Appendix A. Bicycle and Pedestrian Network Development Technical Appendix

The primary inter-community (PIC) bicycle network forms the basis for the Pedestrian and Cycling Master Plan (PCMP) recommendations, focusing regional and municipal planning efforts on the development of a connected network throughout the Capital Regional District (CRD). The bicycle network was developed based on previous planning efforts, existing conditions, and linking key destinations. The Masterplan also identifies pedestrian 'priority areas' that link destinations and provide access to transit where design should provide a high level of accessibility.

This appendix provides an overview of the methodology used to select the PIC cycling network and pedestrian priority areas, as well as the selection process for recommended bicycle facility types and priority bikeway projects. The appendix also addresses engineering considerations that support the walkway and bikeway networks, including trip enhancement facilities and integration with transit.

Identification of Regional Pedestrian Priority Areas

The PCMP identifies primary inter-community non-motorized corridors that provide direct and convenient connections to key destinations including regional trails, parks, schools, transit centres, regional centres, and other locations.

Definition of Regional Pedestrian Priority Areas

Due to the large distances involved with regional trips, most regional pedestrian trips are a function of multi-modal trips, combining walking, transit, bicycling, or other modes. People will walk to lunch or to a store after bicycling to work in the morning. They will walk from their homes to schools or parks. They will ride transit to another location and walk to their destination. They may drive to a trail and walk along it. For these reasons, a regional pedestrian 'network' is more a discontinuous series of smaller areas within which more people are likely to walk than in a solely residential area.

The term 'pedestrian' refers to a person moving from place to place, on foot and/or with the use of an assistive mobility device (when that person has a disability and/or medical condition). "Walking" or "to walk" are the terms used to describe this movement of a pedestrian.

Sidewalks, multi-use trails, and roadway shoulders are typically recognized as pedestrian facilities.[1] Pedestrian travel is accommodated and enhanced by intersection treatments such as crosswalks and curb ramps, as well as planter zones and other amenities. A planting or buffer zone is the area between the sidewalk and the roadway, which may contain street trees, signal poles, utility poles, street lights, controller boxes, hydrants, signs, parking meters, driveway aprons, grates, hatch covers, or street furniture. The buffer zone is a critical component of an improved pedestrian environment as it provides separation between people walking on the sidewalk and motorized traffic.

[1] *American Association of State Highway and Transportation Officials* (AASHTO).

Towards a More Inter-modal Definition

BC Transit recognizes the importance of providing adequate pedestrian routes to transit centres. Some key points noted by representatives of BC Transit include:

> *"Having good quality pedestrian connections from residential areas to local transit stops will help to make the entire transit trip more attractive (especially as an alternative to driving). Good pedestrian connections - especially more direct connections - means that there are more potential transit riders within walking distance (typically 400 m for local service, 1 km+ for a rapid transit station) of a bus stop or transit station. Usually, a grid type network will maximize pedestrian access to a transit stop. If there isn't a grid (e.g., cul-de-sacs), then pedestrian cut-throughs can help to reduce walking distances, resulting in more potential users within walking distance."*

> *"It will also be critical to provide high quality pedestrian connections between transit stations and nearby centres or major trip generators. This is especially the case where major transit corridors may not go through the middle of key nodes. For example, the Tillicum major centre is about 500 m south of the proposed rapid transit alignment, so good pedestrian connections will be important."*

> *"Cycling-transit connections are an effective way of greatly extending the reach or coverage from transit. The "typical" 400 m walking distance represents about a 5 minute walk. The average commuter cyclist could cover 3-4 times this distance in the same time, meaning that the potential area within 5 minutes of the transit stop could increase by a factor of 9 to 16. This may also be a way of providing some transit coverage in lower density areas, where you couldn't support a transit route within 400 m of all residents. BC Transit is looking at including bike storage at transit stations and exchanges. There are also bike racks on buses. Cycling infrastructure should include good connections to transit stations and exchanges to enable these multi-modal trips."*

> *"Transit, walking, and cycling can work together to provide a range of alternatives to driving. While walking is a good alternative for short trips and cycling is good for medium-length trips, transit can be a good alternative to driving for longer, regional trips, or for times when it is not practical to walk or cycle (e.g. due to weather, travelling with children, topography, etc). Better integration of these different networks will make it easier for people to choose from a range of transportation options (or a combinations of options) when planning a trip."*

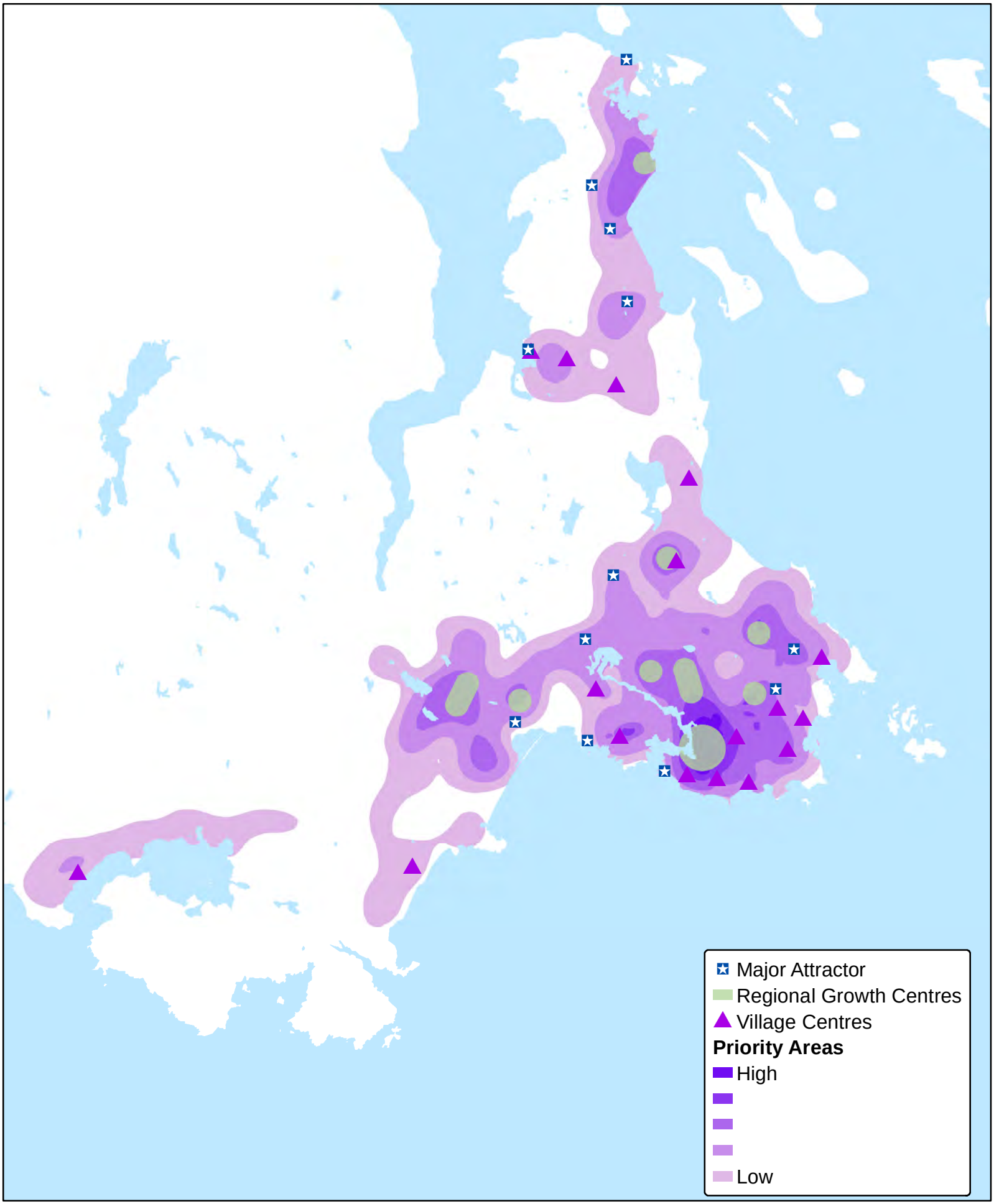
Identification of Pedestrian Priority Areas

Areas more likely to receive high pedestrian use were defined as pedestrian priority areas. The identification of these areas incorporated digital data from the CRD, feedback from BC Transit and other stakeholder groups, as well as proposed regional Regionally Significant Corridor selection criteria.

The following features were considered in the development of regional pedestrian priority areas.

- Regional growth centres
- Village centres
- Future rapid transit exhanges
- Regional, Provincial and Federal parks
- Bus stops
- Regional trails (Lochside, Galloping Goose, and existing/future E&N alignment)
- Primary, secondary, and post-secondary schools
- Civic destinations including justice and government buildings, libraries, museums, recreation centres, and community centres
- Transit exchanges

Variations in urban and rural within CRD were taken into consideration during this process; the same factors were used region wide to identify potential regional pedestrian priority areas, while the analysis of the Juan de Fuca Electoral Area reflects a scoring range more appropriate to rural land use. These pedestrian priority areas indicate locations where increased investment in pedestrian facilities will support the development of a Class I pedestrian environment and promote increased walking for transportation and recreation.



Map 1. Regionally Significant Priority Areas

Capital Regional District Regional Pedestrian and Cycling Master Plan
Author: Alta Planning + Design
Date: March 2011

0 1 2 Kilometres

Pedestrian Facility Typologies

Pedestrian travel is accommodated by sidewalks, multi-use trails, crosswalks, curb ramps, and other infrastructure that provides separated space and enhances visibility for pedestrians. The *TravelChoices* Pedestrian Strategy advocates for a continuous network of pedestrian routes within core municipalities, regional centres, and transit nodes. These pedestrian routes would likely consist of all the facility components listed above.

Table 1. Pedestrian Facility Typologies

Description	Example
Roadway Shoulders Roadway shoulders can accommodate pedestrian travel in rural areas. They should provide sufficient width for pedestrians to be buffered from automobile traffic, and be reasonably level and smooth. Some facilities are separated from the travel lane with a linear curb extrusion.	
Sidewalks Sidewalks are pedestrian-only facilities with widths based on expected use and surrounding land uses.	
Multi-use Trails Multi-use trails are physically separated from motor vehicles and provide sufficient width and supporting facilities to be used by cyclists, pedestrians, and other non-motorized users. Regional designation indicates that the trail is under jurisdiction of CRD Parks and acts as a spine of the bicycle and pedestrian networks. The Galloping Goose Trail, E&N Rail Trail, and Lochside Trail are regional multi-use trails.	

Description	Example
Accessways Accessways are narrow off-street paths that provide a local connection between major trails, residential areas, or destinations such as schools, parks, civic centers, employment centers, transit exchanges, or other areas. Accessways can be used by both bicyclists and pedestrians.	
Pedestrian Pathways Pedestrian pathways are similar to accessways, but may not be accessible to bicyclists or pedestrians with disabilities. They are often narrow and unpaved, and provide short connections to local pedestrian destinations.	

Accessibility on the Regional Pedestrian Network

The pedestrian recommendations resulting from this analysis correspond to the *Bicycle and Pedestrian Design Guidelines.* Design treatments appropriate to areas with differing levels of expected pedestrian traffic are identified in the design guidelines (e.g., crossing treatments appropriate for use in pedestrian high-use areas vs. more residential areas).

Accessibility should be provided for all types and ages of pedestrians through the practice of universal design and access. Accessibility determines who can access or use a particular facility, while the principle of universal design promotes accessibility for all people. While accessibility and universal design are often considered for people with disabilities, these principles are intended to see that everyone, whether a child or a senior, or an adult in a wheelchair or pushing a stroller, can safely and comfortably use the provided facilities and get from one place to another.

