Memo

SUBJECT
Bradfield Park Central Cycle Ramp Review

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OUR REF
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CLIENT
Transport for NSW

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Introduction

Diverse options have been investigated for a ramp to the northern end of the Sydney Harbour Bridge cycleway: this strategic link in the active transport network is accessible today via a long staircase that bicycle users push their bikes up to. A local community group presented an alternate option to North Sydney Council which was peer-reviewed by Barros van den Dool[1], a recognised expert in the field of active transport design based in Sydney.

This memo aims to examine and provide perspective on this design and its review, from two angles: the wider customer-focussed transport planning context and the more detailed design needs of these customers.

Executive summary

From a forward-looking transport planning point of view, the design proposed by the community does not provide good outcomes for future customers and does not achieve the objectives of this major infrastructure project to deliver a crucial transport network link which provides an attractive and safe way to access the Sydney Harbour Bridge cycleway for users of all ages and abilities for decades to come.

This design creates conditions that would be unsafe for the current user base but could become more dangerous as the number and variety of riders using the Sydney Harbour Bridge grow to include cargo bikes, mobility scooters, and less confident riders such as tourists or children riding autonomously. Moreover, it does not offer a comfortable nor attractive riding experience for the wider user base targeted by this new infrastructure.

The scheme proposed by the community could be refined to address these safety, comfort, and attractiveness concerns, however it is likely that the footprint of such a revised design would create a significantly bigger footprint on the surrounding urban realm.

We therefore recommend that Council and TfNSW focus on the development of linear schemes in line with the design competition entries and TfNSW proposal which will provide better outcomes for bicycle users and for the wider Sydney transport network.

Customer-focussed planning

The current users of the Sydney Harbour Bridge cycleway are overwhelmingly fit, able bodied, adult commuters. The obstacle of the current staircase does not allow for a wider diversity of customers who do not have the wish or ability to push their bicycles up several flights of stairs. It is also to be noted that people living

[1] Bradfield Park Central Cycle Ramp – Peer Review (vs03), Dick van den Dool, 22 February 2022

with a disability and using a bicycle, adapted or not, as a mobility aid, do not have the option to dismount and push at all.

This commuter-majority trend is demonstrated by the strong reduction in user-numbers over the weekend compared to weekdays, when the walkway on the other side of the bridge sees its highest patronage: the staircase and cycleway combination are currently rarely used for tourism or recreational purposes.

Previous studies, such as the business case for this ramp, have hence demonstrated the enormous potential for growth in number and types of bicycles users this cycling ramp represents. Moreover, plans for additional cycleways, such as *City of Sydney Cycling Strategy and Action Plan 2018-2030* and *Northern Sydney Transport Infrastructure Strategy, 2020*, are set to increase and diversify the user-base for cycling, tourism and recreation further by making it easier and safer to reach more destinations in the Lower North Shore, CBD and Eastern City areas.

In the decades to come, there is an opportunity for the northern cycleway ramp to provide for a wider user base than what the Sydney Harbour Bridge caters for today: casual and slower commuters, parents in cargo bikes, families with kids on a Sunday stroll, people living with disabilities using adapted bicycles to get to work.

For this opportunity to be seized, however, the ramp design needs to be adapted and attractive to a wide range of users, as per the Six Design Principles of the Transport for NSW (TfNSW) Cycleway Design Toolbox shown in Figure 1.

