Government of **Western Australia**
Department of **Transport**

Empowering a thriving community

Western Australian Bicycle Network
Data and Monitoring Strategy

Executive Summary

The State Government wants to make it easier for Western Australians of all ages and abilities to walk, wheel and ride as part of their everyday journeys, and to feel comfortable, confident and safe in their experience.

Active travel is at the core of an integrated transport network and is essential to ensuring everyone can get around and access the things they need.

Monitoring of the Western Australian Bicycle Network is one of many important factors that informs the focus of State investment in the community.

The Department of Transport's (DoT) strategy for monitoring and evaluating the bicycle network is to collect and analyse data about who is riding, reasons for riding and where they ride, to help us ensure our investments have a positive impact, improving the lives of all Western Australians.

DoT regularly monitors activity on the bicycle network using quantitative and qualitative data sources to provide rich insights. The approach to monitoring, analysing and reporting on bike riding activity has been reviewed, improved, and innovations implemented over the past four years because of methodological review and validation studies and an increase in evaluative capacity at DoT.

Active travel is a priority across government

Developments in active transport policy, legislation and network planning have and will continue to influence the requirements of active travel monitoring in WA, including:

- The finalisation of the Long-Term Cycle Network (LTCN) for Perth and Peel (2020) and continued development and refinement of LTCNs across regional towns and centres.
- The emergence and legalisation of eRideables in WA (2021).
- Record investment by the State Government in construction of active transport infrastructure across Western Australia (2022).
- A successful Stage 1 Business Case to Infrastructure Australia for the increased investment in dedicated active transport connections that link to key strategic centres in Perth (June 2022).
- Upcoming publication of a state-wide active travel strategy, which will replace the WA Bicycle Network Plan.

These developments, and others, result in the need to consider different forms of active travel and eRideables, and people of all ages and abilities that walk, wheel and ride on the active transport network.

Active Travel refers to being physically active to make a journey, which can be for a variety of purposes such as transport, exercise, fun or recreation.

Walking and bike riding are the most common modes, but using a wheelchair, scooting, skating, running, paddling or using other assisted devices (such as an e-bike) are also included.

'Active travel' is used interchangeably with active mobility, active transport (often used to describe infrastructure or the network), and 'walk, wheel, ride'.

Contents

Introduction

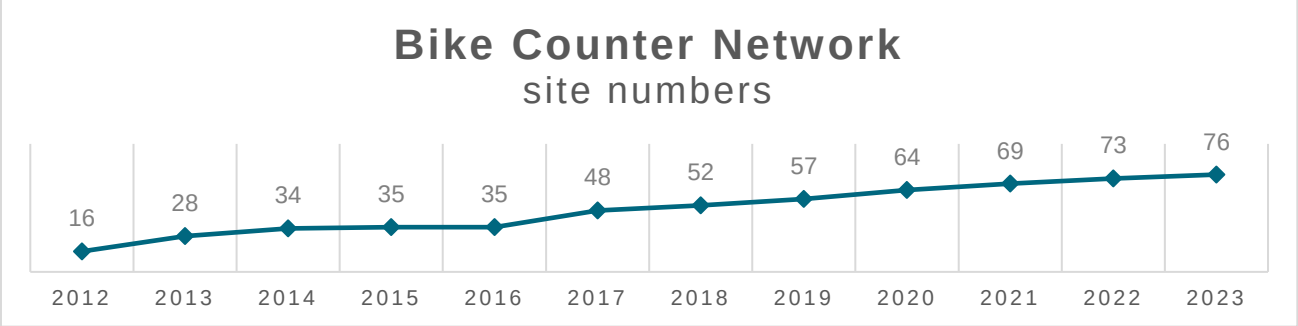
The focus on monitoring bike riding in WA was established in the 2014 WA Bicycle Network Plan, followed by the release of the WA Bicycle Network Counting and Monitoring Strategy, also in 2014[1].

The Strategy recommended a method to undertake consistent, comparable counting and monitoring of bike riding activity on the network using only permanent piezoelectric counter technology. The recommended approach to analysis of the counter data accounted for inconsistencies in the data set due to sites being off-line and the low number of comparable sites (figure 1).

The 2016 Implementation Plan[2] outlined a strategic approach to expanding the bike counter network over a four-year period from 2016 to 2019 to increase reliability of data, with 22 new sites delivered over that time. DoT has continued to grow the bike counter network using a consistent methodology, with a further 19 sites delivered between 2019 and 2023 (figure 1).

