F6 EXTENSION STAGE 1 EIS

TRAFFIC AND TRANSPORT REVIEW

FOR

DEPARTMENT OF PLANNING AND ENVIRONMENT

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EXECUTIVE SUMMARY

Background

The F6 Extension Stage 1 is a proposal to construct a new multi-lane road between the New M5 at Arncliffe and President Avenue at Kogarah. The project includes twin motorway tunnels between the New M5 and President Avenue, upgrades to President Avenue, changes to local streets within the Moorefield Estate and a new shared walking and cycling path through Rockdale Centennial Park, bridging across President Avenue and through Scarborough Park. The Environmental Impact Statement (EIS) for the project dated 26th October 2018 has been submitted by the project's proponent NSW Roads and Maritime Services (Roads and Maritime). Following exhibition of the EIS, community and stakeholder submissions have been reviewed and a Preferred Infrastructure Report (PIR) (*Publication number: RMS.19.1209*, 1st May 2019) has also been submitted by the proponent.

Bitzios Consulting has provided an independent review the traffic and transport assessment components of the documentation prepared for the proposal. This work has included a review of the relevant sections of the EIS, a review of the relevant submissions and responses by Roads and Maritime and a review of the PIR, submissions to the PIR and the Roads and Maritime response to these submissions. This review does not include a detailed verification of the traffic models used but does include 'reasonableness' checks of the published outputs based on site inspections, local knowledge and past experience reviewing similar modelling outputs.

Existing Conditions and Project Need

The project will have its greatest localised influences around the President Avenue area at its southern connection, at the St Peters Interchange in the north and along the roads within the corridor between President Avenue and St Peters; most notably the Princes Highway and General Holmes Drive. Traffic conditions along President Avenue are currently dominated by the major pinch points at the intersections of President Avenue / Princes Highway and President Avenue / General Holmes Drive. The EIS identifies that both of these intersections are operating at a satisfactory Level of Service (LoS) in the base year of 2014/15 although site observations suggest otherwise with long peak period delays and lengthy queues at these intersections. However, the modelling used in the EIS may be understating base year operational conditions and hence the benefits of the project may be conservatively low. However, the travel times reported along the Princes Highway and along General Holmes Drive in the base year seem reasonable as to the congestion influences around the St Peters Interchange area.

The need for the project was determined based on strategic transport modelling of the growth in travel demand in Sydney's southern corridor. This modelling, as expected, showed significant growth in demand to year 2036 and a significant worsening of traffic operations by 2036 if no interventions were implemented. Two of the three 'strategic' alternatives tested to mitigate this worsening were limited to public transport improvements and the third alternative related to the motorway option (the F6 extension). The heavy rail improvements option would have a limited catchment of benefit given the spread of population in the southern corridor and the bus service improvement option would have little benefit because buses would also be caught up in worsening congestion providing no travel time benefit and hence no modal shift away from traffic. The F6 Extension option was logically selected as the most effective option to achieve the objective of restraining the impacts of traffic congestion in the southern corridor.

The twin tunnels are being constructed as three lanes in each direction (with two lanes each way marked at opening) extending from President Avenue northwards to join the two lanes each way on the New M5 with four lanes each way provided for further north on approach to St Peters Interchange. This means that in the future, as traffic volumes increase on the F6 Extension Stage 1 and the third lane is opened to traffic, the third lane will have to merged back into two lanes prior to joining the New M5 to maintain 'lane balance' with what's available downstream. This three lane to two lane merge northbound within the tunnel will inevitably create a pinch point, flow breakdown and congestion. Similarly, in the outbound direction, the third lane southbound will never have enough demand to service it because only two lanes-worth of traffic will arrive from the diverge at the New M5 further to the north. On this basis, there seems to be no benefit in constructing more than two trafficable lanes each way in the project's tunnels unless there are future 'ideas' to also allow a connection to the New M5 west of the join point.

Construction Period Assessment

The construction vehicle estimates and construction site access volumes have been checked and appear reasonable. The construction site access locations, form and management methods are also appropriate although there may be some benefit in 'shielding' vehicle access into Site C6 via a line marked, separated turning area from the two eastbound through lanes on President Avenue.

In terms of workforce parking, it is acknowledged that parking demands will vary over the construction phase of the project and at different locations over this period. The EIS has identified that, in aggregate, more construction parking will be provided than demanded during the construction phase; although this may vary from site to site as localised construction influences each site's demand at specific times once the detailed construction program for each site is known the Construction Traffic Access Management Plan (CTAMP) should consider the potential for shared parking demand across parking sites to overcome the effects of localised peak demands at certain times. A key consideration includes construction near the Illiden Sports Centre car park which could include specific provisions in its CTAMP related to minimising parking at the sports centre during site usage times.

The impacts on walking, cycling and bus stop access due to construction activities have been adequately addressed in general. However, the removal of on street parking in President Avenue to provide a peak period clearway would reduce the peak period separation between cyclists and vehicles (i.e. cyclists can currently partly use the outer/parking lane). There would therefore be benefits in providing an alternative off road shared path along the southern side of President Avenue between the new walk/cycle overpass bridge connections and the Princes Highway intersection.

Operational Period Assessment

As expected, the project generates wide-reaching benefits across the broader network because the relieved capacity on the Princes Highway and General Holmes Drive due to traffic diverting to the project is partly taken up by other regional movements. The strategic modelling has also flagged the New M5 link between the F6 Extension and the St Peters Interchange as being a section that is at risk of significant congestion with this risk escalated when the F6 Extension Stage 2 or the Western Harbour Tunnel and Beaches Link (WHTBL) project are included.

The modelling demonstrates that the upgrade works along President Avenue mostly mitigate the impacts of the additional traffic along President Avenue with the project between the Princes Highway and the F6 Extension Stage 1 entry and exit ramps. There is some 'induced traffic' as well which is attracted to the Princes Highway south of President Avenue. While the impacts of this additional traffic appear to be minimal at most locations, the congested intersection of Rocky Point Road and Princes Highway warrants further consideration of potential improvement measures.

The St Peters Interchange is shown to be at capacity by 2036 with or without the F6 Extension Stage 1. This is a broader issue that needs to be addressed separately from this project and is an issue not significantly worsened by the F6 Extension Stage 1.

In terms of cumulative traffic impacts with the inclusion of the F6 Extension Stage 2, the most significant impact is the increase in traffic demand on the Stage 1 section from 43,000 vehicles per day (vpd) under Stage 1, to 58,000 vpd with Stage 2. This level of traffic would ordinarily warrant six traffic lanes and will most likely generate a congestion pinch point, delays and queuing at the three lane to two lane merge point northbound in the Stage 1 tunnel.

Public transport impacts and benefits associated with the project are minimal with some reduction in peak direction bus travel times and a consequential minor increase in counter-peak direction travel times. Active transport movements receive benefits from the new north-south shared facility to be constructed as part of the project but east-west on-road cyclist movements along President Avenue are impacted by the creation of the clearway lanes in each direction as this effectively reduces the 'buffer' between cyclists and passing motorists. An off road shared walk/cycle facility along the southern side of President Avenue would partially mitigate this impact.

A number of driveways along President Avenue have their access and egress 'protected' by parked vehicles in the outer lanes. With clearway conditions introduced, this protection is removed and there are increased risks associated with vehicles slowing to enter their driveways or reversing out into President Avenue. Site-specific access management plans would be beneficial to develop as the design of the project proceeds and in consultation with individual property occupants/owners.

The EIS included a number of unresolved issues related to changes to access and egress between President Avenue and the Moorefield Estate, including safety, traffic circulation and local street impact considerations. These issues were subsequently addressed in the PIR as described below.

EIS Submissions Review

A number of public submissions were received on the EIS with most of the traffic and transport issues raised related to the need for the project (relative to public transport improvements instead), traffic congestion on President Avenue (with more traffic between Princes Highway and the F6 Extension Stage 1 ramps) and safety / convenience impacts for access to/from the Moorefield Estate.

The 'need'-related issues have been adequately addressed in the EIS without delving into the broader philosophical debate about the merits of public transport projects in preference to road projects. The issues related to the access to/from the Moorefield Estate were mostly addressed in the PIR report, as discussed below.

Preferred Infrastructure Report Review

In terms of traffic and transport changes, the PIR described two key design refinements relating to:

- Operational period access arrangements to/from the Moorefield Estate and associated local street changes within the Moorefield Estate local street system, and
- Extension of the shared cycle and pedestrian pathway to the south through Scarborough Park North and to the Chuter Avenue/O'Connell Street intersection.

The access arrangements to/from the Moorefield Estate resulted in a substantial improvement to the safety and convenience of local accessibility compared to the configuration included within the EIS. Access to/from the TAFE is much improved as is the safety to traffic movements at the Cross Street intersection with President Avenue. No closing the northern end of Moorefield Avenue and retaining it as a left in/left out intersection with President Avenue near West Botany Street is also a better outcome for traffic circulation and safety. Of major benefit was the decision to signalise the Civic Avenue / President Avenue intersection to provide safe, controlled right turns out of Civic Avenue, which is the only location where controlled right turns out are allowed.

Under the PIR concept for President Avenue, right turns in and out are being retained at the Oakdale Avenue intersection with President Avenue. In peak times, President Avenue will be a heavily trafficked six lane road and maintaining 'unprotected' right turns in and out at this location raises traffic safety concerns. A road safety assessment at this location would be important as the design development proceeds with consideration of the potential to ban right turn movements at the same times that the clearway conditions are in place.

The southern extension of the shared cycle and pedestrian path is supported as it connects the facility to the local street system and improves the accessibility of the network with no associated traffic impacts. Any further extensions of this facility, as requested by stakeholders, is a worthy future consideration but is not considered to be directly linked to the mitigation of impacts generated by this project.

Conclusions and Recommendations

The EIS and the PIR prepared for the F6 Extension Stage 1 project have been reviewed in relation to the traffic and transport-related SEARs for the project. In general, the EIS and PIR adequately address the SEARs and provide suitable mitigation measures for the impacts generated. In particular, the suite of traffic modelling and analysis used to assess the project is appropriate and the operational period assessment of the traffic and transport impacts, and the identification of mitigations works is reasonable. The construction period assessment is also considered to be satisfactory with most heavy vehicle construction traffic restricted to the motorway and the arterial road network and associated with spoil removal at discrete locations with good road access. Construction period parking measures, if suitably managed through CTAMPs, also appear appropriate.

There are no significant impacts or benefits to public transport and in terms of active transport, the new north-south shared cycle and pedestrian path will provide an effective off road connection for communities in this area as well as for longer distance recreational cyclists. The project does however, through the introduction of clearways, reduce the amenity of on-road cycling on President Avenue with the potential for a shared cycle/pedestrian path along the southern side of President Avenue worthy of further consideration.

