# Operational Traffic Performance Review

## WestConnex - M4 Widening

Transport for New South Wales | January 2021

NSW GOVERNMENT

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# Contents

# Executive Summary

- The M4 Widening project involved the upgrade and widening to four lanes in each direction for about 7.5 kilometres between Parramatta and Homebush.
- The M4 Widening project was approved by The Department of Planning, Industry and Environment (DPIE), provided that the Conditions of Approval (CoA) were satisfied. As per CoA E6, the project is required to be reviewed 12 months after opening. The project was completed in July 2017 and opened to traffic with tolls on 15th August 2017.
- The Condition of Approval (CoA) E6 requires the preparation of an Operational Traffic Performance Review, 12 months and 5 years after the completion of the M4 Widening project.
- Traffic surveys of 40 different sites were undertaken prior to and after the opening of the M4 Widening Project. These included sites on Parramatta Road, surrounding arterials and the M4 Motorway.
- Sites with a 5% increase or less is considered within normal growth ranges or part of the normal day to day traffic volume variance for this project area. Anything with an observed change of more than 5% was treated as a change and this report will attempt to account for the cause and mitigate the impact where it is as a result of the M4 Widening project.
- Key findings observed from the comparison of the year on year count data include:
    - The M4 Motorway between Church Street and Homebush Bay Drive is experiencing about 50,000 less trips per day since the introduction of a distance based toll in August 2017
    - The opening of the M4 Widening project has resulted in M4 Motorway travel time savings of at least 14 minutes in the AM peak and 18 minutes in the PM peak periods between Parramatta and Homebush
    - There is a 66% reduction in crashes on the M4 Motorway since the widening and introduction of tolls between Church Street and Homebush Bay Drive. In contrast, Parramatta Road along the same section, has seen a 24% increase in crashes
    - Overall peak hour, peak direction travel volumes on Parramatta Road have not generally increased as the corridor was already operating at capacity prior to completion of the M4 Widening project. Queue lengths and durations of peak traffic have increased to cope with the increased demand.
    - There have been peak hour traffic volume increases of at least 30% on Parramatta Road in the direction of travel opposite to the typical Sydney peak direction, that is, westbound in the AM peak and eastbound in the PM peak
    - Northbound travel along Woodville Road near Parramatta Road has seen a 20% reduction in traffic using Woodville Road to then travel east on Parramatta Road.
    - Church Street entry and exit ramps have experienced a 35% increase in traffic volumes since the opening of the M4 Widening project
    - There has been an increase of about 10% in traffic turning left from the Church Street exit ramp towards Parramatta CBD and Parkes Street as an M4 Motorway alternative.
    - There has been a decrease in traffic using the James Ruse Drive corridor between Victoria Road and the M4 Motorway
    - There has been a large decrease in traffic using the James Ruse Drive interchange ramps
    - Rawson Street has seen an increase in traffic between Parramatta Road and St Hilliers Road
    - Silverwater Road is experiencing an increase in traffic along the corridor and using the entry ramps to the motorway in peak period directions
    - Increase in traffic travelling north on Homebush Bay Drive between Arthur Street and Australia Avenue
- Other findings which have been attributed to land use changes and/or other transport projects include:
    - Increases in traffic accessing Carnarvon Street from Silverwater Road.
    - Increase in traffic entering and exiting Carnarvon Street from Silverwater Road
    - Increase in traffic entering and exiting Hill Road from Parramatta Road

- Sites identified with significant traffic changes, and therefore require consideration of mitigation include:
    - M4 Eastbound Exit Ramp/Church St Intersection,
    - Parramatta Road/ Woodville Street/ Church Street Intersection
    - Parramatta Road/James Ruse Drive/Berry Street Intersection
    - Parramatta Road/Rawson Street/Duck Street Intersection
    - Silverwater Road /M4 Motorway Ramps
    - Parramatta Road/Silverwater Road/St Hilliers Road Intersection
    - Parramatta Road/Hill Road/Bombay Street Intersection,
    - Parramatta Road /Birnie Avenue
    - Centenary Drive/Arthur Street
- Over 2,000 pieces of correspondence have been received by Transport for New South Wales since August 2017 when the M4 Widening project opened to traffic with tolls. The majority of the submissions were generally opposed to certain aspects or impacts of the project. Key points raised in the submissions include:
    - Travel conditions and reliability on Parramatta Road have worsened since the M4 Widening project
    - Concern about increased difficulty in accessing properties on Parramatta Road since the project
    - Concern about the time taken to address the safety issue and number of vehicles queued on the M4 Motorway at the Church Street exit
    - Suggestions to upgrade the M4 Motorway west of Church Street to address the road safety issues and queuing impacts since the opening of the M4 Widening project
    - Suggestions about different pricing options depending on the time of day
    - Suggestions about toll relief to assist frequent road users and businesses relying on timely deliveries
    - Suggestions about upgrades and widening of Parramatta Road to improve, safety, amenity and/or visual impacts caused by congestion
    - Suggestions to address worsened congestion on Homebush Bay Drive near Arthur Street
- Mitigations being considered to counteract the impact caused by the M4 Widening project's impacts are described in Sections 6 and 7 of this report and summarised below.
    - Deliver improvements over the next three years to the M4 Motorway between Burnett Street, Merrylands and Church Street, Parramatta including:
        - Further upgrade and widening of the M4 eastbound exit ramp to Church Street and,
        - Improvements to the M4 eastbound entry ramp from the Parramatta Road, Church Street and Woodville Road intersection
    - Over the next 12 months, identify and plan for required improvements to the Parramatta Road, Church Street, Woodville Road intersection to enable efficient and safe performance of the M4 Eastbound exit ramp to Church Street into the long term future
    - Replacement of the two existing intersections at the M4 Motorway ramps and Silverwater Road with a single more efficient intersection beneath the M4 Motorway overpass
    - Upgrade of the Parramatta Road/James Ruse Drive/Berry Street intersection
    - Upgrade of the Parramatta Road/Rawson Street/Duck Street intersection
    - Upgrade of the Centenary Drive/Arthur Street intersection, including efficiency improvements to the Arthur Street/Richmond Street access arrangement onto Centenary Drive
    - Upgrade of the Parramatta Road/Silverwater Road intersection
- Apart from the proposals near Church Street, further investigation and planning is required to improve Transport for New South Wales' understanding of the likely impacts, benefits, costs and feasibility of these proposals before a decision regarding priority and delivery of these proposed mitigations is made. Should any of these proposed mitigations proceed, community and stakeholder consultation will be undertaken during the development of any of these proposed works.
- As per Planning Condition of Approval E6, an equivalent review to this will be prepared by Transport for New South Wales to evaluate the network and any potential mitigation introduced to the network 5 years after the opening of the M4 Widening project.

# 1. Introduction

## 1.1 WestConnex

WestConnex is a significant investment in Sydney's road infrastructure by the NSW and Australian governments. It is the largest urban road project currently underway in Australia and comprises a series of interconnected motorways and road upgrades to increase the capacity of the M4 and M5 Motorways and provide a vital underground link between the two motorways.

WestConnex is 33 kilometres in length, which includes capacity improvements on existing motorways as well as new sections of motorway. It aims to better link Sydney's west with its international gateways and key places of business. WestConnex will act as a catalyst to renew and transform parts of Sydney, creating urban renewal and public transport improvement opportunities. An overview of the WestConnex project is shown in Figure 1.