Accessibility Standards and Guidelines

A best practices review and discussion of accessibility plans and policies is presented in the design guidelines. The discussion is based on the United States *Americans with Disabilities Act* (ADA), as well as the *BC Parks Trail Design and Construction Standards Manual*, the *BC Building Access Handbook*, and the CRD's *Everyone's parks and trails: a universal access plan for CRD Parks* (2003). Although there is no Canada-wide equivalent to the ADA, it should be noted that in 2005 the Province of Ontario passed the Accessibility for Ontarians with Disabilities Act (AODA) to develop, implement, and enforce mandatory accessibility standards. The first standard to come

into effect is the Accessibility Standards for Customer Service; other standards currently under development include those addressing the built environment (buildings and other structures) and transportation.[2]

Regional Cycling Network Development

The PCMP identifies a continuous primary inter-community (PIC) bikeway network that will meet the needs of cyclists aged eight to 80. Involving the public in every step in the process resulted in a bikeway network that increases mobility throughout the region. This PIC network is regional in nature; it includes many roadways that are part of locally designated municipal bikeway networks and are more likely to serve trips between municipalities and make connections to transit.

Existing Conditions Data Collection

Phase I of the PCMP collected existing data from the CRD and member municipalities, as well as relevant planning documents in the fall of 2009. Member municipalities were invited to submit information about existing and planned bikeway facilities. Data maintained by member municipalities was compared to the CRD's database of existing facilities in order to develop a picture of existing regional cycling conditions. Member municipalities were invited to validate the resulting existing bikeway dataset.

Identification of Potential Regional Bikeway Corridors

The project team identified a 'universe of options' of corridors that could be part of the regional cycling network, using the following data sets:

- Roadways classified as arterials and collectors by the British Columbia Digital Road Atlas (DRA)
- Roads of other classifications as necessary to close network gaps or provide the "last kilometre" of access
- Key opportunities identified by CRD staff, Technical Advisory Committee (TAC) members, Citizens Advisory Committee (CAC) members, or the general public

This 'universe of options' for PIC bikeway corridors was reviewed by CRD staff and the Citizens and Technical Advisory Committees.

Evaluation of the Preliminary Regional Bikeway Network

PIC bikeway corridors were determined from the 'universe of options' through selection criteria and a gap analysis, as well as edits from the Technical Advisory Committee (TAC), Citizens Advisory Committee (CAC), and the public as part of the June 2010 open house.

[2] Draft AODA guidelines are available at: http://www.accessiblemunicipalities.ca/home.asp?itemid=13949

PIC Bikeway Corridor Selection Criteria

The selection of PIC corridor is based on the performance of individual corridors against the criteria listed in Table 2.

Table 2. PIC Bicycle Corridor Selection Criteria

Criterion	Considerations
Suitable for bicycling/ walking without improvements	Is the corridor a route that is currently safe and comfortable for cycling? Do existing roadways have low posted speeds and motor vehicle volumes?
Provides/enhances Active and Safe Route to School connection	Does the corridor provide a new or enhanced connection to a school? In the case of rural areas, does the corridor improve access to community centres?
Closes a critical gap	To what degree does the corridor fill a missing gap in the bicycle and/or pedestrian system?
Serves an immediate safety need	Can the project improve bicycling and walking at locations with perceived or documented safety issues? Are roadways designated as either freight or transit routes?
Serves key origins or destinations	How many user generators and attractors does the corridor connect within reasonable walking or bicycling distance, such as schools, parks, regional centers, etc.?
Geographically distributed	To what degree does the project benefit the regional community by offering opportunities for increased connectivity to surrounding communities, regional walkways/bikeways, etc.?
Serves supportive land uses	Does the route travel through areas of higher density, indicating a higher potential use? For rural areas, does the route provide access to regional destinations outside urban areas?
Right-of-way available	Is the corridor currently in public jurisdiction or private ownership?
Interfaces with other transportation modes	Does the corridor provide a new or enhanced connection to a transit centre, exchange, or bus stop?
Has local political and community support	To what degree do CRD member jurisdictions desire the proposed project? (Includes oral and written feedback from the community workshops and feedback received in public surveys.)

Each criterion was assigned a 'high,' 'medium,' or 'low' score, based on how well it fulfills each evaluation criterion. Individual scores were summed to arrive at an aggregate score for roadway segment, which were used to evaluate the function of potential bikeway corridors. The objective measurements of each criterion are shown in Table 3.

Table 3. Project Criteria and Scoring

Criteria	Scores	Measurement
Suitable for bicycling/ walking without improvements	High	Project is on a street with posted speed limit of ≤30 kph
	Medium	Project is on a street with ADT[3]<2,000 *(i.e., "collector")* and posted speed limit of ≤50 kph
	Low	Project is on a street with ADT>2,000 or posted speed limit of ≤50 kph
Provides/enhances Safe Route to School connection	High	Project within 400 m of a school (2.0 km for rural context[4])
	Medium	Project within 800 m of a school (3.0 km for rural context)
	Low	Project further than 800 m from a school (3.0 km for rural context)
Closes critical gap	High	Project connects directly to an existing bicycle or pedestrian facility
	Medium	Project within 400 m of existing bicycle or pedestrian facilities (1.5 km. for rural context)
	Low	Project does not connect to the existing system or provide network coverage
Serves an immediate safety need	High	Project is located on a corridor that has a high exposure to risk
	Medium	Project is located on a corridor that has a moderate exposure to risk
	Low	Project is located on a corridor that has a low exposure to risk
Serves key origins/ destinations	High	Project within 400 m of a regional centre, transit centre, school, civic building or regional park
		For rural areas: project within 2.0 km from a residential / commercial hub, transit stop/ park and ride facility, community centre, or park
	Medium	Project within 800 m of a regional centre or regional park
		For rural areas: project within 4.0 km from a residential / commercial hub, transit stop/ park and ride facility, community centre, or park
	Low	Project further than 800 m (4.0 km for rural) from a regional centre or regional park
Geographically distributed	High	Project provides connection in an area where few bicycle or pedestrian routes exist
	Medium	Project provides a connection where a moderate number of bicycle or pedestrian routes exist
	Low	Project duplicates existing bicycle or pedestrian routes
Serves supportive land uses	High	Project within 400 m of supportive land uses (high-density residential or commercial, or a major employment centre) For rural areas, uses may include all parks, tourist destinations, community centres, residential hubs Distances should be within 2.5 km
	Medium	Project within 800 m (rural areas: 5.0 km) of supportive land uses
	Low	Project not close to supportive land uses
Right-of-way available and/or suitable	High	Corridor is under public ownership or license (local government)
	Medium	Corridor is owned or licensed by a public agency (non municipal)
	Low	Corridor is under private ownership
Interfaces with other transportation modes (e.g., transit, rail, etc.)	High	Project within 400 m of transit stops or 800 m of a transit centre or exchange (For rural areas, the distance is 2.5 km and 4.0 km respectively and should include park and ride facilities)
	Medium	Project within 800 m of transit stops or 1,600 m of a transit centre or exchange (for rural areas, the distances may be 4.0 km and 7- 10 km respectively)
	Low	Project not near transit stops, transit centres, or an exchange. In the case of a rural environment, this may trigger the identification of a geographic system gap and would therefore be given greater importance.

[3] ADT Scale: › 1000 ADT (or 100 per hr. during peak) is typically a *local road* designation; 1000-3000 ADT (both rural and urban context) is typically a *collector*; ›5000 ADT = *arterial* designation.

[4] Threshold for travel distance is extended for the rural context. Distance reflects the Health Canada recommendation which calls for a ½ hour walk per day.

Gap Analysis

The System Gap Analysis was used to identify gaps in the existing PIC bikeway network, based on the GIS networks provided by the CRD and member municipalities in Phase I of the PCMP. Data used included the Digital Road Atlas and common bicycling destinations (e.g., schools, civic destinations, and transit hubs). Network gaps were identified based routes to destinations that may be of interest to utilitarian cyclists (e.g., gaps on routes to regional centres) and potential routes that may serve recreational or touring cyclists (e.g., a loop route of the CRD). This primary identification of network gaps was reviewed by the CAC, TAC, and CRD staff.

Defining Bikeway Gaps

Bikeway gaps range from short 'missing links' on a specific street or path corridor to larger geographic areas with few or no facilities at all. Gaps can then be organized based on length and other characteristics. Gaps can be classified into five main categories:

- **Spot gaps:** Spot gaps refer to point-specific locations lacking dedicated facilities or other treatments to accommodate safe and comfortable pedestrian or bicycle travel. Spot gaps primarily include intersections and other areas with potential conflicts with motor vehicles. Examples include bicycle lanes on a major street 'dropping' to make way for right turn lanes at an intersection, or a lack of intersection crossing treatments for pedestrians on a route or sidewalk as they approach a major street. Spot gaps in the pedestrian network may include intersections with high posted vehicle speeds and volumes, intersections with few gaps in existing motor vehicle traffic that do not provide many pedestrian crossing opportunities or intersections where pedestrian facilities 'drop.'

- **Connection gaps:** Connection gaps are missing segments (400 metres long or less) on a clearly defined and otherwise well-connected walkway or bikeway. Major barriers standing between destinations and clearly defined routes also represent connection gaps. Examples include bicycle lanes on a major street 'dropping' for several blocks to make way for on-street parking, a discontinuous sidewalk along a street, or a freeway standing between a major pedestrian or bicycle route and a school.

- **Lineal gaps:** Similar to connection gaps, lineal gaps are 400 metre to 800 metre long missing link segments on a clearly defined and otherwise well-connected walkway or bikeway.

- **Corridor gaps:** On clearly defined and otherwise well-connected bikeways, corridor gaps are missing links longer than 800 metres. These gaps will sometimes encompass an entire street corridor where bicycle facilities are desired but do not currently exist (does not apply for walkway gaps).

- **System gaps:** Larger geographic areas (e.g., a neighbourhood or business district) where few or no bikeways exist would be identified as system gaps. System gaps exist in areas where a minimum of two intersecting bikeways would be required to achieve the target network density (does not apply for walkway gaps).

Gaps typically exist where physical or other constraints impede bikeway network development. Typical constraints include narrow bridges on existing roadways, severe cross-slopes, and potential environmental damage associated with wider pavement widths. Traffic mobility standards, economic development strategies, and other policy decisions may also lead to gaps in a network. For instance, a community's strong desire for

on-street parking or increased vehicle capacity may hinder efforts to install continuous bicycle lanes along a major street.

Figure 1 presents a theoretical diagram illustrating the five gap types described above.

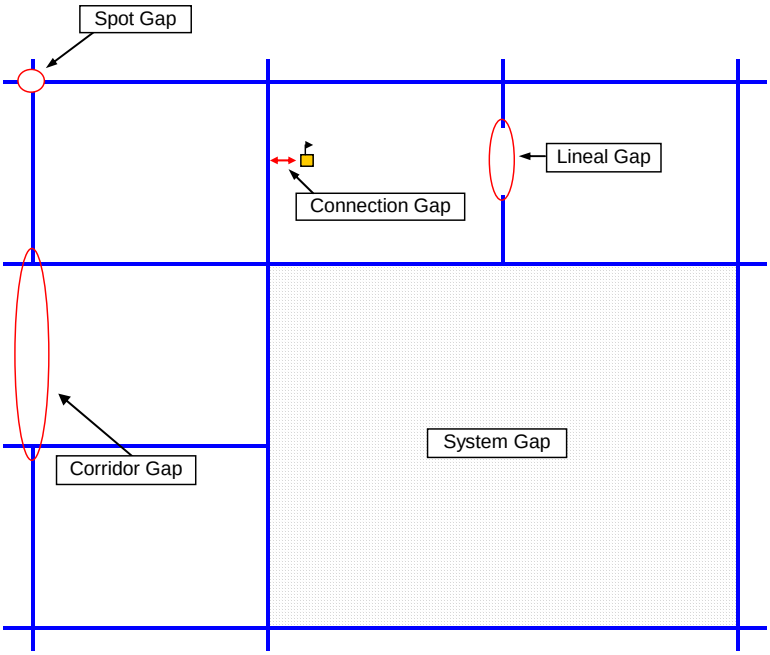


Figure 1. Diagram of Gap Types

Addressing Bikeway Network Gaps

The recommended procedure for addressing gaps in the CRD bikeway network should provide the flexibility to address unique circumstances. Figure 2 graphically depicts the procedure discussed below.

