

Sharrow Markings

Best Practice Guidance Note

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TRANSPORTATION SPECIALISTS

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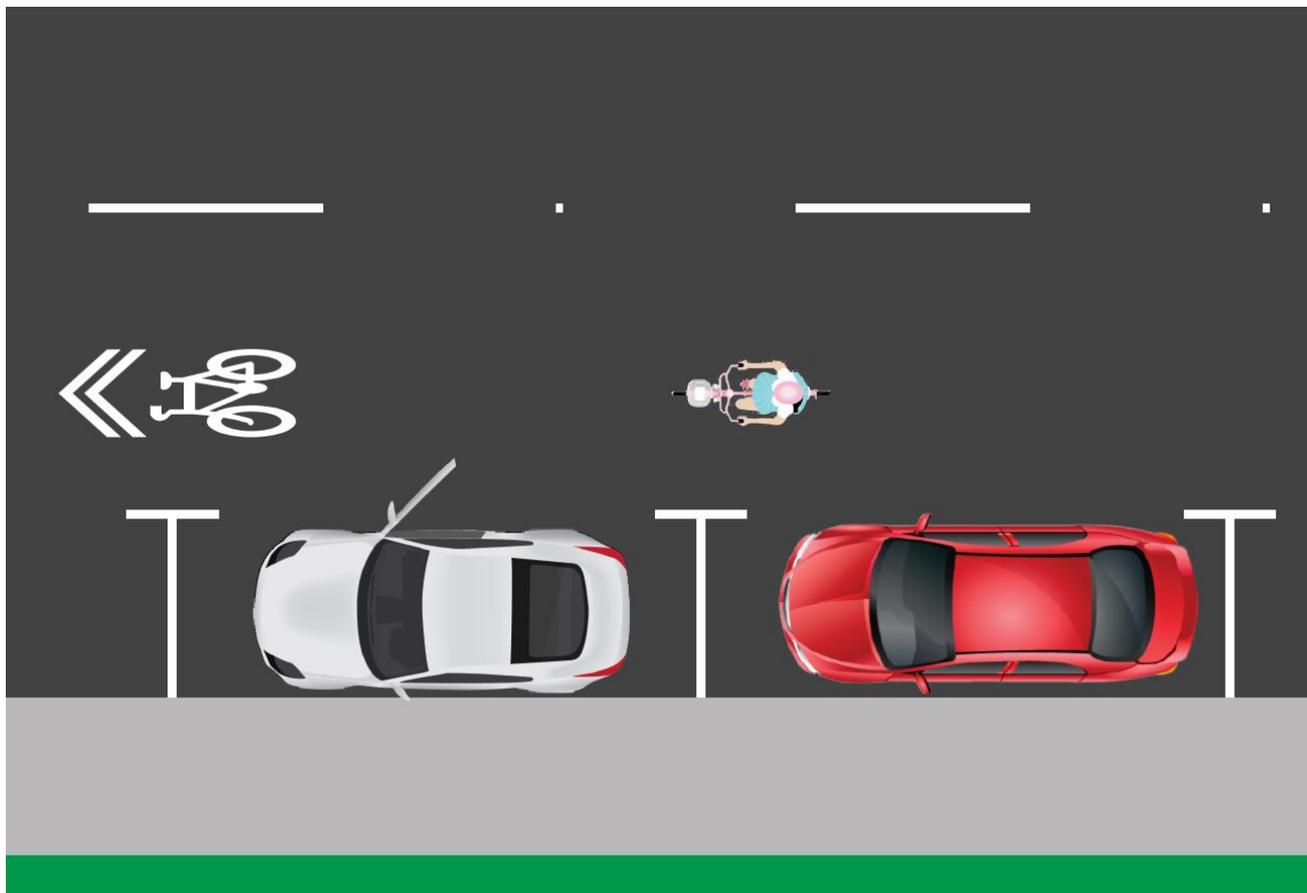
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This Best Practice Guidance Note provides guiding assistance for the implementation of shared lane markings, commonly referred to as cycle sharrow markings (sharrow markings). Sharrow markings are anticipated to become legal road markings, for use on New Zealand roads, in mid-2016. An artist's impression of sharrow markings is illustrated in Figure 1 below.

