Appendix D

Road Safety Audit

NORTHROP

CIVIL

Road Safety Audit (Stage 2 Preliminary Design)

for

MPark - Road 22, Talavera Road, Macquarie Park, NSW

for Stockland Corporation Limited

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Report Document Control

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Revision History

Revision	Report Status	Issue Date	Prepared	Reviewed	Admin
A	DRAFT	22/02/21	JK	MW	BBR
B	PRELIMARY	26/02/21	JK	MW	BBR

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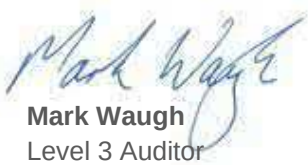
26th February 2021

Reviewed by:



Mark Waugh
Level 3 Auditor
Team Leader
Audits
RSA-02-0097

26th February 2021

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Certificate No: 37000834

26th February 2021

Limitation Statement

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The report was prepared on the dates shown and is based on the conditions and information received at the time of preparation.

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Contents

1. Road Safety Audit

1.1 Auditor and Audit Process

Northrop Consulting Engineers have been commissioned by Stockland Corporation Limited to complete a Preliminary Design (Stage 2) Road Safety Audit (RSA) of a proposed new road (Road 22) that is to provide access and on-street parking requirements to a new development on the corner of Khartoum Road and Talavera Road, Macquarie Park, NSW. Figure 1 illustrates the relationship of the subject site to the adjacent existing public road network.

A Road Safety Audit assesses the road environment's safety performance and crash potential at various stages of a road's life cycle. A road safety audit is defined by Austroads as "….a formal examination of a future road or traffic project or an existing road, in which an independent, qualified team reports on the project's crash potential and safety performance…" It provides a formal assessment report outlining identified safety issues and with, if requested, recommendations for the consideration of the proponent and/or road authorities to review and act on in terms of road safety outcomes. It requires a team of a minimum of two accredited road safety auditors.

This report has been prepared following a site inspection and review of the Preliminary Engineering Plans (Rev A) prepared by Northrop Engineers (Sydney). The nominated road safety audit team is Mark Waugh (RSA-02-0097, Level 3 Auditor and Team Leader), Ben Clark (RSA-02-1451, Level 1 Auditor) and Jason Kidd (10485 NAT Course in Road Safety Audits Cert. 37000834).

It is noted that the Road Safety Audit team (listed above), are geographically located in a separate office and have had no involvement in the design development of the project or proposed road.

