Government of **Western Australia**
Department of **Transport**
and Major Infrastructure

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Assessing Safe Operating Speeds on 30 km/hr Streets Using 85th Percentile Speed Thresholds

Document control

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Amendment record

This document is reviewed to ensure its continuing relevance to the research that it describes. A record of contextual revisions is listed in the following table.

Page No.	Context	Revision	Date

About this document

This document forms part of the Planning and Designing for Active Transport in Western Australia (WA) guidance suite. It provides an explanation of how the 85th percentile speed metric was selected and interrogated for assessing vehicle speeds on streets included in the Safe Active Streets Pilot Program.

The content supports ongoing evaluation of low-speed mixed-traffic environments, by helping practitioners and decision-makers to understand the methodology used to determine acceptable operating speeds on safe active streets and the effectiveness of street design in achieving safer, lower-speed environments for all road users. The findings provide suggested 85th percentile speed thresholds to estimate effectiveness of 30 km/hr mixed-traffic environments.

This explainer can be read in conjunction with the Active Transport in WA Glossary, available as part of the guidance suite, to assist with understanding technical terminology and concepts referenced throughout this document.

1. Background

1.1. What is 85th percentile speed?

The 85th percentile speed is commonly used in traffic engineering as a proxy for how drivers 'naturally' behave on a road – on the assumption that most (i.e. up to 85 per cent) will choose speeds they perceive as safe. This speed profile was referenced by many road authorities up to the 1980s, as a key factor to determine what the posted speed limits should be for different road environments, arguing that 'natural' driving patterns were safer.[i]

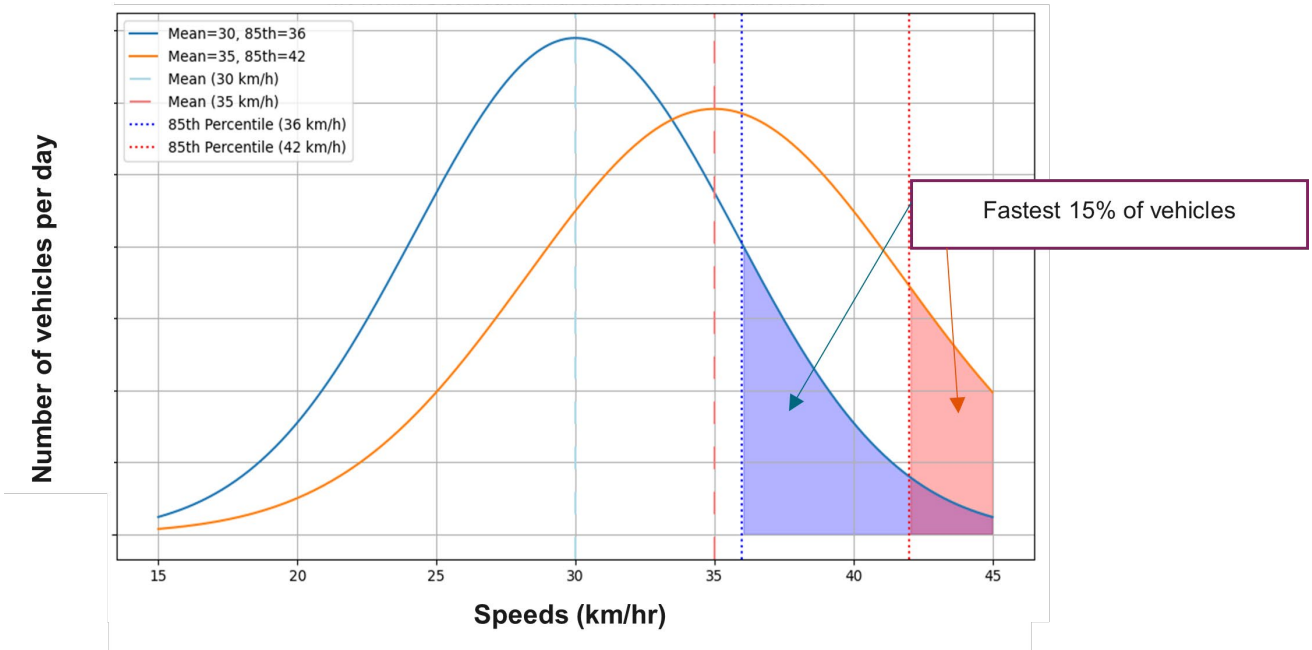
Substantial evidence now exists in support of setting speed limits lower than the 85th percentile speeds, for a variety of benefits. In addition to vehicle crash reduction, an increasing number of studies on low-speed urban environments or shared spaces show increased safety, physical and mental health benefits to vulnerable road users (VRUs). In such contexts, driver-selected speeds do not reflect safety needs or comfort levels for people walking, wheeling or riding.[ii,iii,iv,v]

