1 Introduction

JMT Consulting has been commissioned by the University of New South Wales (UNSW) to prepare this document in response to the issues raised in by government agencies, community organisation groups and the public during the public exhibition of the proposed UNSW Health Translation Hub (HTH) State Significant Development (**SSD**) application (SSD-10822510).

This document has been prepared to respond to the transport related issues raised by Transport for NSW and Randwick City Council as reproduced on the following pages.

2 Response to Submissions

2.1 Response to Randwick City Council Submission

Randwick City Council Submission	JMT Consulting Response
The proposed utilisation of UNSW main campus parking areas for the parking of vehicles generated by the proposed UNSW HTH is noted. It is recommended that positive incentives be given to HTH staff/visitors to encourage them to utilise the UNSW campus parking areas. Details of proposed positive incentives are to be submitted to the satisfaction of DPIE and Council.	UNSW HTH staff in their induction will be informed that no on-site parking is provided within the UNSW HTH building and that adjacent street parking is generally time limited to two hour parking or less. Staff and visitors needing to drive to the site will be incentivised to park on the main UNSW campus as they will have the ability to park for long periods of time. Eligible UNSW staff, contractors and PhD students will be entitled to purchase an annual parking permit (under salary sacrifice provisions) which allows them full use of the car parking areas within the main UNSW campus, including the nearby Botany Street multi-storey car park. In addition to annual parking permits, UNSW also offers affordable all day parking rates for casual staff or those on flexible working arrangements who may only come to campus a few days a week. Casual and visitor parking will continue to be offered within the Botany Street car park. In line with current UNSW policies, staff and visitors will be encouraged to make use of public transport, walking and cycling as a means of access to the site. Given the intention to promote sustainable modes of travel and reduce reliance on private vehicles, no further specific incentives for staff or visitors driving to the site are proposed.
The creation of an intended parking bay for the 'Pick Up/Drop Off' (PUDO) task along Botany Street is not supported. Along a 55m length of 1 hour parking, the creation of a PUDO bay affords no benefit. Indeed, the creation of the proposed PUDO actually reduces parking efficiency due to the required angled transition from the existing kerb line to the recessed kerb line. Council recommends	The Botany Street design has been modified to incorporate Council's suggestion of a continuous kerbline and removing the indented parking bay. A 20m long pick up and drop off area to be used by people accessing the UNSW HTH building will be provided along the Botany Street kerb, with this area to be

Randwick City Council Submission	JMT Consulting Response
simply signposting the PUDO area while maintaining the existing shared path and providing the opportunity to continue some low level Botany Street landscaping elements. This signposted area will accommodate the PUDO task and have the adjacent shard path maintained at full width. In addition, a 'signposting only' solution provides flexibility to increase (or decrease) the length of the PUDO zone in the future, depending on demand over time.	signposted as '5 Minute Parking' to allow for the efficient drop off and pick up of passengers. The location of this 20m long '5 Minute Parking' zone in the context of the continuous kerbline treatment is indicated in the figure below. 
Notwithstanding the above comments, it is recommended that the pathways in the vicinity of the proposed PUDO bay be constructed (and made available for the passage of the public). This will future-proof the option of subsequently	All pathways in the vicinity of the pick up / drop off area will be constructed and made available for public use. This will allow for the introduction of an indented drop off / pick up bay at a later point in time if required, consistent with Council's recommendation.

Randwick City Council Submission	JMT Consulting Response
creating a PUDO bay if traffic conditions warrant removal of all parking along the eastern side of Botany Street.	
The significant End of Trip facilities are commended. However, the need for people walking bicycles to negotiate two swing doors upon entry and two swing doors upon departure, may prove problematic – especially at busier times.	The design of the entry and exitdoors will be further developed during the detailed design phase of the project and consider the practical needs of cyclists entering and exiting the building. This will be undertaken in conjunction with a specialist end of trip facilities consultant.
Consideration should also be given to the construction of a kerb ramp across the roadway of Botany Street, to the shared path, in the vicinity of the top of the ramped access to the End of Trip facilities.	A kerb ramp on Botany Street adjacent to the entrance to the end of trip facilities is not recommended to be provided, primarily on the basis of safety. Key reasons why this measure is not supported are as follows: - A shared pedestrian / cycling pathway is to be provided on the eastern side of Botany Street, adjacent to the entry to the end of trip facilities. Cyclists should be encouraged to use this pathway rather than the Botany Street roadway which does not have any dedicated cycling facilities; - A kerb ramp on Botany Street may provide people with the false impression that a pedestrian crossing point exists at this location. This would in turn create safety concerns with pedestrians attempting to cross Botany Street mid-block rather than utilise the formal crossing points at High Street or the future UNSW Gate 11 traffic lights; and - Cyclists riding at high speeds on Botany Street utilising the kerb ramp would then travel quickly across the shared path into the vicinity of the end of trip facilities – in doing so conflicting with pedestrians walking along the footpath in the perpendicular direction.

2.2 Response to Transport for NSW Sydney Submission

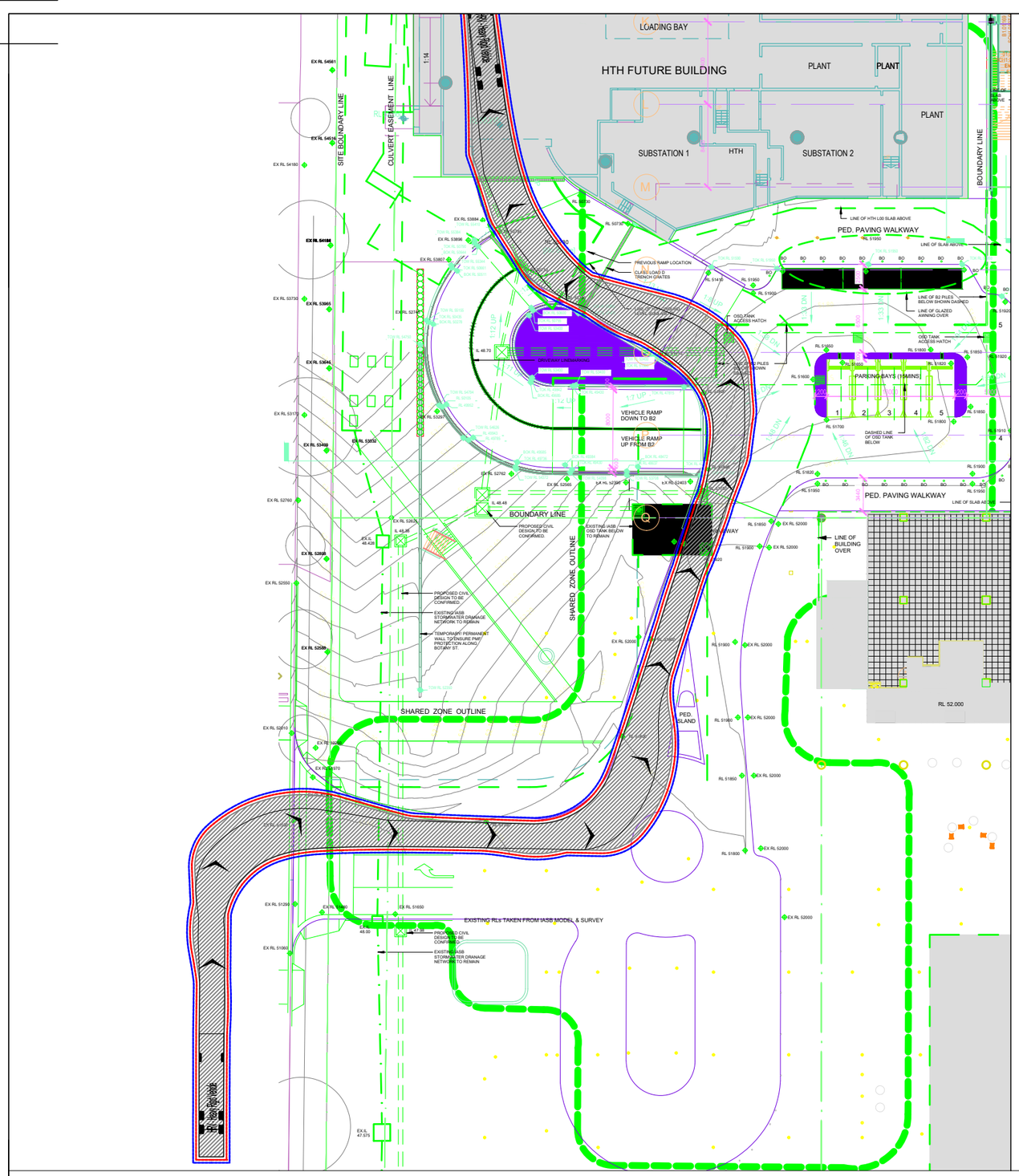
Transport for NSW Submission	JMT Consulting Response
Comment Section 5.6 of the Transport Impact Assessment prepared to support the development application states the following: "It is proposed that approximately 20m of this 1 hour parking zone is redesignated as 5 minute parking (or similar) to facilitate pick up and drop off movements." It is advised that kerbside restrictions are determined based on balancing needs of all users and are constantly subject to change and the proponent should not rely on the need for the suggested designated kerbside use. **Recommendation** It is requested that the applicant provides further detail on the point to point demand, how it would be managed, including the potential need for on-site provision to meet the demand as part of the Response to Submissions.	It is estimated that point to point demand may comprise of up to approximately 3% of total daily trips to the UNSW HTH building, of which half would occur within the dedicated drop off / pick up zone on Botany Street. This is equivalent to approximately 75 vehicle trips per day using the Botany Street drop off / pick up area, of which potentially 12-15 vehicle trips during the busiest hour of the day may be experienced. Assuming an average dwell time of three minutes per vehicle the drop off / pick up would have the capacity to handle 60 vehicles per hour – significantly exceeding the expected demands. The area would be managed through the introduction of appropriate signposting / kerbside restrictions to limit vehicle length of stay.'5 Minute Parking' is recommended to allow for the efficient drop off and pick up of passengers. The restrictions to be adopted will be confirmed following discussions with Randwick City Council closer to the opening of the site. On-site provision for drop off and pick up was considered however was not deemed suitable for the following reasons: - The number of vehicle movements already expected to enter the forecourt area associated with the proposed Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre building - The high number of different users already utilising the internal road system, including IASB drop off / pick up, SCH Stage 1 / CCCC emergency department drop off, SCH Stage 1 / CCCC general car parking, UNSW HTH building logistics access. - Objective of separating UNSW HTH logistics traffic with general drop off / pick up - Increased amount of space dedicated to pedestrians and landscape by minimising the amount of internal space required for traffic movements.