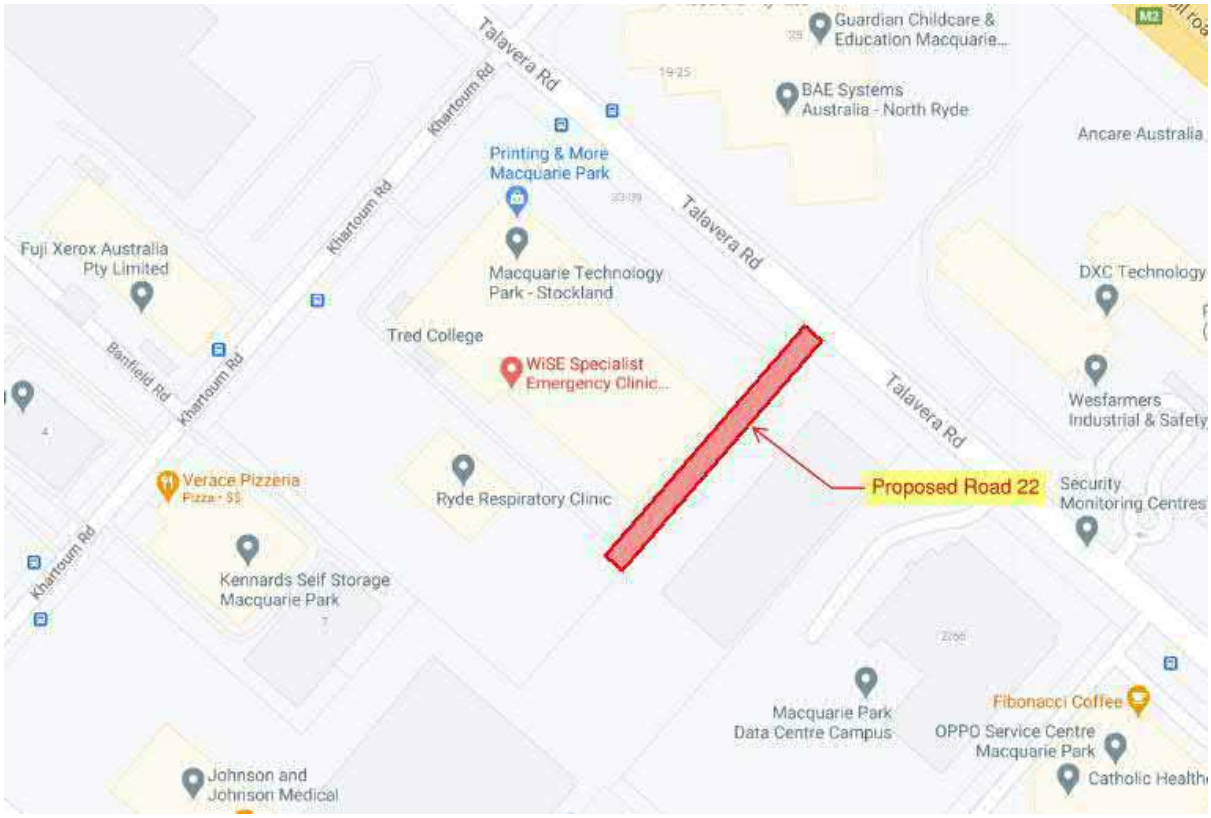


Figure 1: Aerial of Site (source Google Maps)

1.2 Description of the Project

The scope of work associated with the intersection upgrade includes:

- A new 8.50m wide carriageway and intersection off Talavera Road. The carriageway will incorporate an offset crown to the eastern side of the new formation.
- New kerb and gutter to both side of the formation with kerb inlet pits and stormwater drainage infrastructure.
- On-Street parking on the western side of the proposed road.
- Two (2) new driveway access points into the proposed development on the western side of the new carriageway.
- New street lighting.
- Landscaping and footpaths.

1.3 Documents and Plans Reviewed

As part of the road safety audit process, the following documentation has been utilised and / or reviewed:

- Austroads Guide to Road Safety Part 6: Managing Road Safety Audits (Edition 1.0 Feb 2019).
- Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audits (Edition 1.2 Feb 2019):
  - Austroads checklist 2: Preliminary Design Stage Audit (Part 6A Edition 1.2 Feb 2019).
  - Austroads checklist 6: Existing Roads: Road Safety Audit. (Part 6A Edition 1.2 Feb 2019).
- Guidelines for Road Safety Audit Practices, (NSW Roads and Traffic Authority (now RMS) July 2011).
- Austroads Guide to Road Design Part 3: Geometric Design, (Edition 3.2 July 2017).
- RMS Supplements to Austroads Guide to Road Design, (Various).
- Detailed Engineering Design Plans – M_Park – Road 22, 33 Talavera Road & 11-17 Khartoum Road, Macquarie Park – 171708-07– Northrop Engineers (Revision A) dated 18/11/2020.

1.4 Risk Ranking of Safety Issues

The AUSTROADS Guide to Road Safety Part 6A: Implementing Road Safety Audits (Austroads 2019) provides indicative material relating to the level of risk associated with an issue, and how to respond to that risk. Any issues highlighted with recommendations for review as part of the RSA findings (See Table 1 overleaf) are also characterised according to the level of risk, which may aid the project sponsors and owners in responding to the RSA findings.

How often is the problem likely to lead to a crash?

Frequency	Description
Frequent	Once or more per week. An event is expected to occur.
Probable	Once or more per year (but less than once a week.) An event will probably occur.
Occasional	Once every five or ten years. An event might occur in some circumstances.
Improbable	Less often than once every ten years. An event could occur.
Rare	An event could occur only in exceptional circumstances

Source: Table 4.1 – AUSTROADS Guide to Road Safety Part 6A: Implementing Road Safety Audits (Austroads 2019)

What is the likely severity of the resulting crash type?

Severity	Description	Examples
Catastrophic	Likely multiple deaths	High speed, multi vehicle crash. Car runs into a crowded bus stop. Bus and petrol tanker collide. Collapse of a bridge or tunnel.
Serious	Likely death or serious injury	High or medium speed vehicle/ vehicle collision. High or medium speed collision with fixed roadside object. Pedestrian or cyclist struck by a car.
Minor	Likely minor injury	Some low speed vehicle collisions. Cyclist falls from bicycle at low speed. Rear end crashes.
Limited	Likely trivial injury or property damage only	Some low speed vehicle collisions. Pedestrian walks into an object. Car reverses into an object.