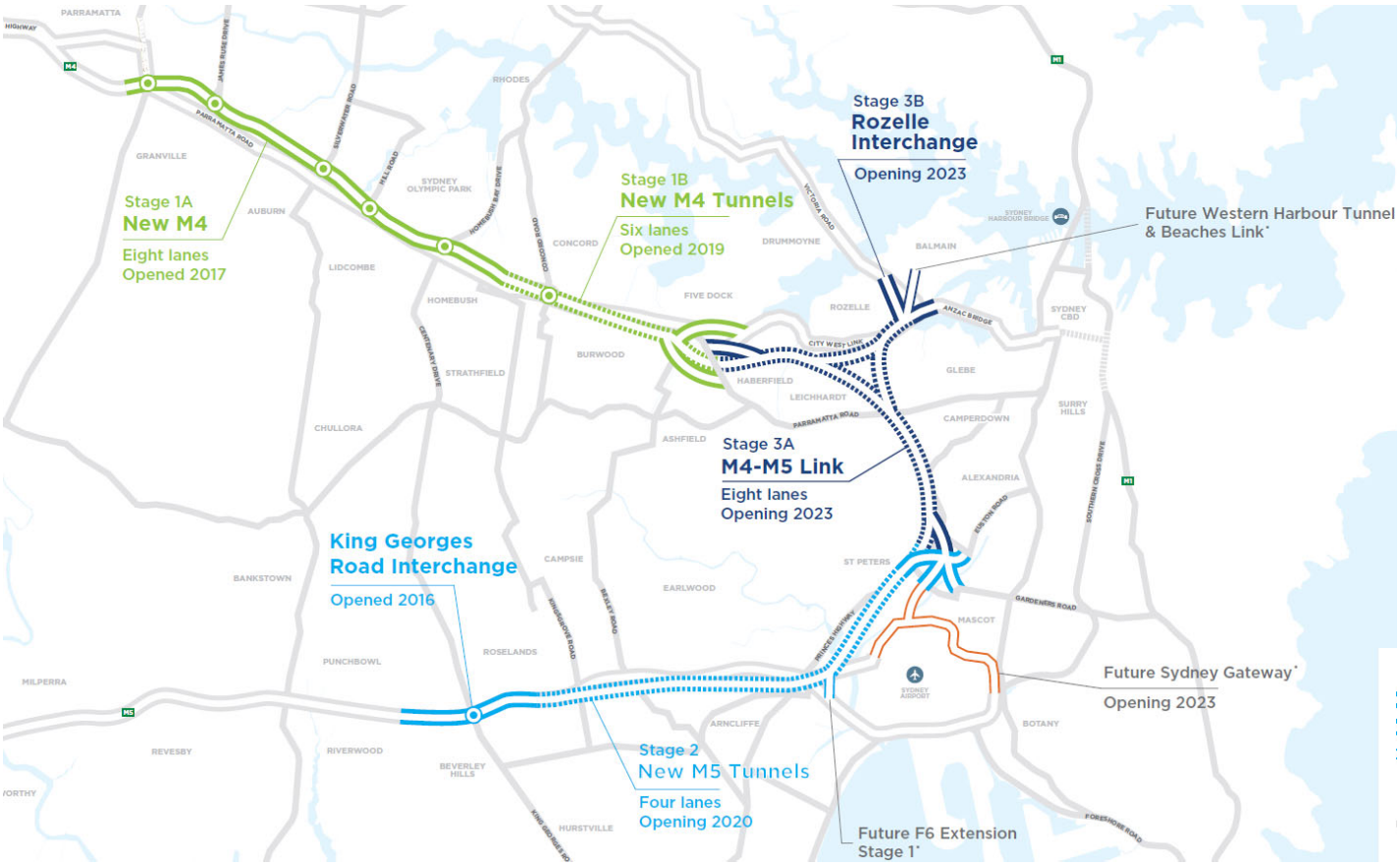



**Figure 1: Overview of WestConnex**

The key objective of WestConnex is to improve access to, and connectivity with, NSW's international gateways, Port Botany and Sydney Airport, which are vital economic assets. Efficient and reliable access to and from these gateways supports some of the state's most important economic journeys and is a critical element in sustaining the future productivity and global competitiveness of Sydney and NSW.

With more than two-thirds of WestConnex being built in underground tunnels, the project will ease congestion on surface roads and improve productivity and efficiency for all road users, including buses, freight and light commercial vehicles.

WestConnex is planned to be delivered in stages. Stage 1, comprising the M4 Widening and the M4 East is complete and open to traffic. Stage 2 and Stage 3 are currently in delivery. The schedule for WestConnex is indicated in Figure 1.

## 1.2 M4 Widening

The M4 Widening project involved the upgrade and widening to four lanes in each direction for about 7.5 kilometres between Parramatta and Homebush. The project was delivered to ease congestion along the motorway corridor and provide more reliable trips on the M4 Motorway.

The key features of the project included widening and upgrading the M4 Motorway generally between Pitt Street, Parramatta and Holroyd and Homebush Bay Drive, Homebush West, including:

- Widening of the existing motorway between Church Street, Parramatta and Homebush Bay Drive, Homebush to provide four traffic lanes in each direction;
- Construction of a new westbound G-loop on ramp to the M4 Motorway from Homebush Bay Drive, Homebush and a new eastbound on-ramp to the M4 from Hill Road, Lidcombe;
- Widening and /or lengthening of the existing ramps at Church Street, James Ruse Drive, Silverwater Road, Hill Road and Homebush Bay drive;
- Provision of intelligent transport systems for motorway operations;
- Provision of road infrastructure and complementary technology services to support the future implementation of smart motorway operations;
- Provision of tolling infrastructure such as gantries and control systems, and;
- Provision of new and modified noise barriers and a new asphalt wearing surface on the M4 Motorway.

The M4 Widening project was approved by The Department of Planning, Industry and Environment (DPIE), provided that the Conditions of Approval (CoA) were satisfied. As per CoA E6, the project is required to be reviewed 12 months after opening. The project was completed in July 2017 and opened to traffic with tolls on 15th August 2017. For the purpose of this traffic review, the 15th August 2017 is considered the date of the project opening.

# 2. Background & Purpose

## 2.1 Condition of Approval E6

The Condition of Approval (CoA) E6 requires the preparation of an Operational Traffic Performance Review, 12 months and 5 years after the completion of the M4 Widening. It was outlined by The Department of Planning, Industry and Environment (DPIE) to report changes in traffic volumes and behaviour of motorists upon the completion of the M4 Widening. This review is to evaluate the impact of the changes in traffic volumes on the road network, around the project.

According to the CoA, the review shall be undertaken in consultation with Transport for NSW and relevant Councils and include, but not necessarily be limited to:

- An assessment of the traffic and road network performance of the SSI and mitigation measures, identified in the Road Network Performance Report required by condition B15,
- A review and confirmation of the timeframe for prioritising and delivering outstanding mitigation measures required by above;
- A review of bus priority measures implemented to mitigate detrimental impacts on bus performance; and
- Details of any complaints received relating to traffic, transport and access impacts, and how they have been addressed in the review.

In response to the CoA E6, Transport for New South Wales has prepared this Operational Traffic Performance Review Plan. A proposed approach to completing the OTPR was agreed with DPIE and is outlined below:

- Compare and analyse pre-opening and post opening traffic volumes and patterns within the project area and study corridors
- Account for and model, where required, the impact of changes in traffic volumes in the project area.
- Develop proposed strategies to address and mitigate the impacts of the changes.
- Provide commentary and/or analysis for those traffic changes which have occurred and appear to be driven by external underlying factors (e.g. land use and development changes).
- Outline the potential timeframe, key considerations and/or priority for developing the outlined mitigation measures traffic improvement outcomes.

## 2.2 Purpose of this Document

The purpose of this report is to document the 12 month review process after M4 Widening completion, as required by DPIE to meet CoA E6. The report will identify those changes in the traffic patterns around the project area, as a result of the M4 Widening and will aim to pinpoint the causes and provide mitigation strategies needed to improve the local road network.

This report will outline the traffic information and assessment findings to consider different mitigation options to improve the transport network for it to operate more cohesively with the M4 Motorway.