- **Step 1: Identify Gap Type:** Identify the gap type under focus (i.e., spot gap, connection gap, lineal gap, corridor gap, or system gap).

- **Step 2: Identify Appropriate Range of Gap Closure Measure Types:** The type of gap determines the initial range of closure measure options. For instance, longer system gaps can be filled through a variety of treatments, while a limited range of measures are appropriate for shorter gaps such as spot and connection gaps.

- **Step 3: Determine Appropriate Location for Gap Closure Measures:** The type of gap provides guidance for the appropriate gap closure location. Due to their relatively short lengths, spot and connection gaps should be addressed where they exist; alternative routing measures are not appropriate for addressing these gaps. Although spot and connection gaps may prove challenging, they represent the most critical bikeway links.

Typically covering longer distances, lineal, corridor, and system gaps offer greater implementation flexibility. Bicyclists generally prefer direct travel routes, though they may tolerate route diversions to avoid long bikeway gap segments. Identifying the appropriate gap closure location for lineal, corridor, and system gaps involves evaluating the feasibility of adding bicycle facilities to the street or path corridor under focus versus the appropriateness of using alternative routes. The feasibility analysis should consider the following:

- Whether compelling safety, operational, environmental, economic, or other reasons preclude bicycle facilities on the major street or path corridor under focus.
- Proximity of alternate route to the major street of path corridor under focus.
- Connectivity and continuity provided by the alternate route.
- The feasibility analysis will determine whether bicycle facilities should be added directly on the major street or path corridor, whether alternative routing is necessary, or both.

- **Step 4: Determine Appropriate Gap Closure Measure Type:** The appropriate gap closure measure type depends on the gap type and location. Intersection improvement measures or mid-block crossings represent the most appropriate strategy for addressing spot gaps, while bicycle lane retrofit, shared roadways, and off-street gap closure measures represent the most appropriate strategies for closing connection gaps. Appropriate measures for lineal, corridor, and system gaps depend on the feasibility analysis referenced in Step 3.

- **Step 5: Determine Specific Gap Closure Measure:** Identification of the appropriate gap closure measure type and specific characteristics of the corridor/location under focus will help determine the appropriate specific gap closure measure.

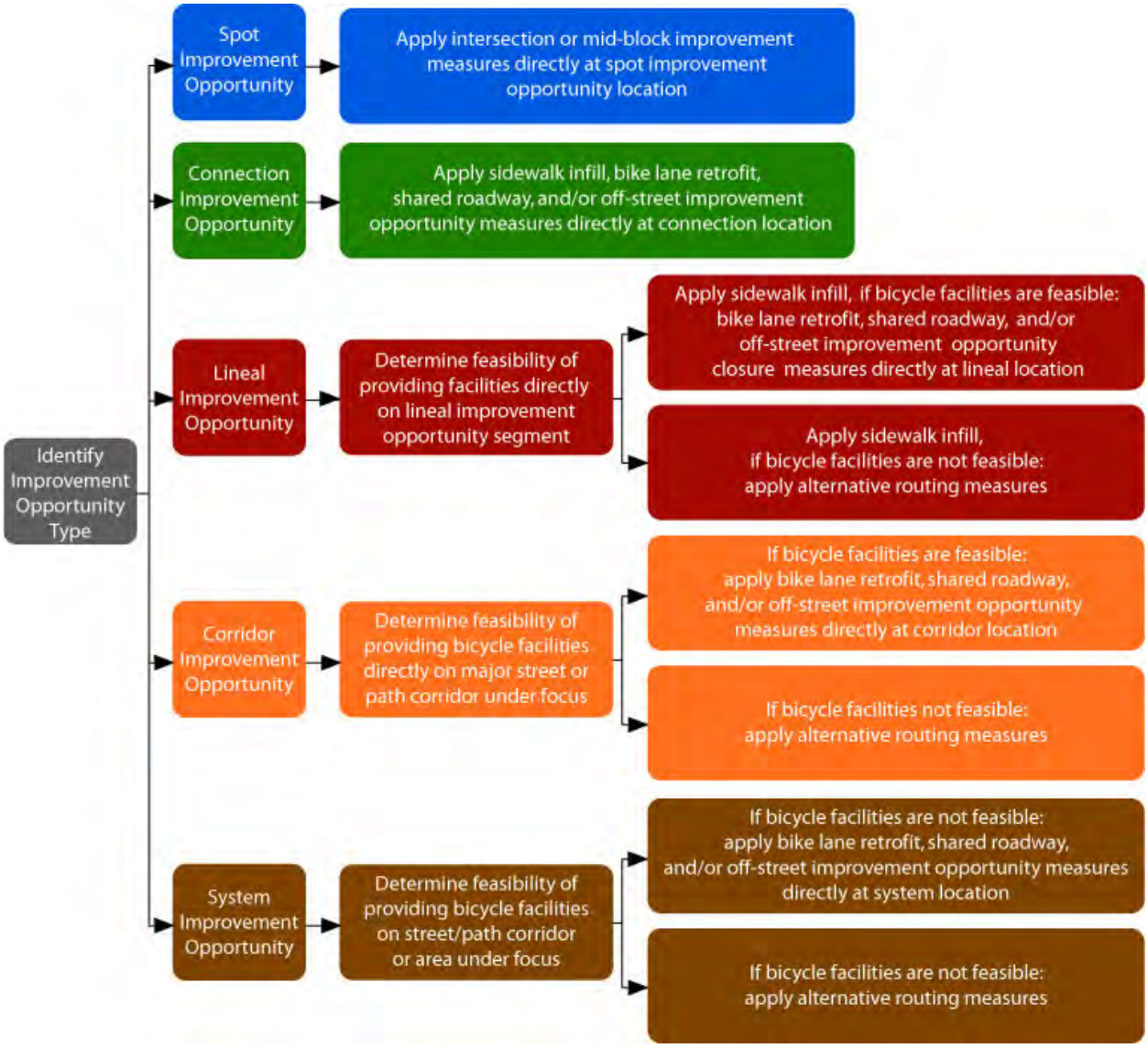


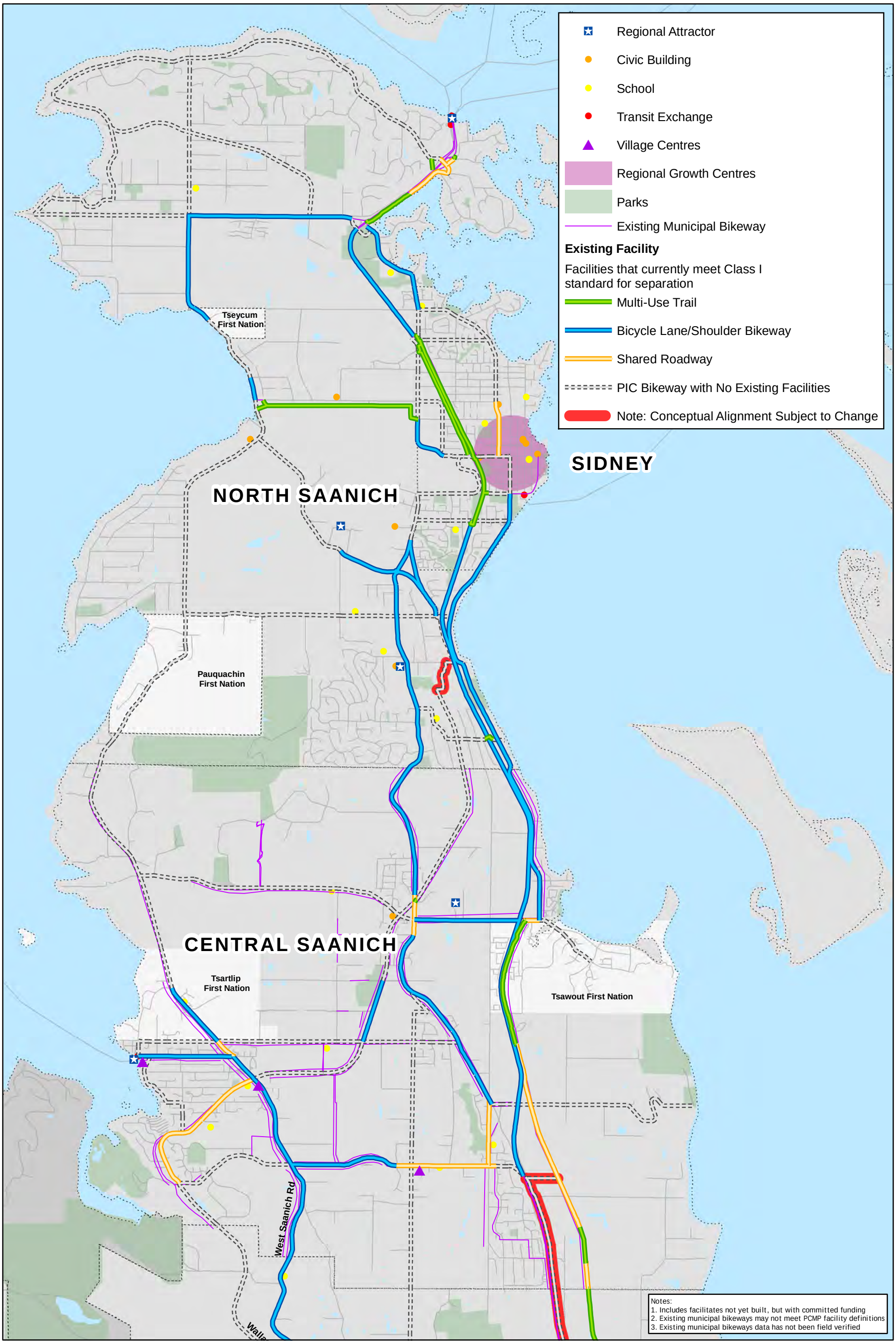
Figure 2. Walkway and Bikeway Gap Closure Strategy

The gap analysis was developed based on existing available data and took the following factors into consideration:

- Several roadways that are part of local bikeway networks but not the regional network were noted as network gaps.
- On-street portions of the Lochside and Galloping Goose Trails were marked as network gaps. The intent was to highlight locations where it may be desirable to construct off-street facilities to provide a continuous facility dedicated to non-motorized transportation that would act as a spine of the regional bikeway and pedestrian network.
- In some areas of the CRD, the analysis did not take into account gaps near every school, park, or transit stop in the most densely populated areas of the CRD (e.g., Portions of Victoria and Oak Bay).

Many of these schools and transit stops are located along local streets and may already have facilities that create suitable cycling and walking conditions.

