

Shared path lighting review

In late-2017 RAC initiated a project to investigate lighting quality along four popular sections of Perth's Principal Shared Path (PSP) and Recreational Shared Path (RSP) networks to understand opportunities to enhance amenity and safety for people using the paths, encouraging more walking and cycling.

Why did we undertake this project?

Western Australia (WA) has a great climate for walking and cycling, helping to make these appealing travel options for many people. However, various factors influence how safe, convenient and attractive it is to walk and cycle, particularly for commuting purposes, not least the availability and quality of infrastructure. Investment in the expansion and upgrading of Perth's existing PSP and RSP networks, which cater for both pedestrians and cyclists, is therefore considered to be an important enabler.



64% of respondents think the State Government should prioritise building on / improving the off-road cycle network (ranked second after investment in on-road infrastructure) to encourage increased cycling participation.

Source: RAC 2015 Cycling Survey

The PSP network, which covers around 180 kilometres, is the core of Perth's cycling network and provides high standard radial routes to and from the Perth central business district (CBD) which are separated from general traffic. These are typically adjacent to Perth's freeways, major highways and rail lines, and provide important connections to local cycling and walking networks and destinations such as train stations and high frequency bus corridors. The RSP network is constructed to a similar standard and caters for recreational users, as well as commuters.

! On average, around 8,000² riders travel into and out of the Perth CBD each weekday using the PSP and RSP networks and RAC's 2015 Cycling Survey revealed that shared paths are the most commonly used cycling infrastructure (on average, respondents spend almost half of their time cycling on these paths).

The planning and design of shared paths can greatly influence usage. Directness, connectivity and segregation from traffic are crucial considerations but to ensure a high quality user experience directional signage and surface and lighting quality are important design elements.

Good quality lighting has the potential to enhance pedestrian and cyclist comfort, personal security and safety (whether perceived or actual). Improved lighting, along with a range of other urban design principles, is widely recognised as an integral component in 'designing out crime'³.

It is essential that lighting requirements are not only considered at the design and construction stages of new infrastructure projects but that sufficient funding is allocated to enable ongoing maintenance and upgrades to ensure the actual lighting levels remain compliant with relevant standards.

What did the project involve?

The project was undertaken to determine the existing lighting levels, measured in 'lux', along four of Perth's most popular shared paths to help identify locations for maintenance and upgrades to enhance the experience for path users.

How much lux is enough?

The amount of light falling on a surface (known as 'illuminance') is measured in 'lux'. The number of lux required in different indoor and outside settings varies considerably, with supermarkets (750 lux) or homes (150 lux)⁴ requiring much more lighting than outdoor public space (typically 20 to 50 lux). When it comes to shared paths, the lighting standard⁵ for the PSP network managed by Main Roads WA is 4.5 to 6 lux ('Category P2' as set out in 'AS/NZS 1158.3.1:2005 - Lighting for roads and public spaces') and for other shared paths managed by local governments it is 2.5 to 4 lux ('Category P3').

RAC commissioned an independent data collection company to survey approximately 67 kilometres of shared paths using an innovative lux survey and mapping technique.

¹ RAC WA (2015). "Cycling survey". <https://rac.com.au/about-rac/advocating-change/reports>

² Department of Transport (2017). "Cycle count data 2017". https://www.transport.wa.gov.au/mediaFiles/active-transport/AT_CYC_P_Cycle_count_data_2017.pdf

³ Department of Planning (2006). "Designing out crime planning guidelines". https://www.planning.wa.gov.au/dop_pub_pdf/docguidelines.pdf

⁴ Engineering ToolBox (2001). "Illuminance - Recommended Light Level". https://www.engineeringtoolbox.com/light-level-rooms-d_708.html

⁵ Main Roads WA (2018). "Lighting Design Guideline for Roadway and Public Space". <https://www.mainroads.wa.gov.au/BuildingRoads/StandardsTechnical/RoadandTrafficEngineering/RoadsideItems/light/Pages/lighting-design.aspx>

Lux survey and mapping technique

A surveying vehicle fitted with lux lighting and Global Positioning System (GPS) sensors drives a given route to accurately capture existing lighting readings. The results are then compared against local lighting standards to determine the lighting performance. The data can be used to create visualisations and graphics, as well as being uploaded into asset management systems to inform repair, maintenance and upgrade investment priorities. This technique is typically used to survey lighting quality along roads, its use for the assessment of lighting along shared paths is relatively novel.

