TECHNICAL MEMO

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To	From
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Company	**MCSL Branch**
City of Nanaimo	2121 – Vancouver
Re	**Date**
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1. INTRODUCTION

This technical memorandum describes the proposed bicycle network in downtown Nanaimo, and protected bicycle facilities that can be implemented on several routes in the short term.

The downtown is an important hub in the City's bicycle network, where several bicycle routes converge and interface with transit, ferries and other transportation services, and where there are numerous commercial, residential, community and recreational destinations. At present, bicycle facilities in the downtown are lacking, and generally consist only of signed routes. The City wishes to enhance and expand the bicycle network to improve safety and connectivity for cyclists and encourage more people to cycle to and within the downtown. In particular, the City wishes to develop protected and separated bicycle facilities that would appeal to cyclists of all ages and abilities.

This objective is supported by feedback documented in a series of community engagement events undertaken in the spring. Enhancing cyclist safety was a top priority for respondents, as was improving connections between bicycle routes (existing and future routes). Other priorities are improving signage and wayfinding for cyclists, and increasing the amount of bicycle parking, particularly secure parking.

This document responds to the City's objectives and the community's desires by presenting a long-term bicycle network incorporating protected and separated facilities. Short-term implementation priorities are presented, with conceptual designs and cross-sections for protected bicycle facilities on several routes. Additional conceptual designs at intersections where bicycle routes intersect will be presented in a subsequent update of this technical memorandum, after traffic operations analysis and other design investigations have been completed.

The cross-sections and concept designs presented in this document are based on the following design guides:

- *British Columbia Active Transportation Design Guide*, Ministry of Transportation and Infrastructure (MoTI), 2019
- *Geometric Design Guide for Canadian Roads*, 6th edition, Transportation Association of Canada (TAC), 2017
- *Urban Bikeway Design Guide*, 2nd edition, National Association of City Transportation Officials (NACTO), 2014

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2. DOWNTOWN BICYCLE NETWORK

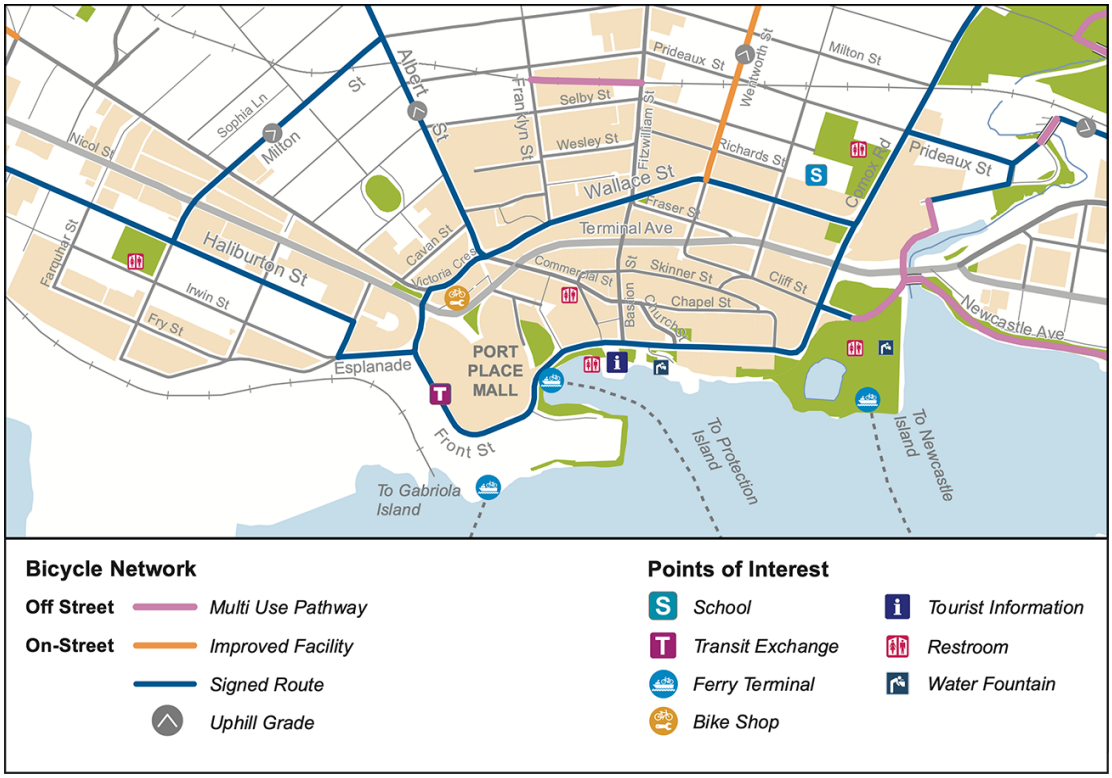
This section proposes an enhanced bicycle network for the downtown incorporating protected and separated facilities. The long-term, ultimate network is described, as well as short-term implementation priorities.