The updated strategy (this document) builds on the previous counting and monitoring approach and improves the breadth of data being collected beyond the counter network to include community survey data. A step change has occurred in the reporting and sharing of insights with stakeholders and the community.

Figure 1: Increase in bike counter site numbers between 2012 and 2023



The new State Government active travel strategy[3] due for release in 2023, will define a whole-of-state remit and strategic priorities for planning and investment in active travel programs and initiatives. With this expanded scope, WWRT will require an updated approach to data collection and monitoring requirements to better capture all those that walk, wheel and ride on the active transport network.

[1] CDM Research. 2014. *Western Australian Bicycle Network Counting and Monitoring Strategy*. Prepared for the Department of Transport. Perth, WA.

[2] WSP, Parsons Brinkerhoff. 2016. *Implementation plan for permanent counters on Perth's bicycle network*. Prepared for the Department of Transport. Perth, WA.

[3] DoT, 2023. WA Active travel strategy.

Reviews and Innovations to Bike Counting and Monitoring in WA (2019-2022)

Long-Term Cycle Network

In 2020, an LTCN for Perth and Peel was finalised, which defines an agreed primary, secondary and local network across Perth and Peel by state and local governments. Similarly, LTCNs are in development (or already exist) across regional WA through various Regional 2050 Cycling Strategies.

In response to the LTCN for Perth and Peel, a nuanced, high-level strategic approach has been implemented to monitor key annual trends in counts and user demographics, as well as patterns in the flux of movement across key parts of the network. This has involved logical site groupings based on user behaviour and data patterns that provide insight on the entire network over a 6-12-month analysis period.

Certain high-value priority projects delivered on the LTCN may still require a detailed pre and post construction evaluation.

Evaluation is a critical component of DoT's projects and initiatives, including the Principal Shared Path (PSP) Key Investment Program and Safe Active Street (SAS) Pilot Program[4]. Separate to this Data and Monitoring Strategy, these programs have project/program-specific evaluation frameworks that consider impacts, cost effectiveness and efficiency of project delivery.

Methodological review and validation studies

Several research methodological review studies[5,6] were undertaken after large increases in bike counts occurred in WA during the 2020 COVID-19 lockdowns. These increases were at sites that reflected 'suburban', 'picturesque' and 'regional' locations of the WA bike network, and large decreases were observed on the Perth CBD cordon. A summary of the three studies is available in Appendix One.

The advances in bike count data analysis and recommendations from the methodology review studies were adopted. The reports and dashboards produced using this revised methodology have provided valuable insights and have already informed planning decisions relating to the WA bike network and will continue to be referred to in future strategic projects.

[4] DoT. 2021. *Evaluation Projects.* Webpage content about DoT's Active Transport Evaluation Projects published by the Department of Transport. Perth, WA.
[5] DAA. 2020. *Cycling Trends in WA 2019 – 2020: Review of data availability and cleaning, with commentary on methodology and approach.* A report prepared by Data Analysis Australia for the Department of Transport. Perth, WA.
[6] AECOM. 2021. *Analysis and Reporting of Automatic Bike Riding Counter Data Methodology review.* A report prepared by AECOM for the Department of Transport. Perth, WA.

Current Data and Monitoring

DoT collects data to:

- guide sustainable active infrastructure investments in local communities across the State;
- undertake evidence based active transport planning;
- establish baseline data before infrastructure interventions; and
- monitor and evaluate transport projects.

DoT collects data to understand the usage of the **network** that is **quantitative** (bike counter data) and **qualitative** (community surveys).

Bike counter network

DoT continues to collect data from permanent piezoelectric bicycle counters[7] strategically placed across the metropolitan and regional bicycle networks, applying the learning from recent studies and reviews (Appendix One). Improving the monitoring of active transport movement at strategic locations across the LTCN is a key goal for DoT, and links to objectives outlined in the 2023 Transport Portfolio Strategic Framework, Connecting People and Places[8].

Performance indicators

There are four key performance indicators that are used to monitor and track progress of the WA bike network[9]:

1. Increased or sustained network level bike counts compared with the previous 12-month period.
2. Increased or sustained bike counts spread evenly across sub-regional areas of the network.
3. Increased or sustained weekly bike riding participation levels compared with the previous general population survey sample and measured in relativity to population growth.
4. Increased variety of users on the network, particularly women and people under 35 participating in weekly bike riding.

As of 2023, there are **76 permanent bike counters** across the WA bike network, primarily in the Perth metropolitan area, with **nine** located in strategic regional locations including Bunbury, Busselton, Geraldton and Karratha.