Figure 1: Artist's Impression of Sharrow Marking



BACKGROUND

Sharrow markings have been used internationally as an on road marking since 1993 to indicate the likely presence of cyclists to motorists. The initial purpose of sharrow markings was to provide an indication of on-road designated cycle routes where formal cycle lanes were deemed unsafe or not practical as well as increasing the awareness for drivers as to the presence of cyclists. Sharrow markings are used internationally in the United States of America (USA), Canada, Australia and Europe.

The possible application of sharrow markings on New Zealand roads was investigated in 2007¹ and considered further in a review of cycle signs and markings in 2011.² Sharrow markings were subsequently trialled in five New Zealand cities in 2014.³

¹ File notes prepared for Auckland City Council by Sinclair Knight Merz, 2007:

² Review of Cycle Signs and Markings, report prepared by ViaStrada Ltd. December 2011:

³ A summary report of five regional trials was prepared for Auckland Transport by Flow in June 2015. The summary report is available upon request.

International Experience

A review of the international use of sharrow markings, specifically referencing the USA and Australia, found that applying sharrow markings reduced the number of people riding on the footpath while increasing the separation between cyclists and parked vehicles (from 80 - 100 mm). Furthermore, the distance between cyclists and cars in the vehicle lane (vehicles overtaking the cyclist), increased by more than 600 mm; this improved cyclists' perception of safety.

Australian research⁴ focused on the application of sharrow markings on slow-speed local roads where cyclists were encouraged to 'take the lane'. Recommendations from this research include the use of cycle sharrow markings at single lane roundabouts and on streets that provide parallel parking but do not provide enough width to provide a dedicated cycle lane. Australian research also suggests that sharrow markings should not be used at greenfield developments or on roads where traffic volumes or vehicle speeds are such that sharing the lane becomes unsafe and dedicated cycle infrastructure is a more appropriate treatment.

National Trials

Trials for the use of sharrow markings were undertaken by five New Zealand road controlling authorities in 2014, example trial sites in Auckland and Wellington are shown in Figure 2 below. While variances are noted between the trial findings, it is broadly concluded that the implementation of sharrow markings results in a shift in the lateral position of cyclists' towards the sharrow marking. This finding suggests that cyclists are 'taking the lane' when a sharrow marking is present on the road corridor. A reduction in vehicle speeds at many trial sites was also recorded. This is an important finding of the trials as reduced vehicle speeds are desirable to improve safety for cyclists and other road users.

Figure 2: Sharrow marking trial (Auckland)⁵



Sharrow marking trial (Wellington)⁶



⁴ "Evaluation of Shared Lane Markings for Cyclists", VicRoads, February 2013

⁵ Photo courtesy of Flow Transportation Specialists

⁶ Photo from Wellington City Council Cycle Symbol Road Marking Trial Report. Prepared For Wellington City Council by Opus

It is conservatively concluded that the benefits of sharrow markings include a small reduction in vehicle speed and a shift in the lateral position of cyclists' away from the kerb towards the cycle sharrow marking, thereby assisting cyclists to 'claim the lane'. While these benefits are acknowledged as slight, the low cost and ease of implementation mean the sharrow marking 'tool' can be considered good value for money and provide an additional instrument in overall planning for cycling.

WHAT IS THE PURPOSE OF SHARROW MARKINGS?

The purpose of sharrow markings is to indicate a shared traffic lane environment for people on bikes and motorists. The presence of sharrow markings can:

- ◆ Help reinforce that the carriageway is a valid place for cyclists to travel (reinforcing to other road users to act accordingly)
- ◆ Help to position cyclists on the street, clear of hazards like car doors and pinch points like kerb build outs and stormwater grates
- ◆ Help the cyclist 'occupy' the traffic lane when it is safe and appropriate to do so.

Figure 3: Sharrow Marking and Traffic Calming



IMPLEMENTATION

This Best Practice Guidance Note provides general guidance as to the positioning of the sharrow marking within the carriageway; however practitioners will need to use location-based professional judgement in all situations when determining the most appropriate placement of a sharrow marking.

Corridors identified for the implementation of sharrow markings should be selected within the scope and development of a wider cycle network rather than focusing on a single street or corridor. This will help to ensure sharrow markings are considered as part of a 'tool box' to develop the cycle network rather than a 'one off' treatment on an isolated corridor.

