of ensuring WestConnex is presented as the only viable option:

- Unreliable buses – increasing unreliability along Parramatta Road is most likely due to pinch points in the bus lanes (having to merge with traffic), a lack of bus priority at intersections/other locations and poor enforcement of bus lane use by other vehicles; factors that could be addressed through enhanced bus priority measures

¹ whilst the EIS states that the TMP includes WestConnex as a leading project that should be tackled as a priority, it fails to acknowledge other priorities within the Master Plan such as that it will “*manage congestion on roads by encouraging the use of public transport*”; the EIS picks and chooses elements in the Master Plan where it is convenient.

² P78 of EIS: Workforce and employment forecasts between 2011 and 2031 indicate that employment will remain higher in eastern Sydney than in the west. This increase in population in Sydney's west (without a similar rate of jobs growth) will significantly increase travel demand towards the east (where the majority of jobs will exist) on an already constrained transport network, particularly along the M4 and Parramatta Road corridor. This corridor is the main east west corridor providing access between Sydney's west, and particularly the major economic precinct of Parramatta, and the Sydney CBD.

P92 of EIS: Public transport options such as rail, light rail or bus would be feasible potential alternatives if the project, as part of WestConnex, was primarily concerned with transporting people to and from centres.

- Improvements to Victoria Street and Queens Street, amongst others, are stated as being in conflict with the Project objective of enhancing north/south movement across Parramatta Road – however the significant expansion of Parramatta Road planned around Ashfield Park/Wattle Street will substantially exacerbate the situation yet is considered to be acceptable.

Given the actual focus and objectives of the Project, outlined in 3-11 of the EIS (and in the Transport Master Plan), as above, consideration should now be given to real alternatives that focus on the achieving these regional goals – i.e. demand for access between the western population growth centres and GEC employment growth, plus the demand for freight movement to the west from the port/airport:

- Expansion of the new Metro:
 - from Bankstown to Parramatta and Epping/Macquarie Park
 - from Parramatta to CBD via Ryde/Drummoyne and/or Strathfield/Olympic Park
 - from Strathfield/Burwood north to Macquarie Park and southeast to Green Square/Airport and Randwick/Bondi Junction
- New road connection from Port Botany to M5 to enable better dispersal of freight from port; upgrade A3/A6 for freight heading north
- Increased services along Western Rail Line
- Improved connections to stations along Airport/Revesby line including park and ride options at major stations; increase frequency of services along this line
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Metro expansion would meet all of the benefits that WestConnex promotes, specifically it will bring time savings from Parramatta to the airport, bypassing 52 sets of traffic lights, halving of travel times from Burwood to the CBD, more reliable trips for those that do need to drive, more time with family, job creation etc.

The traffic and transport review of the proposal undertaken by SGS Economics and Planning (refer commentary on Chapter 8) also notes that no real analysis on assessment of alternatives to the M4 East has been undertaken in the EIS. In particular the report notes that a demand management options assessment would be expected for a project such as the M4 East.

Chapter 8 - Traffic and transport

Sydney City, Marrickville and Leichhardt Councils collaborated concerning the evaluation of the traffic and transport sections of the EIS. SGS Economics and Planning and Veitch Lister Consulting were engaged to review this section and the socioeconomic sections of the EIS.

A copy of the review is **ATTACHMENT A** to this submission.

The review has highlighted a number of issues, several of which demonstrate that the EIS is flawed and the project as currently proposed should not proceed, as follows:

- The M4 East EIS mentions alternatives to the M4 East (public transport and freight rail improvements and demand management policies) but provides no information on the outcomes of these alternatives. It is merely stated that the M4 East is the best solution to the challenges facing the corridor.
- The M4 East EIS has assumed that all sections of WestConnex (with the possible exception of the Western Harbour Tunnel) are completed by 2031. Given the scale of building required and early stages of planning of many sections of WestConnex this creates project risks. If all sections are not completed simultaneously the traffic flowing from the M4 East will have adverse impacts on the inner west and central Sydney. The M4 East EIS has

not addressed the risks in terms of the traffic and socioeconomic impact of the whole project.

- The M4 East is only evaluated post 2021 in combination with other WestConnex sections. There are risks that the M4 East will generate additional traffic that will only be addressed by other sections of WestConnex.
- The M4 East EIS itself acknowledges that the forecasted peak traffic patterns appear to be counter intuitive – westbound in the morning peak and eastbound in the afternoon peak. When compared to recent traffic trends in Sydney this outcome is hard to comprehend. The EIS explanation of this outcome is contrived and complicated and a more likely explanation is a miscalculation in the transport modelling.
- The origin and destination of the users of the M4 East is not explained in any detail within the M4 East EIS. Without this it is difficult to understand the impacts on the broad road network in eastern or western Sydney.
- The M4 East EIS does not explain how toll levels and people's perception of tolls changes into the future. Given the impacts this can have on existing surface roads and the recent toll road failures in Sydney this appears a significant omission.
- Assumptions around the location, supply and cost of car parking (a key component of travel cost to eastern Sydney) is not explained by the M4 East EIS.
- The M4 East EIS documents make no reference to sensitivity tests, nor does the EIS list any results. It should be expected that in a project of this significance, the sensitivity of the model to various assumptions would be tested and potential alternative outcomes be tested in some detail. In particular, the sensitivities to the impacts on the road network of differing toll levels and land use changes along Parramatta Road would be significant.
- The transport model used by the M4 East EIS does not include public transport assignment or even public transport demand forecasting. The M4 East EIS provides no information about the impact on public transport demand, including whether tolls would induce some people to switch to public transport. Due to the lack of a mode split process in the transport modelling, the competing disbenefits of traffic congestion and rail crowding have not been tested for the EIS.
- The M4 East EIS inclusion of bus lanes along Parramatta Road, which are not part of the project (or Westconnex), does reduce road space and traffic flows assuming that traffic does in fact divert into the M4 East tunnel. Based on public information, when these bus lanes will be delivered is unclear.
- The implications of increased bus traffic along Parramatta Road into the Sydney city centre are not addressed by the M4 East EIS. How the central city road network will deal with increased bus traffic is unknown.
- The M4 East EIS avoided car crash benefit has been based on total daily vehicle kilometres travelled and average crash severity. However, crashes in the off-peak periods are likely to be much more severe (and therefore more costly) because of higher possible speeds. If more crashes along the corridor occur in peak period then the car crash benefit could be overstated.
- The absence of a long term modelling (for example 2041) from the M4 East EIS means that any longer term traffic or socioeconomic impacts are not being identified, mitigated or monitored.
- The information contained in the EIS does not reduce any of the concerns around the adverse impacts previously raised in the Strategic Review and Transport Modelling of WestConnex prepared by SGS Economics & Planning and Veitch Lister Consulting. That is, WestConnex will not address the transport challenges being faced by Sydney in the future.

The following supplementary information is primarily concerned with the local impacts of the project and has been prepared by Council's traffic and transport officers:

There should be more detail provided on the 2021 scenario in relation to the 'just the M4' East project and its impacts on the surrounding road networks in the inner west. It is indicated that Parramatta Road within the Marrickville LGA will experience around a 36% increase in traffic in some of the cases with flow on effects to intersections such as Crystal Street and West Street.

In the 2031 Scenario 'do something' (which includes the M4-M5 link) traffic volumes along Parramatta Road towards the city end are still high and Crystal Street still has a level of service F. The EIS itself recommends further investigation in relation to the Parramatta Road/Crystal Street intersection; however it states that it is outside the scope of the project.

In this regard, the EIS is not very detailed in relation to impacts from other components of the project such as the M5 extension/expansion and M4-M5 link and this shortcoming hides further impacts that would be experienced through the Marrickville LGA (i.e. M4 and M5 extensions without the M4-M5 link). Even with the 2031 case 'do something' which includes all the Westconnex stages, there is still little detail on the impact on the roads south of Parramatta Road.

This would be addressed through an over-arching EIS for the entire Westconnex project, i.e. Stages 1, 2, 3, the Southern Gateway and The Sydney Gateway; possibly also the Northern and Southern extensions. However, if Stage 3 is not to be built, a good proportion of the traffic that currently peels off the existing M4 at Centenary Drive and Silverwater Road heading towards Port Botany and Sydney Airport is likely to continue on from Haberfield and filter through the Marrickville LGA via Frederick Street, Ashfield, Old Canterbury Road and West Street, Lewisham, Crystal Street and Bridge Road. This will increase congestion on traffic routes in Marrickville LGA with the potential of increased 'rat runs' in residential streets.

In the absence of a LATM study that considers the impacts of through traffic on residential streets, it is assumed that such impacts of stage 1 (M4 East) will be considerable. Figure 2.1 on page 135 of Volume 2A refers to "*Stub tunnels for possible future M4-M5 Link*". This implies there is a possibility Stage 3 may not go ahead. If that is the case then the Marrickville LGA will be subjected to additional surface traffic. Addressing those impacts through intersection improvements involving acquisition of additional properties and disruptive construction work will not be a palatable solution for the local community.

The EIS must identify the likely impacts of induced traffic on residential streets in the LGA, by means of an appropriate local area traffic management study, and mitigate those impacts by LATM works. The study should include post implementation reviews to identify and address any unforeseen impacts.

Chapter 9 – Air Quality

This chapter addresses several matters relating to the possible effects on human health of the proposed M4 East. The most significant likely impact concerns air quality impacts. To evaluate the impacts and mitigation measures proposed in the EIS Marrickville and Leichhardt Councils jointly engaged an independent peer review of this issue by environmental consultant's Air Noise Environment P/L.

A copy of the review is **ATTACHMENT B** to this submission. The overall conclusion of the assessment is that:

The Air Quality Assessment predicts compliance with the air quality goals for the majority of pollutants. The short term predicted non-compliances are related principally to road traffic emissions, and these impacts are also present for the existing environment. Overall reductions in pollutant impacts are predicted for the majority of receptors.

Providing the issues identified in this review are addressed, and the conclusions of the Air Quality Assessment do not change significantly as a result, it is concluded that the local and regional air quality as a result of the Westconnex M4 East project is not likely to be detrimentally affected to a significant degree.

There are issues that have been identified that require further analysis however and include:

- The 'worst case' assessment presented in the Air Quality Assessment does not consider the maximum emission rates (in g/s), hence the worst case scenario is not in fact considered. Furthermore, a peak congested scenario has not been considered in the air quality assessment. It is considered that these scenarios should be modelled/remodelled.
- Computational fluid dynamics of the interaction of the two ventilation outlets needs to be completed to accurately assess the dispersion of pollutants from the two ventilation outlets.
- Confirmation should be sought from NSW EPA to confirm that the GRAM/GRAL modelling methodology is acceptable.

Additional specific issues that have been identified in the review, and warrant further consideration, are as follows:

- Completion of a quantitative construction air quality assessment, focussing on the risk of particulate impacts and including the potential for release of crystalline silica;
- low efflux velocity for ventilation outlets at night, with potential for stack tip and building downwash issues to be enhanced;
- necessity of incorporating portal emission monitoring if a condition requiring no portal emissions is imposed;
- provision of dampers in the western ventilation outlet to allow for varying outlet diameters.

Chapter 11 – Human Health

The health report focuses on noise/vibration and air quality (discussed above) and suggests mitigation measures. According to the assessment, provided these mitigation measures are taken (and there is no indication they will be) there should be compliance with required standards. Noise/vibration and air quality are covered in dedicated assessments and the health impact assessment is a rehash of those technical assessments.

The health impact assessment should go beyond technical compliance and investigate the impact on people's lives and healthy living. For example the health impact assessment should investigate whether outcomes such as an increase in traffic in local streets, interruption to local pedestrian and bike access, relocation of social infrastructure and increased congestion at the on/off ramps will encourage people in the vicinity of the proposal, and in the wider community, to live healthier lives (by becoming more active) or live less healthier lives (by becoming less active).

By not directly consulting with the people and communities that will be affected (such as cyclists, walkers and joggers, people whose social and support networks could be disrupted, people who recreate in the area) the full health impacts of the proposal have not been explored and the suggested mitigation measures are entirely inadequate. The health impact assessment should be reviewed to include a comprehensive assessment of the health impacts, in consultation with affected people and communities, to identify positive impacts and better mitigation measures for negative impacts.

Chapter 13 - Urban design and visual amenity comments

Section 5.2.2 of the EIS addresses the urban design principles that have guided the design of the project. It considers design features of the interchanges and other surface infrastructure, landscape treatments and the exploration of opportunities to integrate the surface infrastructure elements with the surrounding features of the area. This relates to design of the portals, interchanges and surface infrastructure taking into consideration their visibility and landscape to ensure an appropriate design response that is congruous with the existing M4 and the local road network.

The urban design principles and objectives that have been developed for the WestConnex scheme in the Draft WestConnex Motorway Urban Design Framework are:

- *Objective 1: Leading edge environmental responsiveness – Planning, design, construction and long term management shall be based upon a natural systems approach which is responsive to the environment and promotes the highest levels of sustainability*

- *Objective 2: Connectivity and legibility – Build connectivity across the city, beyond the boundaries of the motorway corridor and promote increased legibility of places, buildings, streets and landmarks*
- *Objective 3: Place-making – Create beautiful places, streets, structures and landscapes that draw their form, character and materiality from local context, the intrinsic natural and cultural qualities of each locale*
- *Objective 4: Urban renewal and liveability – Enable opportunities for urban renewal and provide high levels of urban amenity and liveability*
- *Objective 5: Memorable identity and a safe, enjoyable experience – Provide a memorable project identity and experiences for road users and adjacent stakeholders which are safe, convenient and enjoyable*
- *Objective 6: A new quality benchmark – Provide design and construction quality of world class standard. WestConnex shall establish a new benchmark for integrated sustainability, engineering, art, architecture and urban design.*

These objectives provide a good basis for the project design and basis for evaluation of the proposal as outlined in the EIS.

Section 13 of the EIS provides an assessment of the urban design, landscape character and visual amenity associated with the project. A detailed urban design and visual impact assessment has been undertaken for the project, which is included in Appendix L of the EIS. The evaluation and list of proposed measures to achieve the objectives is rigorous, addressing many aspects to meet the above objectives and mitigate impacts. Table 13.1 provides a summary of the assessment of the key urban design aspects and elements of the project, which adequately addresses matters that need to be achieved at the design stage. Table 13.12 outlines environmental management measures relating to landscape character and visual amenity. While these give a good framework to achieve objective 6, it only states that these measures “*would be considered during detailed design and implemented where feasible and reasonable*”. Many of the specific measures are only being suggested as matters for further consideration, such as “*Consider having the detailed design regularly reviewed by an independent design and sustainability review panel to ensure design quality throughout each stage of works, in accordance with the WUDF Principle 6.6.*” This substantially weakens the commitment required by WestConnex to achieve a new quality benchmark of world class standard. If world class standard quality is to be achieved these must be required to be committed to by the WestConnex Delivery Authority.

Whilst section 13 and Appendix L address urban design objectives relating to the motorway itself, there are some specific deficiencies relating to the broader context. It is noted that these are not within the Marrickville LGA. However, given Council’s involvement with the related Parramatta Road Urban Transformation Strategy and detailed knowledge of the impacts that the M4 East will have on this project it is appropriate that this submission comment on these impacts.

The most significant impact from the proposal is the Powells Creek M4 on-ramp, which has been located at the centre of the place that is earmarked for major urban amenity transformation in the Homebush Precinct under the Parramatta Road Urban Transformation Strategy. The location is where a major green corridor linkage (Powells Creek open space) and an urban corridor linkage (George Street), across Parramatta Road is to be delivered. Also, this stretch of Parramatta Road is planned to be transformed with active building frontages, enhanced public domain and be the location for a strategic bus stop. This is a completely unsuitable location for the on-ramp, which will result in the road infrastructure and traffic having a major impact on the urban design amenity of the area and create a major conflict with proposed active and public transport, which must be prioritised for this area. It shows a lack of integration between these two major transformations and does not achieve the above objectives nor specific Director-General’s Requirements “*consideration of the WestConnex Urban Revitalisation Project*”. This is an unacceptable option for getting westbound traffic onto the motorway that will be to the detriment of this urban transformation and should be abandoned or be relocated.