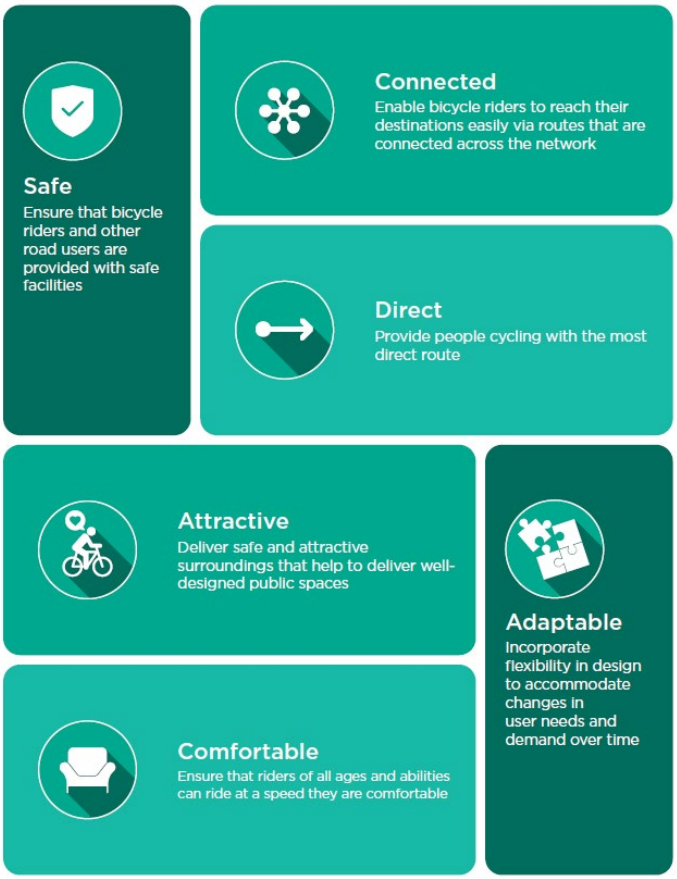

Figure 1 Six Design Principles, Source: Cycleway Design Toolbox, Transport for NSW (TfNSW), 2020

Of particular interest to this review are three of the Six Principles:

- “Safe: Ensure that bicycle riders and other road users are provided with safe facilities” for this ramp this means good sightlines and safe overtaking space, easy to navigate turning radii and safe insertion into the urban realm that does not create conflicts with pedestrians and other uses of public space.

- “Comfortable: Ensure that riders of all ages and all abilities can ride at a speed they are comfortable” for this ramp, this principle translates as desirable turning radii and gradients that will be further explored in the Design Review section of this Memo.

- “Adaptable: Incorporate flexibility in design to accommodate changes in user needs and demand over time.” Here, as we are designing a ramp that will serve the community for several decades to come, this principle means planning for the future user base of the ramp: a mix of ages and abilities, trip purposes, perhaps commuters on weekdays who may be slower and less fit than the average commuter of 2022, perhaps cargo bikes doing deliveries or carrying children to day-care and necessitating bigger turning radii and lower-gradients and most likely a high proportion of tourists and recreational users as “riding the bridge” becomes a weekend activity as popular as walking it.

RELEVANCE OF DESIGN GUIDELINES

Barros van den Dool mentions two main sources in their review: various sections of the Austroads Guide to Road Design[2] and the ipv Delft Brief Dutch Design Manual for Bicycle and Pedestrian Bridges[3] (from the CROW design guide). The CROW design guide is recognised as world-leading best practice when it comes to designing for a wide-range of bicycle users. Meanwhile, aspiring to meet the current Austroads Guide to Road Design does not necessarily lead to a safe and comfortable solution for users of all ages (and abilities).

For example, in regard to the ramp's gradients, Barros van den Dool mentions that the Austroads guidelines state "In general, the 'acceptable' line in the figure would be satisfactory for paths with a high proportion of regular or physically fit riders, which in most instances would include commuter and sporting riders. Otherwise, the 'desirable' line in the figure is recommended." (this refers to the graph on Figure 2). This illustrates how the design recommendations of the Austroads Guide to Road Design tends to favour fit commuters and sporting riders over designing for all ages and abilities.

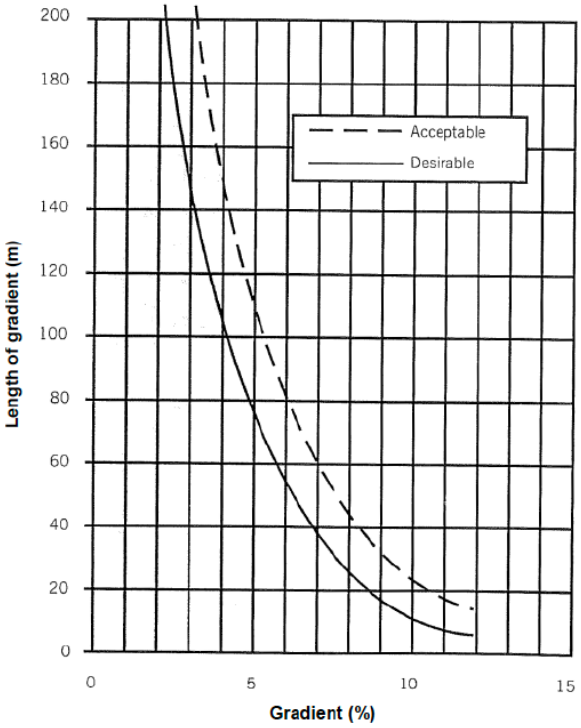

Figure 2 Austroads Guide to Road Design recommended gradients for cycling infrastructure

[2] *Austroads Guide to Road Design. Part 6A. Paths for Walking and Cycling. Edition 2.1, 2021. (GtRD6A) and Austroads Guide to Road Design. Part 3. Geometric Design. Edition 3.4, 2021,*
[3] ipv Delft. Brief Dutch Design Manual for Bicycle and Pedestrian Bridges. English summary of the CROW design guide. June 2015, page 27.

