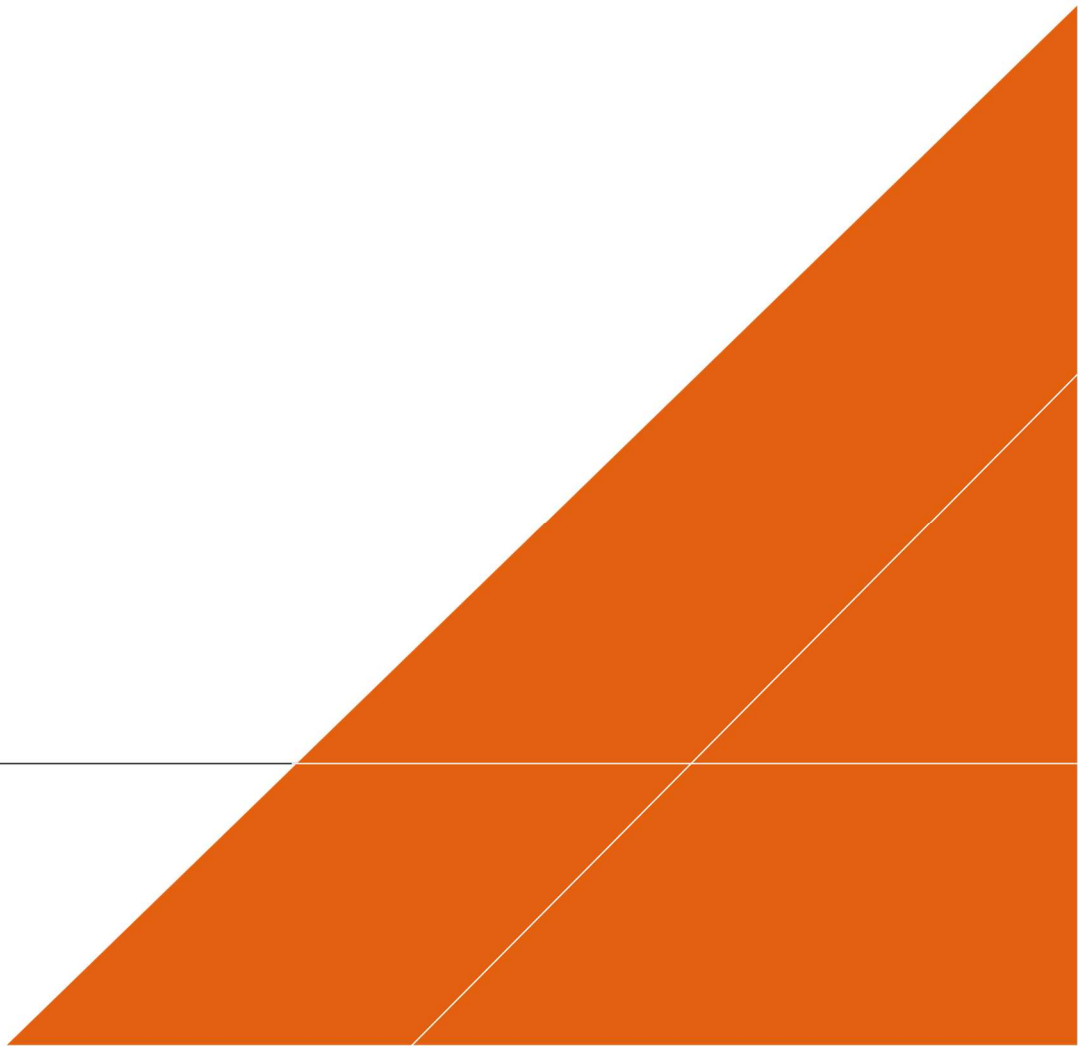
ARCADIS Design & Consultancy for natural and built assets

THORNLEIGH STATION UPGRADE

Detailed Design Road Safety Audit

24/05/2021



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CONTACT

ANDREW SANDHU
Lead Road Safety Auditor

M 0411 558 972
E Andrew.Sandhu@arcadis.com

Arcadis
Level 16, 580 George Street
Sydney NSW 2000, Australia

LAING O'ROURKE
THORNLEIGH STATION UPGRADE

Detailed Design Road Safety Audit

Report No	150337-THR-CI-RPT-00001
Date	24/05/2021
Revision Text	Detailed Design Road Safety Audit