The four routes surveyed (Table 1) were selected because they:

- > form part of Perth's strategic shared path network;
- > are well utilised by cyclists and pedestrians; and
- > serve transport hubs and residential catchments where improved lighting could help to encourage more people to consider walking and cycling for recreation or commuting.

The surveys were predominately undertaken by driving along the paths over three consecutive nights in December 2017. Due to width restrictions, a four-wheeled bicycle (or 'quad-cycle') was also used to survey a small section (approximately 1.6km) of the Swan River route on another night.

Route	Route description	Approx. distance (km)	Responsible authority
Kwinana Freeway PSP	Mounts Bay Road and Rowley Road	25	Main Roads WA
Mitchell Freeway PSP	Aberdeen Street and Burns Beach Road	29	Main Roads WA
Mounts Bay Road RSP	Mounts Bay Road (near Point Lewis Rotary) and Winthrop Avenue	3.7	City of Perth
Swan River RSP	Circulating the Swan River between the Narrows and Causeway bridges	9.3	City of Perth, City of South Perth, Town of Victoria Park
Total		67	

Table 1 » Surveyed routes⁶

Safety management

RAC implemented approved Traffic Management Plans (TMPs) for each route to safely manage any interactions with path users, as well as with other traffic when entering and exiting the paths from the road. The surveys were:

- > scheduled to avoid major events and road works, and undertaken between 10pm and 4am to minimise interactions with path users;
- > advertised via a social media 'Public Service Announcement', and through distribution of information via key stakeholders and cycling groups to ensure path users were aware of the presence of vehicles;
- > undertaken using a road legal vehicle driven at a maximum speed limit of 30km/hr, and in accordance with the current road rules; and
- > undertaken using a two-vehicle mobile convoy arrangement (Figure 1), with a traffic management vehicle travelling ahead of the survey vehicle to provide advanced warning to oncoming path users.

The results were compared against the relevant lighting 'categories' for shared paths (i.e. P2 or P3), outlined in *AS/NZS 1158.3.1:2005 - Lighting for roads and public spaces*, to determine the level of compliance (based on proportion of the routes where the lux readings do or do not meet the required standard).

What were the key findings?

Of the approximately 54 kilometres of PSP network surveyed, just over 65 per cent was deemed to be 'non-compliant' with the required P2 lighting standard. The 13 kilometres of RSP network surveyed showed a higher level of compliance, with under one-third (around 32 per cent) being non-compliant with the P3 lighting standard.

The Kwinana Freeway PSP had the highest level of non-compliance, with around 77 per cent of lighting along the route not meeting the P2 standard. While the Mitchell Freeway PSP showed better results, over half (55 per cent) of the route was still deemed to be non-compliant.

When it comes to the RSP routes, the Mounts Bay Road route had the highest level of compliance (only around 12 per cent was non-compliant) while the 'Swan River loop' displayed varying lighting performance.



Figure 1 » Surveying in progress

⁶Certain sections of these routes could not be surveyed due to vehicle access constraints. All distances have been rounded to the nearest decimal point.