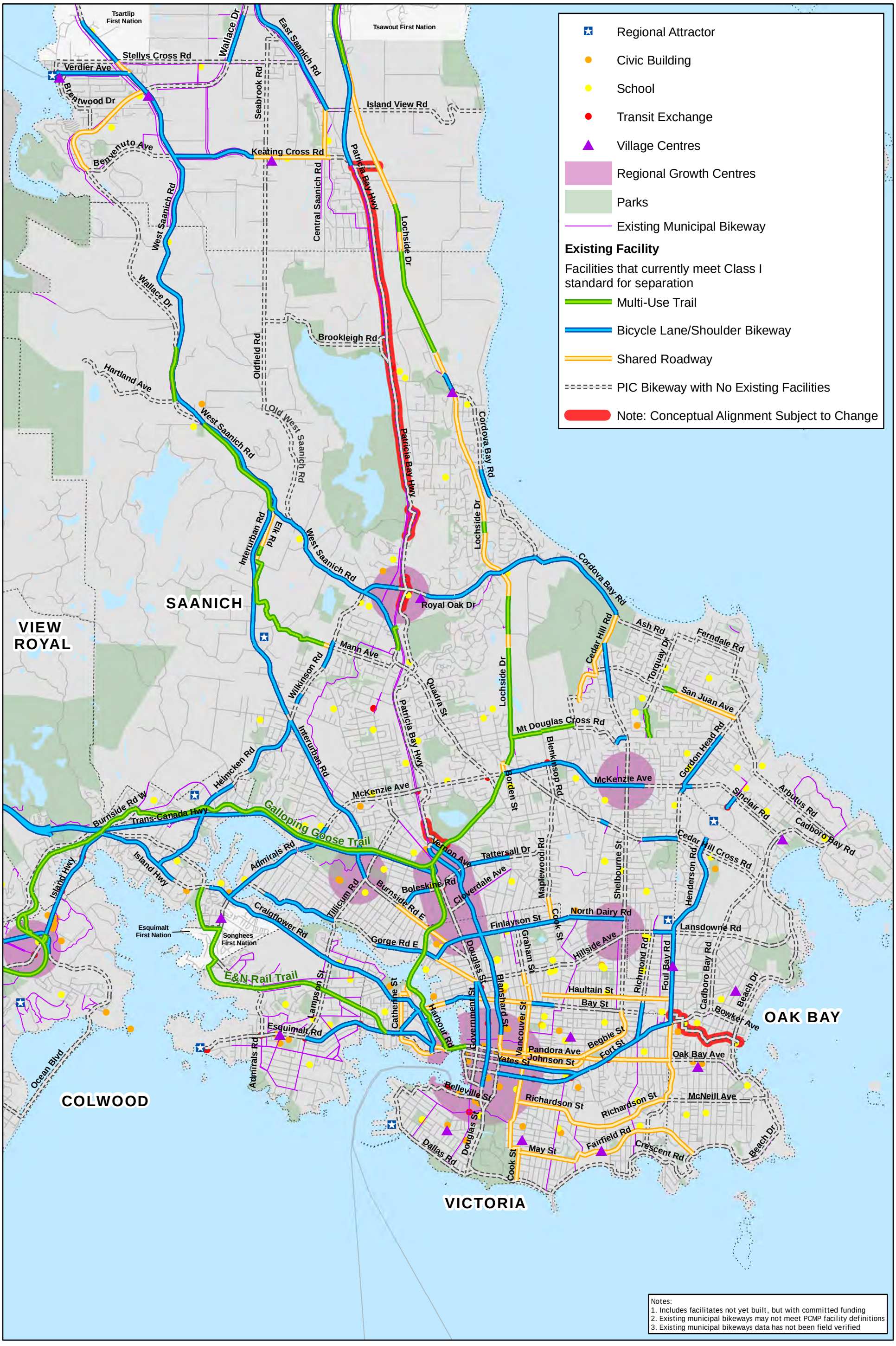
- In some cases, this analysis noted roadways previously designated as local bikeway links as gaps in the regional network to highlight the fact that these routes have potential regional importance.



Map 2. Existing Bicycle Facilities - Peninsula

Capital Regional District
Regional Pedestrian and Cycling Master Plan

0 0.5 1 Kilometers

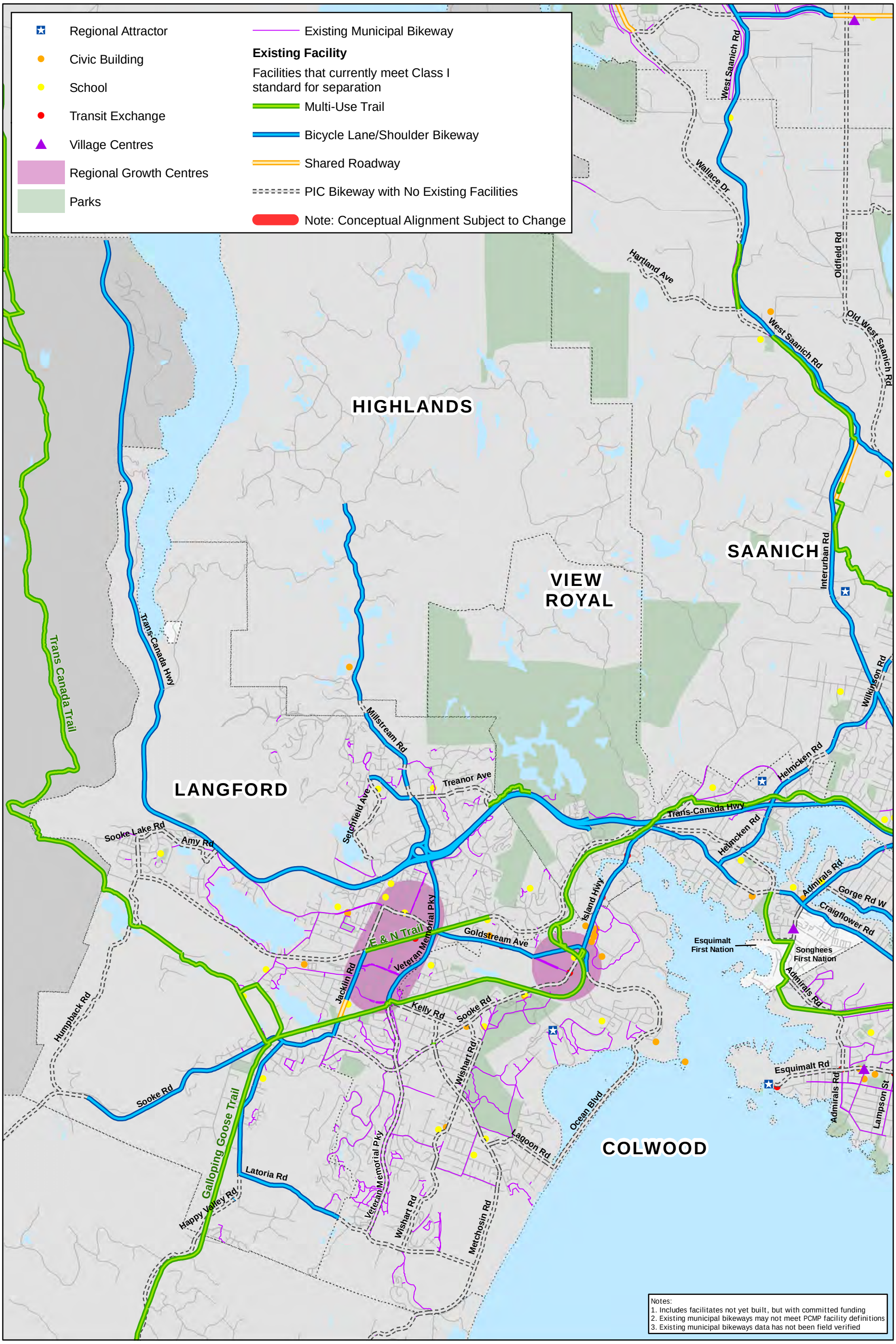


Map 3. Existing Bicycle Facilities - Core

Capital Regional District
Regional Pedestrian and Cycling Master Plan

0 0.5 1 Kilometers

alta PLANNING + DESIGN



Map 4. Existing Bicycle Facilities - West Shore One

Capital Regional District
Regional Pedestrian and Cycling Master Plan

0 0.45 0.9
Kilometers

Regional Attractor
Civic Building
School
Transit Exchange
Village Centres
Regional Growth Centres
Parks

Existing Municipal Bikeway

Existing Facility

Facilities that currently meet Class I standard for separation

Multi-Use Trail

Shared Roadway

PIC Bikeway with No Existing Facilities

Note: Conceptual Alignment Subject to Change

LANGFORD
COLWOOD
METCHOSIN
SOOKE
Trans Canada Hwy
Trans Canada Trail
E & N Trail
Island Hwy
Esquimalt First Nation
Jacklin Rd
Sooke Rd
Wishart Rd
Veteran Memorial Pkwy
Ocean Blvd
Metchosin Rd
Happy Valley Rd
Kangaroo Rd
Galloping Goose Trail
Otter Point Rd
Grant Rd
T'Sou-ke First Nation
E Sooke Rd
West Coast Rd
Becher Bay First Nation

Notes:
1. Includes facilitates not yet built, but with committed funding
2. Existing municipal bikeways may not meet PCMP facility definitions
3. Existing municipal bikeways data has not been field verified

Map 5. Existing Bicycle Facilities - West Shore Two

Capital Regional District
Regional Pedestrian and Cycling Master Plan

0 2 4 Kilometers

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Notes:
1. Includes facilitates not yet built, but with committed funding
2. Existing municipal bikeways may not meet PCMP facility definitions
3. Existing municipal bikeways data has not been field verified

Trans Canada Trail

Pacific Marine Rd

Pacheedaht First Nation

West Coast Rd

Galloping Goose Trail

METCHOSIN

SOOKE

Otter Point Rd

Sooke Rd

T'Sou-ke First Nation

T'Sou-ke First Nation

Becher Bay First Nation

- Regional Attractor
- Civic Building
- School
- Transit Exchange
- Village Centres
- Regional Growth Centres
- Parks

- Existing Municipal Bikeway

Existing Facility

Facilities that currently meet Class I standard for separation

- Multi-Use Trail
- Bicycle Lane/Shoulder Bikeway
- Shared Roadway
- PIC Bikeway with No Existing Facilities
- Note: Conceptual Alignment Subject to Change

Map 6. Existing Bicycle Facilities - Juan de Fuca

Capital Regional District
Regional Pedestrian and Cycling Master Plan

0 2.5 5 Kilometers

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Identification and Assignment of Bikeway Typologies

Standardized definitions of PIC bikeway facility types provide clarification for municipalities as they develop bicycle infrastructure. Standard definitions also encourage consistency throughout the region, which facilitates trips between municipalities by residents and visitors alike.

Currently, the CRD and member municipalities undertake different approaches when identifying and assigning bikeway networks. For example, the CRD's 2002 *TravelChoices* network uses facility type (e.g., bicycle lane or shared roadway) to categorize five distinct types of bikeways, while some municipalities differentiate bikeways by intended use (e.g., recreational or commuter route) or as a "local connector' that accommodates recreational or less-experienced cyclists.

The municipalities also vary with respect to design requirements for various types of bikeways; in some municipalities, 'shared roadways' require signage to designate them as bicycle routes, while others designate a line on a map with no specific treatments. This leads to an inconsistent user experience between municipalities.

The PCMP uses the following typology for assigning on-street bikeway facilities to specific roads:

1. **User Classification:** Bikeway class indicates what types of users might feel comfortable on a particular bikeway facility.

2. **Levels of Facility Separation:** Bikeway facilities are designated by Canadian guidelines and best practices for cycle tracks, bicycle lanes, shared lanes, and other facilities.

3. **Roadway Context:** The volume and speed of motor vehicle traffic, as well as presence of trucks, transit, on-street parking, and large numbers of turning vehicles impact the user experience of different types of bikeway facilities.

In combination, these elements can provide guidance for bikeway facility selection as shown in Figure 3.

User Type Classification

Bikeway class indicates what types of users might feel comfortable on a particular bikeway facility. The Cycling in Cities Program at the University of British Columbia found that the most significant factors influencing bicycle use are motor vehicle traffic volumes and speeds.[5] The study also found that most cyclists have a preference for facilities that are separated from motor vehicle traffic or that are located on local roads with low motor vehicle traffic speeds and volumes. Because off-street pathways are physically separated from the roadway, they are perceived as safe and attractive routes for cyclists who prefer to avoid motor vehicle traffic. A stated preference experiment performed in Edmonton found that, for the typical cyclist, one minute cycling in mixed traffic is as onerous as 4.1 minutes on bike lanes.[6]

[5] http://www.cher.ubc.ca/cyclingincities/survey.html
[6] Hunt and Abraham (2007).