2.1. Existing Bicycle Network

The existing downtown bicycle network is illustrated in *Map 1* (which is extracted from the 2018 *Bicycle Route Map)*.

There are currently no protected or separated AAA facilities in the downtown, other than the existing section of the E&N Trail between Fitzwilliam and Franklyn Streets, which has been added to *Map 1*. The "improved facility" on Wentworth Street refers to shared wide travel lanes.

Map 1: Existing downtown bicycle network

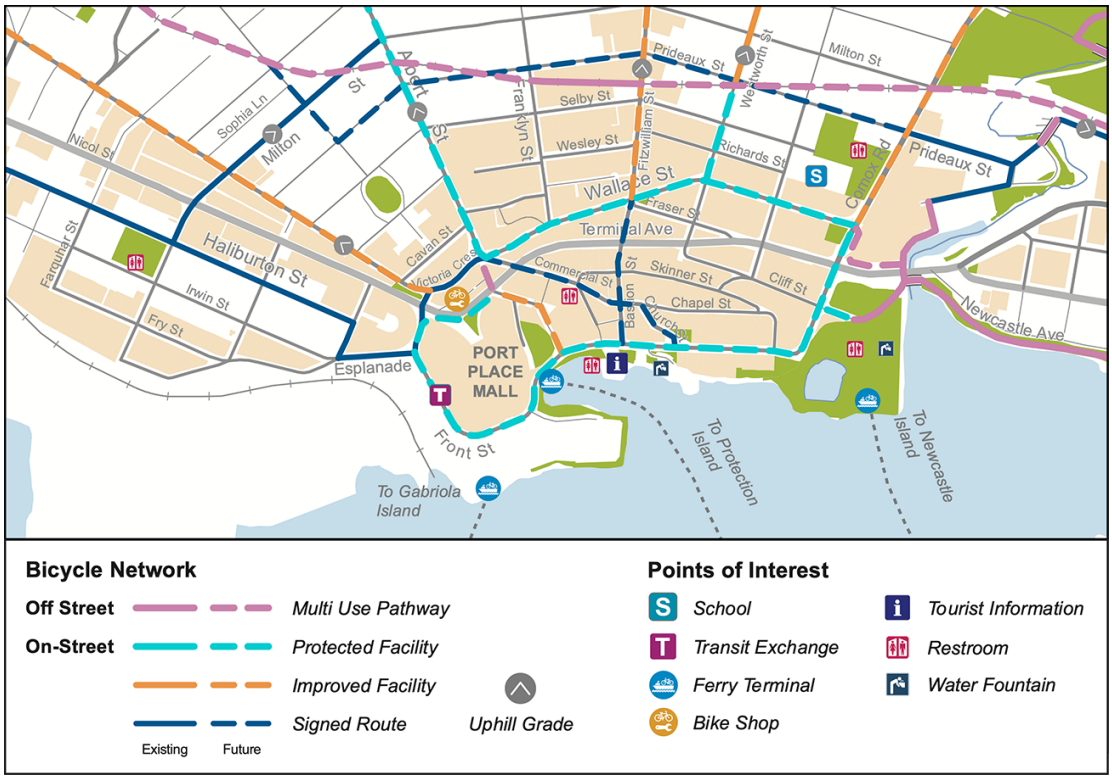


2.2. Long-Term Bicycle Network

The proposed long-term bicycle network in the downtown is illustrated in *Map 2*. The proposed network is based on the bicycle network illustrated in the 2014 *Master Transportation Plan*, with the following new and enhanced features:

- High-quality facilities are identified in the long-term network as "protected facilities" rather than as cycle tracks, so as not to exclude other types of protected and separated facilities (such as protected bicycle lanes and pathways).
- Protected facilities are added on Wallace Street and on Wentworth Street connecting to the future E&N Trail.
- A new protected facility connects the transit exchange to the Terminal/Gordon intersection along Terminal Avenue rather than via Victoria Crescent. This avoids the potential removal of all parking on Victoria Crescent which would be required to implement a protected facility.
- "Improved facilities" include buffered bicycle lanes, conventional bicycle lanes, shared wide travel lanes and low-speed shared space roads.
- A new "improved" connection via Gordon Street and Museum Way connects the Albert Street protected facility to the Front Street facility and the waterfront walkway.
- A new pathway connection makes use of the China Steps between Albert Street and the existing pedestrian crossing on Terminal Avenue (which would likely be shift north to align with the China Steps and Gordon Street).
- Another new pathway connection has been added north of the Wallace/Comox intersection connecting to the existing pathway along the south side of the Millstone River. This new pathway could likely be constructed within the road and highway rights-of-way (which would likely require some retaining walls).
- Although the potential E&N alignment is shown on *Map 2* along the railway right-of-way, the actual alignment might be on-street or in lanes in some sections.