Other findings from this review include:

- There still appears to be no clear basis for constructing three lane tunnels each way, when all that the section of the New M5 to the north-east can accept from the F6 Extension, or deliver to the F6 Extension, is two lanes-worth of traffic.
- It is apparent that the timing of the Sydney Gateway project and the timing of the F6 Extension Stage 1 project are closely related in terms of what impacts and congestion relief is generated where. This will require further consideration beyond the consideration of the F6 Extension Stage 1 project should it be approved.
- Along President Avenue, further consideration of the peak period turn movements at the Oakdale Avenue intersection is warranted as is more detailed consideration of driveway access management plans for the property driveways along President Avenue between the new F6 Extension Stage 1 intersection and the Princes Highway.

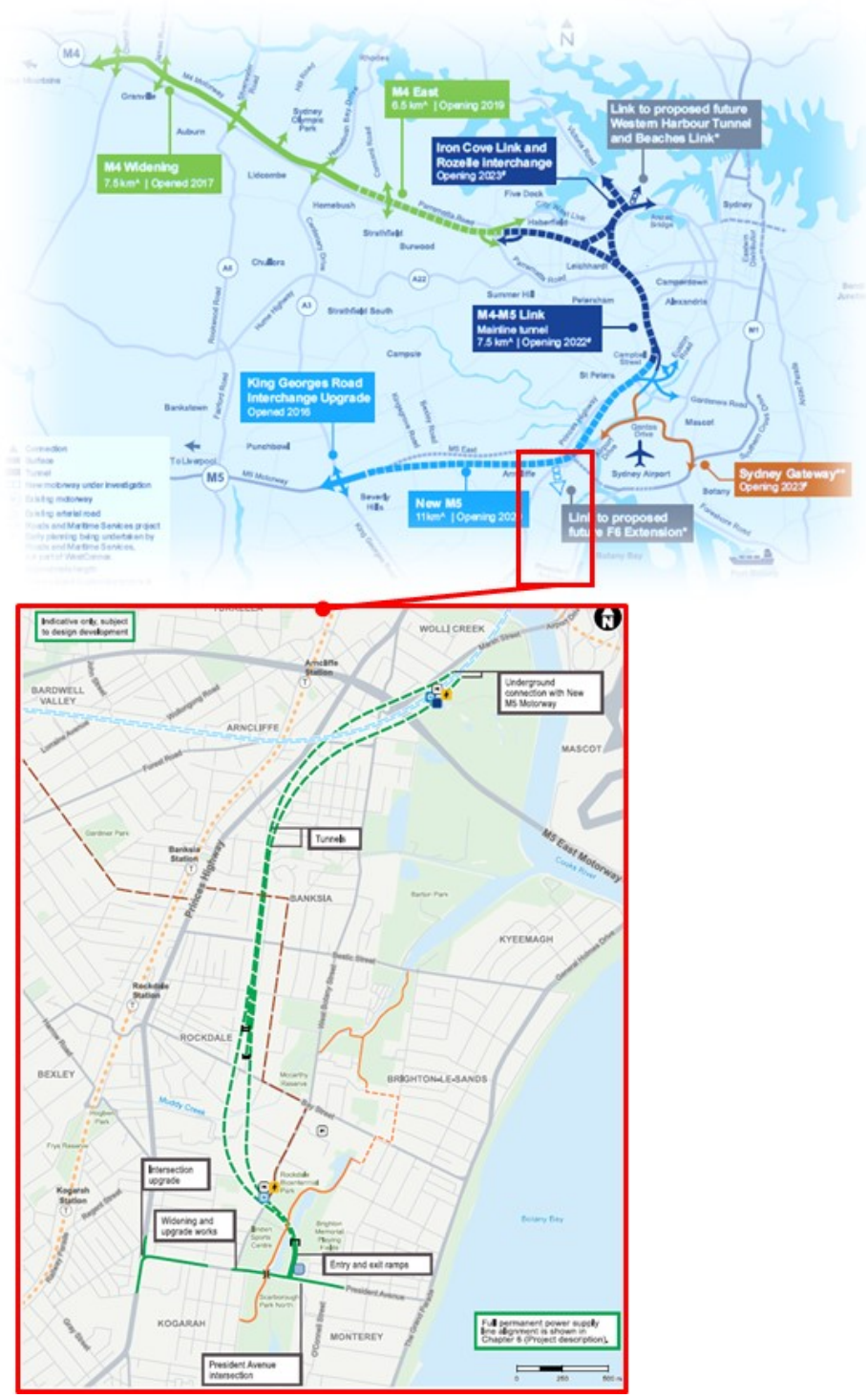
Based on the findings of this review, the key recommendations for consideration when setting approval conditions for the project are:

1. As part of the Parking Management Plan for the Ilinden Sports Centre car park within the CTAMP, make reference to prohibiting construction worker parking during peak sports centre usage times.
2. If not constructed as part of this project, reference/note the benefits of a future project to construct a shared pedestrian-cyclist path along the southern side of President Avenue connecting between the proposed north-south pedestrian-cyclist bridge and the Princes Highway intersection.
3. Consider as part of the detailed design, the line marking detail at the President Avenue approach to the Princes Highway signalised intersection to minimise the risk of right turning vehicles queuing back through the marked left turn lanes.
4. Re-assess the impacts at the Princes Highway / Rocky Point Road intersection for 'do something' after specifically calibrating the 2014/15 performance of this intersection to observed delays and queues given that the project draws more traffic through this intersection. Further consider potential upgrades to this intersection.
5. During design development, identify access and egress impacts to individual properties along President Avenue due to the implementation of clearways and create construction period and operational period access management plans.
6. Develop a mitigation strategy for the St Peters interchange / Campbell Road / Euston Road intersection to overcome its potential to cause queuing back into the St Peters Interchange introducing traffic safety and secondary capacity-blocking issues. This strategy could consider the timing of the construction of the Sydney Gateway project in relation to the F6 Extension Stage 1 project.
7. Document why there is any benefit in extending the F6 beyond Stage 1 if the additional traffic from the extension cannot be accommodated by capacity constraints further north. Such a realisation may require reconsideration of how the entry and exit at President Avenue is configured if it is to be the long term southern terminus of the project.
8. Conduct a road safety audit/assessment of the design for the Oakdale Avenue / President Avenue intersection as part of the design development with a view to banning these movements if warranted by the outcomes of the review.

1. INTRODUCTION

1.1 BACKGROUND

The F6 Extension Stage 1 is proposed to connect from an interchange with the New M5 at Arncliffe to a new intersection with President Avenue at Kogarah. The proposal follows the approved motorway projects within the WestConnex suite of projects including the M4 widening, the M4 East, the New M5 and the M4-M5 Link. The project is being considered at about the same time as other state government motorway projects in Sydney including the Sydney Gateway and Western Harbour Tunnel and Northern Beaches Link. Figure 1.1 shows the F6 Extension Stage 1 in relation to these other projects.



Sources:
WestConnex M4-M5 Link, Technical working paper, Traffic and transport
F6 Extension Stage 1 Environmental Impact Statement

Figure 1.1: F6 Extension Stage 1 and Surrounding Motorway Projects

NSW Road and Maritime Services (Roads and Maritime) is the proponent for the F6 Extension Stage 1 project and is seeking approval to construct and operate it under application number SSI 8931. The application for the project is described as (SEARs, 23/1/18):

The F6 Extension Stage 1 comprising the construction and operation of a new multi-lane road link between the New M5 at Arncliffe and President Avenue at Kogarah, including:

- *Twin motorway tunnels around four kilometres in length*
- *A tunnel portal at Brighton-Le-Sands connecting to on- and off-ramps at a widened President Avenue*
- *Ancillary infrastructure and operational facilities*
- *New and modified utility services.*

The approval is being sought under Part 5.2 of the Environmental Planning and Assessment Act 1979. The NSW Minister for Planning has been requested to declare the project to be State Significant Infrastructure and an Environmental Impact Statement (EIS) has been prepared, dated 26th October 2018.

1.2 SCOPE AND LIMITATIONS

This report provides an independent peer review of the Traffic and Transport assessments published in the EIS. The parts of the EIS on which this review has focussed were:

- Parts of Chapter 4, Strategic Context and Project Need
- Parts of Chapter 5, Project Alternatives and Options
- Chapter 6, Project Description
- Parts of Chapter 7, Construction, relevant to construction period traffic and transport impacts
- Chapter 8, Traffic and Transport
- Appendix D, Traffic and Transport Technical Report.

Following the EIS, the Preferred Infrastructure Report (PIR) was prepared and submitted by the proponent and this report has also been reviewed.

This peer review report is structured as follows:

- Chapter 2 reviews the traffic and transport-related needs for the project and consideration of alternative options to address those needs
- Chapter 3 provides a description of the project to provide the context for the following chapters
- Chapter 4 reviews the assessment methodologies, key assumptions and the adequacy of the breadth and depth of coverage of each issue
- Chapter 5 reviews the description of the existing road network performance
- Chapter 6 reviews the construction period impacts and management measures for traffic and transport
- Chapter 7 reviews the traffic and transport impacts with the project in its operational phase and considering the management measures proposed
- Chapter 8 reviews the submissions made on the Draft EIS related to traffic and transport issues and provides commentary on the respondent's responses to those issues
- Chapter 9 reviews the Preferred Infrastructure Report (PIR) following the Draft EIS, localised traffic changes, combined impact considerations and reviews the RMS response to PIR submissions
- Chapter 10 provides conclusions and recommendations for consideration by the Department of Planning in providing its response to the EIS and in setting conditions of approval if the project is to be approved.

This review presumes that the New M5 and the M4-M5 Link will be operational before the F6 Extension Stage 1 is operational.

This review does not include a detailed verification of transport models although some reasonableness checks of published outputs have been completed based on site investigations and local knowledge of prevailing traffic patterns and conditions. Furthermore, the construction period review has assumed that the construction methodologies and construction period traffic estimates are reasonable and is focussed on reviewing the impacts on traffic, public transport, pedestrians and cyclists for the construction period.

