# Expert Panel on Maritime Safety

## *Report Two on Maritime Safety Impacts of Proposed Green Bridges on Sailing, Rowing and Paddling on the St Lucia, Toowong and Milton Reaches of the Brisbane River*

**28 February 2022**

## Contents

# SUMMARY

This is the second report of the *Green Bridges Expert Panel on Maritime Safety Impacts for Sailing, Rowing and Paddling on the St Lucia, Toowong and Milton Reaches of the Brisbane River*. The first report of the *Green Bridges Expert Panel*[1] provided feedback and recommendations on the relative impacts of alternative bridge locations and optional bridge designs.

This report considers safety impacts to users of passive watersport craft (rowing, sailing, paddling) that would result from the construction of two specific Green Bridge design proposals between Toowong and West End, and from St Lucia and West End which as described in the Brisbane City Council document "TOOWONG TO WEST END AND ST LUCIA TO WEST END GREEN BRIDGES" dated November 2021[2]

As recognised in our first report, the Milton, Toowong and St Lucia reaches of the Brisbane River are frequently used and historically significant sections of waterway that are integral to the ongoing viability and vitality of Brisbane's watersports including rowing, sailing and paddling (i.e., canoeing, kayaking, dragon boat racing etc).

Several long-established community and school watersport clubs are located on the Milton and Toowong reaches including Commercial Rowing Club, St Joseph's Nudgee College Rowing Club, Brisbane State High Rowing Club, Grammar Rowing Club, Brisbane Rowing Club, Vikings Rowing Club, Red Legs Rowing Club, Grammarians Rowing Club, Brisbane and GPS Rowing Club, South Brisbane Sailing Club and the West End Canoe Club. These reaches are also popular with unaffiliated community users.

The necessity to manage possible safety impacts is specified in the Queensland Government's State Code 7 regarding maritime safety[3] which requires that 'Development does not impede the safe movement of vessels in a navigable waterway.'

The Expert Panel concludes that of various design options outlined in our first report regarding the number and placement of piers (i.e. nil piers, one pier, two or more piers), the two bridge designs described in the Brisbane City Council report of November 2021 would create a moderate to high safety risk that is likely to be acceptable, provided recommendations of this second report are accepted and applied.

These proposed designs are preferable to other options with two or more closely spaced piers that would present an unacceptable risk to human safety. The design solution of a single span (no pier) bridge as recommended in our first report, which would present nil safety risks, has not been presented as an option by the Brisbane City Council.

The likelihood of safety impacts at the proposed bridge locations is less than alternative sites indicated in design proposals considered in our first report.

[1] Green Bridges Expert Panel Report on Maritime Safety Impacts for Sailing, Rowing and Paddling on the St Lucia, Toowong and Milton Reaches of the Brisbane River (31 March 2021). Source https://www.sbsc.org.au/about/green-bridges/

[2] Source: https://www.brisbane.qld.gov.au/sites/default/files/documents/2021-11/20211112-Newsletter-TWEGB-and-SLWEGB-PDF.pdf

[3] https://planning.dsdmip.qld.gov.au/planning/better-development/the-development-assessment-process/the-states-role/state-development-assessment-provisions

The successful mitigation of maritime safety risks will be dependent on the satisfactory adoption and compliance with supplementary mitigation measures such as speed controls on powered recreational and commercial craft.

The main risks associated with the proposed designs arise from an increased likelihood of vessel-to-vessel collision or vessel to bridge collision due to narrowing of the central navigable waterway, especially in the case of the Toowong to West End bridge.

Safety impacts that should be considered in final design of the Green Bridges are serious injury, possible fatality, drowning and damage to vessels that could result from the following scenarios:

a) collision between rowing, sailing or paddling boat and bridge piers,
b) collision between powered vessels and rowing, sailing or paddling boats or
c) collusion between powered vessels and bridge piers.

Environmental and human factors that are likely to contribute to potential impacts include:

- Low levels of experience and young age of learning boat skippers, coxswain or captains,
- Frequent strong currents,
- Frequent high winds, period of low winds and increased wind turbulence affecting sailing craft,
- Coincident passage of powered vessels, rowing, sailing or paddling craft through or near the central navigable passage,
- The effect of wash and wave action from powered vessels on navigation of passive craft, and
- Other marine hazards such as debris.

