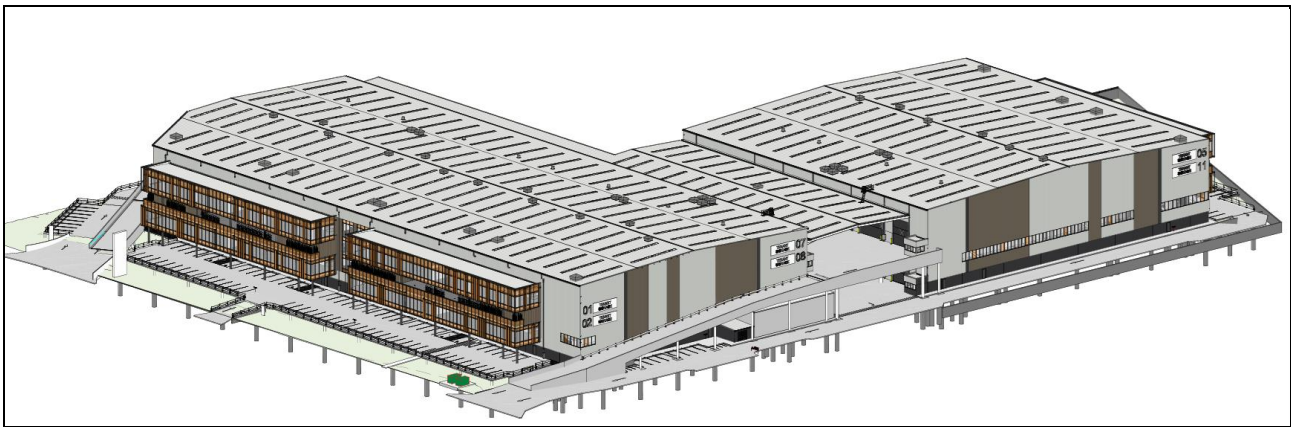
TRAFFIC ENGINEERING

Ason Group

Proposed warehouse at 45-57 Moxon Road, Punchbowl

Detailed design road safety audit



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Proposed warehouse at 45-57 Moxon Road, Punchbowl

Detailed design road safety audit

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Report No ASON-PROJ-0022-04 DD RSA PUNCHBOWL REV 3

Date 20/11/2024

This report has been prepared for Ason Group.

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1 Introduction

1.1 Project and audit details

Details of the audit have been summarised in Table 1.

Table 1 Details of the road safety audit.

Audited project	Warehouse development on the land at 45-57 Moxon Road, Punchbowl (the western side of Moxon Road). The audit was confined to the interfaces of the development with Moxon Road only. That is, the interfaces with the external road network.
Client/ contact	Masoud Khodadadifard Transport Modeller Ason Group Ph: (02) 9083 6601 E: masoud.khodadadifard@asongroup.com.au
Audit type	*Detailed design* road safety audit.
Purpose	A *detailed design* road safety audit was required to assess the likely safety performance of the driveway accesses and parking associated with the development and Moxon Road.
Background	A warehouse development is proposed on the parcel of land on 45-57 Moxon Road, Punchbowl. This includes a number of warehouses on a two-strata layout, an inbound truck and car access at the southern end of the site, a clockwise internal roadway (aisles), an outbound truck and car egress at the northern end of the site, and a 76-space car park on the eastern frontage. Conditions B9 to B11 of the Consent Conditions make reference to the need for a road safety audit as follows: **Road Safety Audit** B9. At the following stages of the development, the Applicant must prepare and submit an independent road safety audit to the satisfaction of the Planning Secretary: (a) prior to commencement of construction (with the exception of demolition and bulk earthworks); and (b) within 12 months of the commencement of operation. B10. Each independent road safety audit required by condition B9 must be provided to Council and: (a) be prepared by a level 3 accredited auditor; (b) assess the safety performance of driveway access and parking associated with the development and Moxon Road; (c) address the relevant design, engineering and safety guidelines, including Austroads Guide to Traffic Management and Guide to Road Safety; and (d) detail any additional management and mitigation measures recommended by the independent level 3 accredited auditor and a timetable for the implementation of any required actions. B11. If additional management and mitigation measures are identified in the independent road safety audit in condition B9(a), the Applicant must not commence operation until additional management and mitigation measures identified in condition B10(d) are implemented. In these respects, this report documents the processes and findings of a *detailed design* road safety audit of the proposed development, being undertaken prior to the commencement of construction in line with Condition B9. The audit was undertaken by a two-person team consisting of a level 3 accredited road safety auditor and a level 2 accredited road safety auditor, consistent with the industry requirements, and also in fulfilment of Condition B10(a). The audit required the audit team to consider and envisage the operational performance of the access points and driveways of the development, and any potential road safety implications on vehicles, bicycles and pedestrians. In this respect, the audit fulfils Condition B10(b) in assessing the safety performance of the stated site features. In undertaking any road safety audit, auditors are expected to draw on their knowledge of the relevant industry standards and guidelines, including Australian Standards, Austroads Guides to Road Design and Austroads Guide to Traffic Management. This knowledge and experience is used to detect and substantiate road safety audit findings. As such, Condition B10(c) is fulfilled. In accordance with Conditions B109(d), management and mitigation measures have been recommended with each audit finding.

Scope of project/ audit	As a design-stage road safety audit, the following designs were issued to the audit team and considered to be the auditable materials:

Sheet Number	Sheet Name	Current Revision	Current Revision Date
A-001	COVER PAGE AND TITLE SHEET	C1	21.06.24
A-003	GLA CALCULATION FLOOR PLANS	C1	21.06.24
A-004	GFA CALCULATION FLOOR PLANS	C1	21.06.24
A-100	SITE PLAN	C1	21.06.24
A-111	DEMOLITION PLAN	C3	21.06.24
A-112	SUSPENDED SLAB SUPPORT AND FOOTINGS PLAN - OVERALL	C1	21.06.24
A-113	SUSPENDED SLAB SUPPORT AND FOOTINGS PLAN - PART 1	C1	21.06.24
A-114	SUSPENDED SLAB SUPPORT AND FOOTINGS PLAN - PART 2	C1	21.06.24
A-115	SUSPENDED SLAB SUPPORT AND FOOTINGS PLAN - PART 3	C1	21.06.24
A-201	GF PLAN	C1	21.06.24
A-202	DETAILED GROUND FLOOR PLAN - PART 1	C1	21.06.24
A-203	DETAILED GROUND FLOOR PLAN - PART 2	C1	21.06.24
A-204	DETAILED GROUND FLOOR PLAN - PART 3	C1	21.06.24
A-205	GF MEZZ PLAN	C1	21.06.24
A-206	L1 PLAN	C1	21.06.24
A-207	DETAILED LEVEL 1 FLOOR PLAN - PART 1	C1	21.06.24
A-208	DETAILED LEVEL 1 FLOOR PLAN - PART 2	C1	21.06.24
A-209	DETAILED LEVEL 1 FLOOR PLAN - PART 3	C1	21.06.24
A-210	L1 MEZZ PLAN	C1	21.06.24
A-211	ROOF PLAN OVERALL	C1	21.06.24
A-215	FIRE CONTROL CENTRE	C1	21.06.24
A-216	PUMP ROOM AND FST	P1	14.05.24
A-220	OFFICE 01 AND 02 - GROUND FLOOR AND GF MEZZANINE PLANS	C1	21.06.24
A-221	OFFICE 03 AND 04 - GROUND FLOOR AND GF MEZZANINE PLANS	C1	21.06.24
A-222	OFFICE 05 AND 06 - GROUND FLOOR AND GF MEZZANINE PLANS	C1	21.06.24
A-223	OFFICE 07 AND 08 - LEVEL 01 AND L1 MEZZANINE PLANS	C1	21.06.24
A-224	OFFICE 09 AND 10 - LEVEL 01 AND L1 MEZZANINE PLANS	C1	21.06.24
A-225	OFFICE 11 AND 12 - LEVEL 01 AND MEZZANINE PLANS	C1	21.06.24
A-251	DOCK OFFICE 01	C1	21.06.24
A-252	DOCK OFFICE 02	C1	21.06.24
A-253	DOCK OFFICE 03	C1	21.06.24
A-254	DOCK OFFICE 04	C1	21.06.24
A-255	DOCK OFFICE 05	C1	21.06.24
A-256	DOCK OFFICE 06	C1	21.06.24
A-257	DOCK OFFICE 07	C1	21.06.24
A-258	DOCK OFFICE 08	C1	21.06.24
A-259	DOCK OFFICE 09	C1	21.06.24
A-260	DOCK OFFICE 10	C1	21.06.24
A-261	DOCK OFFICE 11	C1	21.06.24
A-262	DOCK OFFICE 12	C1	21.06.24
A-300	GF CONCRETE SLAB SETOUT PLAN	C1	21.06.24
A-301	L1 CONCRETE SLABSETOUT PLAN	C1	21.06.24
A-303	GF MEZZANINE CONCRETE SLAB SETOUT PLAN	C1	21.06.24
A-304	L1 MEZZANINE CONCRETE SLAB SETOUT PLAN	C1	21.06.24
A-305	OFFICE 1 - CONCRETE SETOUTS	C1	21.06.24
A-306	OFFICE 2 - CONCRETE SETOUTS	C1	21.06.24
A-307	OFFICE 3 - CONCRETE SETOUTS	C1	21.06.24

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A-308	OFFICE 4 - CONCRETE SETOUTS	C1	21.06.24
A-309	OFFICE 5 - CONCRETE SETOUTS	C1	21.06.24
A-310	OFFICE 6 - CONCRETE SETOUTS	C1	21.06.24
A-311	OFFICE 7 - CONCRETE SETOUTS	C1	21.06.24
A-312	OFFICE 8 - CONCRETE SETOUTS	C1	21.06.24
A-313	OFFICE 9 - CONCRETE SETOUTS	C1	21.06.24
A-314	OFFICE 10 - CONCRETE SETOUTS	C1	21.06.24
A-315	OFFICE 11 - CONCRETE SETOUTS	C1	21.06.24
A-316	OFFICE 12 - CONCRETE SETOUTS	C1	21.06.24
A-400	RCP - OFFICE 01 AND 02 - GROUND FLOOR AND GF MEZZANINE	C1	21.06.24
A-401	RCP - OFFICE 03 AND 04 - GROUND FLOOR AND GF MEZZANINE	C1	21.06.24
A-402	RCP - OFFICE 05 AND 06 - GROUND FLOOR AND GF MEZZANINE	C1	21.06.24
A-403	RCP - OFFICE 07 AND 08 - LEVEL 01 AND L1 MEZZANINE	C1	21.06.24
A-404	RCP - OFFICE 09 AND 10 - LEVEL 01 AND L1 MEZZANINE	C1	21.06.24
A-405	RCP - OFFICE 11 AND 12 - LEVEL 01 AND MEZZANINE	C1	21.06.24
A-601	NORTH, SOUTH AND EASTERN WH BREEZEWAY ELEVATIONS	C1	21.06.24
A-602	EAST, WEST AND WESTERN WH BREEZEWAY ELEVATIONS	C1	21.06.24
A-611	OFFICE ELEVATIONS 1	C1	21.06.24
A-612	OFFICE ELEVATIONS 2	C1	21.06.24
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A-651	WAREHOUSE SECTIONS 1	C1	21.06.24
A-652	WAREHOUSE SECTIONS 2	C1	21.06.24
A-653	WAREHOUSE SECTIONS 3	C1	21.06.24
A-656	OFFICE SECTIONS 1	C1	21.06.24
A-657	OFFICE SECTIONS 2	C1	21.06.24
A-660	WALL SECTIONS SHEET 1	C1	21.06.24
A-661	WALL SECTIONS SHEET 2	C1	21.06.24
A-662	WALL SECTIONS SHEET 3	C1	21.06.24
A-665	OFFICE WALL SECTIONS SHEET 1	C1	21.06.24
A-666	OFFICE WALL SECTIONS SHEET 2	C1	21.06.24
A-667	OFFICE WALL SECTIONS SHEET 3	C1	21.06.24
A-668	OFFICE WALL SECTIONS SHEET 4	C1	21.06.24
A-701	STAIR 1 - DETAILS	C1	21.06.24
A-702	STAIR 2 - DETAILS	C1	21.06.24
A-703	STAIR 3 - DETAILS	C1	21.06.24
A-704	STAIR 4 - DETAILS	C1	21.06.24
A-705	STAIR 5 - DETAILS	C1	21.06.24
A-706	STAIR 6 - DETAILS	C1	21.06.24
A-707	STAIR 7 - DETAILS	C1	21.06.24
A-708	STAIR 8 - DETAILS	C1	21.06.24
A-709	STAIR 9 - 10 - DETAILS	C1	21.06.24
A-710	STAIR 11 - 12 - DETAILS	C1	21.06.24
A-711	STAIR 13 - 14 - DETAILS	C1	21.06.24
A-712	STAIR 15 - 16 - DETAILS	C1	21.06.24
A-713	STAIRS 17- 18 - DETAILS	C1	21.06.24
A-714	STAIRS 19 - 20 - DETAILS	C1	21.06.24
A-715	LIFT 1 - LIFT 2	C1	21.06.24