The project does not adequately address Objective 2 above. Specific matters relating to pedestrian and cycling transport required to be addressed in the Director-General’s Requirements are:

- *details of how the following matters meet the traffic and transport objectives of the project, taking into account adjacent sensitive land uses, future growth areas, approved and proposed infrastructure projects, and traffic (vehicular, cyclist and pedestrian) needs;*
- *the preferred alignment and design;*
- *the proposed interchanges and connections to the surrounding road network, and associated road infrastructure facilities;*
- *impacts on cyclists and pedestrian access and safety and consideration of opportunities to integrate cycleway and pedestrian elements with surrounding networks;*
- *identification of opportunities to utilise surplus or residual land, and utilise key structures (such as stacks) for multiple uses i.e. integration with other structures; and*
- *identification of measures to create, promote and enhance connectivity across Parramatta Road, where impacts to connectivity are associated with the project.*

A pedestrian and cycling report has not been included in the EIS. This would reasonably be expected to be prepared to enable evaluation of strategic opportunities for providing cycleway and pedestrian transportation to create connectivity and integration of the surrounding communities. This is of critical importance in an area that is divided by major roads, rail lines, motorways and stormwater canals. The EIS outlines that only a one-way eastbound cycleway to the north of the M4 and an on-ramp from Queen Street at North Strathfield will be provided. This would only cater for a minority of cyclists who would be comfortable riding on the motorway. Assessing the western part of the project, there is a major opportunity as part of such a substantial piece of infrastructure. For example a regional standard two-way pedestrian and cycling pathway adjacent to but separated from the M4 motorway (where necessary attached to/under the M4 motorway viaduct structures) all the way from Sydney Olympic Park to the Concord Road. This would allow linkage into existing region routes in the west and proposed regional routes to the east along Patterson St/Gibbs St/Queens Road (being delivered as part of the Urban Amenity Improvements under the Parramatta Road Urban Transformation Strategy). This would include bridging over the Northern Railway line that is currently a major barrier, using the M4 motorway viaduct structure. There is also opportunity to provide linkages down to the Powells Creek green corridor; down to Queen St (as proposed); and around the east of the Concord Road Interchange to Patterson St.

In terms of creating improved connectivity across Parramatta Road, there is opportunity to provide:

- a link via the east of the Concord Road Interchange to Ada Street, Franklyn Street and an improved level crossing over Parramatta Rd to Mosely Street (allowing link to Strathfield Station);
- a link over the disused rail bridge over Parramatta Road on the eastern side of the Northern Rail line (as identified in the Homebush Access and Movement Plan in the Parramatta Road Urban Transformation Strategy); and
- a link where the Powells Creek green corridor meets Parramatta Road, via an improved level crossing, and also given its strategic corridor status and the space available with park either side of Parramatta Road, provision of a pedestrian/cycle bridge over Parramatta Road, linking up to the regional western pedestrian and cycling pathway attached to M4 motorway viaduct structure (as above).

A clear integrated strategic plan needs to be established for this crucial urban transformation project achieving all the objectives, coordinated between all stakeholders (e.g. WestConnex, Roads and Maritime Services, Urban Growth NSW, Department of Planning, surrounding Councils and local community).

Chapter 14 – Social and Economic

Economic assessment

The economic impact assessment is rudimentary and too focussed on micro level considerations. Given the scale of the investment in the proposal a focus on macro level productivity and GDP is considered the appropriate focus of the economic impact assessment. Impacts on local businesses and the people they service are more appropriately considered in the social impact assessment.

The ongoing benefit is worked out simplistically using multipliers that are based on assumptions and, therefore, fraught with potential errors. It is not unreasonable to expect sophisticated econometric modelling to be undertaken for such a major project, with comprehensive cost/benefit analysis and a business case that clearly demonstrated justification for the project.

Notwithstanding, the long term financial contribution to the economy of \$39 million per annum appears a paltry result in relation to the cost of the project, and is minuscule in comparison to the GDP of the Sydney Region and NSW. Similarly, the 110 potential ongoing jobs is paltry in relation to employment and unemployment in Sydney and NSW.

The boost to the economy during the construction period, touted as one of the major benefits of the proposal, will be short lived and there is no comparison with options that could have created longer term benefits to economic activity and productivity. Further, the drain on productivity from congestion and delays for commuters is generally accepted among economists. However, the economic impact assessment focuses on benefits for freight and, therefore, is not comprehensive.

By not focussing on the true economic benefits of the proposal the full economic impacts of the proposal have not been explored and the suggested mitigation measures are entirely simplistic, ill-conceived and inadequate, and benefits that might provide justification for the proposal have not been identified.

The economic impact assessment should be reviewed to include a comprehensive assessment of the impacts, and incorporating modelling, cost/benefit analysis, inclusion of opportunity costs and business case. These assessments will provide clarity and transparency. In the economic impact assessment that has been provided justification for the proposal is not apparent.

Social assessment

The social impact assessment satisfies some of the parameters for a social impact assessment but to no purpose (such as the community profile – it is there for some of the affected population groups but then not related to any of the (minimal) assessment).

All of the considerations within the assessment overlap with other documents dedicated to a singular topic and most are the usual planning impacts assessed in any planning assessment. The social impact assessment misses the fundamental aim of a social impact assessment, which is to:

Measure and manage social change processes invoked by the intervention (the proposal) with the aim of bringing about a more equitable and sustainable social/physical environment.

The focus should be on how this project will cause change in people's lives and should be on change for the better such as:

- Creating healthy built environments by encouraging people to walk, cycle and recreate more and use active transport (nothing in the report on healthy environments or living healthy lives).
- Improving equity - this project destroys one persons' amenity to improve someone else's amenity – that is not equitable. The impacts are likely to force those who can afford it to move and the area will be populated with lower income households and more vulnerable people who put up with the impacts (because they have to) and will suffer the consequences.
- Actually committing to helping people to manage the changes (in their lives) that will be caused by the project, rather than leaving it at suggestions (this help should be thought out and planned for implementation with the start of the project – which was long ago).

Other fundamental failings in the report:

- No scoping of the population groups who will potentially be affected – apart from the people whose land will be acquired (referred to as properties rather than people in the report) and a few social infrastructure (the people who use the social infrastructure are not mentioned,)

- No direct consultation with the people and population groups who will be directly affected (had they been appropriately identified) – would have been useful to ask them what they needed to manage the impacts on their lives
- Assessment of construction impacts – given these are normally temporary they are not expected to result in permanent changes to a persons' life and are not a normal part of social impact assessment unless there will be on going impacts on people's lives from the construction period. Construction impacts should be, and usually are, addressed by conditions of consent, and don't include measures that "manage social change processes"
- Assesses operational impacts (with focus on what are usual planning considerations) but does not assess how people's lives will be change by the project.

The main mitigation measures identified in the report are:

- Pay for independent land valuations (required by just terms legislation)
- Provide relocation support services (no commitment to doing this)
- Compensation and assistance being negotiated to find alternate locations for affected social infrastructure (what if alternate locations can't be found)
- Open space to be leased without alternatives – interruption to service may impact on people's lives.

By not directly consulting with the people and communities that will be affected (such as those who use the streets, parks, bus stops, social infrastructure and social networks/support) the full social impacts have not been explored and the suggested mitigation measures are entirely inadequate. The social impact assessment should be reviewed to include a comprehensive assessment of the social impacts, in consultation with affected people and communities, to identify positive impacts and better mitigation measures for negative impacts.

Chapter 16 - Contamination

The investigation undertaken and outlined with respect to contamination could only be considered a Preliminary Site Investigation as per the Guidelines for Consultants Reporting on Contaminated Sites (NSW EPA 2011). The scale of the proposal, lack of information about past activities, and known presence of contamination and contaminating processes over the entire project site warrant a Detailed Site Investigation prior to approval, and not deferred to a later stage.

Inadequate sampling for contamination

In some site areas there has been inadequate or no sampling undertaken. This is problematic as the area is known to have a long history of contamination and contaminating practices. The risk with inadequate sampling is that contamination may go undetected or the extent of contamination will be unknown. This is also an identified limitation of the EIS. In addition, the results have been used to justify classifying the vast majority of the spoil as VENM. Incorrectly classified spoil poses a risk to site workers, neighbouring residents, businesses and those at receiving landfill sites.

Despite the 'low risk' of contamination in residential areas, these areas pose a risk for high lead concentrations and the presence of asbestos and petrochemicals. Accordingly, any residential property proposed for acquisition for this project should have detailed contamination assessments prior to project approval.

A Detailed Site Investigation is required due to the limitations posed by few (or no) samples taken in most project areas. The results of this should inform areas for remediation or waste classification if required. This should not be deferred to later stages. Given this project is of a significant scale, the EIS should confidently provide an understanding of location and extent of contamination that can only be obtained by a Detailed Site Investigation that includes adequate sampling.

Failure to do this may result in incorrectly classifying waste or not remediating contaminated sites. This poses a risk to site workers, other users, neighbours and the environment.

Insufficient Laboratory Testing

The field testing for acid sulfate soils (PASS) showed evidence of further samples potentially being characterised as ASS according to the methodology described in section 3-5. It is recommended that more samples are tested for SPOCAS and Chromium Reducible Sulphur in the laboratory environment. In addition to this, Envirolab reports revealed exceeding levels of acceptable relative per cent difference (RPD) in some duplicate samples. Such results were deemed acceptable due to the non-homogenous nature of the samples. Such interpretation of results fail the quality control of the laboratory testing provided, as they do not represent accurate 'data representativeness' and 'completeness' of the measurements.

Dangerous Interpretation of Results

In most sites, varying levels of contaminants have been revealed, including heavy metals, petrochemicals and asbestos. In many samples, results that have exceeded guidelines have been ignored due to assumed 'background contamination'. While background contamination may be a factor for Sydney, it doesn't discount the human health and environmental implications for disturbing contaminated soil. When contaminated soils are disturbed they pose an environmental and human health, regardless of the source of contamination.

In just one example is the interpretation of the *in situ* waste classification for sample BH1353 (0.5 metres) where exceeding concentrations of benzo(a)pyrene were found. The interpretation of the EPA waste classification guidelines in Section 4-49 require further explanation.

In instances where contamination exceeds guidelines, appropriate remediation or waste classification should be undertaken as per the NSW EPA requirements. These should not be discounted with the assumption of background contamination.

Failure to correctly manage contamination poses significant risks to human and environmental health.

No plan to manage Acid Sulphate Soil (ASS)

The NSW EPA explicitly requires the EIS to provide an Acid Sulphate Management Plan. This has been deferred to 'prior to construction'. The detail provided is inadequate.

EIS identified potential for ASS at several locations with a low risk as a result of testing. Regardless of this, the ASS Management Plan should be included in this EIS.

A detailed ASS Management Plan should be prepared prior to project approval as per the EPA requirement.

An Acid Sulphate event resulting from this project may have significant ecological and economic impacts for communities in the Sydney Harbour catchment. This is the reason for the requirement to produce an ASS Management Plan for the EIS.

Limited Waste Classification produced

More detail is required to determine an appropriate waste classification and this is identified in the EIS as a limitation of the investigation. As previously mentioned, a Detailed Site Investigation is required to adequately determine a waste classification that is reliable. Significant human and environmental health implications may result from inadequately classified waste.

No management plans produced

Despite the limitations of the EIS and identified hazardous contamination, there have been no plans of management produced for environmental and human health. These are only suggested. This is an EPA requirement. More detail is required on how contamination risks will be managed instead of being deferred.

Significant risks have been identified, yet it is unclear if or how these will be managed.

Chapter 18 - Groundwater

Alteration to groundwater flow paths and tables are anticipated following construction of tunnels (5.5km long). The impact on the existing health of large trees which are dependent of groundwater has not been adequately considered. There may also be impact on groundwater dependent ecosystems in future when some of the existing lined channels are rehabilitated into natural sections.

Use of treated water

Seepage from the tunnels will be treated at a facility at Cintra Park, Concord and will be disposed of to the downstream creek. The treatment process should be adequate to allow reuse e.g. used for watering sporting facilities within Cintra Park and to meet the water demands of the transport infrastructure (i.e. the M4E).

Water quality

Drainage water from the proposed interchanges of the M4E will be collected and disposed of directly to the nearby creeks and channels. The EIS should have included options to treat the road runoff using bio-filter (or some treatment measures) prior to the discharge, in order to improve water quality.

Damage to riparian corridors

The existing riparian corridors of some creeks crossing the new works are likely to be damaged. These adverse impacts should be addressed (and/or mitigated) through the development of offset schemes for biodiversity corridors within these catchments.

Chapter 20 - Biodiversity

There are significant gaps and inadequacies in the methodology used and assessment of biodiversity impacts.

There was no consultation with local government regarding local biodiversity strategies or plans they or other landholders have adopted (e.g. Sydney Olympic Park).

Relevant historical biodiversity data held by local government, which is necessary to complete an effective and comprehensive assessment, was not considered.

Poor survey effort is demonstrated throughout the report and assumptions about local biodiversity have been made with little data to back them up.

There is a demonstrated lack of understanding of the importance of urban biodiversity throughout the report.

Cumulative impacts to all fauna, including Threatened Species, have been inadequately considered. A significant quantity (15.9 ha) of vegetation will be removed, including 12.9 ha of treed lands. The biodiversity impacts of this have not been adequately considered in either within this component or within the whole WestConnex project.

Removed trees should be reused in revegetation works to create habitat/bank stabilisation. This is not addressed in the EIS.

Chapter 21 - Greenhouse gas

EIS should address and minimise Scope 3 (indirect) emissions through sustainable supply chain management, including purchase of low carbon materials, emissions targets for contractors and enforced by competent contract management.

The comparison of operational road use emissions with the project should be extended to include other transport options such as those outlined in Chapter 4.2. This would provide a greater context of comparison.

Commentary should be included on the comparison of car versus public transport emissions and how the NSW Long Term Transport Master Plan objective to grow the proportion of travel by sustainable modes such as public transport as noted in the policy setting section (21.2.1) is being adhered to.

Figure 21.2 should be verified each year in the Annual Sustainability report as this project may encourage more people to drive instead of using alternative modes of transport.

Chapter 23 - Resource use and waste minimisation

The project will generate 2.4 million cubic metres of spoil. The EIS assumes that the majority of excavated spoil material would be uncontaminated crushed sandstone and shale, classified as virgin excavated natural material (VENM). This would generally consist of mixed size crushed rock, ranging from shale and sand to lumps of rock. This assumption is of major concern. (See further detail under *contamination*).

There is no detail about the management of asbestos and disposal sites. No assessment of volumes has been undertaken to determine if there is sufficient capacity at accepting facilities.

Heavy metals, hazardous materials including lead and asbestos may be in materials and soils. The EIS should include criteria for what will be tested and when (e.g. residential and commercial areas, historic landfill sites), as well as how this will be done.

The method of demolition of homes should have been addressed and is not. Deconstruction is the best option to maximise material recovery and minimise the potential impacts of asbestos and toxic materials.

Absence of a Spoil Management Plan

There will be 12,000 cubic metres of spoil with the rest of the material identified as fill (e.g. landscaping, barrier mounds, land reclamation, capping) and land restoration (e.g. filling of disused mines and quarries). The EIS states that a formal spoil management plan will be developed and documented for the project before tunnelling works begin. It should be stated who will review the spoil management plan.

A Spoil Management Plan should be developed in consultation with Councils and the community, and approval for the plan received prior to project approval.

Construction resource use

Huge volumes of materials are involved. The EIS suggests a weighting for local supply and sustainability outcomes (including recycled content over raw materials) in tendering for resources. These should be required as part of the project.