REVISIONS

Revision	Date	Description	Prepared by	Approved by
01	23/11/2020	Draft Report Issue	DM/AS	DT
02	27/11/2020	Final Report Issue	DM/AS	DT
03	19/05/2021	Draft Report Issue	VT/KP/AS	AS
04	24/05/2021	Final Report Issue	VT/KP/AS	AS

CONTENTS

APPENDICES

1 INTRODUCTION AND GENERAL INFORMATION

1.1 INTRODUCTION

This Road Safety Audit has been prepared for Laing O'Rourke. The report details the findings of a Detailed Design Road Safety Audit undertaken for the CDR Detailed Design stage of the project.

The Road Safety Audit was commissioned to assess and review the design and its background information, the existing site and interaction of the design with its surroundings and identify any aspects of the design that may result in unnecessary or unreasonable hazards for all road users.

1.2 SCOPE OF THE AUDIT

Road Safety Auditing is a formalised procedure, which can be applied to all phases of a road project or to an existing road. 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 identify any road safety concerns from the perspective of road users.

1.3 OBJECTIVES

The objectives of the road safety audit are to:

- Review the operational site, design and background information and form conclusions about the safety performance and accident potential for the road.
- Evaluate the operational site in terms of interaction with its surrounds and nearby roads and to visualise potential impediments and conflicts for road users.
- Identify and report on aspects of the design that may result in unnecessary or unreasonable hazards for all road users.

1.4 RESPONDING TO THE ROAD SAFETY AUDIT REPORT

Road safety audits provide the opportunity to highlight potential road safety problems and have them formally considered by the project manager in conjunction with all other project considerations. The responsibility for the project rests with the project manager, not with the auditor. The project manager is under no obligation to accept the audit findings and if applicable, audit recommendations. Rather, the audit provides the opportunity to highlight potential road safety problems and have them formally considered by the designer and project manager in conjunction with all other project considerations. In general, there are four methods of responding to an audit report. In order of preference, they are:

1. Remove the obstacle
2. Redesign the obstacle so it can be safely traversed
3. Relocate the obstacle to where it is less likely to be struck
4. Reduce impact severity by using an appropriate breakaway device

Finally, it is not the role of the auditor to approve the designer or project manager’s responses to the audit. The auditor is however able to provide advice and assist in the determination of a suitable design response pursuant to reaching an agreement on a suitable response and / or design amendment.

2 PROJECT DESCRIPTION

2.1 PROJECT INFORMATION AND SITE DETAILS

Thornleigh railway station is located on the Main Northern line, serving the Sydney suburb of Thornleigh. It is served by Sydney Trains T9 Northern Line services.

The upgrade at Thornleigh Station is being delivered as part of the Transport Access Program, a NSW Government initiative to provide a better experience for public transport customers by delivering accessible, modern, secure and integrated transport infrastructure across the state. As part of the program, the Thornleigh Station Upgrade would aim to provide a station precinct that is accessible to those with a disability, limited mobility, parents/carers with prams and customers with luggage.

The design elements considered and confirmed at Thornleigh are:

- Accessible parking spot and an accessible kiss and ride parking spot to be located at the base of access ramp from Railway Parade, including an extension of the footpath to allow an accessible path with a joint kerb ramp to the shared space
- Regrade of The Esplanade plaza entrance to the train station lift location to provide an accessible path from the modes of transport, including the southbound bus stop and existing commuter carpark
- Regrade and widen footpath to the southbound bus stop on The Esplanade
- Upgrade The Esplanade south bound bus stop with new shelter and TGSI
- Regrade accessible path from Railway Parade to the existing footbridge
- provide accessible carparking spots in existing commuter carpark on The Esplanade