# RECOMMENDATIONS

The Expert Panel recommends that prior to commissioning of detailed design and construction of the proposed Bridges, the Brisbane City Council should:

1. Require the undertaking of a collision analysis that takes account of possible loss of life and injury that would result from collision between powered craft, rowing boats, sailing boats, other non-powered watercraft and bridge piers, and use this analysis to inform final design parameters and identify necessary measures for management of maritime safety risks including speed controls.
2. Take into account recent collisions (listed below) and manage safety risks resulting from forecast projections of passive and powered vessel use for the projected design life of bridges.
    - Kookaburra Queen Boat crash with Goodwill Bridge (April 2004) [4]
    - CityCat collision with rowing boat (16 Aug 2005)[5]
    - Kookaburra Queen Boat crash with the William Jolly Bridge (29 Oct 2009) [6]
    - CityCat collision with rowing boat (12 June 2012)[7]
    - CityCat collision with rowing boat (1 June 2015)[8]
3. Require adoption of design principles by *Knott, M., Pruca, Z. "Vessel Collison Design of Bridges." Bridge Engineering Handbook. Ed. Wai-Fah Chen & Lian Duan Boca Raton: CRC Press, 2000* especially the following:
    - The risk acceptance criteria consider both the probability of occurrence of a vessel collision and the consequences of the collision.
    - In addition to the potential for loss of life, the consequences of a collision can include damage to the bridge, disruption of motorist and marine traffic, damage to the vessel and cargo, regional economic losses, and environmental pollution.
4. Identify the costs and feasibility of additional maritime safety controls needed mitigate risks to rowers, sailors and paddlers based on the above analysis which includes controls such as:
    - Establishing and regulation of speed controls for powered vessels to 6 knots within 250m of bridges or between the West End and the Regatta Ferry Terminal, and
    - Addition of special markers for management of powered vessel traffic.
5. Require that bridge piers including collars / skirts include input from expert water flow engineers to reducing the risk of boat or person entrapment to acceptable levels at all tidal levels esp. when there is a strong current.
6. Ensure the construction period and method takes into account usage patterns of non-powered watercraft in a way that does not cause unacceptable impacts on the safety and viability of watersports including rowing, sailing and paddling.

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[4] https://amp.couriermail.com.au/news/queensland/paddlewheeler-kookaburra-queen-hits-william-jolly-bridge/news-story/bc570b16a3828693724db565885112bb

[5] https://www.abc.net.au/news/2005-08-16/investigation-begins-into-brisbane-river-collision/2082054

[6] https://www.brisbanetimes.com.au/national/queensland/brisbane-river-boat-in-bridge-collision-20091029-hljj.html

[7] https://www.brisbanetimes.com.au/national/queensland/teen-rower-severely-injured-in-citycat-collision-20120612-206js.html

[88] https://www.brisbanetimes.com.au/national/queensland/citycat-crashes-into-rowers-on-brisbane-river-20150601-ghdt1x.html

# 1 Introduction

The Milton, Toowong and St Lucia reaches of the Brisbane River are frequently used and historically significant sections of waterway that are integral to the ongoing viability and vitality of Brisbane's watersports including rowing, sailing and paddling (i.e., canoeing, kayaking, dragon boat racing etc).

Several long-established community and school watersport clubs are located on the Milton and Toowong reaches including Commercial Rowing Club, St Joseph's Nudgee College Rowing Club, Brisbane State High Rowing Club, Grammar Rowing Club, Brisbane Rowing Club, Vikings Rowing Club, Red Legs Rowing Club, Grammarians Rowing Club, Brisbane and GPS Rowing Club, South Brisbane Sailing Club and the West End Canoe Club.

The reaches are also popular with unaffiliated community users, as echoed by the Brisbane City Council policy to promote river access for recreational purposes[9].

It considers safety impacts to users of passive watersport craft (rowing, sailing, paddling)

This report presents a summary of maritime safety risks and design considerations needed to ensure compliance with Queensland's State Planning Policies on Maritime Safety associated with construction of 'Green Bridges' between Toowong and West End, and from St Lucia and West End as described in Brisbane City Council document "TOOWONG TO WEST END AND ST LUCIA TO WEST END GREEN BRIDGES" dated November 2021[10]

# 2 Likely safety impacts

Safety impacts that should be considered in final design of the Green Bridges are serious injury, possible fatality, drowning and damage to vessels that could result from the following scenarios:

d) collision between rowing, sailing or paddling boat and bridge piers,
e) collision between powered vessels and rowing, sailing or paddling boats or
f) collusion between powered vessels and bridge piers.