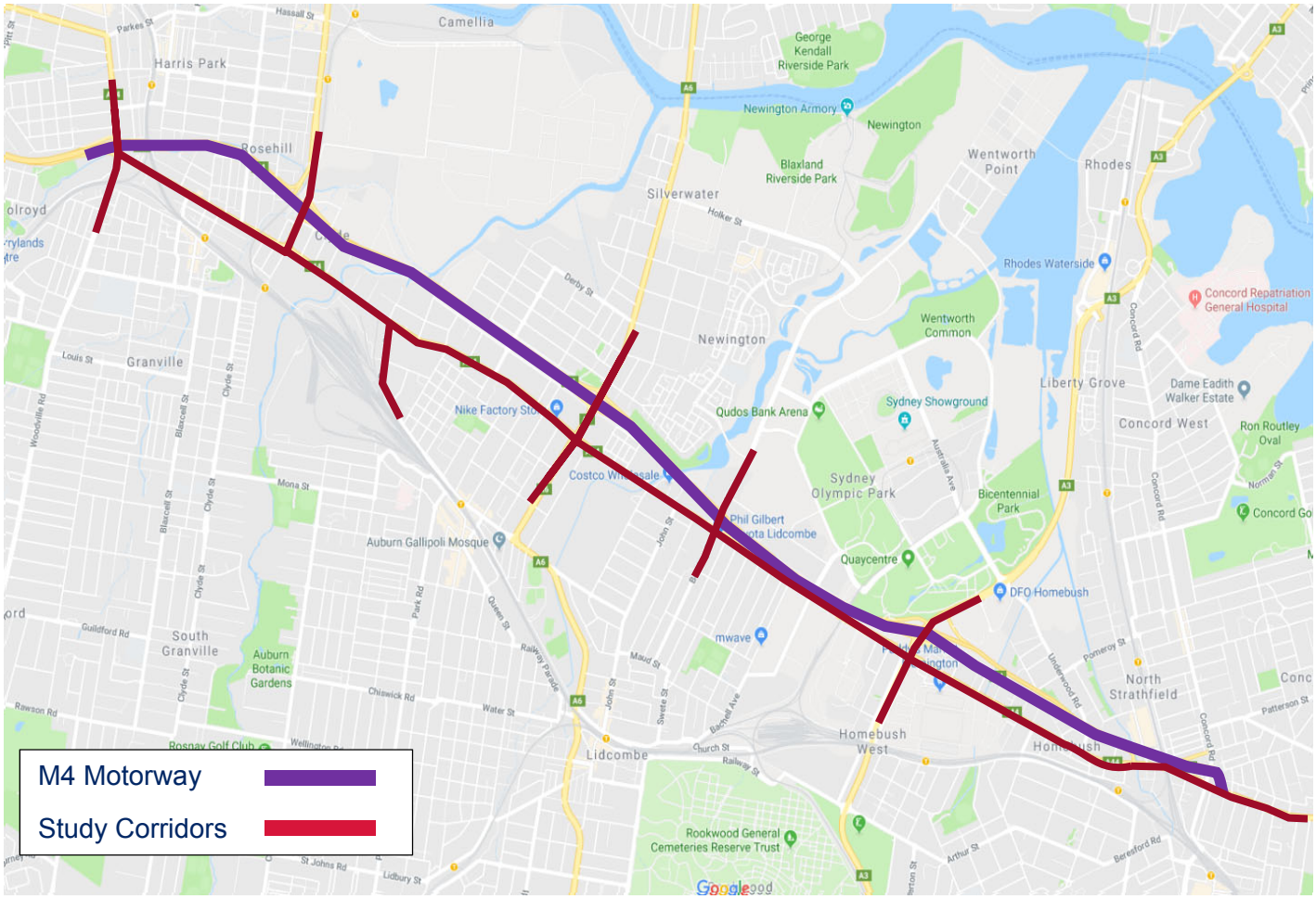
# 3. Objectives

## 3.1 Methodology

As per the proposed approach outlined in section 2.1, this report will consider and compare traffic volumes pre and post opening of the M4 Widening project. The comparison will identify the change in traffic patterns and any increases in usage of the transport network as a result of the M4 Widening project. This will highlight key areas that are deemed to have been highly impacted by the M4 Widening project. A summary of potential mitigation options for those locations will be included for further consideration by Transport for New South Wales.

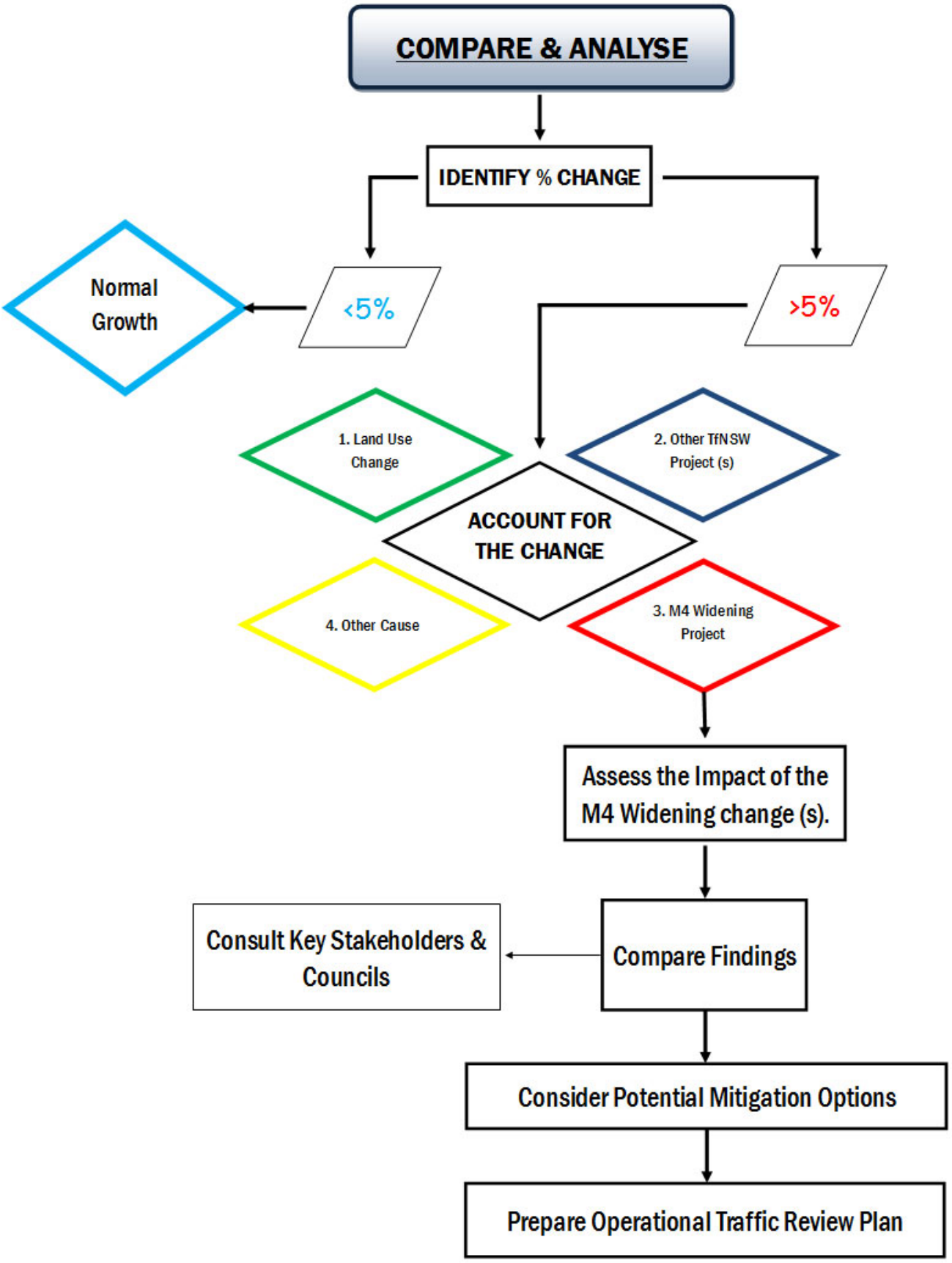
The report will discuss different mitigation strategies to manage key intersections and consider the feedback of key transport stakeholders around the project area. The report will also compare the mitigation options, with the Do Nothing Approach, and will weigh benefit of implementing these options in the proposed road network area, and also consider if they align with local council improvement works and future plans. The flow chart in Section 3.3 illustrates the assessment process to address CoA E6.

## 3.2 Study Area




Traffic surveys of 40 different sites were undertaken prior to and after the opening of the M4 Widening project. These included sites on Parramatta Road, surrounding arterials and the M4 Motorway. In consultation with key stakeholders, the sites were chosen based on their likely impact as a result of the M4 Widening project. Any impacts which were identified to the east of Homebush Bay Drive will be assessed as part of the post opening review of the New M4 Tunnels.

## 3.3 Process Flow Diagram



# 4. Findings

## 4.1 Traffic Counts

Traffic volume surveys were performed at a number of sites around the M4 Widening project. These surveys have been compared and analysed to determine the change in traffic volumes between March 2017 and March 2018. A percentage measure has been used to allow comparison of results across the study area.

Anything with a 5% increase or less is considered within normal growth ranges or part of the normal day to day traffic volume variance for this project area. Anything with an observed change of more than 5% was treated as a change and this report will attempt to account for the cause and mitigate the impact where it is as a result of the M4 Widening project. Section 4.1.1 and Section 4.1.2 summarise the key findings and sites observed with changes greater than 5% year on year.