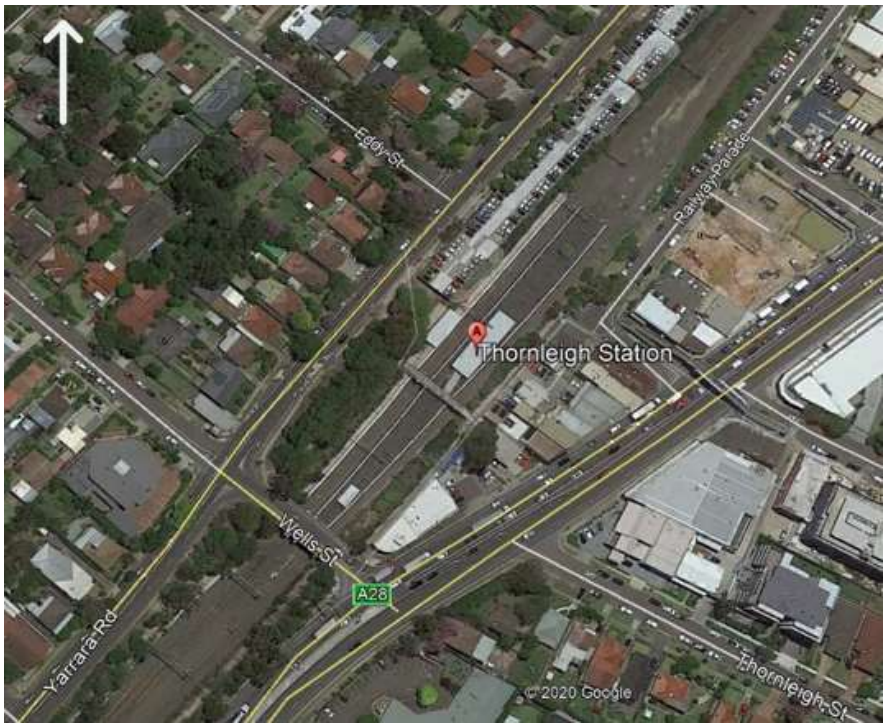


Figure 2-1 Thornleigh Station Upgrade (Image courtesy NSW Globe)

2.2 PREVIOUS ROAD SAFETY AUDIT REPORTS

A Concept Design road safety audit was carried in November 2020. Issues remaining from this audit are listed on table 5.1

3 ROAD SAFETY AUDIT DETAILS

Table 3-1 Road Safety Audit Details

Audited project	Thornleigh Station Upgrade
Client	Laing O'Rourke.
Audit type	Detailed Design.
Designer Details	Designer: Arcadis. Designer Representative: Brendan Walton, Civil Engineer, Arcadis.
Audit team	Andrew Sandhu, Lead Auditor, Arcadis Australia (Level 3 Road Safety Auditor – RSA-07-0413). Kane Petrie, Arcadis Australia (Level 2 Road Safety Auditor – RSA-02-1338). Vicke Tindall, Arcadis Australia (Level 1 Road Safety Auditor –).
Documentation Audited	Refer to Appendix A for detailed list: • Thornleigh Station Upgrade Transport Access Program 3 MC Tranche 2 Civil Design (Revision 2, Issued for CDR1 04/05/21)
Audit methodology	• This road safety audit has been undertaken with reference to Roads and Maritime *Road Safety Audit Practice Guidelines.* • The audit is structured around a standard checklist provided in the *Austroads' Guide to Road Safety Part 6: Road Safety Audit and the NSW Guidelines for Road Safety Audit Practices*. • The documents above were reviewed from 07/05/2021 to 24/05/2021 • The report includes a completed *Concept Design Audit Checklist* as provided in the Austroads Guide to Road Safety Part 6: Road Safety Audit.
Meeting and assessment details	A commencement meeting was held on 07/05/2021 between Brendan Walton, Michael Maxted, Robert Casamento, Andrew Sandhu, Kane Petrie and Vicke Tindall. The audit was carried out from 07/05/2021 to 24/05/2021. A Completion out meeting was held on 24/05/2021 between Brendan Walton, Michael Maxted, Robert Casamento, Andrew Sandhu, Kane Petrie and Vickie Tindall.

4 RISK CLASSIFICATION METHODOLOGY

Identified issues and deficiencies have been rated in order of importance based on estimated crash frequency, crash severity and level of risk in accordance with Austroads Guide to Road Safety Part 6: Road Safety Audits 2009, Section 4.8.