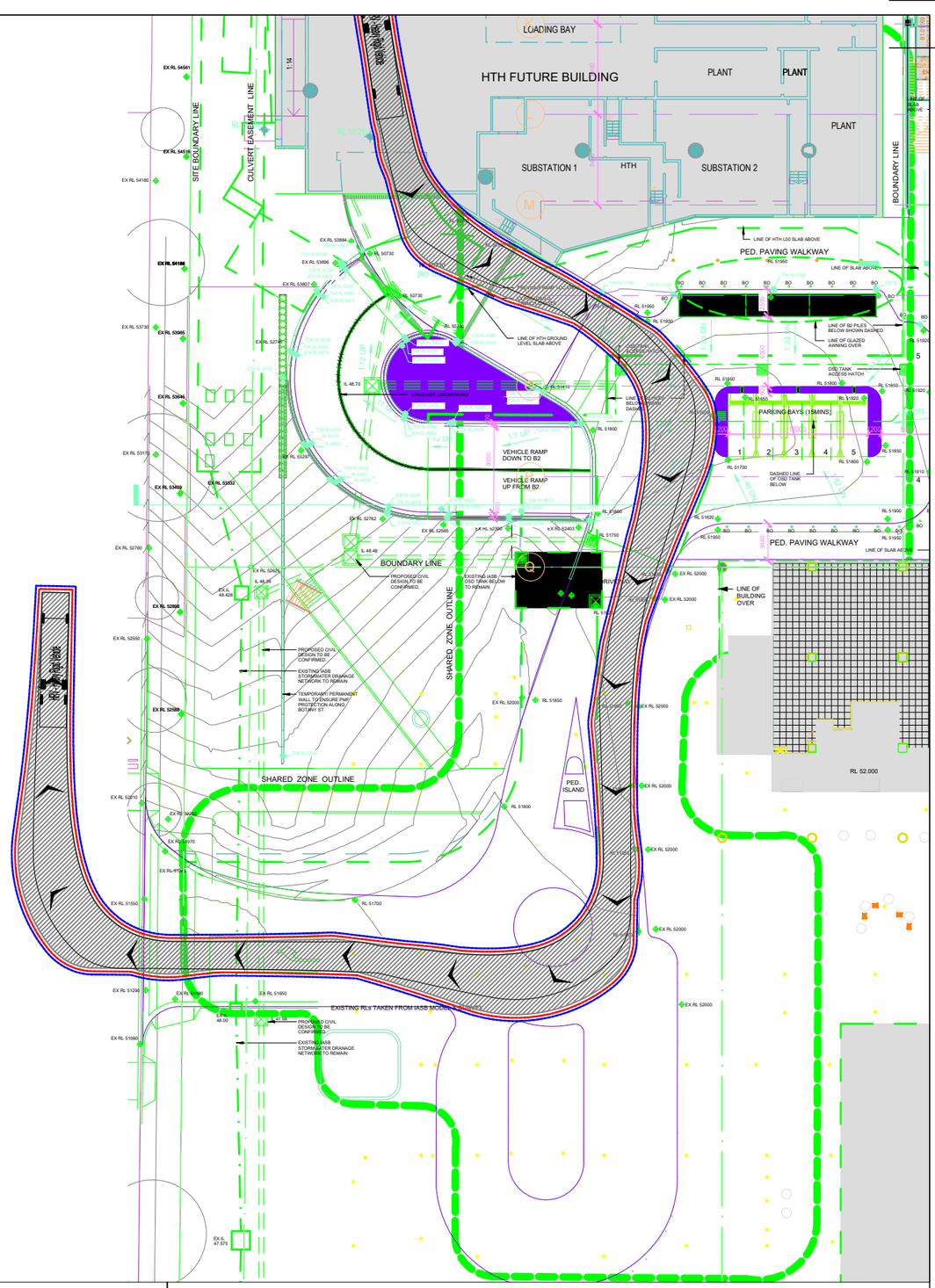
Transport for NSW Submission	JMT Consulting Response
Comment Section 6.6 of the Transport Impact Assessment states the following: "Travel demand management measures, e.g. Travel Plans and carpooling, are currently well established at UNSW. The UNSW Environmental Sustainability Plan 2019-21 (ESP) outlines a roadmap towards best practice in environmental sustainability in the higher education sector." It is noted that the Transport Impact Assessment includes a number of recommendations for the development of a Green Travel Plan. It is advised that: □ It should be a priority for the proponent to secure funding, human resourcing and an agreed timeframe for completion of key actions identified in the GTP to support sustainable transport outcomes; and □ TfNSW would welcome further discussions with the proponent regarding these matters to ensure their delivery. **Recommendation** It is requested that the applicant be conditioned to prepare a Green Travel Plan in consultation with TfNSW and submit a copy of the final plan for TfNSW endorsement, prior to the issue of the Occupation Certificate.	UNSW has well-established travel demand management measures in place, through its Environmental Sustainability Plan. The Plan aims to increase the percentage of staff and students commuting by active travel modes through various strategies and programs. UNSW has, through the implementation of these measures, been successful in reducing private vehicle usage to the campus over a number of years. Recent travel surveys have indicated private vehicle usage has decreased from 32% in 2007 to 15% in 2019 – an average reduction of approximately 1.5% per annum. UNSW is already an active participant within the Randwick Collaboration Area and shares information regarding travel behaviours, including recently undertaken travel surveys, with key stakeholders including Transport for NSW. Travel to UNSW and the future UNSW HTH building cannot be viewed in the prism of individual buildings, instead a holistic approach needs to be taken which considers the broader requirements of campus users. In this context it is not considered appropriate to link a whole of campus Green Travel Plan condition to an individual building. Likewise, it is also inappropriate to require a Green Travel Plan for one building in isolation. It is also noteworthy that the proposed UNSW HTH building contains no on-site car parking spaces. The building will also provide significant End of Trip Facilities. The implementation of these strategies will contribute to reducing parking demand, particularly for staff, and encourage other forms of sustainable transport to the site. It is also noted that the recently approved D14 project (SSD-9606) and B22 projects (SSD-9673), both to be run and operated by UNSW similar to the UNSW HTH building, did not have such a requirement imposed. Therefore, it is not considered appropriate to impose a Green Travel Plan condition on this consent.