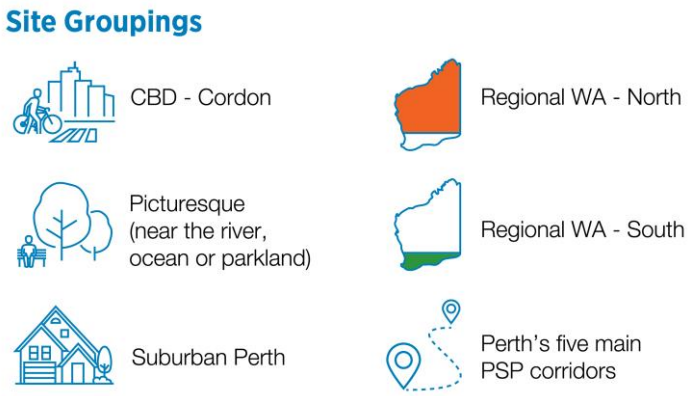
Bike counter placement – site groupings

DoT continues to install new counters following construction of major shared path or other active transport infrastructure projects, and prior to construction (where possible) for priority projects that are subject to evaluation.

[7] DoT 2021. Network monitoring and reporting (Bike counter data > *Counting and monitoring bike riding in WA FAQ*). An information sheet published by the Department of Transport. Perth, WA.
[8] Transport Portfolio, 2023. The Transport Portfolio Strategic Framework: Connecting People and places.
[9] Note: Where fluctuations occur, these are explored in reports in relation to known or suspected influential factors such as: PSP upgrades, closures, or detours; increased working from home or recreational use of the network during the pandemic associated lockdowns, etc.

Revised analysis methodology now accounts for potential double counting that can occur on some parts of the primary network and relies on a minimum number of these counters being active during the analysis period.

DoT has regularly reported on the Perth CBD cordon of bike counters, which was set up to detect changes in bike riding in and out of the CBD. DoT has recently adopted additional bike counter groupings, based on locations and usage profiles, and is interpreting this data to inform decision making. These groups of sites are summarised as:



Bike counter insight reporting

DoT provides insight reports on bike riding network trends and patterns to the WA public and all key stakeholders. The purpose of the reports is to explore trends in bike trips across the network compared to previous financial year periods. Additional contextual insight is derived from weekday and weekend network changes, or changes in trips across the various site groupings.

The Making Tracks: Monitoring WA's bicycle network[10,11] insight reports are published on the DoT website.

Community surveys

DoT collects a wide range of sentiment and behavioural data to better understand people's attitudes, perceptions, and use of the bike network.

DoT collates the data from two types of general population surveys which measure the proportion and demographic of the population that ride a bicycle in a specified period (e.g., weekly, or monthly) specific to Perth and more broadly across WA.

Annual Perth metropolitan general population survey

Since 2020, DoT has funded an annual Perth metropolitan general population survey. The survey tool was refined over multiple iterations and piloted during the April 2020 Perth COVID-19 shutdown period. Rich insight has been obtained and reported on in addition to the improved bike counter insights that

[10] DoT. 2022. Network monitoring and reporting (WA Bike Network reports > *Making Tracks: Monitoring WA's bicycle network - 2021-22*). A summary report published by the Department of Transport. Perth, WA.
[11] DoT. 2022. Network monitoring and reporting (WA Bike Network reports > *Making Tracks: Monitoring WA's bicycle network - 2020-21*). A summary report published by the Department of Transport. Perth, WA

have been produced in recent years[12]. Additionally, these surveys collect a broader range of information such as motivations and attitudes towards bike riding, participation levels compared to other modes (including walking/running and eRideables), trip purpose, and the duration of time spent riding a bike for a transport or recreational trip.

National Walking and Cycling Participation Surveys

DoT supports the collection of state-wide population data through the bi-annual National Walking and Cycling Participation Surveys (NWCPS)[13]. The NWCPS data provides comparison to national and state averages, which can be tracked back over time to 2011.

Emergent sources of data

Many data sources are available that can detect peoples' active travel movements. Most, however, have focussed on the counting of bikes to a high degree of accuracy, and there are fewer technologies that can reliably detect people walking or participating in other active travel modes. DoT is currently determining which data sources will be the most useful and accurate for the ongoing and regular monitoring of network level active travel movement, whilst also being cost effective and durable. DoT is also investigating valid methods of correlating, triangulating, or comparing the data sources so that insights can continue to emerge over time with high reliability and accuracy. For example, a costly data source such as video, or a biased data source such as Strava, can produce consistent patterns that have a high correlation with parts of the piezoelectric bike counter network already in place.