Scope of project/ audit	Continued from previous page…

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A-720	GF-GFM -AMENITIES LAYOUT - SHEET 1	C1	21.06.24
A-721	GF-GFM - AMENITIES LAYOUT - SHEET 2	C1	21.06.24
A-722	GF-GFM - AMENITIES LAYOUT - SHEET 3	C1	21.06.24
A-723	GF-GFM - AMENITIES LAYOUT - SHEET 4	C1	21.06.24
A-724	L1-L1M - AMENITIES LAYOUT - SHEET 1	C1	21.06.24
A-725	L1-L1M - AMENITIES LAYOUT - SHEET 2	C1	21.06.24
A-726	L1-L1M - AMENITIES LAYOUT - SHEET 3	C1	21.06.24
A-727	L1-L1M - AMENITIES LAYOUT - SHEET 4	C1	21.06.24
A-728	GF-GFM- AMENITIES LAYOUT - ACC TYPE 01	C1	21.06.24
A-729	GF-GFM- AMENITIES LAYOUT - ACC TYPE 02	C1	21.06.24
A-730	L1- AMENITIES LAYOUT - ACC TYPE 03	C1	21.06.24
A-732	L1M - AMENITIES LAYOUT - ACC TYPE 05-06	C1	21.06.24
A-733	L1M - AMENITIES LAYOUT - ACC TYPE 07	C1	21.06.24
A-740	AMENITIES ELEVATIONS SHEET 1	C1	21.06.24
A-742	AMENITIES ELEVATIONS SHEET 3	C1	21.06.24
A-746	TYP AMENITIES DETAILS	C1	21.06.24
A-751	DOCK OFFICE AMENITIES TYP	C1	21.06.24
A-760	TYP ACCESSIBLE AND AMBULANT AMENITIES DETAILS	C1	21.06.24
A-780	KITCHENETTE TYPE 1	C1	21.06.24
A-781	KITCHENETTE TYPE 2	C1	21.06.24
A-782	KITCHENETTE TYPE 3	C1	21.06.24
A-783	KITCHENETTE TYPE 4	P1	31.05.24
A-801	DOOR SCHEDULE TABLE SHEET 1	C1	21.06.24
A-802	DOOR SCHEDULE TABLE SHEET 2	C1	21.06.24
A-803	DOOR SCHEDULE TABLE SHEET 3	C1	21.06.24
A-804	GRAPHIC DOOR SCHEDULE	C1	21.06.24
A-805	ROLLER SHUTTER DOOR SCHEDULE	C1	21.06.24
A-806	STATUTORY SIGNAGE SCHEDULE	C1	21.06.24
A-810	WINDOW SCHEDULE 1	C1	21.06.24
A-811	WINDOW SCHEDULE 2	C1	21.06.24
A-812	WINDOW SCHEDULE 3	C1	21.06.24
A-813	WINDOW SCHEDULE 4	C1	21.06.24
A-814	WINDOW SCHEDULE 5	C1	21.06.24
A-815	WINDOW SCHEDULE 6	C1	21.06.24
A-816	WINDOW SCHEDULE 7	C1	21.06.24
A-817	WINDOW SCHEDULE 8	C1	21.06.24
A-818	WINDOW SCHEDULE 9	C1	21.06.24
A-820	WINDOW SCHEDULE 11	C1	21.06.24
A-821	WINDOW SCHEDULE 12	C1	21.06.24
A-830	WALL TYPES (EXTERNAL)	C1	21.06.24
A-831	WALL TYPES (INTERNAL)	C1	21.06.24
A-901	FENCING & GATE DETAILS	C1	21.06.24
A-902	METAL PROTECTION DETAILS	C1	21.06.24
A-903	STAIR TREAD, HANDRAIL AND BALUSTRADE DETAILS	C1	21.06.24

Revision numbers and issue dates for each plan are noted above as well.

The audit was confined to the interfaces of the development with the external road network. The internal road, circulation, parking and pedestrian aspects were not part of the audit scope.

Audit team details	Damien Chee, level 3 (lead) road safety auditor - Registration number: RSA-02-0094. Linda Chee, level 2 road safety auditor –Registration number RSA-02-1069.

<table>
<tr><td>Audit methodology</td><td>
The audit was undertaken using the following methodology:

Review of the design on 2/9/2024.
A familiarisation site inspection was carried out on 20/5/2023 as part of the previous audit conducted for this site.
The road safety audit findings have been documented in this report in accordance with the NSW Centre for Road Safety's Guidelines for Road Safety Audit Practices (2011).

The following table responds to the conditions under which this audit was to be undertaken:
<table>
<tr><th>Condition</th><th>Commentary</th></tr>
<tr><td>B10 Each independent road safety audit required by condition B9 must be provided to Council and:</td><td></td></tr>
<tr><td>(a) Be prepared by a level 3 road safety auditor;</td><td>Details of the audit team and accreditation levels are stated on the previous page and includes a level 3 accredited road safety auditor.</td></tr>
<tr><td>(b) Assess the safety performance of driveway access and parking associated with the development and Moxon Road;</td><td>The inherent purpose of a road safety audit is to consider and envisage the road safety impacts of the project. This is achieved by examining the designs, carrying out a site inspection, considering and envisaging the operations of the project when integrated with existing road, traffic and parking conditions. The audit findings are then documented in an audit findings table. See Tables 2 and 3 in this report.</td></tr>
<tr><td>(c) Address the relevant design, engineering and safety guidelines, including Austroads Guide to Traffic Management and Guide to Road Safety; and</td><td>All road safety audits rely on the knowledge and experience of the road safety audit team. Road safety audit teams are required to have a comprehensive knowledge of the relevant industry standards, guidelines, policies and technical directions. Examples of relevant industry documents that are applicable to this project are AS2890, Austroads Guide to Road Design series and Austroads Guide to Traffic Management Series. As each audited project is different, it is not appropriate to stipulate a fixed schedule of reference documents for all road safety audits. Rather, the audit team needs to select documents as appropriate and relevant to the nature of the project.

