Finding space for on-road bicycle lanes

Purpose

This note identifies methods for making bicycle facilities provision on existing roads and offers information about selecting the best type of treatments in various situations.

Aim

This series of notes aims to assist planners and engineers to provide for cycling in their local area.
The Cycle Notes should be read in conjunction with:

- Guide to Traffic Engineering Practice, Part 14 – Bicycles (Austroads, 1999)
- Queensland Manual of Uniform Traffic Control Devices, Part 9 Bicycle Facilities
- Road Planning and Design Manual (Queensland Department of Main Roads).

Contents

Introduction

Bicycle riders can legally travel on all roads except where specifically banned. Where possible/practical it is always desirable that provision be made for on-road cycling. This is especially the case where a roadway is identified as part of a priority bicycle route on an integrated cycle network plan. Designated cycle-only lanes are preferred as they provide a level of separation between bikes and other road traffic. The aim is to increase rider safety, enhance the attractiveness of cycling and improve traffic flow.

The Queensland Department of Main Roads' *Cycling on State Controlled Roads* policy commits Main Roads (where possible) to positively provide for bicycle riders in road upgrading projects for the section of road that forms part of a priority cycling route. Where this is not possible, an alternative solution will be found (e.g. alternative route). Main Roads will seek to make other sections of state controlled roads attractive to cycling by incorporating cycle-friendly design in traffic operations, road-upgrading and maintenance projects. Reference should be made to the Main Roads policy for details.

At many locations (after an initial assessment), it might appear difficult to provide for on-road cycling in a way that satisfies the needs of bicycle riders and other road users. However, there are numerous ways to create space for on-road cycling within existing roads. Designers may utilise one or more of these to find space.

Cycle Note B4 - *Design of good quality on-road facilities* provides more details about the types of on-road cycling facilities and Cycle Note B6 - *Cycling and intersections* addresses issues related to bicycles at intersections.

How to find space for bicycle riders on existing roads

The assessment process outlined in this note is used to identify the optimal solution when retrofitting existing roads to make provision for on-road cycling. The options include:

- remarking traffic and parking lanes (i.e. reducing their width)
- sealing shoulders
- indenting car parking (i.e. provide indented parking bays in lieu of a parking lane, see Figure 1)
- rationalising car parking
- use existing service roads
- road widening at the median
- road widening at the left-hand side (in direction of travel)
- removing a motor vehicle lane
- set back raised islands for continuity of sealed shoulders through intersections
- provide marked stand-up lanes at intersections.

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See Table 1 for details on ways to gain on-road space for cycling.

It should be noted that in implementing any of the above options, the standard of the changed aspect (e.g. lane width, exclusive cycling lane, shared lane) should not be reduced below minimums given in relevant standard/s. Other consequences should also be fully investigated before adopting a measure or measures (e.g. effect of denying parking or reducing parking available to residents).

If none of the above options (or a combination of these) can produce enough space so that adequate provision can be made for on-road cycling, consideration should be given to:
- making use of an alternative route or routes (e.g. via other local or service roads), or
- providing off-road cycling facilities (see Cycle Note B3 – *Designing good quality off-road facilities*).

Alternative routes – service roads

Many arterial roads have long lengths of wide service roads running parallel to the main arterial road. These service roads provide an ideal opportunity for the provision of on-road cycling. Route continuity and providing for bicycle riders at intersections are important factors to consider. For this reason, checks involving detailed design of intersections are required to ensure that acceptable provision is made for bicycle riders (e.g. marked stand-up lanes).

Advantages include:
- may be a low-cost treatment
- bicycle riders are exposed to lower motor vehicle volumes and speeds than experienced on arterial roads
- there may be sufficient space to mark shared bicycle and car parking lanes
- redesign of intersections provides a good level of service to bicycle riders.

Disadvantages include:
- may require changes to existing intersections. Should changes to intersections be required, the cost of this option may be substantially increased unless coordinated with other planned works
- may involve changes to line marking and signage, adding to cost
- there may be a need to enforce changes
- may introduce the inconvenience of a longer route.