Source: Table 4.2 - AUSTROADS Guide to Road Safety Part 6A: Implementing Road Safety Audits (Austroads 2019)

The Resulting Level of Risk

	Frequent	Probable	Occasional	Improbable
Catastrophic	Intolerable	Intolerable	Intolerable	High
Serious	Intolerable	Intolerable	High	Medium
Minor	Intolerable	High	Medium	Low
Limited	High	Medium	Low	Low

Source: Table 4.3 - AUSTROADS Guide to Road Safety Part 6A: Implementing Road Safety Audits (Austroads 2019)

A safety issue with an assessed **intolerable** level of risk would require immediate action.

Treatment Approach

Priority levels for treatments (e.g. high, medium or low) have been assigned to each identified safety issue. The priority levels are defined as follows:

Risk	Suggested Treatment Approach
Intolerable	Must be corrected
High	Should be corrected or the risk significantly reduced, even if the treatment costs are high. A high road safety risk requiring redesign or design amendment with resolution prior to construction.
Medium	Should be corrected or the risk significantly reduced, if the treatment cost is moderate, but not too high.
Low	Should be corrected or the risk significantly reduced, if the treatment cost is low.

Source: Table 4.4 - AUSTROADS Guide to Guide to Road Safety Part 6A: Implementing Road Safety Audits (Austroads 2019)

1.5 Road Review, Findings and Suggested Treatments

A detailed review of the proposed Engineering Drawings and surrounding road network was undertaken on the 14 February 2021. It is noted that no previous Road Safety Audit for this project were supplied or reviewed as part of this audit.

Of note in reviewing the proposed intersection are the following features:

1. The proposed intersection will be unsignalised and will provide an unmarked crossing point for pedestrians i.e. pedestrians and cyclists will be required to giveway to turning traffic into and from the proposed new road.
2. There was no street lighting assessment/design provided for review for this audit. It is noted that the design drawings do nominate the location of new streetlights and lighting levels should be checked for safety and standard compliance.
3. There is an existing driveway on Talavera Road located opposite the proposed new Road 22. Turning path templates provided do not include simulations from this driveway and therefore conflict cannot be determined.
4. Talavera Road has provisions for on-street parking on both sides of the formation. It is noted that there is no existing dedicated cycle lane on Talavera Road.

5. The natural topography of the Talavera Road/ Road 22 intersection is generally flat and does not create any significant crest/ sag visibility concerns.

6. The posted speed limit of Talavera Road is 50km/h, however the wide existing formation and straight geometry has the potential to encourage users to travel at higher speeds.

7. Time restricted parking operates in both directions on Talavera Road, with No Stopping restrictions applying on Talavera Road at other times. The window allowed for parking is 10AM to 3PM, meaning the road operates as a 2 lane 2 way road during peak periods.

1.5.1. Site Inspection and Design Review

The proposed road and intersection were inspected on 14th of February 2021 to review the existing conditions and aspects of the proposed layout. It is noted that the weather conditions during the audit were wet and overcast.

Photographs taken during the inspection are provided below.

Photo 1: Looking west along Talavera Road from the proposed road intersection.

Photo 2 Looking east along Talavera Road from the proposed Intersection

Photo 3: Looking at the proposed Road 22 from the northern side of Talavera Road

Photo 4: Standing on the northern side of Talavera Road looking eastward towards proposed Road 22.

Photo 5: Looking west from the proposed Road 22 at the existing shared path on the southern side of Talavera Road

Photo 6: Photo of time restricted parking located on both side of Talavera Road

1.6 Responding to the Audit Report

As set out in the *Road Safety Audit Guidelines*, responsibility for the subject development rests with the Developer, Designers and Road Authorities. Ultimate responsibility for the road environment does not rest with the auditor. The designer or owner of the asset is not under any obligation to accept all or any of the audit recommendations. Also, it is not the role of the auditor to agree to or approve the project manager's or owner's response to the audit. Rather, the audit provides the opportunity to highlight potential problems and have them formally considered by the project team and road authorities.