As with all cycle facilities, transport planners and engineers will need to use professional judgement when implementing sharrow markings. Roadway width, vehicle volume and vehicle speed are three critical factors when determining if sharrow markings are appropriate and/or practical to implement.

Where is it appropriate to implement a sharrow marking?

Sharrow markings are a tool that could be installed on an identified cycle route as part of an overall cycle network plan. Their placement on the corridor will depend on the carriageway configuration, lane widths, car parking provision, vehicle volume and speed and land use.

Existing cycle infrastructure generally consists of on-road cycle lanes, shared paths, off-road cycle paths and shared bus/bike lanes. These treatments are generally suited to routes that are identified as core components of the wider cycle network, from connections through parks and open space to arterial routes carrying higher volumes of traffic and/or experiencing higher vehicle speeds. Local roads and some collector roads carrying lower volumes of traffic are generally less likely to warrant dedicated cycle treatments that offer a degree of separation from general traffic; sharrow markings may be appropriate on these kinds of roads.

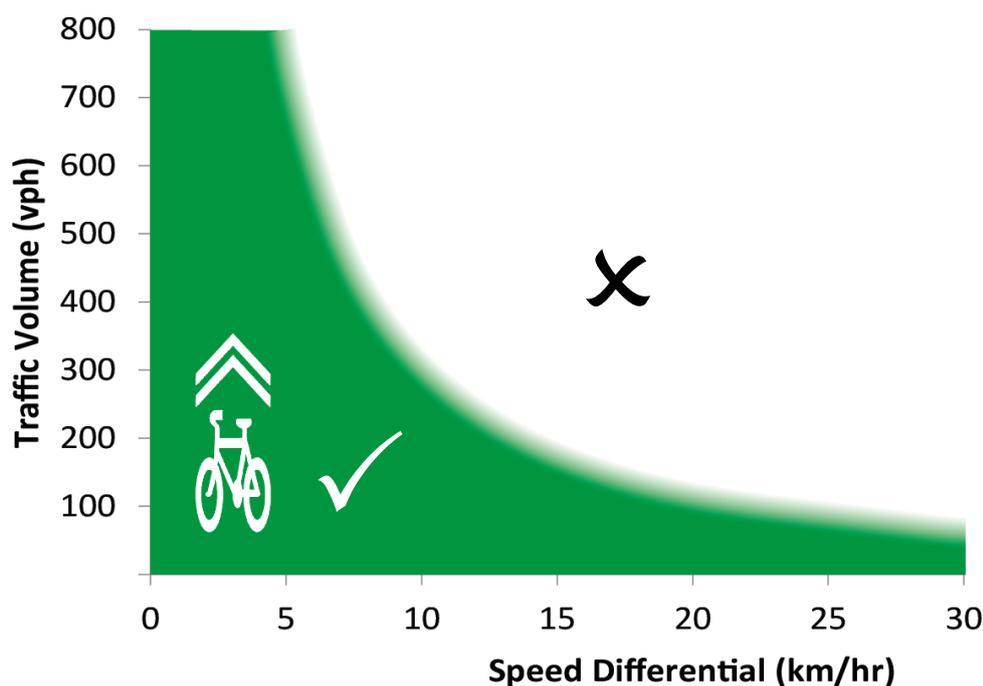
There are a number of themes that can be identified with regard to where sharrow markings are most appropriate to implement. The primary characteristics for the potential implementation of sharrow markings on a route are:

- ◆ Low vehicle volumes
- ◆ Low vehicle speeds
- ◆ The operational characteristics of the carriageway, including the available width, terrain and vehicle composition.

Sharrow markings have also been successfully trialled in city centres with lower posted speed limits (posted 30 km/h). While vehicle volumes can be moderately high (for example, less than 8,000 AADT) through city and town centres, a slower posted speed limit, for example 30 km/h, may result in a road environment suitable for sharrow markings; this is because cyclists can more easily travel at the same speed as vehicles in areas with lower operating speed. This in turn means that cyclists may feel more confident to 'own the lane.'

Note: speed reductions of 1-6 kph were observed during the New Zealand sharrows trial.