Route and sections	Length (km)	Non compliance (per cent) ⁷
Kwinana Freeway PSP		
Cranford Avenue to Mounts Bay Road ⁸	9.3	81.94
Rowley Road to Selway Road	15.8	74.48
Route sub-total	25	77.24
Mitchell Freeway PSP		
Cayley Street to Doveridge Drive	12.6	76.42
Hepburn Avenue to Burns Beach Road	11.8	46.73
Aberdeen Street to Goody Close	4.5	17.68
Route sub-total	29	55.15
PSP sub-total	54	66.53
Mounts Bay Road RSP		
Mounts Bay Roads to UWA	3.7	11.9
Swan River RSP		
Swan River RSP – Riverside Drive to Douglas Avenue via the Causeway	3.9	57.44
Swan River RSP – Riverside Drive to Ellam Street via the Narrows Bridge	3.9	32.24
Swan River RSP – Ellam Street to Douglas Avenue	16	18.27
Route sub-total	9.3	40.20
RSP sub-total	13	32.22
Total - combined PSP and RSP	67	58.94

Table 2 » Level of non-compliance



⁷ Weighted averages have been applied to the data to calculate the sub-totals and combined total. All numbers have been rounded to the nearest two decimal points.
⁸ The PSP on Mount Henry Bridge could not be surveyed due to vehicle access constraints.

Case study – Canning Bridge

Location

Approximately 900m of the Kwinana Freeway PSP was assessed in more detail to identify recommended lighting improvements / maintenance priorities and associated costings.

This section carries around 2,000 daily users, connects with the Canning Bridge RSP and provides access to Canning Bridge train station.

Issues

- > The northern side of Canning Bridge was deemed to be 64 per cent non-compliant against P2 standard (it has two dedicated lights for the underpass and 'spill' lighting from the Kwinana Freeway).
- > The southern side was 100 per cent non-compliant (it has no dedicated lighting and insufficient spill lighting).

Recommendations

The consultant's report recommends the installation of dedicated pathway lighting throughout the area, based on 5m high poles at 22m spacing⁹ (with 20w LED lights on each pole). The estimated cost is \$2,000 per pole, plus \$100/m for cabling¹⁰. This would equate to 40 light poles and 900m of cabling at an estimated total cost of \$170,000.



Figure 2 » Case study location (Kwinana Freeway PSP near Canning Bridge)



Figure 3 » Kwinana Freeway PSP: Cranford Avenue to Mounts Bay Road

⁹The height and spacing of lighting is in accordance with P2 standards. However lighting could be installed to be in accordance with local Main Roads WA standards (7m high at 25m spacing) by adjusting the wattage. Additional cost may be incurred.
¹⁰NB. Costs include contingency for unexpected service relocations. Costs may vary for the northern side if the two existing lights are in a suitable condition for use.