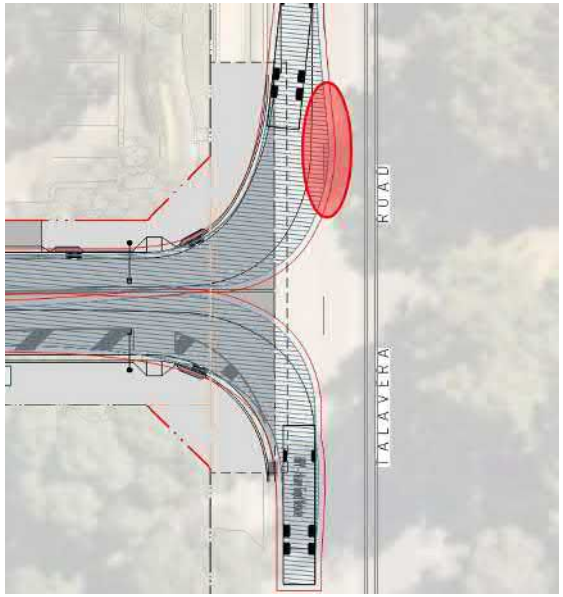
As part of this audit process both design and existing issues have been taken into consideration.

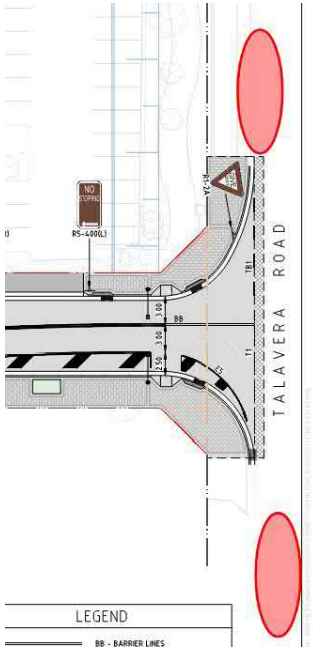
This formal road safety audit report should be responded to in writing by the developer/ designer or asset owner. The response should include acceptance and actions, or reasons for rejection of an audit finding, and if requested any recommendations put forward by the audit team. To assist with this, Table 1 overleaf (containing this audit's findings and recommendations) contains two columns for that formal response. Where an audit finding is accepted, the solution/ action to be taken to address a finding should be identified in the Response column of Table 1.

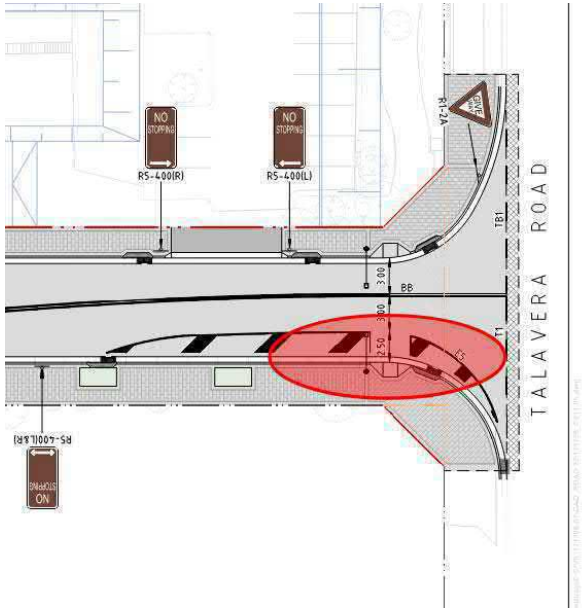
1.7 Concluding Statement

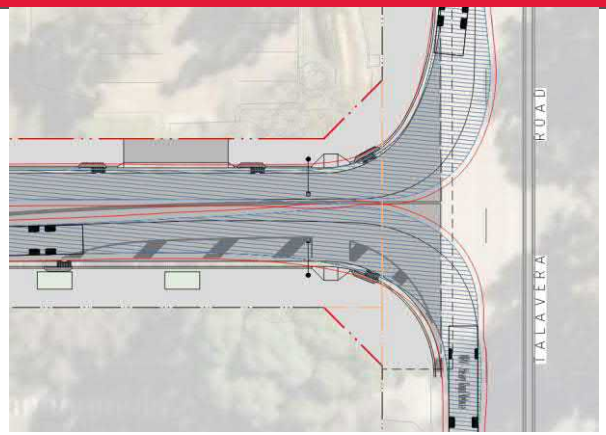
A review of the design of the proposed Road 22 and intersection with Talavera Road, and a review of the existing road conditions has been undertaken. The audit has been carried out for the sole purpose of identifying any elements of the proposed new road formation and intersection environment and its features that could be altered or removed to improve safety for all road users. The findings of the audit are contained in Table 1 overleaf. The findings are put forward for consideration by the Developer, Designers and Road Authorities.