Transport for NSW Submission	JMT Consulting Response
Comment The proposed access arrangement allows light and heavy vehicle movements via Botany Street with multiple conflicts at the access to the loading dock to the subject site, the loop road and the car park access for the Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre. The following conflicts in vehicle / pedestrian movements would have potential to cause safety issues: • Vehicles accessing the loading dock of the subject site and the car park for the Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre; • Vehicles accessing the loading dock for the subject site and the proposed loop road; and • Vehicles accessing the subject site as well as other properties adjacent to the site and pedestrian accessing these sites. Appendix A of the Transport Impact Assessment includes swept paths of the service vehicles within the loading dock. However, a swept path analysis has not been undertaken for the maximum size of the service vehicles (Heavy Rigid Vehicle) entering and leaving the loading dock via Botany Street. **Recommendation** It is requested that the applicant undertakes the following as part of the Response to Submissions: • Consider providing a consolidated loading dock for the subject site as well as the Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre with access via Hospital Road. This is to remove the heavy vehicle access via Botany Street;	UNSW and Health Infrastructure (HI) have worked collaboratively for a number of years to consider the most appropriate integrated design solution for the UNSW HTH Building and the proposed Sydney Children's Hospital Stage 1 and Children's Comprehensive Cancer Centre building. As part of this collaborative design process a single loading dock access point via Hospital Road was considered however not deemed to be feasible due to issues around project staging and building design. In lieu of a single loading dock entry, UNSW and HI have developed a safe, legible and efficient internal road network which allows for logistics vehicles to access the UNSW HTH loading dock. The UNSW HTH loading dock will generate a relatively small number of vehicles per day and not significantly impact the safety of other users in the internal road network. The majority of vehicles accessing the site will be small vans and utes, with a maximum of 10% of vehicles expected to be large rigid vehicles such as Medium Rigid Vehicles (MRVs). Deliveries via Heavy Rigid Vehicles (HRVs) are expected to be rare, approximately once per month. Consistent with TfNSW's recommendation vehicle swept path analysis has been undertaken for an HRV entering and leaving the loading dock to / from Botany Street. The swept paths demonstrate that the internal road network and site access intersection have been designed appropriately to accommodate this vehicle type. The swept paths are provided in Appendix A of this document. Additionally, also consistent with TfNSW's recommendation, a Stage 2 (Concept Plan) Road Safety Audit has been undertaken by an independent consultant (DC Traffic Engineering) for the proposed vehicle and pedestrian access and is provided as Appendix B of this document. The audit has identified only five items in total, none of which relates to the internal vehicle and pedestrian access arrangements which was noted as a potential issue by TfNSW in their submission. Importantly the five items identified have been classified as either a 'medium' or 'low' priority. No 'high' priority items were identified in the audit, demonstrating there are no road safety issues of significance in the current design.

Transport for NSW Submission	JMT Consulting Response
□ A Stage 2 (Concept Plan) Road Safety Audit for the proposed vehicles and pedestrian access arrangement to the subject site in accordance with Austroads Guide to Road Safety Part 6: Managing Road Safety Audits and Austroads Guide to Road Safety Part 6A: Implementing Road Safety Audits by an independent TfNSW accredited road safety auditor; and □ A swept path analysis for Heavy Rigid Vehicles entering and leaving the loading dock to / from Botany Street. Based on the results of the road safety audit and the swept path analysis, the design drawings need to be reviewed to identify safety measures that may need to be implemented.	One of the items identified in the audit is the indented parking bay and it's impact on cyclists movements on Botany Street. This issue will be resolved through the removal of the indented parking bay and creation of a continuous kerbline treatment – consistent with the recommendation of Randwick City Council. As noted in the audit, the remaining items identified will be considered as part of the detailed design process for the project.
Comment Several construction projects are likely to occur within the Randwick Precinct at the same time as this development. The cumulative increase in construction vehicle movements from these projects could have the potential to impact on general traffic and public transport operations within the Randwick Precinct, as well as the safety of pedestrians and cyclists particularly during commuter peak periods. Details on how the pedestrian bridge over Botany Road will be constructed to minimise impacts on all road users should be provided. **Recommendation** TfNSW provides a list of proposed draft conditions of consent, which can be considered further once draft conditions are issued.	No objections are raised to the recommended condition of consent

Appendix A: Vehicle Swept Paths





Client
University of New South Wales

Job Title
Health Translation Hub

Drawing Title
Turning Paths - HRV

Date
12.07.21

Job No
2009

Drawing No
SKT06

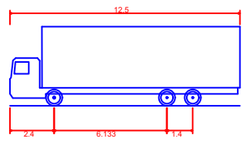
Drawing Status
For Information

Scale at A3
1:500

Legend

- Body Envelope
- 300mm Envelope
- 600mm Envelope
- Wheel Envelope

Vehicle type(s)



HRV - Heavy Rigid Vehicle

Overall Length	12.500m
Overall Width	2.500m
Overall Body Height	4.300m
Min Body Ground Clearance	0.417m
Track Width	2.500m
Lock to Lock Time	6.00 sec
Curb to Curb Turning Radius	12.500m

JMT Consulting
JMT Consulting
+61 415 563 177
josh.milston@jmtconsulting.com.au
www.jmtconsulting.com.au

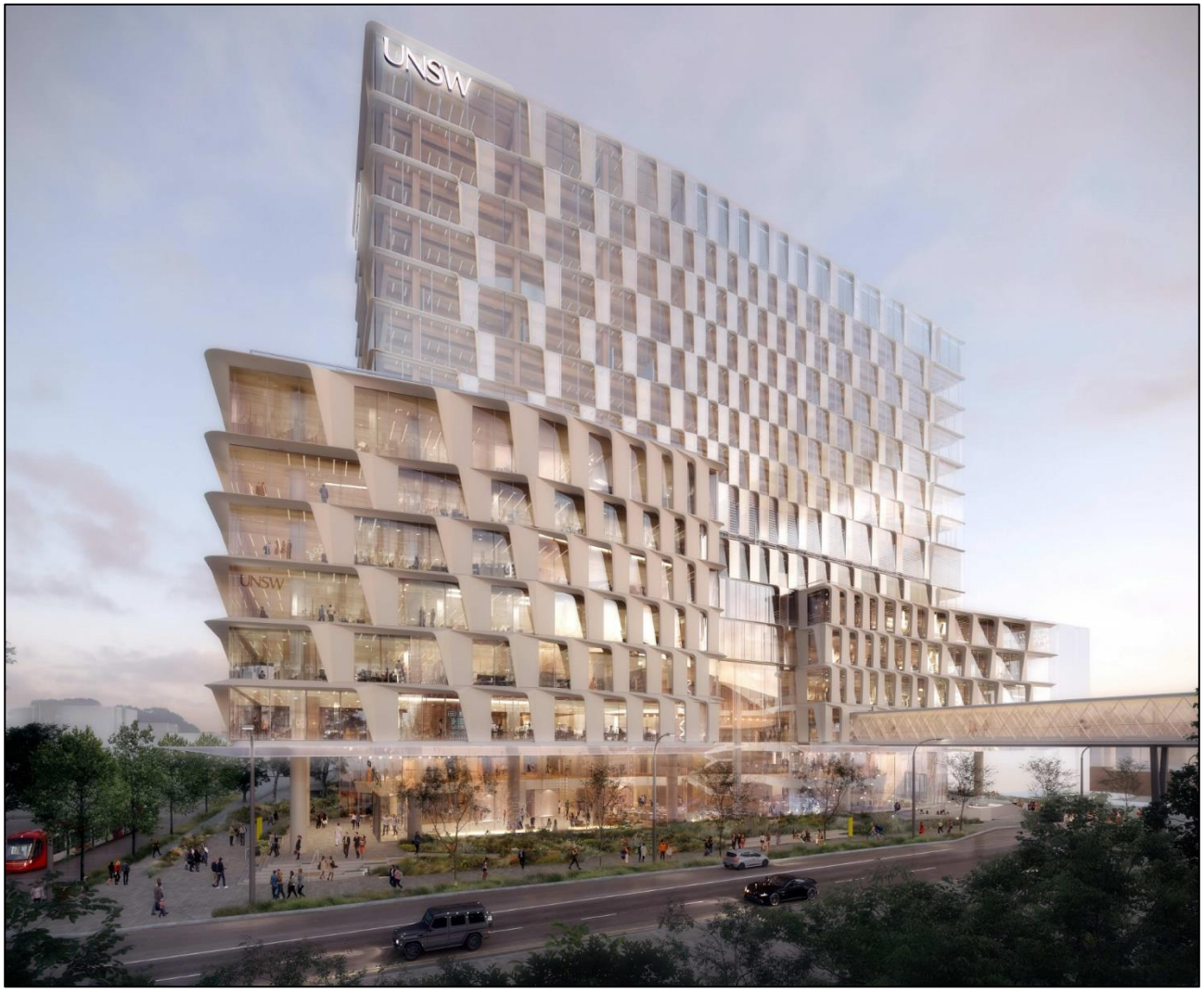
Appendix B: Road Safety Audit

TRAFFIC ENGINEERING

UNSW

UNSW Health Translation Hub

Concept design road safety audit



DC Traffic Engineering Pty Ltd
ABN 50 148 960 632
www.dctrafficengineering.com.au