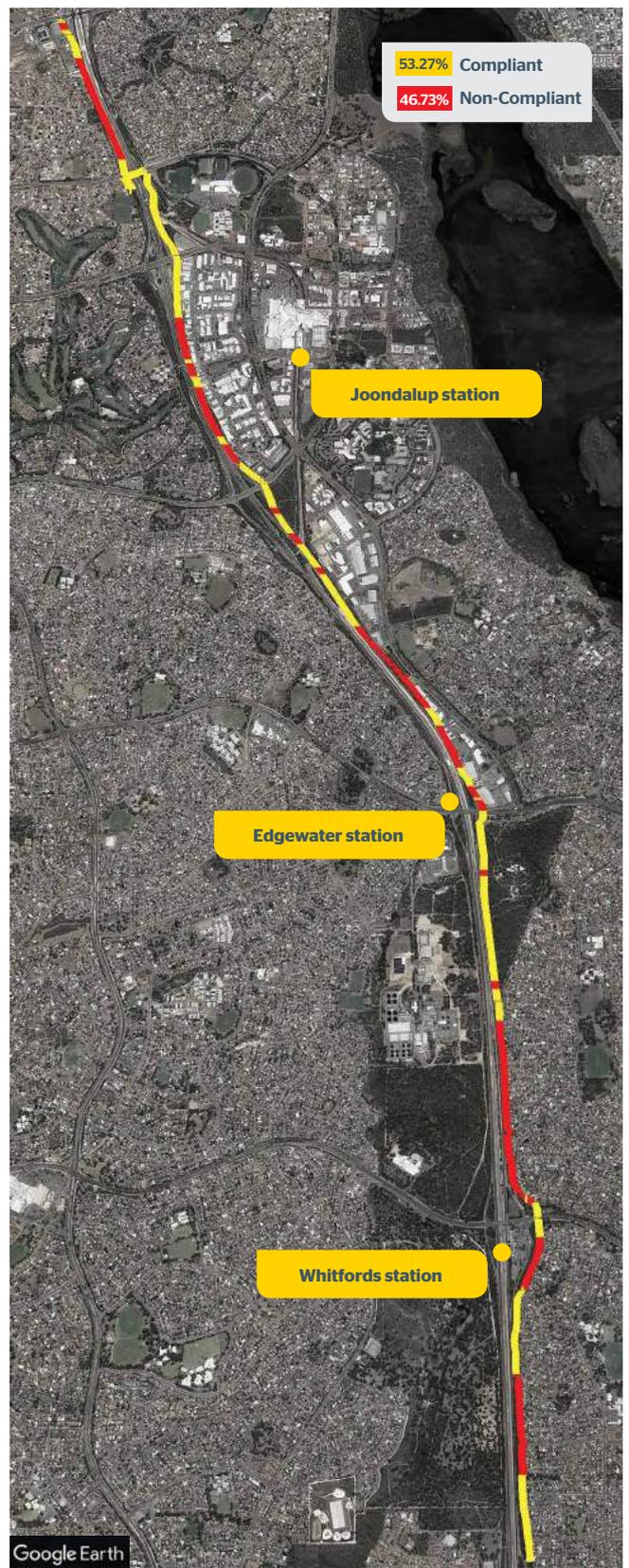
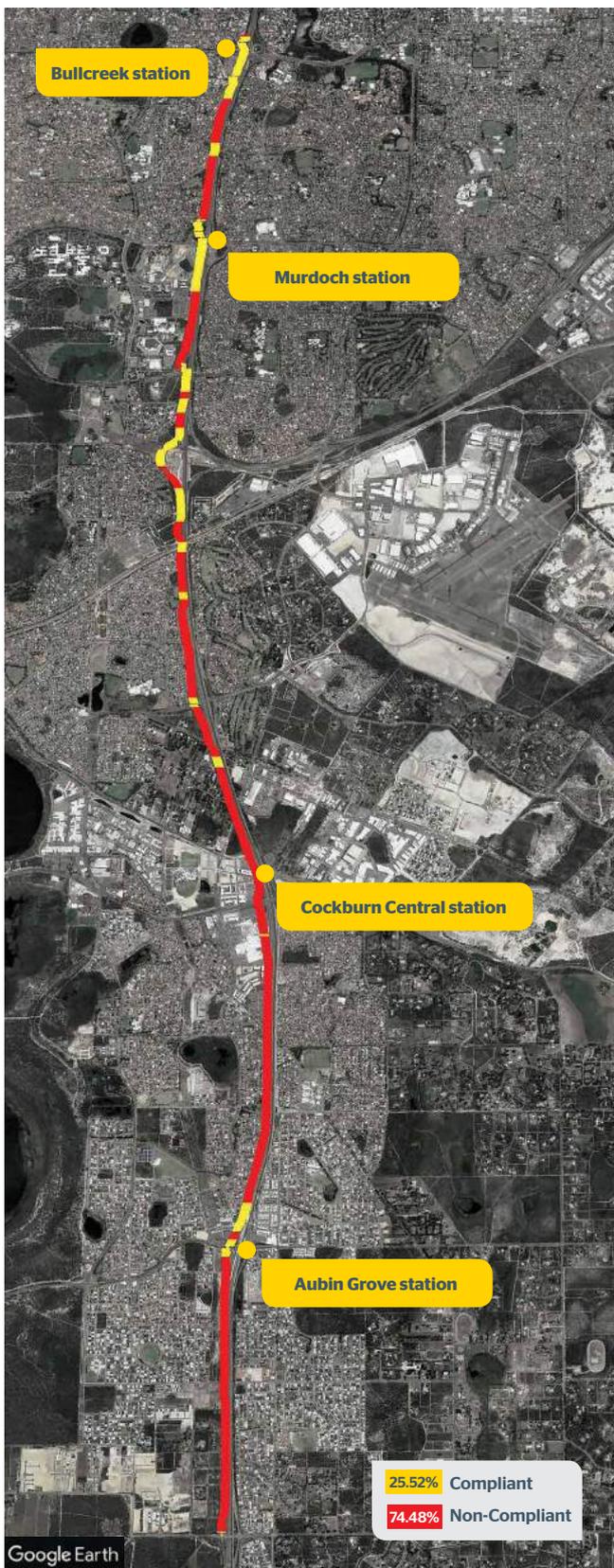