4.1 Crash Frequency

The probable frequency of an incident or crash occurring has been estimated for each issue listed in the Road Safety Audit findings based on the options listed in Table 4.1.

Table 4-1 Crash Frequency

Frequency	Description
Highly Probable	There are likely to be two or more occurrences of this type of crash in a year.
Occasional	There is likely to be one occurrence of this type of crash in a year.
Improbable	There is likely to be one occurrence of this type of crash in a three-year period.

4.2 Crash Severity

The severity of a crash identified in the Road Safety Audit is assessed based on the options listed in Table 4.2.

Table 4-2 Crash Severity

Severity	Description	Examples of Incident
Major	The crash is likely to result in death or serious injury.	High/medium speed vehicle collision High/medium speed collision with a fixed object Pedestrian/cyclist hit by a vehicle at high/medium speed Pedestrian/cyclist fall with serious injury
Moderate	The crash is likely to result in minor injury or major property damage	Low speed vehicle collision Low speed collision with a fixed object resulting in minor injury Pedestrian/cyclist fall with no head injury Low speed collision between vehicle and cyclist
Minor	The crash is likely to result in minor property damage or near miss events	Minor vehicle collision, property damage only Vehicle collision with a fixed object resulting in minor property damage Pedestrian/cyclist hits fixed object resulting in minor injury

4.3 Level of Risk

Deficiencies are rated for their importance according to a three-tiered system based on the matrix in Table 4.3.

Table 4-3 Level of Risk

	Highly Probable	Occasional	Improbable
Major	High	High	Medium
Moderate	High	Medium	Low
Minor	Medium	Low	Low

5 SAFETY AUDIT FINDINGS

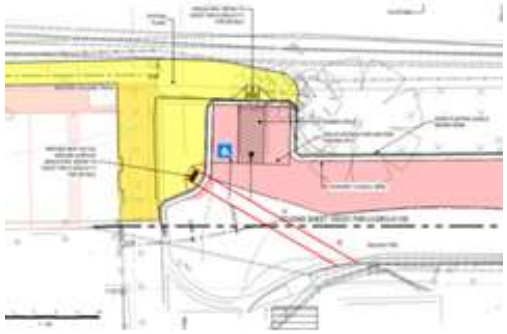
5.1 REMAINING ISSUES FROM CONCEPT DESIGN RSA

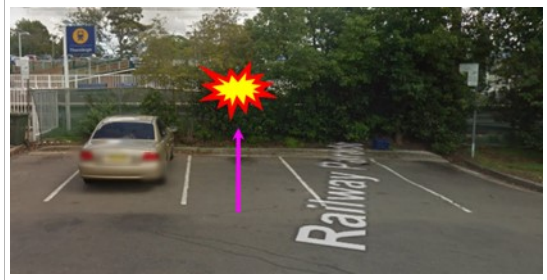
Issues remaining from Concept Design have been documented in Table 5.1. Complete table including columns for actions and responses as well as close-out column are available in a separate excel file.

Table 5-1 Remaining Issues from Concept Design RSA

ITEM	ISSUE	ILLUSTRATION	RISK RATING	ACTIONS AND RESPONSES
1.	Concept Design Stage Audit finding. Wheel stops have not been provided in the CDR / detailed design submission. Thornleigh Station Carpark (The Esplanade access). Wheels stops do not appear to be reinstated. This may lead to property damage type crashes.		Low	Wheel stops to be located within the accessible parking spaces. To be shown in drawing notes for installation.

ITEM	ISSUE	ILLUSTRATION	RISK RATING	ACTIONS AND RESPONSES
2.	Railway Parade access to train station - poor fence condition. During the site visit the existing fence adjacent to the footpath at the southern side access appeared to be in poor condition and may be at risk of collapsing. The fence may collapse onto the footpath which may result in injury to commuters and property damage.		Low	Structural stability of the fence line to be assessed during path regrade construction. To be replaced as required.
3.	DDA Accessible parking spots at existing commuter carpark. Existing light not working reducing visibility at proposed DDA parking spaces.		Note Only	DDA accessible parking lighting design to be in accordance with T HR SS 80001 ST version 3.0. To be shown as part of the lighting design. Currently ongoing.