Environmental and human factors that are likely to contribute to potential impacts include:

- Low levels of experience and young age of learning boat skippers, coxswain or captains,
- Frequent strong currents,
- Frequent high winds, period of low winds and increased wind turbulence affecting sailing craft,
- Coincident passage of powered vessels, rowing, sailing or paddling craft through or near the central navigable passage,
- The effect of wash and wave action from powered vessels on navigation of passive craft, and
- Other marine hazards such as debris.

[9] https://www.brisbane.qld.gov.au/things-to-see-and-do/outdoor-activities/boating-canoeing-and-fishing/public-river-and-recreation-hubs-boat-ramps-canoe-ramps-and-pontoons/river-access-network
[10] Source: https://www.brisbane.qld.gov.au/sites/default/files/documents/2021-11/20211112-Newsletter-TWEGB-and-SLWEGB-PDF.pdf

*Figure 1. Example of bridge pier impact by rowing boat and current effects*

An important safety risk is the entrapment of boats or persons requiring design of collars / skirts that effectively reduce this risk at all tidal levels and during strong currents (Figure 1).

It is noted that contemporary bridge structures typically involve a pile cap above low water level, so that the form of the pylon at water level is similar to a table with a tablecloth (pre-cast concrete skirt panels) hanging over the edges.

Tidal currents creating could create downdrafts/subducting undercurrents that would risk entrapment under the pile cap or under the skirt and between the piles for vessels or persons, or worse, a combination of both. Capsized or partially sunken vessels are of particular concern because sails or hulls that are underwater will be subject to strong water-drag forces.

# 3 Risk of alternative bridge locations and design options

Of various design options outlined in our first report regarding the number and placement of piers (i.e., nil piers, one pier, two or more piers), the two bridge designs described in the Brisbane City Council report of November 2021 would create a moderate to high safety risk that is likely to be acceptable, provided recommendations of this second report are accepted and applied.

These proposed designs are preferable to other options with two or more closely spaced piers that would present an unacceptable risk to human safety. The design solution of a single span (no pier) bridge as recommended in our first report, which would present nil safety risks, has not been presented as an option by the Brisbane City Council.

The likelihood of safety impacts at the proposed locations is less than alternative sites indicated in earlier design proposals.

While the Toowong to West End Bridge is outside the delineated “Area of Caution” (Appendix C) between the St Lucia and Milton Reaches of the Brisbane River, speed controls for powered craft in this area would help to reduce the possibility and severity of vessel-to-vessel collision.

# 4 Collision analysis to comply with Queensland Government design manual

The need for proper consideration of maritime safety impacts is specified in the Queensland Government's State Code 7 regarding maritime safety[11] which requires that 'Development does not impede the safe movement of vessels in a navigable waterway.'

Compliance with the Queensland Department of Transport manual on Design Criteria for Bridges and Other Structures (Appendix A Item 50), also require collision analysis including usage patterns of rowing boats, sailing boats and other non-motorised vessels in order to give "due consideration of all vessels currently operating in the waterway or likely to operate in the waterway for the next 100 years." [12]

This collision analysis would take into account possible loss of life and injury that would result from collision between powered craft, rowing boats, sailing boats, other non-powered watercraft and bridge piers, and use this analysis to inform final design parameters and identify additional measures for management of maritime safety risks.

The analysis would also need to take into account recent collisions (listed below).

- Kookaburra Queen Boat crash with Goodwill Bridge (April 2004) [13]
- CityCat collision with rowing boat (16 Aug 2005)[14]
- Kookaburra Queen Boat crash with the William Jolly Bridge (29 Oct 2009) [15]
- CityCat collision with rowing boat (12 June 2012)[16]
- CityCat collision with rowing boat (1 June 2015)[17]

The following design principles by *Knott, M., Pruca, Z. "Vessel Collison Design of Bridges." Bridge Engineering Handbook. Ed. Wai-Fah Chen & Lian Duan Boca Raton: CRC Press, 2000* are also relevant.