1.3 SEARs

The Secretary's Environmental Assessment Requirements (SEARs, 23rd Jan 2018) lists out the impacts which the EIS must address. The requirements relevant to traffic and transport considerations are:

1. *The Proponent must assess construction transport and traffic (network, vehicle, pedestrian and cyclists) impacts, including, but not necessarily limited to:*
   - *a) a considered approach to route identification, including for spoil haulage, and scheduling of transport movements, particularly outside standard construction hours;*
   - *b) the number, frequency and size of construction related vehicles (passenger, commercial and heavy vehicles, including spoil management movements);*
   - *c) construction worker parking;*
   - *d) the nature of existing traffic (types and number of movements) on construction access routes (including consideration of peak traffic times and sensitive road users and parking demand and arrangements including adequate parking for sports games);*
   - *e) access constraints and impacts on public transport, pedestrians and cyclists;*
   - *f) how construction of the project affects the condition and capacity of, and the need to close, divert or otherwise reconfigure elements of the local road, cycle and pedestrian network and public carparks;*
   - *g) details on construction scheduling and management to maintain traffic capacity along President Avenue and sports field parking during construction;*
   - *h) details of how construction and scheduling of works would be coordinated in regard to public events and cumulative traffic impacts resulting from concurrent work on the project and other major projects, under or preparing for or commencing construction in the vicinity of the proposal;*
   - *i) alternatives to road transport of construction spoil including rail options as well as potential re-use in proposed fill areas or in association with Resource Recovery Exceptions (if obtained from the EPA) to minimise traffic impacts on the road network; and*
   - *j) the likely risks of the project to public safety, paying particular attention to recreational users of open space in the area including Rockdale Bicentennial Park, Memorial Fields, Ilinden Sports Centre, Scarborough Park north, Barton Park and the Kogarah Golf Course.*
2. *The Proponent must assess and model the operational transport impacts of the project including, but not necessarily limited to:*
   - *a) forecast travel demand and traffic volumes (expressed in terms of total numbers and heavy and light vehicle numbers) for the project and the surrounding road, cycle and public transport networks; including potential shifts of traffic movements on alternate routes inside and outside the proposal area and impact of any permanent road closures directly attributable to the SSI;*
   - *b) impacts on access to and parking for commercial centres and health and education facilities within the vicinity of the project;*
   - *c) travel time analysis;*
   - *d) performance of key interchanges and intersections by undertaking a level of service analysis at key locations;*
   - *e) wider transport interactions (local and regional roads, cycling, public and freight transport);*
   - *f) induced traffic and operational implications for existing and proposed public transport (particularly with respect to strategic bus corridors and bus routes and permanent closure/relocation of bus stops) and consideration of opportunities to improve public transport;*
   - *g) impacts on cyclists and pedestrian access and safety;*
   - *h) opportunities for active transport, including new and integrated cycling and pedestrian elements connecting to surrounding networks;*
   - *i) property and business access and on street parking; and*
   - *j) an explanation for the scope of the modelled area, including justification of the nominated boundaries.*
3. *The operational transport impact assessment must consider both operation of the Project (Stage 1) in isolation and as part of the overall F6 Extension Proposal, and other relevant motorway projects.*

2. PROJECT NEED AND ALTERNATIVES ASSESSMENT

2.1 PROJECT NEED REVIEW

The need for the project has been identified in the EIS as being due to:

- A 'gap' in the Motorway network between where the M1 transitions into the Princes Highway (A1) at Waterfall and the New M5 at Arncliffe
- Congestion and heavy traffic volumes on the Princes Highway which affects bus and private vehicle travel times and reliability
- Excessive volumes on local roads such as The Grand Parade which also cater for pedestrians, cyclists, local traffic access and parking
- Population growth pressures with the South District expected to accommodate over 200,000 more people by 2036.

The above reasons for the F6 Extension are consistent with pragmatic strategic road network planning and suggest that the F6 Extension Stage 1 will alleviate existing functional and congestion issues whilst providing capacity for growth in the South District.

2.2 STRATEGIC ALTERNATIVES REVIEW

Four alternative scenarios for addressing the identified current and future transport issues in the southern corridor were raised in the EIS, as follows:

- *Alternative 1 – The base case or 'do nothing/do minimum'*
- *Alternative 2 – Rail infrastructure improvement options*
- *Alternative 3 – Bus service improvements*
- *Alternative 4 – Motorway option (development of the F6 Extension).*

The EIS identifies that the 'do nothing/do minimum' case does not overcome the opportunity to separate inter-regional and local traffic and provides only minor or short-term reductions in congestion levels. This is a reasonable conclusion to draw given the growth forecast for the South District.

Whilst rail improvements will be beneficial for specific travel origin-destination markets, they will not cater for the range of trip origins and destinations outside the corridor that are drawn in to use the road corridor as a key north-south route given limited alternative arterial routes. It is agreed that rail improvements will be complimentary to the F6 Extension project and not be a direct competitor with it given these travel market considerations.

Bus service improvements only would have little benefit as buses would still be impacted by traffic delays on the Princes Highway and its accessing streets.

On the basis of the above, it is agreed that the Motorway option is the best of the four alternative options raised to reduce congestion in the southern corridor.

2.3 PROJECT OPTIONS REVIEW

2.3.1 Lane Numbers and Configurations

The preferred option involves the two lanes northbound on the F6 Extension Stage 1 joining the two lanes northbound on the New M5 to create four lanes northbound between the merge point at Arncliffe and St Peters Interchange (with a similar configuration in the southbound direction). This configuration seems the most pragmatic in the short term as any merging from two lanes to one lane would be likely to block traffic back within the F6 Extension tunnel in order to favour the New M5 traffic. Similarly, in the southbound direction, a single lane diverge from the New M5 to the F6 extension may 'throttle' the usage of the F6 southbound and increase the likelihood of congestion on the New M5 south of St Peters.

2.3.2 President Avenue Changes

The options considered in the EIS along President Avenue primarily involved managing the safety of turning movements to/from the area to the south of President Avenue and west of Scarborough Park North as well as the changes necessitated by the new lanes needed for the President Avenue signalised intersection with the F6 Extension Stage 1 ramps. Given that grade separation options would be impractical and too many new signalised intersections would affect the efficiency of the President Avenue link between the F6 Extension Stage 1 and the Princess Highway for inter-regional trips, the type of options considered appear reasonable.

2.3.3 Princess Highway / President Avenue Intersection

The options raised and the evaluation that at-grade improvements are the preferred option to cater for more traffic demand between the Princess Highway and President Avenue (on route to the F6 Extension entry intersection) appear reasonable.

2.3.4 President Avenue / F6 Extension Entry Ramps Intersection Options Analysis

No options analysis has been published for the configuration of this intersection. Given that one of the EIS-stated roles of the F6 Extension was to reduce traffic on The Grand Parade, there would be some logic in at least testing options relating to orientating this intersection such that the movements between the F6 Extension and President Avenue West are the 'through' movements at the intersection with President Avenue east forming the minor leg to the signalised T intersection. Roads and Maritime Services has responded to this issue during the course of this review suggesting that the configuration has been selected for signal coordination purposes along The Grand Parade and to more efficiently cater for future extensions of the F6 to the south. This explanation is considered to be reasonable.

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3. PROJECT DESCRIPTION

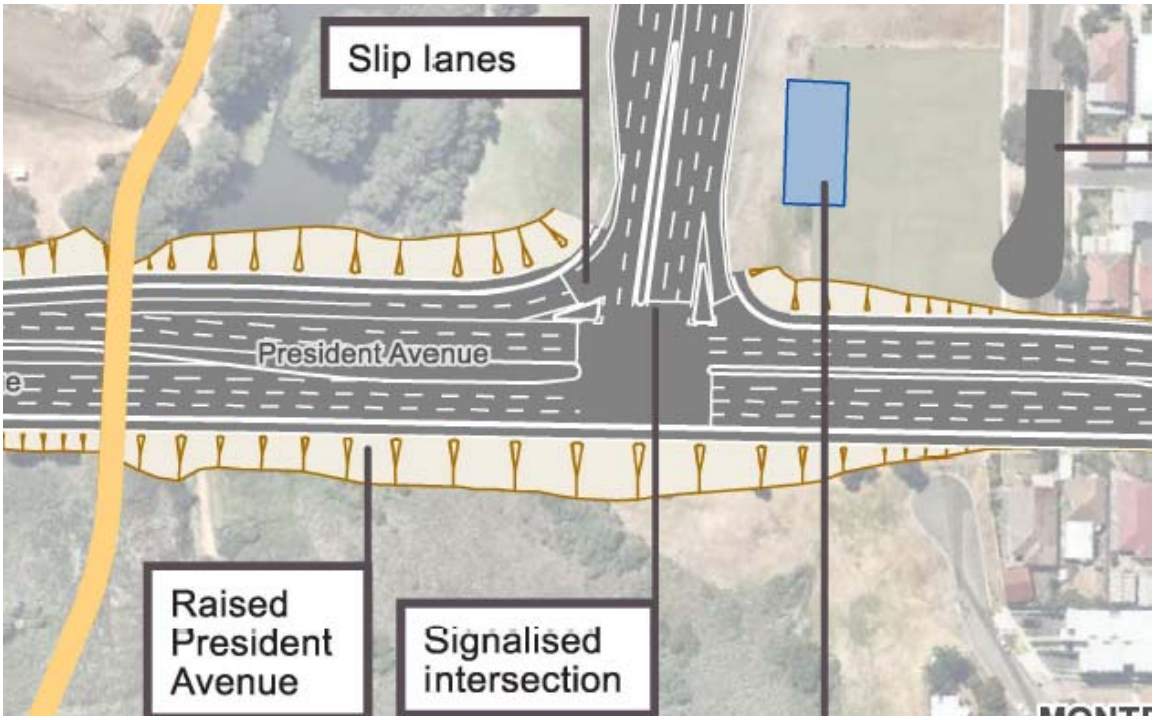
3.1 MAIN LINE TUNNELS

The tunnels are proposed to include the potential for three traffic lanes in each direction. It is unclear why a third lane each way would be necessary given that the New M5 north of the connection to/from the F6 Extension Stage 1 would be only four lanes each way, with two of these lanes needed to cater for New M5 traffic west of the F6 connection. Also, there are no plans for west-facing ramps between the F6 Extension and the New M5 west of the F6 Extension.

Roads and Maritime responded to this issue during the course of this review to state that the tunnels would be line-marked as two lanes in each direction when they are opened, and potentially re-marked as three lanes each way if and when the F6 is extended further to the south. This response still does not address the issue that the three lanes northbound would need to be reduced to two lanes northbound anyway prior to the merge point with the New M5; rendering the third lane northbound (and similarly the third lane southbound) redundant to providing additional traffic capacity. In fact, the merge point northbound, if introduced, could be a localised source of congestion based on the forecast volumes.

3.2 PRESIDENT AVENUE / F6 EXTENSION STAGE 1 RAMPS INTERSECTION

The intersection layout plan presented in Figure 6-10 in the EIS (see Figure 3.1) does not show pedestrian and cyclist facilities through the intersection nor is there any commentary as to how pedestrians and cyclists would be provided for through at-grade crossing locations and line marking. This is inconsistent with the detail of the line marking shown in Figure 6-11 at the Princes Highway / President Avenue intersection layout plan.