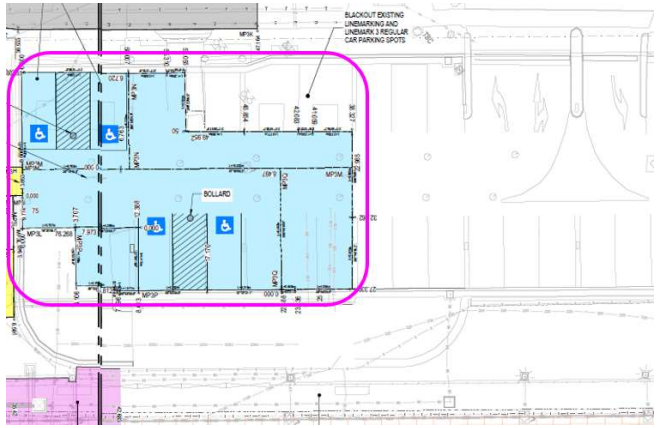
ITEM	ISSUE	ILLUSTRATION	RISK RATING	ACTIONS AND RESPONSES
4.	Concept Design Stage Audit finding, noting response 'Area under investigation for inclusion of a raised pedestrian crossing'. Railway Parade. The new kerb ramp crossing does not align with the existing kerb ramp on the other side. This may lead to the visually impaired becoming unstable and confusion about where the footpath is.		Medium	Kerb ramp alignment to be updated to point to centre of existing kerb ramp across roadway.
5.	Concept Design Stage Audit finding, noting response 'Further design development has since identified the inclusion of a raised pedestrian crossing to be included as a variation currently awaiting formal direction to proceed'. Railway Parade. The proximity of the station exit and the desire to cross toward the footbridge and the opposite footpath may lead to vehicle hit pedestrian type incidents. Austroads suggests raised pedestrian priority crossings when the number of pedestrians is higher than vehicles.		High	A kerb ramp has been including in the design to ensure connectivity to the Pennant Hills pedestrian overpass structure. A raised pedestrian crossing was considered but is however not viable without a major functional change to the area due to the existing locations of driveways, electrical poles, and the close proximity of the Pennant Hills overpass to the existing kerb line. Noting the existing services, a formalised crossing is raised as best way forward. Please note: To date based on discussions with Client, raised crossing is not considered as a part of the TAP Project.

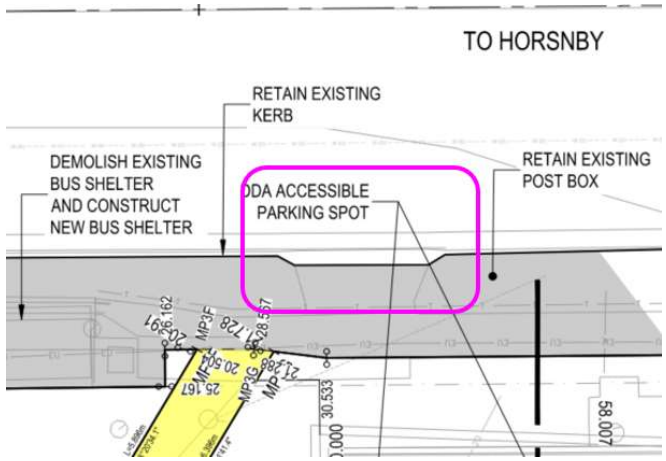
ITEM	ISSUE	ILLUSTRATION	RISK RATING	ACTIONS AND RESPONSES
6.	Concept Design Stage Audit finding, noting response 'It is further noted that development of the raised crossing option will change this arrangement'. Railway Parade - disabled parking spaces. There is a risk an errant vehicle may mount the kerb adjacent to parking spaces and travel onto the rail tracks. It is unclear if the existing kerb and fence can absorb the impact of an errant vehicle and prevent a vehicle from entering the rail corridor. This may lead to a vehicle/train type crash.	 	Medium	The accessible parking spot and accessible kiss and ride parking spot is located in the existing orientation of parking in the proposed design. An access path is located behind the realigned kerb and the rail corridor fence realigned and set back from the proposed accessible parking spots. Railway Parade is a low speed environment. The parking is proposed at the location of the existing cul de sac on Railway Parade and at this location there are existing driveways and the access to the pedestrian overpass bridge of Pennant Hill Road is located on the opposite corner. A road barrier is not proposed as the design improves on the existing condition. Wheel stops can however be added. Please note: To date based on discussions with Client, raised crossing is not considered as a part of the TAP Project.