- The risk acceptance criteria consider both the probability of occurrence of a vessel collision and the consequences of the collision. The probability of occurrence of a vessel collision is affected by factors related to the waterway, vessel traffic, and bridge characteristics.
- In addition to the potential for loss of life, the consequences of a collision can include damage to the bridge, disruption of motorist and marine traffic, damage to the vessel and cargo, regional economic losses, and environmental pollution.

[11] https://planning.dsdmip.qld.gov.au/planning/better-development/the-development-assessment-process/the-states-role/state-development-assessment-provisions
[12] https://www.tmr.qld.gov.au/-/media/busind/techstdpubs/Bridges-marine-and-other-structures/Bridge-design-and-assessment-criteria-manual/DesignCriteriaforBridgesandOtherStructures.pdf?la=en
[13] https://amp.couriermail.com.au/news/queensland/paddlewheeler-kookaburra-queen-hits-william-jolly-bridge/news-story/bc570b16a3828693724db565885112bb
[14] https://www.abc.net.au/news/2005-08-16/investigation-begins-into-brisbane-river-collision/2082054
[15] https://www.brisbanetimes.com.au/national/queensland/brisbane-river-boat-in-bridge-collision-20091029-hljj.html
[16] https://www.brisbanetimes.com.au/national/queensland/teen-rower-severely-injured-in-citycat-collision-20120612-206js.html
[1717] https://www.brisbanetimes.com.au/national/queensland/citycat-crashes-into-rowers-on-brisbane-river-20150601-ghdt1x.html

# 5 Conclusions

The Expert Panel concludes that of various options for the number and placement of piers (incl. nil piers, one pier, two or more piers), the proposed bridge designs present an acceptable and moderate to high safety risk.

The new proposed designs as presented by the Brisbane City Council in the November 2021 Green Bridges report are preferable to other options with two or more closely spaced piers that would present an unacceptable risk to human safety.

The likelihood of safety impacts at the proposed bridge locations is less than alternative sites indicated in earlier design proposals.

The successful and ongoing mitigation of maritime safety risks will be dependent on satisfactory adoption of number of factors including:

- completion of a collision analysis would take into account possible loss of life and injury that would result from collision between powered craft, rowing boats, sailing boats, other non-powered watercraft and bridge piers,
- use of this analysis to inform final design parameters and identify additional measures for management of maritime safety risks,
- satisfactory adoption and compliance with supplementary mitigation measures such as speed controls on powered recreational and commercial craft,
- ensuring that bridge piers including collars / skirts include input from expert water flow engineers to reducing the risk of boat or person entrapment to acceptable levels at all tidal levels esp. when there is a strong current, and
- Ensure the construction period and method takes into account usage patterns of non-powered watercraft in a way that does not cause unacceptable impacts on the safety and viability of watersports including rowing, sailing and paddling.

# 6 Expert Panel Membership


**Robert Preston** BSc GCSocRes, MEnv
Chair, Expert Panel on Maritime Safety
President, South Brisbane Sailing Club
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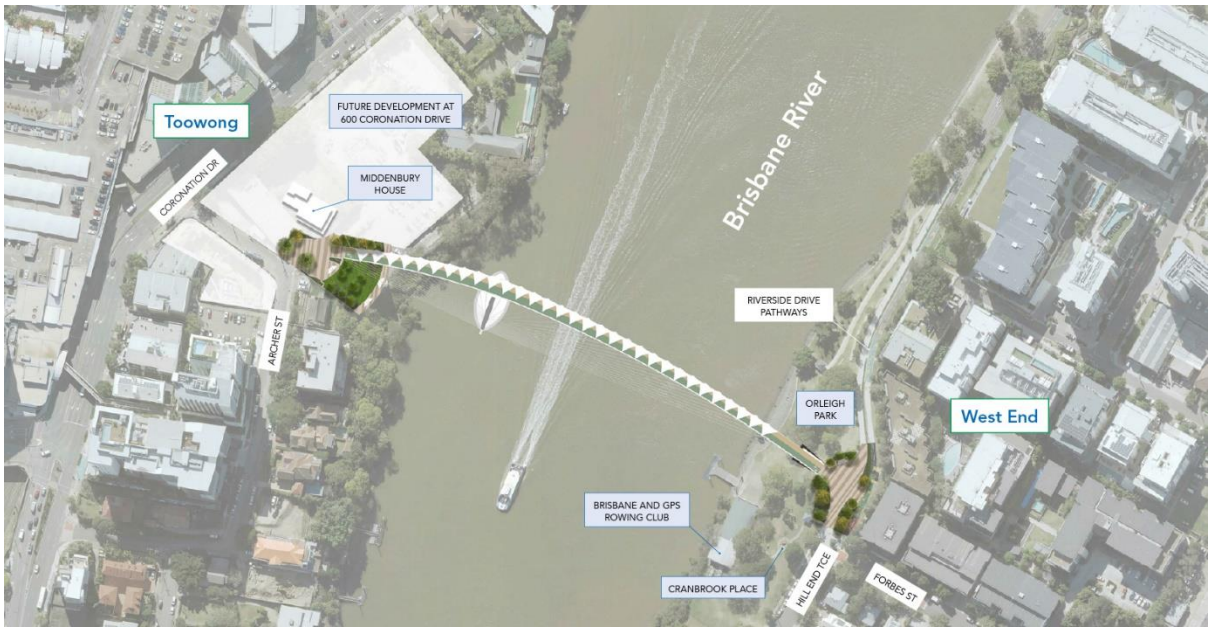
**Stephen McDonald** BE
President, West End Canoe Club