Figure 4: Traffic volume versus speed differential



Note: Mean cycling speeds are assumed to be approximately 15-25 km/hr on straight flat roads, 5-10 km/hr on a 5-10% climbs, and 30-50 km/hr on a 5-10% descent.

When is it not appropriate to implement sharrow markings?

Sharrows are intended for use on cycling routes, and have not been trialed for use as a standalone marking at isolated locations. As such, it is not recommended that sharrows be used at squeeze-points or roundabout approaches, for example, unless those features happen to be part of a cycling route and other cycle-specific markings, signs or more sharrows are used along that route.

Sharrow markings should not be implemented as a panacea on a corridor more suited to the implementation of dedicated cycle facilities. This may include corridors where the need for a cycle route has been established but that does not currently have sufficient road width to readily provide for dedicated cycle infrastructure possibly due to the presence of on-street parking.

A cycle route that is proposed for sharrow markings may be located parallel to an arterial route, offering less confident cyclists a safer route option; however, sharrow markings should not be viewed as an 'inexpensive alternative' to providing dedicated cycle infrastructure where it is needed. This is important so that sharrow markings are not misunderstood as being an appropriate substitute treatment for dedicated cycle infrastructure. Indeed, cycle sharrow markings are unlikely to be an appropriate option if dedicated cycle facilities are also being considered as an option for the same section of corridor.

Sharrow markings are not recommended for implementation on roads with actual travel speeds above 50 km/h except possibly on descents where speed differentials are relatively low.

Additional Considerations

A corridor providing marked or unmarked on-street car parking that is significantly underutilised at some or all times of the day has the potential to create uncertainty for cyclists and/or motorists if sharrow markings are implemented; this is because, as stated in the New Zealand Road Code,⁷ cyclists should generally keep 'as near as practical' to the left side of the roadway. In the absence of kerbside parked vehicles, a sharrow marking may be viewed as positioned right-of-centre within a traffic lane (for example, during the operation of a clearway that is otherwise occupied by parking). Given the fair assumption that some cyclists will view the sharrow marking as a guide to their road positioning, this situation may cause confusion as to where the cyclist should be located because cyclists normally position themselves as far left towards the kerb as is practical and safe.

In situations where on street parking is observed as being significantly underutilised for extended lengths and/or time periods, the implementation of sharrow markings should be considered very carefully and may not be a desirable treatment. It may be appropriate to add a parking lane line to encourage better riding line discipline.

Variations in speed differentials between cyclists and motorists caused by road gradients above 3% should also be considered.

- ◆ In the downhill direction, where speed differentials are lower, sharrows may be more appropriate as cyclists can keep pace with motor vehicle traffic (even at 50 /h, regardless of fitness, where the gradient approaches 10%).
- ◆ In the uphill direction where average cycle speeds are down around 10 km/h and speed differentials are higher, sharrows may be less appropriate (unless the general traffic environment is very slow).

Education and information campaigns are recommended at a national, regional and local level to support the introduction of sharrow markings as a new road marking on New Zealand roads. The NZ Transport Agency is producing a resource for this purpose.

When carefully planned as a component of an overall cycle network strategy, sharrow markings have the potential to be a cost effective addition to the cycle facilities 'tool box'. Care must be taken to ensure that sharrow markings are considered in the right locations and are not applied merely as a solution to difficulties that may arise when considering and implementing more appropriate cycle infrastructure.

⁷ <http://www.nzta.govt.nz/resources/roadcode/cyclist-code/about-cycling/cyclist-responsibilities/>