TfNSW aims for a transport system that is customer-focussed and, in this particular case, the future customers will be more diverse than commuter and sporting riders only as the bridge becomes accessible to a wider-range of bicycle users, as shown on Figure 2, and call for preferably compliance to the “desirable” side of the Austroads guidelines which is closer aligned with the CROW guide (see Figure 4).

Figure 3 User of all ages and all abilities, Source: Cycleway Design Toolbox, TfNSW

Design review

Due to the local environment and existing infrastructure, designing the cycleway ramp structure as an alternative access to the steps is a complex design challenge.

While the design proposed by the community generally fits within the “acceptable” Australian design guidelines, it is a far-cry from global best practice. When upgrading the cycling infrastructure on the Harbour Bridge, it should be safe and comfortable for all types of users in decades to come.

This design raises significant points of concern in terms of rider's safety and comfort, notably:

CONNECTION AT TOP OF THE RAMP

- The point of connection between the ramp and the existing cycleway on the bridge presents a very low curve radius, causing a safety hazard for descending riders. The radius of this curve is not included in the peer-review by Barros van den Dool (table 1). However, the radius seems well below the ideal radius between 10m and 20m[4] and approaches the absolute minimum of 5m[5]. This creates a potentially dangerous situation given the potential speed of descending riders and potentially swerving uphill riders.
- The very low curve radius at the top of the ramp is also uncomfortable, both for downhill riders and for uphill riders who just climbed the relatively steep ramp, especially for people riding a longer or wider bike (such as a cargo bike or tricycle, often used by people living with disabilities) or for less experienced users.

REVERSE CURVES

- Use of a series of reverse curves is an engineering tool to manage excessive speeds. However, in this specific situation the series of reverse curves is not suitable: the combination of an access ramp with relatively high grades, two-way bicycle traffic, relatively high deflection angles and expected mixed-use of the cycleway by experienced and less-experienced users creates a safety hazard. Due to expected differences in cycling speed, it is likely overtaking will occur on the ramp, downhill riders might take a turn, and uphill riders are likely to swerve, especially less experienced riders on the relatively steep sections. These factors increase the likelihood of both intentional and accidental veering into the opposite lane and increase the likelihood of head-on collisions, especially as all curves of the series of reverse curves have different radii and one curve even has different radii within the same curve.
- The ‘deflection angles’ of the reverse curves do not meet the *NSW Bicycle Guidelines (2003)* recommended maximum deflection of 10 or 20 degrees (when used as a speed limiting device)
- The series of reverse curves are uncomfortable, especially on a ramp with a relatively high gradient and with a longer or wider bike (such as cargo bikes or tricycles, often used by people living with disabilities) or less experienced users. It is generally recommended to maintain curves in the same direction and with the same curve radius as reverse curves and curves with changing radii are significantly harder to navigate.

[4] This radius was measured from the plan and is approximate only.
[5] Brief Dutch Design Manual for Bicycle and Pedestrian Bridges. English summary of the world-renowned CROW Design manual for bicycle traffic. (ipv Delft, June 2015, page 21).

BOTTOM LANDING AREA

The bottom landing area will be a safety hazard with high likelihood of conflicts between riders and pedestrians, as the Burton Street footpath is heavily used: the *TfNSW Cycleway Design Toolbox* advises against the use of shared paths in this context (high pedestrian activity or high cross-cycleway movement) and the connection to Burton Street will be impeded by the regular markets held in this location. Moreover, parked cars along Burton Street and the bridge structure and stairs might block sight of pedestrians and car traffic on riders, and vice versa.

SLOPES / GRADIENTS:

With a height difference of 8.8m, the proposed average slope of this ramp is 4.8%. This is way beyond the upper limit of 2.2% as defined by the *CROW Design Guide*[6] and shown on Figure 3 (this document is also quoted by Barros van den Dool in their review and considered a reference for global design best practice).