Chapter 24 - Climate change risk and adaptation

THE EIS does not adequately address the impact of the project on future climate change. This project should not be viewed in isolation but considered in reference to Australia's commitment to emissions reduction and Ecologically Sustainable Development as outlined in the *Protection of the Environment Administration Act 1991* (NSW) and the *Environment Protection and Biodiversity Conservation Act 1999*.

It is unclear how the adaptation options outlined in this chapter will be addressed in the detailed design.

Chapter 27 - Sustainability

The objectives of the WestConnex Sustainability Vision are supported. To achieve these:

Table 27.2 should specify what reporting standard the annual sustainability report will use.

Table 27.2 should use stronger language to ensure objectives are met. For example, contractors “must” (not “would”) implement actions in accordance with sustainability targets.

Conclusion

Marrickville Council is opposed to the WestConnex project on the basis that it is a poor solution to Sydney’s transport problems. Based on the evaluation within this submission, the current M4 East project (as a component of the broader WestConnex proposal), has not been adequately assessed particularly with regard to viable alternatives. Similarly, a satisfactory business case for such a significant level of public expenditure has not been made. Many of the proposed mitigation and management measures proposed within the EIS have also been shown to be unsuitable or inadequately justified for the project.

M4 East EIS Review

Draft Final Report

City of Sydney

October 2015



Independent insight.



This report has been prepared for City of Sydney. SGS Economics and Planning has taken all due care in the preparation of this report. However, SGS and its associated consultants are not liable to any person or entity for any damage or loss that has occurred, or may occur, in relation to that person or entity taking or not taking action in respect of any representation, statement, opinion or advice referred to herein.

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EXECUTIVE SUMMARY

First announced in 2012, WestConnex is a suite of projects, including the M4 Widening, the M4 East, the new M5, a M4-M5 Link, a Western Harbour Tunnel, the Southern Gateway (a link to the Illawarra), the Sydney Gateway (a link to the port and airport). Should all stages of WestConnex be completed it would be the largest continuous motorway in Australia.

The Environmental Impact Statement (EIS) for the M4 East was released on the 10th of September, 2015. The purpose of the EIS is to identify comprehensive mitigation and management measures that would be implemented to avoid, manage, mitigate, offset and/or monitor impacts during construction and operation of the project.

The M4 East EIS followed the release of the M4 Widening EIS in August 2014. These two documents and the Strategic Review and Transport Modelling of WestConnex prepared by SGS Economics & Planning and Veitch Lister Consulting comprise the only detailed public information on the potential impacts of WestConnex.

A review of the transport and socioeconomic sections of the M4 East EIS has highlighted a number of issues:

- The M4 East EIS mentions alternatives to the M4 East (public transport and freight rail improvements and demand management policies) but provides no information on the outcomes of these alternatives. It is merely stated that the M4 East is the best solution to the challenges facing the corridor.
- The M4 East EIS has assumed that all sections of WestConnex listed above (with the possible exception of the Western Harbour Tunnel)¹ are completed by 2031. Given the scale of building required and early stages of planning of many sections of WestConnex this creates project risks. If all sections are not completed simultaneously the traffic flowing from the M4 East will have adverse impacts on the inner west and central Sydney. The M4 East EIS has not addressed the risks in terms of the traffic and socioeconomic impact of the whole project.
- The M4 East is only evaluated post 2021 in combination with other WestConnex sections. There are risks that the M4 East will generate additional traffic that will only be addressed by other sections of WestConnex.
- The M4 East EIS itself acknowledges that the forecasted peak traffic patterns appear to be counter intuitive – westbound in the morning peak and eastbound in the afternoon peak. When compared to recent traffic trends in Sydney this outcome is hard to comprehend. The EIS explanation of this outcome is contrived and complicated and a more likely explanation is a miscalculation in the transport modelling.
- The origin and destination of the users of the M4 East is not explained in any detail within the M4 East EIS. Without this it is difficult to understand the impacts on the broad road network in eastern or western Sydney.

¹ The status of this project is not clearly defined in the M4 East EIS

- The M4 East EIS does not explain how toll levels and people's perception of tolls changes into the future. Given the impacts this can have on existing surface roads and the recent toll road failures in Sydney this appears a significant omission.
- Assumptions around the location, supply and cost of car parking (a key component of travel cost to eastern Sydney) is not explained by the M4 East EIS.
- The M4 East EIS documents make no reference to sensitivity tests, nor does the EIS list any results. It should be expected that in a project of this significance, the sensitivity of the model to various assumptions would be tested and potential alternative outcomes be tested in some detail. In particular, the sensitivities to the impacts on the road network of differing toll levels and land use changes along Parramatta Road would be significant.
- The transport model used by the M4 East EIS does not include public transport assignment or even public transport demand forecasting. The M4 East EIS provides no information about the impact on public transport demand, including whether tolls would induce some people to switch to public transport. Due to the lack of a mode split process in the transport modelling, the competing disbenefits of traffic congestion and rail crowding have not been tested for the EIS.
- The M4 East EIS inclusion of bus lanes along Parramatta Road, which are not part of the project (or Westconnex), does reduce road space and traffic flows assuming that traffic does in fact divert into the M4 East tunnel. Based on public information, when these bus lanes will be delivered is unclear.
- The implications of increased bus traffic along Parramatta Road into the Sydney city centre are not addressed by the M4 East EIS. How the central city road network will deal with increased bus traffic is unknown.
- The M4 East EIS avoided car crash benefit has been based on total daily vehicle kilometres travelled and average crash severity. However, crashes in the off-peak periods are likely to be much more severe (and therefore more costly) because of higher possible speeds. If more crashes along the corridor occur in peak period then the car crash benefit could be overstated.
- The absence of a long term modelling (for example 2041) from the M4 East EIS means that any longer term traffic or socioeconomic impacts are not being identified, mitigated or monitored.

The information contained in the EIS does not reduce any of the concerns around the adverse impacts previously raised in the Strategic Review and Transport Modelling of WestConnex prepared by SGS Economics & Planning and Veitch Lister Consulting. That is, WestConnex will not address the transport challenges being faced by Sydney in the future.

1 INTRODUCTION

The purpose of the Environmental Impact Statement (EIS) is to identify comprehensive mitigation and management measures that would be implemented to avoid, manage, mitigate, offset and/or monitor impacts during construction and operation of the project. The EIS for the M4 East section (see Figure 1) of WestConnex was released on the 10th of September, 2015.

FIGURE 1 WESTCONNEX ALIGNMENT (DECEMBER 2014)



Source: WestConnex Delivery Authority, 2014

The M4 East is a complex road project, with a number of key features, including:

- The widening and realignment of the M4 between Homebush Bay Drive and Underwood Road at Homebush.
- Construction of two 5.5 km three-lane tunnels extending from west of Underwood Road at Homebush to near Alt Street at Haberfield.
- The upgrade of the existing Homebush Bay Drive interchange connecting the western end of the M4 East to the existing M4 and Homebush Bay Drive.
- An interchange at Concord Road at North Strathfield/Concord. Access to the existing M4 to Concord Road would be maintained via Sydney Street.
- An interchange at Wattle Street (City West Link) at Haberfield.
- An interchange at Parramatta Road at Ashfield/Haberfield.

The M4 East will also interact with a number of other proposed projects, including a new M5, a M4-M5 Link, a Western Harbour Tunnel, the Southern Gateway (a link to the Illawarra) and the Sydney Gateway (a link to the port and airport).

The EIS is prepared as per the provisions made for environmental assessment of State Significant Infrastructure projects under Part 5.1 of the Environmental Planning and Assessment Act 1979. The Act stipulates that the EIS be prepared to provide assessment of all potential environmental issues identified during the planning and assessment of the project. The public exhibition of the EIS commenced on the 10th of September and has been extended until the 2nd of November due to its complex nature and missing information not included in the 10th of September release. The EIS focuses on the impacts, not the net community benefit of the proposed M4 extension.

This report provides a peer review of the material contained within the EIS and its supporting documents, with foci on the key transport outcomes and socio-economic narrative for the project.

2 IDENTIFIED ISSUES

This section presents a range of issues identified during the review. To highlight the various issues material has been drawn from the M4 East EIS and previous SGS Economics and Planning and Veitch Lister Consulting reports which examined the impact of WestConnex. These reports² are:

1. Strategic Review of the WestConnex Proposal: Final Report
2. WestConnex Transport Modelling: Summary report
3. WestConnex Transport Modelling: Technical report

No real analysis on assessment of alternatives to the M4 East

The M4 East EIS states a number of different alternatives to the project were considered but provides no information on the outcomes of these alternatives. These include:

- Improving the existing arterial roads, such as upgrading Parramatta Road, Victoria Road and/or alternative road corridors such as Patterson Street, Queens Road and Ramsay Road.
- Investing in public transport and freight rail improvements in isolation, without any improvement to the road network.
- Demand management policies which are intended to reduce individual trips and make alternative mode options more viable.

However, no real analysis of these options is presented. One would expect the type of analysis shown below on the topic of demand management to be considered by the M4 East EIS.

Demand Management Option Assessment

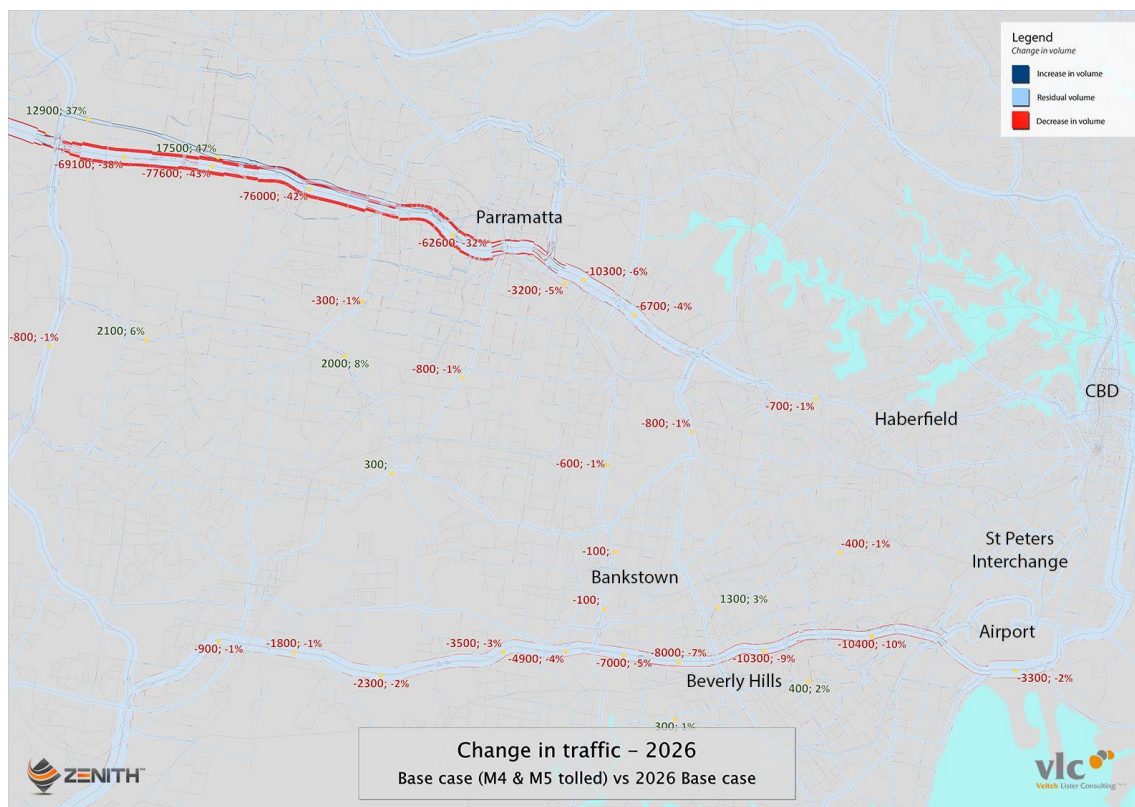
The Bureau of Transport Statistics has previously produced research drawing from Household Travel Surveys that shows there are still a number of discretionary trips being made in peak periods that could be shifted to non-peak times.

Rather than increasing road capacity by building new road infrastructure, congestion on the existing road network may be better managed through a new or updated price mechanism. The Zenith model shows a major driver of improved volume-to-capacity ratio on the M4 is the introduction of tolls. If this were desired, a reduction in usage could be achieved simply by tolling the motorway without upgrading. Figure 2 shows the impact of the introduction of tolls on the full length of the M4 and on the M5 East from Beverly Hills to Princes Highway in the base case (i.e. without WestConnex).

The model predicts a heavy reduction on the M4 (of about 40 per cent) and an increase on the Great Western Highway (of about 50 per cent). There will be a small reduction on Parramatta Road, mainly due to the reduction in traffic coming from the M7 via the M4. Other local roads will see a slight increase in traffic volumes.

² <http://www.cityofsydney.nsw.gov.au/council/news-and-updates/featured-articles/westconnex-wont-benefit-sydney>

FIGURE 2 IMPACT OF M4 AND M5 TOLLED (BASE CASE)



Source: Veitch Lister Consulting

Assumptions that all sections of WestConnex completed by 2031

The M4 East EIS is assessing a *Do something* compared with a *Do minimum* to understand the impacts of the M4 East. These two scenarios are defined below:

Do minimum: A future network scenario including the King Georges Road Interchange Upgrade and the M4 Widening projects and some upgrades to the broader transport network over time. However, this scenario does not include the M4 East or subsequent WestConnex projects. This represents the future conditions without the projected environmental assessment measure.

Do something: As per the 'do minimum', but with the project complete and open to traffic. Additionally, this scenario excludes subsequent WestConnex projects in 2021, but assumes all WestConnex projects are complete (including the Sydney Gateway and the Southern Extension) by 2031. This represents the operational impacts of the environmental assessment measure. It is unclear if the Western Harbour Tunnel is included in the *Do something*.

Future motorway extensions related to WestConnex (namely the Western Harbour Tunnel, Sydney Gateway and the Southern Gateway) are shown in Figure 3. Below is a brief summary of the status of each of the projects contained within the Do something scenario.

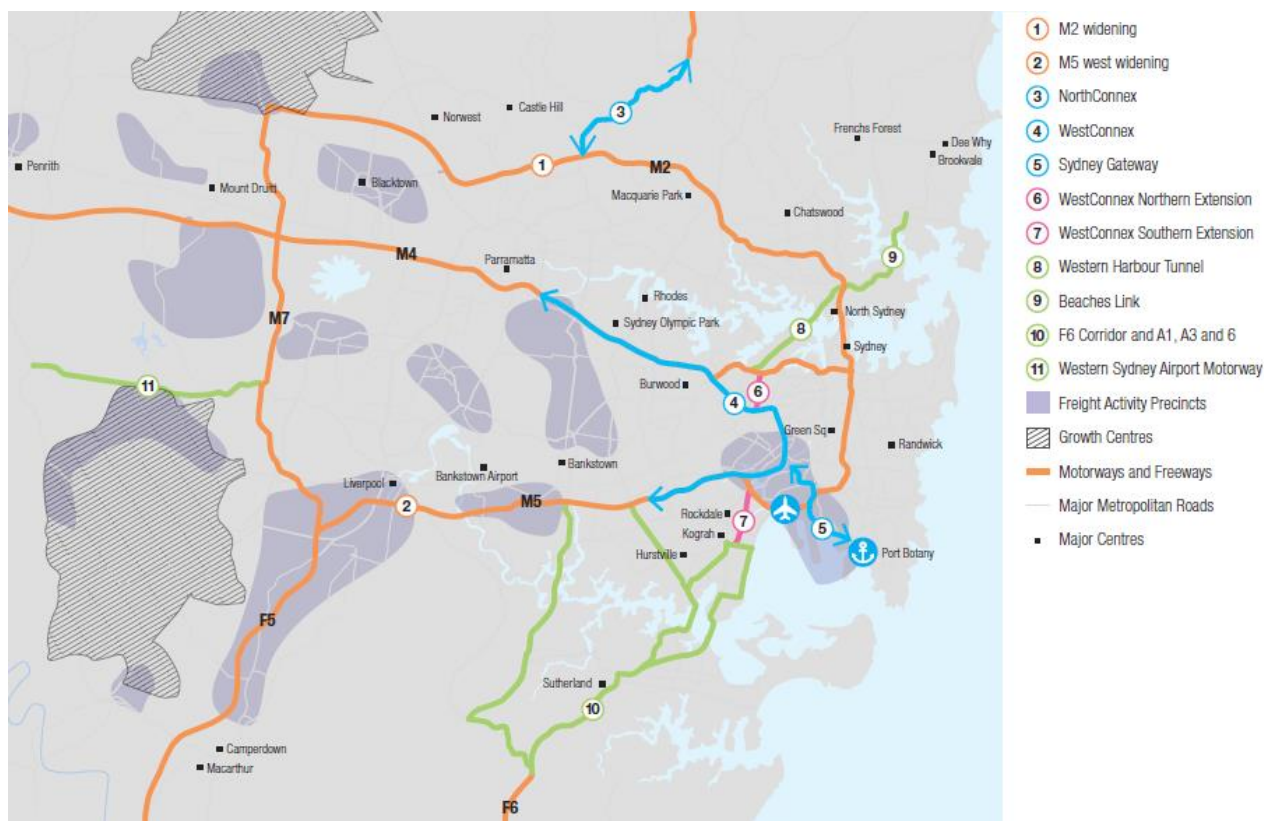
WestConnex Stage 2 – M5 East

The second stage of the WestConnex project, the construction of new tunnels on the eastern section of the M5 from Beverly Hills to St Peters, has commenced in part, with construction being undertaken on the upgrade of the Kingsgrove interchange of the existing M5. A commitment deed has been signed with

the selected joint venture between Leighton, Samsung and Dragados, though no contract has yet been signed for the completion of the work and an EIS has not yet been exhibited for the project.