It is important to note that audit findings are raised based on the auditor's expert opinion first and foremost, and industry guidelines/ standards/ policies etc are used as background philosophies in (1) detecting the problem in some instances, (2) substantiating the project where appropriate to aid the reader's understanding of the problem and (3) determine appropriate mitigation measures. Audit findings are not necessarily based on non-compliance with industry guidelines (although non-compliance is often a reason/ justification for an issue being a road safety problem). Road safety risks are usually multi-faceted and the link to a relevant industry guideline/ standard is usually only half of the painted picture.

Note: Due to the large number of industry standards, guidelines, technical directions, policies and best practice notes, it is not practical to list all of these documents here.</td></tr>
<tr><td>(d) Detail any additional management and mitigation measures recommended by the independent level 3 accredited road safety auditor and a timetable for the implementation of any required actions.</td><td>Management and mitigation measures have been included with each audit finding. In Table 2, these have been included in the last column since this is a historic audit and the improvement measures were developed post-audit.

In Table 3, these improvement measures have been embedded with the main description of the audit finding.</td></tr>
</table>
</td></tr>
<tr><td>Material supplied</td><td>See scope of project/ audit.</td></tr>
<tr><td>Meeting and assessment details</td><td>Review of design concept on 2/9/2024.
Site inspection carried out on 20/5/2023.</td></tr>
</table>

1.2 Responding to the 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. They are to be considered as a “value-add” process in identifying potential safety risks that may have been overlooked in the design. They are not intended to “catch out” the project team, and the audit process and report should not be used to stifle a project. Rather, if used appropriately, road safety audits should make projects more justifiable by encouraging the inclusion of additional safety measures, or alternatively removing potentially unsafe aspects.

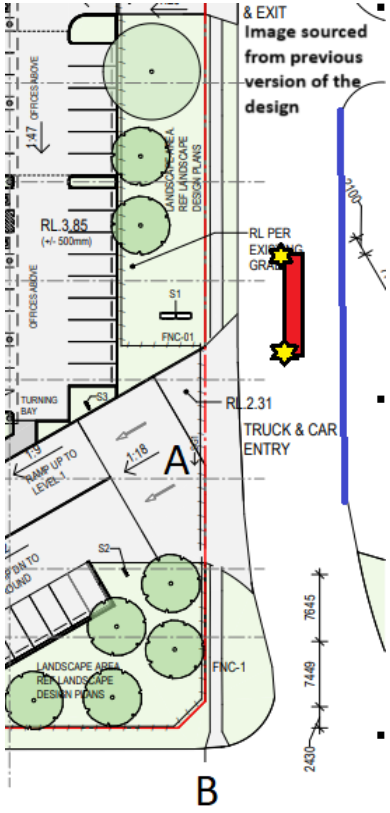
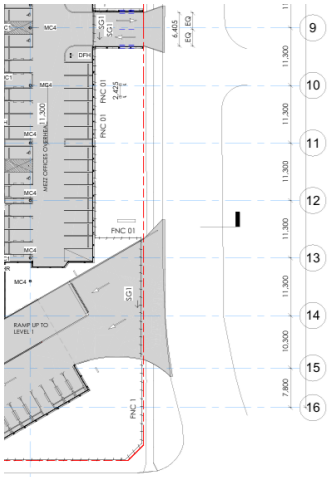
The responsibility for the project rests with the project manager, not with the auditor. The project manager is under no obligation to accept the audit findings. Also, it is not the role of the auditor to agree to, or approve the project manager’s responses to the audit. The audit team is not responsible for the project and does not own or manage the risk associated with the project. Therefore, it is also inappropriate for the audit team to direct the project team on a particular course of action following the audit. It should be appreciated that in responding to audit findings, the project team needs to consider the wide range of influencing factors, not just the road safety aspect. In these respects, the audit team is not positioned to consider all project factors. In the same respects, it is inappropriate for the audit team to approve or reject the action plan that follows a road safety audit. This close out/ action plan should be at the discretion of the project team in consultation with relevant stakeholders.

1.3 Previous audits

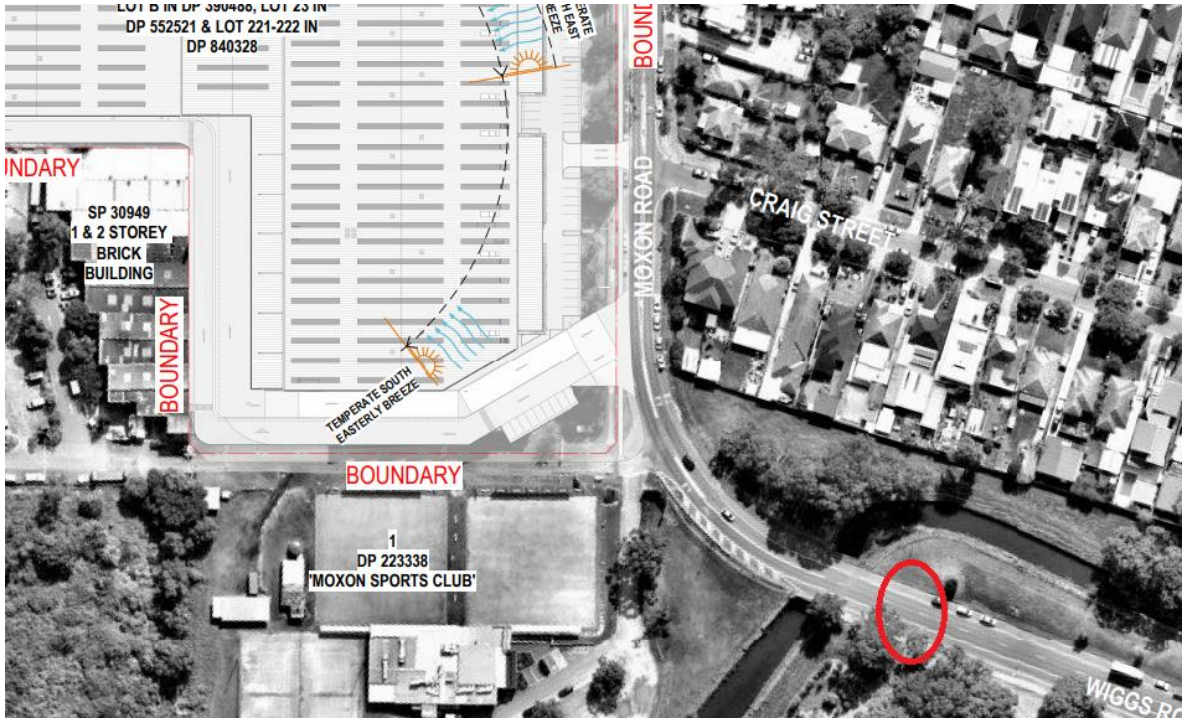
A *concept design* road safety audit was undertaken by DC Traffic Engineering (DCTE) on an earlier version of the design in May 2023. This was documented in the DCTE report registered as ASON-PROJ-0022-01 (revision 2, dated 31/5/2023). The findings from that road safety audit have been provided in Table 2 along with a commentary from the current audit team. Each of the findings have been numbered as C1, C2 etc where “C” refers to *concept design stage* and the suffix numbers are the same sequential order as in that report. Only the issues of relevance to the current design layout have been included in Table 2.