UNSW

UNSW Health Translation Hub

Concept design road safety audit

Authors Damien Chee

Report No JMT-PROJ-0002-01 CD RSA UNSW HTH REV 2

Date 6/9/2021

This report has been prepared for UNSW.

CONTENTS

Appendices

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	Proposed vehicle and pedestrian access arrangements associated with the University of New South Wales (UNSW) Health Translation Hub.
Client/ contact	Shane McLoughlin Senior Manager Development Estate Manager UNSW CC: Josh Milston Director JMT Consulting Ph: 0415 563 177 E: josh.milston@jmtconsulting.com.au
Audit type	*Concept design* road safety audit.
Purpose	A *concept design* road safety audit was required to identify potential safety issues associated with the proposed vehicle and pedestrian access arrangements to the UNSW Health Translation Hub. This was also required in response to a Transport for NSW (TfNSW) request.
Background	The NSW Government is partnering with UNSW Sydney to strengthen the Randwick Health & Innovation Precinct through the integration of additional health education, training, and research with acute healthcare services - directly benefiting patients, carers, and the wider NSW community. Building on over 60 years of teaching hospital affiliations, this partnership will help grow the relationship between UNSW Sydney and the Randwick Hospitals Campus, its research institutes and broader health partners. The UNSW Health Translation Hub will enable a seamless physical and working integration between the hospitals and the University, positioning the wider precinct at the forefront of international health research and education. Located on the corner of High Street and Botany Street, Randwick and providing opportunities for collaboration, the UNSW Health Translation Hub will enable the rapid translation of research, innovation, and education into improved patient care, enabling greater outcomes and impacts for Randwick Health & Innovation Precinct to positively impact on the wellbeing of the broader community. The UNSW Health Translation Hub will include: ▪ Purpose-built spaces for researchers, educators, students and industry partners to work alongside clinicians ▪ Education, training and research rooms ▪ Clinical schools ▪ Ambulatory care clinics ▪ Support facilities including retail premises ▪ Over 2,500 m^2 of publicly accessible open space for staff, students, patients and the community.

Scope of project/ audit

As a *concept design* road safety audit, it was the proposed development concept that was the subject of this review. This concept was interpreted from various documents listed below.

Architectural plans from project 190551.00

SHEET NUMBER	SHEET NAME	CURRENT REVISION	CURRENT REVISION DATE
DA0000	Cover Sheet	A	18.02.21
DA0010	Context & Locality Plan	A	18.02.21
DA0015	Site Analysis	A	18.02.21
DA0020	Site Plan	A	18.02.21
DA0030	Site Boundary & Building Setbacks	A	18.02.21
DA0050	Site Survey	A	18.02.21
DA1000	Basement Level -01	A	18.02.21
DA1001	Ground 00	A	18.02.21
DA1002	Level 01	A	18.02.21
DA1003	Level 02	A	18.02.21
DA1004	Level 03	A	18.02.21
DA1005	Level 04	A	18.02.21
DA1006	Level 05	A	18.02.21
DA1007	Level 06	A	18.02.21
DA1008	Level 07	A	18.02.21
DA1009	Level 08	A	18.02.21
DA1010	Level 09	A	18.02.21
DA1011	Level 10	A	18.02.21
DA1012	Level 11	A	18.02.21
DA1013	Level 12	A	18.02.21
DA1014	Level 13	A	18.02.21
DA1015	Level 14 - Plant	A	18.02.21
DA1016	Level 15 - Roof	A	18.02.21
DA2001	North Elevation	A	18.02.21
DA2002	South Elevation	A	18.02.21
DA2003	East Elevation	A	18.02.21
DA2004	West Elevation	A	18.02.21
DA2101	Section A	A	18.02.21
DA2102	Section B	A	18.02.21
DA2103	Section C	A	18.02.21
DA5700	UNSW Campus Connection - Floor Plan	A	18.02.21
DA5701	UNSW Campus Connection - Roof + Soffit Plan	A	18.02.21
DA5750	UNSW Campus Connection - Elevation	A	18.02.21
DA5751	UNSW Campus Connection - Elevation Wallace Wurth	A	18.02.21
DA5755	UNSW Campus Connection - Section	A	18.02.21
DA5760	SCH - Bridge Connection - Floor Plan	A	18.02.21
DA5765	SCH - Bridge Connection - Elevation	A	18.02.21
DA5766	SCH - Bridge Connection - Section	A	18.02.21
DA9100	Independent Basement Plan	A	18.02.21
DA9101	Independent Ground Floor Plan	A	18.02.21
DA9200	Shadow Analysis	A	18.02.21
DA9300	External Materials Schedule	A	18.02.21
DA9310	External Renders	A	18.02.21
DA9311	External Renders	A	18.02.21
DA9312	External Renders	A	18.02.21
DA9313	External Renders	A	18.02.21
DA9314	External Renders	A	18.02.21
DA9315	Signage	A	18.02.21
DA9502	Area Schedule GFA 01	A	18.02.21
DA9503	Area Schedule GFA 02	A	18.02.21

Architectural report

Design report for State Significant Development Application SSD-10822510, Rev B dated 7/4/2021.

Transport report

UNSW Health Translation Hub – Transport Impact Assessment, dated 12/4/2021.

Turning path assessments/ models

- SKT06 dated 12/7/2021.
- SKT102 rev C dated 27/4/2021.

It should be emphasised that this road safety audit focussed primarily on the proposed vehicle and pedestrian access arrangement associated with the UNSW HTH.

Audit team details

Damien Chee, DC Traffic Engineering (level 3 and lead auditor – RSA-02-0094).

Linda Chee, DC Traffic Engineering (level 2 road safety auditor - RSA-02-1069).

Audit methodology	The audit was undertaken using the following methodology: ▪ Formal review of the issued documents to understand the design concept carried out on 15/7/2021. ▪ A familiarisation site inspection was carried out on 16/7/2021. ▪ 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 audit findings are documented in Section 3. ▪ This report includes completed *checklist 2 –concept design stage audit* as sourced from the Austroads *Guide to Road Safety Part 6A: Implementing Road Safety Audits*.
Material supplied	See *scope of project/ audit*.
Meeting and assessment details	Review of plans/ documents carried out on 15/7/2021. Site inspection carried out on 16/7/2021.

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.

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.

1.3 Previous audits

There were no previous road safety audit reports of direct relevance to the proposed upgrades that were issued to the audit team.