The qualitative and quantitative data sources DoT has been investigating for use in network and area specific monitoring, including their potential insights and uses, are summarised in **Table 1.**

Strava Metro data

Strava Metro data is one such data source that DoT has reviewed. Strava counts were found to have a 20-40 per cent representation to the fixed counts on primary and secondary routes, where most of DoT's piezoelectric counters are located. Whilst this representation appears high, a comprehensive Perth correlation study has not yet been undertaken. DoT has, however, used Strava Metro as a secondary source to support the evaluation of newly delivered PSPs where correlations between fixed counts and Strava are highest. Several studies (now cited in the updated Australian Transport and Planning Guidelines for Active Travel - M4) have found that Strava Metro data bears a strong correlation (R^2 >.75)[14] with fixed bike counters located on primary and secondary corridors.

[12] DoT. 2021.Network monitoring and reporting (WA Bike Network reports > *Perth Bike Riding: 2020 data insights.* A summary report published by the Department of Transport. Perth, WA.

[13]CWANZ. 2021. *National Walking and Cycling Participation Survey 2021: Western Australia.* A report prepared by CDM Research for Cycling and Walking Australia and New Zealand. Melbourne, Australia.

[14] ATAP. 2023. *The Australian Transport Assessment and Planning (ATAP) Guidelines: Mode Specific Guidance M4 Active Travel– Background Report.* A background report prepared for the 2023 update to the ATAP Guidelines Suite for the Commonwealth of Australia. Canberra, Australia.

Table 1: A summary of the emergent data sources for active transport monitoring that DoT either currently utilises or has under investigation

Data source	Description	Potential insights	Potential uses
General population surveys	Annual surveys with large sample of a diverse yet representative sample of people from across the Perth metropolitan area.	Frequency of travel using bike, walk, or eRideable. Trip purpose. Attitudes towards bike riding. Barriers and motivators. Demographic information.	Market segmentation: comparison with count data insights and better understanding of types and proportion of people making which trips on the network and how often. Consideration of network improvements to increase active travel use and diversity of users.
ABS data	Census data collected every 5-years from the australian population. Census day, firstTuesday in August, is not a seasonally attractive day for bike riding and bike mode share may be misrepresentative.	Journey to work by mode. Bike ownership per household. Demographic information.	Demand estimation: correlation with quantitative bike count data to infer potential for bike riding uptake in a location of interest.
Strava Metro	Mobile phone activity tracking app – voluntarily provided by users of the app and deidentified.	Longitudinal, daily trip data on bicycle and pedestrian trips, and more recently eRidebale trips. Data can be analysed in aggregate for the network or at specific path sections of interest. Origin and destination information is available for most primary and secondary routes.	The data is skewed towards certain types of 'users' but could be normalised through correlation with piezoelectric count data. Data could be correlated with daily or weekly average count data (from bike counters, videos, or other) to understand use patterns on specific routes or sections of the network that are of particular interest.
Ride share usage data	Ride-share companies sharing their de-identified eRideable hire records.	Number of trips per available eRideable per population catchment size. Can compare data across cities / locations.	The data is skewed towards certain types of 'users' but could be normalised through correlation with piezoelectric count data. Data could be correlated with daily or weekly average count data (from bike counters, videos, or other) to understand use patterns on specific routes

Data source	Description	Potential insights	Potential uses
			or sections of the network that are of particular interest.
Video studies	Video cameras placed at selected locations along a route or around an activity centre. Usually done over three days, including two work/school days and one weekend day (e.g., Wednesday, Thursday, Saturday).	Video data provides an accurate count of all active transport users (pedestrian, eRider, bike), their travel directions and can be broadly grouped as adult or child.	Data could be correlated with Strava Metro and/or piezoelectric bike count data to understand use patterns on specific routes or sections of the network that are of particular interest.
Super Tuesday manual counts	Manual counts of bikes and eRideables at certain locations around the Perth CBD taken on one day annually in March, across Australia. *Limited insight due to being a snapshot on one day only.*	Number of people using a bike or eRideable in Perth CBD compared to other CBDs in Australia. Proportion of bikes to eRideables.	Data could be correlated with Strava Metro and/or piezoelectric bike count data to understand use patterns on specific routes or sections of the network that are of particular interest.
Other movement sensors (e.g., light, acoustic, blue tooth)	Sensors placed adjacent to piezoelectric bike counters at key sites. *Lower cost option than videos and can provide a longer temporal dataset. However, accuracy is much less reliable.*	Could potentially be used for monitoring of pedestrians and differentiation of eRideables from bikes.	Data could be correlated with Strava Metro and/or piezoelectric bike count data to understand use patterns on specific routes or sections of the network that are of particular interest.
Incident data	Self-reported record of low-, moderate- and high-impact incidents that occur anywhere on the network (path or road) from any active transport user (bike, pedestrian or eRideable).	Number of low-, moderate- and high-impact incidents occurring each year. 'Black spot' incident identification mapping.	Consideration of network improvements to reduce hazards and conflict points and increase user safety.
Market sales data	Sales records of eRideables and bikes provided voluntarily from stores or centralised records.	Number of bikes or eRideables purchased in Perth and WA each year.	Indications of mode popularity by geographic location. Compare with bike / eRidebale ownership survey data.