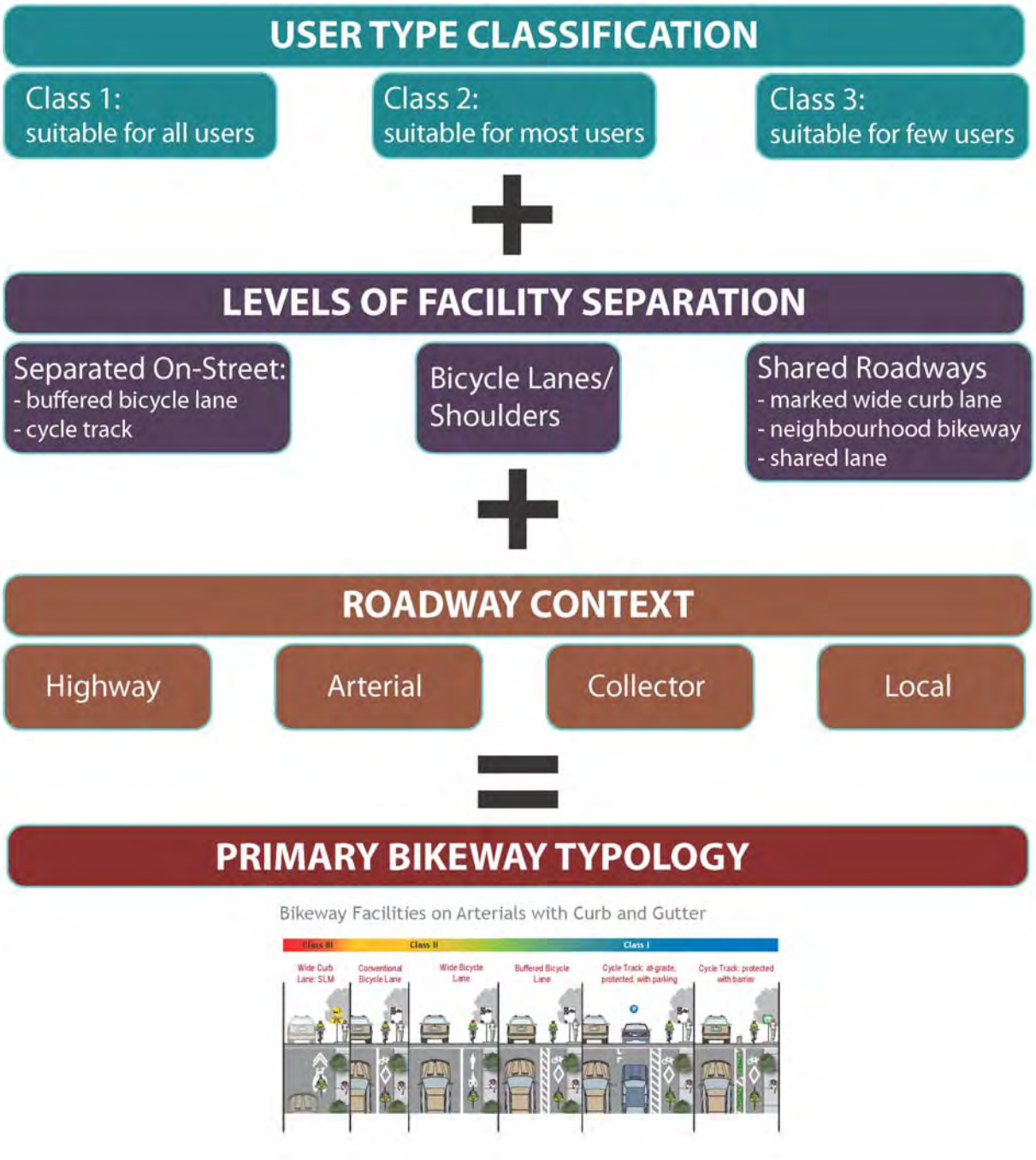


Figure 3. Typology of Bicycle Faculty Application

The PCMP identifies the following classes of facilities by user type:

- ***Class 1 facilities*** provide a high degree of separation between cyclists and motor vehicle traffic and are comfortable for all users including recreational and inexperienced cyclists.
- ***Class 2 facilities*** provide a moderate degree of separation from motor vehicle traffic and offer enhanced traffic calming treatments on local roadways.
- ***Class 3 facilities*** generally include on-street facilities with limited physical separation from motor vehicle traffic but may appeal to commuter cyclists due to their route connectivity.

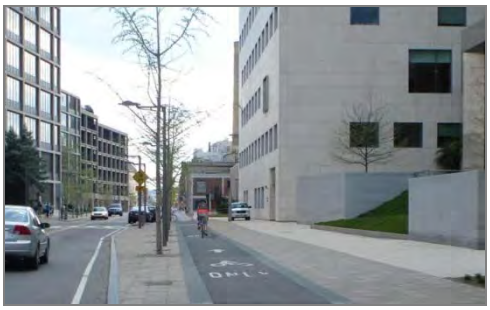
Levels of Facility Separation

Standards for classifying bikeway types are provided in the Transportation Association of Canada (TAC) *Bikeway Traffic Control Guidelines for Canada* (2010 Draft), *Geometric Design Guide for Canadian Roads*, and *MUTCD-Canada*. The variety of existing facility classifications used in the CRD and member municipalities can be synthesized into the categories defined in Table 4.

The classifications identified in Table 4 are common regional classifications that describe bicycle facilities by engineering treatment. This classification system integrates the various municipal classifications and does not preclude the municipalities from continuing to use existing user classification systems. Facility type information is useful at the planning and engineering level, while the designation of a local commuter route is beneficial for system users, who are more concerned about finding a continuous route on a level with which they feel comfortable than identifying design treatments. It is recommended that municipalities use the terms defined in the PCMP at the engineering and planning level to be clear and precise about bicycle facility planning, while use designations can continue to be used for mapping and sharing the network with the public if that is the preferred local method.

Table 4. Recommended On-Street Bicycle Facility Classification

Description	Example
Off-Street Facilities	
Regional Multi-use Trails Multi-use trails are physically separated from motor vehicles and provide sufficient width and supporting facilities to be used by cyclists, pedestrians, and other non-motorized users. Regional designation indicates that the trail is under jurisdiction of CRD Parks and acts as a spine of the bicycle and pedestrian networks. The Galloping Goose Trail, E&N Rail Trail, and Lochside Trail are regional multi-use trails.	
Bicycle Pathways Bicycle pathways are similar to multi-use pathways, but are intended for exclusive bicycle use. They are usually provided adjacent to pedestrian paths.	

Description	Example
Separated On-Street Bicycle Facilities	
Cycle Tracks Cycle tracks are a hybrid bicycle facility combining the experience of a separated path with the on-street infrastructure of a conventional bike lane. Cycle tracks utilize a variety of applications such as parking placement, channelization, mountable curbs, bollards and pavement markings, and grade separation.	
Buffered Bicycle Lanes Buffered bicycle lanes are designed to increase the space between the bicycle lanes and the travel lane or parked cars. They are appropriate on streets with high automobile traffic volumes and speeds, on-street parked cars, and high volumes of truck or oversized vehicle traffic.	
Bicycle Lane/Shoulder Bikeway	
Bicycle Lanes Bicycle lanes provide separated designated roadway space for bicyclists. Bicycle lane treatments include conventional bicycle lanes, coloured bicycle lanes, and other treatments such as contra-flow bicycle lanes, left side bicycle lanes, off-peak bicycle lanes, uphill bicycle lanes, and shared bike/bus lanes.	

Description	Example
Shoulder Bikeways Shoulder bikeways, or paved shoulders, include roadways that provide adequate shoulder width for safe bicycling. Located on streets without curb and gutters, shoulder bikeways include signing and striping, but do not always include bicycle stencils.	
Shared Roadway	
Marked Wide Curb Lanes Marked wide curb lanes provide direct routes for experienced cyclists along the outer lane of a roadway.	
Neighbourhood Bikeways Neighbourhood bikeways include a range of treatments for bikeways, from relatively basic facilities consisting of signage and pavement markings to bikeways with varying degrees of traffic calming implemented to improve safety for cyclists and other road users.	
Shared Routes Shared routes provide key connections between more formal bikeways and key destinations. They are indicated by signage and sometimes pavement markings.	

Roadway Context

Context describes conditions on the roadway. Many roadway factors impact the experience of cycling; automobile speeds and volumes, presence of heavy vehicles, trucks, or transit vehicles, roadway width, visibility, adjacent land uses, and urban or rural context all contribute to the context of a bikeway. While all these factors are important, the major indicators of the context are automobile speed and volume. In addition, urban or rural context affects engineering treatments appropriate on a particular roadway. Roadway classification indicates many of these context issues and provides guidance for what types of bikeway facilities are appropriate.

The British Columbia Digital Road Atlas (DRA) database was used for classifying roadways. The classifications are defined in Table 5. While this dataset is a useful first step in facility selection, in some cases actual road traffic speeds and/or volumes differ from the DRA. Additional engineering judgement should be applied when selecting bicycle facilities appropriate to a particular roadway.

Table 5. Definition of Roadway Classifications, B.C. Digital Road Atlas

Road Class	Definition	Posted Speeds*	Average ADT
Highway/Freeway	Controlled access, typically divided carriageway/ primary or secondary provincial highway, may be single or multilane each way	50-90 km/h	5,400
Arterial	A thoroughfare with a generally large traffic capacity, generally multilane each way	30-70 km/h	3,200
Collector	A road to collect traffic from areas and/or to cross town with the general right of way, generally one lane each way	30-60 km/h	1,900
Local	local, residential roads	20-50 km/h	900

* Note: Speeds and ADT summarized from DRA GIS file, rather than a technical definition.

The following pages show the range of bicycle facilities appropriate on roadways depending on their classification. While most people are comfortable riding in a shared lane on a local street, few people would ride in a shared lane on an arterial.

Roads with curbs and gutters are likely to provide sidewalks for pedestrians, as well as having designated on-street parking where parking is allowed. On roads without curbs and gutters, pedestrians are more likely to walk alongside the road. Where the shoulders have been paved for bicycle use, pedestrians often walk in the shoulder bikeway, and parking can be allowed. Higher-level shoulder bikeways provide separated pedestrian space and prohibit parking except in emergencies. If a road designated as a shoulder bikeway is developed with a curb and gutter, marked and signed bicycle lanes should be incorporated into the design of the new roadway.