Figure 4 » Kwinana Freeway PSP: Rowley Road to Selway Road

Figure 5 » Mitchell Freeway PSP: Hepburn Avenue to Burns Beach Road

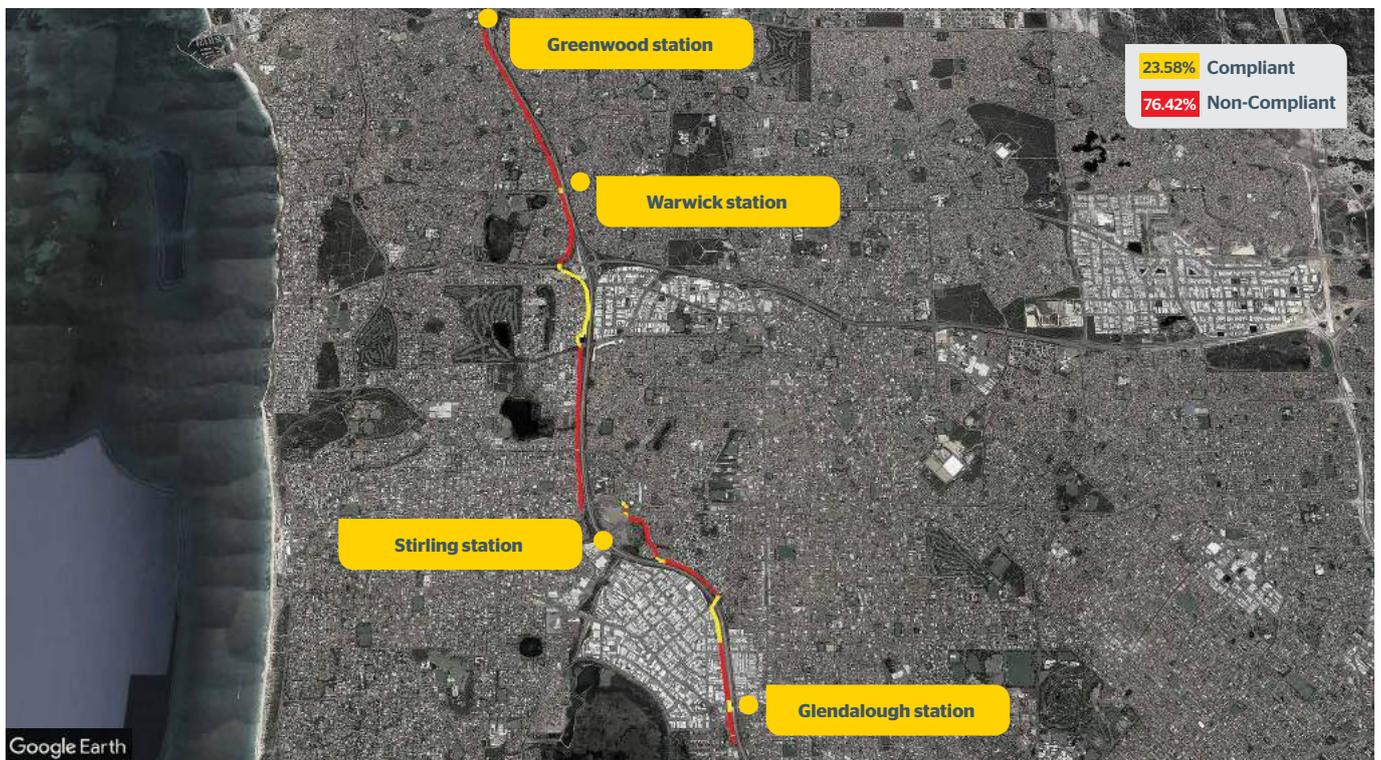


Figure 6 » Mitchell Freeway PSP: Cayley Street to Doveridge Drive



Figure 7 » Mitchell Freeway PSP: Aberdeen Street to Goody Close

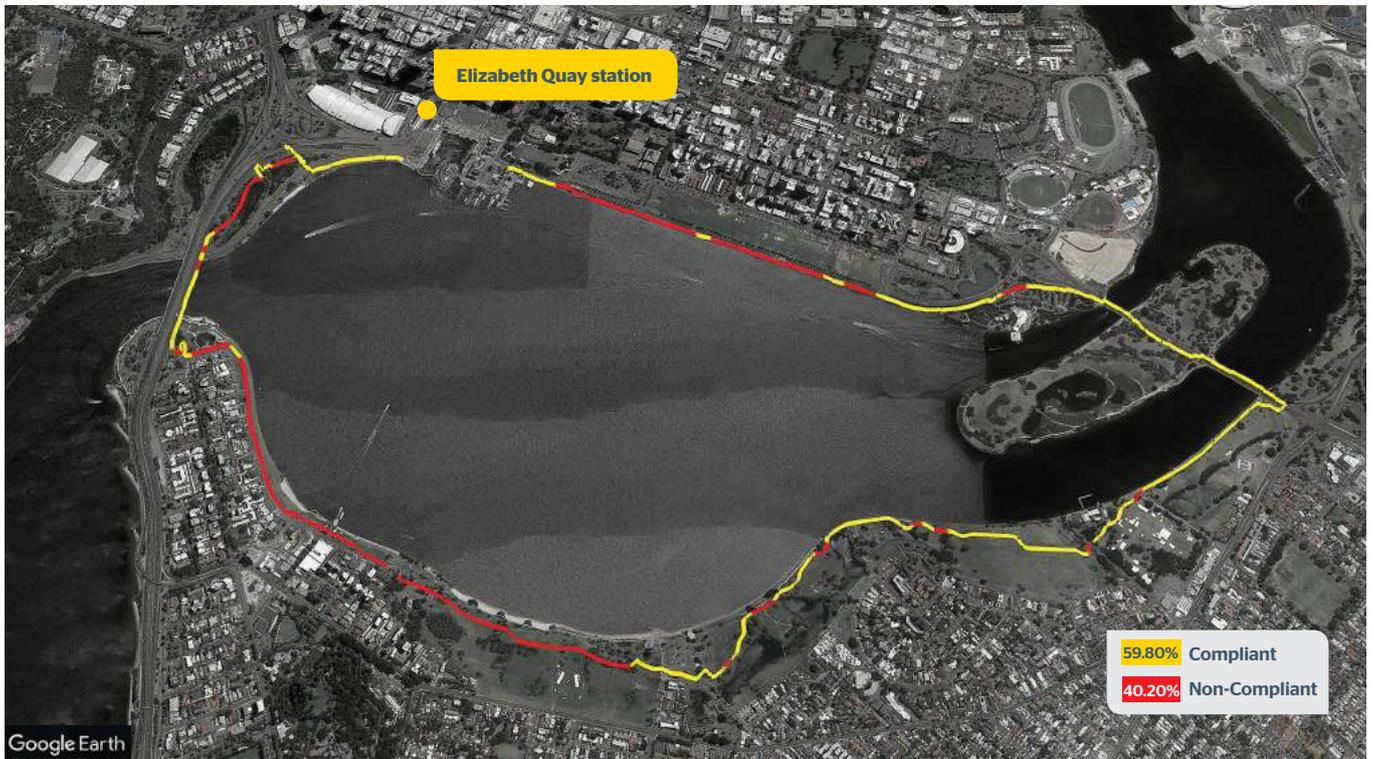


Figure 8 » Swan River RSP: Swan River Loop



Figure 9 » Mounts Bay Road RSP: Mounts Bay Road to UWA

Lighting the way

In the short-term, there are some opportunities for **'quick-wins'** to improve lighting quality along the shared paths, including:

> **Globe cleaning and replacement**

General maintenance of lighting infrastructure, such as cleaning or replacing the globes, could provide improved lighting quality for path users at a minimal cost. There were a number of locations where lighting was poor simply because the globe was broken. Globes that are replaced should be energy efficient.

> **Trimming overhanging trees**

There were many instances where tree canopies and foliage obstructed lights, impacting their coverage and performance. While trees perform an important function in providing natural shade from the harsh daytime sun and enhance the attractiveness of the routes, regular pruning could help improve the performance of existing lighting, such as along the Swan River.

State Government commitment to cycling

