

WestConnex Stage 1A: M4 Widening

Church Street to Homebush Bay Drive

Final Detail Design –As Built

Bicycle Path Safety Audit – Detail Design Stage

October 2016, Revision 4

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1. INTRODUCTION

This Bicycle Path Safety Audit Report has been prepared as a condition of approval for the M4 project. The report presents the findings of a Detailed Design Road Safety Audit of the Westconnex Stage 1A: M4 Widening, between Carlingford Rail line and Duck Creek, Homebush, of the Bicycle Path approved under a project Modification. Refer to Figure 1.1 for the locality plan.

The audit was undertaken as a desktop audit of the As Built plans provided by the design team on 4/10/2016. A review of the audit site was conducted by the audit team at an earlier time, Wednesday 1 April 2015 during daylight conditions.

This audit was carried out by a Road Safety Audit team consisting of Melbourne based SMEC Traffic Engineering and Transport Planning team staff independent to the design process and the teams involved. The road safety audit team is made up of suitably qualified and experienced senior road safety auditors.

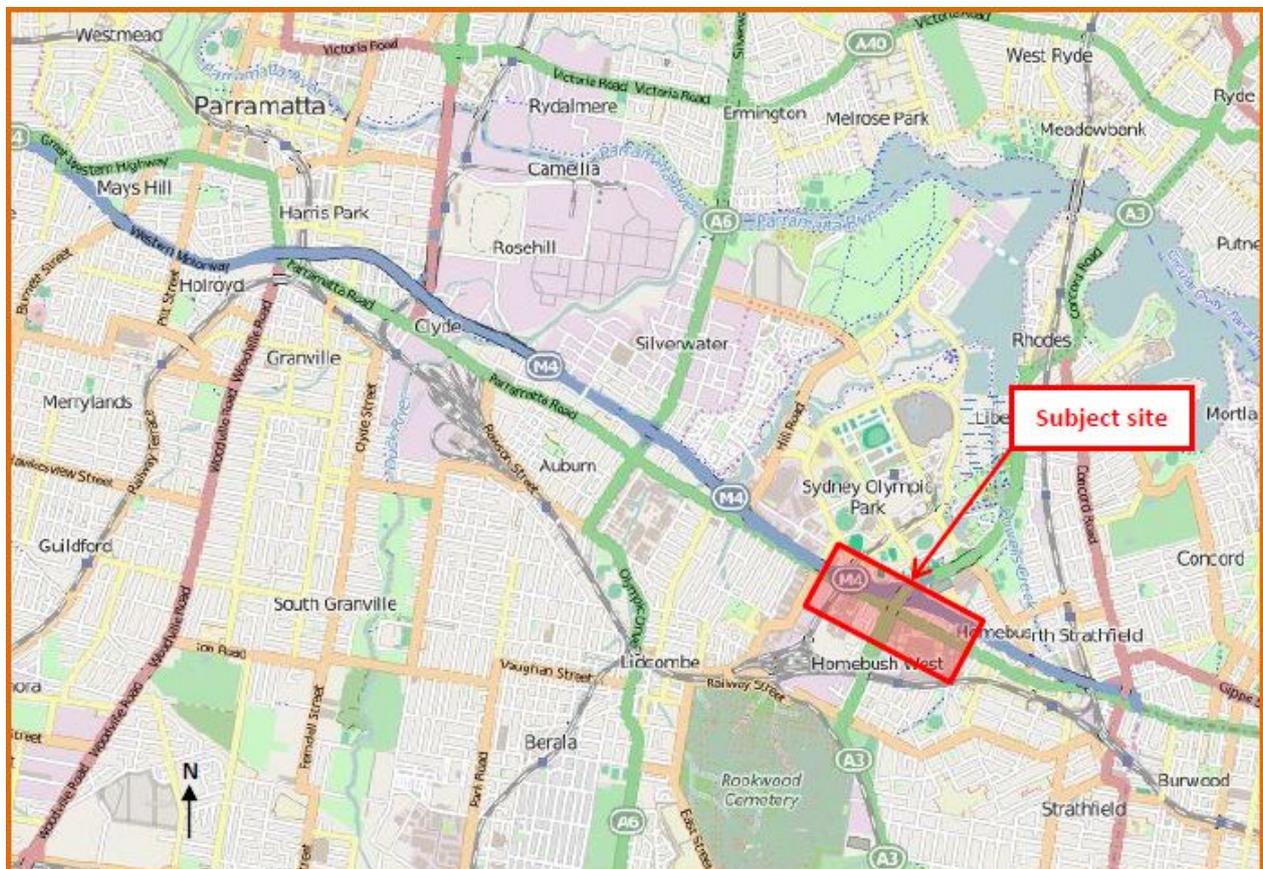


Figure 1.1: Locality Map (Source: www.openstreetmap.org)

2. EXISTING CONDITIONS

The M4 Motorway is an urban freeway connecting areas west of Sydney to Central Sydney and is under the management and control of the Roads and Maritime Service, New South Wales. It is located south of Sydney Harbour and runs in an east-west direction between Parramatta and Homebush.