Map 2: Long-term downtown bicycle network



2.3. Short-Term Bicycle Network

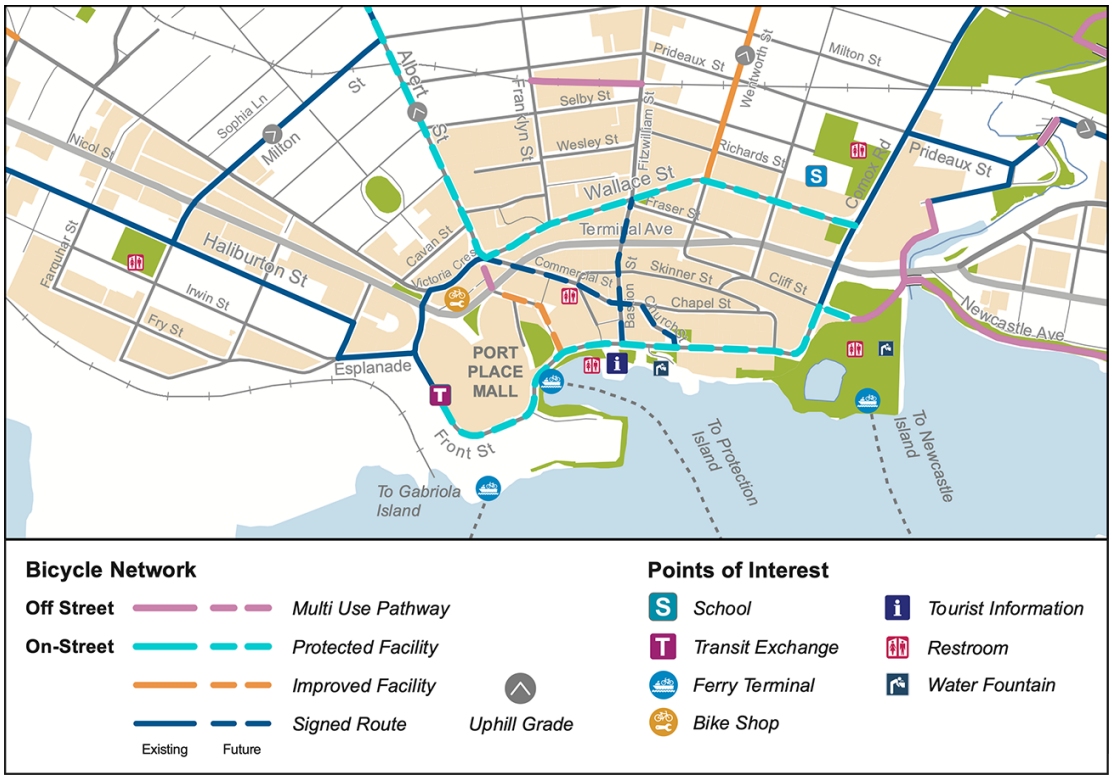
The proposed short-term bicycle network in the downtown is illustrated in *Map 3.* The objectives for the short-term network are:

- Implement routes and facilities within 5 years.
- Provide continuous “all ages and abilities” bicycle connections to and through the downtown.
- Minimize capital costs (including using temporary devices where possible to defer construction costs and permit adjustments to geometry before construction to a permanent standard).

Priority facilities for short-term implementation include:

- A protected facility on Albert Street (extending to the China Steps).
- Upgrading of the China Steps to incorporate a ramp for cyclists and persons with varied abilities.
- A protected facility on Front Street from Maffeo Sutton Park to the transit exchange (the connection into the park would either be via the Comox/Cliff intersection as shown on *Map 3*, or a multiuse pathway connecting to the protected facility on Front Street at the Front/Comox horizontal curve).
- A low-speed shared space facility on Gordon Street and Museum Way to connect the protected facilities on Albert Street and Front Street and the waterfront walkway.
- A protected facility on Wallace Street.
- New signed bicycle routes on Commercial, Church and Bastion Streets.

Map 3: Short-term downtown bicycle network



3. PROTECTED BICYCLE FACILITIES

A key feature of the downtown bicycle network is protected bicycle facilities on several routes. Protected bicycle facilities increase cyclist comfort and safety by separating and protecting cyclists from motor vehicle traffic. Protected facilities are attractive to cyclists of all ages and abilities, and consequently are often referred to as “AAA” bicycle facilities.