1.4 Assumptions and preclusions

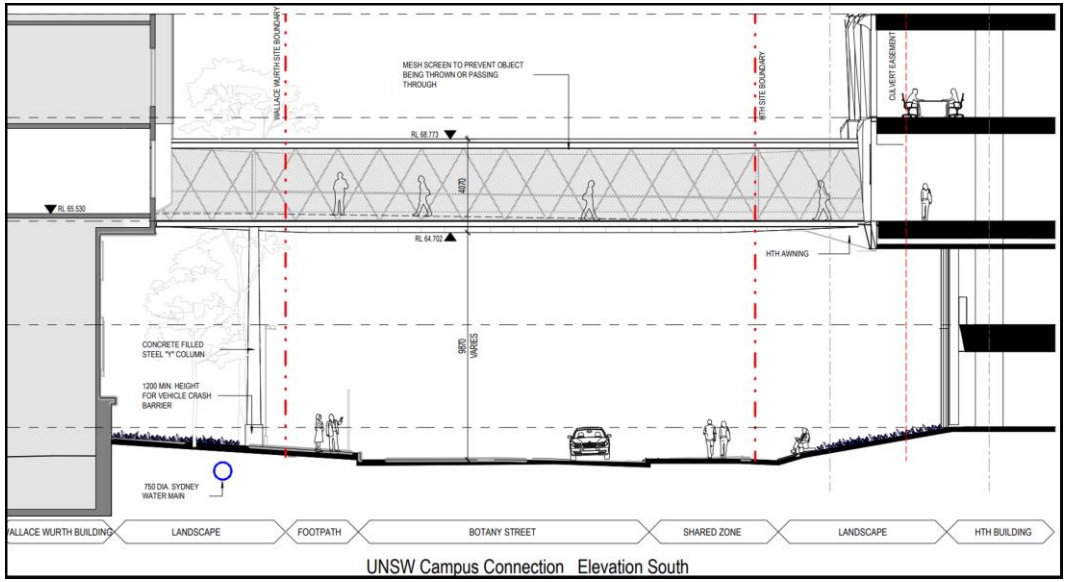
Although not shown on the architectural drawings, the Botany Street intersection with UNSW Gate 11 and the HTH vehicle access will be a four-way, traffic-signal-controlled intersection. This was confirmed by the project team and also expressly described in the Transport Report. The finer details of this signalised intersection (including both geometric design, as well as signal hardware and phasing design) were not available in the documents provided. However, relying on knowledge and experience with signalised intersections, the audit team were able to provide some high-level road safety issues. These issues should be considered in the refinement of the design and its progression to detailed design. The documentation of these issues in this report, does not forego the need to have the more detailed design formally reviewed and checked, when those plans are available.

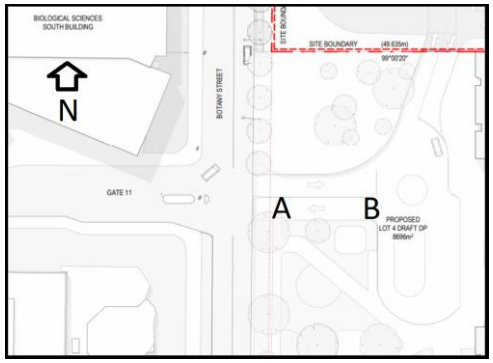
There were several discrepancies in the design documents regarding the intended status of the roadside area on the eastern side of Botany Street. Some design sheets referred to this area as a footpath, implying exclusive use by pedestrians except for cyclists under the special provisions of NSW Road Rule 250. Other design sheets referred to this as a shared path which allows combined use by pedestrians and cyclists. The audit team has considered that this will be a shared path. This is also consistent with the advice from the Transport Report.

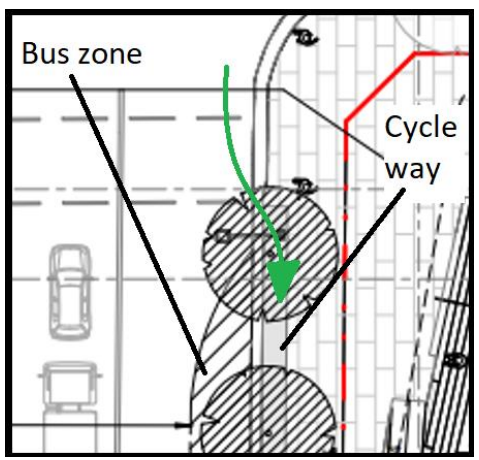
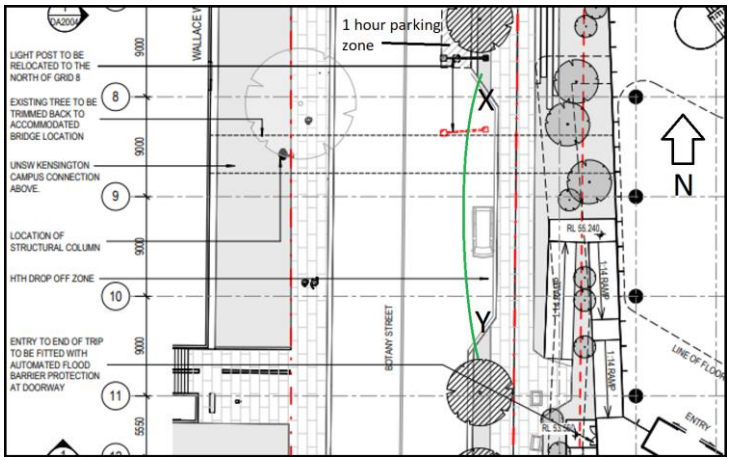
2 Safety audit findings

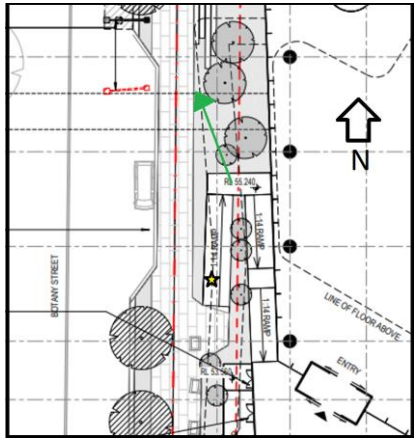
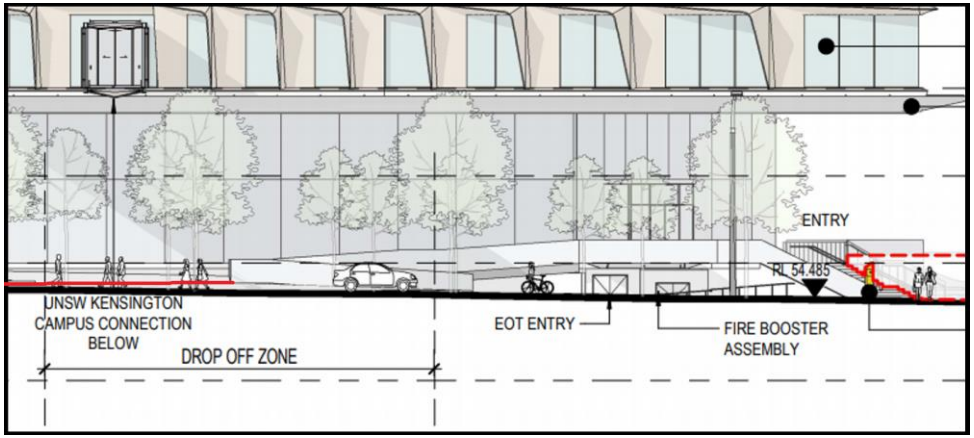
The road safety audit findings are presented in Table 2.

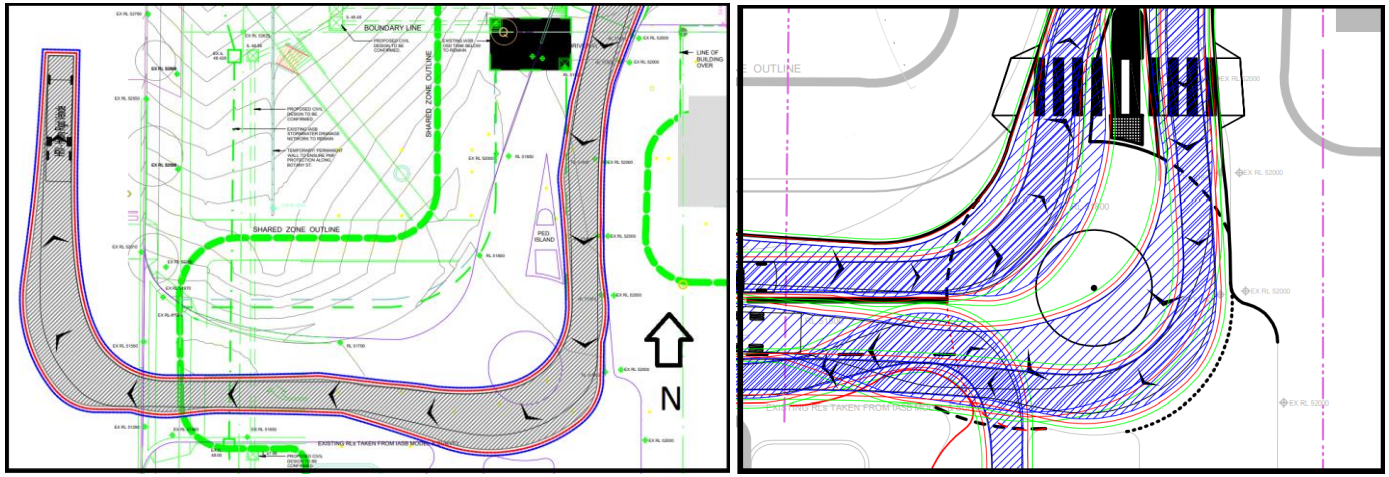
Table 2 Road safety audit findings.