The subject site comprises a 7.5km length of the M4 Motorway commencing at Pitt Street, Parramatta and terminating at east of Homebush Bay Drive, Homebush. This section of M4 Motorway operates as a multi-lane dual carriageway. The posted speed limit along this section of the motorway is 90km/h with localised time or congestion based variable speed reductions.

3. PROJECT DETAILS

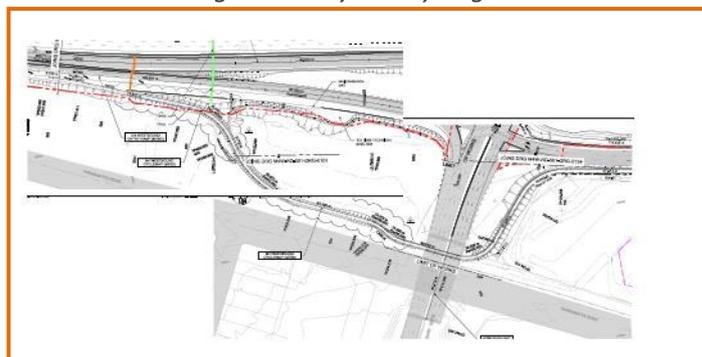
The M4 Widening Project comprises the first stage in the delivery of WestConnex. It includes widening and upgrading approximately 7.5 km of the M4 Motorway between Pitt Street, Parramatta and Homebush Bay Drive, Homebush.

The M4 Widening project will include the following key features:

- Construction of a new two lane viaduct for westbound traffic, on the southern side of the existing viaduct structure between Church Street, Parramatta and Wentworth Street, Granville.
- Reconfiguration of the traffic lanes on the existing viaduct to four lanes eastbound and two lanes westbound (making a total of four lanes in each direction).
- Construction of a new bridge / viaduct over Duck River at Auburn.
- Widening of the existing motorway to the south of the westbound carriageway between Wentworth Street, Granville and Duck River, Auburn.
- Widening of the at-grade carriageway of the motorway predominantly within the existing motorway corridor (utilizing both the existing median and the verge areas), between Junction Street and Homebush Bay Drive, Homebush to provide four lanes westbound and four lanes eastbound.
- Construction of a new westbound G-loop on-ramp to the M4 Motorway from Homebush Bay Drive, Homebush.
- Construction of a new eastbound on-ramp to the M4 Motorway from Hill Road, Lidcombe.
- Provision of Intelligent Transport Systems (ITS) infrastructure for motorway operations.
- Provision of road infrastructure and services to support the future implementation of smart motorway (Managed Motorway) operations.

The Bicycle Path Modification (cycleway) comprises the construction of a permanent off-road one-way (westbound) cycleway from the Homebush Bay Drive interchange to divert cyclists from the existing westbound shoulder of the M4 Motorway. The cycleway purpose is to remove potential sources of conflict between cyclists and motorists once the motorway shoulders are removed and from the on/off-ramps and merge points in this location. The cycleway would diverge from the motorway shoulder from the southern side of the Homebush Bay Drive exit ramp, travel under the Homebush Bay Drive Bridge adjacent to Parramatta Road, and re-join the on-ramp near the merge with the motorway.

Figure 2: Bicycleway alignment



4. BICYCLE ROAD SAFETY AUDIT DETAILS

4.1. Bicycle Road Safety Audit

Road Safety Auditing is a formalised procedure which can be applied to all phases of a road project or to an existing road system. The Auditor and audit team must be independent of the designer, so that the design is viewed with “fresh eyes”. The purpose of the audit is not to rate the design, but rather to identify any road safety concerns arising from the design or not adequately addressed.

In reviewing the safety aspects of a road, the reporting procedure is not intended to initiate a redesign process, but to outline potential, or existing, road safety issues, and establish a basis upon which ongoing design improvements may produce an acceptable solution to the design intent.