3.1. Types of Facilities

There are three types of protected and separated bicycle facilities:

- Uni-directional protected bicycle lanes on each side of the road (*Figure 1* and *Figure 2*). Cyclists are physically protected or separated from motor vehicle traffic or parked cars by some type of barrier, which can be as simple as flexible plastic pylons, or as substantial as a raised concrete curb.
- A bi-directional cycle track on one side of the road (*Figure 3* and *Figure 4*). Cycle tracks are similar to protected bicycle lanes, but are designed for two-way bicycle use and are therefore wider than a uni-directional facility.
- A multi-use pathway (*Figure 5*) shared by cyclists, pedestrians and other non- motorized modes of transportation, including persons using wheelchairs and other mobility aids. Pathways are separated from roadways, although they may be located parallel to a roadway.

Figure 1: Uni-directional protected bicycle lanes, New Westminster

Figure 2: Uni-directional protected bicycle lanes, Vancouver

Figure 3: Bi-directional cycle track, Victoria

Figure 4: Bi-directional cycle track, Seattle

Figure 5: Multiuse pathway, North Vancouver

3.2. Facility Selection

Selecting the appropriate type of facility on a particular road is a function of a number of factors, including road classification, number of intersections and driveways, one-way or two-way traffic flow, number of turning vehicles, signalization, grades, pavement width and right-of-way width, adjacent land uses, connections to intersecting bicycle facilities and the available budget.

It is important to recognize that protected facilities may not be appropriate in every situation. The challenge in developing the bicycle network is to determine what conditions each type of protected facility is best suited to, and how can they be implemented on roads in the downtown. Protected bicycle lanes and cycle tracks have their place, and each can be the optimum configuration in the right circumstances. But in most cases they also mean that something has to be removed from the road to make room for the protected bicycle facility, such as removing a lane of traffic, turn lanes or parking, and it is important to consider whether the benefits of the protected facility outweigh the impacts of removing other transportation facilities. In some cases, depending on the frequency of intersections and driveways, a protected facility might not be able to offer much protection on a particular road, and other options such as conventional bicycle lanes or even a different route should be considered instead. Lastly, but no less important is that the cost of protected facilities is considerably higher than the cost of conventional or buffered bicycle lanes, and it is important to consider the relative “return on investment” that each type of facility offers on a specific route in order to determine which is the optimum choice.

In general, the preferred type of on-street facility is uni-directional bicycle lanes. Cyclists are positioned at the sides of the roadway where motorists expect to encounter them, and cyclists travelling in the opposite direction are on the opposite side of the road as expected. On the other hand, bi-directional cycle tracks position cyclists where motorists might not see them or expect to encounter them. Cyclists travelling in one direction are travelling on the “wrong” side of the road where motorists might not expect to encounter them, and as a result are less likely to see and yield to these cyclists. The experience in some communities suggests that the rate of conflicts and collisions between cyclists and motor vehicles is higher in cycle tracks than with uni-directional bicycle lanes or even no bicycle facilities.

Safety concerns associated with protected bicycle facilities – particularly two-way cycle tracks – can be mitigated with additional design features such as restricting turns or closing some driveways or side streets to reduce potential conflicts, elevating crossings to slow turning vehicles, signalizing intersections and adding bicycle-only phases, and increasing illumination of intersections and approaches.

Although uni-directional bicycle lanes are preferred to cycle tracks, in some cases it may not be possible or desirable to implement uni-directional bicycle lanes, and a bi-directional cycle track can be considered instead. Examples of situations where a cycle track might be preferred include:

- A one-way road. It is preferable to locate a cycle track on the right side of a one-way road, so that right-turning motorists can clearly see cyclists approaching in the opposite direction.
- A road with few intersections and driveways on one side. Implementing a cycle track on this side of the road would reduce potential conflicts with turning vehicles as compared with a uni-directional bicycle lane on the other side of the road.
- A road where the pavement width is wide enough to implement a cycle track, but not wide enough to implement uni-directional bicycle lanes.
- A short segment of on-street bicycle route that connects to a multiuse pathway at one or both ends.

3.3. Downtown Nanaimo

Given the above considerations, the following types of protected bicycle facilities are proposed on routes identified in the Short-Term Bicycle Network (Map 3 in Section 2 above):

- **Albert Street:** Protected bicycle lanes are preferred to minimize potential conflicts at the numerous intersections and driveways along Albert Street. The road is 13.1–13.2 m wide, which is sufficient to implement protected bicycle lanes on both sides of the road and retain parking on the one side of the road as illustrated in *Figure 6*.