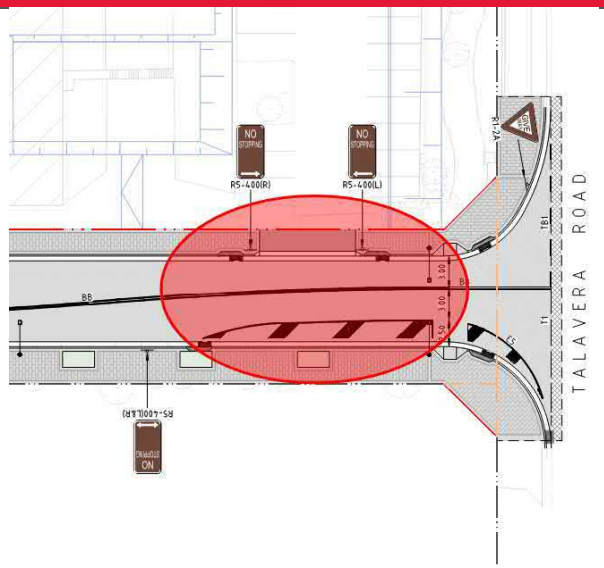
Table 1 - Road Safety Audit Findings

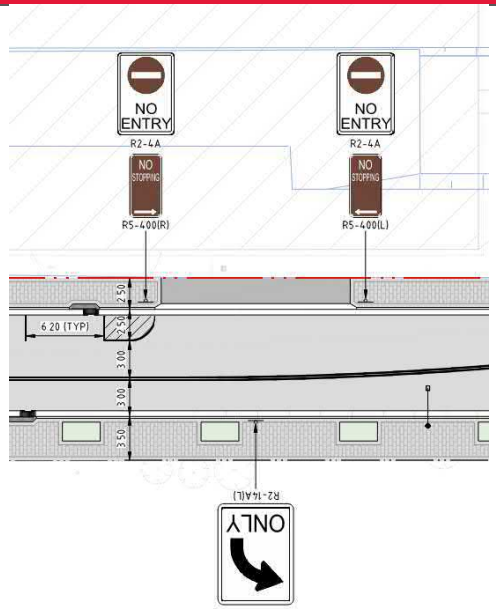
Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
1. Left turn vehicle template impacts parking lane on Talavera Road. (Rear end and Side swipe collisions).	The proposed new intersection and turning paths indicate a 12.5m HRV will use the outside parking lane to access Talavera Road. It is noted that the parking lane on Talavera Road is open to parking only between 10am and 3pm Monday to Friday. If the shown 12.5m vehicle is operating within these times, it is likely to clash with parked vehicles.  It is unclear if the above turning template can turn left into the outside lane and maintain lane discipline. It appears left turns that are avoiding parked vehicles are likely to cross the Talavera Road centre line and increase head-on collisions.	Probable, Minor = **High**		

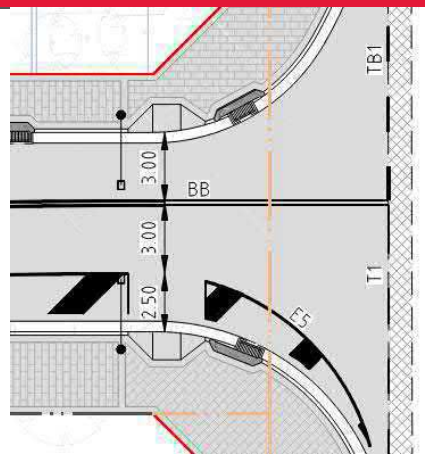
Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
2. Parked vehicles either side of Intersection obstructing Sight Distance and exit movements. Potential Side Swipe and/or T-Bone Collisions	The drawings do not provide clarity to the allowance of right turn movements onto Talavera Road. It is understood that right turns may not be permitted and therefore only the on-street parking located to the east of Road 22 will impact Safe Intersection Sight Distance (SISD) and lead to sideswipe or T-bone collisions. 	Probable, Minor = **High**		

Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
3. Line marking suggests protected crossing refuge. Potential for vehicle/pedestrian collisions	The proposed pavement markings would seem to indicate the existence of an on-grade pedestrian refuge/ pedestrian protection where the provided 12.5m HRV turning paths will use this area to access Road 22. It is also noted that the adjacent pathway is a shared path with high pedestrian/cyclist use. 	Probable, Serious = **Intolerable**		