The objectives of this road safety audit incorporating the cycleway are:

- To review the operational site, design and background information, and form conclusions about the safety performance and crash potential of the proposal under review;
- To evaluate the operational site in terms of interaction with its surrounds and nearby roads, and to visualise potential impediments and conflicts for road users;
- To identify and report on aspects of the design that may result in unnecessary or unreasonable hazards for all road users; and
- To conduct an on-site inspection during daylight and night conditions.

In accordance with the Austroads Guide, this audit seeks to identify potential safety hazards, however, auditors cannot guarantee that every deficiency has been identified and if all the recommendations in this report were to be followed, this would not guarantee that this section of road is “safe”. Rather, adoption of the recommendations should improve the level of safety for this road.

4.2. Auditors and Audit Process

This report details the results of a detailed design road safety audit for the WestConnex Stage 1A: M4 Widening FDD plan set as provided by the design team, along with ‘as built’ drawings provided by the construction team.

The independent audit team consisted of Phill Ridgeway and Glen Chrzanowski from SMEC Australia Pty Ltd. Each member of the audit team is an experienced road safety auditor and senior road and traffic engineer.

An Audit Findings Schedule summarising the findings of this road safety audit is provided in Section 5 of this report. The Project Manager and/ or Lead Designer are required to indicate in this schedule whether or not the finding is accepted, and if not accepted to provide a reason for non-acceptance.

This audit has been undertaken to meet the Condition of Approval for the cycleway which is as follows:

B14A An independent Bicycle Road Safety Audit shall be undertaken prior to the commencement of construction of the cycleway by an appropriately qualified and experienced person in accordance with the Austroads Guide to Traffic Engineering, Part 14 - Bicycles and the Austroads Road Safety Audit Manual. The Audit will assess the safety performance of the permanent westbound off-road cycleway diversion at the Homebush Bay Drive Interchange, and ensure that it meets the requirements of condition B14(c)¹. The audit shall also consider factors including grades, hazards,

¹ B14(c): In relation to new or modified local road, parking, pedestrian and cycle infrastructure, the SSI shall be

comfort, convenience, consistency and connectivity of the off-road cycleway. The Audit findings and recommendations shall be actioned prior to construction and shall be made available to the Secretary on request.

The audit was undertaken in accordance with the requirements of the Austroads Guide to Traffic Engineering Practice, Part 14 - Bicycles and the Austroads Road Safety Audit Manual in accordance with the WDA requirements and the Austroads Guide to Road Safety Part 6- Road Safety Audit.

4.3. Previous Audits

The audit team conducted an earlier road safety audit and produced a report with audit findings of the Developed Concept Design (DCD) in April 2015. The issues identified in that earlier report have not been duplicated in this Road Safety Audit report of the FDD provided plans. This Road Safety Audit report reflecting a review of the FDD plans contains audit findings tabled in Section 5 of this report.

It should be noted that the audit issues identified in this report and the earlier Road Safety Audit report are provided for the Design Team to consider and manage as deemed appropriate. It is the intention that those safety issues identified in earlier audits have not been replicated in this audit.

The design team have provided the following contextual advice to assist the audit:

The strategy for the management of cyclists is that cyclist provisions will match the existing standard on the motorway, with the addition of a dedicated cycle path at Homebush Bay Drive (westbound) to avoid crossing the exit ramp and crossing the bridge over Homebush Bay Drive. The WDA SPR and RMS online cycleway finder indicated that no cyclists are permitted on the M4 between Church Street and Silverwater Road therefore no cyclist provisions have been considered at these locations.

Eastbound cyclists are required to exit the M4 motorway as per existing signage prior to the Church Street interchange and use local roads and existing shared path network. Cyclists can then re-enter the M4 at the Silverwater Road eastbound entry ramp where sufficient shoulder widths and barrier heights have been provided to cater for cyclists.

Westbound cyclists will be required to exit the M4 motorway at the Homebush Bay Drive westbound exit ramp and use the proposed one-way cycleway, then re-enter at the Homebush Bay Drive westbound entry ramp. The horizontal and vertical geometry of the cycleway is compliant with Austroads Part 6a, Austroads Guide to Road Design – Pedestrians and Cyclist Paths which supersedes the Austroads Guide to Traffic Engineering Part 14 Bicycles and RMS supplement, for a 30km/h design speed. The RSA was undertaken in accordance with these documents. Where cyclists could previously continue on the M4 until the James Ruse Drive interchange, cyclists must now exit at the Silverwater Road westbound exit ramp and use local roads and existing shared user paths to continue to the West.