Figure 1: Sylvan Road, Toowong, retrofitted with bicycle lanes and indented parking

Table 1: Ways to gain on-road space to make provision for on-road cycling (derived from VicRoads, 2001)

Space finding techniques	Definition/opportunities to implement	Benefits/Advantages	Other considerations
1. Re-marking traffic and/or parking lanes	When traffic and parking lanes are wider than necessary (e.g. wider than the minimums given in the Main Roads RPDM and/or Austroads GTEP Part 11), lane markings can be removed and repainted to allow for an exclusive bicycle lane.	■ Relatively low cost treatment. ■ Can be undertaken during maintenance (e.g. of line marking or as part of road resurfacing). ■ Causes minimal disruption to other road users.	■ May limit lane widths for other road users. ■ Widths should not be reduced below minimums given in the relevant standards. ■ May reduce the capacity of the road and so possibly increase congestion. ■ May increase “friction” between through motorised traffic, cyclists and parked vehicles.
2. Sealing shoulders	Some roads in outer suburban and regional areas have long lengths of continuous unsealed shoulders that could be sealed to provide bicycle lanes for bicycle riders (providing shoulder materials are suitable).	■ Increased road safety for all road users. ■ Less road maintenance - reduction in edge breaks and ravelling of surface. ■ Access to funding from road safety and maintenance programs.	■ Shoulder should only be sealed if the shoulder materials/pavement are/is suitable to serve as a pavement and are/is suitable for sealing. In such cases the shoulder should not be sealed unless the shoulder material is removed and replaced with pavement materials complying with a certified design. ■ Need to ensure shoulders remain free of debris. ■ Must be constructed so they do not break up. ■ Stone sizes of 7mm or less are desirable when cycles are to use shoulders. Use of 7mm stone size may not be suitable for high-speeds environments.
3. Indenting car parking	Indenting parking frees up space that can be used to make provision for on-road cycling. Car parking can be indented on both sides of the road or on one-side only.	■ Maintains some car parking on one or both sides of the road. ■ Efficient use of available space.	■ Need to control parking between indented areas. ■ Possibly reduced car parking capacity. ■ Reducing footpath width may affect Public Utility Plant (PUP), road lighting poles and/or stormwater (e.g. pits/gullies). ■ Relocation of PUP, road lighting poles and/or stormwater (e.g. pits/gullies) may be required which may increase costs. ■ Unsuitable in areas of high pedestrian activity (unless footpaths are wide).

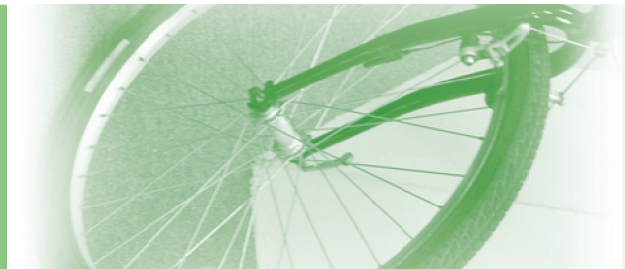

Table 1: Ways to gain on-road space to make provision for on-road cycling (derived from VicRoads 2001)

Space finding techniques	Definition/opportunities to implement	Benefits/Advantages	Other considerations
4. Rationalising car parking	On many roads parallel parking is permitted on both sides of the street even where there is off-street parking available or insufficient demand for the volume of on-street parking provided. In these situations, it may be possible to prohibit parking on one side of the road, or perhaps on both sides, to create sufficient space to make provision for on-road cycling.	■ Relatively low-cost treatment. ■ Rationalised volume of available parking corresponds to forecast demand or may be used as a travel demand management measure.	■ Reduced car parking capacity which may affect residents and businesses. ■ May require changed line marking and signage. This may add to cost. ■ Need to enforce changes.
5. Road widening at the median	In situations where it may not be possible to use any of the above measures, it may be possible to widen the road by reducing the width of the median strip. Median strips may offer a cost effective space for widening of a road as they often contain minimal amounts of stormwater drainage and services. Of course, it is important to ensure that medians are wide enough to accommodate turning lanes, traffic signals, PUP, lighting poles, safety barriers, pedestrians etc as required.	■ May minimise disruption to drainage and services.	■ May be a high-cost treatment. ■ May reduce landscaping opportunities. ■ Removal of a table drain may require installation of underground stormwater systems. ■ Relocation of PUP, road lighting poles and/or stormwater (e.g. pits/gullies) may be required which may increase costs. ■ Safety barrier may need to be installed or existing safety barriers may need to be relocated.
6. Road widening at the left hand side (in direction of travel)	On roads that do not have a median strip or that have a median strip that cannot be reduced further, it may be possible to widen the road by reducing the width of the footpath/nature strip.		■ May be a high-cost treatment. ■ May be appropriate where the footpath is wider than necessary or where there is little pedestrian activity/ demand. ■ Important not to reduce useable footpath space for pedestrians if there is reasonable pedestrian activity/ demand. ■ Relocation of PUP, road lighting poles and/or stormwater (e.g. pits/gullies) may be required which may increase costs. ■ Footpath may need to be reinstated. ■ May reduce landscaping opportunities.
7. Removing a motor vehicle lane	It may be that a road is either too wide and/or contains too many traffic lanes for the volume of traffic that they carry or will carry in the future. It may be possible to introduce a tidal flow lane arrangment or a centre turning lane to manage peak hour traffic volumes. The resulting space may be sufficient so that adequate provision for on-road cycling can be made.	■ May be relatively low-cost treatment requiring only changes to line marking.	■ Poorer Level of Service and consequent reduction in motor vehicle capacity (i.e. greater congestion) ■ Need to consider forecast traffic demand and implications of removing lane. ■ Potential Travel Demand Management measure.
8. Combinations of the above	Some measures may be combined to make space (e.g. indent parking and the remark of lane lines). Refer to discussion of each treatment.	■ Refer to discussion of each treatment.	■ Refer to discussion of each treatment.