  Parking should be on the uphill side of Albert Street to provide additional manoeuvring room for uphill cyclists, and to avoid obstructing motorists' views of downhill cyclists. The 0.9 m buffer zone on the uphill side provides sufficient width to minimize the potential for open vehicle doors to extend into the bicycle lane and hit cyclists. The width of the parking lane should not be reduced from the indicated 2.3 m to 2.4 m so as to avoid larger parked vehicles intruding into the buffer zone and open vehicle doors extending into the bicycle lane. Removing parking from the south side of the road would reduce the parking capacity on Albert Street by approximately 64 vehicles.

  The preferred bus stop configuration incorporates a "floating" island between the bicycle lane and traffic lane, as illustrated in *Figure 7* and *Figure 8.* The bicycle lane is raised at the bus stop island to provide a continuous surface for pedestrians to cross, and crosswalks are marked where pedestrians cross to and from the front and back doors of the bus. Green paint can optionally be used to highlight the bicycle lane, and a yellow tactile strip is placed on the sidewalk to alert persons with visual impairments to the presence of the bicycle lane. A minimum 1.0 m width is desirable for the bus stop island, and in constrained conditions the bicycle lane can be reduced to 1.2 m wide as shown in *Figure 7* (the reduced width of the bicycle lane also helps to encourage cyclists to slow through the bus stop zone).

- **Front Street:** Cycle track. There are few intersections and driveways on the east (water) side of Front Street, which means this side of the road would be suitable for a cycle track. The Front Street right-of-way varies in width from 18.5 m to 21.5 m. A cycle track can be implemented in this width with one traffic lane in each direction and parking on the west side of the road, and wide sidewalks to accommodate higher numbers of pedestrians, as summarized in *Table 1* and illustrated in *Figure 9*. In contrast, implementing protected bicycle lanes on Front Street would reduce sidewalk widths and/or eliminate all parking, as well as increase the potential for conflicts with turning vehicles at the numerous intersections and driveways on the west side of the road.

  Parking is currently on permitted on the east side of Front Street between Church and Chapel Streets. Implementing a cycle track on the east side of the road would eliminate the 11 parking spaces in this section. This loss of parking would be offset by up to 30 new parking spaces created on the west side of Front Street south of Church Street.

Table 1: Front Street cross-sections, minimum and maximum right-of-way widths

Sidewalk (west side)	Parking/ Loading	Traffic Lane (southbound)	Traffic Lane (northbound)	Barrier	Cycle Track	Sidewalk (east side)	Total
2.7 m	2.4 m	3.4 m	3.4 m	0.3 m	3.6 m	2.7 m	**18.5 m**
3.8 m	2.5 m	3.4 m	3.4 m	1.0 m	3.6 m	3.8 m	**21.5 m**

- **Wallace Street:** Protected bicycle lanes. The pavement width on Wallace Street varies from 12.0 m to 15.0 m. Uni-directional protected bicycle lanes can be implemented in sections that are 13.2 m or wider, retaining parking on one side of the road, as shown in *Figure 10*. This includes the section of Wallace Street north of Fitzwilliam/Bastion Streets and the section south of Franklyn Street. The section between Fitzwilliam and Franklyn Streets is 12.0 m wide, which means that in order to implement protected bicycle lanes, the metered parking on the west side of the road in front of two office buildings would be eliminated, as shown in *Figure 11* (there is currently no parking on the east side of the road). In total, removing parking to implement protected bicycle lanes would reduce the parking capacity on Wallace Street by approximately 57 vehicles.