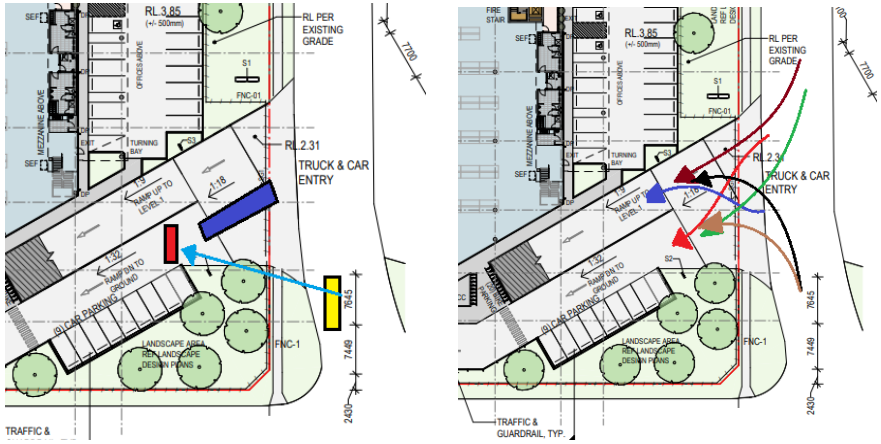
The audit team takes the position that if issues were raised and documented in previous road safety audits, and made known to the project team at the time, then these need not be re-reported in the current audit. This is based on the assumption that the project team considered and reached a close out position on each matter at that time. In these respects, previously reported items are considered to be precluded items from this current audit.

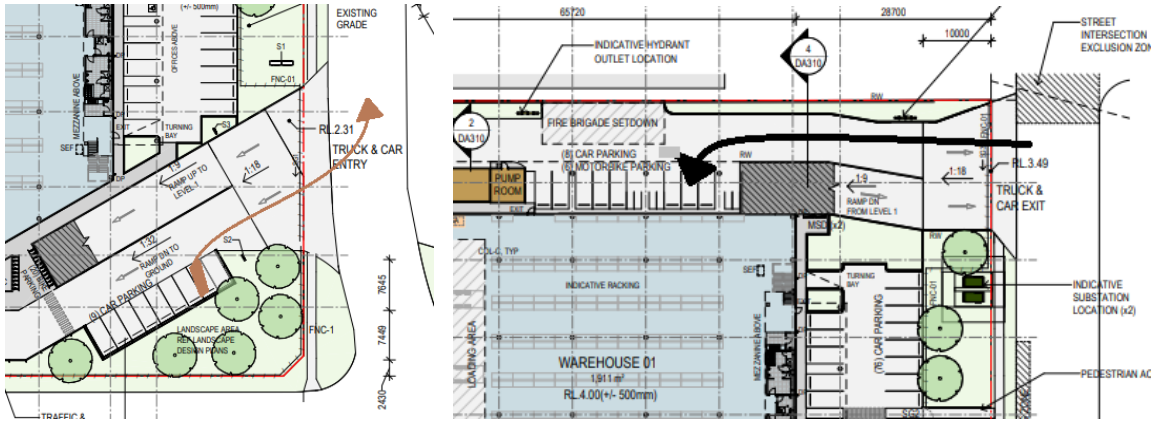
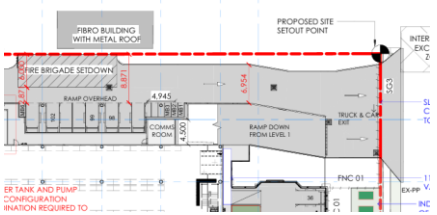
Table 2 Previous road safety audit findings (sourced from *concept design* road safety audit report ASON-PROJ-0022-01 Rev 2).