Assessment process

The following is a procedure that may be followed to help determine the most suitable method of making on-road space for bicycles.

Step 1: Route investigation

It is necessary to understand an existing space and how it is used before determining what options are available. On site, you will need to:

- take accurate measurements of the road's cross-section at regular intervals along the roadway including:
  - recording the widths of parking bays, all lanes, medians, footpaths etc (ensure that every centimetre of road space is accounted for)
  - measuring to the property boundary
- record any surface texture issues that might make cycling difficult (e.g. pavers, large stone size on a seal)
- establish the type, skill level and frequency of bicycle riders through observation and consultation.

The way in which the space is currently being used must then be recorded including:

- acceptable level of service (taking into account future forecast traffic flows)
- presence of parking
- presence of clearways
- presence of High Occupancy Vehicle lanes, bus lanes etc
- traffic speed
- presence of bus stops
- road hierarchy level/function of the road
- presence of wide sealed shoulder.

Details of traffic speed and volume (including bicycle and pedestrian volumes) and parking demand may require investigation over an extended period to determine daily, weekly and seasonal trends.

Figure 2 gives an example of a pro-forma that may be used to record site details. It may need to be modified to allow other site-specific details to be recorded (e.g. bus lanes).

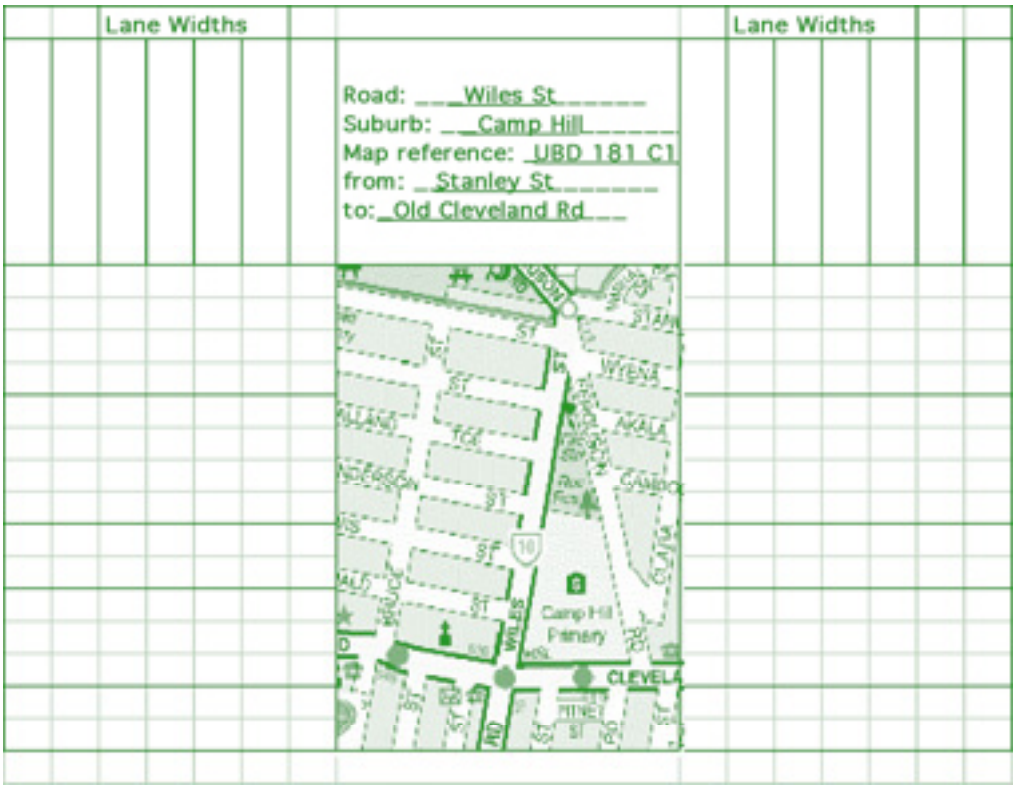

Figure 2: An example of a data collection sheet for site investigation (Source: UBD, 2000)

Step 2: Identify all practical options

It is now time to assess the site to determine the preferred treatment. This process involves considering the practicality of all eight treatments or a combination of them (irrespective of cost), so that full consideration is given to finding the best solution. Once all the practical possible options have been identified they can be further evaluated, considering constraints such as cost, engineering issues etc.

By tabulating these options as shown in Table 2, designers can quickly identify the options to be short-listed:

Table 2: Sample tabulation for quick identification of the options to be short-listed

Space finding techniques	Practical	Comment
1. Narrowing traffic and parking lanes	6	
2. Sealing shoulders	6	
3. Indenting car parking	6	
4. Totally prohibiting car parking or restricting it to one side of the road	4	
5. Using existing service roads	6	
6. Road widening at the median	4	
7. Road widening at the left hand side (in direction of travel)	4	
8. Removing a motor vehicle lane	6	