Ref	Location	Road safety audit finding	Priority
1	UNSW Campus Connection bridge.	The design includes a pedestrian bridge over Botany Street to link the HTH to the Wallace Wurth Building. This appears to be exclusively for patrons of the HTH and the Wallace Wurth Building, to enable these pedestrians to cross between these buildings without using the roadway. The audit team questions why this bridge cannot be made more accessible to other members of the public. This also includes other patrons of both sites that may not come from the required floors of the building, eg. pedestrians in the UNSW Plaza area, from the bus zone or from the ground level facilities in the HTH. A more publicly accessible bridge would offer a grade separated road crossing facility that eliminates the *vehicle-pedestrian* crash conflict. The alternative for ground-level pedestrians is to walk 60m north to the signalised crossing at the High Street intersection, or 100m south to the signalised intersection at the vehicle access to HTH. As both of these signalised crossing points are considerable distances in each direction, the audit team envisages a high degree of non-compliance, with pedestrians likely to jaywalk between the two sides of Botany Street in uncontrolled midblock locations.  UNSW Campus Connection Elevation South ***Above:*** *The design includes a bridge connection between the HTH and the Wallace Wurth Building. However, this does not appear to allow for public access. Rather, it appears to be exclusively for patrons of the HTH and Wallace Wurth Building. This is a missed opportunity to improve safety and amenity for all pedestrians.*	Medium

Ref	Location	Road safety audit finding	Priority
2	Botany Street intersection with Gate 11 and the HTH access.	The Transport Report indicates that the Botany Street intersection with Gate 11 of UNSW and the HTH will be traffic-signal-controlled. Although the civil and traffic signal designs for this intersection were not provided to the audit team, there are several high-level road safety issues that are evident. These include: Opposing right-turn movements from Botany Street: There does not appear to be sufficient width in Botany Street to allow concurrent and opposing right-turn movements, ie. northbound right-turns into HTH and southbound right-turns into Gate 11. If spatial clearance is not achievable, this could result in *head-on* crashes between opposing right-turning vehicles. Alternatively, the northbound and southbound right-turns would need to be managed by split phases* which is counter-productive and delay-inducing. Short stacking in the HTH leg: The length between point A and B in the left-hand image is approximately 35m. Although the traffic volume demands into and out of the HTH leg would not be significant (negligible on-site parking is proposed), there could still be situations where the queue at the traffic signals spills back towards point B and blocks the roundabout. For example, if several trucks egress at the same time. This risk is exacerbated as the channel A-B only includes one outbound lane with more risks of queuing, especially if egressing vehicles wish to turn right or proceed straight through the intersection to UNSW. *Right-turn on pedestrian* crash conflicts: If filtered right-turns are allowed from the northbound direction of Botany Street to the HTH, this could present risks of *right-turn on pedestrian* crashes. This is irrespective of whether red signal/ arrow holds are used to safeguard pedestrians and cyclists crossing at point A (the Transport Report indicates that there would be a shared path on this side of the road). The risk is exacerbated since the northbound driver would tend to look to the north to judge gaps in the southbound traffic stream. By doing so, the same driver may fail to notice pedestrians/ cyclists crossing the driveway leg. Left-turns into and out of the HTH leg: With limited width in the Botany Street legs to the intersection, there may be difficulty performing left-turns into and out of the HTH, especially by long vehicles. The swept path modelling provided to the audit team suggests that 12.5m rigid trucks would be required to commence the left-turn from the inside lane (lane 2). However, even smaller vehicles may not be able to perform this left-turn. As a comparative example, the right-hand photo shows a left-turning van from Gate 11 of the UNSW under existing conditions. Note how the vehicle crossed the centreline to perform this turn. Overall, these issues (along with many others) would need to be checked at the detailed design stage when civil and traffic signal designs are prepared. * Split phase operations involve an *all northbound* phase (including right-turns) followed by an *all southbound* phase (including right-turns) since the opposing right-turns cannot run concurrently. This typically increases intersection delays and queuing.   ***Left:*** *The layout of the Botany Street/ Gate 11/ HTH access as presented in the architectural plans.* ***Right:*** *Looking northbound along Botany Street under existing conditions. Note how the left-turning van from Gate 11 needed to cross the centreline to complete this turn.*	Medium

Ref	Location	Road safety audit finding	Priority
3	Eastern side of Botany Street – Legibility of cycleway.	The design indicates that there will be a cycleway provided on the eastern side of Botany Street. The audit team notes the following issues: ▪ The entire cycleway is lined with trees. If these trees are indeed planted at these locations, they would pose as obstructions to bicycle movements. This could result in *bicycle-tree* impacts. Alternatively, even if placed immediately adjacent to the cycleway, the trees may pose as sight line obstructions to pedestrians. That is, pedestrians that are visually obscured by the trees could emerge suddenly into the path of an unwary cyclist. ▪ Similar to the trees, there are also a number of streetlighting poles along this cycleway. These would also pose as obstructions. ▪ There is no obvious method for cyclists to enter the cycleway from the northern end near High Street. This may result in cyclists entering from the kerb ramp which is meant for pedestrians (see green arrow in left-hand image). There would be risks of impacting pedestrians waiting to cross the road as well as potential impacts with traffic signal posts. ▪ The black and white hatched area in the left-hand image is a bus zone, which will presumably include a bus stop. Any bicycle movements along the marked cycleway could result in impacts with pedestrians either waiting for a bus, or boarding/ alighting a bus. ▪ At the HTH drop off bay, the cycleway terminates at point X (right-hand image) and then recommences at point Y on the other side of the bay. It is unclear how the cyclist is to move from point X to Y. some cyclists may believe that they are meant to enter the roadway. This would present risks of impacts with/ by road vehicles including those in the drop off bay. Also, there are no kerb ramps shown to allow safe movements over these two kerb lines. If cyclists veer around the drop off bay, they could endanger pedestrians on this portion of the path. Although this is intended to be a shared path, cyclists typically ride faster on dedicated cycleways compared with shared paths. It should also be noted that this portion of the path is downhill in the southbound direction (ie. in the direction of the cyclist). ▪ Further to the previous point, any veering movement around the drop off zone could result in bicycle impacts with pedestrians or opened doors of vehicles in the drop off bay. ▪ Towards the southern end, the cyclists may also be at risk of running into opened doors of vehicles parked in the 1-hour parking spaces.   ***Left:*** *It is unclear how southbound cyclists are to access the cycleway. If they use the kerb ramp at the pedestrian crossing (green arrow) this could endanger pedestrians waiting to cross the road.* ***Right:*** *It is unclear how cyclists are to move from the terminated cycleway at X to the recommencement of the cycleway at Y.*	Medium

Ref	Location	Road safety audit finding	Priority
4	Accessibility ramp from eastern side of Botany Road to the south-eastern corner of the HTH building.	The design proposes a ramped connection from the street level to the south-eastern corner of the HTH building. This includes one return/ landing. The audit team notes the following issues: The ramp is likely to be used by mobility-impaired pedestrians, particularly those dropped off at the indented drop off parking bay adjacent to the ramp. However, from the drop off bay, the pedestrian would need to travel downhill first, only to travel up the 1V:14H ramp grade. If the lower branch of the ramp was realigned to the north (as per the green arrow), a more level ramp could be achieved with the same length since the ramp would commence from higher ground. Also, there is less redundancy since the pedestrian does not need to go downhill before going up-ramp. The right-hand image attempts to illustrate this with the red line. This line is the same length as the lower branch of the ramp, only it faces north instead of south. Note how the ramp achieves a much more level grade. In fact, if the entire ramp was made to face north, it may even be possible to achieve a ramp without any upwards incline at all (or at least a substantially reduced upwards gradient). If the lower branch of the ramp is realigned to face north, the drop off bay should be relocated to the north accordingly. This would enable mobility-impaired pedestrians from all parts of the drop off zone to access the ramp in a downhill run.   ***Left:*** *The design proposes a lower branch of the accessible ramp which returns 180° to the south (see yellow star). This ramp chases the grade and also invokes a redundant downhill movement to the base of the ramp only for the pedestrian to travel up-grade on the ramp. The ramp could be realigned to face north.* ***Right:*** *If the ramp was realigned to face north, it would be almost level and much easier to negotiate, particularly by mobility-impaired pedestrians.*	Low