### 4.1.1 Findings

Key findings observed from the comparison of the year on year counted data include:

- The M4 Motorway between Church Street and Homebush Bay Drive is experiencing about 50,000 less trips per day since the introduction of a distance based toll in August 2017
- The opening of the M4 Widening project has resulted in M4 Motorway travel time savings of at least 14 minutes in the AM peak and 18 minutes in the PM peak periods between Parramatta and Homebush
- There is a 66% reduction in crashes on the M4 Motorway since the widening and introduction of tolls between Church Street and Homebush Bay Drive. In contrast, Parramatta Road along the same section, has seen a 24% increase in crashes
- Overall peak hour, peak direction travel volumes on Parramatta Road have not generally increased as the corridor was already operating at capacity prior to completion of the M4 Widening project. Queue lengths and durations of peak traffic have increased to cope with the increased demand.
- There have been peak hour traffic volume increases of at least 30% on Parramatta Road in the direction of travel opposite to the typical Sydney peak direction, that is, westbound in the AM peak and eastbound in the PM peak
- Northbound travel along Woodville Road near Parramatta Road has seen a 20% reduction in traffic using Woodville Road to then travel east on Parramatta Road.
- Church Street entry and exit ramps have experienced a 35% increase in traffic volumes since the opening of the M4 Widening project
- There has been an increase of about 10% in traffic turning left from the Church Street exit ramp towards Parramatta CBD and Parkes Street as an M4 Motorway alternative.
- There has been a decrease in traffic using the James Ruse Drive corridor between Victoria Road and the M4 Motorway
- There has been a large decrease in traffic using the James Ruse Drive interchange ramps
- Rawson Street has seen an increase in traffic between Parramatta Road and St Hilliers Road
- Silverwater Road is experiencing an increase in traffic along the corridor and using the entry ramps to the motorway in peak period directions
- Increase in traffic travelling north on Homebush Bay Drive between Arthur Street and Australia Avenue

Other findings which are not caused by the M4 Widening project and have been attributed to developments, land use changes and/or other transport projects include:

- Increase in traffic entering and exiting Carnarvon Street from Silverwater Road due to increased industrial development.
- Increase in traffic entering and exiting Hill Road from Parramatta Road due to increased residential developments within Sydney Olympic Park

- No change to public transport servicing and infrastructure as there is no public transport priority infrastructure currently on Parramatta Road between Granville and Homebush (any proposed mitigations  will consider opportunities to improve public transport infrastructure)

## 4.1.2 Findings Commentary

The table below provides some commentary and reference (where applicable) about key findings and their discussion in the following sections of this report.

| Finding | Commentary and/or section in report where finding mitigation is proposed |
|---|---|
| The M4 Motorway between Church Street and Homebush Bay Drive is experiencing about 50,000 less trips per day since the introduction of a distance based toll in August 2017 | The reduction in trips on the motorway is as a result of the introduction of tolls between Church Street, Parramatta and Homebush Bay Drive, Homebush. A change to the tolling arrangement is not part of the scope of this report. |
| The opening of the M4 Widening project has resulted in M4 Motorway travel time savings of at least 14 minutes in the AM peak and 18 minutes in the PM peak periods between Parramatta and Homebush | Travel time savings on the M4 Motorway have been achieved. This is due to the reduction in trips now being taken on the motorway compared to the period prior to the completion of the M4 Widening project. |
| There is a 66% reduction in crashes on the M4 Motorway since the introduction of tolls between Church Street and Homebush Bay Drive. In contrast, Parramatta Road along the same section, has seen a 24% increase in crashes | Section 4.3. This corresponds to the reduction of trips on the M4 Motorway and increase in trips on Parramatta Road between Parramatta and Homebush. |
| Overall peak hour, peak direction travel volumes on Parramatta Road have not generally increased as the corridor was already operating at capacity prior to completion of the M4 Widening project. Queue lengths and durations of peak traffic have increased to cope with the increased demand. | There is increased demand for trips along Parramatta Road between Parramatta and Homebush. While any widening of Parramatta Road would address this finding it is not considered feasible within the timeframes for this review. Long term plans for Parramatta Road are also being developed with Transport for New South Wales for the Greater Parramatta and Olympic Park precinct which will provide improved understanding of the long term needs for the corridor. |
| There have been peak hour traffic volume increases of at least 30% on Parramatta Road in the direction of travel opposite to the typical Sydney peak direction, that is, westbound in the AM peak and eastbound in the PM peak | |
| Northbound travel along Woodville Road near Parramatta Road has seen a 20% reduction in traffic using Woodville Road to then travel east on Parramatta Road. | Section 6. Improvements to the Parramatta Road/Church Street/Woodville Road intersection would discourage and remove the need for any potential travel through Granville. |
| Church Street entry and exit ramps have experienced a 35% increase in traffic volumes since the opening of the M4 | Section 6 |

| Finding | Commentary and/or section in report where finding mitigation is proposed |
|---|---|
| Widening project | |
| There has been an increase of about 10% in traffic turning left from the Church Street exit ramp towards Parramatta CBD and Parkes Street as an M4 Motorway alternative. | This is partly due to increased developments within Parramatta CBD. Mitigation on Parkes Street has not been considered due to likely changes which would occur as a result of Parramatta Light Rail. Changes are proposed at the Church Street/Parkes Street intersection as part of the Parramatta Congestion Improvement Program. This work is expected to address the M4 Widening traffic impacts at this location. |
| There has been a decrease in traffic using the James Ruse Drive corridor between Victoria Road and the M4 Motorway | No mitigation required |
| There has been a large decrease in traffic using the James Ruse Drive interchange ramps | No mitigation required |
| Rawson Street has seen an increase in traffic between Parramatta Road and St Hilliers Road | Section 6. Improvements to the Parramatta Road/Silverwater Road intersection would discourage and remove the need for traffic to use Rawson Street as a Parramatta Road and Silverwater Road alternative. |
| Silverwater Road is experiencing an increase in traffic along the corridor and using the entry ramps to the motorway in peak period directions | Section 6 |
| Increase in traffic travelling north on Homebush Bay Drive between Arthur Street and Australia Avenue | Section 6 |

### 4.1.3 Areas Identified for Further Analysis

The sites listed in this section are those which have resulted in significant increases in traffic volumes, and in some instances the increase in traffic volumes has exceeded 30%. It is evident some traffic is diverting from the M4 Motorway and opting for alternate routes across the network. Prior to the M4 Widening project, these equivalent trips were being serviced by the toll free M4 Motorway corridor. Observed trends include the diversion of traffic from the M4 Widening project corridor. This has resulted in trips being serviced by the surrounding arterial road network. In some locations, traffic changes have coincided with other changes since the opening of the M4 Widening project which include land use changes, development and other transport infrastructure changes.

A list of sites most affected by traffic volume increases was compiled for further investigation. This list of sites was developed using the findings and corresponding locations where traffic changes have been

observed in the 12 month period since the widening and introduction of a toll on the M4 Motorway. The list of sites identified for further and more detailed traffic assessment is included in the table below.

| Intersection | Site Description |
|---|---|
| 1 | M4 Motorway Eastbound Exit Ramp/Church St intersection,<br>M4 Motorway Westbound Entry Ramp/Parramatta Rd/ Woodville St/ Church St intersection |
| 2 | Parramatta Rd/James Ruse Dr/Berry St intersection |
| 3 | Parramatta Rd/Rawson St/Duck St intersection |
| 4 | M4 Motorway ramps/Silverwater Rd intersection,<br>Parramatta Rd/Silverwater Rd/St Hilliers Rd intersection |
| 5 | Parramatta Rd/Hill Rd/Bombay St intersection, |
| 6 | Parramatta Rd/Birnie Avenue intersection |
| 7 | Centenary Dr/Arthur Street intersection |

## 4.2 Traffic Analysis

Using the sites listed in Section 4.1.3 of this report, traffic analysis was undertaken to capture the performance capability of each of these sites prior to and after the introduction of a distance based toll on the M4 Motorway.

For each site two simple traffic models were developed to provide a comparison of intersection performance prior to and after widening and introduction of the M4 Motorway toll. These models were based on surveyed traffic volumes travelling through the intersections. The pre-opening baseline survey was carried out in March 2017. This was done to provide a true representation of the network performance before M4 Widening's completion. The final months of the M4 Widening project included opening of the new lanes on the motorway which would have affected network performance and traffic flows. The post opening survey was carried out in March 2019, 12 months after the initial survey to provide an accurate comparison with the pre-opening data.

Preliminary traffic analysis was undertaken to confirm the extent of network performance impacts since the completion of the M4 Widening project.

### 4.2.1 M4 Motorway/ Parramatta Road/ Woodville Road/ Church Street

This site is a four way signalised intersection operating with three phases. This intersection provides the connection between Parramatta Road and the untolled section of the M4 Motorway to the west. To the north of this site is the M4 eastbound exit ramp to Church Street. These two signal sites are coordinated.


**Figure 4-1: Church Street Woodville Road/Parramatta Road intersection with M4 Motorway ramps**

The table below is the performance summary of the existing site, using the volumes observed prior to and after the introduction of tolls on the M4 Motorway.

| M4 Motorway Westbound Entry Ramp/Parramatta Road/ Woodville Road/Church Street | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | Post M4 Widening | | 12 month difference | |
| | AM | PM | AM | PM | AM | PM |
| Average Queue length (m) | 249 | 294 | 500 | 578 | +251 | +284 |
| Average Delay time (sec) | 36 | 57 | 64 | 75 | +28 | +18 |
| Intersection Level of Service | C | E | E | F | N/A | |

The analysis confirms that since the M4 Widening project there has been a significant reduction in performance at this location. The key contributors to this performance change are due to additional trips on Parramatta Road and additional traffic exiting the M4 Motorway at Church Street and then turning left onto Parramatta Road at this intersection.

