9 EVALUATING CYCLE ROUTE OPTIONS

EVALUATE CYCLE ROUTE OPTIONS
Evaluate, compare and contrast the options for satisfying the needs of the various cyclist types and trip purposes likely on each cycle route.
Select the preferred option(s) for each route.

9.1 Introduction
A perennial problem in cycle route network planning is the reliance on bright ideas and pet projects that may not have been critically evaluated for usefulness and value for money.
This chapter describes how to evaluate routes or facilities identified in accordance with chapter 8 using the following assessment methods:

- needs assessment
- audits
- cycle review
- level of service assessments.

9.2 Needs assessment

Description
This is an assessment against the criteria in chapter 3 in relation to each cyclist type and the route characteristics they need.
To permit a comparison, a summary for each option could be prepared in a standard format — and from this a conclusion or recommendation determined.
This summary can be reported on a single page in a similar format to Table 3.1 as a table indicating how the proposal will suit each cyclist type.

Advantages
This assessment provides an opportunity to consider all overarching issues, including intangible matters such as attractiveness and comfort.

Disadvantage
This is a qualitative assessment.

Recommendations
Always perform a needs assessment. No other assessment satisfactorily considers the full range of cyclists’ needs.
Include the outcome of other assessments, for example the LOS, in a needs assessment report.
9.3 Audits

Description
Audits are a formal process for identifying deficiencies in provision for cyclists. They can be applied to existing facilities or new proposals and can be applied during all project phases, from concept to post-construction audit. They can also be applied to a specific facility, a route or a network.

Four different types of audit affect cycling:

- A **cycle audit** aims to identify all matters that affect how well a situation meets the needs of cyclists, such as in *Guidelines for cycle audit and cycle review* (IHT et al., 1998).
- A **road safety audit** is a well established and respected process aimed at identifying deficiencies that will affect the safety of all road users. The best practice guide is the *Austroads Guide to road safety audit*.
- A **cycling safety audit** concentrates on cycle safety issues. It typically interprets safety broadly, as most other matters affect safety in some way. It was developed because traditional road safety audits frequently overlooked cycling issues. Refer to *Cycling by design* (Scottish Executive, 1999) and *Guide to traffic engineering practice: Part 14: Bicycles* (Austroads, 1999).
- A **vulnerable road user audit** combines a cycle audit with the needs of pedestrians, including disability access issues. It was developed in Oxfordshire County Council because cycle audits on their own were difficult to justify; cycle use is a small proportion of United Kingdom traffic (two percent). By contrast walking, cycling and mobility-impaired users together account for about 30 percent of urban traffic deaths, so clearly deserve more careful attention. The United Kingdom Transport Research Laboratory is developing this concept further.

Advantages
Audits take a systematic approach to identifying safety and other problems and help to prevent inappropriate designs being constructed.

Disadvantages
The quality of audit results under this method depends on the cycling experience and knowledge of the auditor(s).

While audits identify the deficiencies of an option, they do not distinguish between options or rate them.

Recommendations
Use cycle audits routinely in project development. Ensure that the audit process includes all the features of a cycle audit, whether as a stand-alone process or as part of a wider audit process.

Use a cycle audit to identify deficiencies on existing roads and paths.

Don’t use a cycle audit as a tool to evaluate and compare options.

9.4 Cycle review

Description
*Guidelines for cycle audit and cycle review* (IHT et al., 1998) is an audit process for an existing road situation, combining professional engineering and user perceptions of quality. It reviews how well existing facilities meet cyclist needs and provides a thorough process for identifying improvements. It includes data collection, LOS assessment and deficiency analysis.

Among other purposes, a cycle review seeks to:
- systematically assess cycling conditions
- highlight the greatest problems for cyclists
- enable LOS to be assessed quantitatively
- identify feasible measures for improvement
- provide a framework to help with choosing the preferred option.

Cycle review is applied at different levels and in its complete form represents a comprehensive process that can be applied to routes intended to form part of a cycle route network.

Advantages
The value of this model lies in its partially holistic assessment methods. As well as considering the nature of a facility it assesses route directness and coherency, and the need to influence surrounding conditions such as the traffic speed environment. Importantly, accessibility and safety issues are key considerations in this model.

Disadvantages
The credibility of the package depends on the judgement of the experts that prepared it. Further research is desirable to confirm how well it reflects cyclists’ needs and perceptions.

The overall package is a little cumbersome, even though the individual reviews are straightforward.

Recommendation
Individual road authorities should consider implementing a cycle review model.
Figure 9.1 Bicycling — levels of quality
9.5 Level of service (LOS) assessments

LOS is a traffic engineering term that describes traffic quality. It is traditionally applied to motor traffic, where it is primarily concerned with delays and interruptions to traffic. However, when applied to cycling other aspects seem to be more important. To distinguish it from traditional LOS measurements it is sometimes also referred to as ‘level of stress’, ‘level of quality’, ‘bicycle compatibility’ and ‘cyclability’.