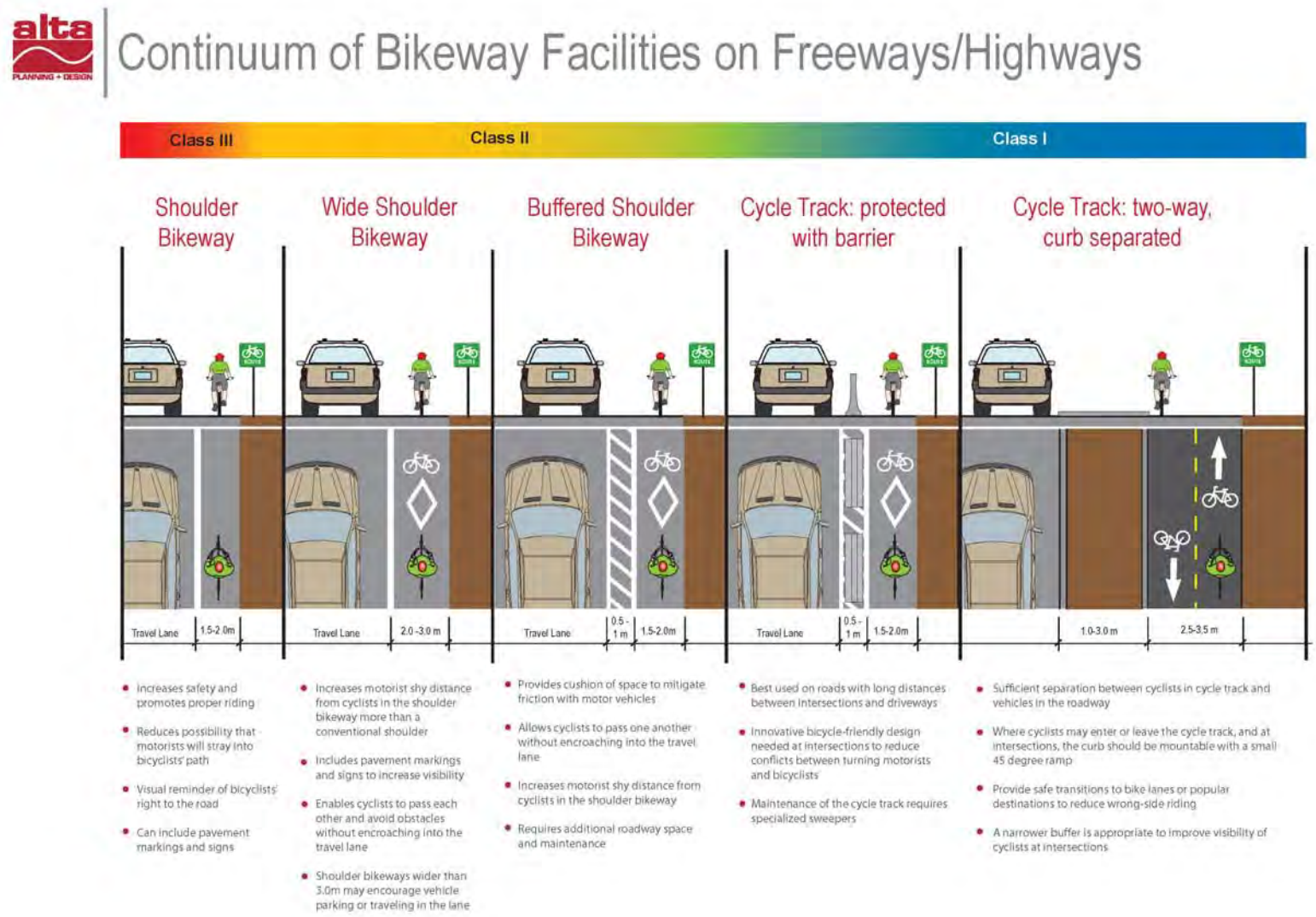
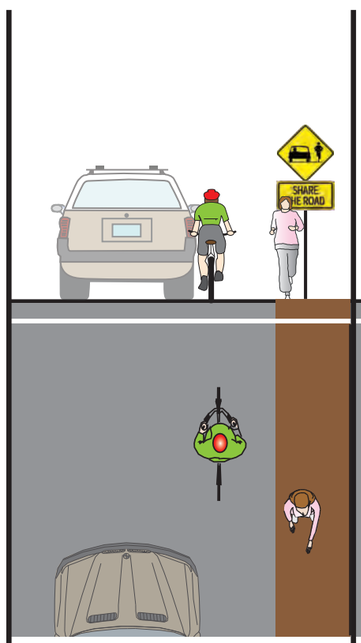


Figure 4. Continuum of Bikeway Facilities on Freeways/Highways

Continuum of Bikeway Facilities on Arterials without Curb & Gutter

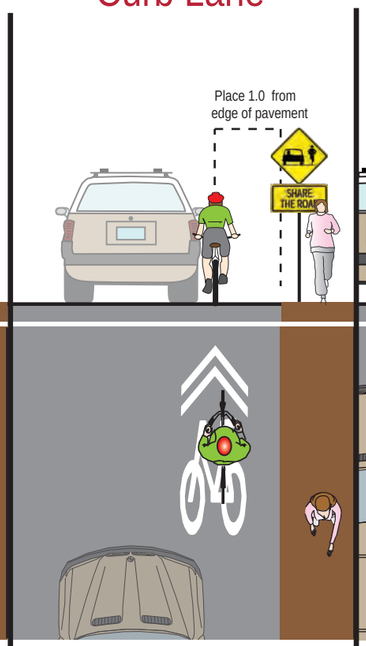
Class III — **Class II** — **Class I**

Shared Lane



- No special accomodation for pedestrians
- "Share the Road" and /or "Bike Route" signs identify the road as a bikeway
- Not comfortable for many cyclists

Marked Wide Curb Lane

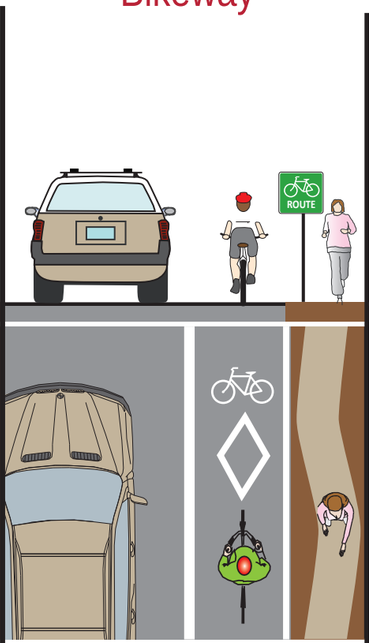


- Visibly reminds motorists to expect bicyclists on the roadway
- Increases motorist shy distance from cyclists sharing a lane
- Not comfortable for many cyclists
- No specific accomodation for pedestrians

Shoulder Bikeway

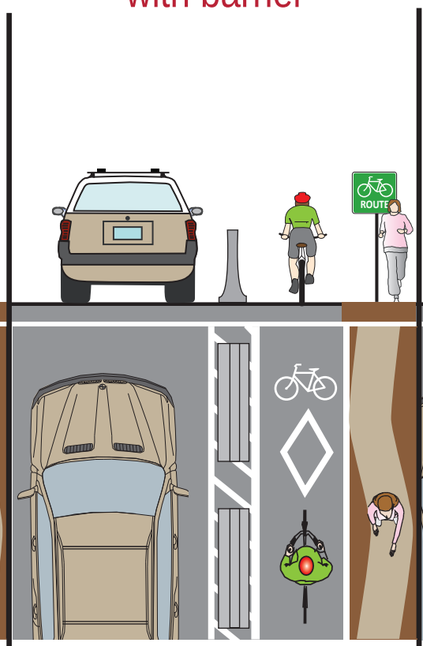
- Can be shared bicycle/ pedestrian space
- Reduces possibility that motorists will stray into bicyclists' path
- Visual reminder of bicyclists' right to the road
- Can include pavement markings and signs
- Can be used for emergency vehicle parking

Wide Shoulder Bikeway



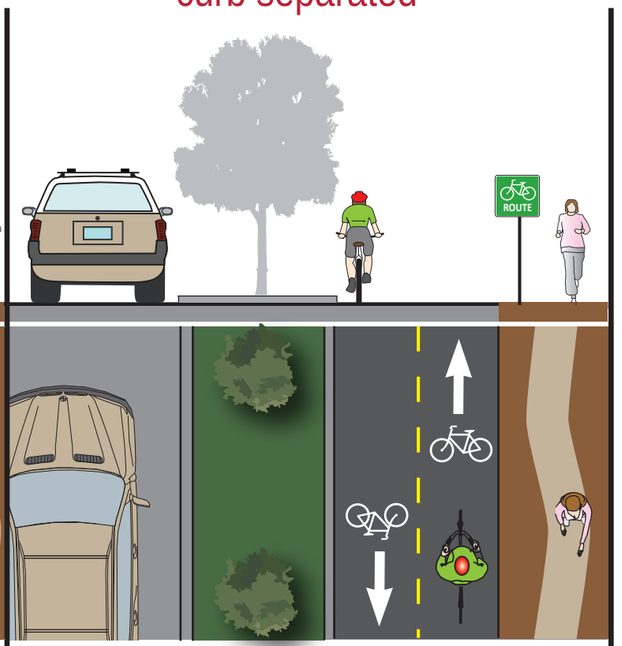
- Increases motorist shy distance from cyclists more than a conventional shoulder; a buffer may be provided as well
- Enables cyclists to pass one another and avoid obstacles without encroaching into the travel lane
- Mark a shy line from the pavement end
- Can be used for emergency vehicle parking

Cycle Track: protected with barrier



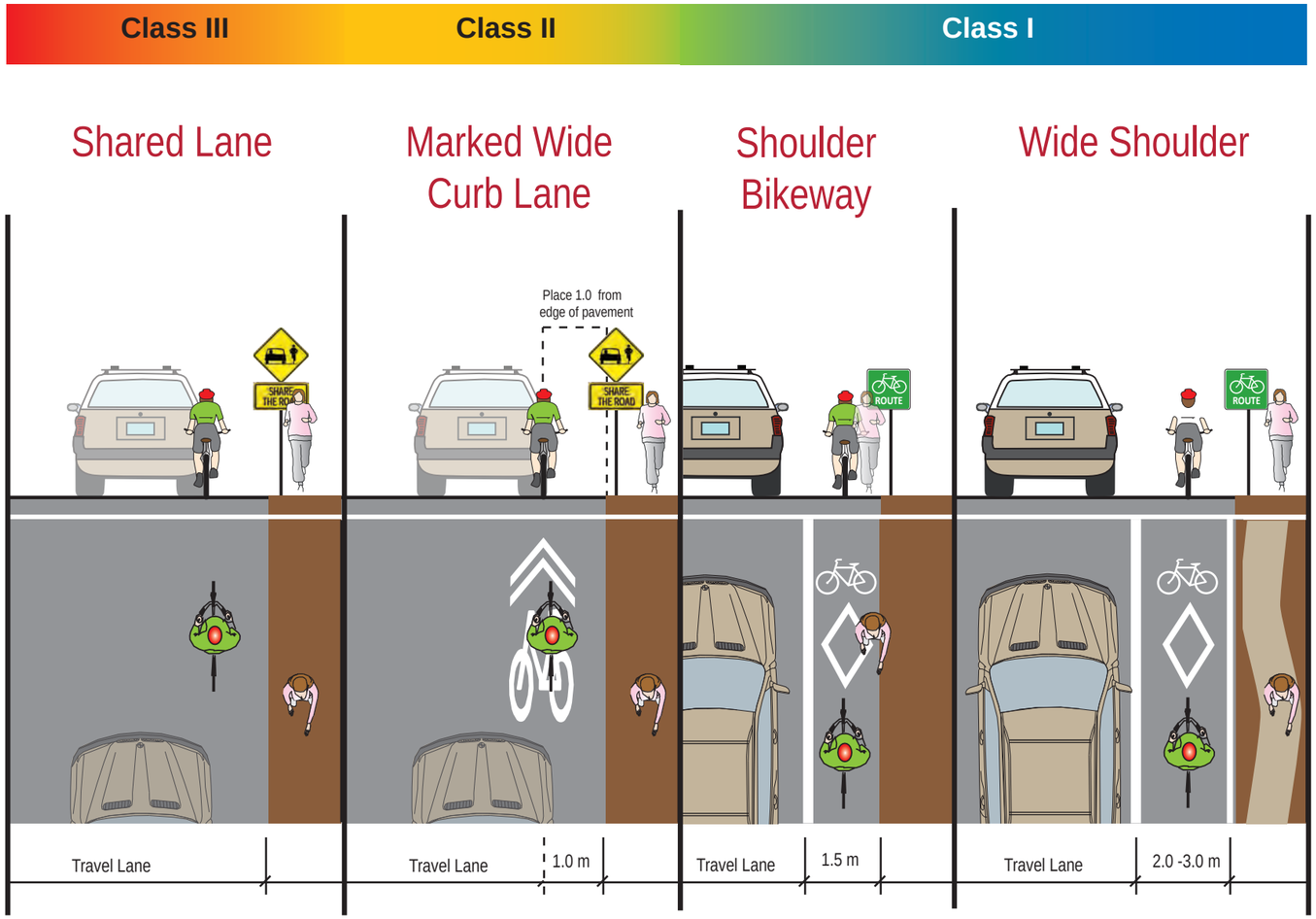
- Can be shared bicycle/pedestrian space, ideally separated where high levels of use
- Best used on roads with long distances between intersections and driveways
- Innovative bicycle-friendly design needed at intersections to reduce conflicts between turning motorists and bicyclists
- Barrier options include extruded curb, jersey barriers, bollards, and grade separation.