Source: Excerpt from F6 Extension Stage 1 EIS Volume 1, Figure 6-10

Figure 3.1: Absence of Pedestrian and Cyclist Facility Markings

Roads and Maritime has confirmed that no pedestrian crossings are proposed within the President Avenue/F6 Extension Stage 1 ramps intersection and that the north-south 'Active Transport Corridor' will be relied upon, with the path along the southern side of President Avenue, for this purpose.

Whilst not ideal for active transport connectivity through this area, given the nature of surrounding land use, the need to not have pedestrian phases at this signalised intersection is acknowledged on the basis of intersection safety and efficiency.

3.3 President Avenue Between the F6 Extension Ramps and Princes Highway

The EIS-proposal included converting parking lanes in President Avenue to traffic lanes and providing a central median in this section. The proposal maintained both the left turn and right turn movements out of Lachal Avenue and out of the Kogarah TAFE car park, with median protection provided to allow for 'two-stage' right turns out of these locations.

With the increase in traffic volumes in this section of President Avenue, and with a much larger proportion of articulated trucks and large rigid trucks as well, there safety concerns were raised regarding maintaining these 'uncontrolled right turn out' movements across three lanes of traffic. In combination, the changes would have been expected to significantly influence the likelihood and consequence of crashes at the Lachal Avenue / President Avenue intersection.

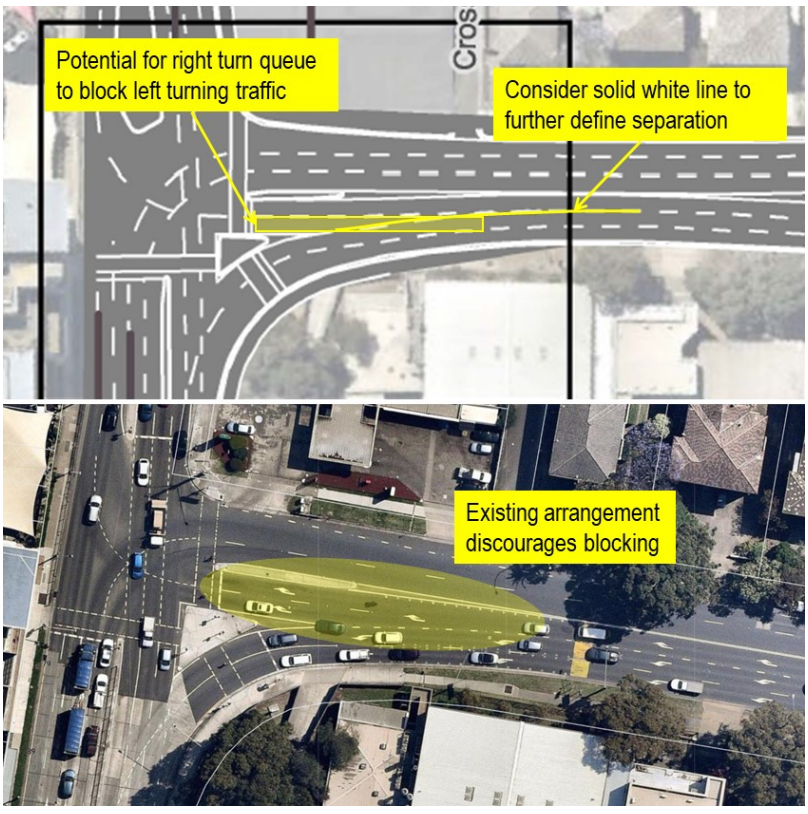
These arrangements were subsequently modified in the PIR as discussed in Chapter 9 of this report.

3.4 President Avenue / Princes Highway Intersection

The predominant movements associated with President Avenue will be expected to be:

- The left turn out of President Avenue into Princes Highway southbound
- The right run into President Avenue from the Princes Highway northbound.

The proposed arrangements as shown in Figure 3.2 for the right turn out of President Avenue introduce the potential for queuing back from the right turn pocket into the left turn lane, introducing capacity and safety issues. Whilst it is acknowledged that the figure provided in the EIS is a concept only, the suggested modification below is considered to be valuable to clarify lane queuing arrangements for safety.



Sources:
Exert from F6 Extension Stage 1 EIS Figure 6-11 and Nearmap

Figure 3.2: Potential for Lane Blocking and Lane Under-Utilisation

4. ASSESSMENT METHODOLOGIES AND ASSUMPTIONS

4.1 TYPES OF TRAFFIC MODELS

4.1.1 Overall Approach/Process

The approach documented in the EIS involved using Sydney-wide strategic modelling to develop project area demand forecasts which then were used as inputs into operational models around the project and its interface areas. This approach is consistent with previous modelling approaches used for other WestConnex projects in Sydney in recent years and is considered to be reasonable.

4.1.2 Demand Forecasting

The traffic demand forecasting was based on the Strategic Motorway Planning Model (SMPM) V1 and included a Toll Choice model which included the other operational and approved toll roads in Sydney. The demand forecasting was completed for 2026 and 2036 for 'do minimum', 'do something' and 'cumulative' scenarios. The approved WestConnex projects, including the M4-M5 Link, were included in the 'do minimum' scenarios along with NorthConnex. An EIS has not yet been prepared for the Sydney Gateway project but this project has been included in the 'do minimum' scenario which is reasonable given the government's commitment to this project.

It is apparent from the demand forecasting that the Sydney Gateway project will provide the traffic capacity relief needed for the St Peters interchange to accept increased traffic arrivals from the F6 Extension Stage 1 project and the relative timing of these two projects is a key consideration in managing the traffic impacts in the intermediate years between their openings.

The SMPM has not been reviewed in detail and it is assumed in this review that the model is fit for the purpose of demand forecasting for this project.

4.1.3 Operational Period Modelling

Three operational modelling areas were modelled separately. These areas were:

- President Avenue intersection area (using VISUM with Intersection Capacity Analysis - ICA for a wider area and VISSIM for President Avenue)
- F6 Extension Stage 1 tunnel operations (using VISSIM)
- St Peters Interchange area (using Paramics).

The types of operational models used, including the specific attributes of each software package are considered appropriate for the operational modelling purposes needed. The coverage areas of the models is also considered to be appropriate to capture the geographical extents of traffic needs and impacts.

The operational models have not been reviewed as part of this peer review and it is assumed in this review that the models are fit for the purpose of assessing the traffic needs and impacts of the project.

4.1.4 Construction Period Modelling

The construction period modelling around each construction site was based on LinSig models created for each traffic access area in order to sensitively model intersection impacts of relatively small changes in traffic volumes. This approach and the software used is appropriate for the construction period impact assessment.

4.2 IMPACT CRITERIA

The 'three-level' approach used in assessing the impacts of the project is consistent with the approach used for other recent toll road projects in Sydney and was based on:

- At a strategic network level (using the SMPM) and at the local network level using the operational models to output network-wide statistics about changes in vehicle hours travelled, travel times, 'unreleased' vehicles etc.
- At a single point (mid-block) level to describe link-based volume, delay and Level of Service (LoS) impacts
- At the intersection level to describe intersection-based volumes, delays and Level of Service (LoS) impacts.

Whilst this three-level approach is supported, the primary determinant of operational impacts in congested urban environments such as this one is the impact on intersection delays. Furthermore, when adding strategic model demands into operational models it is common for the future year operational models to operate over their network capacity with model 'gridlock' occurring. Peak spreading has been used to mitigate this artificial effect in the models and this approach is supported.

The LoS criteria used for intersection performance is consistent with the Guide to Traffic Generating Developments (RTA, 2002). It should be noted however that isolated intersection LoS can be misleading as a determinant of impact in some cases and greater reliance should be placed on reviewing the delay and queuing performance of the series of intersections in a corridor and the cumulative change in delay across those intersections.

5. EXISTING ROAD NETWORK PERFORMANCE

5.1 PRESIDENT AVENUE INTERSECTION INFLUENCE AREA

Table 8-11 and Table 8-12 from Volume 1 of the EIS document the modelled LoS for intersections within the influence area of the President Avenue intersection. These tables report that most intersections operate at the targeted threshold of LoS D or better in both peak periods. It is unclear as to whether the VISUM and VISSIM models have been validated to back of queue data as some intersections observed are at capacity in 2018 peak hours, such as the intersection of President Avenue and The Grand Parade but not reported as such in the EIS. Also, the reported LoS for the major intersection of the Princes Highway and President Avenue is reported at LoS B in the AM peak and LoS C in the PM peak with an average delay of under 30 seconds per vehicle. These results infer that this intersection rarely operates at capacity which contradicts site observations and photography from March 2017, as shown in Figure 5.1.

Source: Nearmap

Figure 5.1: Potential for Lane Blocking and Lane Under-Utilisation

There is no way of checking if the modelled performance matches the observed intersection performance without reference to the intersection-based calibration/validation outputs from the VISUM and VISSIM models. Whilst the use of average delays at signalised intersections as the basis for reporting LoS is the approach recommended in Roads and Maritime's modelling guidelines, it may understate extensive queueing and impacts for specific movements.

5.2 PRESIDENT AVENUE TO ST PETERS INTERCHANGE CORRIDOR

The AM peak and PM peak travel times along Princes Highway and along General Holmes Drive which run parallel to the proposed F6 Extension Stage 1 tunnels have peak hour travel speeds which are approximately half of the posted speed limit. Put another way, this data suggests that half of the time spent on these links are typically associated with delays at intersections along them. These outputs from the modelling appear reasonable given the spacing and impacts of signalised intersections on these links.

5.3 ST PETERS INTERCHANGE AREA

The intersection performance results presented in Table 8-16 of the EIS reflect intersections in the St Peters area that are approaching capacity in 2014/15. Whilst the individual intersection delays and LoS results may be 'masked' by congestion preventing traffic flows arriving at adjacent intersections, and may not represent observed experiences at key intersections, in aggregate they do reflect an area which is susceptible to congestion and over-capacity conditions. For example, the congestion observed at Princes Highway / May Street intersection (reported as LoS F in the AM peak) is typically a consequence of LoS F conditions at the downstream Princes Highway / Campbell Street intersection (reported as LoS D), as shown in Figure 5.2.

Source: Nearmap

Figure 5.2: May Street intersection congestion as a consequence of Campbell Street intersection congestion

6. CONSTRUCTION PERIOD ASSESSMENT

6.1 IMPACT TYPES

Three types of construction period traffic impacts have been identified, namely:

- Impacts due to additional construction vehicles on the road network
- Impacts due to surface road works such as lane and road closures including (short term, long term, night time, off peak, pedestrian and cyclist route diversions and bus stop impacts)
- Impacts due to reduced speed limits within construction zones.

6.2 CONSTRUCTION VEHICLES

Table 7-6 in the EIS includes the estimates of construction vehicle volumes in each peak period for each construction site. This table identified site C3 with the largest traffic movements of all sites in the PM peak hour with 145 two-way movements, of which 30 are heavy vehicle movements. In the context of surrounding traffic volumes on President Avenue these additional volumes are relatively minor.