Cyclist crossing points have been provided at exit ramps, where required, with the exception of Homebush Bay Drive eastbound exit ramp where it is not possible to provide a compliant cyclist crossing due to existing constraints. Crossing points were noted but no safety issues were noted in the issues findings table of the safety audit report. Existing signage currently directs cyclist to a crossing point on the Homebush Bay Drive eastbound exit ramp although in the existing situation a safe crossing point does not exist. This is due to the location of a type F barrier hard up against the shoulder where a cyclist crossing point would normally be provided.

designed to meet relevant design, engineering and safety guidelines, including *Austroads Guide to Traffic Engineering Practice*

There is currently no provision for pedestrians along the existing motorway. From Church Street to Haslams Creek, a separate shared path is provided along the alignment. From Haslams Creek to the limit of works, pedestrians are directed to the local road network. No pedestrian access is proposed along the motorway alignment.

The alignment strategy has been reflected in the relevant design lots, predominantly RS-001 Signage and Linemarking. A short re-alignment on the shared path beneath Duck River Bridge has been required in order to facilitate a suitable location for the positioning of a proposed bridge pier. The re-alignment is 60m in length and consists of two 12.5m radii reverse curves. These reverse curves do not meet the bicycle design speed requirement of 30km/h. These curves relate to bicycle speed of +20 km/h. The design of the cycle pathway at the proposed pier location which ties back into existing with a 25m radius curve meets the 30km/h bicycle design speed requirement.

4.4. Inspection

A site inspection was undertaken on Wednesday 20 1 April 2015 in daylight conditions. The road was mostly dry and the weather was overcast with occasional rain showers.

4.5. Design Drawings

The following 'Work as Executed' plans / mark-ups were provided to the audit team for review purposes:

Drainage Drawings

M4W-DR-001-DRG-0134, Rev B

M4W-DR-001-DRG-0135, Rev B

M4W-DR-001-DRG-0151, Rev A

Landscape Design Drawings

M4W-LS-001-DRG-0134, Rev 03

M4W-LS-001-DRG-0135, Rev 03

M4W-LS-001-DRG-0135, Rev 03

Pavement Drawings

M4W-PV-001-DRG-0134, Rev B

M4W-PV-001-DRG-0135, Rev B

M4W-PV-001-DRG-0465, Rev C

M4W-PV-001-DRG-0466, Rev C

M4W-PV-001-DRG-0467, Rev C

Road Geometry

M4W-RD-001-DRG-0133, Rev C

M4W-RD-001-DRG-0134, Rev C

M4W-RD-001-DRG-0135, Rev C

M4W-RD-001-DRG-0151, Rev B

Road Furniture

M4W-RF-001-DRG-0134, Rev B

M4W-RF-001-DRG-0135, Rev B

M4W-RF-001-DRG-0115, Rev A

Signage and Line Marking Drawing

M4W-RS-001-DRG-0134, Rev C

M4W-RF-001-DRG-0135, Rev B

Street Lighting Drawings

M4W-UL-001-DRG-0134, Rev A

M4W-UL-001-DRG-0135, Rev A

M4W-UL-001-DRG-0151, Rev A

Retaining Wall (RW-21) Drawings

M4W-RW-01B-DRG-2100, Rev A
M4W-RW-01B-DRG-2101, Rev A
M4W-RW-01B-DRG-2110, Rev B
M4W-RW-01B-DRG-2111, Rev A
M4W-RW-01B-DRG-2120, Rev B
M4W-RW-01B-DRG-2130, Rev B
M4W-RW-01B-DRG-2131, Rev A

4.6. Responding to the Audit Report

This formal road safety audit should be responded to in writing including reasons for rejecting an audit recommendation. Where a finding is accepted, the action undertaken should be identified in the Action/ Comments column. The resulting document will be stored by the client with the Road Safety Audit report provided by the audit team. *The response to the auditor's comments is contained in Section 5 Road Safety Audit Findings.*

To assist the Project team, any safety-related deficiencies identified during the detailed design audit were given a 'High', 'Medium' or 'Low' risk rating in accordance with the following response time criteria. Refer to Table 4.

Table 4.1 Risk Level Summary

Risk Level	Response to Identified Risk
High	Requiring immediate attention as it presents a hazard likely to result in a collision and serious injury.
Medium	Presents a collision or crash promoting situation, but is not urgent. Should be corrected or the risk significantly reduced.
Low	Should be corrected or the risk reduced.
Noted	Issue potentially requiring further design consideration.

The above risk ranking table has been developed from the Austroads Guide to Road Safety, Part 6: Road Safety Audit (2009) and is a reflection of tables 6.1, 6.2 and 6.3 within the guide document.