Cycling LOS assessment is based on a significant volume of empirical research on cyclists’ views and reactions to specific road environments, conducted mostly over the past 10 years. United States research is reported in Sorton and Walsh (1994), Epperson (1994), and Landis et al (1997) and (2003). United Kingdom research is described in Guthrie et al (2001). Further US research is being conducted into multi-modal LOS assessment.

This approach has limitations but is helpful in comparing routes and options. Its most desirable aspect is that it is an independent and objective measure.

Several cycling LOS methods have been published. The bicycle compatibility index (BCI) (FHWA, 1998), Cycle review level of service (IHT et al, 1998) and Multi-modal level of service assessment, handbook (Florida DOT, 2002) describe methods worth further investigation.

The levels of quality developed by Walkable Communities Inc (see Figure 9.1 opposite) provide a visual guide to service levels for different facility types.

Note that different assessment methods will not produce identical results.

Table 9.1 lists an alternative service level description used in a cycle review LOS assessment.

<table>
<thead>
<tr>
<th>LOS</th>
<th>SCORE</th>
<th>TYPICAL TRAFFIC CHARACTERISTICS</th>
<th>LIKELY ROAD/PATH TYPE</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>81 — 100</td>
<td>Little or no motor traffic; low speeds; good passing width; no significant conflicts; good riding surface; lit; good social safety</td>
<td>High-quality cycle path; well surfaced minor rural road; 30 km/h limit urban road</td>
</tr>
<tr>
<td>B</td>
<td>61 — 80</td>
<td>Light/moderate traffic flows; good/adequate passing width; few conflicts; good riding surface</td>
<td>Minor road; well surfaced but unlit cycle path</td>
</tr>
<tr>
<td>C</td>
<td>41 — 60</td>
<td>Moderate traffic flows; 85th percentile speeds around 50 km/h; adequate passing width; some conflicts (not major)</td>
<td>Minor road/local distributor</td>
</tr>
<tr>
<td>D</td>
<td>21 — 40</td>
<td>Busy traffic, HCV/buses; speeds around 70 km/h</td>
<td>Urban single carriageway; poor-quality cycle path</td>
</tr>
<tr>
<td>E</td>
<td>1 — 20</td>
<td>Heavy traffic flows; speeds &gt;70 km/h; HCV</td>
<td>Dual carriageway speed limit 70 km/h or higher; large roundabouts</td>
</tr>
<tr>
<td>F</td>
<td>&lt;0</td>
<td>Heavy traffic flows, HCVs; speeds 100 km/h, narrow lanes; unlit</td>
<td>Narrow rural single carriageway or dual carriageway; grade separated junctions</td>
</tr>
</tbody>
</table>

Table 9.1 Cycle review LOS scales

HCV = Heavy commercial vehicles
9.5.1 Bicycle compatibility index (BCI)

**Advantages**
The BCI measure is flexible and simple to use and can be used to distinguish between conditions on roads during different periods.

As Table 9.2 demonstrates, a minimum of data is required to determine a BCI/LOS result for an entire route. The data is readily sourced in most instances.

**Disadvantages**
BCI does not account for:
- low traffic volume environments where cyclists readily integrate with other traffic
- significant intersections
- strategic considerations such as route directness, coherence and purpose
- paths. A similar US-developed process is available for paths, but it is not known whether the two methods may not be compatible for comparing path and road options.

**Recommendations**
The BCI method is most useful when comparing mid-block route options at an early stage, and when a quick and simple method is desirable.

9.5.2 Cycle review LOS

**Advantages**
This is more comprehensive than the BCI method. Among other factors, it gives basic consideration to intersections and route directness, and includes paths.

**Disadvantages**
A significant volume of data is required. It can be time consuming to compare several quite different route options.

**Recommendations**
This comprehensive method (IHT et al., 1998) can be used to examine existing infrastructure and to compare different route options provided concept proposals for routes are reasonably well defined.

It should be used at a level appropriate for each route.

Straightforward situations with obvious choices will not gain much benefit from the full depth of the process, but will nevertheless benefit from analysis based on its concepts.

It can be used to assign an overall LOS score for a route proposal.

9.5.3 Florida bicycle LOS

This method is the most widely used approach in the USA. It assesses bicycle LOS on links and straight through intersections as part of a multi-modal assessment of LOS. It is based on the research by Landis. The method includes a computer program to simplify the calculations. Refer to Florida DOT (2002).

9.6 Which method?

**Further research**
Further investigation into the appropriateness of the above methods for application in New Zealand is required and will be undertaken. Local authorities are invited to contact the LTSA with a view to participating and/or leading trial projects.