Ref	Location	Road safety audit finding	Priority
5	Roundabout for access to Botany Street, the HTH basement, Sydney Children's Hospital (SCH1/CCCC) and Integrated Acute Services Building (IASB) project.	The images below are extracts from the swept path model for a 12.5m rigid heavy vehicle egressing from the site. As shown, the truck is required to track over the central island of the roundabout that provides access to HTH, SCH1/CCCC and IASB. Seeing that most vehicle movements to the HTH basement will be loading vehicles (either utes, vans or trucks), the audit team questions whether a roundabout is really the most optimal solution. With all outbound trucks, and presumably most inbound trucks needing to mount over the central island, this would be a major inconvenience, even if the central island is fully mountable. The frequent movements over the island would also incur more pavement damage and the tyre marks would be unsightly and require routine cleaning. An intersection control allowing the trucks to remain on level ground throughout these turns may be a more viable solution. Additional speed reduction mitigations could be considered to compensate if the revised intersection fails to achieve the same speed reduction as a roundabout. The audit team adds that it is acceptable for trucks and other long vehicles to mount and track over the central island of a roundabout, if these are relatively rare and special cases. In most applications were this happens (eg. a mountable roundabout on a bus route), most vehicles are able to track completely around the central island without encroaching into it. It is only the occasional long vehicle (eg. bus) that needs to track over part or all of the roundabout island. However, in this scenario, since the vast majority of loading vehicles will need to track over the central island, it is not considered appropriate as the default access-egress method.  ***Above:*** *The swept path models indicate that long vehicles (such as 12.5m trucks) would need to track over the central island of the roundabout. Since this represents a large proportion of the vehicles accessing the HTH basement, the audit team questions whether this is the most optimal design solution.*	Low

3 Concluding statement

DC Traffic Engineering has undertaken a *concept 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
Audit Team Leader
DC Traffic Engineering Pty Ltd

Appendix A

Road Safety Audit Checklist

Issue	Comment
2.1 General topics	
1 Changes since previous audit ▪ Do the conditions for which the scheme was originally designed still apply? (eg. no changes to the surrounding network, area activities or traffic mix) ▪ Has the general form of the project design remained unchanged since previous audit (if any)?	There were no previous road safety audit reports of direct relevance to this project that were issued to the audit team.
2 Drainage ▪ Will the scheme drain adequately? ▪ Has the possibility of surface flooding been adequately addressed, including overflow from surrounding or intersecting drains and water courses?	Presumably, a full schedule of drainage pits would be included as part of the detailed design of the works.
3 Climatic conditions ▪ Has consideration been given to weather records or local experience which may indicate a particular problem? (eg. snow, ice, wind, fog).	Yes.
4 Landscaping ▪ If any landscaping proposals are available, are they compatible with safety requirements (eg. sight lines and hazards in clear zones)?	Trees noted as obstructions to bicycle movements on the cycleway.
5 Services ▪ Does the design adequately deal with buried and overhead services (especially in regard to overhead clearances, etc)? ▪ Has the location of fixed objects or furniture associated with services been checked, including the position of poles?	Street lighting poles noted as obstructions to bicycle movements on the cycleway.
6 Access to property and developments ▪ Can all accesses be used safely? (entry and exit/merging). ▪ Is the design free of any downstream or upstream effects from accesses, particularly near intersections? ▪ Have rest areas and truck parking accesses been checked for adequate sight distance, etc.?	High-level issues noted with the Botany Road/ HTH access. Issues noted with the roundabout inside the HTH access.
7 Adjacent developments ▪ Does the design handle accesses to major adjacent generators of traffic and developments safely? ▪ Is the drivers' perception of the road ahead free of misleading effects of any lighting or traffic signals on an adjacent road?	See above.
8 Emergency vehicles and access ▪ Has provision been made for safe access and movements by emergency vehicles? ▪ Does the design and positioning of medians and vehicle barriers allow emergency vehicles to stop & turn without unnecessarily disrupting traffic?	Yes.

Issue	Comment
9 Future widening and/or realignments ▪ If the scheme is only a stage towards a wider or dual carriageway is the design adequate to impart this message to drivers? (Is the reliance on signs minimal/appropriate, rather than excessive?) ▪ Is the transition between single and dual carriageway (either way) handled safely?	Unknown.
10 Staging of the scheme ▪ If the scheme is to be staged or constructed at different times: ▪ Are the construction plans and program arranged to ensure maximum safety? ▪ Do the construction plans and program include specific safety measures, signing; adequate transitional geometry; etc. for any temporary arrangements?	Unknown.
11 Staging of the works ▪ If the construction is to be split into several contracts, are they arranged safely?	Unknown.
12 Maintenance ▪ Can maintenance vehicles be safely located?	Yes.
2.2 Design issues (general)	
1 Design standards ▪ Is the design speed and speed limit appropriate (eg. consider the terrain; function of the road)? ▪ Has the appropriate design vehicle and check vehicle been used?	Swept path modelling indicates that trucks will need to mount and cross the central island of the internal roundabout. This is considered to be a frequent vehicle movement.
2 Typical cross sections ▪ Are lane widths, shoulders, medians and other cross section features adequate for the function of the road? ▪ Is the width of traffic lanes and carriageway suitable in relation to: • ▪ Alignment? ▪ Traffic volume? ▪ Vehicle dimensions? ▪ The speed environment? ▪ Combinations of speed and traffic volume? ▪ Are overtaking/climbing lanes provided if needed? ▪ Have adequate clear zones been achieved?	The design was not detailed for Botany Street. However, it appears that the width is not sufficient for opposing right-turns into the HTH and UNSW Gate 11.

Issue	Comment
3 The effect of cross sectional variation ▪ Is the design free of undesirable variations in cross section design? ▪ Are crossfalls safe? (particularly where sections of existing highway have been utilised or there have been compromises to accommodate accesses, etc.) ▪ Does the cross section avoid unsafe compromises such as narrowings at bridge approaches or past physical features?	See above.
4 Roadway layout ▪ Are all traffic management features designed so as to avoid creating unsafe conditions? ▪ Is the layout of road markings and reflective materials able to deal satisfactorily with changes in alignment? (particularly where the alignment may be substandard.)	Yes.
5 Shoulders and edge treatment ▪ Are the following safety aspects of shoulder provision satisfactory: ▪ Provision of sealed or unsealed shoulders? ▪ Width and treatment on embankments? ▪ Cross fall of shoulders? ▪ Are the shoulders likely to be safe if used by slow moving vehicles or cyclists? ▪ Are any rest areas and truck parking areas safely designed?	NA.
6 Effect of departures from standards or guidelines ▪ Any approved departures from standards or guidelines: is safety maintained? ▪ Any hitherto undetected departures from standards: is safety maintained?	Yes.
2.3 Alignment details	
1 Geometry of horizontal and vertical alignment ▪ Does the horizontal and vertical design fit together correctly? ▪ Is the design free of visual cues that would cause a driver to misread the road characteristics (eg. visual illusions, subliminal delineation such as lines of trees, poles, etc.)? ▪ Does the alignment provide for speed consistency?	Yes.

Issue	Comment

2 Visibility; sight distance
▪ Are horizontal and vertical alignments consistent with the visibility requirements?
▪ Will the design be free of sight line obstructions due to:
  ▪ Safety fences or barriers?
  ▪ Boundary fences?
  ▪ Street furniture?
  ▪ Parking facilities?
  ▪ Signs?
  ▪ Landscaping?
  ▪ Bridge abutments?
  ▪ Parked vehicles in laybys or at the kerb?
  ▪ Queued traffic?
▪ Are railway crossings, bridges and other hazards all conspicuous?
▪ Is the design free of any other local features which may affect visibility?
	The Gate 11/ HTH access intersection will be traffic-signal-controlled.