Some traffic is also diverting away from Woodville Road and potentially travelling through Granville to avoid turning right at this location due to the additional and competing traffic flows from the M4 Church Street exit ramp resulting in longer queues and wait times to turn right onto Parramatta Road.

The performance of the four way intersection controls the efficiency of the eastbound M4 Motorway Church Street exit ramp signals described in Section 4.2.2.

## 4.2.2 M4 Motorway Church Street Exit Ramp/ Church Street

These signals are coordinated as a pair with the adjacent Parramatta Road/Woodville Road signals described above and shown in Figure 4-1. The site is a three way T intersection operating with two phases. Whilst it is a more efficient configuration than the adjacent signals at Parramatta Road, it is unable to be cycled more frequently due to the limited storage between the signals which quickly fills when the exit ramp traffic is allowed to proceed.

The performance change before and after the introduction of the M4 Motorway toll is shown in the table below.

| M4 Motorway Church Street Exit Ramp/Church Street | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening project | | After the M4 Widening project | | 12 month difference | |
| | AM | PM | AM | PM | AM | PM |
| Average Queue length (m) | 194 | 328 | 508 | 536 | +314 | +208 |
| Average Delay time (sec) | 25 | 36 | 55 | 73 | +30 | +37 |
| Intersection Level of Service | B | C | D | F | N/A | |

Since the M4 Widening project there has been a reduction in performance at this location. This aligns with the adjacent signals at the Parramatta Road/Woodville Road intersection. This change in performance is primarily due to the increase of up to 450 vehicles per hour (about 30%) in the peak periods using this exit ramp. This change is as a result of the introduction of a toll to the east of Church Street. This exit ramp has become the last exit before toll charges apply.

There is an increase in traffic turning left towards Parramatta CBD from the exit ramp. These trips are most likely using Parkes Street and Hassall Street to reach James Ruse Drive instead of Parramatta Road or the M4 Motorway. The predominant increase has been in traffic turning right onto Church Street to ultimately resume eastbound travel along Parramatta Road as the toll free alternate route to the widened M4.

There have been a number of operational and road safety issues develop as a result of the additional queueing at this exit ramp. Shortly after opening, the number of crashes was averaging more than 35 per month. This has been partly addressed with some short term traffic control measures at the exit ramp to calm traffic queueing patterns on the motorway. Despite recent ramp upgrade works being completed in December 2019, further measures are required to remove the queueing of traffic on the main carriageway of the M4 Motorway.

Further potential improvements and mitigation measures are discussed in Section 6 of this report.

## 4.2.3 Parramatta Road/James Ruse Drive/Berry Street

This is a four way intersection with three primary legs and an entry only connection with Berry Street. This arrangement is shown in Figure 4-2.


**Figure 4-2: James Ruse Drive/Berry Street/Parramatta Road intersection with M4 Motorway ramps**

This intersection has experienced increased east-west through traffic along Parramatta Road. This aligns with the general finding that Parramatta Road is carrying additional traffic for longer periods of the day. There is also additional traffic turning left onto Parramatta Road from James Ruse Drive, indicating traffic is bypassing the M4 Motorway ramps to the north and opting to use Parramatta Road instead. All other movements at the intersection have remained generally consistent in their use. The minimal change in right turning vehicles out of James Ruse Drive aligns with the expectation that traffic is using Grand Avenue/Hassall Street/Parkes Street to travel westbound instead of using the section of Parramatta Road through Granville. The performance change before and after the introduction of the M4 Motorway toll is shown in the table below.

| Parramatta Rd/ James Ruse Dr/ Berry St | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | Post M4 Widening | | 12 month difference | |
| | AM | PM | AM | PM | AM | PM |
| **Queue length (m)** | 651 | 728 | 1041 | 1309 | +390 | +581 |
| **Delay time (sec)** | 53 | 49 | 95 | 92 | +42 | +43 |
| **Level of Service** | D | D | F | F | N/A | |

The analysis confirms increased traffic and delays at this site. The significant increase in queue length confirms the impact of the M4 toll. The additional queueing in this location impacts adjacent intersections and has resulted in an overall increase in travel time on this section of Parramatta Road. The adjacent decreases in traffic volumes and improvements in performance at the James Ruse Drive/M4 Motorway ramp intersections confirm the M4 Motorway is less utilised at the expense of Parramatta Road.

### 4.2.4 Parramatta Road/ Rawson Road/ Duck Street

This intersection is a four way intersection with all movements permitted in all directions. Despite increases in traffic volumes along Parramatta Road there have also been increases in traffic using the southern connection with Rawson Street.


**Figure 4-3: Parramatta Road/Rawson Street/Duck Street intersection**

Rawson Street provides a relatively direct connection to St Hilliers Road as opposed to Parramatta Road. The alternate route along Rawson Street passes through Auburn town centre. This connection has seen increased traffic since the M4 Widening project as it avoids a section of Parramatta Road. This change in traffic patterns has been the primary cause of increased delays at this intersection as shown in the table below.

| Parramatta Rd/ Rawson St/ Duck St | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | Post M4 Widening | | 12 month Difference | |
| | AM | PM | AM | PM | AM | PM* |
| Queue length (m) | 903 | 469 | 1357 | 421 | +492 | -135 |
| Delay time (sec) | 62 | 62 | 118 | 48 | +56 | -14 |
| Level of Service | E | E | F | C | N/A | |

* Results affected by downstream congestion extending from Parramatta Road/James Ruse Drive intersection

## 4.2.5 M4 Motorway/Silverwater Road Ramp Intersections

This interchange consists of two closely spaced intersections which service eastbound and westbound travel between Silverwater Road and the M4 Motorway. The intersections are limited in their efficiency by their close proximity to each other and the queueing from the nearby Silverwater Road/Parramatta Road intersection.


**Figure 4-4: M4 Motorway/Silverwater Road Ramps intersections**

These intersections have experienced a minor increase in traffic since the project, confirming the widening and introduction of a toll has done little to change the volume of traffic travelling to and from Silverwater Road. This travel pattern is supported by the fact the previous M4 toll (removed in 2010) was levied near Silverwater Road and traffic is familiar with tolled trips in this location. The significant volume of traffic connecting to Silverwater Road is confirmed with the removal and addition of lanes on each side of the Silverwater Road interchange, that is, only three lanes continue on the M4 Motorway over the bridge at Silverwater Road. With this arrangement queue back from the interchange onto the M4 Motorway is of higher concern since it has the potential to interfere with traffic safely and efficiently using the remaining three lanes on the M4 Motorway. The changes as a result of the M4 Widening project are shown below.

| M4 Eastbound Ramps/Silverwater Rd | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | After M4 Widening | | 12 month difference | |
| | AM | PM | AM | PM | AM | PM |
| Queue lengths (m) | 223 | 196 | 283 | 314 | +60 | +118 |
| Delay time (sec) | 22 | 26 | 33 | 41 | +11 | +15 |
| Level of Service | B | B | C | C | N/A | |

| M4 Westbound Ramps/Silverwater Rd | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | After M4 Widening | | 12 month difference | |
| | AM | PM | AM | PM | AM | PM |
| Queue lengths (m) | 261 | 153 | 274 | 217 | +13 | +64 |
| Delay time (sec) | 21 | 18 | 23 | 20 | +2 | +2 |
| Level of Service | B | B | B | B | N/A | |

## 4.2.6 Silverwater Road/Parramatta Road/St Hilliers Road

This is a four way intersection between two arterial corridors. Additional through lanes are already provided on Parramatta Road to improve intersection efficiency and queue lengths.


**Figure 4-5: Parramatta Road/Silverwater Road intersection**

This intersection has always operated near capacity even prior to the M4 Widening project in 2017. The intersection is required to support significant east-west and north-south movements. Since the M4 Widening project, traffic volumes on Parramatta Road and Silverwater Road/St Hilliers Road corridors have increased resulting in increased green time demand for these opposing movements. This has resulted in an overall increase in delays for traffic at the intersection.

| Silverwater Rd/Parramatta Rd/St Hilliers Road | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | After M4 Widening | | 12 Month Difference | |
| | AM | PM | AM | PM | AM | PM |
| **Average Queue lengths (m)** | 311 | 421 | 497 | 611 | +186 | +190 |
| **Average Delay Times (Sec)** | 57 | 57 | 82 | 88 | +25 | +29 |
| **Level of Service** | E | E | F | F | N/A | |

## 4.2.7 Parramatta Road/Hill Road/Bombay Street

This intersection is a four way signalised intersection with all movements permitted with the exception of the eastbound right turn into Bombay Street.