6.3 CONSTRUCTION SITES

6.3.1 Site C1

The access to this site is to be as per the modification to the Marsh Street / Flora Street signals for the New M5 construction. It is agreed that no additional significant impacts are expected.

6.3.2 Site C2

Access would be via temporary signals on West Botany Street and given the street's function and the access volumes forecast, it is agreed that no significant impacts are likely.

6.3.3 Site C3

This site has left in/out access off President Avenue and full movement access off West Botany Street via temporary signals. It is expected that most heavy vehicles would enter via President Avenue and exit via West Botany Street thereby minimising any turning impacts associated with right turns in by heavy vehicles off West Botany Street.

6.3.4 Site C4/C5

These sites are relatively small construction facilities with a maximum of 15 vehicle movements expected in the PM peak hour at site C5. It is agreed that the impacts of these sites are minor and given that the impacts to Bruce Street for access to Site C5 will be limited to its western end which is close to West Botany Street.

6.3.5 Site C6

The access to this site is proposed to make use for the eastern-most driveway currently used by the 7-eleven on the site. This site is in a high-volume area and the additional traffic movements associated with the site would be negligible in the context of this background traffic. Any opportunity to 'shield' left turn movements into this driveway via clearly line marking the separation of a turning area separate from the two eastbound through lanes would provide access safety benefits.

6.4 WORKFORCE PARKING

Parking demands at worksites vary considerably during various phases of construction with typically more light vehicles needed towards the end of construction when a range of fit out and finalisation tasks are undertaken by multiple disciplines. The EIS identifies that there will be more on-site parking provided than the expected light vehicle peak demand and there is no basis to dispute this. The Construction Traffic Access Management Plan (CTAMP) would include a Parking Management Plan that would be developed when the detailed construction program for each site was better known.

6.5 INTERSECTION IMPACTS ASSESSMENTS

The EIS identifies construction traffic will add to the congestion at the Marsh Street / M5 ramps intersection which is well over capacity in the morning peak with the green time for the dual right turn lane towards the M5 controlled such that excess traffic volumes from Marsh Street do not 'flood' the M5 tunnel on-ramp with traffic. Site observations suggest that the right turn out of the tunnel off-ramp, and the left turn into the tunnel on-ramp, which are the primary movements associated with construction vehicles, will be able to accommodate the minor increases in turn movements in their associated signal phases.

The Marsh Street / Flora Street intersection has also been identified to worsen slightly due to construction vehicles. The key to minimising the impacts at this intersection is to ensure that the green time for right turns into Flora Street is not reduced such that the tail of the queue from its pocket extends further into Marsh Street westbound (as is sometimes the case in the AM peak).

The Princes Highway / Wickham Street / Forest Road intersection and the West Botany Street / Bay Street intersection are both identified as being well over capacity in peak periods. The construction traffic adds less than 1% more traffic to the Princes Highway / Wickham Street / Forest Road intersection and 4%-5% more traffic to the West Botany Street / Bay Street intersection. These volume increases would be expected to be within the daily fluctuations in traffic at these intersections and are not significant.

6.6 PARKING IMPACTS

6.6.1 Ilinden Sports Centre

The direct impacts on the sports centre's off-street parking area appear to be minimal and would be mitigated to some extent by the removal of the demand associated with the two ovals, skate park and children's playground area. However, even though the EIS identifies that there would be sufficient construction worker parking provided elsewhere, there is the potential for construction workers to park in this area due to its proximity to the construction zone. The CTAMP should specifically preclude construction worker parking at times when the sports centre is in peak use; for example, from 3:00 PM onwards weekdays and on week-ends.

6.6.2 On Street Parking

The temporary parking impacts in O'Neill Street would be mitigated to some extent by the removal of the parking demands for the houses west of O'Neill Street which are being removed.

The spaces being removed in Civic Avenue can readily be absorbed by parking in sections further to the south.

The loss of on-street parking on West Botany Street north of French Street would appear to mostly affect out-of-peak parking by visitors to the light industrial businesses along this section. There appears to be sufficient on-site parking to the rear of these businesses to accommodate the dislocated parking demand.

6.7 ACTIVE TRANSPORT INCLUDING BUS STOP ACCESS

The most relevant temporary bus stop impacts appear to be on President Avenue although it is agreed that any relocations would have relatively minor impacts.

Table 8-24 of the EIS deals with the impacts of the temporary closure of footpaths and cycleways due to construction activities near President Avenue, West Botany Street and Bicentennial Park. The impacts identified appear to cover all of the likely impacts during construction with suitable diversion routes/strategies able to be put in place.

However, the removal of the parking lane in each direction in President Avenue and replacing it with a traffic lane would reduce the separation between cyclists and traffic, and particularly heavy traffic which would most likely be using the outer lanes.

President Avenue could otherwise be an attractive cycle route with access to a school and TAFE at its western end and connections to the north-south regional cycleway facility at Rockdale Bicentennial Park. With 3.0m to 3.5m wide lanes proposed for President Avenue, there would be a clear benefit in providing a 2.0m wide shared pedestrian/cycle path on one (or both) sides of President Avenue between the proposed new facility north-south shared path and the Princes Highway, ideally during construction and prior to converting Princes Highway to three lanes each way at all times. Such a path along the southern side of President Avenue would facilitate a connection between the new north-south regional facility and the wide path on the Princes Highway which connects to the Hogben Street pedestrian/cycle overpass.

7. OPERATIONAL PERIOD ASSESSMENT

7.1 OPERATIONAL PERFORMANCE WITHOUT THE PROJECT

7.1.1 President Avenue Intersection Area

For some intersections, the LoS results presented in Table 8-31 ('do minimum', 2026) differ from those presented in Table 8-22 (without construction, 2021). Whilst this highlights a difference in the modelling software used for construction period impact assessment and the operational period modelling, Table 8-31 also suggests that three of the four intersections along the Princes Highway will operate at LoS D or better through to 2026 and by 2036 only one of the four intersections assessed along the Princes Highway will experience average delays in excess of 70 seconds in either peak hour.

What these results may infer, is that the network models are reflecting traffic being 'held up' in other parts of the network and not being able to freely arrive at the reported intersections. If this is the case, these issues would also be relevant in the 'do something' scenarios.

The results presented in Table 8-31 show that for the four intersections reported along the Prince Highway, average AM delays (in total) increase from 128 seconds in 2014/15 to 182 seconds in 2036 (+42%) This is consistent with the results shown in Figure 8-15 with AM peak northbound travel time increases (two-way) from approximately 22.3 minutes in 2014/15 to 31.6 minutes in 2036 (+42%). Similarly, in the PM peak average delay increases from 141 seconds to 185 seconds (+31%) and two-way travel times increase from 21.1 minutes to 31.3 minutes (+48%), although the lower volume counter-peak direction has the most significant increase which may slightly bias the comparison.

7.1.2 St Peters Interchange Area

The St Peters interchange area, and east of this area into Mascot is expected to be even more congested by 2036 than is currently the case with the entire Mascot-St Peters precinct operating at capacity in peak hours. A number of intersections on Table 8-64 show LoS F and delays of '>100' seconds. There is a marked difference between an average delay of 120 seconds and an average delay of over 300 seconds and publishing the average delay in 'bands' greater than 100 seconds would have allowed the relative scale of these issues to be better understood.

7.2 NETWORK IMPACTS AND BENEFITS WITH THE PROJECT

7.2.1 Traffic Catchments

As expected, on a metropolitan Sydney-wide basis, the F6 Extension Stage 1 results in a minimal percentage change in Vehicle Hours Travelled (VHT) and induces slightly longer distance trips with marginal increases in Vehicle Kilometres Travelled (VKT).

The roads which benefit most from the project via a reduction in their volumes are the General Holmes Drive – M1 corridor as some vehicles heading to/from the CBD and north of the CBD are drawn in via the F6 Extension to the New M5 and the M4-M5 link. The screenline analysis shows however that the F6 Extension Stage 1 draws from a broad catchment with reductions in traffic from directly competing routes of General Holmes Drive, Princes Highway and West Botany Street comprising 17,500 vehicles per day of the total 43,100 vehicles per day in 2036. That is, more than half of the traffic reduction benefit is derived from 'indirect' trips which would have otherwise used routes much further afield.

7.2.2 Link-Based LoS

The link-based LoS shown in Appendix D, Table 10-6 shows all motorway links operating at LoS D or better with the project except for the St Peters Interchange southbound on-ramp which is shown as LoS E.

This finding flags a potential issue in 2036 PM peak as well in that the volume entering the New M5 southbound from the St Peters interchange is more than double the volume arriving from further north on the M4-M5 link. Then, with this combined volume of nearly 6,000 vehicles per hour over 4 lanes on the New M5, about half of this traffic diverges to the start of the F6 Extension Stage 1. This part of Sydney's motorway network is highly susceptible to growth and other projects such as the F6 Extension Stage 2 or the Western Harbour Tunnel Northern Beaches Link (WHTNBL) which would draw more traffic through this section.

7.3 PRESIDENT AVENUE INTERCHANGE AREA

7.3.1 Traffic Impacts

When reviewing the volume change plots in Figure 8-35 and Figure 8-36 in the EIS, it is clear that the increases in traffic volumes on the surface road system due to the project are focused on:

- The Princess Highway corridor south of President Avenue
- President Avenue between the Princess Highway and the F6 Extension Stage 1 ramps intersection.

The upgrade to the President Avenue / Princes Highway intersection proposed under the project improves the performance of this intersection under 'do something' compared to under 'do nothing', which is expected. The next major intersection to the south; the Princes Highway/Rocky Point Road intersection, shows a marginal worsening from LoS C to LoS D in the 2036 AM peak. Site observations suggest that this intersection is not at LoS C now but rather is at capacity in the AM peak as northbound traffic from the Princes Highway and northbound traffic from Rocky Point Road converge at their intersection to compete for the available green time at the signals. Further assessment and consideration of potential improvement measures at this intersection would be appropriate.

The Lachal Avenue / President Avenue intersection was not assessed in the EIS however the PIR made changes to this area and this intersection which are considered in Chapter 9 of this report.

7.3.2 Public Transport

The modelling suggests an increase in bus travel times associated with 'do something' compared to 'do minimum and this appears to be an increase in contra-peak direction traffic travel times. The travel time increases are not considered to be significant in the context of total trip lengths and times.

7.3.3 Active Transport

Whilst the new regional north-south shared pedestrian-cyclist facility will be a significant improvement in the area, as discussed in Section 6.7 above, removal of the parking lanes in President Avenue means a less protected environment for on-road cyclists and suggests the need for a shared off-road facility along the southern side of President Avenue between the new regional facility and the Princes Highway.