Cycle Track: two-way, curb separated



- Can be shared bicycle/pedestrian space, or have a parallel softsurface pedestrian route
- Sufficient separation between cyclists in cycle track and vehicles in the roadway
- Where cyclists may enter or leave the cycle track, or where motorists cross at a driveway, the curb should be mountable with a small 45 degree ramp, allowing cyclist turning movements
- Provide safe transitions to bike lanes or popular destinations to reduce wrong-side riding

Continuum of Bikeway Facilities on Collectors without Curb & Gutter



- No special accomodation for pedestrians
- "Share the Road" and /or "Bike Route" signs identify the road as a bikeway
- Not comfortable for many cyclists

- Visibly reminds motorists to expect bicyclists on the roadway
- Increases motorist shy distance from cyclists sharing a lane
- Not comfortable for many cyclists
- No specific accomodation for pedestrians

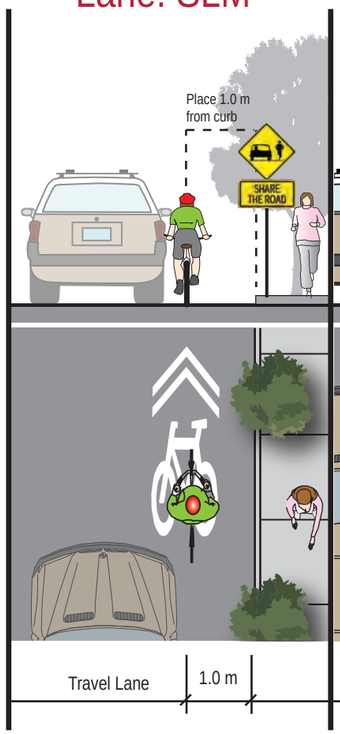
- Can be shared bicycle/pedestrian space
- Reduces possibility that motorists will stray into bicyclists' path
- Visual reminder of bicyclists' right to the road
- Should include pavement markings and signs
- Can be used for emergency vehicle parking

- Dedicated space for cyclists and pedestrians
- Increases motorist shy distance from cyclists more than a conventional shoulder
- Enables cyclists to pass one another and avoid obstacles without encroaching into the travel lane
- Mark a shy line from the pavement end
- Can be used for emergency vehicle parking

Continuum of Bikeway Facilities on Arterials with Curb and Gutter

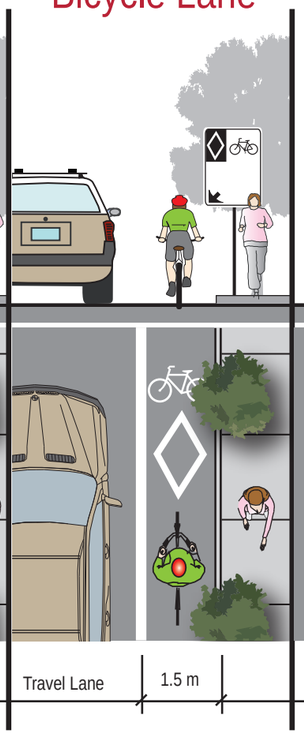
Class III | **Class II** | **Class I**

Wide Curb Lane: SLM



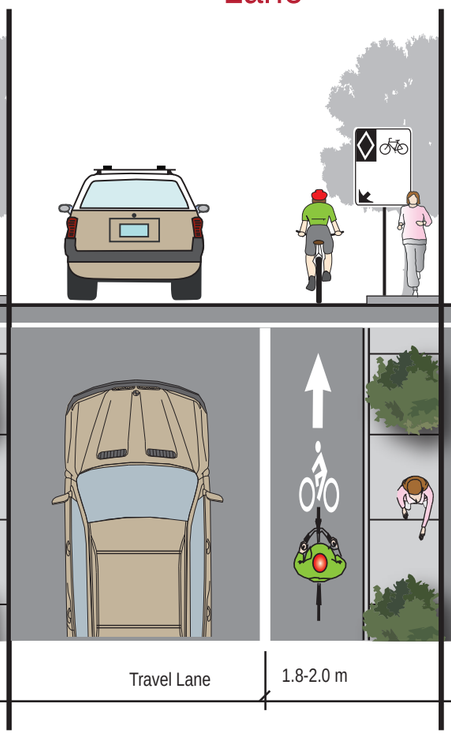
- "Share the Road" and /or "Bike Route" signs identify the road as a bikeway
- Shared lane markings increase safety and promote proper riding
- Reduces possibility that motorists will stray into bicyclists' path
- Visual reminder of bicyclists' right to the road

Conventional Bicycle Lane



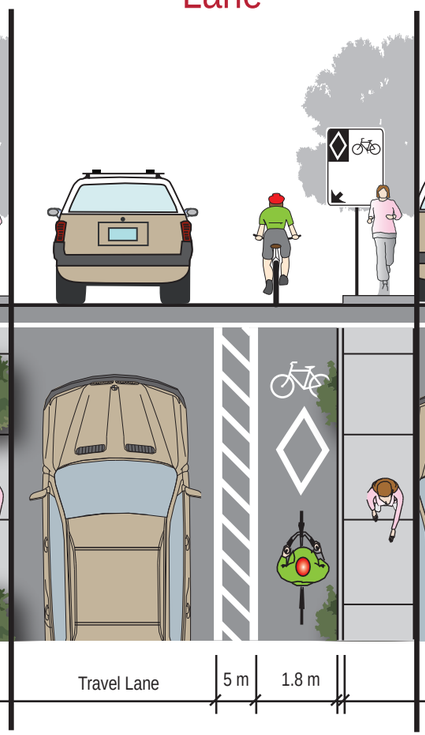
- Dedicated space for cyclists increases comfort and safety of cyclists
- Cyclists must encroach into the travel lane to pass one another

Wide Bicycle Lane



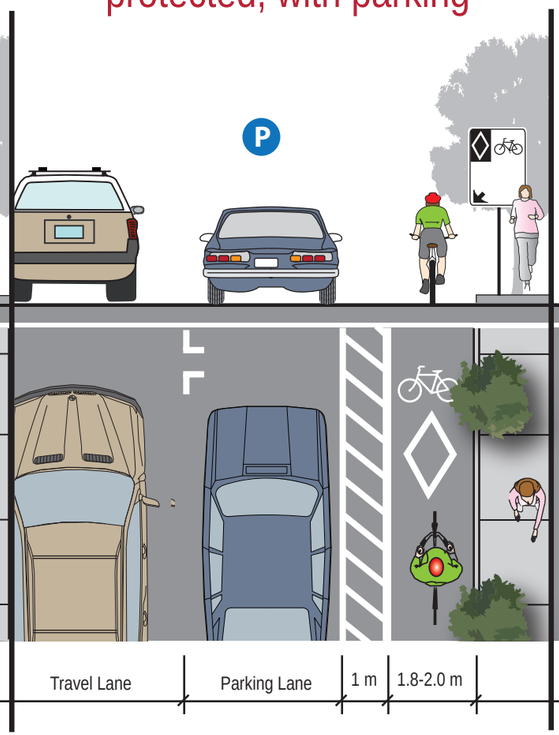
- Increases motorist shy distance from cyclists in the bike lane more than a conventional bike lane
- Enables cyclists to pass one another without encroaching into the travel lane
- Bike lanes wider than 2.0m may encourage vehicle loading in bike lane

Buffered Bicycle Lane



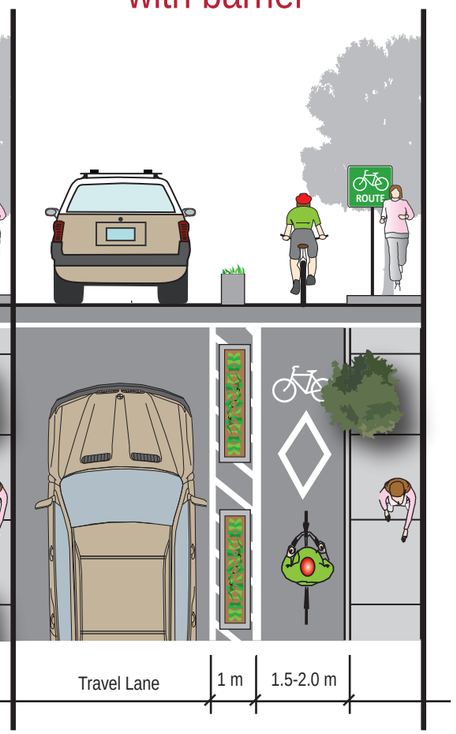
- Provides cushion of space to mitigate friction with motor vehicles on streets with narrow bike lanes
- Allows cyclists to pass one another without encroaching into the travel lane
- Increases motorist shy distance from cyclists in the bike lane
- Requires additional roadway space and maintenance

Cycle Track: at-grade, protected, with parking



- Dedicates and protects space for bicyclists and improves perceived comfort and safety
- Reduces risk of 'dooring' compared to a bike lane, and eliminates of the risk of a doored cyclist being run over by a motor vehicle
- Low implementation cost through use of existing pavement using parking lane as a barrier
- Apply along roadways with high motor vehicle volumes and/or speeds
- Best on streets with parking lanes that stay mostly occupied