**Figure 4-6: Parramatta Road/Hill Road/Bombay Street intersection**

Increased traffic on Parramatta Road has resulted in an increased demand for green time on Parramatta Road. In conjunction with this increase traffic volumes have increased on the Hill Road approach to the traffic signals due to land use changes and ongoing development in the Sydney Olympic Park precinct. With these factors considered, intersection performance at this location has worsened since the M4 Widening project.

| Parramatta Rd/Hill Rd/Bombay St | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | After M4 Widening | | 12 Month Difference | |
| | AM | PM | AM | PM | AM | PM* |
| **Average Queue lengths (m)** | 603 | 808 | 930 | 471 | +327 | -337 |
| **Average Delay Times (Sec)** | 54 | 54 | 78 | 38 | +24 | -16 |
| **Level of Service** | D | D | F | C | N/A | |

*Results affected by downstream congestion extending from Parramatta Road/Silverwater Road intersection

## 4.2.8 Parramatta Road/Birnie Avenue

This intersection is a four way intersection with all movements permitted.


**Figure 4-7: Parramatta Road/Birnie Avenue intersection**

The intersection operates with similar delays and performance to the adjacent Hill Road intersection. This intersection has also seen similar changes in traffic patterns with some changes as a result of the land use changes and ongoing development in Sydney Olympic Park.

| Parramatta Rd/Birnie Ave | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | After M4 Widening | | 12 Month Difference | |
| | AM | PM | AM | PM | AM | PM* |
| **Queue lengths (m)** | 370 | 616 | 426 | 322 | +56 | -294 |
| **Delay Times (Sec)** | 42 | 67 | 50 | 45 | +8 | -22 |
| **Level of Service** | C | E | D | D | N/A | |

*Results affected by downstream congestion extending from Parramatta Road/Hill Road/Bomaby Street intersection

## 4.2.9 Centenary Drive/Arthur Street

This intersection is a four way intersection with all movements permitted with the exception of the westbound right turn from Arthur Street onto Centenary Drive.


**Figure 4-8: Centenary Drive/Arthur Street intersection**

The intersection operates with slightly increased delay since the opening of the M4 Widening project. Whilst traffic volumes on the corridor have not improved significantly as the intersection is at the end of the tolling area, the patterns of traffic arrival have changed since the M4 Motorway/Homebush Bay Drive interchange was upgraded as part of the M4 Widening project to improve traffic flow. This has resulted in noticeable and ongoing queue length increases at the Centenary Drive/Arthur Street intersection.

The table below highlights the increased delays experienced at this intersection.

| Centenary Dr/ Arthur St | | | | | | |
|---|---|---|---|---|---|---|
| | Prior to M4 Widening | | After M4 Widening | | 12 Month Difference | |
| | AM | PM | AM | PM | AM | PM |
| **Queue lengths (m)** | 504 | 544 | 668 | 591 | +164 | +47 |
| **Delay Times (Sec)** | 44 | 45 | 57 | 52 | +13 | +7 |
| **Level of Service** | D | D | E | D | N/A | |

# 4.3 Road Safety Performance

## 4.3.1 Parramatta Road

Review of the crashes for the 12 months prior to and following the introduction of tolls has identified a 24% increase in crashes on Parramatta Road between Church Street, Parramatta and Homebush Bay Drive, Homebush. The increased crash rate is generally as a result of increased traffic using sections of Parramatta Road. Key trends from a review of the crashes on Parramatta Road in the 24 month period include:

- A total of 83 crashes occurred in the 12 months prior to the introduction of tolls on the M4 Motorway.
- 103 crashes occurred in the 12 months following the introduction of tolls
- Almost 50% of all crashes were rear end crashes
- Almost 33% of all crashes were at intersections and involved turning vehicles
- There were 5 pedestrian related crashes with no clear trends before or after the introduction of tolls on the M4 Motorway
- The largest concentrations of all crashes appeared in the section of Parramatta Road between Church Street, Parramatta and Rawson Street, Auburn

Improvements to the corridor to alleviate congestion and simplify access arrangements would appear to provide opportunities to reduce the current crash rate. Potential strategies to reduce crashes at key locations along Parramatta Road are identified in Section 6 of this report.

## 4.3.2 M4 Motorway and Interchanges

A 66% reduction in crashes has been identified on the M4 Motorway between Church Street, Parramatta and Homebush Bay Drive, Homebush. The reduced crash rate is generally as a result of decreased traffic using the widened and tolled section of the M4 Motorway. Key trends from a review of the crashes on the M4 Motorway in the 24 month period include:

- A total of 165 crashes occurred in the 12 months prior to the widening and introduction of tolls on the M4 Motorway which also resulted in two fatalities. This period included temporary changes associated with the road works for the M4 Widening project.
- 56 crashes occurred in the 12 months following the widening and introduction of tolls representing a 66% reduction in crashes.
- Almost 75% of all crashes were either rear end crashes or lane changing related crashes
- In the period prior to the opening of the M4 Widening project there was one pedestrian related crash on the M4 Motorway which resulted in a fatality
- Prior to the opening of the M4 Widening project, crashes along the M4 Motorway appear scattered along the corridor.
- Since the opening of the project, there are fewer crashes with concentrations of crashes now occurring at key interchanges with main roads such as James Ruse Drive, Silverwater Road and Hill Road.
- The M4 Motorway, west of the M4 Widening project, between Burnett Street and Church Street has seen 120 additional crashes when comparing the 12 months before and after opening of the M4 Widening project.

# 5. Community & Stakeholder Feedback

In preparing this report, Transport for NSW analysed over 2,000 pieces of community and stakeholder correspondence relating to the Widened M4 received in the period since August 2017 including through:

- General media enquiries to Transport for NSW and WestConnex
- Phone, email and written correspondence received by Transport for New South Wales and WestConnex
- Calls to the Transport Management Centre hotline
- Ministerial correspondence received by the former Minister for WestConnex and the Minister for Transport.

The majority of the submissions were generally opposed to certain aspects or impacts of the project. Review of the correspondence and communication records identified feedback on the following key operational issues and concerns.

| Submission Topic | Response |
|---|---|
| Concern that travel conditions, amenity and reliability on Parramatta Road have worsened since opening and tolling the Widened M4 | Potential mitigation measures to improve travel conditions on Parramatta Road are outlined in Section 6 of this report. |
| Concern about increased difficulty in accessing properties on Parramatta Road since completion of the project | Impacts to traffic and travel conditions on Parramatta Road have been observed since the opening of the M4 Widening project. Potential mitigation measures, as outlined in Section 6 of this report have been developed to offset these impacts and provide relief to traffic on Parramatta Road |
| Concern about the time taken to address the safety issue and number of vehicles queued on the M4 Motorway at the Church Street exit | Preliminary works have already been completed at the Church Street exit ramp. Additional upgrades of the Motorway including the entry and exit ramps at Church Street are currently being planned. These are noted in Section 6 of this report. |
| Suggestions to upgrade the M4 Motorway west of Church Street to address the road safety issues and queuing impacts since opening and tolling the Widened M4 | |
| Suggestions for the application of time of day tolling on the motorway | Out of scope for this review |
| Suggestions about toll relief to assist frequent road users and businesses relying on timely deliveries | Out of scope for this review |
| Suggestions to upgrade and widen Parramatta Road to improve, safety, amenity and/or visual impacts caused by congestion | Out of scope for this review |
| Suggestions to widen the road corridor on Parramatta Road to allow widening to occur in the future | Out of scope for this review |
| Suggestions to address worsened congestion on Homebush Bay Drive near Arthur Street | Potential mitigation measures are outlined in Section 6 of this report. |
| Support for the project and/or some aspects of it including the improved travel time, reliability and quality of the M4 Motorway between Church Street and Homebush Bay Drive. | Noted |

# 6. Potential Mitigations

The potential mitigation measures outlined below have a common objective of mitigating the network impact since the completion of the M4 Widening project. The mitigations below have been developed using desktop assessments only for the purpose of this report and do not entirely consider each site's various constraints. Further ongoing assessments including detailed traffic modelling would need to be finalised to confirm feasibility of any of these mitigations.