7.3.4 Local Property Access and On Street Parking

A number of individual driveways to multi-unit properties and individual dwellings along President Avenue will remain.

Access to/from these driveways is currently 'protected' by vehicles parked in the outer lane in each direction. Removing these parking lanes and parked vehicles along with increased traffic volumes and increased heavy vehicle volumes would in combination impact the ease of access to and from these driveways. Some of these dwellings don't have on-site garages and rely on the President Avenue for parking. Other dwellings have short driveways which require reverse movements onto President Avenue. Site-specific access management plans would be beneficial as part of the construction period and operational period access management for these sites.

7.4 ST PETERS INTERCHANGE AND SURROUNDS

7.4.1 Traffic Impacts

The modelling suggests that, in general, the St Peters Interchange area will be at capacity in 2036 without or with the F6 Extension Stage 1. The additional traffic attracted to the interchange due to the F6 Extension simply adds to the congested conditions. For example, 600 vph added to the network to the 2036 AM peak cannot be absorbed and increases the total travel time in the network by 7%. Similarly, in the 2036 PM peak, the addition of 200 vph increases the total time travelled in the network by 9%. These results highlight the vulnerability of the St Peters Interchange area to congestion and delays with only marginal increases in traffic demand.

These escalating congestion issues are generally not reflected in the route-based travel times shown in Figure 8-45 and Figure 8-46 in the EIS because the route-based travel times are for traffic which arrives to the start of the route and does not account for the travel delays in getting to the start of the route, or from the end of the route to the final destination. The presented changes in route-based travel times can be misleading in signalised at-capacity corridors where travel times 'bottom out' to times dictated by signal settings.

The key highlight from Figure 8-45 is the over five minutes of additional travel time from the St Peters interchange off-ramp into Euston Road in the AM peak. This essentially reflects the over-capacity condition of the Euston Road / Campbell Road / M5 ramps intersection in the AM peak where the additional traffic introduced by the F6 Extension Stage 1 increases average delays at this intersection from 70 seconds to over 100 seconds. This may result in queues blocking back into the St Peters interchange, introducing safety issues. This intersection is being constructed with a very large footprint and further consideration should be given to either grade-separation of this intersection or early construction of the link from the St Peters interchange to the south via the Sydney Gateway proposal to take pressure off this intersection.

7.4.2 Public Transport

Figure 8-47 in the EIS shows a minimal change in bus travel times when comparing 'do minimum' with 'do something'. These results can be misleading as they do not suggest which routes are being measured nor do they reflect average bus speeds. With the levels of congestion expected between 2026 and 2036, bus travel times will increase rapidly in some parts the network along with worsening travel time reliability under 'do minimum' and 'do something'.

7.4.3 Active Transport

The F6 Extension Stage 1 has no influence on active transport near the St Peters Interchange.

7.5 CUMULATIVE IMPACTS

7.5.1 General

What the modelling suggests is that the extension of the F6 further south for 'Stage 2' increases its volume north of President Avenue from 43,000 vpd to 58,000 vpd, most likely demanding six lanes in the F6 extension. Table 12.1 and Table 12.2 of Appendix D in the EIS identify that the three lanes northbound on the F6 will ultimately be merged back to two lanes before joining the two lanes on the M5. This will create a 'throttle' on the F6 which will generate long queues back along the F6 in the AM peak. The extent of this queue has not been published but would be expected to be significant. No travel times has been published for the F6 Extension to verify the extent of this impact.

What the modelling also suggests is, should the WHTNBL project also be approved, then this would make the F6 Extension corridor even more attractive and would bring forward the pressure to open up the 5th and 6th lanes on the F6 Extension, with potential congestion consequences at its juncture with the New M5.

7.5.2 President Avenue Intersection Area

West Botany Street intersections are shown to generate the most impacts when the F6 is extended into Stage 2. It is unclear if this is a consequence of traffic avoiding entering the F6 at President Avenue in the AM peak because of the congestion throttle created at the northern F6 Extension and diverting traffic back to the surface road system under the cumulative scenario. That is, traffic from the F6 Stage 2 catchment would essentially displace traffic from the F6 Stage 1 catchment when comparing the 2036 'cumulative scenario' to the 2036 'do something' scenario.

7.5.3 St Peters Interchange Area

Table 8-62 in the EIS identified that more traffic is able to enter the network in the cumulative scenario but there are 360 vph more in the AM peak that cannot enter the network compared to the 'do something' scenario. Whilst volumes have increased, average speeds have also increased substantially even though key intersections are performing just as poorly as the do something scenario in the PM peak. These results are not explained in the EIS.

The results initially appear counter-intuitive but may be a consequence of the F6 Extension (with Stage 2 and with WHTNBL) attracting longer distance trips and displacing shorter distance trips thereby marginally reducing traffic impacts near the St Peters Interchange because some of this traffic now uses the surface road system under the cumulative scenario and the impacts are dissolved over a larger area.

8. REVIEW OF EIS SUBMISSIONS

8.1 OVERVIEW

A number of the public submissions to the EIS included comments related to traffic and transport matters. This section summarises a selection of these submissions and responds to the issues raised.

8.2 KEY ISSUES AND RESPONSES

The key issues raised in selected submissions and the associated responses are summarised below.

ID	Summary of issue(s) raised	Response(s)
1	The safety of turning right into President Avenue from Lachal Avenue given that the intersection is unsignalized and consideration of traffic signals.	The proposed configuration contained in the EIS was likely to increase the likelihood of crashes for right turns from the Moorefield Estate into President Avenue compared to the current situation. The consideration of this issue was superseded by the contents of the PIR which included changes to the access to/from and the configuration of streets in the Moorefield Estate (see Chapter 9).
2	1. Southern Sydney needs public transport improvements instead. 2. Insufficient geographical scope of the modelling in relation to cumulative impacts. 3. Traffic benefits will be short term due to induced demands.	1. The EIS adequately addresses the options assessment and project need. Whilst public transport improvements will be important, the project serves a range of travel markets and has a range of purposes that cannot be solely addressed by better public transport. 2. The modelling methodology is considered to be sound. The hierarchy of models and the region each 'level' of model covers is commensurate with the scale of the project's impacts in these regions. 3. The EIS identifies that the project and surrounding areas will have some capacity issues by 2036. Whilst the project will induce traffic into the F6 Stage 1 corridor and its connecting routes, the travel time reduction benefits compared to the 'do minimum' scenario are considered to be beneficial for the long term.
3	1. Construction of Stage 1 only will generate more traffic in President Avenue. 2. More attention on public transport and commuter car parks instead. 3. TAFE access entry has insufficient capacity for crossing three lanes of traffic. 4. Lachal Avenue is narrow and the intersection with President Avenue should be signalised. 5. Removal of the right turn in from President Avenue to Traynor Avenue will inconvenience residents. 6. Civic Avenue left in/out only will impact residents and more traffic means that they won't be able to access the right turn into West Botany Street. It is a wide street and hence the 'logical location' for traffic signals on President Avenue. 7. The Marshall Street / Rocky Point Road intersection should be incorporated into the signalised intersection of Princes Highway / Rocky Point Road.	1. The modelling identifies that Stage 1 will introduce more traffic into President Avenue west of the F6 Extension Stage 1 intersection and the EIS identifies that this will be mitigated with capacity improvement works in this section. The capacity-based mitigation measures are adequate to cater for increased traffic volumes. 2. Whilst public transport improvements will be important, the project serves a range of travel markets and has a range of purposes that cannot be solely addressed by better public transport. 3. No specific capacity or safety assessment of the TAFE entry has been included in the EIS and a more targeted assessment for access to/from the TAFE was considered to be warranted, as subsequently provided via the PIR. 4. No specific capacity or safety assessment been included in the EIS for the unsignalised intersection of Lachal Avenue and President Avenue. The assessment of this intersection was superseded by the contents of the PIR as discussed in Chapter 9. 5. This issue was further addressed in the PIR as discussed in Chapter 9. 6. This issue was further addressed in the PIR as discussed in Chapter 9. 7. The Princes Highway / Rocky Point Road intersection is already at capacity in peak periods and bringing in the Marshall Street intersection would further complicate phasing arrangements at this intersection, and further congest it.

ID	Summary of issue(s) raised	Response(s)
4	1. Biased evaluation of other transport alternatives for the F6 Corridor: *"an inadequate analysis is provided of the alternatives to this project proposal. I do not consider one and half pages of public transport alternatives an adequate analysis. (EIS Chapter 5, page 4). This poor biased evaluation of the alternatives left the reader with the impression that the F6 Project would be considered the only viable alternative. I disagree with this analysis and its outcome. I seek that a more comprehensive alternative analysis be done by an independent body to evaluate if a Motorway proposal is the best option for the FG corridor*". 2. Road and pedestrian safety risks: *'more accidents and be increased danger as a pedestrian'* 3. Entrapment of Moorefield Estate Residents: - More difficult to access West Botany Street from Civic Avenue. - Right turn from President Avenue into Traynor Street will be 'impossible' and its already difficult. - The right turn from Lachal Avenue into President Avenue is difficult now and will be dangerous with the project. - Removal of the right turn at Civic Avenue into President Avenue reduces Moorefield Estate route options to head east.	1. The public transport alternatives evaluation is sufficient and reasonable in that it confirms that improving public transport, both rail-based and bus-based, is part of the overall package of measures needed to address transport demands into the future. However, the project serves a range of travel markets and has a range of purposes that cannot be solely addressed by better public transport, such as heavy road freight movement and intra-suburban travel. 2. There will be more traffic on President Avenue west of the F6 Extension Stage 1 intersection which will naturally result in a higher likelihood of incidents for pedestrians crossing President Avenue and crossing side streets near President Avenue when vehicles are turning. This is partially mitigated by the proposed grade separated walk/cycle crossing being proposed as part of the project. 3. The route path options for Moorefield Estate residents to enter and leave the estate are reduced and, in most cases, longer routes are required in order to access/egress via controlled intersections. A number of these specific turning movement concerns were subsequently addressed in the PIR as discussed in Chapter 9.
5	1. There are major issues with the Traffic and Transport Assessment. There is insufficient information about the modelling inputs, assumptions and methodology for the forecasts to be independently verified. There is no sensitivity analysis of key assumptions. 2. Congestion relief could (instead) be met through better management of demand on the existing road network, e.g., through reform of road pricing. The corridor already has an extensive and high capacity road network; there is just too much demand at present for it to operate effectively. Adding more capacity will not lessen this demand; it will only serve to increase it. Should invest in public transport instead. 3. For radial transport into and out of urban centres, mass transit is more efficient and economical, and has less impact on the human population. 4. Construction period traffic and parking impacts (generally). 5. Traffic and transport impacts don't consider the broader study area.	1. The modelling assumptions provided in Appendix D to the EIS are consistent with the level of modelling detail provided for other similar EISs. It would be unreasonable and excessive to include all of the background material used to create the PTPM and the SMPM in the EIS. Whilst the models have not been audited and verified by DoP, the modelling results have been independently reviewed and are considered representative of expected results from the models at the strategic, mesoscopic and simulation model levels. Sensitivity analysis would be unlikely to significantly alter the project's need or impacts by 2036 given that the sub-regional network is mostly at-capacity at this year. 2. Broader road pricing policy is considered to be out of scope for this project. The consideration of public transport alternatives is considered to be sufficient in the EIS in that it confirms that improving public transport, both rail-based and bus-based, is part of the overall package of measures needed to address transport demands into the future. However, the Project serves a range of travel markets and has a range of purposes that cannot be solely addressed by better public transport, such as heavy road freight movement and intra-suburban travel. 3. This is a broader issue related to transport policy and not specifically related to this project. 4. The construction and parking impact assessment is sufficiently detailed for this stage of the project design's evolution. The CTMP is expected to address a number of the comments raised and other issues identified in the DoP review of the EIS.