1.2. Using 85th percentile speed for assessment

To assess the effectiveness of a lowered speed limit, the 85th percentile is a useful indicator of the variation in speeds occurring at the measurement site or along a route, whereas average speeds focus on central tendencies. If most drivers (as indicated by the 85th percentile) are travelling close to the posted speed limit, or not far above it, it indicates that the average speed is also performing well.

Conversely, it indicates that a relatively small proportion of drivers (15 per cent) are travelling at faster speeds. Setting a target to reduce the threshold at which those fastest speeds are beginning to deviate from the 'norm' could provide a helpful metric to assess the effectiveness of a speed reduction intervention or changed street environment. Figure 1 illustrates this concept. A higher than desirable 85th percentile could help to identify issues in road design, speed zone enforcement or driver education.[vi]

Figure 1: Conceptual illustration of how 85th percentile speeds can be used to assess route performance



2. Western Australian Research

2.1. Safe Active Streets Pilot Program

The Safe Active Streets (SAS) Pilot Program is a Department of Transport and Major Infrastructure (DTMI) initiative and a key action from the Western Australian Bicycle Network (WABN) Plan. DTMI worked with local governments between 2015 and 2023, to develop, trial and evaluate nine safe active streets, which applied local area traffic management treatments to encourage more people to walk, wheel and ride in their communities.[vii]

The posted speed for a safe active street is 30 km/hr. The nine routes in the SAS Pilot Program had their speed limits reduced from 50 km/hr. To support the desired reduction in speeds, each of the safe active street routes underwent re-design and installation of physical treatments using visible signage and constraints.

Speed measurement

Evaluation of the SAS Pilot Program involved a typical Before-After-Control-Intervention (BACI) approach. Vehicle counts and speeds were measured on treatment and control routes using pneumatic tube counters placed at multiple mid-block locations along each route, repeated before and after construction.

The speed measurements on each safe active street route reflect daily averages taken from multiple counter sites and averaged for each of two or more route segments. Route segmentation was influenced by length, physical context and design changes along each route. Twenty-nine route segments were defined in total across the nine routes.

2.2. Determining a base threshold for 85th percentile speeds

To determine a base threshold for 85th percentile speeds, DTMI considered variations in average speeds and the potential effect of pneumatic tube placement and calibration error on recoded speeds.

Ideally, average speeds should be at or below the posted speed limit of 30 km/hr for a safe active street. Research indicates however, that many drivers use posted speed limits as a target rather than specific determinants of compliance.[viii] Noting the likely variation within speed samples, an upper limit for average speeds on safe active streets was estimated by considering natural variability around the mean. A review of average speeds on all safe active street route segments, after speed-limits were reduced to 30 km/hr, found a margin of error of +/- 1.4 km/hr.

Instrument calibration effects were also considered, to account for the error margin inherent due to pneumatic tube site installation.[1] A review of the accepted site installation error for temporary pneumatic tube counters found estimates of +/- 2%, based on daily averages and +/- 4% for individual vehicles.[ix,x,xi] Using this information, DTMI accepted a variation of +/- 0.6 km/hr (two per cent of the posted speed), applied to daily average speeds detected on each route segment.

Therefore, the base threshold for 85th percentile speeds reflected an upper range for average speeds on the safe active street routes, and was calculated as: 30 km/hr + 1.4 km/hr + 0.6 km/hr = 32 km/hr.

[1] Note: pneumatic tube counters operate by sensing the compression of air within a looped tube placed at a specific distance apart on the road surface. Calibration is affected by the exact parallel placement of either side of the looped tube.

2.3. Assessing safe operating speeds in 30 km/hr mixed-traffic environments

To assess effectiveness of the lowered speed limits and changed street conditions of safe active street routes on people's driving behaviour, DTMI identified an acceptable operating range and upper bound for 85th percentile speeds.