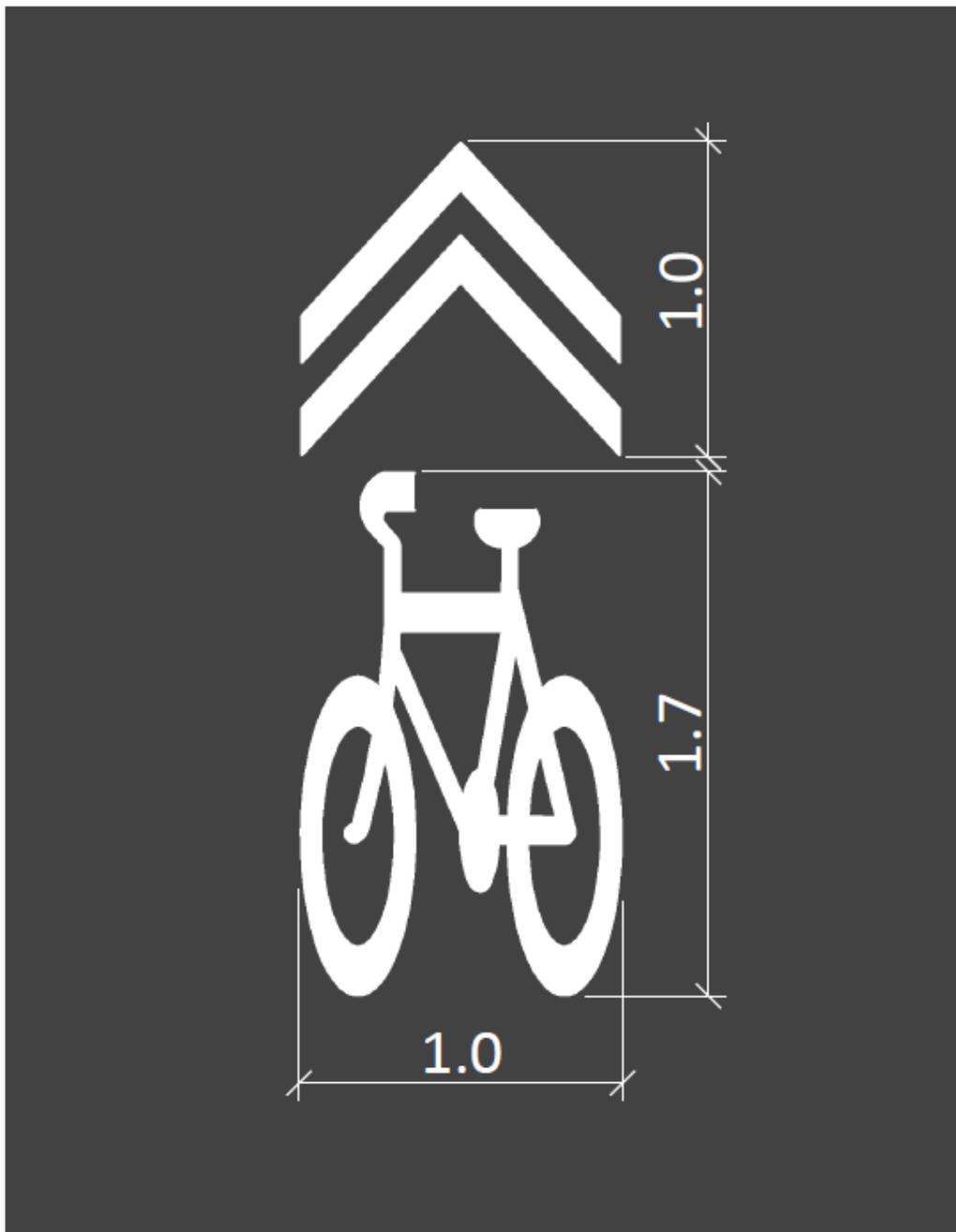
DESIGN PARAMETERS

Sharrow Marking Symbol

A sharrow marking comprises the white cycle symbol used to indicate a cycle lane supplemented by two white chevron markings. Materials must be adequately skid resistance and retro-reflective (consequently the use of glass bead is likely to be necessary).

The minimum dimensions of a sharrow marking are provided in Figure 5 below.

Figure 5: Minimum Dimensions of a Sharrow Marking



Location of Sharrow Marking in General Traffic Lane

The most desirable location for a sharrow marking is centre to slightly left of centre of the useable portion of a general traffic lane, with the sharrow marking remaining clear of a road's centreline. Central placement is required so that motorists will generally traverse at least part of the sharrow marking. The recommended preferred widths, as illustrated in Figure 6, may need to be reduced in some locations to ensure the sharrow marking is appropriately placed in the road corridor. Given that some cyclists may view the sharrow as a guide to their best road position, a sharrow should not be placed in a location where cycling would be relatively unsafe (for example, right-of-centre in a relatively fast, wide lane).