ID	Summary of issue(s) raised	Response(s)
	6. Insufficient information provided on the modelling.	5. The traffic pattern changes introduced by the F6 Extension Stage 1 are shown in Figure 10-2 in Appendix D to the EIS and demonstrate that the primary 'broader' effects are on the Princes Highway and on other parts of the motorway network. The broader study area has been adequately covered in terms of impact assessment. 6. As per response 1 above.
6	1. Local streets in Moorefield Estate are narrow and cannot cater for increased circulating traffic. 2. There will be issues gaining safe access to and egress from Moorefield Estate.	1. The number of route paths for entry to and exit from the Moorefield Estate have been reduced with the project due to street closures and turn bans at its intersection with President Avenue. Some on street parking rationalisation may be required to provide for two way flows on a number of estate streets to cater for circulating traffic. Moorefield Estate access and circulation issues were subsequently addressed in the PIR as presented in Chapter 9. 2. This issue was further addressed in the PIR as discussed in Chapter 9.
7	Relevant traffic and transport issues raised were: 1. The project will generate more traffic onto Princes Highway and Rocky Point Road south of the President Avenue. 2. The Stage 1 terminus will exacerbate traffic congestion in the local area. 3. The project will increase the difficulty of local residents to access Princes Highway and Rocky Point Road.	1. The project does attract more traffic to both Princes Highway and Rocky Point Road south of the President Avenue. Both are arterial roads with a primary function of carrying through traffic. 2. Stage 1 will increase traffic on President Avenue west of the F6 Extension Stage 1 intersection and whilst some upgrades to President Avenue have been provided, congestion will worsen. 3. Yes, the project will result in more traffic on Princes Highway and Rocky Point Road south of President Avenue and will increase delays for Moorefield Estate residents to access Rocky Point Road. These impacts have not been quantified in the EIS, and no specific mitigation measures have been proposed.

9. PREFERRED INFRASTRUCTURE REPORT REVIEW

9.1 OVERVIEW

The PIR describes the design changes and refinements that are proposed to address issues raised during public exhibition of the EIS. The PIR has described two design refinements to the project, namely:

- *'Changes to the operational (period) access arrangements to and from President Avenue at Lachal Avenue, Traynor Avenue, West Botany Street and Civic Avenue*
- *Extension of the shared cycle and pedestrian pathway from President Avenue through Scarborough Park North to Chuter Avenue/O'Connell Street in the southern part of the project footprint'*.

This section of this report provides the outcomes of the review of the two items above based on the contents of the PIR.

9.2 REVIEW OF LOCALISED TRAFFIC CHANGES

The key changes to traffic and access along President Avenue in the PIR compared to the EIS and the current situation are discussed below.

9.2.1 TAFE Egress, TAFE Access and Lachal Avenue

The revised access arrangements in the PIR for this area shown in Figure 9.1 are supported as they provide a much safer arrangement for entries and exits. Traffic entering Lachal Avenue is 'protected' by means of a signal which stops opposing westbound traffic in President Avenue and Lachal Avenue is provided as one way southbound. This new signal will also provide gaps for right turning traffic exiting the TAFE site to move across the westbound carriageway and into the storage area in the middle of President Avenue to accept a gap in eastbound flows. Similarly, the new signal at Lachal Avenue will provide gaps for traffic from President Avenue to turn right into the site.

This is a substantial improvement from the EIS configuration however the only potential issue is the profile of the driveway crossover into the TAFE site. What could occur, due to the limited separation between the signal stop line in President Avenue and the right turn in storage pocket, is that a vehicle may commence its right turn just as the President Avenue signal goes green. Given this distance is about 45m producing a gap of about 8 seconds, there is a possibility that an entering vehicle will prop at the crossover and have its rear protruding into the kerbside lane as a westbound vehicle approaches. There is however adequate sight distance for a westbound vehicle to observe this occurring and take appropriate action if required.

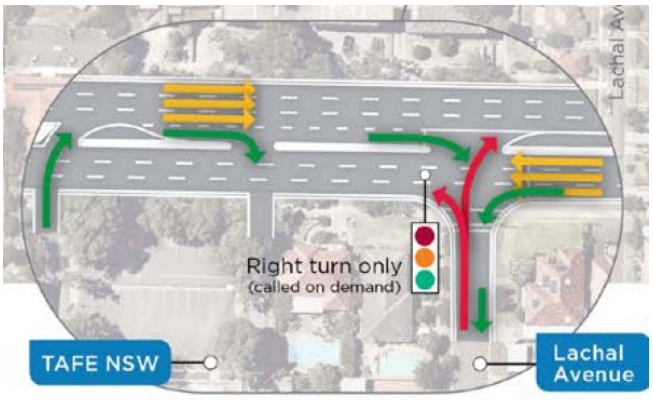


Figure 9.1: TAFE and Lachal Avenue Access Changes

9.2.2 Traynor Avenue / Cross Street / President Avenue

Traynor Avenue is converted to one-way northbound with only left turns out allowed at President Avenue, as shown in Figure 9.2. This is a much-improved concept compared to the EIS concept and compliments the one-way southbound change at Lachal Avenue.

The restriction of Cross Street to left in / out is also supported due to its safety benefits and with right turns out being able to be made via the West Botany Street intersection instead.

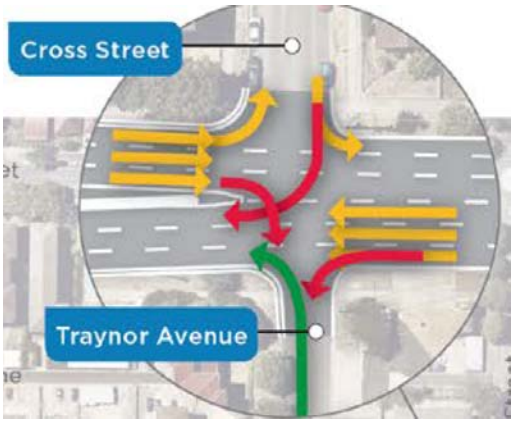


Figure 9.2: Traynor Avenue / Cross Street / President Avenue Changes

9.2.3 Oakdale Avenue / President Avenue

As shown in Figure 9.3, no changes are proposed in this location and the concern remains regarding the potential for right turns in and right turns out which would be hazardous movements given the number of lanes, proportion of large vehicles, high traffic volumes and proximity of adjacent intersections in President Avenue. A road safety assessment specifically associated with these movements at this location would be important during the design development phase of the project.

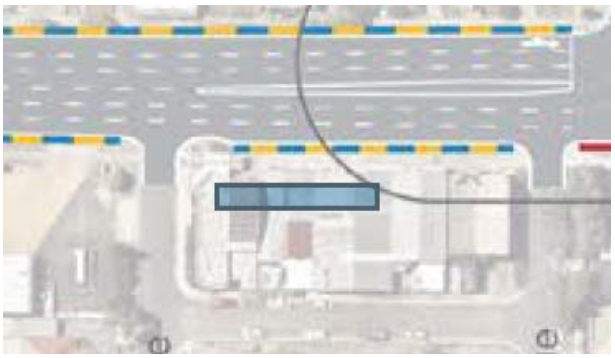


Figure 9.3: Oakdale Avenue / President Avenue Configuration

9.2.4 Moorefield Avenue / West Botany Street

Retaining Moorefield Avenue as left in/out with no cul-de-sac as shown in Figure 9.4 is supported as it provides for improved circulation, better dispersion of traffic and better access to the parking for the small commercial centre adjacent to this street. At West Botany Street, the additional (separated) left turn lane will benefit the capacity and safety of the intersection and is also supported.

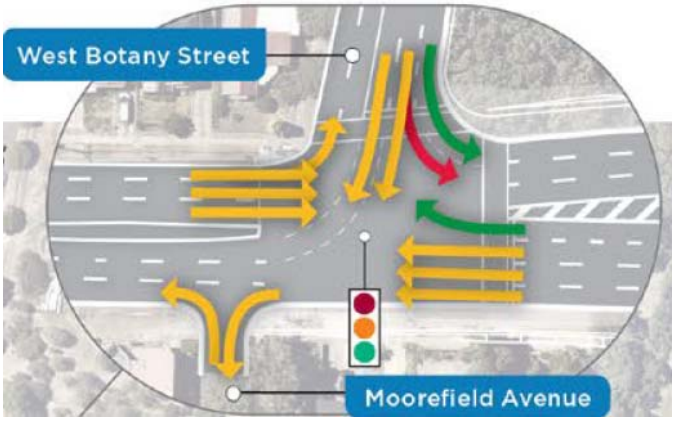


Figure 9.4: Moorefield Avenue / West Botany Street Configuration

9.2.5 Civic Avenue/President Avenue

The modification to include signalisation of this intersection is supported as Civic Avenue is the only controlled right turn out opportunity into President Avenue from Moorefield Estate.

The signalisation of this intersection also assists with the ability for left turning vehicles from Civic Avenue to join the right turn queue for turns into West Botany Street further east, although keeping clear through this intersection in the westbound direction could be influenced by the extension of the central painted median.

Figure 9.5: Civic Avenue / President Avenue Configuration

9.3 COMBINED IMPACTS CONSIDERATIONS

The traffic capacity review in the PIR shows that all of the above intersections operate with an acceptable LoS, which would be expected. Given that Civic Avenue is the only controlled right turn out of Moorefield Estate, there may be some benefit in 'future proofing' the right turn design for two right turn lanes.

The combination of the access changes to/from President Avenue between Civic Avenue and the Princes Highway were shown to produce marginal impacts in average travel times along President Avenue although it is expected that the introduction of traffic signals at Lachal Avenue and at Civic Avenue will increase the maximum travel time in the westbound direction, but not significantly enough to outweigh the traffic safety benefits that the changes achieve.