WestConnex Stage 3 – M4 to M5 Link: The third stage of the WestConnex project, a link between the M4 and M5 extensions which comprise Stages 1 and 2 of WestConnex, has featured in several of the State's strategic documents, including the *State Infrastructure Strategy Update* (the *Strategy Update* 2014) and *A Plan for Growing Sydney* (2014). As yet there have been no detailed arrangements made for funding or construction of the project, nor has there been a specific alignment for the project produced, aside from broad indications of the location of interchanges and connections with other parts of the road network.

FIGURE 3 VISION FOR SYDNEY'S MOTORWAY NETWORK



Source: INSW, 2014 (adapted from TfNSW 2012)

Western Harbour Tunnel: The *Strategy Update* has identified that a third road harbour crossing is under investigation by the State Government as part of its strategic motorway planning program. It is undergoing investigation for the viability of the project, with the *Strategy Update* identifying that a business case should be prepared to assess the project in conjunction with or immediately after the delivery of the WestConnex Stage 3. At this stage there is no design or costing for this project.

Southern Gateway: The *Strategy Update* identifies that the government is undertaking detailed investigation as to the potential options for providing increased connectivity to the Sutherland Shire and Illawarra Regions via the A1 (Princes Highway), A3 (King Georges Road), A6 (Alfords Point Road) and F6 Corridors. The *Strategy Update* notes that substantial upgrades to these corridors are likely to be very expensive. The investigative study is yet to be completed. At this stage there is no design or costing for this project.

Sydney Gateway: The Sydney Gateway is identified in the *Strategy Update* only as an indicative alignment for which further investigation is required. It has also appeared in the 2012 *NSW Long Term Transport Master Plan*, as a potential alignment to be investigated for “enhanced Port Botany links”, with no detailed description being provided. At this stage there is no design or costing for this project.

Parramatta Road Bus Rapid Transit: *Sydney's Bus Future* (2013) identifies the implementation of Bus Rapid Transit infrastructure along Parramatta Road as a potential option for investment for investigation over the long term. The *Strategy Update* also reiterates the potential for a BRT line along Parramatta Road, dependent on its viability in light traffic conditions after the implementation of the various stages of WestConnex.

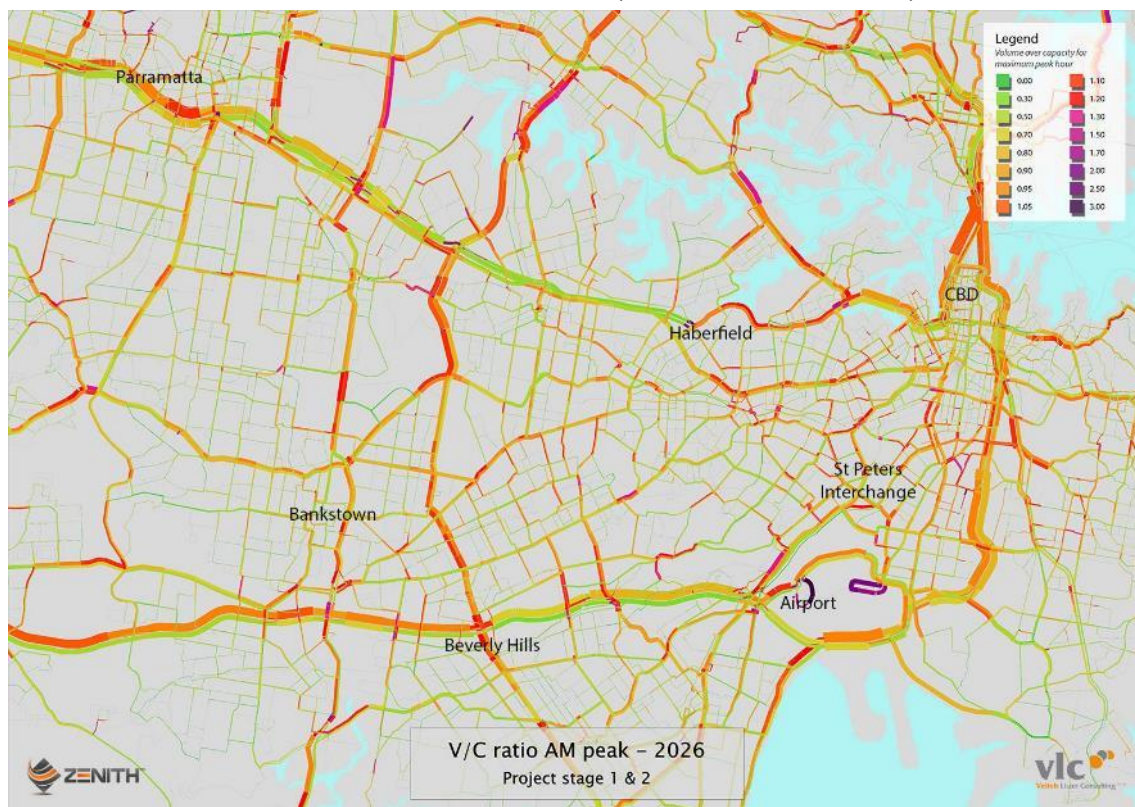
There is no detail in terms of the design of these projects presented in the EIS. For example:

... the proposed M4-M5 Link design is not yet defined and is yet to be endorsed. As a consequence, the functionality of a future CBD connection is not yet determined. Due to capacity constraints on the ANZAC and Sydney Harbour bridges the provision of this connection is not possible without an additional harbour crossing³.

Given the scale of building required and early stages of planning of many sections of WestConnex, expecting all sections to be completed by 2031 is somewhat ambitious. This creates project risks which the M4 East EIS should have considered. If all sections are not completed simultaneously the traffic flowing from the M4 East will have adverse impacts on the inner west and central Sydney.

Also any adverse impacts from the M4 East's opening in 2021 are not assessed by the M4 East EIS. **The** M4 East is only evaluated post 2021 in combination with other WestConnex sections. There are risks that the M4 East will generate additional traffic (see Figure 5) that will only be addressed by other sections of WestConnex.

FIGURE 4 VOLUME CAPACITY RATIO 2026 (PROJECT STAGE 1 & 2)



Source: Veitch Lister Consulting

Traffic conditions in the rest of Sydney will deteriorate quickly during the construction phase. This will continue after the completion of the M4 East (Stage 1) and M5 Stage 2. This deterioration will be alleviated in part when WestConnex Stage 3 is complete. The benefits of WestConnex accrue primarily

³ Volume 2A Appendix G Part 1 page 4-6

once the entire project has been constructed. At the completion of just Stages 1 and 2, roads in the inner Sydney area are more likely to be at capacity, as depicted in the map below.

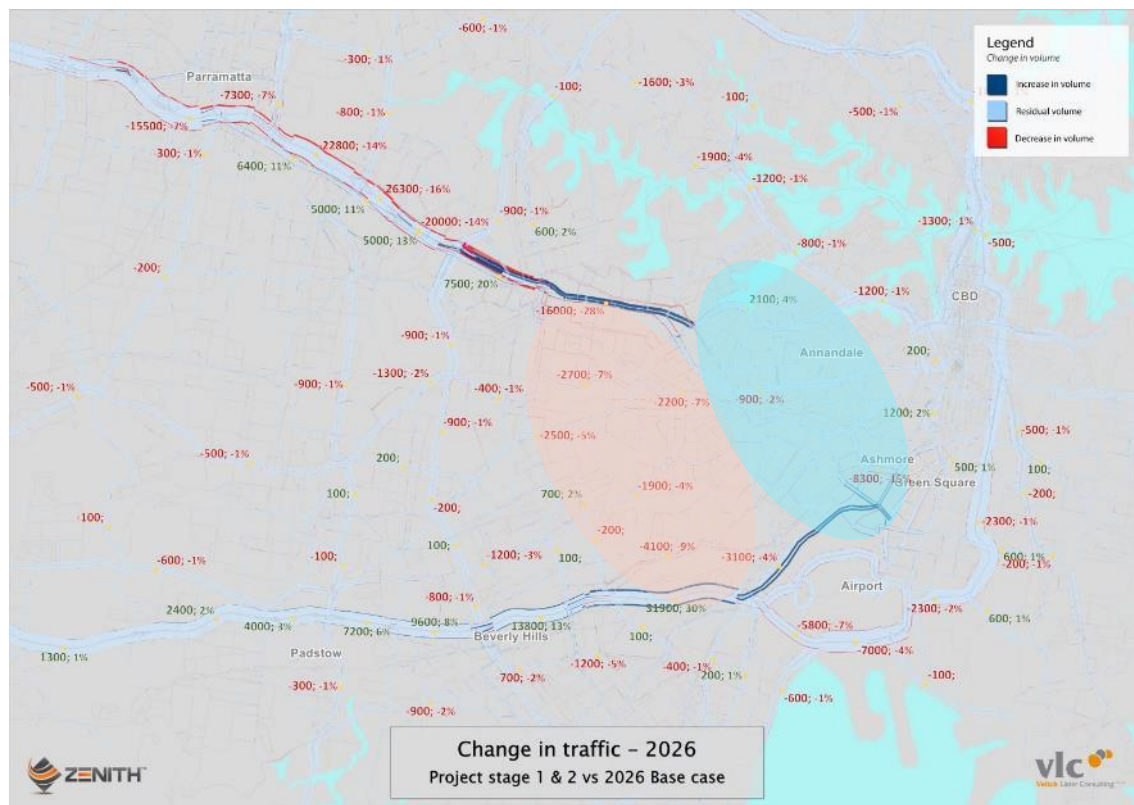
The M4 East EIS has not addressed the risks in terms of the traffic and socioeconomic impact of the project. Figure 5 provides an example of impacts which are not being considered by the EIS. Figure 5 shows the change in traffic volumes if only WestConnex Stage 1 and 2 are operational.

WestConnex Stage 1 and 2 create two distinct corridors on the local network (highlighted in Figure 5):

- the first one (in red) where the traffic volumes generally decrease by a small amount;
- the second one (in light blue), between Haberfield and St Peters precincts, where volumes generally increase.

There are risks that EIS should have identified around increased surface road traffic (and associated amenity and possible business impacts) which could result if Stage 3 of WestConnex is not completed at the same time as the M4 East.

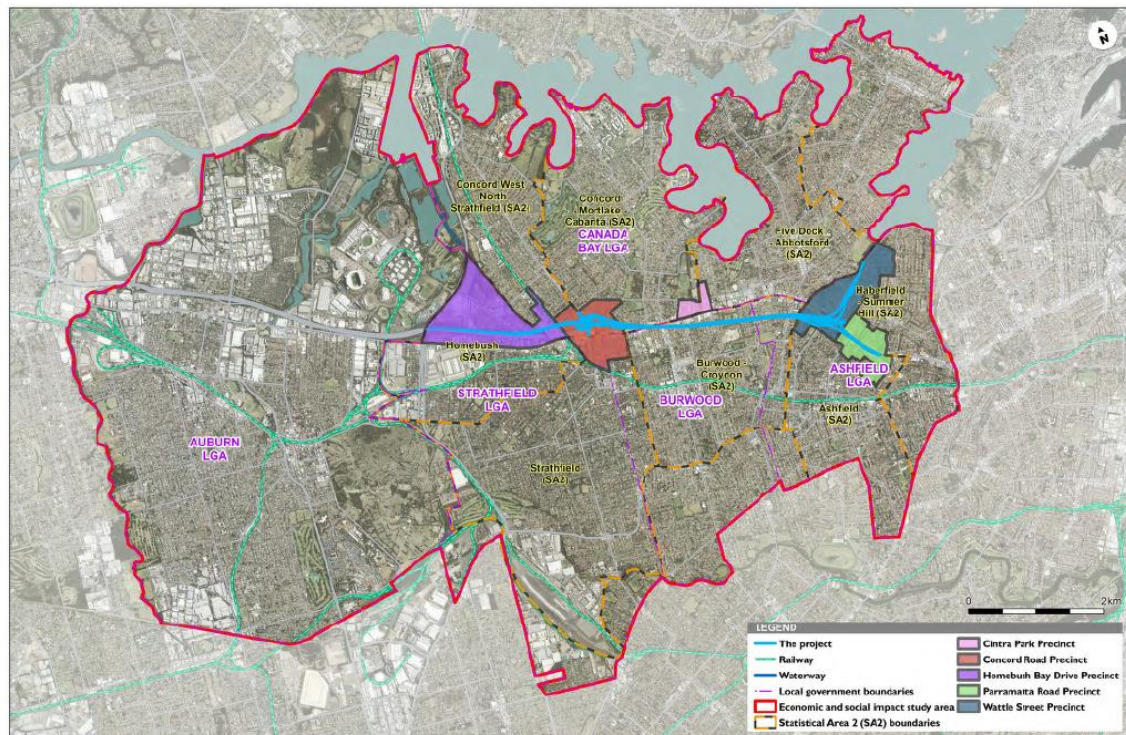
FIGURE 5 CHANGE IN VOLUMES 2026 (STAGE 1 & 2 VS BASE)



Source: Veitch Lister Consulting

It should be noted that the area impacted by the increase in traffic flows shown in the previous maps is outside of the study area for socio-economic impacts. This is despite the M4 East EIS stating that dealing with access to Sydney Airport and Port Botany, population growth and transport demand in Western Sydney is a key reason for the M4 East project.

FIGURE 6 M4 EAST EIS ECONOMIC & SOCIAL IMPACT ASSESSMENT STUDY AREA



Source: M4 East EIS

The forecasted peak traffic patterns appear to be counter intuitive

The M4 East EIS itself acknowledges that the forecasted peak traffic patterns appear to be counter intuitive. That is, westbound in the morning peak and eastbound in the afternoon peak. When compared to recent traffic trends in Sydney this outcome is hard to comprehend.

The following four reasons are provided on page 4-7 of Appendix G explaining why forecast traffic flows are higher in the off-peak direction than in the peak direction.