4.7. Engineering Standards

The following engineering standards are used as reference as required in the Condition of Approval:

- RTA Accident Reduction Guide Part 2 Road Safety Audits (2005)
- Austroads Guide to Road Design (2009)
- RMS Supplements to Austroads Guide to Road Design (2009)
- RTA Road Design Guide (1989) as contextual background.
In addition to the mandatory reference manuals, the following documents have been relied upon for design and audit standards:
 - Austroads Guide to Road design Part 6A- Pedestrian and Cyclist Paths
 - Austroads guide to Road Safety Part 6 Road Safety Audit

5. ROAD SAFETY AUDIT FINDINGS

5.1. Road Safety Audit Findings

Road Safety Audit findings are listed in the following Corrective Action Schedule in Table 5.1.

Table 5.1: Audit Findings Schedule

No.	Audit Finding	Risk	Drawing Number	Corrective Action Implemented by the Design Manager in response to the Audit Findings
1	Drainage pits 248/4 and 248A/1 are located next to the bikeway on the alignment of the adjacent SO channel. The proximity of these pits to the path edge and the direction of the grate will present a hazard to the passing cyclist.	L	M4W-DR-001-DRG-0134, Rev B	The RMS approved 'cyclist safe' grate selected by the designers has been provided to minimise risk to cyclists.
2	Retained vegetation at the toe of batter partially restricts rider sight lines 	L	M4W-DR-001-DRG-0151, Rev A	This photograph was taken above the hand rail and therefore does not necessarily represent a cyclist's line of sight. However, the Contractor should ensure that vegetation is avoided within the required line of sight. Given the 30km/h design speed and 4% downgrade a 38m sight distance is required (AGTRD Part 6a Figure 7.7) taken from the centre of the lane.

No.	Audit Finding	Risk	Drawing Number	Corrective Action Implemented by the Design Manager in response to the Audit Findings
3	<p>The proximity of the proposed fence is located within the prescribed offset/clearance to the pathway edge. Cyclists may make contact with the fence or conversely hold the centreline and make contact with approaching cyclists.</p>	L	<p>M4W-RD-001-DRG-0133, Rev C M4W-RD-001-DRG-0134, Rev C M4W-RD-001-DRG-0151, Rev B</p>	<p>The cycleway has been designed with a width in excess of the 1.5 m desirable width (AGTRD Part 6a Appendix A RefA3) and as a consequence it is anticipated that cyclists would be unlikely to get too close to the adjacent fence.</p> <p>Implementation of delineation at 0.5m offset from the fence was considered, however given the low risk rating, adequate width of path, one-way nature, provision of warning signage, good sightlines and design compliance the provision of additional delineation is deemed unnecessary to facilitate a safe cycleway.</p> <p>Holding the centreline is not considered to be a safety issue, and is actually preferred, as the cycleway is one-way only and the likelihood of cyclists using the path in the opposite direction is considered to be extremely low due to the origin and destination of the path.</p> <p>To encourage cyclists to use the path centre as the travel line, and to reinforce the one-way operation of the path, the designer recommends that cycle symbols along with associated directional arrows are implemented in line with AS 1742.9.</p>

No.	Audit Finding	Risk	Drawing Number	Corrective Action Implemented by the Design Manager in response to the Audit Findings
4	Retaining wall section indicates a path width of 2.5m from SO channel to fence line. Due to the proximity of the fence and to a lesser extent the lip of SO channel, each presents a hazard to the passing bicycle user.	L	M4W-RW-01B-DRG-2120, Rev B	As noted above the implementation of cycle symbols and associated directional arrows in accordance with AS 1742.9 should discourage cyclists from utilising the outer extremities of the cycleway.

5.2. Road Safety Audit Commentary

In accordance with the provisions listed in the Condition of Approval, refer to 4.2 of this report, the road safety audit team are required to consider and provide comment on the proposed changes to the cycleway in terms of grades, hazards, comfort, convenience, consistency and connectivity. Each of these review elements are dealt in the following passages:

- Hazards – Hazards or safety issues have been captured and listed in part 5.1 of this report.
- Grade – No response in this road safety audit.
- Comfort – No response in this road safety audit.
- Convenience – No response in this road safety audit.
- Consistency – No response in this road safety audit.
- Connectivity – No response in this road safety audit.

6. CONCLUDING STATEMENT

The audit team have examined the drawings and information referred to in Section 4. The audit has been carried out for the sole purpose of identifying any features that could be altered or removed to improve the safety of the project for all road users. The findings are included in Section 5 of this report.



13/10/2016

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13/10/2016

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