Figure 6: Albert Street protected bicycle lanes, typical cross-section

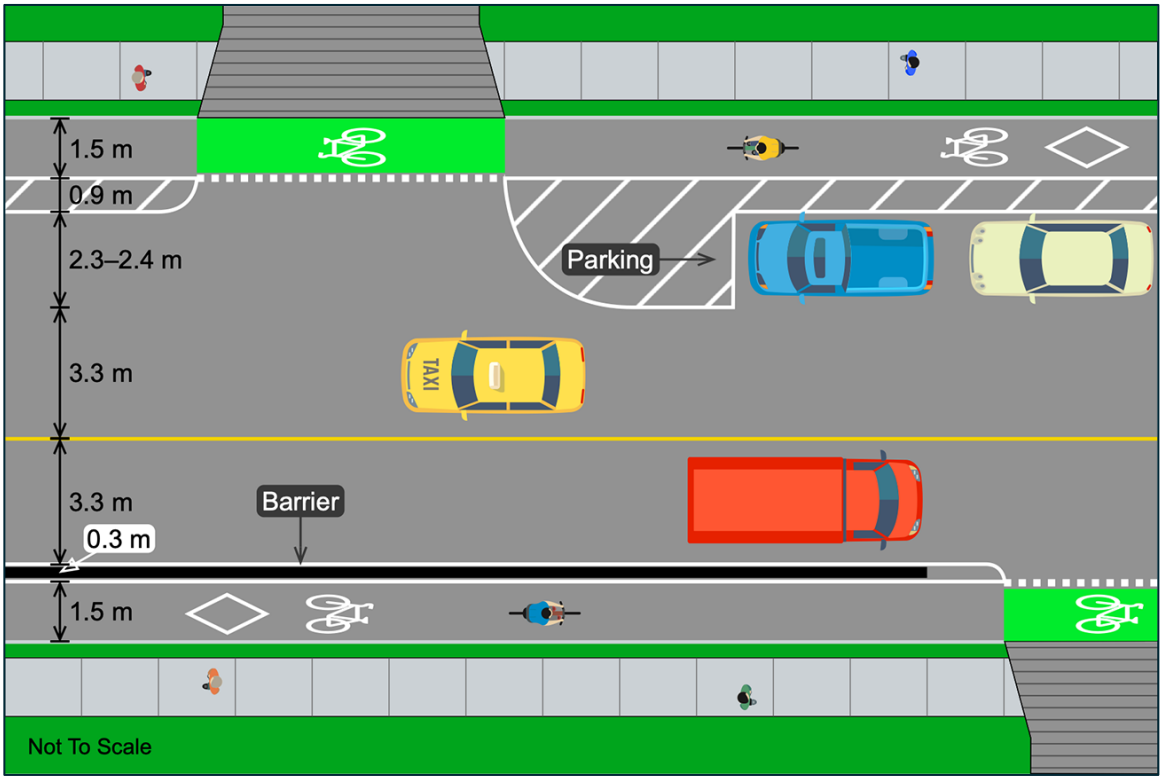


Figure 7: Albert Street protected bicycle lanes with eastbound farside bus stop

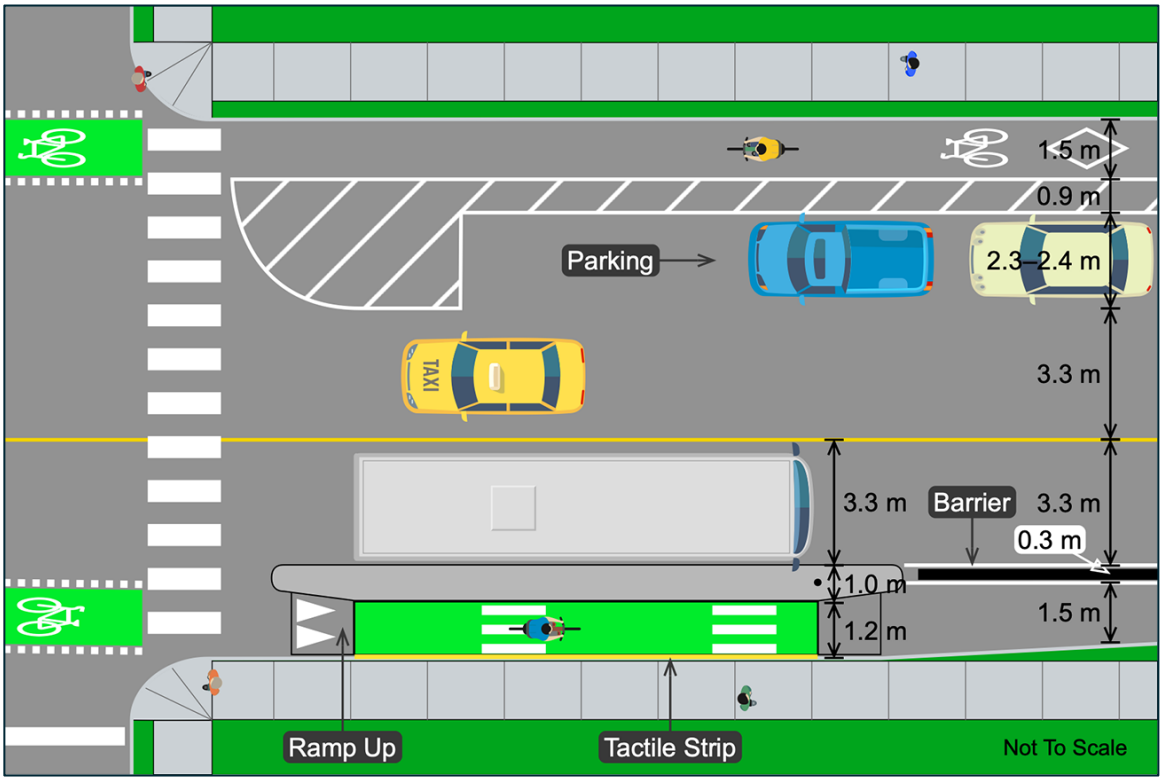