9. Off-road bicycle facility	6	
10. Increase raised island setback	6	

Step 3: Identify preferred options

Having identified which options are physically possible, the next step is to identify the most favourable option by considering and evaluating the following issues. This may be undertaken using an assessment matrix of multiple criteria. Table 3 shows a number of positive and negative issues that may apply to each of the options.

Table 3: Sample assessment matrix

	Considerations				
Option	**Construction cost**	**Difficulty of construction**	**Impact on other stakeholders**	**Level of service provided by the option**	**Consistency along route**
1. Narrowing traffic and parking lanes	-	-	-	-	
2. Sealing shoulders	-	-	-	-	
3. Indenting car parking	-	-	-	-	
4. Totally prohibiting car parking or restricting it to one side of the road	Low	Low	Medium	Medium	
5. Road widening at the median	High	High	Medium	Medium	
6. Road widening at the left hand side (in direction of travel)	High	High	High	Medium	
7. Removing a motor vehicle lane	-	-	-	-	
8. Combination of options	-	-	-	-	

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In some cases, the best solution is obvious. In others, careful consideration may be required. The best solution may even be a combination of methods along a particular route.

An example given by Cumming and Shepard (1996) is that a decision may need to be made between providing an exclusive bicycle lane by indenting the car parking into the footpath or widening the road into the central median after relocating light poles. This becomes a trade-off between the high cost of widening into the median and relocating light poles versus the loss of footpath and possible reduction of car parking capacity (with indented car parking). There is no perfect answer. On one road the median option may be chosen, while on another, indented car parking may be selected.

After having undertaken a review of the possible solutions and ranking each in accordance to the other relevant considerations, the authority is able to fully cost the solution and build it into a prioritised work plan.

Other references

1. Cumming A., Barber H. & Smithers R. (1999). *The Model Bicycle Lane*. Velozity: Australasian Cycling Conference, Adelaide, South Australia.
2. Loder & Bayly Consulting Group (1993). *Rockhampton Strategic Cycleway Plan*. Rockhampton City Council, Queensland.
3. Cumming A. & Shepherd R. (1996). Retrofitting Bicycle Lanes on Existing Main Road. *Proceedings 18th ARRB Transport Research Conference*. Volume 5.
4. VicRoads (2001). Cycle Notes No. 9 April 2001: *Creating On-Road Space for Cyclists, VicRoads* Publication No. 00736. http://www.vicroads.vic.gov.au/vrpdf/trum/tr2001118.pdf.

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