1. *The foundation of the future year traffic forecasts are the base matrices. These have been calibrated against existing traffic flows. However, on highly constrained transport corridors such as Parramatta Road, the flow across the stopline in the peak direction is actually lower than the counter peak, not because of lower demand, but because of road network constraints. Therefore the counter peak demand is accurately captured in the counter peak direction but flow rather than demand is captured in the peak direction*
2. *As these base matrices form the foundation of future demands, as population growth is factored in the counter intuitive peaks are retained*
3. *The induced demand method utilised is elasticity based and the magnitude is directly related to the original forecast demands which further skews the volumes in favour of the counter peak direction*
4. *The counter peak direction draws more traffic from parallel routes than the peak direction.*

The explanations provided in these bullet points are not coherent. The first bullet point argues that in highly congested road networks, flows across the stopline in the peak direction are lower because of road network restrictions. These road network restrictions are not identified.

In any case, it is difficult to understand why a lower demand in the peak direction is not captured correctly, when a higher demand in the off-peak period is captured correctly. This would impact the base year count, and therefore cause errors in the traffic origin destination matrix estimation. To know and

acknowledge that there are errors in the counts that distort the matrix estimation but not take actions to correct them seems highly inappropriate.

The second bullet point attributes the counter-intuitive direction demands to unbalanced base year counts, exacerbated by growth rates over 20 years to the forecast horizon. That is, the M4 East EIS appears to be suggesting that there is an error in the current traffic data which only grows into the future.

The third bullet point argues that the number of induced vehicles is proportional to the original traffic demand and is therefore higher in the counter-peak direction. This may be so at a trivial level (10 per cent of a big number is bigger than 10 per cent of a small number) but our understanding of the modelling procedure is that the induced trips were only applied to the project cases, not the base case, which is apparently being discussed here.

In any case, determination of induced traffic is the travel time elasticity of demand and so the elasticity should be dependent on the change in travel times, which are presumably lower for the more highly trafficked counter-peak direction than the peak direction.

The fourth bullet point argues that the counter-peak direction draws more traffic from parallel routes than the peak direction. This argument is not consistent with the fact that the counter-peak traffic flow is higher than the peak, therefore offering lower travel speeds than in the peak direction.

The arguments presented in the four bullet points are contrived and complicated. It is a much more likely and simple explanation that the traffic flows are the result of erroneous matrix estimation, the demographic growth patterns contained in the model or both.

In addition, the asymmetric tolling regime on the Harbour crossings and on the Eastern Distributor has reasonably far-flung ramifications on the road network. The ANZAC Bridge, for example, carries 10,000 vehicles per day more in the eastbound direction (into the CBD) than the westbound direction, a direct result of those who can avoid the southbound toll on the Harbour Bridge and Tunnel but using the toll-free northbound direction on the return trip. The M4 corridor was similarly affected, at least on its eastern sections.

Without a great deal of further investigation, it is difficult to assess whether the toll regime does, in fact affect the directional flow in the M4 East corridor.

The origin and destination of the users of the M4 East is not explained in any detail

The origin and destination of the users of the M4 East is not explained in any detail within the M4 East EIS. Without this it is difficult to understand the impacts on the broad road network in eastern or western Sydney.

For example, Figure 7 shows the WestConnex volumes and trip origins in the M4 East (Stage 1) and New M5 (Stage 2). Within the figures the bandwidths show the expected routes of WestConnex users, from where their trip originates to their final destination.

The size of the 'pies' is proportional to the number of trips originating in the travel zones that use WestConnex. The slices of the pies are coloured in the same way as the bandwidths. Trips made on WestConnex in a clockwise direction are coloured in shades of blue depending on the WestConnex section they access first; anticlockwise trips are coloured in shades of purple.

The results are:

Clockwise

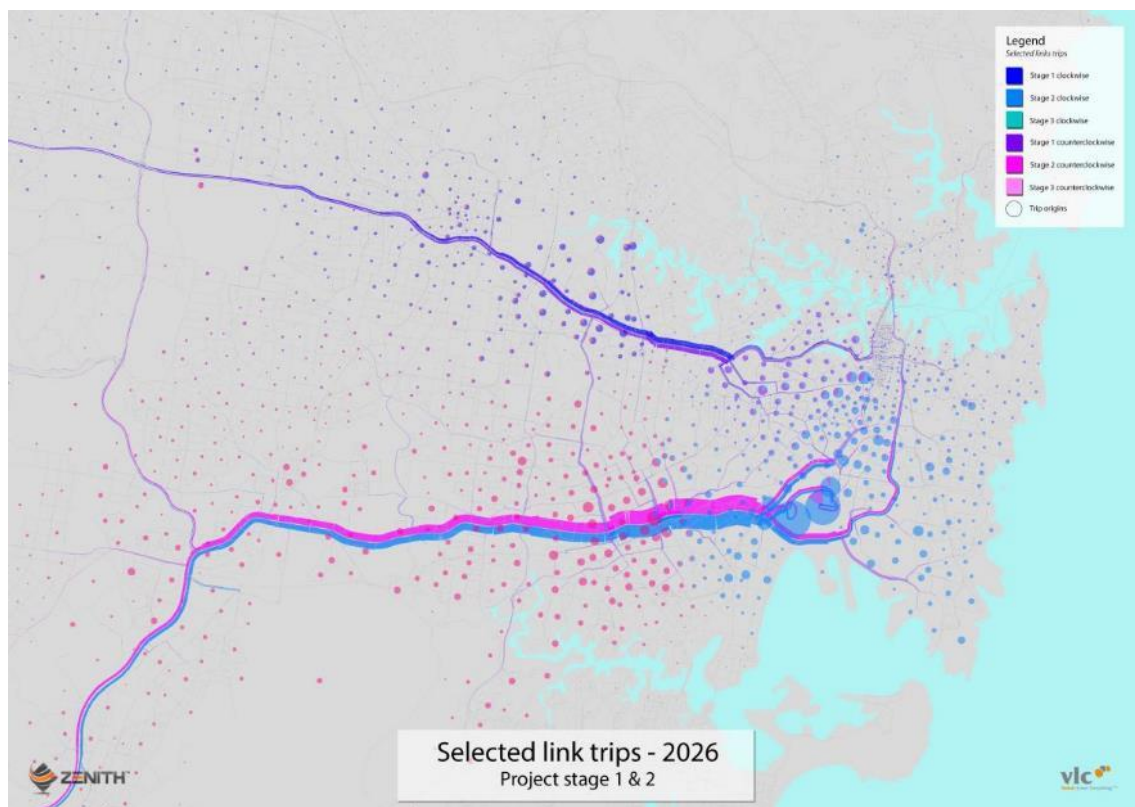
- Trips accessing WestConnex Stage 1 and travelling eastbound are coloured dark blue, even if they keep travelling on Stage 3 and 2,
- Trips accessing WestConnex Stage 2 and travelling westbound are coloured light blue,
- Trips accessing WestConnex Stage 3 and travelling southbound are coloured in a blue in between dark and light, even if they keep travelling on Stage 2.

Anticlockwise

- Trips accessing WestConnex Stage 1 and travelling westbound are coloured dark purple,
- Trips accessing WestConnex Stage 2 and travelling eastbound are coloured light purple, even if they keep travelling on Stage 3 and 1,
- Trips accessing WestConnex Stage 3 and travelling northbound are coloured in a purple in between dark and light, even if they keep travelling on Stage 1.

Figure 7 makes it clear that Stages 1 and 2 serve different markets. Stage 1 provides access to Parramatta and Haberfield, with vehicles at the end of Stage 1 at Frederick Street dispersing across the local network. Stage 2 serves mainly Sydney airport, Green Square and other eastern suburbs.

FIGURE 7 WESTCONNEX CATCHMENT 2026 (PROJECT STAGE 1 & 2)



This analysis highlights that there are risk from the project to other parts of Sydney road network which are not being considered by the EIS.

Toll levels and people's perceptions of tolls are not explained

The M4 East EIS does not explain how toll levels and people's perception of tolls changes into the future. Given the impacts this can have on existing surface roads and the recent toll road failures in Sydney this appears a significant omission. Assumptions around the location, supply and cost of car parking (a key component of travel cost to eastern Sydney) are not explained in the M4 East EIS.

It can only be assumed that the toll levels similar to those reported in the public documents (Table 1) have been used as reference to calculate the toll value on each WestConnex section:

- Stage 1: 55 c/km;
- Stage 2: about 45 c/km;
- Stage 3: about 50 c/km;
- With a toll cap of \$7.35.

TABLE 1 WESTCONNEX REFERENCE TOLLING SCENARIO

Stage	Indicative average toll (\$2013, incl GST)	Indicative min/max toll (\$2013, incl GST)
M4 Widening (Church Street to Homebush Bay Drive)	\$3.00	Min: \$1.50 Max: \$3.90
M4 East (Homebush Bay Drive to Parramatta Road and City West Link)	\$2.40	Min: \$2.00 Max: \$3.60
Stage 2 – M5 East Airport Link (Beverly Hills to St Peters)	\$2.70	Min: \$1.70 Max: \$4.80
Stage 3 – M4 South (Haberfield to St Peters)	\$3.00	Min: \$1.80 Max: \$4.10
WestConnex average toll	\$4.50	Min: \$1.50 Max: \$7.35 (cap)

Source: WestConnex Delivery Authority

Lack of sensitivity tests

The M4 East EIS documents make no reference to sensitivity tests, nor does the EIS list any results. It should be expected that in a project of this significance, the sensitivity of the model to various assumptions would be tested and potential alternative outcomes be tested in some detail. In particular, the sensitivities to the impacts on the road network of differing toll levels and land use changes along Parramatta Road would be significant.

For example, the East West Link – Eastern Section Business Case (a similar project to the M4 East) produced sensitivities based on the introduction of other potential road and public transport projects, alternative land use outcomes, and differing tolling schemes. These types of sensitivity tests are missing from the M4 East EIS.

Of particular interest is the lack of land use scenarios. The EIS states:

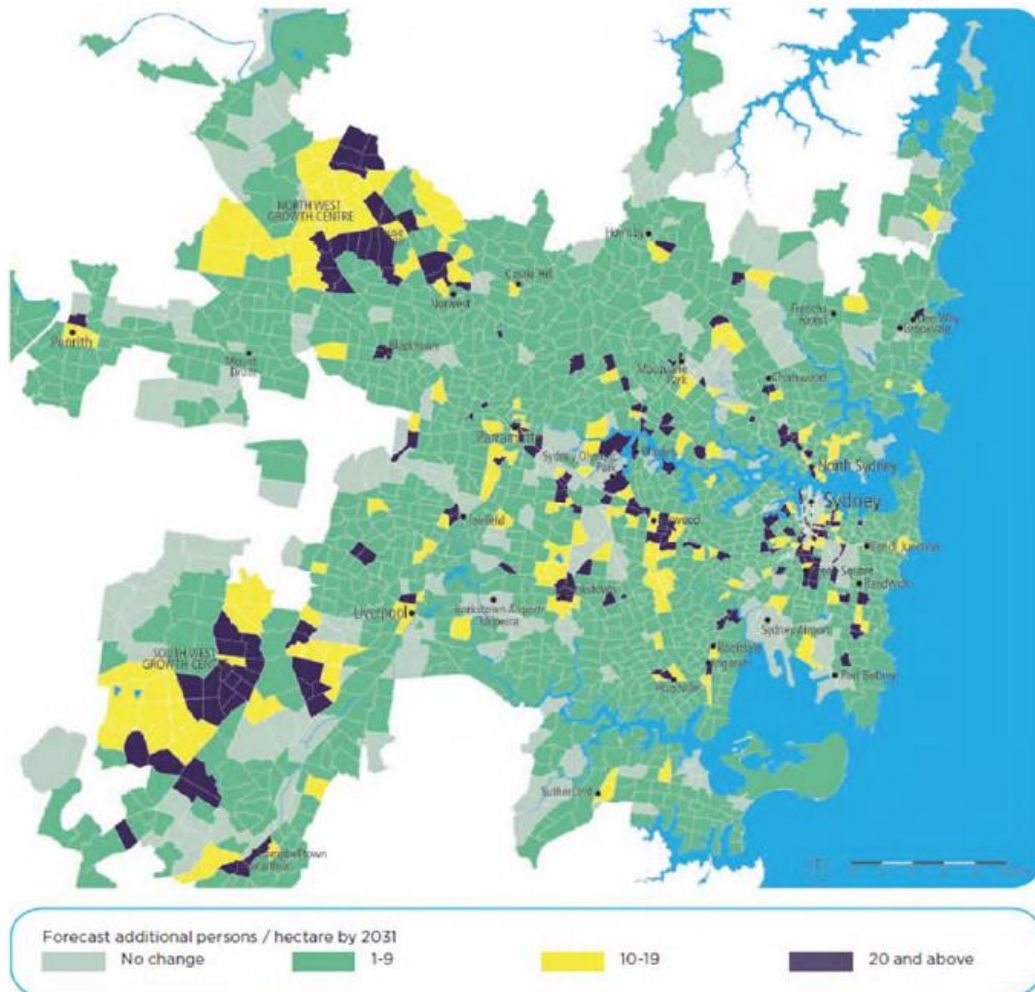
The project, as part of WestConnex, would act as a catalyst for urban revitalisation in the Parramatta Road corridor, which has the potential to significantly alter land use⁴.

But the standard land use projections shown in Figure 8 indicate that there would clearly be implications for travel demand along the Parramatta Road Corridor and M4 East if there were an additional 70,000 residents⁵ along Parramatta Road. Assessing this project risk should have been part of the M4 EIS.

⁴ Volume 1A page X

⁵ https://newparrard.com.au/wp-content/uploads/2015/10/150930_DPRUT_Strategy.pdf page 3

FIGURE 8 SYDNEY'S POPULATION GROWTH FORECAST (2011–2031)



Source: Transport Master Plan

Impacts on public transport

The transport model used by the M4 East EIS does not include public transport assignment or even public transport demand forecasting.

The M4 East EIS provides no information about the impact on public transport demand. That is, whether tolls would induce some people to switch to public transport. Due to the lack of a mode split process in the transport modelling, the competing disbenefits of traffic congestion and rail crowding have not been tested for the EIS.

The M4 East EIS inclusion of bus lanes along Parramatta Road, which are explicitly excluded from the project, does reduce road space and surface traffic flows, assuming that traffic does in fact divert into the M4 East tunnel.

The implications of increased bus traffic along Parramatta Road and travelling into the Sydney city centre are not addressed by the M4 East EIS. How the central city road network will deal with increased bus traffic is unknown.

It needs to be noted that text associated with Figure 3.2, page 3-2 of Appendix G of Volume 2-A of the EIS document, implies that public transport will be particularly crowded in the do-nothing case.

In fact, the volume capacity (VC)⁶ ratios provided in the figure show that there are no capacity issues with bus services, where the demand for transport will leave between 20 per cent and 50 per cent of the available seats unoccupied.

The train capacities in 2031 look worse than they are at 1.47 for the Macdonaldtown – Redfern link. The VC ratio in Figure 3.2 is based on a seated capacity and Sydney trains can accommodate double their seated capacity as a crush capacity (ie. up to a VC of 2). It should also be noted that the major CBD stations are just beyond Redfern, so that the forecast crowding occurs only for a short distance and travel time.

Because of the lack of a mode split process in the WestConnex modelling, the competing disbenefits of traffic congestion and rail crowding have not been tested by the M4 East EIS.

Longer term assessment

The absence of a long term modelling (for example to 2041) from the M4 East EIS means that any longer term traffic or socioeconomic impacts from the operation of the M4 East are not being identified, mitigated or monitored. As shown in the tables below the traffic along the corridor increase significantly (in most cases around 10,000 additional trips) between 2026 and 2041.