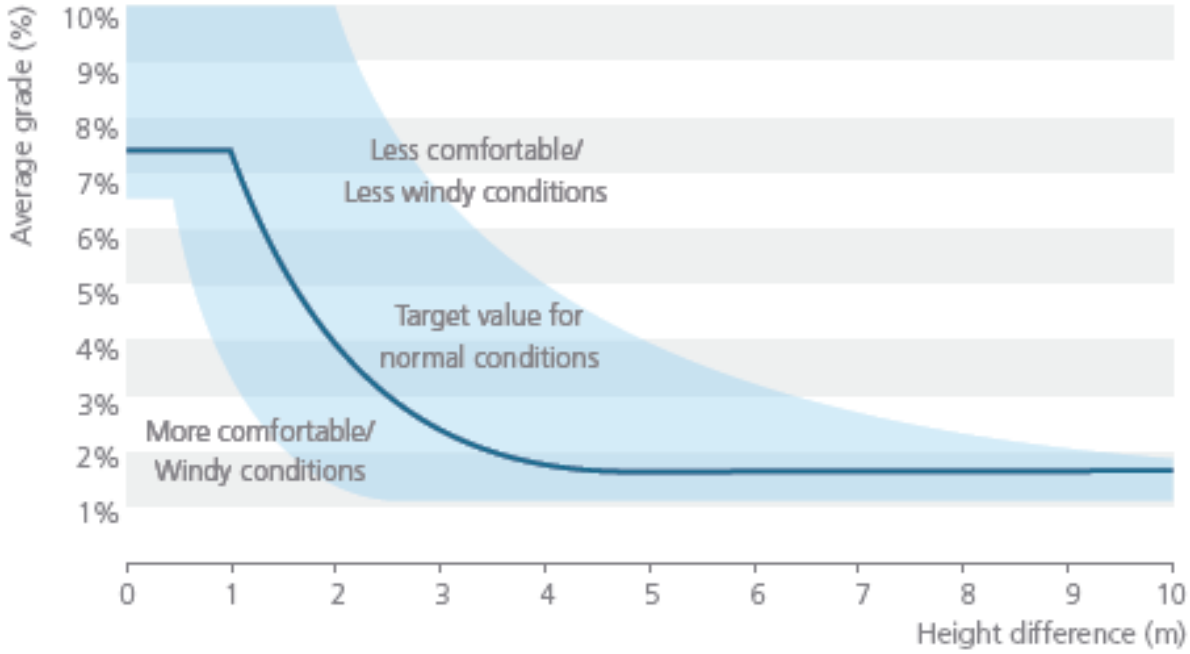

Figure 4 Recommended ramp grades based on height differences, source: ipv Delft. Brief Dutch Design Manual for Bicycle and Pedestrian Bridges. English summary of the CROW design guide. June 2015, page 27

[6] ipv Delft. Brief Dutch Design Manual for Bicycle and Pedestrian Bridges. English summary of the CROW design guide. June 2015, page 26

The authors

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Alex is a Dutch cycle infrastructure specialist with over 15 years' experience in the project management and design of traffic and transportation schemes, active transport, and traffic safety. Before joining Arcadis in the Netherlands, Alex worked in Australia for four years and most recently led the preparation of TfNSW Principal *Bicycle Network Design Toolbox.*

His experience comprises of numerous strategic active and integrated transport projects such as the Sydney Harbour Bridge Cycleway Access study for RMS, the Centenary Highway Cycleway Options Analysis for Queensland Department of Transport, the Randwick City Council Active Travel to School Strategy and a wide range of roles as active transport expert on Dutch projects.

Alex brings to our team global best practice and technical excellence in planning and implementing cycling infrastructure that can be applied to our local environment.

Lise Chesnais

Arcadis NSW Transport Planning Team Lead

Lise Chesnais has 11 years of experience in the transport planning industry. She has a deep interest in active transport modes and their developments in urban contexts which led her to attend the 'Copenhagenize' masterclass in Denmark. The course provided international best practice on cycle planning. She also completed TfNSW *Designing for pedestrians and bike riders* course to deepen her knowledge of the standards in NSW. Lise is the author of a master thesis on *How to increase cycling usage in the inner suburbs of Paris* and of an article about the state of Cycling in Sydney (Provelo, 2019).

In 2020, Lise supported the Northern Beaches and Parramatta City Councils in planning for their active transport Covid19-recovery. Her work included planning for the implementation of tactical urbanism cycleways and traffic calming.

Most recently Lise has been the Transport Planning Lead for the Lower North Shore Place-based Transport Plan, giving her deeper insight into the local and future transport context of the area.