Practitioners are encouraged to assess other methods where appropriate and available.

**Recommendations**
Use a mix of the methods outlined above.

A needs assessment is always important. In general, many of the issues associated with developing a cycle route are qualitative, and only this type of assessment will consider all the overarching issues.

For a quantitative assessment, the cycle review LOS method appears to be the most useful.

Individual RCAs are encouraged to consider implementing a cycle audit and cycle review style of process, and to work with the LTSA to develop a New Zealand recommended process.

A review of crash records (see section 7.3.2) is also worthwhile when assessing existing conditions.

Two aspects stand out as being important in any cycling assessment:
- Does the facility meet the users' needs?
- The choice of routes in urban areas is largely determined by the extent to which junction features can be resolved where the cycle route meets or crosses more heavily trafficked roads (Ove Arup and Partners, 1997).
<table>
<thead>
<tr>
<th>LOCATION</th>
<th>South Terrace — Greenhill Road</th>
<th>Greenhill Road — Fisher Road</th>
<th>Fisher Street — Cross Road</th>
<th>Cross Road — Grange Road</th>
<th>Overall route</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GEOMETRIC &amp; ROADSIDE DATA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length (km)</td>
<td>0.62</td>
<td>1.87</td>
<td>0.86</td>
<td>1.19</td>
<td>4.54</td>
</tr>
<tr>
<td>No. of lanes (one direction)</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Kerb lane width (m)</td>
<td>3</td>
<td>3.4</td>
<td>3.4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Bicycle lane width (m)</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Paved shoulder width (m)</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Residential development (y/n)</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td></td>
</tr>
<tr>
<td><strong>TRAFFIC OPERATIONS DATA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Speed limit (km/h)</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>85th percentile speed (km/h)</td>
<td>60</td>
<td>50</td>
<td>60</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Traffic flow (AADT)</td>
<td>28,000</td>
<td>28,000</td>
<td>28,000</td>
<td>31,000</td>
<td></td>
</tr>
<tr>
<td>Large truck % (HCV)</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td>0.50</td>
<td></td>
</tr>
<tr>
<td>Left turn %</td>
<td>0.00</td>
<td>0.09</td>
<td>0.05</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td><strong>PARKING DATA</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parking lane (y/n)</td>
<td>y</td>
<td>n</td>
<td>n</td>
<td>n</td>
<td></td>
</tr>
<tr>
<td>Occupancy (%)</td>
<td>50</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time limit (minutes)</td>
<td>120</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>RESULTS</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BCI</td>
<td>4.74</td>
<td>3.78</td>
<td>4.00</td>
<td>4.43</td>
<td>4.12</td>
</tr>
<tr>
<td>Level of service</td>
<td>E</td>
<td>D</td>
<td>D</td>
<td>E</td>
<td>D</td>
</tr>
<tr>
<td>Bicycle compatibility level</td>
<td>Very low</td>
<td>Moderately low</td>
<td>Moderately low</td>
<td>Very low</td>
<td>Moderately low</td>
</tr>
</tbody>
</table>

*Table 9.2: Example of BCI calculation*
9.7 Evaluate the whole route
Routes should be assessed in their entirety wherever possible. However, it is not uncommon for the project scope to be limited for financial or other reasons.

For example, a route may extend through more than one local authority’s area or depend on access to land under the control of another authority. In cases like this, any insurmountable issues with another authority may limit the route’s feasibility.

If the project scope means a route cannot be considered in its entirety, it is important to conduct a less rigorous review beyond the area of detailed assessment. This will help determine any likely physical, financial and political influences that could render a project unfeasible in the future.

9.8 Financial considerations
Any evaluation of cycle facilities must include considering the financial commitment required to implement them. Any measures must be both viable and represent value for money. Economic evaluations should use the procedures for cycling projects in Transfund New Zealand’s Project evaluation manual.

9.9 Other assessments
Proposals should also be assessed for their effects on the environment, including effects on other road users, authorities or property owners.

9.10 Consultation
Consultation with cyclists is an important part of assessing the impact of a proposal on existing or potential users.

The ways cyclists’ views are obtained are less important than that they are obtained.

Unsolicited complaints (or praise), such as letters to the RCA, are an importance source of feedback on existing routes.

A local cycling advocacy group (see section 14.5) can be included in the process. In a more structured way, cyclists could be asked to rate elements of a route for safety and LOS.

9.11 Route option selection
Cycle route option evaluation concludes with the selection of the preferred option(s) for each route.

A plan can be produced of the proposal ready for further planning and consultation — see Figure 9.2 for an example.
Figure 9.2: Cycle route plan
Source: Dorrestyn & Co Pty Ltd