TABLE 2 EASTBOUND DAILY TRAFFIC VOLUMES (CLOCKWISE⁷)

Section	2026 base	2026 S123	2026 S123 % diff	2041 S123
M4 Church Street - James Ruse Dr	77,000	69,300	-10%	78,800
M4 James Ruse Dr - Silverwater Road	82,700	79,200	-4%	90,200
M4 Hill Road - Homebush Bay Dr	70,100	73,200	4%	84,400
M4 Homebush Bay Dr - Concord Road	54,300	43,900	-19%	50,600
Concord - Road Frederick Street		55,400		63,900

Source: Veitch Lister Consulting

TABLE 3 WESTBOUND DAILY TRAFFIC VOLUMES (COUNTERCLOCKWISE⁸)

Section	2026 base	2026 S123	2026 S123 % diff	2041 S123
M4 Church Street - James Ruse Dr	76,500	71,600	-6%	81,400
M4 James Ruse Dr - Silverwater Road	81,000	82,300	2%	93,400
M4 Hill Road - Homebush Bay Dr	70,900	75,900	7%	87,600
M4 Homebush Bay Dr - Concord Road	54,600	63,400	16%	76,400
Concord - Road Frederick Street		53,300		63,000

Source: Veitch Lister Consulting

Avoided car crash benefits

We draw attention to the fact that the M4 East EIS avoided car crash benefit has been based on total daily vehicle kilometres travelled and average crash severity. However, crashes in the off-peak periods are likely to be much more severe (and therefore more costly) because of higher possible speeds. If more crashes occur along the corridor in the peak period then the car crash benefit could be overstated.

⁶ The volume capacity (VC) ratio is a measure that reflects mobility and quality of travel along a transport link. It compares roadway demand (vehicle volumes) with roadway supply (carrying capacity). A VC of 1.00 indicates the roadway facility is operating at its designed carrying capacity. Above 1 is over capacity and below 1 is under capacity.

⁷ A journey starting at the western end of the M4 and travelling to the southwestern end of M5 along WestConnex

⁸ A journey starting at the southwestern end of M5 and travelling to the western end of the M4 along WestConnex

3 MODEL COMPARISON

In the previous section results from the comprehensive modelling of WestConnex from the Zenith model were used to interpret results from the M4 East EIS traffic model. This section presents a comparison of the various assumptions, inputs and outputs from the two transport models. While there are a range of differences the models appear to be producing a broadly consistent picture of traffic travelling along the M4 East. Before focussing on specific differences, there are some general observations to be made on the EIS processes and the document. These are discussed below.

The Modelling Process

The M4 East EIS Road Traffic modelling has:

- a) Extracted a base case road traffic trip matrix from Strategic Travel Model (STM)⁹;
- b) Refined the trip matrix through matrix estimation;
- c) Introduced induced trips into the project case using travel time elasticities of demand for travel by car;
- d) Forecast detailed volumes and turning movements by applying growth calculated from the difference in base year and future year to the base year values. The EIS document is not clear on how volumes and turning movements on new roads and intersections are estimated.

The M4 East EIS Road Traffic Model, a purely traffic assignment model, is then used to assign the trip matrix to the road network and to provide more detailed toll choice modelling than can be achieved within the capabilities of the STM.

The M4 East EIS Road Traffic Model process, while acceptable, includes many implicit assumptions, including that provision of significant transport infrastructure will not impact on growth rates of demand.

Zenith is a multi-modal, 4-step model and, in the modelling of WestConnex, has implemented all four steps within a single model. These differences will undoubtedly be the source of some of the differences between the M4 East EIS Road Traffic Model and Zenith forecasts.

Extent of Model

The Zenith Westconnex Model (ZWM) includes the Illawarra Region, the Central Coast and the Hunter Region. The STM, which provided the base case trip matrix, has roughly the same coverage as ZWM. The M4 East EIS Road Traffic Model, however, includes the Sydney Metropolitan Area only.

The major issue with the limited coverage is that the M4 East EIS Road Traffic Model has no mechanism to include route shifting between corridors. The most significant of these are the choice of route for travel between:

- Sydney Metropolitan Area and the Illawarra Region, where there is a choice between the Hume Highway and the F6;
- Sydney Metropolitan Area and northern areas of Central Coast and the Hunter Region, where there is the choice between the Princes Highway and the F2.

However, since these are reasonably remote from the M4 East corridor, it is unlikely that they will have a significant impact on the outputs of the models.

⁹ More information on the STM can be found here <http://www.bts.nsw.gov.au/Publications/Latest-publications/default.aspx>

Differences in the Models

We have identified several differences in the assumptions contained in the two models and the procedures that were used to provide forecasts of traffic demand. These are itemised below.

Network Coding

The alignment of M4 East in the M4 East EIS Road Traffic Model is located south of Parramatta Road. In ZWM it is north of Parramatta Road. This is unlikely to produce significantly different outputs.

The Eastern Portal Interchange: The M4 East EIS Road Traffic Model connects Westconnex to Wattle Street and Parramatta Road via long ramps. In Zenith, Westconnex is linked to the Wattle Street/Ramsay Street Intersection.

There may be minor differences in travel times as a result of this difference, but these should not be significant enough to result in major differences in assigned volumes.

The M4 East EIS states that some changes were made to the surface road network, including some turn bans. However, the changes have not been specifically identified in the document. In ZWM, the surface road network was unaltered.

The M4 East EIS Road Traffic Model includes bus lanes on Parramatta Road (thereby reducing capacity of these links in the model) while Zenith does not.

Mode choice

M4 East EIS Road Traffic Model uses elasticities to calculate induced traffic, which includes the shift from public transport to cars. ZWM contains mode split within the model.

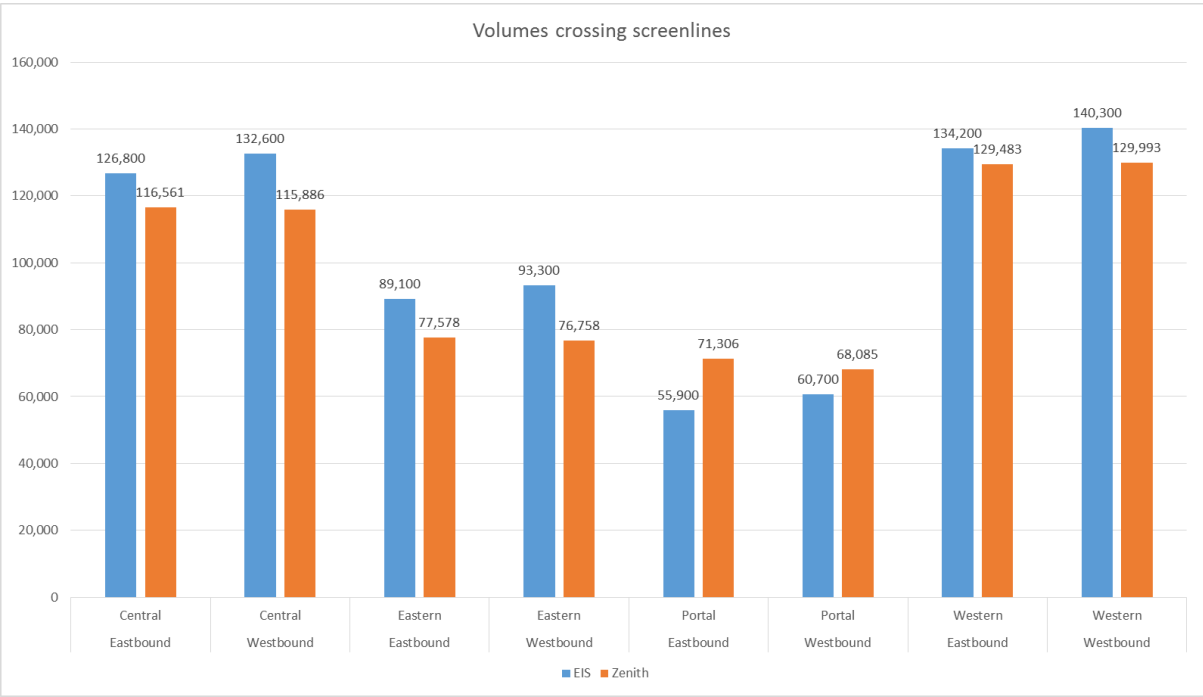
Tolls and Toll Strategy

The M4 East EIS does not explain how tolls and perceptions of them changes into the future (see page 13 for a possible tolling strategy used in the M4 East EIS). We understand from other sources that there is an assumption that income increases in real terms by 1 per cent per year. Zenith does take into account changes in perceptions of tolls and willingness to pay.

Direct Comparisons

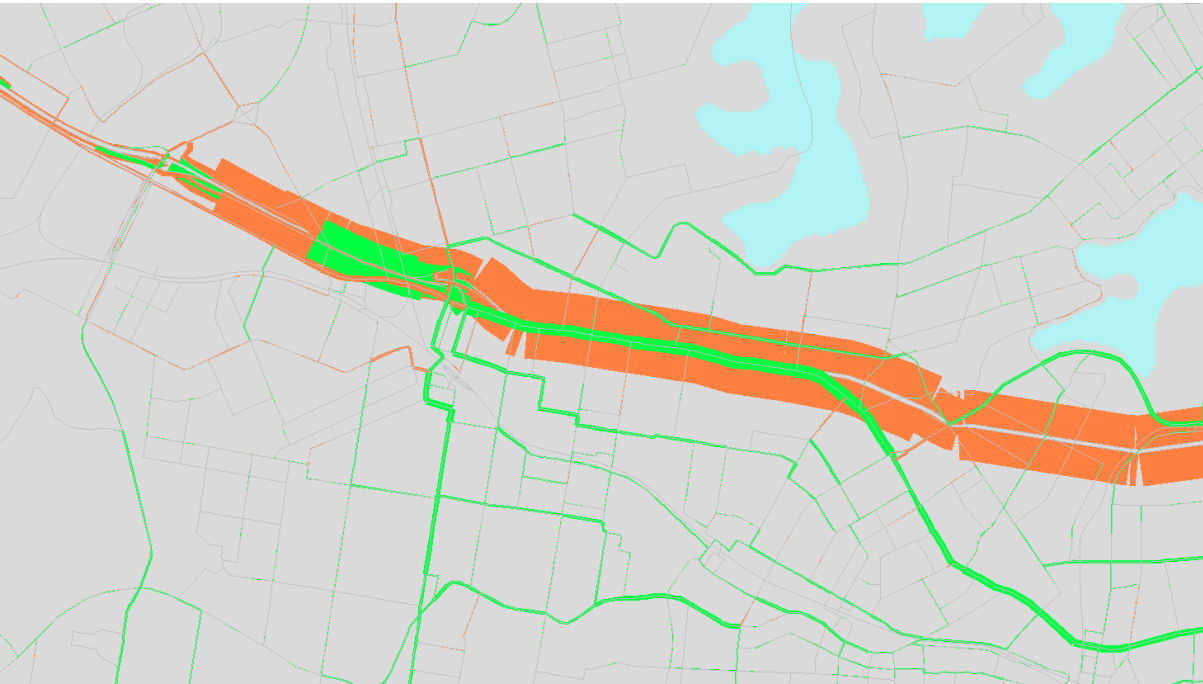
The figure below compares the volumes across the four screenlines out of the two models. The two sets of results are very similar. The figure below can be compared to Figure 8.2 in the EIS document. It shows that the forecasts of diversions to the new road infrastructure are consistent.

FIGURE 9 COMPARISON OF DO NOTHING AND PROJECT CASE FOR 2031



Source: Veitch Lister Consulting and M4 East EIS

FIGURE 10 ZENITH FORECASTS OF DIVERSIONS



Source: Veitch Lister Consulting

FIGURE 11 M4 EAST EIS FORECASTS OF DIVERSIONS



Figure 8.2 2031 AWDT Do something vs. Do minimum
WestConnex M4 East
WestConnex Delivery Authority
Traffic and Transport Assessment

8-4

Source: Veitch Lister Consulting

4 CONCLUSION

The purpose of the M4 East EIS is to identify comprehensive mitigation and management measures that would be implemented to avoid, manage, mitigate, offset and/or monitor impacts during construction and operation of the project. A review of the transport and socioeconomic sections of the M4 East EIS has highlighted a number of issues. Of most concern are:

- The M4 East EIS itself acknowledges that the forecasted peak traffic patterns appear to be counter intuitive – westbound in the morning peak and eastbound in the afternoon peak. When compared to recent traffic trends in Sydney this outcome is hard to comprehend. The EIS explanation of this outcome is contrived and complicated is likely due to a miscalculation in the transport modelling.
- Alternatives to the M4 East (public transport and freight rail improvements and demand management policies) are not assessed in any depth. The M4 East EIS merely states that the M4 East is the best solution to the challenges facing the corridor.
- The M4 East EIS has assumed that all sections of WestConnex listed above are completed by 2031. If all sections are not completed simultaneously, the traffic flowing from the M4 East will have adverse impacts on the inner west and central Sydney. The M4 East EIS has not addressed the risks in terms of the traffic and socioeconomic impact of the project.
- The M4 East EIS does not explain how toll levels and people's perception of tolls changes into the future. Given the impacts this can have on existing surface roads and the recent toll road failures in Sydney this appears a significant omission. Assumptions around the location, supply and cost of car parking (a key component of travel cost to eastern Sydney) is not explained by the M4 East EIS.
- The M4 East EIS documents make no reference to sensitivity tests. It should be expected that a project of this significance, the sensitivity of the model to various assumptions and potential alternative outcomes would be tested in detail. In particular, the sensitivities to the impacts on the road network of differing toll levels and land use changes would be significant.
- The transport model used by the M4 East EIS does not include public transport assignment or even public transport demand forecasting. Due to the lack of a mode split process in the transport modelling, the competing disbenefits of traffic congestion and rail crowding has not been tested for the EIS.
- The implications of increased bus traffic along Parramatta Road into the central city are not addressed by the M4 East EIS. How the central city road network will deal with increased bus traffic is unknown.
- The absence of long term modelling (for example to 2041) in the M4 East EIS means that any longer term traffic or socioeconomic impacts are not being identified, mitigated or monitored.

The information contained in the EIS does not reduce any of the concerns around the adverse impacts previously raised in the Strategic Review and Transport Modelling of WestConnex prepared by SGS Economics & Planning and Veitch Lister Consulting. That is, WestConnex will not address the transport challenges being faced by Sydney in the future.

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Leichhardt and Marrickville Councils

c/o Marrickville Councils

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Petersham

NSW 2049

Attention: Kendall Banfield

19 October 2015

Ref: 4358RepLet02.odt

Dear Kendal

RE: INDEPENDENT PEER REVIEW - APPENDIX H, AIR QUALITY ASSESSMENT, WESTCONNEX M4 EAST AIR QUALITY ASSESSMENT

This letter report presents the outcome of an independent expert review of the Air Quality Impact Assessment (Appendix H) of the Westconnex M4 East Environmental Impact Assessment. The independent peer review represents an impartial, independent review that has been based on knowledge and experience of current practices, procedures and information. The views expressed in the report are those of the reviewer, hence may not represent those of the client, however both Marrickville and Leichhardt Council have had the opportunity to review and comment on the review prior to finalisation.

The expert review has considered all aspects of the Appendix H Air Quality Assessment. In particular, as per the brief provided by Marrickville and Leichhardt Councils and the scope of work agreed for this peer review, the following issues have been specifically commented on in this report:

- The adopted methodologies for the air quality assessment and their suitability in the context of the project information.
- The suitability of the inputs and assumptions underlying the air quality modelling and the traffic scenarios considered in the modelling. In particular, ventilation rates (efflux velocity) and temperature of emissions have been reviewed in the context of the influence on dispersion, and emission rates.





- The suitability of the meteorological datasets prepared for the atmospheric dispersion modelling.
- The adequacy of local background air quality data utilised in the assessment of cumulative (project plus background) impacts.
- The adopted air quality goals and health risk standards, and suitability for assessment of the risk of impacts.
- The suitability of the proposed in-tunnel and external monitoring methodologies for determining compliance with typical approval conditions (referencing the NorthConnex approval as a primary example) and external ambient air quality goals.
- Whether the assessment has been completed in a manner that is consistent with the analysis and recommendations of the Advisory Committee on Tunnel Air Quality.
- The suitability of the assessment methodologies adopted for the construction air quality assessment, including review of the modelling inputs and assumptions.
- The overall predicted cumulative impact from the project, in conjunction with existing background and emissions from future stages of the WestConnex project. A particular focus will be the proposed co-location of the eastern ventilation stack with the WestConnex Stage 3 ventilation stack.
- The expected impact on the Marrickville and Leichhardt Local Government Areas both for the overall cumulative project impacts.
- The overall conclusions of the assessment and how robust these conclusions are based on the review of the methodologies and assumptions.
- The appropriateness of proposed mitigation strategies, and identification of any additional mitigation measures or controls that could further reduce the potential exposure of the local population to air pollution emissions from the project.