**Ian Holzberger** BSc GeoSc, Math, Dip Proj Mgt
CEO Rowing Queensland,

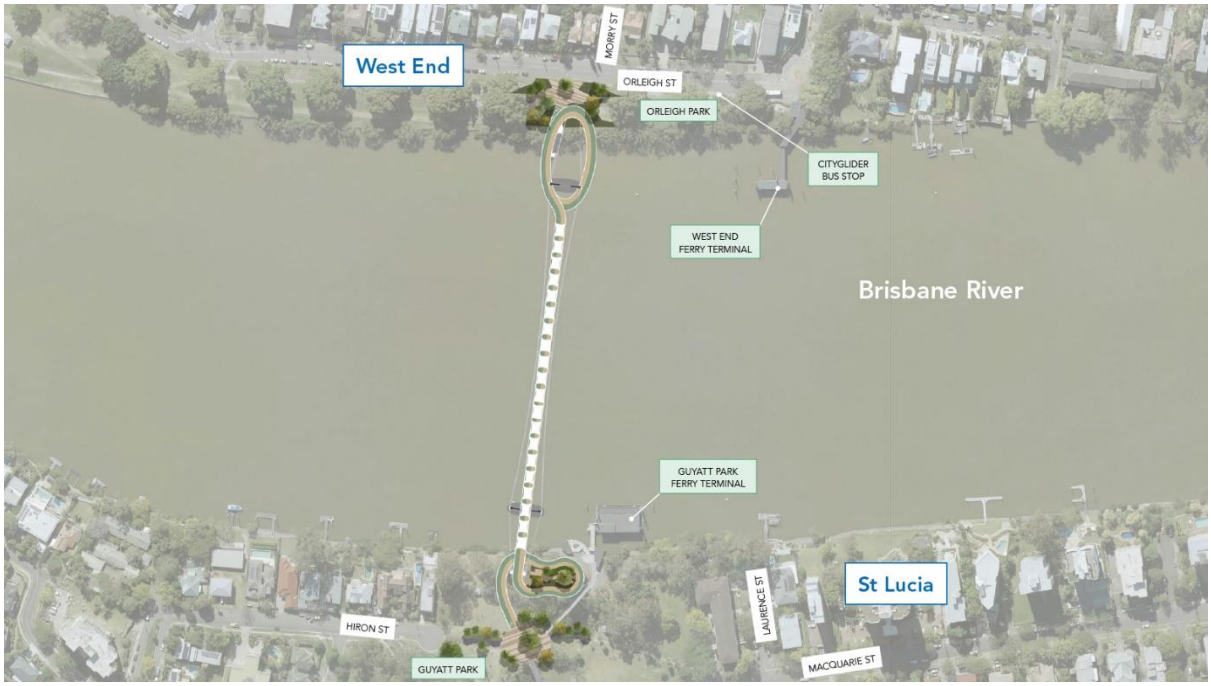
**John Price** BArch(Hons), AIA, RYA Yachtmaster
Senior Sailing Instructor,