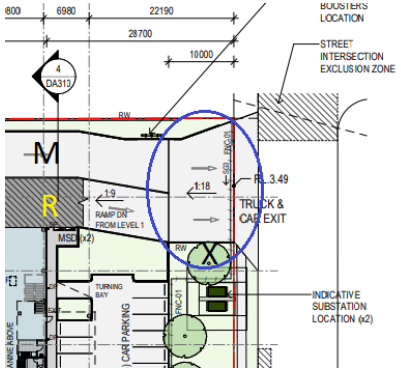
Ref	*Location/ theme*	*Previous road safety audit finding (from report ASON-PROJ-0022-01 Rev 2).*	Commentary as part of current audit
C1a	*Inbound driveway to the warehouse docks at the southern end of the site.*	*The design indicates that an inbound driveway will be provided at the southern end of the site, The audit team notes the following issues:*  ▪ *If southbound vehicles on Moxon Road stop to wait for gaps to turn right into the property, there may not be sufficient passing clearance available for trailing southbound vehicles. This could generate rear-end crash risk, as well as cause queues and congestion. Although there is a shoulder available in the southbound direction, this is generally used as a parking lane. Parked cars may block thoroughfare on the passing lane. Consideration could be given to installing a short length of NO STOPPING zone to keep more of this shoulder clear for other vehicles to pass around. The improved passing opportunity would also reduce the pressure on the waiting right-turning driver and hence less risk of poor gap acceptance and speeding through small gaps. The blue line is the indicative kerbline that could be designated as a no stopping zone. A similar issue applies to the access to the 76-space car park (see item C1b).* ▪ *The new inbound driveway ("A" in the left-hand image) will be just north of the existing side road ("B"). There may be confusion in interpreting the right-hand indicator of southbound vehicles. For example, if a southbound driver sees the vehicle in front activate its right-hand indicator, they may falsely believe this is an intended right-turn into road B. However, if the right-turn indicating vehicle stops "prematurely" at driveway "A", this could take the trailing driver by surprise. Similarly, an outbound driver at road B may interpret a right-turn indicating vehicle to be an intended right-turn into driveway A, when it is really an intended turn into Road B. This could also result in poor gap acceptance and cross traffic crash conflicts. A similar issue applies to the access to the 76-space car park (see item C1b).* ▪ *The skewed angled driveway ("A") reduces the swept path envelope for entering vehicles. However, it may also encourage southbound vehicles to negotiate this right-turn to the site at a high speed. This could compromise safety of pedestrians crossing the driveway. It would also affect the time that drivers have to decide which ramp to take.* ▪ *The skewed angle of the driveway also increases the crossing length for pedestrians. They would be exposed to conflicts by inbound vehicles over a longer length compared with a perpendicularly aligned driveway.*	Points 1-4: This is still the case under the latest design. Consideration should be given to the following: ▪ Installing a length of NO STOPPING zone on the eastern kerbline of Moxon Road to improve passing opportunities for southbound traffic. A timed condition can be stated to effect this restriction during periods when the warehouse is operational. ▪ Appropriate signage should be installed to direct vehicles to the ramp or the ground level channel, depending on their desired destination. These works should be implemented as soon as practicable atter operations commence, and no later.  ***Above:*** *Extract from the new design showing the similar layout and position of the inbound truck and car entry at the southern end of the site.*

Ref	*Location/ theme*	*Previous road safety audit finding (from report ASON-PROJ-0022-01 Rev 2).*	**Commentary as part of current audit**
C1b	*Inbound movements to the 76-space car park along the eastern frontage of the site.*	*The first two bullet points in item C1a also apply to the driveway to the 76-space car park on the eastern frontage of the site. This car park entry-exit would also be another source of southbound right-turning traffic. That is, in the southbound direction of Moxon Road, there would be three right-turn opportunities in close succession, being – (i) the right-turn into the 76-space car park, (ii) the right-turn into the southern driveway of the site and (iii) the right-turn into the side road accessing Moxon Sports Club.*	The project team advised that, according to Condition B5 of the SSD-55266460, dated 19 July 2024, the central driveway is limited to left turn movements in and out of the Site. As such, it is not expected to have southbound light vehicles to turn right into the property from Moxon Road. In these respects, and assuming 100% compliance with the turn restriction, this is no longer a relevant issue. There are no mitigation measures proposed as a result.

Ref	Location/ theme	Previous road safety audit finding (from report ASON-PROJ-0022-01 Rev 2).	Commentary as part of current audit
C2	*Westbound traffic movements on Wiggs Road in approach to Moxon Road and impacts on inbound traffic to the site.*	*The inbound driveway to the site is positioned at the southern end of the site. This is close to the horizontal curve from Moxon Road to Wiggs Road. This curve is somewhat sight-limited. Southbound drivers on Moxon Road that stop to turn right into the site would have only 90m of MGSD sight line available to an opposing (westbound) vehicle on Wiggs Road. This equates to a time-gap of 5.4 seconds which may not be a sufficient gap if it is a slow-moving and long truck making the right-turn. As the sight line is unlikely to be improved, based on the geometric and roadside conditions, the speeds of westbound vehicles on Wiggs Road would need to be controlled. The audit team notes that Wiggs Road is a long and straight road in approach to this horizontal curve into Moxon Road. As such, additional speed attenuation may be required to reduce the approach speeds of westbound traffic on Wiggs Road, and thereby increase the time-gap equivalent of the 90m sight line. For example, additional speed cushions could be provided at the red circle below.*  ***Above:*** *Due to the sight-limited horizontal curve from Moxon Road to Wiggs Road, the approach speeds by westbound vehicles on Wiggs Road may need to be further controlled (reduced) to ensure sufficient MGSD sight line for right-turning vehicles entering the site. This is mindful that many of the right-turning entering vehicles would be slow-moving and long trucks. Image sourced from previous version of the design.*	This issue still persists in the new design. Consideration should be given to installing speed humps or other speed-reduction devices on Wiggs Road in the westbound direction approaching the site. These works should be implemented as soon as practicable atter operations commence, and no later.

Ref	Location/ theme	Previous road safety audit finding (from report ASON-PROJ-0022-01 Rev 2).	Commentary as part of current audit
C3	*Inbound driveway to the warehouse docks and car park.*	*The inbound driveway to the warehouse docks and side/rear car parks will be at the southern end of the site. Generally, it is not ideal to have situations where inbound vehicles are forced to stop so soon after entering the site. This could create rear-end crash conflicts immediately upon entering the site. It could also lead to queue spillback into Moxon Road where the vehicle at the back of queue is exposed to impacts by Moxon Road traffic. The queue spillback may also block the footpath and force pedestrians to walk around the stopped vehicle.* *The audit team notes several scenarios where inbound vehicles may be forced to stop immediately after entering the site, as follows:* ▪ *There are 90° parking spaces a short distance into the inbound driveway as shown in the left-hand image. If inbound vehicles (eg. blue truck) are forced to stop in response to vehicles manoeuvring into or out of these parking spaces (eg. red car), this could cause blockages and queues in the inbound driveway.* ▪ *Immediately downstream of the Moxon Road intersection, the inbound driveway splits into two separate ramps. This forces drivers to make a quick decision on which ramp to take. This could result in impacts with the barrier splitting this ramp. Alternatively, a more common response would be driver hesitancy, indecision and confusion, with potential stoppages and exposure to rear-end impacts. There may also be "last second" decision changes, such as drivers changing from one lane to the other to access the adjacent ramp. The right-hand image shows the multitude of crash conflicts due to "last-second" decision changes (blue and red arrow movements). Furthermore, some drivers may also attempt to reverse back out to access the other ramp.* *As a side note, the proposed trees on the southern side of the driveway may restrict drivers' visibility to cars manoeuvring into the parking spaces or pedestrians moving to or from these cars. In the left-hand image, the driver of the yellow car may have limited visibility to the red car or any pedestrians in this area.*  ***Left:** Inbound drivers (blue truck) may be forced to stop immediately after entering the driveway due to parking movements into and out of the 90° parking spaces (red vehicle). **Right:** The multitude of conflicts at the inbound driveway due to the split to two ramps being so close to the entry point from Moxon Road. Both images sourced from previous version of the design.*	Landscaping details were not provided in the new design. However, these issues would still persist in the new design presuming the tree planting schedule remains the same. Consideration should be given to the following measures: ▪ Installing NO STOPPING signs as appropriate to prohibit stopping in the driveway immediately after entering. ▪ Using pavement hatching/ markings to signify the extents of the *no stopping* zone. ▪ Trees within the critical sight lines should not be planted. These works should be implemented before operations commence. ***Above:** The internal 90° parking rank still exists in the inbound driveway on the new design.*