5.2 DETAILED DESIGN ISSUES

The road safety audit findings for the Detailed Design have been documented in Table 5.2. Complete table including columns for actions and responses as well as close-out column are available in a separate excel file.

Table 5-2 Detailed Design Issues

ITEM	ISSUE	ILLUSTRATION	RISK RATING
1.	150337-THR-CI-DRG-01151, 01152. The underground car park does not have vertical clearance warning signage or a strike / impact protection beam, the finished surface level is proposed to be raised (approx. 50mm-80mm). It is unclear if the vertical clearance to the roof and overhead services will have adequate clearance. This may lead to property damage type crashes.		Low
2.	150337-THR-CI-DRG-01151 It is assumed that pedestrians intending to cross The Esplanade from the existing bus stop towards the station entry will intend to do so following desire lines direct to the station, rather than travelling 35m North to the signalised intersection at Eddy St. This may lead to hit pedestrian type crashes, particularly with pedestrians who may be shielded by a stationary bus or parked car.		Medium

ITEM	ISSUE	ILLUSTRATION	RISK RATING
3.	150337-THR-CI-DRG-01151 The existing kerb ramp on The Esplanade is to be retained. This provides a poor / conflicting queue to vision impaired persons who may mistake this ramp as a designated crossing location. With no connectivity to the opposing roadside, this may lead to hit pedestrian type crashes.		Medium

6 CONCLUDING STATEMENT

This road safety audit has been undertaken by representatives from Arcadis Australia using the references and documentation detailed previously.

While the Road Safety Audit may provide recommendations about possible remedial measures in response to identified road safety issues, it is ultimately the responsibility of the road owner to determine how best to respond to each identified safety issue.

The audit has been undertaken for the sole purpose of identifying any safety-deficient features of the subject road sections. Every effort was made to ensure that all relevant road safety issues were considered and the findings are the opinion and judgment of the audit team. The audit findings are included in Section 5 of this report.