Distance from Kerb to Sharrow Marking

Where marked or unmarked on-street parallel parking is provided the preferred minimum width **between the kerb** and the **centre of a sharrow marking** is 3.5 m. The application of sharrow markings on roads with a carriageway of less than 8.0 m where car parking is permitted but usage is extremely low may be appropriate in some cases. In this instance, the placing of a sharrow marking would fall within the door zone of a potentially parked vehicle. Parking usage would need to be extremely low to consider sharrow markings in this instance. A complementary treatment may be to consider implementing no stopping at all times in association with the sharrow markings.

In all instances, more generous widths may be feasible to move the cyclists further away from the 'dooring zone'; this is encouraged when appropriate but is subject to the sharrow marking remaining appropriately placed within the general traffic lane.

Where on-street parking is not provided, the preferred minimum width **between the kerb** and the **centre of a sharrow marking** is 1.4 m.

If a road does not have a centreline, the sharrow marking must fall clear of the dooring zone (if on-street parking is at all likely), and must be placed entirely 'within the lane' to the left of an imaginary centreline.

Recommended widths are further specified in Table 1.

Distance from Edge of Parallel Car Parking to Sharrow Marking

Where marked on-street parallel parking is provided, the preferred minimum width between the **outer edge of the car park** and the **centre of the sharrow marking** is 1.4 m.

The minimum width between the **outer edge of a car park** and the **kerbside edge of the sharrow marking** is 0.9 m, the 'dooring' zone.⁸⁹ This may be increased to 1.0 m where space permits.

⁸ 2.9 m is the 85th percentile of cars with doors open. San Francisco's Shared Lane Pavement Markings: Improving Bicycle Safety. Prepared for San Francisco Department of Parking and Traffic by Alta Planning and Design. February 2004

⁹ It is noted that the New Zealand Road Code states that cyclists should "Never ride in the 'door zone' (the space where car doors open) when cycling past parked cars" and that cyclists should "Allow at least one metre between you and a parked car".

Note: Where a kerb extension protrudes into a roadway where there is otherwise on-street parking, the sharrow should be centrally placed in the usable roadway (a similar distance from the kerb extension as it is from the parked cars).

Sharrow Markings and Angle Car Parking

Generally, the preferred widths for implementing sharrow markings adjacent to angle parking closely reflect those dimensions often referenced when proposing on road cycle lanes. It is however noted that these widths may be difficult to achieve in more constricted road environments; the use of sharrow markings in association with angle parking should be very carefully considered, particularly in more constrained locations.

Note: there is generally no need for sharrows in a lane over 3.8 metres wide.

Frequency of Placement

Frequent and visible placement of sharrow markings is important. Sharrow marking should be marked along a road every 30-70 m. The number of sharrow markings on a road may vary depending on the situation, for example, sharrow markings should be placed more frequently on a road when they are being applied to bridge a gap in a discontinuous cycle facility and on roads with higher vehicle volumes. Conversely, sharrow markings may be placed less frequently on roads with lower vehicle speeds and lower vehicle volumes.¹⁰

¹⁰ <http://nacto.org/publication/urban-bikeway-design-guide/bikeway-signing-marking/shared-lane-markings/>