9.4 SOUTHERN EXTENSION OF THE SHARED CYCLE AND PEDESTRIAN PATHWAY

The extension to this facility documented in the PIR improves the connectivity of this facility to a broader network and provides greater accessibility for surrounding residences, with no traffic and transport impacts. This change is supported on this basis.

9.5 REVIEW OF THE ROADS AND MARITIME RESPONSES TO PIR SUBMISSIONS

A number of submissions were received on the PIR and Roads and Maritime has responses to these submissions. These responses have been reviewed below.

9.5.1 Southern Extension of the Active Transport Corridor

Summary of submissions issue(s) raised	Summary of Roads and Maritime Response(s)	Review Comment
A further extension of the route south was proposed within a few submissions, specifically noting Barton Street would be the preferred point of connection as it provides immediate east-west connectivity and links to pathways leading further south.	An intention of the extension was to link to existing pathways at Chuter Avenue, connecting it with the eastern side of the corridor. Access to areas further south would be part of future stages are beyond the scope for the F6 Extension Stage 1.	The Roads and Maritime position is reasonable as the extension provides sufficient access to nearby residential streets and provides a network that has greater and better accessibility to residential areas than what exists without the project.
Objection to the proposed on-road section of the shared cycle and pedestrian pathway, stating that it presents a safety risk to users and that the impacts of property acquisition required for an off-road cycleway are outweighed by the benefits that a contiguous shared pathway would provide.	Roads and Maritime is not proposing an off road alignment	The Roads and Maritime position is reasonable as the off road alignment would be an excessive impost of the project relative to its impacts.

9.5.2 President Avenue Access Changes

Summary of submissions issue(s) raised	Summary of Roads and Maritime Response(s)	Review Comment
The access changes into the Moorefield Estate would not provide benefits for traffic using President Avenue. Congestion along President Avenue would become worse, and the intersection with the Princes Highway would also be worse. Extra traffic signals will cause more congestion and more vehicle emissions. Concerns were raised that the changes will further increase the traffic connecting to O'Connell Street and access to this street should be prevented.	The changes being proposed reflect a balance between providing safe access into and out of the estate, and traffic flows along President Avenue. The introduction of the new traffic signals was assessed and demonstrated minimal changes compared to the EIS arrangement therefore overall emission levels along President Avenue would be the same as outlined in the EIS. The signalisation of the Civic Avenue intersection would operate in conjunction with the West Botany Street intersection signals with minimal delay impact.	The safety v efficiency compromises made in the concept changes in the PIR are supported as they achieve safer local accessibility with minimal impacts on traffic efficiency.
The safety of the Marshall Street intersection resulting from increased traffic from the project.	The project would not impact the safety of this intersection.	The Roads and Maritime response is agreed with.
No pedestrian link was provided on the northern side of President Avenue. requiring a very convoluted and potentially dangerous pedestrian route moving east-west through President Avenue.	Whilst no pedestrian access is provided on the northern side of President Avenue, the project is providing a footpath on the southern side to maintain east-west connectivity. Pedestrians would be able to cross to the southern side via the pedestrian crossing at West Botany Street and then head east along President Avenue to Brighton Le-Sands. Access to Brighton Le-Sands School can be accessed via the shared cycle and pedestrian pathway from the northern side of President Avenue through Rockdale Bicentennial Park.	Whilst it is acknowledged that the alternative option is provided by the project for pedestrian movements, there would be benefits in including at least one north-south pedestrian crossing (if possible) as part of the configuration of the intersection given the long distances required to access the new grade separated facility.

9.5.3 Bayside Council Submission

Summary of submissions issue(s) raised	Summary of Roads and Maritime Response(s)	Review Comment
The PIR does not state the length of a holding lane in President Avenue for traffic that turns right out of Civic Avenue. This holding lane is required to allow traffic from Civic Ave to merge safely with traffic travelling in President Avenue.	A further review of operation and safety identified an undesirable potential for a traffic conflict with this arrangement and the traffic signals have been modified to ensure that all movements are fully signal-controlled, and a holding bay is not required.	This safety benefits of this revised arrangement are supported
The shared cycle and pedestrian pathway, when it is on ground, is to be provided as a separated five metre active transport corridor (three metres cycleway, 1.5 metres pedestrian path). When the path merges to a shared-use boardwalk, the boardwalk width is to be a minimum 3.6 metres in width (between handrails) as per Austroads recommendations for high-use boardwalks and elevated paths.	The boardwalk section of the pathway was designed at three meters was to limit the potential impact of the boardwalk on the threatened vegetation and aesthetic qualities of Patmore Swamp. The detailed design will detail the optimal design width, whilst considering the other factors such as limiting native tree removal.	It is unlikely that this shared path would meet the volume warrants to be defined as a 'high use boardwalk'.
Council requests that the shared cycle/pedestrian path extension is further extended from Robinson Street to Barton Street with the retention of the refuge and crossing point on Chuter Avenue/O'Connell Street at Robinson Street	Access to areas substantially further south would be part of future stages of the F6 Extension and does not form the scope for the F6 Extension Stage 1.	It is agreed that further extensions of this facility to the south, whilst beneficial, are not related to the impacts and needs associated with this project.

10. CONCLUSIONS AND RECOMMENDATIONS

10.1 CONCLUSIONS

The EIS prepared for the F6 Extension Stage 1 has been reviewed considering the SEARs relevant to the Traffic and Transport Assessment. The key findings of the assessment were:

- There is no clear logic in the EIS for building the tunnels as three lanes each way given that only two lanes can merge with the two lanes northbound on the New M5 to join to form the maximum four lanes northbound on the New M5 north of this junction. Furthermore, 'throttling' the capacity of the F6 Extension to two lanes each way at its northern end would itself generate queues within the F6 Extension tunnel on approach to the New M5 merge.
- The proposed line marking on the President Avenue westbound approach to the Princes Highway signalised intersection introduces the potential for the right turn queues out of President Avenue blocking the higher volume left turn volumes from President Avenue. A solid separation line between the left turning and right turning lanes would reduce this risk.
- The suite of traffic models and software packages used and the relationships between them are considered appropriate for the construction period and the operational period impact assessment needs of the EIS.
- It is apparent from the modelling that the Sydney Gateway project will provide the traffic capacity relief needed for the St Peters interchange to accept increased traffic arrivals from the F6 Extension Stage 1 project and the relative timing of these two projects is a key consideration in managing the traffic impacts in the intermediate years between them.
- The construction period traffic impact assessment appears reasonable with relatively low volumes attracted to each construction site access (relatively surrounding background traffic) and suitable accesses provided. The only workforce parking impact that should be considered further as part of the CTAMP would be to prohibit worker parking during peak sports centre usage times at the Illiden Sports Centre car park.
- The removal of on street parking for the President Avenue clearway is likely to be implemented early on in the project and there are no alternative proximate cycle routes. Consideration could be given to the construction of a shared pathway along the southern side of President Avenue as part of this project, or another separate project to mitigate this impact.
- There are a number of intersection delay values where the LoS is F is shown as '>100 seconds'. Reporting the actual delay, or at least a graduated scale of delays (e.g. '100-200 seconds', '200-300 seconds' etc.) will allow the relative impact of the project to be better understood in each area. Simply stating that 'do minimum' and 'do something' are both LoS F does not provide any meaningful basis for identification of relative impacts.
- The Princes Highway / Rocky Point Road intersection is over capacity now, but this is not reflected in the 2014/15 modelling or the future year modelling. Given that the F6 Extension Stage 1 draws more traffic through this intersection, further assessment and consideration of potential improvement measures at this intersection would be appropriate.
- A number of individual residential properties along President Avenue rely on the on-street parking provided and some have driveways which require vehicles to reverse out onto President Avenue. These movements are currently 'protected' to some extent by parked vehicles. The creation of clearways will impact the safety of access to these properties and construction period and operational period access management plans for these properties would be beneficial.
- In terms of cumulative impacts, there is limited discussion on what effects the F6 Extension Stage 2 will have on F6 Stage 1, or what the WHTNBL will do to volumes on the F6 Extension Stage 1 in terms of bringing forward impacts or benefits to the President Avenue intersection area or the St Peters Interchange area.
- No changes are proposed at the Oakdale Avenue / President Avenue intersection which means that right turns in and right turns out are still possible with the project. These would be hazardous movements in peak periods given the number of lanes, proportion of large vehicles, high traffic volumes and proximity of adjacent intersections in President Avenue. A road safety assessment specifically associated with these movements at this location would be important during the design development phase of the project.

- Overall, the two changes proposed in the PIR are supported. The traffic and access changes at the intersections to Moorefield Estate along President Avenue address a number of the traffic safety issues from the concept included in the EIS.
- Given that Civic Avenue is the only controlled right turn out of Moorefield Estate under the PIR, there may be some benefit in 'future proofing' the right turn design for two right turn lanes.
- The southern extension of the Active Transport corridor as identified in the PIR provides improved connectivity to the residential areas to the east of the corridor.

10.2 RECOMMENDATIONS

Recommendations from the review of the F6 Extension Stage 1 EIS and PIR for consideration when setting approval conditions for the project are:

- As part of the Parking Management Plan for the Ilinden Sports Centre car park within the CTAMP, make reference to prohibiting construction worker parking during peak sports centre usage times.
- If not constructed as part of this project, reference the benefits of a future project to construct a shared pedestrian-cyclist path along the southern side of President Avenue connecting between the proposed north-south pedestrian-cyclist bridge and the Princes Highway intersection.
- Consider as part of the detailed design, the line marking detail at the President Avenue approach to the Princes Highway signalised intersection to minimise the risk of right turning vehicles queuing back through the marked left turn lanes.
- Re-assess the impacts at the Princes Highway / Rocky Point Road intersection for 'do something' after specifically calibrating the 2014/15 performance of this intersection to observed delays and queues given that the project draws more traffic through this intersection. Further consider potential upgrades to this intersection.
- During design development, identify access and egress impacts to individual properties along President Avenue due to the implementation of clearways and create construction period and operational period access management plans.
- Develop a mitigation strategy for the St Peters interchange / Campbell Road / Euston Road intersection to overcome its potential to cause queuing back into the St Peters Interchange introducing traffic safety and secondary capacity-blocking issues. This strategy could consider the timing of the construction of the Sydney Gateway project in relation to the F6 Extension Stage 1 project.
- Document why there is any benefit in extending the F6 beyond Stage 1 if the additional traffic from the extension cannot be accommodated by capacity constraints further north. Such a realisation may require reconsideration of how the entry and exit at President Avenue is configured if it is to be the long term southern terminus of the project.
- Conduct a road safety audit/assessment of the design for the Oakdale Avenue / President Avenue intersection as part of the design development with a view to banning these movements if warranted by the outcomes of the review.