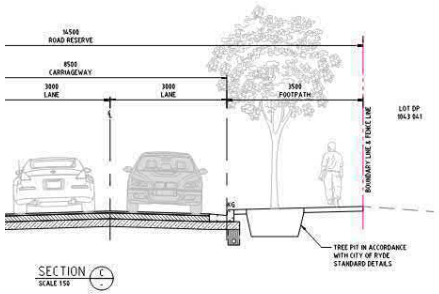
Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
				
4. Proposed pram ramps locations do not align with shared path requirements.	The proposed pram ramps do not appear wide enough to facilitate the existing cycle and pedestrian shared use. Also, the crossings appear located in a position that does not maintain the shared path's desire lines. This may lead to users avoiding the crossings and potentially tripping on the kerbs.	Probable, Minor = **High**		
5. Vehicle access into and from northern most driveway on Road 22. Potential Rear-end, T-bone and Head-on collisions	On review of the turning templates, it is assumed that the nominal use for the site will be to provide access and egress for a 12.5m HRV. The location of the site's northern most driveway appears to create issues with right turn movements into the site (potential queue lengths onto Talavera Road) and left turn movements onto Road 22 from site (12.5m HRV would appear to cross the centre line).	Occasional, Minor = **Medium**		

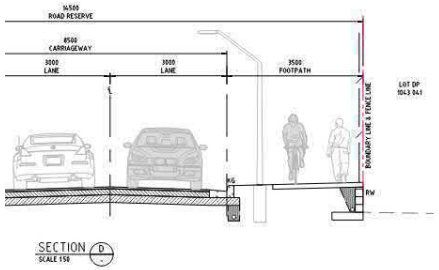
Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
				
6. Right Turn movements from site's middle driveway onto Road 22. Possible Rear-end, T-bone and Head-on Collisions	Reviewing the provided 12.5m HRV turning templates, it is understood that the proposed development will require access and egress by 12.5m HRVs. As such, the left turn movements by the HRV from the middle driveway appear as though they will cross the central Double Barrier line marking, increasing the risk for T-Bone and Head-on collisions. It is also noted that the 'No Entry' signage appear to be proposed in a location that is likely to reduce the sight line visibility of a truck exiting the site onto Road 22 further increasing the risk of collisions.	Probable, Minor = **High**		

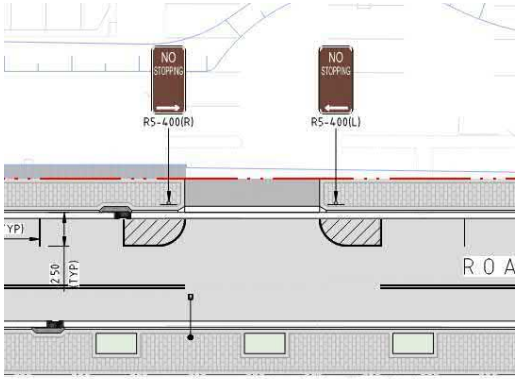
Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
				
7. **Kerb inlet pits are very close to pram ramps. Potential for trip and slip hazards of pedestrians.**	With close proximity of the pram ramps to proposed stormwater pits and unknown gutter flow widths, there is a chance that pedestrians may not use the pram ramp to access the footpath and therefore trip/ slip on the pit lintel causing injury. Gutter flow widths may not allow pedestrians and cyclists to use pram ramps without stepping into/ riding through deep flows.	Probable, Minor = **High**		

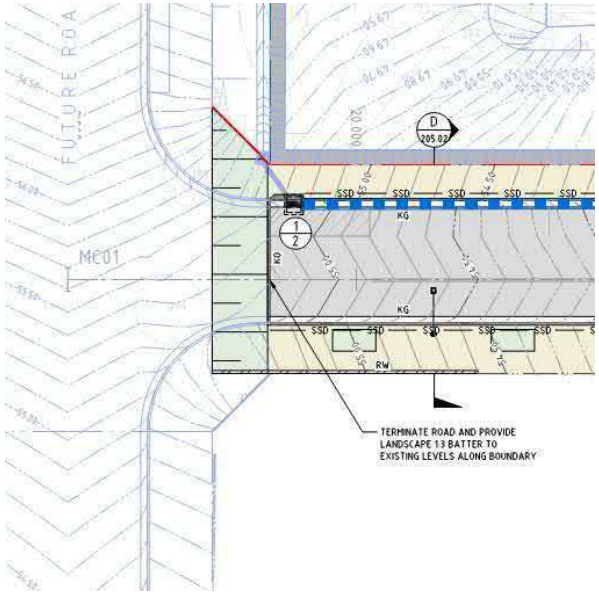
Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
				