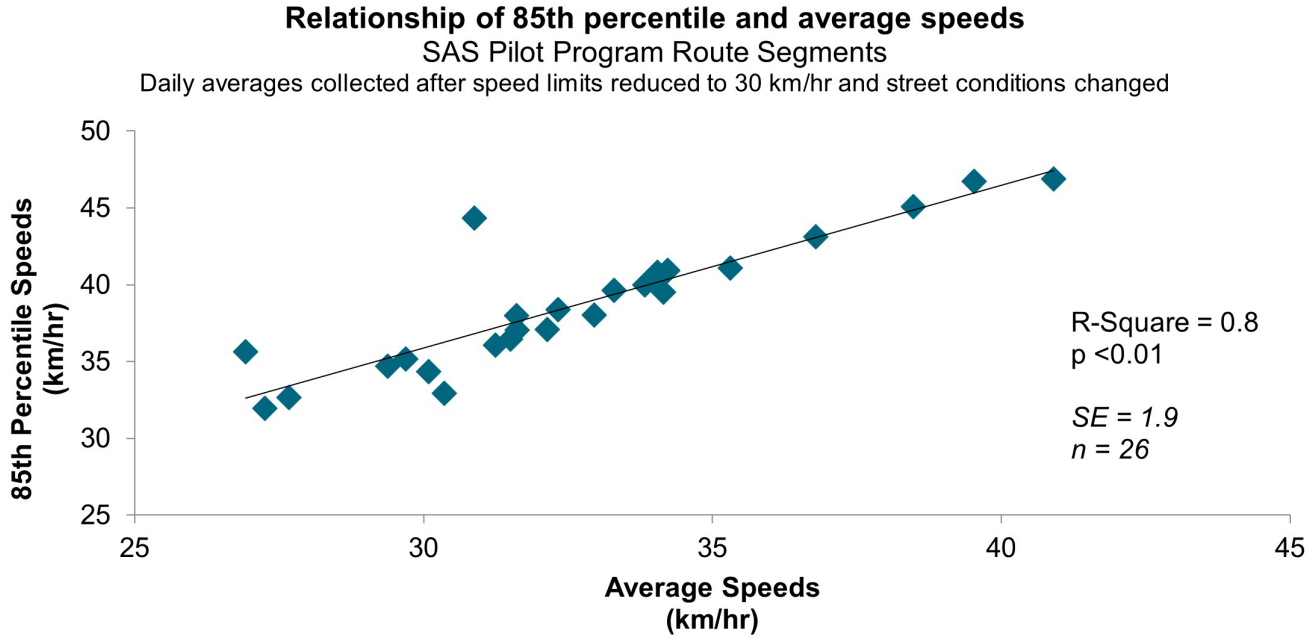
Analysing relationships between average speeds and 85th percentile speeds

Operating ranges were determined by analysing the relationship between average speeds and 85th percentile speeds on the data from SAS Pilot Program route segments,[2] measured after construction.

Regression analysis found a statistically significant strong correlation (r = 0.8) between 85th percentile speeds and average speeds, as illustrated in Figure 2.

The mean difference between speeds was 6 km/hr, with a standard error of 1.9 km/hr.

Figure 2: Regression analysis and summary statistics of the relationship between average speeds and 85th percentile speeds on safe active street route segments



[2] Note: three route segments were not included in the regression analysis due to missing measures of daily average speeds – at those sites only 85th percentile speeds were collected.

Operating thresholds for 85th percentile speeds

Using this information, the operating thresholds for 85th percentile speeds could be established as outlined in Table 1 and illustrated in Figure 4.

Table 1: Data derived thresholds for 85th percentile speed assessments of 30 km/hr safe active streets (Source: DTMI analysis of SAS Pilot Program data, 2025)

85th percentile speed thresholds	Rationale	Value calculation
≤32 km/h	Below upper range for average speeds on the safe active street routes.	**30 km/hr** + 0.6 km/hr (instrument calibration) + 1.4 km/hr (within one margin of error of average speeds)
32.1 to 38.1 km/h	Within the mean variation of 85th percentile speeds above average speeds.	**32.1 km/hr** + 6.0 km/hr (mean difference between 85th percentile speeds and average speeds)
38.2 to 40.1 km/h	Within one margin of error above an acceptable variation for 85th percentile speeds compared with average speeds.	**38.2 km/hr** + 1.9 km/hr (within one margin of error of acceptable 85th percentile speeds)
40.2 to 42 km/h	Within two margins of error above an acceptable variation for 85th percentile speeds compared with average speeds.	**40.2 km/hr** + 1.9 km/hr (one margin of error above an upper bound of 85th percentile speeds)
> 42.1 km/h	All speeds greater than two margins of error above an acceptable variation for 85th percentile speeds compared with average speeds.	**> 42.1 km/hr** = Outside of a normal range of variation and error.