The Peer Review Team

This peer review has been completed by Air Noise Environment personnel with extensive experience in completing air quality impact assessments of major infrastructure projects, and road tunnels in particular. The review team comprised the following personnel:

- Principal Consultant: Claire Richardson, BSc(Hons), MAAS.
- Technical Director: Craig Beyers, BEng(Env), MAAS.
- Senior Environmental Engineer: Samuel Wong, BEng(Chem), MAAS.

This team has been involved in air quality assessment of the majority of tunnel projects completed in Australia over the last 20 years, including the following:

- Clem7 Tunnel (Brisbane)
- Cross City Tunnel (Sydney)
- Lane Cove Tunnel (Sydney)



- West Connex Stage 2b (bid phase)
- M5 East duplication (bid phase)
- East-West Link (Melbourne)
- Airport Link Northern Busway (APLNB), Brisbane
- EastLink Motorway (Melbourne)
- M5 East Motorway (Sydney)

The ANE team, in conjunction with Holmes Air Sciences, was also responsible for leading the development of a guideline for the monitoring, modelling and assessment of air quality impacts for road and tunnel projects in NSW on behalf of the NSW RTA.

The project team has expertise in air quality and meteorological modelling, including the use of the GRAL model adopted for use in the M4 East Air Quality Assessment.

Structure of the Review

The review information is presented in three ways. Firstly, comments on the questions identified in the scope of work are addressed in Attachment A. Secondly, specific comments are tabulated in Attachment B in a format that will allow cross-referencing with the relevant sections/pages in the Environmental Impact Assessment documentation. Finally, overall analysis and conclusions are presented in the main body of this letter report, based on a broader synthesis of the more detailed information presented in Attachment B.

Overall Analysis and Comment

Overall, it is considered that the Air Quality Assessment presented in Appendix H of the West Connex M4 East Environmental Impact Assessment presents an in depth, high quality analysis of the air quality issues associated with this major project. As with any project of this complexity, there are numerous uncertainties associated with the analysis of potential impacts, and the Air Quality Assessment has sought to address these in a thorough, scientifically sound manner.

The additional analyses has included further developing current methodologies in an attempt to improve the assessment of specific aspects, particularly where approaches used in the past have been less than ideal. Whilst these attempts to develop improved methodologies are an important step in developing our understanding of the impacts of complex infrastructure projects, there are inherent risks in the application of methodologies that have had limited application to tunnel projects in the past. This has resulted in some specific issues that have not been satisfactorily addressed in the Air Quality Assessment. These issues relate primarily to the inability of the dispersion modelling methodology (GRAM/GRAL model) to consider:

- building downwash effects;
- data from multiple meteorological stations;
- hourly time varying emission rates;
- time varying emission temperatures; and





- limitations on the number of receptors where predicted impacts can be considered in detail.

The assessment report has sought to address these limitations through sensitivity analysis and verification of the datasets used. However, these factors combine to introduce significant uncertainty to the predicted concentrations for the predicted short term nitrogen dioxide concentrations.

These effects are likely to be most apparent for the dispersion of emissions from the ventilation stations. The estimates for variability presented in the assessment confirm +/- 50 % variability each for building downwash and emission temperature for 24 hour average predicted concentrations. Additional uncertainty would be added to the predicted impacts of the ventilation stations as a result of the smoothing of hourly emission rates, as these uncertainties relate to 24 hour average data. This could result in predicted non-compliances at a number of additional receptors in close proximity to the ventilation outlets. There is also variability introduced due to the use of a single meteorological station that is located in the centre of the overall WestConnex modelling domain, as opposed to stations in closer proximity to the M4 East, for the prediction of the meteorological data used in the GRAL modelling.

The overall uncertainty associated with the modelling predictions is considered to be significantly reduced for the road related emissions. It is important to recognise that road traffic emissions are the overwhelmingly dominant source in the modelling domain. Similarly, the additional uncertainties are likely to be reduced for the pollutants with longer averaging times (CO, PM₁₀ and PM_{2.5}) and are most significant for predicted 1-hour average nitrogen dioxide concentrations.

The adopted methodology does not satisfy all of the requirements of the 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' however, the Air Quality Assessment report does not confirm that the NSW EPA has approved the alternative assessment methodology that has been adopted. Confirmation should be sought from NSW EPA to confirm that the GRAM/GRAL modelling methodology is acceptable.

One of the issues identified in the review relates to a factor that is unique to this assessment. This is the co-location of two ventilation outlets with differing characteristics – height, volumetric flow, temperature and emission concentrations. Combining the two ventilation outlets is an option that would address these issues and could yield savings in terms of energy costs and routine emission monitoring. However, assuming that this option has already been considered and rejected, it is recommended that computational fluid dynamics of the interaction of the two ventilation outlets is completed to accurately assess the dispersion of pollutants from the two ventilation outlets.

A further area of significant relevance to the air quality outcomes of this project relates to the potential for the traffic volumes for the project to differ markedly from those considered in the Air Quality Assessment. As noted in the EIS, history demonstrates that operational traffic volumes through road tunnels can differ markedly from those projected at the design phase. In many cases traffic volumes are lower (Cross City Tunnel, Clem7, Airport Link, for example). In some cases, traffic volumes are higher and the traffic mix differs significantly from the original projects. The M5 East Motorway tunnel is an example of this issue. The EIS has attempted to address this by considering a worst case scenario, whereby it is assumed that the emission concentrations from the tunnel ventilation outlet are equivalent to the licence limits imposed on the NorthConnex ventilation outlets.





However, the 'worst case' assessment presented in the Air Quality Assessment does not consider the maximum emission rates (in g/s), hence the worst case scenario is not in fact considered. Furthermore, a peak congested scenario has not been considered in the air quality assessment. It is considered that these scenarios should be modelled/remodelled.

Additional specific issues that have been identified in the review, and warrant further consideration, are as follows:

- completion of a quantitative construction air quality assessment, focussing on the risk of particulate impacts and including the potential for release of crystalline silica;
- low efflux velocity for ventilation outlets at night, with potential for stack tip and building downwash issues to be enhanced;
- necessity of incorporating portal emission monitoring if a condition requiring no portal emissions is imposed;
- provision of dampers in the western ventilation outlet to allow for varying outlet diameters.

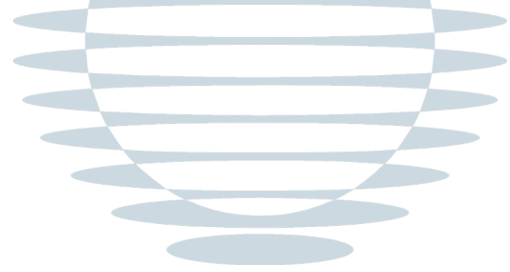
Overall Conclusions

The Air Quality Assessment predicts compliance with the air quality goals for the majority of pollutants. The short term predicted non-compliances are related principally to road traffic emissions, and these impacts are also present for the existing environment. Overall reductions in pollutant impacts are predicted for the majority of receptors.

Providing the issues identified in this review are addressed, and the conclusions of the Air Quality Assessment do not change significantly as a result, it is concluded that the local and regional air quality as a result of the Westconnex M4 East project is not likely to be detrimentally affected to a significant degree.

Disclaimer

This document has been prepared with all due care and attention by professional environmental practitioners according to accepted practices and techniques. This document is issued in confidence and is relevant only to the issues pertinent to the subject matter contained herein. Air Noise Environment Pty Ltd holds no responsibility for misapplication or misinterpretation by third parties of the contents of this document. If this document does not contain an original signature, it is not an authorised copy. Unauthorised versions should not be relied upon for any purpose by the client, regulatory agencies or other interested parties.



Where site inspections, testing or fieldwork have taken place, the report is based on the information made available by the client or their nominees during the visit, visual observations and any subsequent discussions with regulatory authorities. The validity and comprehensiveness of supplied information has not been independently verified and, for the purposes of this report, it is assumed that the information provided to Air Noise Environment Pty Ltd is both complete and accurate. It is further assumed that normal activities were being undertaken at the site on the day of the site visit(s).

Yours sincerely

for Air Noise Environment Pty Ltd

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Principal Consultant





Attachment A
Response to Questions Raised in Brief and Scope of Work

Issue	Peer Review Comments
The adopted methodologies for the air quality assessment and their suitability in the context of the project information.	The adoption of an alternative meteorological and dispersion modelling package (GRAM and GRAL) has introduced some limitations in the assessment methodology, relative to the current approved regulatory models. Whilst the NSW EPA Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales does not preclude the use of alternative air quality models, the Air Quality Assessment does not confirm that the NSW EPA were approached regarding the suitability of the model for this assessment. The GRAM/GRAL model does not contain features necessary for addressing a number of the requirements of the NSW Approved Methods for the M4 East project. These include building downwash, prediction of hourly cumulative receptor concentrations (this has been completed for averaged emissions over 3 periods a day only, not by hour, due to computational limitations), and consideration of site specific meteorology (a single meteorological dataset has been incorporated to represent the overall WestConnex project area). The GRAM/GRAL model provides an approach that allows consideration of road emissions and ventilation emissions in a single model. The latest version of the approved regulatory model CALPUFF/CALMET (V7 released in June 2015) provides this feature, however prior to release of V7 summation of predictions from two different models (for example, CALINE4 and CALPUFF) would have been required to complete analysis of the roads and ventilation outlets. Due to computational limitations, use of the GRAL model for the M4 East assessment also limits the number of discrete receptors that can be considered in detail.





Issue	Peer Review Comments
	Specific comments on the modelling approach are provided in Attachment B.
The suitability of the inputs and assumptions underlying the air quality modelling and the traffic scenarios considered in the modelling. In particular, ventilation rates (efflux velocity) and temperature of emissions will be reviewed in the context of the influence on dispersion, and emission rates.	Specific comments are provided in Attachment B.
The suitability of the meteorological datasets prepared for the atmospheric dispersion modelling.	The meteorological dataset has been prepared to represent the WestConnex project as a whole, and is based on Bureau of Meteorology data for Canterbury Racecourse. This approach results in the meteorological dataset poorly representing the specific meteorological conditions for the M4 East project (as indicated by the relatively poor correlation between the predicted meteorology at Sydney Olympic Park and Rozelle) although the broader annual trends at these locations appears to be well represented (as demonstrated by the cumulative frequency comparisons in Appendix H – Meteorological data analysis and model evaluation). The adoption of the GRAM and GRAL model for the meteorological and dispersion modelling is the reason for the assimilation of only a single observational meteorological dataset. Had one of the currently approved regulatory models, such as CALMET and CALPUFF, been adopted in the assessment, numerous meteorological dataset could have been incorporated. This may have improved the performance of the meteorological modelling, possibly to a significant degree.
The adequacy of local background air quality data utilised in the assessment of cumulative (project	Background air quality data has been compiled from existing ambient monitoring stations operated by the NSW EPA in the vicinity of the project. The data has been analysed and compared, and the approach adopted for



Issue	Peer Review Comments
plus background) impacts.	selection of the background air quality monitoring dataset for use in the cumulative assessment is considered acceptable. It is noted that the cumulative impact assessment has summed the contributions of the local roads, the ventilation outlets and existing background air quality. This introduces conservatism, as the existing background air quality will be largely defined by the existing road traffic emissions. In addition, background contributions in the 'fresh' air drawn into the tunnel for maintenance of in-tunnel air quality is considered in the ventilation calculations. This adds conservatism to the vent outlet modelling, as the existing background concentrations are added again as part of the cumulative impact assessment. These approaches are likely to over estimate the influence of existing background concentrations, hence it is concluded that a conservative approach has been adopted with respect to the influence of existing background concentrations on the cumulative predictions.
The adopted air quality goals and health risk standards, and suitability for assessment of the risk of impacts.	The air quality goals and criteria adopted in the Appendix H Air Quality Assessment are consistent with the current requirements in NSW and the Commonwealth. In addition, proposed national standards for particulates have been considered. The authors of the Air Quality Assessment have also discussed the issue of ultra fine particles and the use of particulate numbers as an assessment approach. Due to the absence of criteria and goals, and the fact that ultrafines are considered in the Air Quality Assessment as PM_{2.5} includes this size fractions, the Air Quality Assessment has not assessed this issue further. This approach is considered acceptable given the current lack of defined air quality goals and standards for ultra fine particles measured by particle number.
The suitability of the proposed in-tunnel and external monitoring methodologies for determining compliance with typical approval conditions	The proposed monitoring methodologies have not been identified in the air quality assessment. The methodologies would generally be identified in a condition of approval (for example, refer to NorthConnex Instrument of Approval E10). Therefore, the fact that the monitoring requirements are not defined in the Air



Issue	Peer Review Comments
(referencing the NorthConnex approval as a primary example) and external ambient air quality goals.	Quality Assessment is not considered to be a significant omission. It is noted that, if zero portal emissions is to be a condition of approval, this would require monitoring in the outbound portals.
Whether the assessment has been completed in a manner that is consistent with the analysis and recommendations of the Advisory Committee on Tunnel Air Quality.	The Advisory Committee on Tunnel Air Quality made three recommendations in the Interim Report published in July 2014. These relate to completion of further research and assessment of the following key issues: - portal emissions - in-tunnel nitrogen dioxide limits - in-tunnel nitrogen dioxide monitoring The air quality assessment does not consider portal emissions, and assumes that there will be a requirement for no portal emissions as per previous tunnel projects in Sydney. The air quality assessment makes reference to existing in-tunnel nitrogen dioxide goals. Monitoring methods are not specified, however, this would generally be defined in the conditions of approval and not necessarily at the EIS stage. Eleven Technical Papers were prepared to support the Interim Report of the Advisory Committee on Tunnel Air Quality. These present that state of knowledge relating to tunnel related air quality, and do not make specific recommendations.
The suitability of the assessment methodologies adopted for the construction air quality assessment, including review of the modelling inputs and	The construction air quality assessment has not adopted a quantitative approach, and has not included air dispersion modelling of potential impacts.





Issue	Peer Review Comments
assumptions.	
The overall predicted cumulative impact from the project, in conjunction with existing background and emissions from future stages of the WestConnex project. A particular focus will be the proposed co-location of the eastern ventilation stack with the WestConnex Stage 3 ventilation stack.	Specific comments on the approaches adopted in the modelling are presented in Attachment B.
The expected impact on the Marrickville and Leichhardt Local Government Areas both for the overall cumulative project impacts.	The predicted air quality impacts for the Western portion of the M4 East project are most relevant for the Marrickville and Leichhardt Council areas. In particular, the proposed co-location of the M4 East eastern and the M4 – M5 western vent stations are of relevance. The air quality assessment has identified air quality non-compliances may be occurring for the 'do minimum' scenario, and are likely to occur in the future. The modelling of the ventilation stations has considered the two proposed outlets and concluded there will be negligible impacts from the ventilation emissions. Due to the method adopted for the modelling of the ventilation emissions, there is considerable uncertainty associated with the predicted emissions from the ventilation outlets. These concerns are identified in more detail in Attachment B.
The overall conclusions of the assessment and how robust these conclusions are based on the review of the methodologies and assumptions.	Atmospheric dispersion modelling is a complex process that attempts to apply, in a scientific way, estimation and calculation methods to predict extremely complex temporal and spatial processes. Inevitably, assumptions must be adopted and the uncertainty associated with these assumptions is considered by applying validation and sensitivity analysis techniques. The Air Quality Assessment has sought to address specific uncertainties posed by the modelling approaches that have been adopted through analysis of this type. However, there are



Issue	Peer Review Comments
	some aspects of the modelling where it is considered that specific assumptions and approaches have not been fully justified and the uncertainties associated with the method considered. These include the meteorological data inputs, building downwash and emission temperature for the ventilation outlets, averaging of emissions rates across periods of many hours rather than completing hourly cumulative assessments, and the generic meteorological dataset that has been adopted. These variables could significantly affect the outcomes of the dispersion modelling for project specific emissions only, hence would not necessarily result in significant increases in the predicted cumulative concentrations at specific receptors. It is important to recognise that the existing background pollution concentrations (defined by current road traffic emissions) are the dominant feature of the current air quality climate. These emissions are predicted to result in non-compliances for a number of existing near road receptors as well as the same types of receptor for the future modelling scenarios.
The appropriateness of proposed mitigation strategies, and identification of any additional mitigation measures or controls that could further reduce the potential exposure of the local population to air pollution emissions from the project.	Mitigation measures are not proposed for the construction or operational phases of the project. For the construction phase, mitigation is likely to be required with respect to management of dust emissions. As a quantitative assessment has not been completed, there has been no quantification of risk, or development of mitigation solutions. For the operational phase non-compliances are predicted for a number of near road receptors. This is also predicted for the 'do minimum' (ie, the status quo) scenario. Therefore, the mitigation tool of primary relevance will be management of vehicle emissions in the region. This is consistent with the conclusions of the Advisory Committee on Tunnel Air Quality.