8. Landscaping/tree beds appear to provide narrow footpath width. Potential cyclists/pedestrian collisions	The landscaping/ tree beds on the design plans and typical sections appear to provide a very narrow footpath width to the outside of the proposed tree. Provided sections indicate the intended use of the path is to be a shared path. This narrower footpath section is likely to either direct cyclists or pedestrians into the trees of force the cyclists and pedestrians into the same footpath sections and therefore into conflict.	Probable, Minor = **High**		

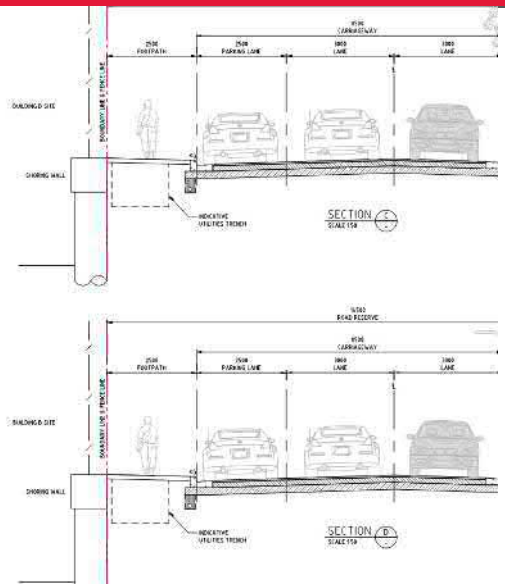
Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments

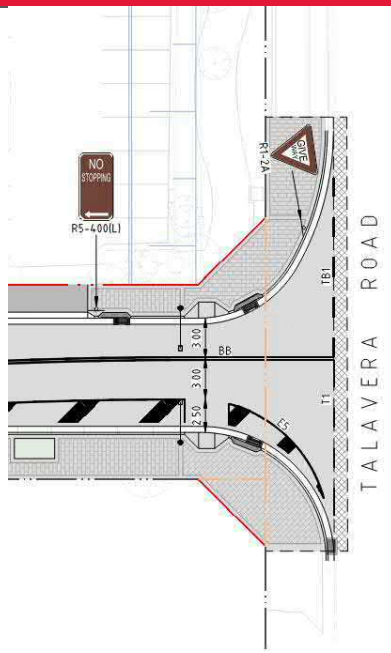




Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
9. Left turn movements from site onto Road 22 crossing road centreline. Head-on and side swipe collisions.	Signage indicates the southernmost driveway will allow entry and exit movements. Based on the turning paths provided (12.5m HRV) it is probable that the HRV will cross the centre line and increase the likelihood of head-on collisions 	Occasional, Minor = **Medium**		
10. Road 22 end treatment. No signage indicating 'No Through Road'. Potential confusion for drivers and 'U' turn restriction	It is understood that Road 22 will form part of the public road network and will be temporarily terminated at the southern end of the proposed development. It appears future works will be to construct a new intersection at the southern end of the development. Safety concerns are identified around the lack of end termination at the Talavera Road intersection where road users may misread the intersection treatment and find themselves on Road 22 with no available room to turn around. This can lead to	Occasional, Limited = **Low**		

Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
	large vehicle mounting kerbs or colliding with parked vehicles, or reversing for some distance to make use of an alternate turning opportunity. 			
11. Steep drop on west side of Road 22 (Typical Sections C and D).	There appears to be a steep drop from the footpath into the proposed development. This has the potential for pedestrians and errant vehicles to fall off the road formation. Further details must be provided around fencing and the need for crash/ safety barriers to prevent steep falls.	Occasional, Minor = **Medium**		

Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner Accept: Yes/ No	Reasons/ Comments
				
12. Proximity, location and intent of Giveway treatment at intersection.	The proposed location of Giveway signage appears to be in the centre of the shared path. If Road 22 is intended to be left in left out only with Giveway signage, the sign will be out of the typical sight line of drivers turning onto Talavera Road i.e. drivers will be wanting to look to their right for clear gaps and not focusing on the Giveway line or sign positioned a significant distance to their left. The sign will also be around the corner and not visible until a vehicle is effectively partly around the corner.	Occasional, Serious = **High**		

Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
	 Given the traffic volume on Talavera Road and Road 22 crossing a shared path, a Giveway sign does not appear to be the safest treatment to control and hold vehicles prior to entering traffic. This could increase potential Sideswipe or T-bone collisions.			
13. **Parked vehicles either side of the intersection obstructing through movements along Talavera Road when a vehicle is**	It is unclear from the drawings whether right turns are to be permitted either into or out of Road 22, which it is understood will be a public road. If allowed, during times when on street parking is permitted on Talavera Road, a right turning	Probable, Serious = **Intolerable**		

Audit Findings	Notes	Frequency, Severity = Risk Rating	Project Manager/ Asset Owner	
			Accept: Yes/ No	Reasons/ Comments
stopped waiting to turn right into Road 22. Potential for Rear End / Side Swipe collisions.	vehicle forced to stop and give way to oncoming traffic on Talavera Road will block the only available through lane. This has the potential to lead to rear end collisions, or sideswipe collisions. It right turns are not allowed, there is no signage nominated to reinforce the existing / proposed line marking.			

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S171708

26 February 2021

Maud Garnier
Stockland
Level 29, 133 Castlereagh Street,
Sydney NSW 2000

Dear Maud,

Re: M_Park Road 22 Talavera Road Macquarie Park
Response to Road Safety Audit Findings

Northrop Consulting Engineers as the design of Road 22 and the intersection with Talavera Road to support the SSDA application for the site offer the following responses to the audit findings.

Audit Finding Item Number	Design Engineer Response
1	Left hand turn template is to demonstrate a 12.5m HRV can make the turn when the parking restrictions are in force. The red zone shown on the diagram is actually the separation of the two west bound lanes and not the centreline. A 12.5m HRV can turn into the furthest westbound lane without crossing the centreline.
2	No Stopping zones on Talavera Road can be introduced to prevent parking and improve SISD. This can be incorporated at the detail design phase.
3	The pavement markings were introduced to show vehicles the best alignment when entering Road 22. The line markings can be deleted to reduce or negate the risk of vehicle / pedestrian collisions. This can be amended during the detail design phase.
4.	Pram crossings can be relocated closer to shared path desire lines. This can be amended during the detail design phase.
5.	The northernmost driveway has been provided for maintenance access only and will be used infrequently. When in operation the driveway will be used outside peak times and under traffic control.
6.	Passenger vehicles and HRV will cross the verge at approximately 30 degrees allowing the vehicle to access the kerb side lane without crossing the centreline. “No Entry” signage can be moved to within the property boundary to improve sight line visibility, The signage location can be updated during the detail design phase.

Audit Finding Item Number	Design Engineer Response
7.	The stormwater pit can be relocated away from the desire lines from the shared pathway and upstream of the relocated pram crossings avoid this risk. This can be updated during the detail design phase.
8.	Tree pits shown indicatively at the concept design phase. Tree pits can be minimised in size to maximise shared pathway width. This can be amended at the detail design phase. We note that the general arrangement is in accord with Ryde Council's public domain manual.
9.	The southernmost driveway has been provided for site ingress only. No vehicles will be leaving the site from this driveway.
10.	During the period where Road 22 terminates, provision for vehicles to turn around will be made just beyond the southern driveway. In this area signage and line marking will be provided to prevent parking within the turnaround area. "No Through Road" signage to be provided near the Talavera / Road 22 intersection. This can be updated during the detail design phase. During the period where Road 22 terminates infrequent traffic is expected on this road.
11.	Crash barriers to be provided at the top of the western side "drop". This has been documented as part of the retaining structure proposed for this portion of the site.
12	The give way sign can be replaced with a "Stop" sign. The stop sign can be located prior to the kerb return. This can be updated during the detail design phase.
13	The intersection be designed as a left hand turn in, left hand turn out only arrangement with a median introduced to Talavera Road to prevent right hand turn vehicle movements. This can be incorporated into the intersection during the detail design phase.

I trust you find the above satisfactory. Feel free to discuss any aspect with me.

Yours faithfully,

Stephen Fryer
Principal | Senior Civil Engineer
BE(Civil) MIEAust CPEng NER RPEQ

On behalf of Northrop Consulting Engineers Pty Ltd