24/05/2021

Andrew Sandhu
LEAD ROAD SAFETY AUDITOR
Road Safety Auditor Level 3, RSA-07-0413

24/05/2021

Kane Petrie
ROAD SAFETY AUDITOR
Road Safety Auditor Level 2, RSA-02-1338

PP 

24/05/2021

Vicke Tindall
ROAD SAFETY AUDITOR
Road Safety Auditor Level 1,

APPENDIX A - DRAWING LIST

DWG No.	DRAWING TITLE	SHEET No.	REV No.
THORNLEIGH STATION UPGRADE TRANSPORT ACCESS PROGRAM 3 MC TRANCHE 2 - CIVIL DESIGN			
105337-THR-CI-DRG-01101	COVER SHEET AND DRAWING LIST	SHEET 1	2
105337-THR-CI-DRG-01102	GENERAL NOTES, LEGEND AND SPECIFICATIONS	SHEET 1	2
105337-THR-CI-DRG-01103	GENERAL NOTES, LEGEND AND SPECIFICATIONS	SHEET 2	2
105337-THR-CI-DRG-01111	TYPICAL DETAILS	SHEET 1	2
150337-THR-CI-DRG-01112	TYPICAL DETAILS	SHEET 2	2
150337-THR-CI-DRG-01119	TRANSFORMER PAD MOUNT DETAILS	SHEET 1	2
105337-THR-CI-DRG-01121	CIVIL WORKS KEY PLAN	SHEET 1	2
105337-THR-CI-DRG-01151	GENERAL ARRANGEMENT PLAN	SHEET 1	2
105337-THR-CI-DRG-01152	GENERAL ARRANGEMENT PLAN	SHEET 2	2
105337-THR-CI-DRG-01153	GENERAL ARRANGEMENT PLAN	SHEET 3	2
105337-THR-CI-DRG-01154	GENERAL ARRANGEMENT PLAN	SHEET 4	2
105337-THR-CI-DRG-01155	GENERAL ARRANGEMENT PLAN	SHEET 5	2
105337-THR-CI-DRG-01156	GENERAL ARRANGEMENT PLAN	SHEET 6	2
105337-THR-CI-DRG-01161	LINEMARKING AND SIGNAGE PLAN	SHEET 1	2
105337-THR-CI-DRG-01162	LINEMARKING AND SIGNAGE PLAN	SHEET 2	2
105337-THR-CI-DRG-01165	LINEMARKING AND SIGNAGE PLAN	SHEET 3	2
105337-THR-CI-DRG-01166	LINEMARKING AND SIGNAGE PLAN	SHEET 4	2
150337-THR-CI-DRG-01201	LONGITUDINAL SECTION MP32	SHEET 1	2
150337-THR-CI-DRG-01202	LONGITUDINAL SECTION MP3H, MP3M	SHEET 2	2
150337-THR-CI-DRG-01203	LONGITUDINAL SECTION MP3R	SHEET 3	2
150337-THR-CI-DRG-01204	LONGITUDINAL SECTION MC30	SHEET 4	2
150337-THR-CI-DRG-01205	LONGITUDINAL SECTION MC31	SHEET 5	2
150337-THR-CI-DRG-01251	CROSS SECTIONS MC30	SHEET 1	2
150337-THR-CI-DRG-01252	CROSS SECTIONS MC30	SHEET 2	2
150337-THR-CI-DRG-01253	CROSS SECTIONS MC31	SHEET 1	2
150337-THR-CI-DRG-01254	CROSS SECTIONS MC31	SHEET 2	2
150337-THR-CI-DRG-01255	CROSS SECTIONS MC31	SHEET 3	2
150337-THR-CI-DRG-01256	CROSS SECTIONS MC31	SHEET 4	2
150337-THR-CI-DRG-01257	CROSS SECTIONS MC31	SHEET 5	2
150337-THR-CI-DRG-01258	CROSS SECTIONS MC31	SHEET 6	2
150337-THR-CI-DRG-01259	CROSS SECTIONS MP32	SHEET 1	2
150337-THR-CI-DRG-01260	CROSS SECTIONS MP32	SHEET 2	2
150337-THR-CI-DRG-01261	CROSS SECTIONS MCC0	SHEET 1	2
150337-THR-CI-DRG-01262	CROSS SECTIONS MCC0	SHEET 2	2
150337-THR-CI-DRG-01263	CROSS SECTIONS MCC0	SHEET 3	2
150337-THR-CI-DRG-01264	CROSS SECTIONS MP3M	SHEET 1	2
150337-THR-CI-DRG-01265	CROSS SECTIONS MP3R	SHEET 1	2
150337-THR-CI-DRG-01266	CROSS SECTIONS MP3R	SHEET 2	2
150337-THR-CI-DRG-01267	CROSS SECTIONS MP3R	SHEET 3	2
150337-THR-CI-DRG-01351	DRAINAGE PROFILE	SHEET 1	2
150337-THR-CI-DRG-01352	DRAINAGE PROFILE	SHEET 2	2
150337-THR-CI-DRG-01353	DRAINAGE SCHEDULE	SHEET 1	2
150337-THR-CI-DRG-01401	SETOUT PLAN	SHEET 1	2
150337-THR-CI-DRG-01402	SETOUT PLAN	SHEET 2	2
150337-THR-CI-DRG-01403	SETOUT PLAN TABLE	SHEET 3	2
150337-THR-CI-DRG-01404	SETOUT PLAN TABLE	SHEET 4	2
150337-THR-CI-DRG-01411	SETOUT PLATFORM REGRADE	SHEET 1	2
105337-THR-CI-DRG-01501	UTILITIES COORDINATION PLAN	SHEET 1	2
105337-THR-CI-DRG-01502	UTILITIES COORDINATION PLAN	SHEET 2	2
105337-THR-CI-DRG-01503	UTILITIES COORDINATION PLAN	SHEET 3	2
105337-THR-CI-DRG-01504	UTILITIES COORDINATION PLAN	SHEET 4	2
105337-THR-CI-DRG-01505	UTILITIES COORDINATION PLAN	SHEET 5	2
105337-THR-CI-DRG-01506	UTILITIES COORDINATION PLAN	SHEET 6	2
105337-THR-CI-DRG-01551	UTILITIES COORDINATION REGISTER	SHEET 1	2