| | Site | Problem Definition | Potential Response | Expected Improvements |
|---|---|---|---|---|
| 1 | M4 Motorway eastbound between Burnett Street and Church Street & Parramatta Road/ Woodville Street/ Church Street intersection | Eastbound Church Street exit ramp experiences congestion which results in queuing onto the M4 Motorway main carriageway<br>Significant increase in crashes near the Church Street exit ramp (about 120 additional crashes per year) since the opening of the M4 Widening project<br>Limited left turn opportunities at the Parramatta Road/Woodville Road/Church Street intersection for nearby M4 exit ramp traffic to continue their eastbound journey on Parramatta Road. The left turn eastbound competes with the right turn from Woodville Road for priority. | Improve the M4 Motorway around Church Street to address ongoing operational safety issues<br>Improve the phasing and coordination opportunities between the M4 Eastbound Church Street exit ramp and the Parramatta Road/Woodville Road/Church Street intersection<br>Improve the capacity and efficiency of the Parramatta Road/Woodville Road/Church Street intersection | Improved M4 Eastbound Church Street exit ramp queue lengths and safety<br>Improved travel efficiency between the exit ramp and the eastbound carriageway of Parramatta Road<br>Improved eastbound motorway travel and safety between Burnett Street and Church Street<br>Improved operation of the Parramatta Road/Woodville Road/Church Street intersection |
| 2 | Parramatta Road/James Ruse Drive/Berry Street intersection | The James Ruse Drive intersection is experiencing increased traffic volumes and significant queueing on Parramatta Road which extends beyond adjacent intersections and the rail level crossing. | Improve the efficiency of the site to allow more rapid cycling of the traffic lights<br>Provide additional capacity to allow more traffic to pass through the intersection in each phase and reduce the overall queue lengths | Improved east and westbound travel time on Parramatta Road including improvements for the M92 and 909 bus services<br>Reduced queue lengths on Parramatta Road<br>Improved safety on Parramatta Road |

| | Site | Problem Definition | Potential Response | Expected Improvements |
|---|---|---|---|---|
| 3 | Parramatta Rd/Rawson St/Duck St | This intersection is experiencing increased traffic volumes and significant queueing on Parramatta Road which extends beyond adjacent intersections.<br>Increased eastbound right turn traffic onto Rawson Street which has resulted in increased queue lengths in the single lane right turn bay<br>Inefficient phasing arrangement between Rawson Street and Duck Street<br>Dip in road which affects vehicle movement speeds into and out of Rawson Street | Improve the efficiency of the site to allow more rapid cycling of the traffic lights<br>Provide additional capacity to allow more traffic to pass through the intersection in each phase and reduce the overall queue lengths | Simplified intersection operation and improved efficiency<br>Improved east and westbound travel time on Parramatta Road including improvements for the M92 and 909 bus services<br>Reduced queue lengths on Parramatta Road and Rawson Street<br>Improved safety on Parramatta Road<br>Improved opportunities for pedestrian movements between key pedestrian attractions and businesses |
| 4 | Silverwater Road/ M4 Westbound Ramps and Silverwater Road M4 Eastbound Ramps | The intersections experience significant exit traffic volume and queueing<br>The intersections are closely spaced limiting the ability of traffic to enter and exit each intersection<br>The phasing of each intersection is at certain times governed by traffic flows on the adjacent intersection | Reconfigure the interchange with a single intersection to improve the efficiency and operation to allow more rapid cycling of the traffic lights | Simplified intersection operation and improved efficiency<br>Improved east and westbound travel time on Parramatta Road including improvements for the M92 and 909 bus services<br>Reduced queue lengths on Parramatta Road and Rawson Street<br>Improved safety on Parramatta Road |

| | Site | Problem Definition | Potential Response | Expected Improvements |
|---|---|---|---|---|
| 5 | Parramatta Rd/Silverwater Rd/St Hilliers Rd | Increased east west traffic on Parramatta Road<br>Increase traffic turning at Parramatta Road<br>Increased traffic on Silverwater Road | Upgrade of the intersection to improve capacity.<br>*Note: Given the capacity of the surrounding arterial road network and the current size of the intersection, options which involve added lanes would not appear to provide any benefits for traffic* | Improved travel times, queue lengths and travel reliability on Parramatta Road<br>Improved coordination with M4 Interchange to the north<br>Improved east and westbound travel time on Parramatta Road including improvements for the M92 and 909 bus services<br>Improved road user safety<br>Improved opportunities for pedestrian movements between key pedestrian attractions and businesses |
| 6 | M4 Eastbound Off-Ramp/ Hill Road<br>Parramatta Rd/Hill Rd/Bombay St | Increased traffic utilising the Hill Road eastbound exit ramp<br>Increased traffic on Hill Road<br>Increased traffic turning at Hill Road<br>Increased traffic on Parramatta Road travelling eastbound and westbound | Upgrade of the intersection to improve the phasing efficiency of movements which would allow improved cycle times | Simplified intersection operation and improved efficiency<br>Improved east and westbound travel time on Parramatta Road<br>Reduced queue lengths on Parramatta Road and Hill Road<br>Improved access from Hill Road southbound to M4 westbound entry ramp |
| 7 | Parramatta Rd /Birnie Ave | Increased traffic on Parramatta Road travelling eastbound and westbound | None since the intersection is continuing to operate at acceptable levels of service. | N/A |
| 8 | Homebush Bay Dr/M4 Eastbound and Westbound Ramps<br>Centenary | Increased north south traffic on Homebush Bay Drive with M4 Interchange operating at improved level of service congestion has shifted to Arthur Street intersection.<br>Removal of the adjacent intersection | Upgrade of the intersection to improve capacity.<br>*Note: Given the capacity of the surrounding arterial road network and the current size of the intersection, options which involve added* | Improved travel times, queue lengths and travel reliability on Centenary Drive<br>Simplified network operations<br>Improved corridor travel times |

| | Site | Problem Definition | Potential Response | Expected Improvements |
|---|---|---|---|---|
| | Drive/Arthur Street | between Arthur Street and Richmond Street which creates operational issues given the limited distance between the sites | *lanes would not appear to provide any benefits for traffic* | Improved open space and public transport travel times on Parramatta Road<br>Improved road user safety |

# 7. Delivery Priority

## 7.1 Completed Works

Transport for New South Wales has already delivered several smaller initiatives in preparation for and/or in response to the completion of the M4 Widening project.

These smaller works included:

- 38 minor changes to line marking and kerbside signposting on the road network around the M4 Widening project. These changes generally improved vehicle storage and capacity around intersections along Parramatta Road and key alternative routes. These changes were carried in mid-2017 prior to the completion of the M4 Widening project to prepare the transport network for the expected changes in traffic patterns.
- Introduction of a flexible traffic barrier at the M4 Motorway eastbound exit ramp at Church Street. This traffic barrier was introduced in May 2018 to respond to and prevent dangerous driving behaviour and queueing from the Church Street exit ramp extending across multiple lanes of the M4 Motorway
- Widening of the M4 Motorway eastbound exit ramp at Church Street to improve vehicle storage capacity for exiting traffic. The ramp widening was opened to traffic on 10 December 2019 and provided an additional right turn lane from the exit ramp and an extended left turn storage lane to attempt to minimize queueing of vehicles extending onto the M4 Motorway.

These minor works have already been delivered and have provided preliminary safety and capacity benefits for transport network users. Further planning is now underway to prioritise future potential works as described in the following sections of this report.

## 7.2 Selection criteria for potential future works

The potential mitigation works described in this report satisfy the requirements of the M4 Widening planning condition of approval E6 and NSW Government funding requirements for WestConnex Network Integration works.

The Network Integration program has been established to improve the integration of the WestConnex projects into the wider transport network. This includes accounting for and responding to the Planning Conditions of Approval which relate to Transport for New South Wales' post opening obligations for each stage of the WestConnex motorway.

The Network Integration program is aimed at enhancing network outcomes which comply with but are not limited to the following general requirements:

- The proposed mitigation is required as a result of adverse changes to the network caused by WestConnex
- The proposed mitigation would provide immediate and long term network and safety benefits
- The proposed mitigation is aligned with wider government strategies
- The proposed mitigation provides the most optimal return for the wider community when compared against other potential projects and needs
- The proposed mitigation is able to be completed soon enough to provide improvements to the transport network within a reasonable period after opening of the respective WestConnex projects.

The eight sites identified in Section 6 will need to be reviewed further and prioritised based on a criteria which provides optimal improvement for the network and allows Transport for New South Wales to provide an adequate level of Network Integration amongst the subsequent stages of WestConnex.

## 7.3 Delivery Priority and Timeframes

The table below provides commentary regarding the feasibility, indicative lead times and potential priority amongst the eight proposals listed. Refer to Section 6 for an outline of the intended purpose of each potential mitigation listed below.