**Ben Callard** BSMSM, GradDipEd
Regional Manager (Queensland)
Australian Sailing

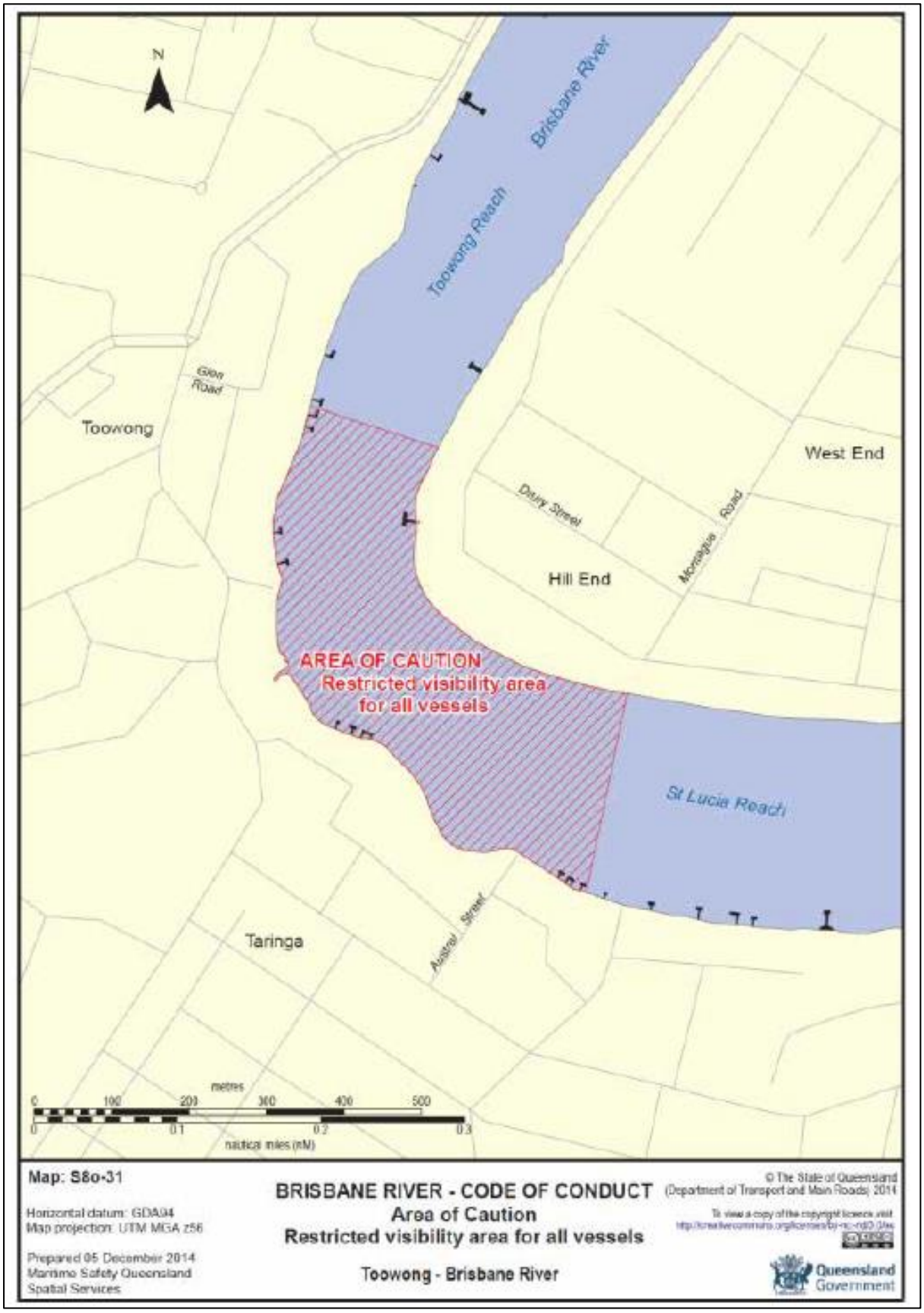
# 7 Appendix A. Toowong to West End Green Bridge location map (BCC, Nov 2021)




# 8 Appendix B. St Lucia to West End Green Bridge location map (BCC, Nov 2021)



# 9 Appendix C. Area of Caution – West End Peninsula




*Source: Brisbane River Code of Conduct, Maritime Safety Queensland (2014)*