DWG No.	DRAWING TITLE	SHEET No.	REV No.
105337-THR-CI-DRG-01552	UTILITIES COORDINATION REGISTER	SHEET 2	2
105337-THR-CI-DRG-01553	UTILITIES COORDINATION REGISTER	SHEET 3	2

APPENDIX B – ROAD SAFETY AUDIT CHECKLIST

Detailed Design Stage Audit Checklist

ITEM	TOPIC	DATA PROVIDED?	CHECKED?	COMMENTS
B.1	**General topics**			
B.1.01	Changes since previous audit	Yes	Yes	
B.1.02	Drainage	Yes	Yes	
B.1.03	Climatic conditions	Yes	Yes	
B.1.04	Landscaping	Yes	Yes	
B.1.05	Services	Yes	Yes	
B.1.06	Access to property and developments	Yes	Yes	
B.1.07	Emergencies, breakdowns, emergency and service vehicle access	Yes	Yes	
B.1.08	Future widening and/or realignments	Yes	Yes	
B.1.09	Staging of the scheme	Yes	Yes	
B.1.10	Staging of the work	Yes	Yes	
B.1.11	Adjacent developments	Yes	Yes	
B.1.12	Stability of cut and fill	Yes	Yes	
B.1.13	Skid resistance	Yes	Yes	
B.2	**Design issues (general)**			
B.2.01	Geometry of horizontal and vertical alignment	Yes	Yes	
B.2.02	Typical cross-sections	Yes	Yes	
B.2.03	Effect of cross-sectional variation	Yes	Yes	
B.2.04	Roadway layout	Yes	Yes	
B.2.05	Shoulders and edge treatment	Yes	Yes	
B.2.06	Effect of departures from standards or guidelines	Yes	Yes	
B.2.07	Visibility and sight distance	Yes	Yes	
B.2.08	Environmental treatments	Yes	Yes	
B.3	**Alignment details**			
B.3.01	Visibility; sight distance	Yes	Yes	
B.3.02	New/existing road interface	Yes	Yes	
B.3.03	Readability of the alignment by drivers	Yes	Yes	
B.3.04	Detail of geometric design	Yes	Yes	
B.3.05	Treatment at bridges and culverts	Yes	Yes	
B.4	**Intersections**			
B.4.01	Visibility to and at intersections	Yes	Yes	
B.4.02	Layout	Yes	Yes	
B.4.03	Readability by drivers	Yes	Yes	
B.4.04	Detailed geometric design	Yes	Yes	
B.4.05	Traffic signals	Yes	Yes	
B.4.06	Roundabouts	Yes	Yes	

ITEM	TOPIC	DATA PROVIDED?	CHECKED?	COMMENTS
B.4.07	**Other intersections**	Yes	Yes	
B.5	**Special road users**			
B.5.01	**Adjacent land**	Yes	Yes	
B.5.02	**Pedestrians**	Yes	Yes	
B.5.03	**Cyclists**	Yes	Yes	
B.5.04	**Motorcyclists**	Yes	Yes	
B.5.05	**Equestrians and stock**	Yes	Yes	
B.5.06	**Freight**	Yes	Yes	
B.5.07	**Public transport**	Yes	Yes	
B.5.08	**Road maintenance vehicles**	Yes	Yes	
B.6	**Lighting, signs and delineation**			
B.6.01	**Lighting**	Yes	Yes	
B.6.02	**Signs**	Yes	Yes	
B.6.03	**Marking and delineation**	Yes	Yes	
B.7	**Physical objects**			
B.7.01	**Median barriers**	Yes	Yes	
B.7.02	**Poles and other obstructions**	Yes	Yes	
B.7.03	**Crash barriers**	Yes	Yes	
B.7.04	**Bridges, culverts and causeways/floodways**	Yes	Yes	
B.8	**Any other matter**			
B.8.01	**Safety aspects not already covered**	Yes	Yes	

Checklist based on Austroads Guide to Road Safety, Part 6, Road Safety Audit, section 11.2