In 2017, the State Government committed \$129 million towards cycling to 2021. Around \$55 million will be allocated to filling gaps in the existing PSP network (chiefly within a 15 kilometre radius of the Perth CBD) and \$29 million towards grants for local governments, with the remaining \$45 million being invested in paths alongside new major road projects¹¹. The local government grants in particular may provide opportunities for path and lighting upgrades.

In addition to considering how lighting can be delivered as part of the planned shared path network expansions and upgrades, to enhance amenity and safety for path users, the State Government should consider:

- > **implementing the quick-wins** identified by this study;
- > **updating the [online hazard report](#)** form to include poor / damaged lighting as a hazard description and promoting this tool to the community;
- > **resourcing a lighting review of the broader PSP and RSP networks**, supplementing the findings of this study, to identify maintenance and upgrade priorities to ensure these are appropriately planned and budgeted for (this should be accompanied by an audit of surface quality to help inform prioritisation of more significant path upgrades);
- > **trailing and introduction of 'smart' path lighting solutions** to improve energy efficiency and performance across the network, as well as reducing ongoing maintenance requirements (this could include LED lighting, dynamic lighting that comes on when users are present¹² or establishing a Central Management System that can automatically detect lighting issues¹³); and
- > **increasing funding for maintenance and upgrades** of the existing shared path networks (particularly within the 15 kilometre radius of the Perth CBD).

About RAC

RAC works collaboratively with Government and other organisations to ensure our members and the community can move around our State safely, easily and in a more sustainable way.

We give back by reinvesting our profits for the benefit of our members through projects aligned to RAC's Mobility Agenda, such as this Shared Path Lighting Review and our Electric Bike Trials.

For more info please contact advocacy@rac.com.au



For the better

¹¹ Premier of Western Australia (2017), 'Major Boost to cycling for the future', <https://www.mediastatements.wagov.au/Pages/McGowan/2017/09/Major-boost-to-cycling-for-the-future.aspx>

¹² Bicycle Dutch (2018), 'Lights that switch on just for you', <https://bicycledutch.wordpress.com/2018/01/09/lights-that-switch-on-just-for-you/>

¹³ ACT Government Minister City Services (2018), 'Smarter streetlights to help cut emissions and increase reliability' https://www.cmtedd.act.gov.au/open_government/inform/act_government_media_releases/chris-steel-mla-media-releases/2018/smarter-streetlights-to-help-cut-emissions-and-increase-reliability