Attachment B
Detailed Comments on Appendix H - Air Quality Assessment

Section/Page	Issue	Comment
Section 2.4.1, Page 19 Figure 2.3, Page 20, Figure 2-4 Page 21, Figure 2-6, Page 22 Section 8.3.6 Page 109 Section 8.7.3, Page 179	'back-to-back' ventilation outlets for M4 East and M4-M5 link projects. Building downwash Interaction of the plumes from the two outlets	The location and indicative layouts are provided for the two ventilation stacks. Elevations showing the heights of the proposed ventilation buildings are not provided. Buildings attached to stacks and vents can cause significant impacts on the effective dispersion of plumes due to turbulence (plume downwash impacts). The height of the ventilation buildings, and other buildings and structures in close proximity to the ventilation outlets (eg, fire water tanks, electrical plant rooms, tunnel operations buildings) are an essential consideration in atmospheric dispersion modelling from tunnel ventilation outlets. This downwash has not been satisfactorily addressed in the EIS Appendix H. As identified in Section 8.3.6 of the Air Quality Assessment, it was impractical to incorporate the building downwash effects in the GRAL model due to run times and the ability to assess the data at an appropriate resolution. A sensitivity analysis of the issue of building downwash is presented in Section 8.7.3 however only the potential influence of existing buildings in the vicinity of the project are considered. The sensitivity analysis identifies a possible increase in predicted concentrations of 50 % based on 24 hour and annual average calculations. The likely difference for 1 hour predictions is not provided, and this is significant for NO₂ which has a 1 hour average and has predicted non-compliances for some RWR receptors. Furthermore, the sensitivity analysis does not consider the proposed ventilation buildings and other project related buildings. This omission is critical for the assessment of the dispersion of emissions from the ventilation outlet – it is the ventilation building that houses the ventilation fans that has the most significant influence on





Section/Page	Issue	Comment
		building downwash. The Air Quality Assessment identifies that the eastern M4 East ventilation outlet and the western M4-M5 ventilation outlet will be located 'back-to-back'. The ventilation outlets are proposed to be different heights – 30.5 m for the M4 East vent and 25.0 m for the M4-M5 vent. The diurnal emission profiles for the vents will also differ. Maximum emissions will occur during the morning for the M4 East vent, and in the afternoon for the M4-M5 vent – this is because the two vents service traffic travelling in different directions. These issues cause additional complexities surrounding the effective dispersion of emissions from the two vents. There is uncertainty surrounding the maintenance of effective dispersion where the two plumes interact, particularly due to the different heights of the emission points, the differing velocities, the potential downwash and, potentially, the slightly different temperatures involved. True co-location of the emissions in a single vent would resolve these issues, and potentially improve dispersion and reduce energy costs for the operation of these tunnels. Operating costs associated with emissions monitoring and management would also be reduced. If co-location of the emission points in a single ventilation outlet is not possible, it is recommended that Computational Fluid Dynamics modelling is completed to assess the issues surrounding the mixing of the two tunnel vent plumes.
Section 2.4.2 Page 23, Section 4.5 Page 35	Portal Emissions	Prevention of emissions of tunnel air via the outbound portals requires operation of jet fans to reverse the flow of air against the traffic. This increases energy costs, and needs to be considered in the context of the overall environmental impact of the project. Portal emission are permitted for some tunnel projects (eg, City Link Melbourne) for off peak periods. However, where there are sensitive receptors in close proximity to tunnel portals, portal emissions can result in elevated pollutant concentrations in the vicinity of the portals.





Section/Page	Issue	Comment
		Therefore, the potential for portal emissions must be considered on a case by case basis. If a zero portal emission condition is included in the approval for the project, in-portal monitoring will be necessary to demonstrate compliance with this requirement.
Section 5.5, Page 42 and Section 7.4 Page 70	Particulate Emissions, construction	Where silica is present in the material being bored, there is potential for crystalline silica emissions to occur during tunnel boring due to the high temperatures caused at the boring face. The potential for crystalline silica to be released is primarily relevant to occupational exposure, however it is considered appropriate to consider this issue in the construction environmental management plan if sensitive receptors are located in close proximity to tunnelling shafts and air extracts.
Section 7	Construction Assessment	The construction assessment does not quantify air quality impacts in terms of predicted concentrations of air pollution. The approach that has been adopted is a risk based semi-quantitative method. It is acknowledged that the specific detailed information relating to the construction works necessary for completing accurate dispersion modelling may not available at the time of preparing an EIS and, even when it is, there are likely to be significant changes during the construction phase as different site constraints are addressed. Previous tunnel EIS (eg, Northconnex) have attempted to quantify the air quality impacts during the construction phase, however, such analyses are reliant on the data available at the time. As a result, the predictions must be considered indicative. For many sensitive receptors, the primary impacts of a major infrastructure project are during the construction phase. Therefore, it is important that the assessment process ensures that, as and when the relevant construction information becomes available, there is an opportunity for assessment by the regulatory authorities and those that may be potentially affected by these impacts. The absence of more detailed construction information in the Air Quality Assessment limits the opportunity for local authorities, regulatory agencies and



Section/Page	Issue	Comment
		potentially affected receptors to consider and comment on this aspect of the project. For the Westconnex M4 East EIS the Noise Impact Assessment (Appendix I) does consider in detail the potential impact of construction noise. This indicates that sufficient data is available to complete an indicative quantitative assessment of the construction air quality impacts.
Section 8.2, Appendix I	Emission rates	Hourly emission rates have not been adopted in the Air Quality Assessment, due to the limitations of the GRAL model. The approach has been to consider average emissions from three time periods in the day (Hours 00 -05, 06 - 17, 18 - 23). The effect of this is to smooth out the variability in the data, with lower emission rates assumed for peak hours, and higher for off-peak hours, within the three time periods adopted. This is not strictly in accordance with the requirements of the NSW EPA 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW' document, for a Level 2 air dispersion modelling assessment. This requires addition of hourly predicted emissions from the source to the corresponding hourly background concentration. The use of averaged emission rates smooths out the variability in the predicted hourly concentrations. This is not considered to be a significant issue where 24 hour average criteria are relevant (eg, for PM₁₀ and PM_{2.5}). For pollutants with criteria referenced to averaging periods that are less than 24 hours, such as NO₂ and to a lesser extent CO, the smoothing of emissions is likely to result in an underestimate of peak predicted impacts. This variability has not been quantified in the assessment.
Section 6.4, Section 8.3.5, Page 105	Meteorological Data	The model domain for the GRAMM meteorological analysis encompassed the entire WestConnex project area. The reason for this was to allow for consistency with air quality assessments for future sections of the WestConnex project. A single meteorological station is included in the GRAL model due to model limitations.



Section/Page	Issue	Comment
		The GRAMM modelling has adopted 2014 meteorological data from the Canterbury Racecourse AWS station, which is in the centre of the adopted model domain. The Sydney Olympic Park BOM and Rozelle stations are located in closer proximity to the western and eastern ventilation outlets respectively. The low predicted vs measured correlation at the Sydney Olympic Park and Rozelle stations ($R^2 = 0.6$ and $R^2 = 0.45$ respectively) introduces additional uncertainty into the modelling predictions for sensitive receivers for the M4 East project due to the use of the Canterbury Race Course meteorological data as opposed to the local datasets.
Section 8.2.3, Table 8-3, Page 90	Road widths	Table 8-3 indicates that the road widths are narrower for Motorways than Highways and Regional Arterials. This appears unusual, and may be a typographic error. However, this is likely to only have a marginal influence on the modelling results unless receptors are in close proximity to the modelled road.
Section 8.3.6, Page 109	Receptors	Both gridded (RWR) and discrete receptors have been considered, as is standard practice for an air quality assessment. However, due to limitations in GRAL, only 31 discrete receptors have been considered in the assessment. These receptors have been selected on the basis of landuses. Detailed analysis of predicted concentrations has been presented in the Air Quality Assessment report for these 31 receptors. Review of the location of the 31 receptors confirms that these represent a range of near road receptors, and specific sensitive receptors that are more remote from the Project. Few receptors are within the 500 m of the ventilation outlets although a number of RWR receptors are included in these areas. Because of this, the 31 discrete receptors are not likely to be representative of the worst case impacts from the ventilation outlets, although the RWR receptors are likely to represent these impacts.



Section/Page	Issue	Comment
Section 8.3.6, Page 116	Outlet Diameters	The eastern VSO and the M4-M5 eastern VSO are identified as having a single outlet diameter. The western VSO is identified as having three outlet diameters. This will require provision of two dampers in the stack however this is not confirmed in Appendix L (Ventilation Report) of the Air Quality Assessment so this design requirement cannot be verified.
Section 8.3.6, Page 116	Vent emission temperatures	Average temperatures were adopted in the modelling for summer and winter. This is an over simplification of reality. Data for currently operating tunnels confirms that there are periods when the tunnel emission temperature is higher than the external ambient air, eg at night in the winter. Conversely, there are significant periods when the emission temperature is lower than the ambient air, eg peak morning periods in the summer. Where the emission temperature is assumed to be higher than the external ambient air, initial plume rise due to buoyancy is accounted for in the model. Where temperature averaging results in specific hours of the day where the temperature should be lower than ambient, but the model adopts a higher than ambient temperature, the predictions may overestimate plume dispersion. The effect of this is to underestimate receptor concentrations. The sensitivity analysis suggests a variability of +/- 50 %, with predicted receptor concentrations 1.5 times higher where the emission temperature is 10 degrees lower than that adopted in the modelling. Again, the loss of resolution in the input data due to the averaging of emission rates and temperatures across 3 periods a day could introduce a higher variability for this parameter.
Section 8.3..6, Table 18	Efflux Velocity	Table 18 confirms that relatively low efflux velocities have been modelled for some periods of the day (as low as 3.3 m/s at night for the M4 East). Both stack tip downwash and building downwash can significantly increase predicted receptor concentrations where the vertical efflux velocity is insufficient to overcome the effect of cross wind conditions above a specific velocity.





Section/Page	Issue	Comment
		As building downwash caused by the ventilation building and other project buildings has not been considered in the modelling, there is considerable uncertainty associated with adoption of the low efflux velocities for the night time period in particular, and much higher predicted receptor concentrations (ventilation outlet only) could be expected as a result.
Section 8.3.7, Table 8-2, Page 117	M5 East Ventilation Outlet Temperature	A constant temperature of 30 degrees has been adopted based on the annual average of the data reviewed for the purposes of the Air Quality Assessment. As noted previously, application of an average temperature will over estimate dispersion for some periods, and underestimate dispersion for others. The sensitivity analysis suggests a variability of +/- 50 %. It is noted that the M5 East ventilation outlet is somewhat unusual, as the emissions from the tunnel are transported via an underground duct over a distance of a few hundred metres prior to discharge via the stack. This may result in differing temperature variability than compared to other tunnels in Sydney.
Section 8.3.7 and Table 8-21 and 8-22, Page 118	Regulatory worst case scenario emission rates	The regulatory worst case scenario has not presented the results for the maximum permitted emission rates in g/s, as only a 'medium case scenario' is presented. The assessment notes that an alternative 'high' and 'low' emission scenario were tested and gave 'very similar' results. If the high emission rate scenario was adopted, the mass emission rates presented in Table 8-22 would be significantly higher. The higher volumetric flow rates would be expected to result in improved dispersion of emissions, however presentation of the modelling results for the worst case “polluting to the limit” scenario is considered appropriate from a transparency perspective. If the NorthConnex licence conditions are mirrored in the approval for the M4 East project, there will need to be continuous monitoring of emissions via a process control system. When emissions from the ventilation outlet approach the licence limits, traffic management measures will need to be implemented to prevent emissions



Section/Page	Issue	Comment
		exceeding the licence limits.
Section 8.3.7, Table 8-22, Page 118	Outlet temperature	A constant temperature of 25 degrees has been adopted based on the annual average of the data reviewed for the purposes of the Air Quality Assessment. As noted previously, application of an average temperature will over estimate dispersion for some periods, and underestimate dispersion for others. The sensitivity analysis suggests a variability of +/- 50 %.
Section 8.4.4, Pages 138 - 140	One hour NO ₂ predictions	The one hour predicted NO₂ results are presented for the 31 community receptors; the cumulative predicted concentrations are within the overall limit of 246 µg/m³, but at or above 200 µg/m³ in all cases. The surface roads were the biggest contribution. For the RWR receptors, there are predicted exceedances of the 1-hour NO₂ criterion for a significant number of near road receptors. The NO_x/NO₂ conversion rates adopted in the assessment are based on an empirical formula developed specifically for the WestConnex project area. Different conversion rates were adopted for prediction of hourly and annual average concentrations. The adoption of alternative methods is permitted in the NSW EPA 'Approved Methods for the Modelling and Assessment of Air Pollutants in NSW', subject to appropriate detailed scientific assessment. The method adopted in the Air Quality Assessment appears valid, however it is noted that the approach is likely to be more accurate for the emissions from the road based sources than the ventilation outlets, as the monitoring data used to determine the empirical relationship is primarily defined by vehicle emissions. As the road based emission sources are the dominant source in the project area, this assumption is considered reasonable.
Section 8.5, Table 8-27,	Regulatory Worst Case	The predicted 1-hour NO ₂ concentrations, ventilation outlets only, are likely to result in exceedance of the



Section/Page	Issue	Comment
Page 171	Scenarios	criterion of 246 $\mu\text{g}/\text{m}^3$ when combined with background and surface road emissions for the regulatory worst case scenarios. The extent of this has not been quantified. This is of particular relevance if operational traffic is significantly higher than projected, and the tunnel emissions routinely approach the expected licence limits. In simple terms, based on this modelling, the project as proposed could result in regular and extensive exceedance of the 1-hour NO_2 criteria if the project operates at significantly higher traffic flows than have been considered as the normal operating scenario.
Section 8.7.1, Page 178	Outlet Temperatures	The sensitivity analysis identifies a factor difference of around 1.5 if the temperature is 10 degrees lower than the average of 25 degrees assumed in the modelling. Therefore, for peak morning periods in the summer when the external temperature could be 10 degrees higher than the tunnel emissions, predicted one hour concentrations could be 50 % higher for the tunnel ventilation emissions. The analysis presented in the assessment considers the impact of temperature changes on 24 hour average predictions only. The differences on 1 hour predictions for NO_2 are not presented. The predictions for this pollutant exceed the assessment criteria for some RWR receptors, and the pollutant that is closest to the regulatory limit for the discrete receptors. Therefore, analysis of the impact on 1-hour predicted concentrations is considered essential to determine the sensitivity of the modelling to this assumption.