Looking Forward

A holistic Active Travel Monitoring Strategy and Implementation Plan will be developed following the release of WA's new active travel strategy[15].

Potential future monitoring scenarios may include responsive monitoring of key destinations (e.g., activity centres and public transport hubs) and the detection of multiple active transport modes (e.g., bike riding, walking and eRideable use). It will also consider improvements in monitoring capabilities for walking and eRideables that can be triangulated with the relatively advanced methods for monitoring of bikes.

Monitoring improvement ideas for investigation

Essential to the development of usage targets that are linked to the State Government's strategic goals is the collection of baseline area-specific usage data. This is to estimate the daily profiles or annual volumes of people walking, wheeling or riding through a key destination or area of interest.

Baseline data provides useful information to estimate the wide-ranging potential benefits that come from investment in active transport infrastructure and behaviour change programs. For example, DoT recognises opportunities to improve the monitoring of active travel near key destinations around the Perth metropolitan area that are heavily trafficked by short car trips, and to continue monitoring activity after the delivery of an active transport investment.

Parallel to identifying these strategic monitoring opportunities, technical studies could be undertaken. These may include:

- testing the triangulation of several data sources to obtain valid holistic active transport usage estimates; and
- determining the optimal placement and implementation of the preferred counting technologies to improve the monitoring of overall and targeted active transport network activity.

[15] DoT, 2023. WA Active travel strategy.

Appendix One – Strategy Development Background Information

To inform development of the Western Australia Bicycle Network Data and Monitoring Strategy, DoT progressed two methodological reviews and one validation study between 2020 and 2021.

A validation study led by DoT's portfolio partner Main Roads WA to determine: 1) current bike counter accuracy, 2) whether it was possible to detect movements of cycling groups around the network, and 3) whether the permanent piezoelectric strip counters could singly be used to accurately detect eRideables or pedestrians. This study concluded that:

a. The technology was –
    i. 97 per cent accurate in detecting single bike counts
    ii. 92 per cent accurate in detecting a bike when it was passing among a group of four or more bike riders
    iii. not reliable to differentiate eRideables from bikes due to their wheelbases being too similarly sized
    iv. not reliable to detect pedestrians nor be used to estimate their number, due to the unpredictable way that a pedestrian typically crosses the sensors.
b. Future innovations would be required to capture pedestrian and eRideable active travel movements on the network.

1. A methodological review study[16] that suggested data cleaning and processing changes to improve the consistency and accuracy of bike count data analyses, and reporting of trends.
    a. The study determined these methodology improvements would be possible due to the increased size and scope of the counter network and reduced impact of sporadic site outages.
2. A second methodological review study[17] that explored the creation of additional sub-groupings of sites to derive greater insights about what bike activity changes were occurring on which parts of the network and how they compared or contrasted with changes on other parts of the network (e.g., increased bike riding in suburban locations around Perth and reduced bike riding in the Perth CBD).
    a. The study recommended nine new groupings of specific counter sites, minimum numbers of sites active in each period, and methods to mitigate impacts of double counting from multiple counters located along the radial arms of the network.
    b. The study also improved a method to analyse network level year-on-year growth or loss, whilst accounting for the annual increase in counts related to a growth in the numbers of counter sites across the network.
    c. The consultancy recommended 6-monthly reporting of network insights and provided an interactive PowerBI dashboard for the first two calendar and financial reporting periods included in the analysis.

[16] DAA. 2020. *Cycling Trends in WA 2019 – 2020: Review of data availability and cleaning, with commentary on methodology and approach.* A report prepared by Data Analysis Australia for the Department of Transport. Perth, WA.
[17] AECOM. 2021. *Analysis and Reporting of Automatic Bike Riding Counter Data Methodology review.* A report prepared by AECOM for the Department of Transport. Perth, WA.