Validation with other data sources

These thresholds were compared with data from all treatment and control routes in the SAS Pilot Program, which indicated a trend towards increased active transport use when most vehicles (i.e. 85 per cent) were travelling at lower speeds, and minimal or no change to active transport use when more vehicles were travelling at faster speeds along a route (Figure 4). Data also showed a reduced number of vehicles using the route segments when these lowered speeds were being complied with by most motorists.[xii]

These associations are consistent with findings from the UK, where lower 85th percentile speeds were reliable indicators of improved perceived safety and comfort of pedestrians and bike riders.[xiii]

The route-level reports for each safe active street included in the SAS Pilot Program provide more detail on the 85th percentile speeds for each route segment. The various applications of design treatments and differences in context impacted the outcomes of user behaviour along each route. These reports discuss how route segments performed in relation to the operating thresholds for 85th percentile speeds, vehicle volumes, active transport use and safe active street design scores.

Figure 3: SAS Pilot Program evaluation derived operating thresholds for 85th percentile speeds applied to a hypothetical normally distributed dataset, based on a 30 km/hr speed-limited street environment.

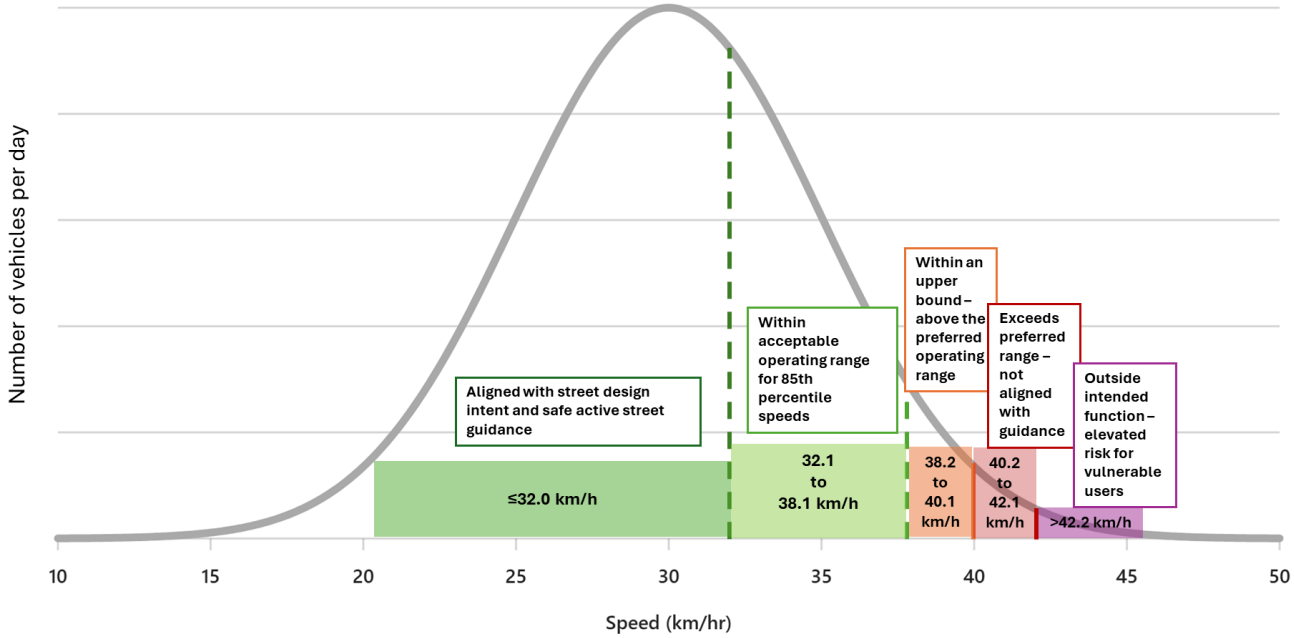
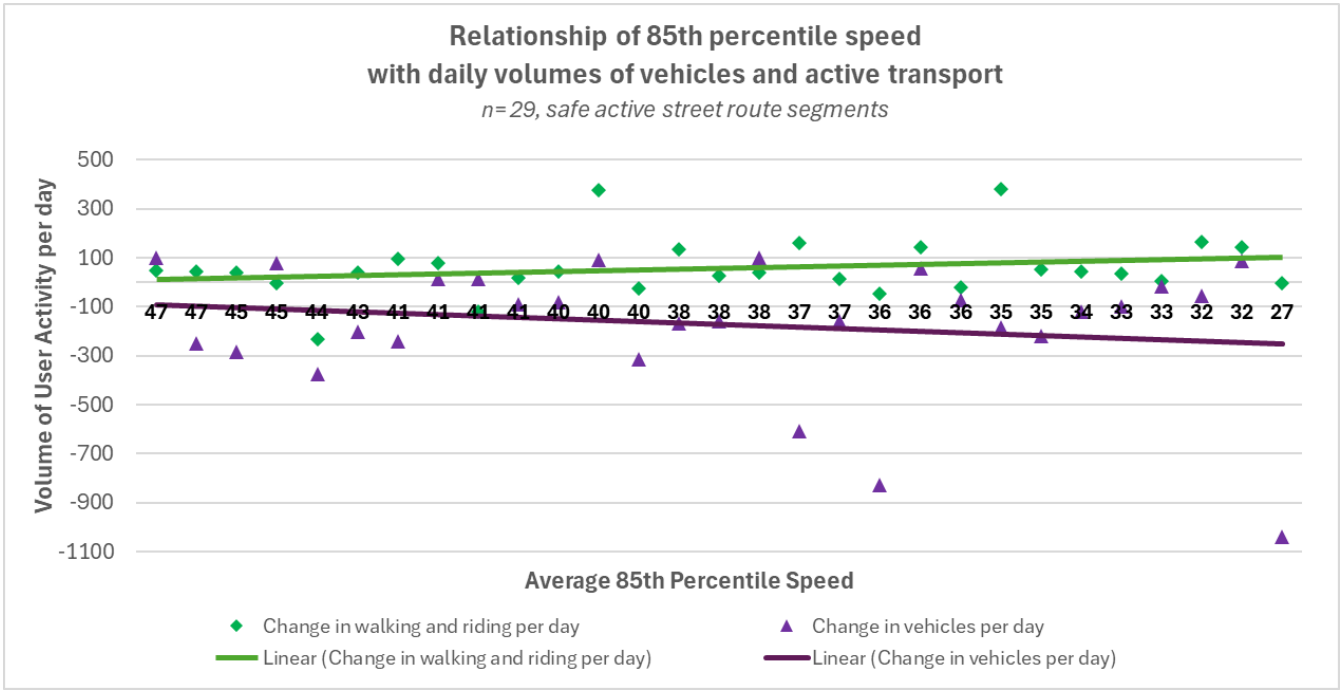


Figure 4: SAS Pilot Program data from after routes were constructed, showing a trend towards increased active transport use and reduced vehicle volumes when 85 per cent of vehicles were travelling at slower speeds.



3. Insights

When monitoring the impact of a speed reduction intervention in a shared space or urban environment, 85th percentile speed thresholds can be useful indicators to estimate effectiveness of the intervention and consider whether refinements should be undertaken.

3.1. Interpretation of 85th percentile speeds

The 85th percentile speed thresholds identified for use in the SAS Pilot Program evaluation, are summarised in Table 2, including how route and segment speed scores can be interpreted, and recommended actions that should be taken. Thresholds are not legal limits but provide a basis for evidence-informed decision-making and prioritisation.