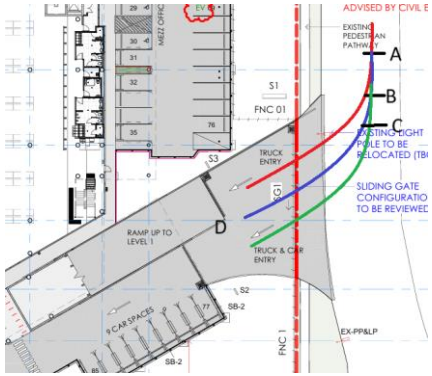
Ref	Location/ theme	Previous road safety audit finding (from report ASON-PROJ-0022-01 Rev 2).	Commentary as part of current audit
C4	*90° parking spaces in the inbound driveway and outbound driveway.*	*The internal roadway to the warehouse docks and side/rear car parks will operate as a one-way clockwise system. All inbound movements will be via the southern driveway and all outbound movements would be via the northern driveway. The proposed 90° parking spaces in the inbound and outbound driveways may tempt drivers to make deliberate "wrong way" movements. For example, drivers that use the nine 90° parking spaces at the southern end of the site (see left-hand image) may be tempted to exit the site using the inbound driveway as depicted by the brown arrow. This would be a "wrong way" movement. This would be a significantly shorter outbound trip and hence this being a tempting option.* *Similarly, inbound drivers that wish to use the eight car parking spaces and six motorcycle parking spaces at the northern end of the site may be tempted to make wrong way inbound movements via the black arrow in the right-hand image.* *These wrong way movements have obvious head-on crash risks. However, perhaps more likely is when two opposing vehicles come head-to-head and one or both vehicles is forced to stop and reverse to clear the way for the other. This could also result in congestion in the circulation aisle and potential spillback into Moxon Road, as well as collision risks involving reversing vehicles.*  ***Left:*** *Drivers in these 90° parking spaces may be tempted to egress by travelling the wrong way through the inbound driveway as shown by the brown arrow.* ***Right:*** *Drivers intending to use these parking spaces may be tempted to enter via the outbound driveway as shown by the black arrow. This is also a "wrong way" movement. Both images sourced from previous version of the design.*	These would still be issues in the new design due to the retained parking facilities and their close proximities to the respective inbound and outbound driveways. The 90° parking rank on the inbound driveway was shown in the commentary to item C3. The retained parking facility on the outbound driveway is shown below. Consideration should be given to the following: ▪ Installing pavement arrows throughout the circulation channels to reinforce the circulation direction. ▪ Placing a few ONE WAY signs at strategic locations throughout the internal circulation route where non-compliance would be most likely to happen. ▪ Installing NO ENTRY signs on the inbound and outbound driveways facing the directions from which wrong way movements would approach from. These works should be implemented before operations commence.  ***Above:*** *The 90° parking rank on the outbound driveway as presented in the new design.*