Figure 8: Albert Street protected bicycle lanes with westbound nearside bus stop

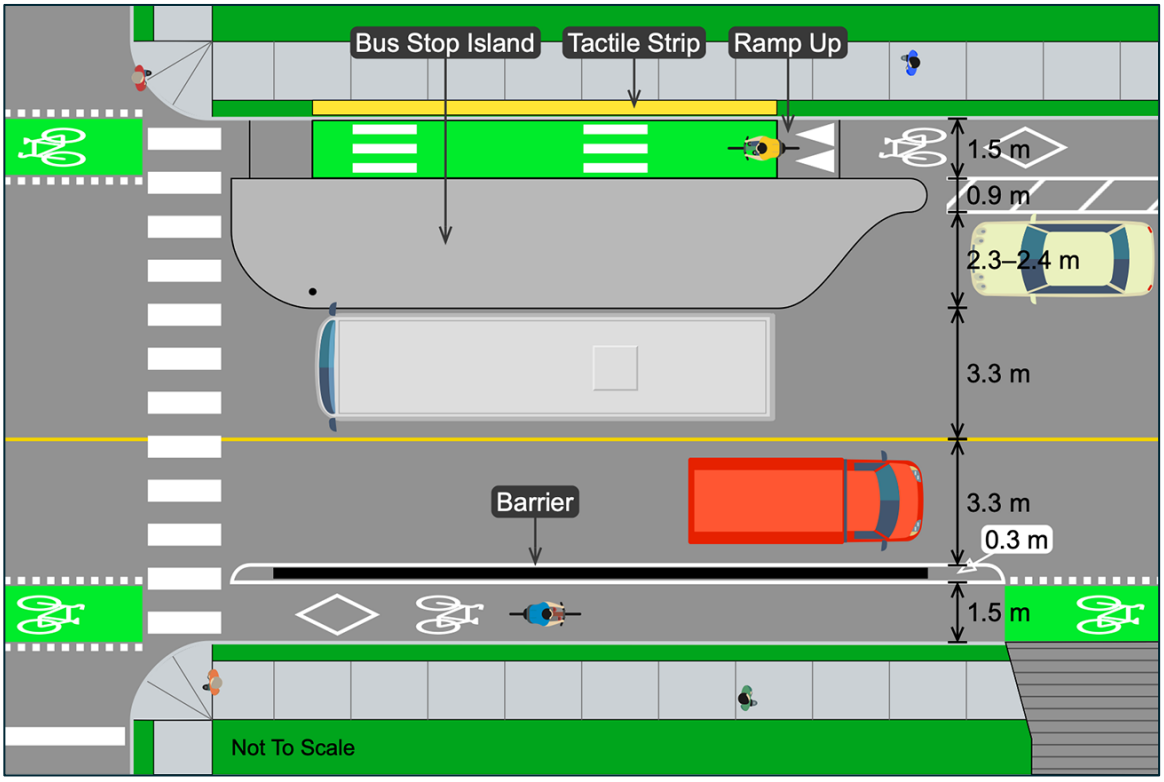


Figure 9: Front Street cycle track, typical cross-section, maximum right-of-way width