Table 2: SAS Pilot Program evaluation derived 85th percentile speed thresholds for 30 km/hr streets (Source: DTMI analysis of SAS Pilot Program data, 2025)

85th percentile speed	Interpretation	Recommended action
≤32.0 km/h	Aligned with street design intent and safe active street guidance	No immediate action required. Continue to monitor. Reflects strong alignment with safe active street objectives and safe system guidance.
32.1 to 38.1 km/h	Within acceptable operating range for 85th percentile speeds	Monitor to determine if action is needed to maintain or reduce speeds. Consider performance of route segments – targeted interventions may be required to maintain or reduce overall route speeds.
38.2 to 40.1 km/h	Within an upper bound – above the preferred operating range	Review and monitor. Consider minor or localised interventions where context warrants (e.g. signage, crossing enhancements), especially on route segments with high VRU activity (e.g. school zones). Identify whether speeds are trending up or down, and if further design response is needed to target speed reductions at specific locations.
40.2 to 42.0 km/h	Exceeds preferred range – not aligned with guidance	Initiate design review. Develop and implement intervention options to reduce speed, particularly where VRUs are expected or encouraged.
> 42.1 km/h	Outside intended function – elevated risk for vulnerable users	Prioritise for review and intervention. Consult SAS design guidelines for measures to bring speeds closer to safe system thresholds. Escalate where part of a broader corridor issue.

Further considerations

Interpretation of 85th percentile speeds should consider the following:

- Seasonal consistency in sampling for before and after studies
- Sampling duration and potential for day-of-the-week effects
- Segment-level differences along the route, including external conditions (e.g. key destinations)
- Repeat sampling to determine if elevated speeds are isolated, occasional or systemic.

4. Conclusion

These findings support the ongoing evaluation of mixed-traffic environments including safe active streets and low-speed shared zones. Specifically, that the 85th percentile speed thresholds proposed in this paper can be used to estimate effectiveness of 30 km/hr mixed-traffic environments.

Resources and information to support evaluations are available within DTMI's Active Transport web pages, including the Planning and Design Guidance suite[xiv] and Evaluation, Monitoring and Reporting pages.[xv]

5. References

[i] Austroads. 2024. *Guide to Road Safety Part 3: Safe Speed*. Prepared by Austroads. Sydney, NSW.

[ii] BN. 2024. *Victoria Walks: Safer Urban Speed Limits, Position statement.* Prepared by Bicycle Network. Vic.

[iii] Lawrence, B., Thompson, L., Newstead, S., Oxley. J., Fildes, B. 2020. *Final report of the 30 km/h speed limit trial evaluation in the City of Yarra.* Prepared by the Accident Research Centre, Monash University. Melbourne, Vic.

[iv] Arias, D., Ederer, D., Rodgers, M., Hunter, M., Watkins, K. 2021. *Estimating the effect of vehicle speeds on bicycle and pedestrian safety on the Georgia arterial roadway network.* Accident Analysis & Prevention, Volume 161.

[v] NACTO. 2017. *Urban Street Design Guide: A blueprint for designing 21st century streets. An* association of North American cities and transit agencies. USA.

[vi] MetroCount. 2023. *Resource Library: The 85th Percentile Speed*. Prepared by Metro Count. Perth, WA.

[vii] Department of Transport and Major Infrastructure. 2025. *DTMI – Active Transport webpages: Safe Active Street Pilot Program*. Government of Western Australia. Perth. WA.

[viii] Giles, M. 2004. Driver speed compliance in Western Australia: a multivariate analysis. Transport Policy. Volume 11, Issue 3: 227-235.

[ix] Austroads. 2020. *Guide to Traffic Management Part 3: Transport Study and Analysis Methods*. Prepared by Austroads. Sydney, NSW.

[x] MetroCount. 2023. *Resource Library: Speed Accuracy*. Prepared by Metro Count. Perth, WA.

[xi] Main Roads Western Australia. 2025. *Personal Communication from MRWA Traffic Data Manager*. Government of Western Australia. Perth, WA.

[xii] Department of Transport and Major Infrastructure. 2026. *Safe Active Streets Pilot Program: Final Report*. Government of Western Australia. Perth. WA.

[xiii] Transport for London. 2019. *Achieving lower speeds: the toolkit*. A report prepared by Transport for London. UK.

[xiv] Department of Transport and Major Infrastructure. 2026. *DTMI – Active Transport webpages: Planning and Designing for Active Transport*. Government of Western Australia. Perth. WA.

[xv] Department of Transport and Major Infrastructure. 2026. *DTMI – Active Transport webpages: Evaluation, Monitoring and Reporting*. Government of Western Australia. Perth. WA.