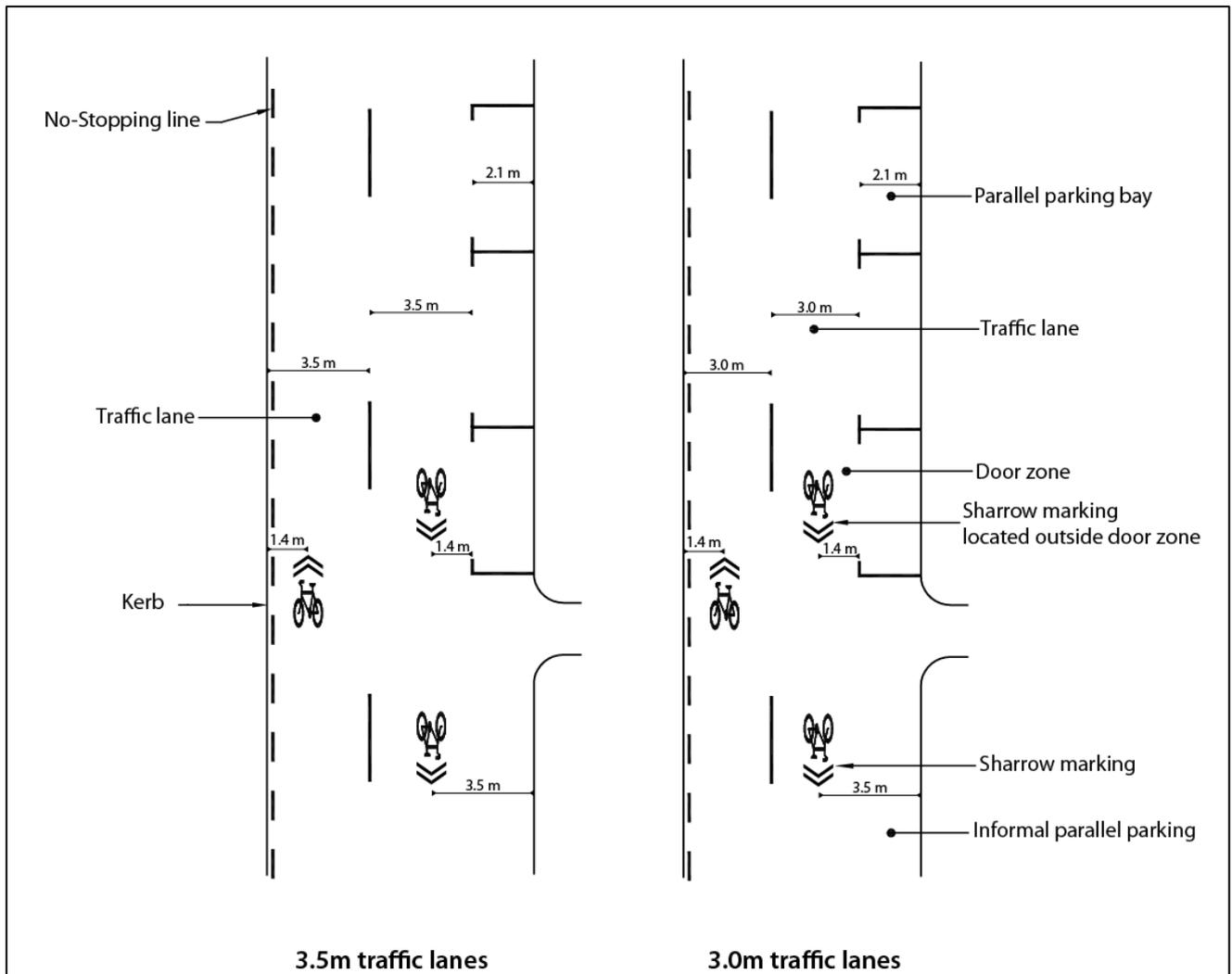
Table 1: Distance from Kerb to Centre of Sharrow Marking (Parallel Parking)

Lane Configuration	Width from kerb to centre of sharrow marking
Marked or unmarked on-street kerbside car parking provided	Preferred minimum 3.5 m (Assumes 2.1 m parallel parking and 3.0 m – 3.5 m general traffic lanes)
No kerbside parking	Preferred minimum 1.4 m. Additional width likely required if adjacent or close to pinch point

Table 2: Preferred Clearance between Angle Parking and Edge of Sharrow Marking

Parking Angle (Degrees)	45°	60°	90°
Preferred Clearance	2.0 m	2.5 m	3.0 m

Figure 6: Examples -Distance from Kerb to Centre of Sharrow Marking



Sharrow markings at roundabouts

Sharrow markings have been successfully trialled at low volume roundabouts. As with other situations where the lane is very narrow or constrained by kerbs, sharrow markings should be positioned centrally within a traffic lane to encourage cyclists to take the lane.

Sharrow markings should be applied before and after surface 'give way' signage on each leg of a roundabout and are considered appropriate for use in association with both single- and double lane roundabouts (subject to the appropriateness of the site).

Complementary Treatments

It may be useful to complement sharrow markings with treatments that optimise a particular route for cyclists. Treatments can include speed limit reductions, local area traffic management measures including traffic calming (to both slow and/or reduce vehicle volumes from the corridor), line markings ("greening"), signage and intersection crossing treatments. Refer to the NZ Transport Agency's Speed Management Guide.