3 New/existing road interface ▪ Does the interface occur well away from any hazard? (eg. a crest, a bend, a roadside hazard or where poor visibility/distractions may occur.) ▪ If carriageway standards differ, is the change effected safely? ▪ Is the transition where the road environment changes (eg. urban to rural; restricted to unrestricted; lit to unlit) Is it done safely? ▪ Has the need for advance warning been considered?	Poor interface between southbound traffic lane of Botany Street and the cycleway. There is no obvious means for cyclists to enter this cycleway.
4 'Readability' of the alignment by drivers ▪ Will the general layout, function and broad features be recognised by drivers in sufficient time? ▪ Will approach speeds be suitable and can drivers correctly track through the scheme?	Yes.
2.4 Intersections	

Issue	Comment
1 Visibility to and visibility at intersections ▪ Are horizontal and vertical alignments at the intersection or on the approaches to the intersection consistent with the visibility requirements? ▪ Will drivers be aware of the presence of the intersection (especially on the minor road approach)? ▪ Will the design be free of sight line obstructions due to: ▪ Safety fences or barriers? ▪ Boundary fences? ▪ Street furniture? ▪ Parking facilities? ▪ Signs? ▪ Landscaping? ▪ Bridge abutments? ▪ Are railway crossings, bridges and other hazards near intersections conspicuous? ▪ Will the design be free of any local features which adversely affect visibility? ▪ Will intersection sight lines be obstructed by permanent or temporary features such as parked vehicles in laybys, or by parked or queued traffic generally?	Yes.
2 Layout, including the appropriateness of type ▪ Is the type of intersection selected (cross roads, T, roundabout, signalised, etc.) appropriate for the function of the two roads? ▪ Are the proposed controls (Give Way, Stop, Signals, etc.) appropriate for the particular intersection? ▪ Are junction sizes appropriate for all vehicle movements? ▪ Are the intersections free of any unusual features which could affect road safety? ▪ Are the lane widths and swept paths adequate for all vehicles? ▪ Is the design free of any upstream or downstream geometric features which could affect safety? (eg. merging of lanes.) ▪ Are the approach speeds consistent with the intersection design? ▪ Where a roundabout is proposed: ▪ Have pedal cycle movements been considered? ▪ Have pedestrian movements been considered? ▪ Are details regarding the circulating carriageway sufficient?	Lack of queue length in the HTH approach to its intersection with Botany Street.

Issue	Comment
3 Readability by drivers ▪ Will the general type, function and broad features be perceived correctly by drivers? ▪ Are the approach speeds and likely positions of vehicles as they track through the scheme safe? ▪ Is the design free of sunrise or sunset problems which may create a hazard for motorists?	Yes.
2.5 Special road users	
1 Adjacent land ▪ Will the scheme be free of adverse effects from adjacent activity and intensity of land use? (If not, what special measures are needed?	Yes.
2 Pedestrians ▪ Have pedestrian needs been satisfactorily considered? ▪ If footpaths are not specifically provided, is the road layout safe for use by pedestrians (particularly at blind corners or on bridges)? ▪ Are pedestrian subways or footbridges sited to provide maximum use? (i.e. Is the possibility of pedestrians crossing at grade in their vicinity minimised?) ▪ Has specific provision been made for pedestrian crossings, school crossings or pedestrian signals? ▪ Where present, are these facilities sited to provide maximum use with safety? ▪ Are pedestrian refuges/kerb extensions provided where needed? ▪ Has specific consideration been given to provision required for special groups (eg. young, elderly, disabled, deaf or blind)?	Poor ramp layout requires redundant downhill walk only to ascend up-grade on the accessible ramp.
3 Cyclists ▪ Have the needs of cyclists been satisfactorily considered, especially at intersections? ▪ Have cycle lanes been considered? ▪ Are all cycleways of standard or adequate design? ▪ Where a need for shared pedestrian/cycle facilities exists, have they been safely treated? ▪ Where cycleways terminate at intersections or adjacent to the carriageway, has the transition treatment been handled safely? ▪ Have any needs for special cycle facilities been satisfactorily considered? (eg. cycle signals)	Hazards to cyclists noted along the cycleway.

Issue	Comment
4 Motorcyclists ▪ Has the location of devices or objects which might destabilise a motorcycle been avoided on the road surface? ▪ Will warning or delineation be adequate for motorcyclists? ▪ Has barrier kerb been avoided in high speed areas? ▪ In areas more likely to have motorcycles run off the road is the roadside forgiving or safely shielded?	Yes.
5 Equestrians and stock ▪ Have the needs of equestrians been considered, including the use of verges or shoulders and rules regarding the use of the carriageway? ▪ Can underpass facilities be used by equestrians/stock?	Yes.
6 Freight ▪ Have the needs of truck drivers been considered, including turning radii and lane widths?	Swept path models indicate that trucks will need to mount and cross over the central island of the internal roundabout.
7 Public transport ▪ Has public transport been catered for? ▪ Have the needs of public transport users been considered? ▪ Have the manoeuvring needs of public transport vehicles been considered? ▪ Are bus stops well positioned for safety?	Bus passengers versus bicycle conflicts.
8 Road maintenance vehicles ▪ Has provision been made for road maintenance vehicles to be used safely at the site?	Yes.
2.6 Signs and lighting	
1 Lighting ▪ Is this project to be lit? Will safety be maintained if the project is not lit? ▪ Is the design free of features which make illuminating sections of the road difficult (eg. Shadow from trees or overbridges)? ▪ Has the question of siting of lighting poles been considered as part of the general concept of the scheme? ▪ Are frangible or slip-base poles to be provided? ▪ Are any special needs created by ambient lighting? Will safety be maintained if special treatments are not provided? ▪ Have the safety consequences of vehicles striking lighting poles (of any type) been considered?	Street lights will be an obstruction to cyclists on the cycleway.

Issue	Comment
2 Signs ▪ Are signs appropriate for their location? ▪ Are signs located where they can be seen and read in adequate time? ▪ Will signs be readily understood? ▪ Are signs located so that visibility to and from accesses and intersecting roads is maintained? ▪ Are signs appropriate to the driver's needs (eg. destination signs, advisory speed signs, etc.)? ▪ Have the safety consequences of vehicles striking sign posts been considered? ▪ Are signs located so that drivers' sight distance is maintained? ▪ Any signs to be located in the clear zone: are they frangible or adequately shielded by a crash barrier?	Signage plan not provided at this stage.
3 Marking and delineation ▪ Has the appropriate standard of delineation and marking been adopted? ▪ Are the proposed markings consistent with the works in the adjoining section of the route? ▪ Are the previous/adjacent markings to be upgraded? If not, will safety be maintained?	Linemarking plan not provided at this stage.
2.7 Traffic management	
1 Traffic flow and access restrictions ▪ Can traffic volumes from the proposed scheme be safely accommodated on existing sections of road? ▪ Has parking provision and parking control been adequately considered? ▪ Can any turn bans be implemented without causing problems at adjacent intersections? ▪ Has the effect of access to future developments been considered? ▪ Any traffic diverting to other roads (eg. to avoid a traffic control device): is safety maintained?	Queue spillback risks in the HTH leg to its intersection with Botany Street.

Issue	Comment
2 Overtaking and merges ▪ Is overtaking sight distance and stopping distance adequate? ▪ Have suitable shoulder widths been provided at lane drop merges? ▪ Have standard signs and markings been provided for any lane drop? ▪ Has adequate sight distance been provided to any lane drop? ▪ Are shoulders wide enough opposite access points and intersections?	NA.
3 Rest areas and stopping zones Are there sufficient roadside stopping areas, rest areas and truck parking areas? Are any entries and exits to rest areas or truck parking areas safe?	NA.
4 Construction and operation ▪ If the scheme is to be constructed "under traffic", can this be done so safely? ▪ Can the scheme be safely constructed? ▪ Have the maintenance requirements been adequately considered? ▪ Is safe access to and from the works available?	This would need to be examined from construction staging plans (not available as part of this audit).
2.8 Additional questions to be considered for development proposals	Questions omitted as issues adequately covered in other checklist questions.
2.9 Any other matter	
1 Safety aspects not already covered ▪ Will there be special events? Have any consequent unusual or hazardous conditions been considered? ▪ Is the road able to safely handle oversize vehicles, or large vehicles like trucks, buses, emergency vehicles, road maintenance vehicles? ▪ If required, can the road be closed for special events in a safe manner? ▪ If applicable, are special requirements of scenic or tourist routes satisfied?	No.