Each potential mitigation measure would remain subject to further feasibility and reasonability assessment and funding consideration by Transport for New South Wales.

| Potential Mitigation Site | Requirements to build potential mitigation | Likely timeframe to complete | Key Priority Considerations |
|---|---|---|---|
| **M4 Motorway eastbound between Burnett Street and Church Street & Parramatta Road/ Church Street/ Woodville Road/** | Requires relocation of utilities<br>Would require some acquisition of adjacent property to enable any road widening<br>Requires extensive change to road layout during construction | Up to 3 years to complete planning, design and construction | In addition to the works already completed, further mitigation of traffic impacts is required since it directly governs the efficiency of the M4 eastbound exit ramp to Church Street.<br>Ramp has been consistently experiencing extensive queueing which now extends back on the main carriageway of the M4 Motorway<br>Queueing has resulted in a significant increase (about 120 additional crashes per year) in the number of crashes, fatalities and poor driver behaviour. |
| **Parramatta Road/James Ruse Drive/Berry Street** | Requires utility relocations<br>May require changes to access on the network<br>Would require some acquisition of adjacent property to enable any road widening<br>Construction will affect servicing on the M92 and 909 bus routes | Up to 5 years to complete planning, design and construction | This location has experienced increased congestion on Parramatta Road.<br>Improvements may not translate to significant overall improvement to journey times on Parramatta Road due to the limited capacity each side of this site<br>Limited change to bus travel times following completion of the works<br>Queueing at this location does not impact other key intersection due to separation to other key intersections exceeding 600 metres<br>Network access changes may need to be considered as part of this proposed mitigation |
| **Parramatta Road/Rawson Street/Duck** | Requires relocation of utilities potentially including sewerage mains | Up to 5 years to complete planning, design | This intersection has experienced increased traffic volumes and changed traffic patterns.<br>Improvements to the intersection would provide benefits to this section of |

| Potential Mitigation Site | Requirements to build potential mitigation | Likely timeframe to complete | Key Priority Considerations |
|---|---|---|---|
| **Street** | Would require some acquisition of adjacent property to enable any road widening<br>May require changes to access on the network | and construction | Parramatta Road, particularly on Rawson Street and westbound on Parramatta Road which experiences extended delays due to the high right turn volume into Rawson Street.<br>Improvements to this intersection would contribute to improved travel time on Parramatta Road between Silverwater Road and James Ruse Drive. This would assist the east-west bus routes in this location.<br>Network access changes may need to be considered as part of this proposed mitigation |
| **Parramatta Road/Silverwater Road** | Requires relocation of utilities<br>Requires substantial acquisition of adjacent properties to enable road widening and reconfiguration of intersection<br>Requires extensive change to road layout<br>Involves significant construction duration and environmental impacts<br>Will affect servicing on bus routes M92 and 909 | Up to 10 years to complete planning, design and construction | This intersection is at and near capacity for long durations of each day including peak periods.<br>It has previously been widened and expanded to provide the maximum available lane space in each direction with added lanes already provided at the intersection in an east-west direction to reduce queue lengths on Parramatta Road<br>Further surface upgrades to provide added lanes at the intersection would not be safe, well utilised or tie in to the surrounding cross section on Parramatta Road.<br>Significant construction, property acquisition and visual changes would be required to deliver any further improvement<br>Any significant change would require extensive planning and development work required to inform such proposal and would remove the possibility of delivering early benefits to the community.<br>Network access changes may need to be considered as part of this proposed mitigation |

| Potential Mitigation Site | Requirements to build potential mitigation | Likely timeframe to complete | Key Priority Considerations |
|---|---|---|---|
| **Silverwater Road/M4 Motorway Ramps** | Would require relocation of some utilities<br>Would require minor acquisition of adjacent property frontages to enable road widening and reconfiguration of intersections<br>Would require extensive change to road layout<br>Would involve minimal impact during construction | Up to 3 years to complete planning, design and construction | Silverwater Road corridor and connecting M4 Motorway ramps are experiencing increased traffic<br>Improvements would provide travel benefits on Silverwater Road and for motorway ramp traffic<br>Queue length reductions expected on exit ramps which reduces the risk of queued stationary reaching the M4 Motorway<br>Improvements would prevent queued traffic affecting southbound travel on Silverwater Road near the M4 Motorway ramps<br>Potential solution is relatively simple to construct and can be built relatively quickly |
| **Parramatta Road/Hill Road/Bombay Street** | Would require relocation of some utilities<br>Minimal changes to road layout during construction<br>Would require interface with planned Hill Road westbound exit ramp<br>Will affect servicing on bus route 404 during construction | Up to 2 years to complete planning, design and construction | Any significant improvement opportunities are limited by the M4 Motorway bridge over Hill Road<br>Further upgrade of Parramatta Road/Hill Road intersection would inevitably be required to offset forecast traffic impacts from increased development within Sydney Olympic Park<br>Potential mitigations is relatively simple to implement and could provide some improvements<br>There is a proposed new westbound exit ramp from the M4 Motorway to improve access to Hill Road being considered. Introduction of this ramp may lead to changes in traffic movement and require additional and other changes to this intersection.<br>Any mitigation to the M4 Widening project at this location may become sacrificed if construction of a new westbound exit ramp is constructed separately. A decision about improvements to this area would need to be postponed until approval and the timing of the proposed westbound exit ramp to Hill Road is known. Both proposals could be coordinated and delivered as a single work package. |

| Potential Mitigation Site | Requirements to build potential mitigation | Likely timeframe to complete | Key Priority Considerations |
|---|---|---|---|
| **Parramatta Road/Birnie Ave** | No construction work proposed | N/A | The intersection is not operating at or near capacity.<br>Improvements and changes would not provide benefits unless queuing impacts from the east are improved |
| **Centenary Drive/Arthur Street** | Would require relocation of utilities<br>Would require substantial acquisition of adjacent properties to enable road widening and reconfiguration of intersection<br>Would require extensive change to road layout<br>Would involve significant construction duration | Up to 8 years to complete planning, design and construction | This intersection is at and near capacity for long durations of each day including peak periods.<br>The intersection is currently built to provide the maximum available lane space in each direction. Further surface upgrades to provide added lanes at the intersection would not be safe, well utilised or tie in to the surrounding cross section on Centenary Drive.<br>Significant construction, property acquisition and visual changes would be required to deliver any further improvement<br>Any significant change would require extensive planning and development work required to inform such proposal and would remove the possibility of delivering early benefits to the community.<br>Network access changes for Richmond Street would be required to support a grade separation proposal. |

## 7.4 Future evaluation of potential mitigations

Given the significant increase in crashes and safety risks on the M4 Motorway between Burnett Street and Church Street, planning has already commenced for a proposal to:

- Upgrade M4 Motorway between Burnett Street and Church Street to improve congestion, travel speeds and road safety for through traffic, and;
- Upgrade the M4 Motorway's eastbound exit ramp and westbound entry ramp at Church Street to provide improved merge and exit safety

These works will be in addition to the works recently completed at the M4 Motorway eastbound exit ramp at Church Street and it is expected these improvements will be planned and carried out over the next three years.

Transport for New South Wales will also continue to carry out further investigations to determine feasibility and reasonability of the other potential mitigations described in this report.

Engagement with Department of Planning, Industry and Environment, local councils has commenced with future engagement with the wider community to be undertaken to shape and refine any potential mitigation before any mitigations are considered for approval and construction.

It is intended the success of any of these mitigations, should they proceed, be evaluated in another review planned to commence 5 years after the opening of the M4 Widening project.

# 8. Conclusion

Mitigations being considered to counteract the impact caused by the M4 Widening project's impacts are described in Section 6 of this report and summarised below.

1. Deliver improvements over the next three years to the M4 Motorway between Burnett Street, Merrylands and Church Street, including:
    - Further widening of the M4 eastbound exit ramp to Church Street and,
    - Improvements to the M4 eastbound entry ramp from the Parramatta Road, Church Street and Woodville Road intersection
2. Over the next 12 months, identify and plan for required improvements to the Parramatta Road, Church Street, Woodville Road intersection to enable efficient and safe performance of the M4 Eastbound exit ramp to Church Street into the long term future
3. Replacement of the two existing intersections at the M4 Motorway ramps and Silverwater Road with a single more efficient intersection beneath the M4 Motorway overpass
4. Upgrade of the Parramatta Road/James Ruse Drive/Berry Street intersection
5. Upgrade of the Parramatta Road/Rawson Street/Duck Street intersection
6. Upgrade of the Centenary Drive/Arthur Street intersection, including efficiency improvements to the Arthur Street/Richmond Street access arrangement onto Centenary Drive
7. Upgrade of the Parramatta Road/Silverwater Road intersection

Apart from the proposals near Church Street, further investigation and planning is required to improve Transport for New South Wales' understanding of the likely impacts, costs and feasibility of these proposals before a decision regarding priority and delivery of these proposed mitigations is made. Should any of these proposed mitigations proceed, community consultation will be undertaken during the development of any of these proposed works.

As per Planning Condition of Approval E6, an equivalent review to this will be prepared by Transport for New South Wales to evaluate the network and any potential mitigation introduced to the network 5 years after the opening of the M4 Widening project.

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