Additional treatments that contribute to creating safer and more convenient routes for cyclists of all confidence levels are also likely to complement sharrow markings (for example, broken yellow lines, flush medians, or cycle signage).

Figure 7: Sharrow markings at Roundabout



Figure 8: Sharrow markings implemented on all legs of single-lane roundabout before and after give way signage

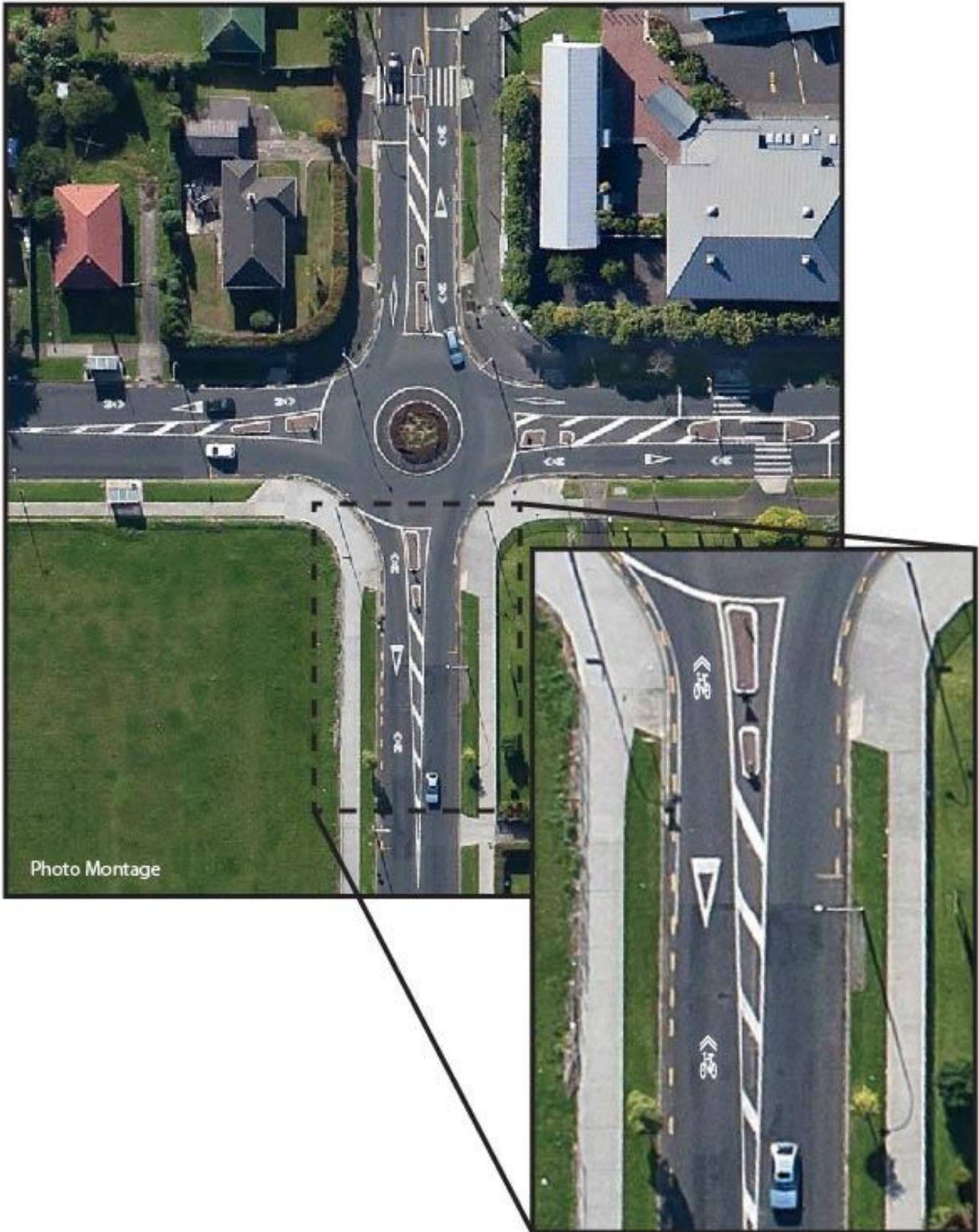


Figure 9: Transition from separated bike facility to sharrow markings