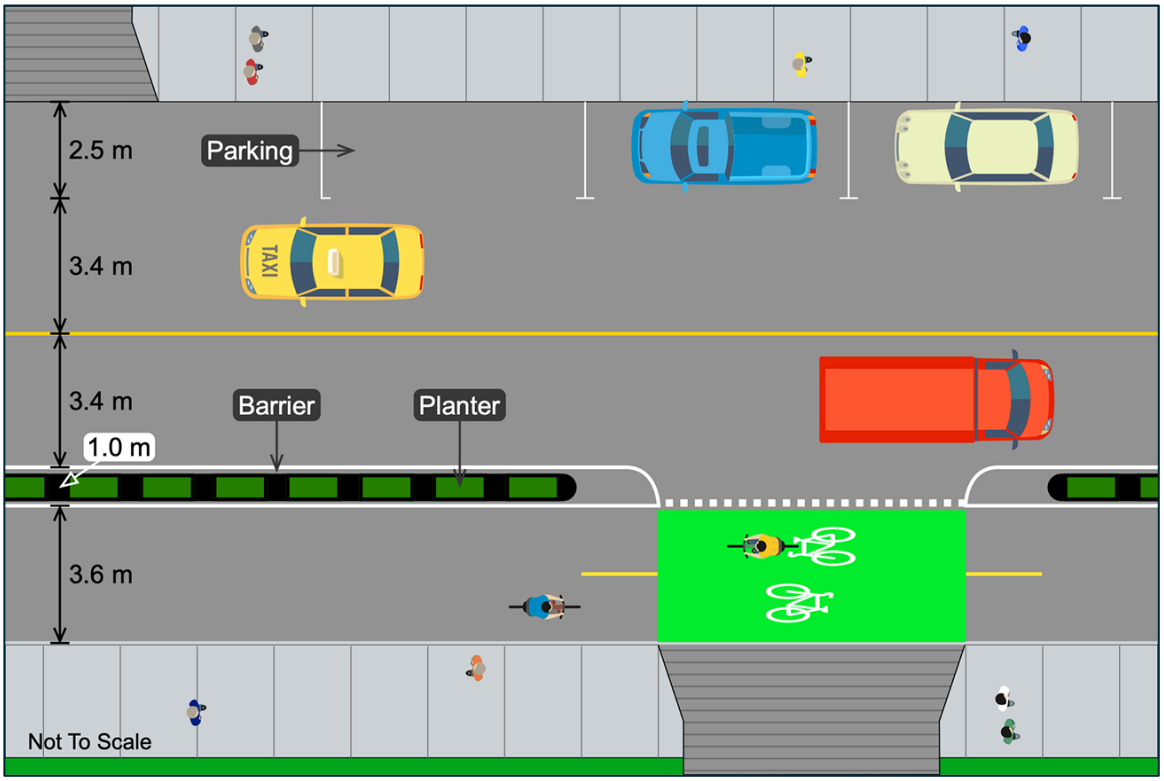


Figure 10: Wallace Street protected bicycle lanes, typical cross-section north of Fitzwilliam

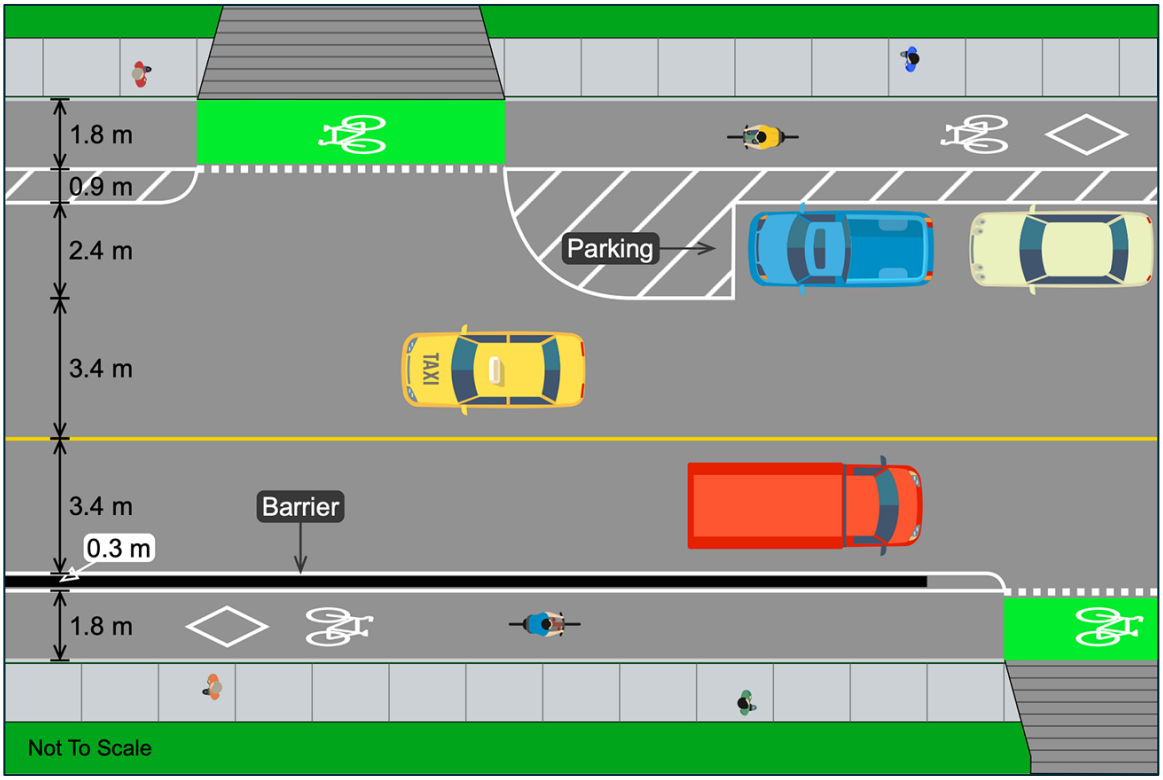


Figure 11: Wallace Street protected bicycle lanes, typical cross-section Fitzwilliam–Franklyn