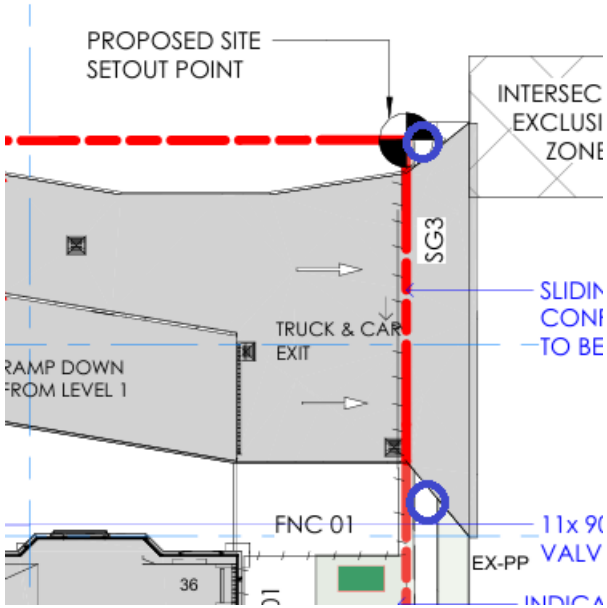
Ref	Location/ theme	Previous road safety audit finding (from report ASON-PROJ-0022-01 Rev 2).	Commentary as part of current audit
C5	*Egress driveway.*	*The egress driveway from the warehouse docks and side/rear car parks is shown below. The audit team notes the following safety issues:* ▪ *The 1:9 ramp descends towards the driveway. There would be poor sight lines from the main circulation channel (M) towards any vehicles on the ramp (R). These two vehicle streams are vertically separated with the elevation difference and the side barriers/ parapets being the main sight obstructing features. These two vehicle streams would converge towards the 1:18 ramp with little awareness of each other or each other's intended movements when egressing to Moxon Road. The poor sight conditions could increase the risk of side-swipe collisions.* ▪ *Even if these vehicles become aware of each other, there is a very short "sorting" area available. The 1:18 ramp is only 10m long. In this short driveway length, any vehicles from channel M that wish to turn right into Moxon Road would need to shift to the right and cut across the "R" traffic stream. Similarly, any vehicles from ramp R that wish to turn left into Moxon Road would need to shift left and cut across the "M" traffic stream. This traffic arrangement is messy and prone to mistakes and collisions.* ▪ *Many drivers would perceive that there are actually two outbound lanes – one as an extension of channel M and the other as an extension of channel R. This is particularly if pavement arrows are provided as shown on the plan. This is not acceptable for a priority-controlled egress, especially if the two channels allow for both left and right turn movements into Moxon Road. There would be risks of vehicles from channel M attempting a right-turn movement from their departure lane (rather than merging into a single file first). Similarly, there would be risks of vehicles from channel R attempting a left turn from their departure lane (rather than merging into a single file first). This would have rear-end and side-swipe crash risks. Also, it is not acceptable to have two adjacent streams of traffic turning in the same direction under a priority-controlled (gap-acceptance) scheme. Both vehicles may attempt to use the same gap in the Moxon Road stream, which then requires them to merge into a single file whilst moving into that gap.* ▪ *The tree at point X is an unnecessary sight line obstruction. Egressing drivers may not have a clear view of any pedestrians approaching the driveway from its southern side.*  ***Left:*** *Extract from the design showing the egress driveway and convergence of the 1:9 ramp and channel M. Image sourced from previous version of the design.*	Point 1: This issue still persists in the new design. This is best illustrated by the 3D architectural drawing (below) showing the level difference of the ramp (R) and the main circulation channel (M) and how the parapet to the ramp would obstruct the mutual sight line. Points 2 and 3: This issue still persists in the new design. Point 4: Landscaping details were not presented in the new design. However, this issue is likely to still persist if the tree planting schedule is the same as the previous design. Consideration should be given to the following: ▪ Making the ground level channel (M) GIVE WAY controlled at this interface point. ▪ Installing a sign upstream of this point in channel M stating "GIVE WAY TO RAMP TRAFFIC". ▪ Installing a convex mirror so that drivers from channel M can see vehicles descending on ramp R. ▪ Installing a NO RIGHT TURN sign in channel M and forcing all of this traffic to turn left into Moxon Road. ▪ Removing the tree at point X. These works should be implemented before operations commence. ***Above:*** *The 3D image of the convergence point between the ramp and the main circulation roadway.*

2 Safety audit findings

The road safety audit findings, associated with the review of the detailed design drawings are presented in Table 3.

Table 3 Road safety audit findings – from review of detailed design.

Ref	Location/ theme	Road safety audit finding – from review of detailed design	Project team's response
1	Inbound driveway at the southern end of the site.	Immediately downstream of its interface with Moxon Road, the inbound driveway splits with the left-hand channel providing circulation access to the ground level loading facilities as well as the various light vehicle car parks, and the right-hand channel providing truck access to the first floor loading facilities. As noted in item C3 of the previous audit (Table 2), there is very little road length, and hence very little time for vehicles to sort into these respective channels. In this regard, there is a critical need for wayfinding advice to be provided as soon as practicable, ie. via gateway signs, pavement markings or large signs above/beside each channel that are visible from Moxon Road. The early advice is particularly important for trucks as they need to know when and where to commence their turning movement, as well as where to stop if they need to wait for a gap in the northbound traffic stream. This should be implemented prior to commencement of operations. Using the image below, if a southbound truck advanced to point C (or even point B) to wait for a gap to turn right into the driveway, they may not have enough manoeuvring space to turn into the elevated ramp. If the driver is too far south when commencing the turn from Moxon Road, they will not be able to complete the right-turn manoeuvre in a single turn. They may be required to make a reversing adjustment (three-point turn) with associated risks of impacting other vehicles. When stuck in this position, the only viable correction would be to circle the block and re-attempt the right-turn properly. Many drivers would be reluctant to do this. If the driver caught in this position refuses to make the three-point turn adjustment, they could also be at risk of impacting the parapet separating the ramp from the ground level circulation roadway. A similar risk would prevail for northbound left-turners into the driveway. If they commence their left turn too early, they would not be able to access the elevated ramp. If they commence too late, they may not be able to access the ground level circulation channel. This is also a very tight turn for long trucks. They may be required to cross the centreline or make reversing adjustments as well. Consideration should be given to banning northbound left-turn entries for long trucks. This should be implemented prior to commencement of operations.  ***Left:*** *Early wayfinding signs and advice are critical at the southern gate since drivers need to know when to commence their turning movements. If the turning movements from Moxon Road are commenced at the wrong position, it may be difficult to access the desired destination at the ramp split. This problem arises for both southbound right turns as well as northbound left turns into the site.*	

Ref	Location/ theme	Road safety audit finding – from review of detailed design	Project team's response
2	Pedestrian safety at the egress driveway.	From the new design, it is more apparent that a boundary fence will be provided along the Moxon Road frontage of the property. Sliding gates will be provided at the inbound and outbound driveways. Typically, fences with vertical balusters result in very poor see-through visibility/ sight lines. This is especially when the sight line is an acute angle through the fence, such that the successive balusters form a visual "barrier". In these respects, the outbound driver may have poor sight lines to pedestrians on the external footpath, especially to those moving towards, and about to step into the driveway area. The poor sight lines could increase the risk of *vehicle-pedestrian* crashes. Consideration should be given to the following: ▪ Selecting a fence type with the best "see through" visibility via the arrangement and profile of the balusters. For example, fences with horizontal members or angled balusters could be used instead. ▪ Offsetting the footpath so that it is further away from the fence/ gateline and hence offering more time/ length for drivers to react before conflicting with pedestrians. ▪ Installing warning signs in the driveway to warn of the presence of pedestrians on the external footpath. These measures should be implemented prior to commencement of operations.  ***Left:*** *Pedestrians at the footpath interfaces with the outbound driveway may not be clearly seen by outbound drivers. The combined effect of the vertical balusters of the fence and the acute viewing angle through the fence may limit the see-through visibility.*	

3 Concluding statement

DC Traffic Engineering has undertaken a *detailed design* road safety audit of this project in accordance with the methodology outlined in Section 1 of this report.

Issues identified have been noted in this report for the Project Manager to review, assess, and where appropriate, make the necessary recommendations to improve safety.

Damien Chee
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DC Traffic Engineering Pty Ltd