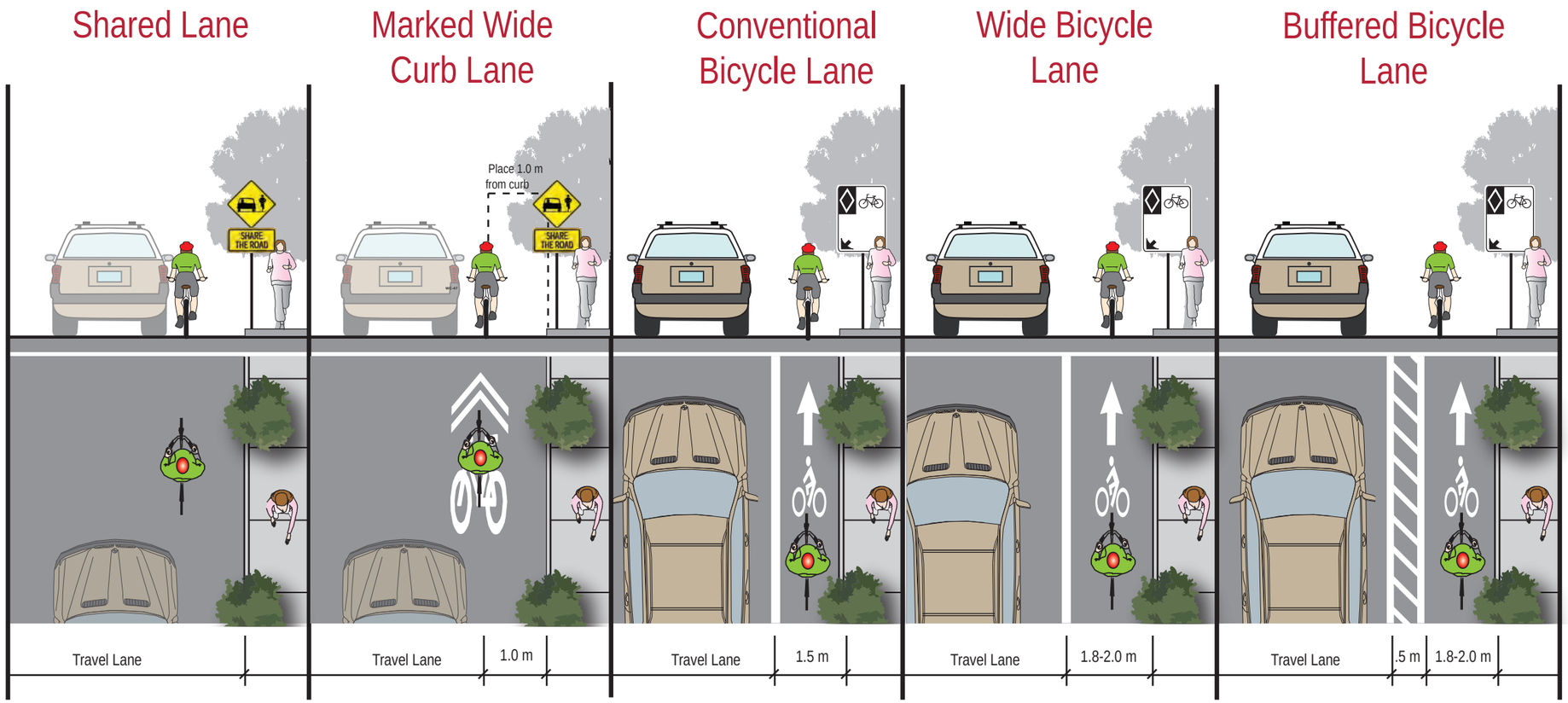
Cycle Track: protected with barrier



- Barrier options include extruded curb, bollards, and grade separation.
- Best used on roads with high speeds and long distances between interesections and driveways
- Innovative bicycle-friendly design needed at intersections to reduce conflicts between turning motorists and bicyclists
- Maintenance of the cycle track requires specialized sweepers
- Width should never be taken from the pedestrian zone to make room for a cycle track

Continuum of Bikeway Facilities on Collectors with Curb & Gutter

Class III **Class II** **Class I**



- "Share the Road" and/or TAC "Bike Route" signs indicate to cyclists and motorists that the road is a designated bicycle route.

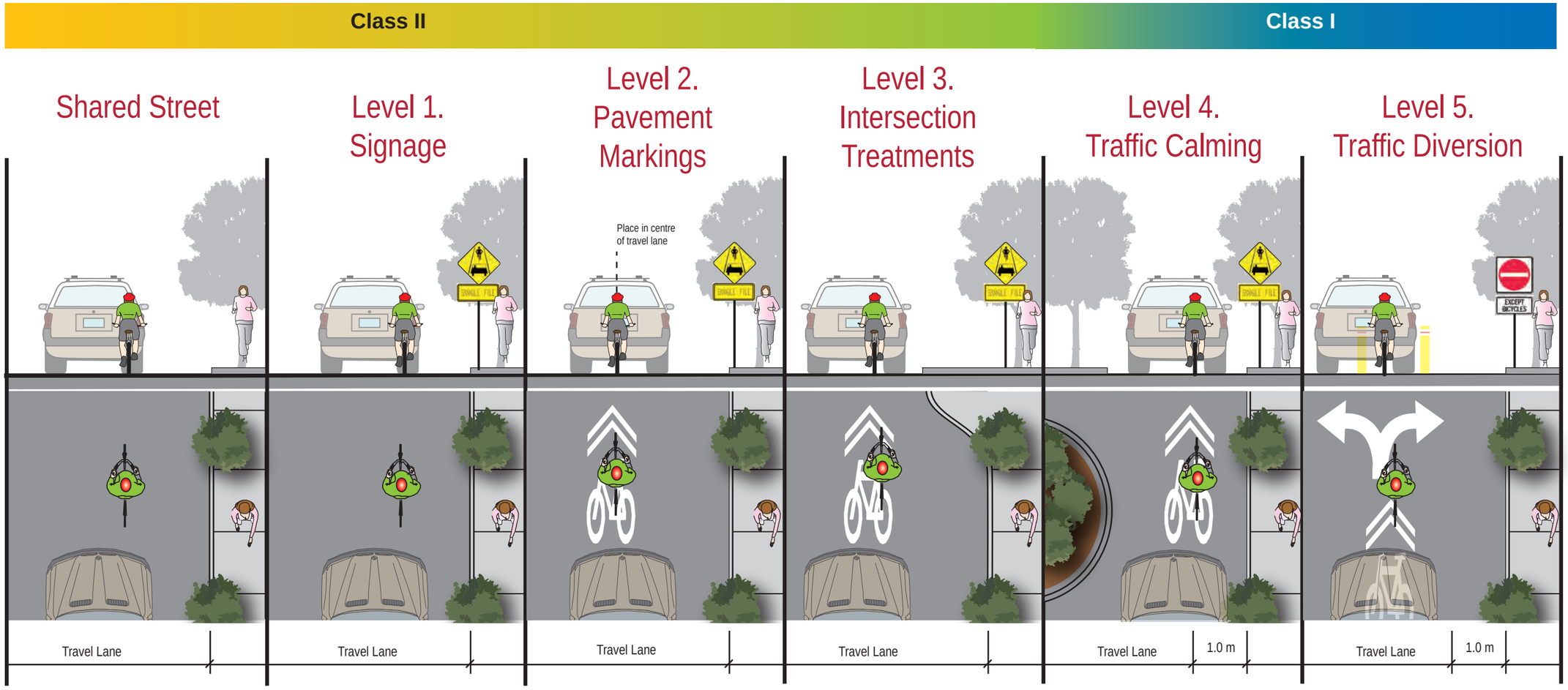
- Increases safety and promotes proper riding
- Visual reminder of bicyclists' right to the road
- Can be used with on-street parking; place marking 3.5 m from curb where parking is present

- Increases safety and promotes proper riding
- Reduces possibility that motorists will stray into bicyclists' path
- Can be curb-tight or adjacent to on-street parking. Where parking is permitted, the lane should be at least 1.5m due to conflicts with car doors

- Increases motorist shy distance from cyclists in the bike lane more than a conventional bike lane
- Enables cyclists to pass one another without encroaching into the travel lane
- Bike lanes wider than 2.0m may encourage vehicle loading in bike lane

- Provides a cushion of space to mitigate friction with motor vehicles on streets with narrow bike lanes
- Allows cyclists to pass one another without encroaching into the travel lane
- Increases motorist shy distance from cyclists in the bike lane
- Requires additional roadway space and maintenance

Continuum of Bikeway Facilities on Local Streets
(with or without curb & gutter)



- No specific bicycle accomodation, although many cyclists feel comfortable riding on local streets

- Warning signs inform cyclists that they are on a designated bicycle route and remind motorists to watch for cyclists
- Wayfinding signs provide valuable information for cyclists about key destinations and route finding. They also create a coherent identity for the regional bikeway network

- Encourages cyclists to take the lane on streets that are too narrow for an automobile to pass a cyclist within the travel lane
- Highlights that the roadway is intended for use by cyclists and that automobiles must pass with caution

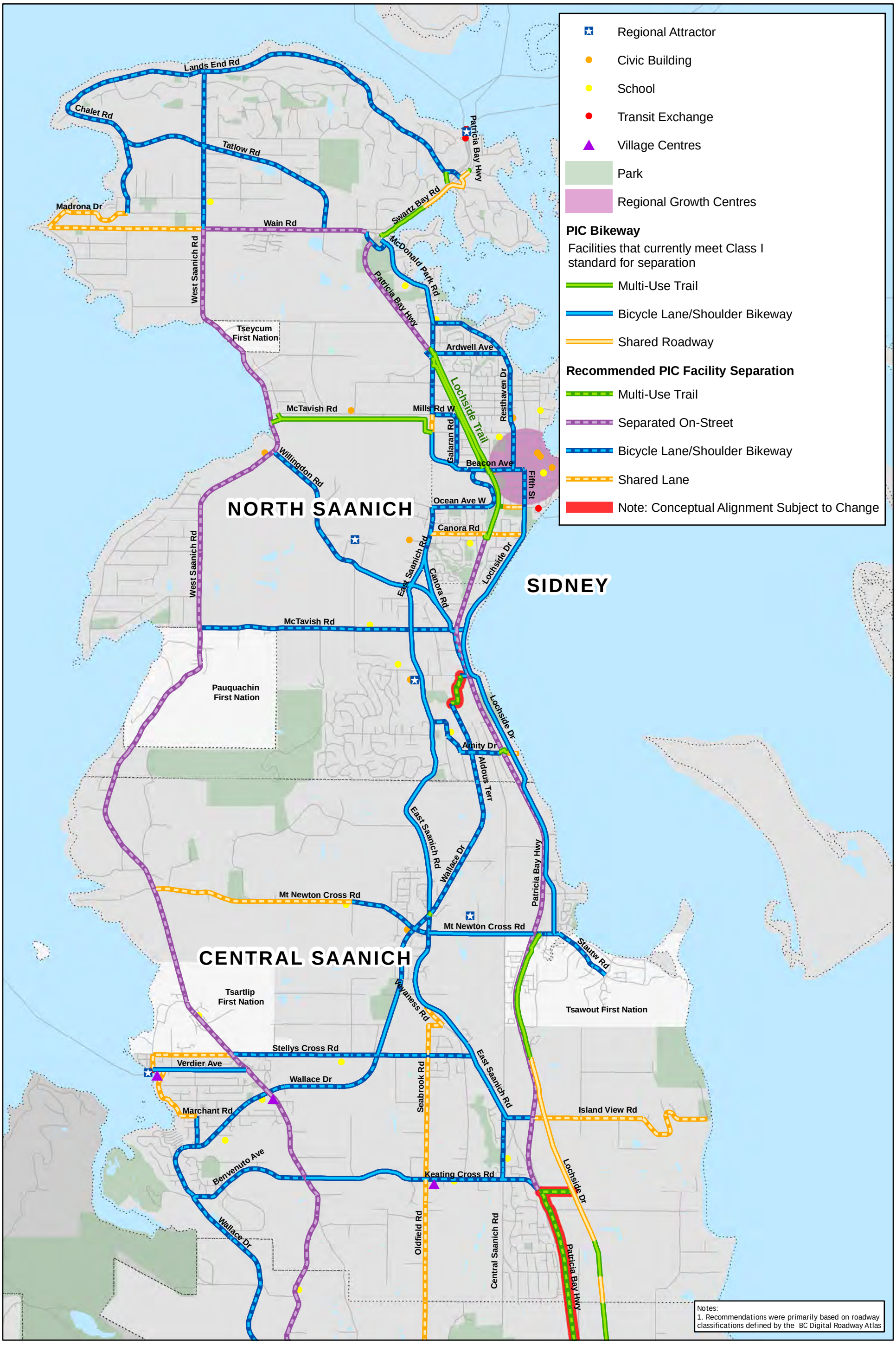
- At a minimum, stop-control all intersections; preferably stop cross -traffic
- At minor intersections, use curb ramps, pavement markings, and bicycle forward stop bars to increase visibility of cyclists
- At intersections with larger streets, provide medians, refuge islands, or bicycle-actuated half-signals

- Reduces vehicle speeds so they generally match cyclists' operating speeds (20-25 kmh), enabling motorists and cyclists to safely co-exist on the same facility
- Treatments include chicanes, mini traffic circles, and speed humps

- Maintains through-bicycle travel on a street while physically restricting through-vehicle traffic
- Reduces motor vehicle volumes on the bikeway

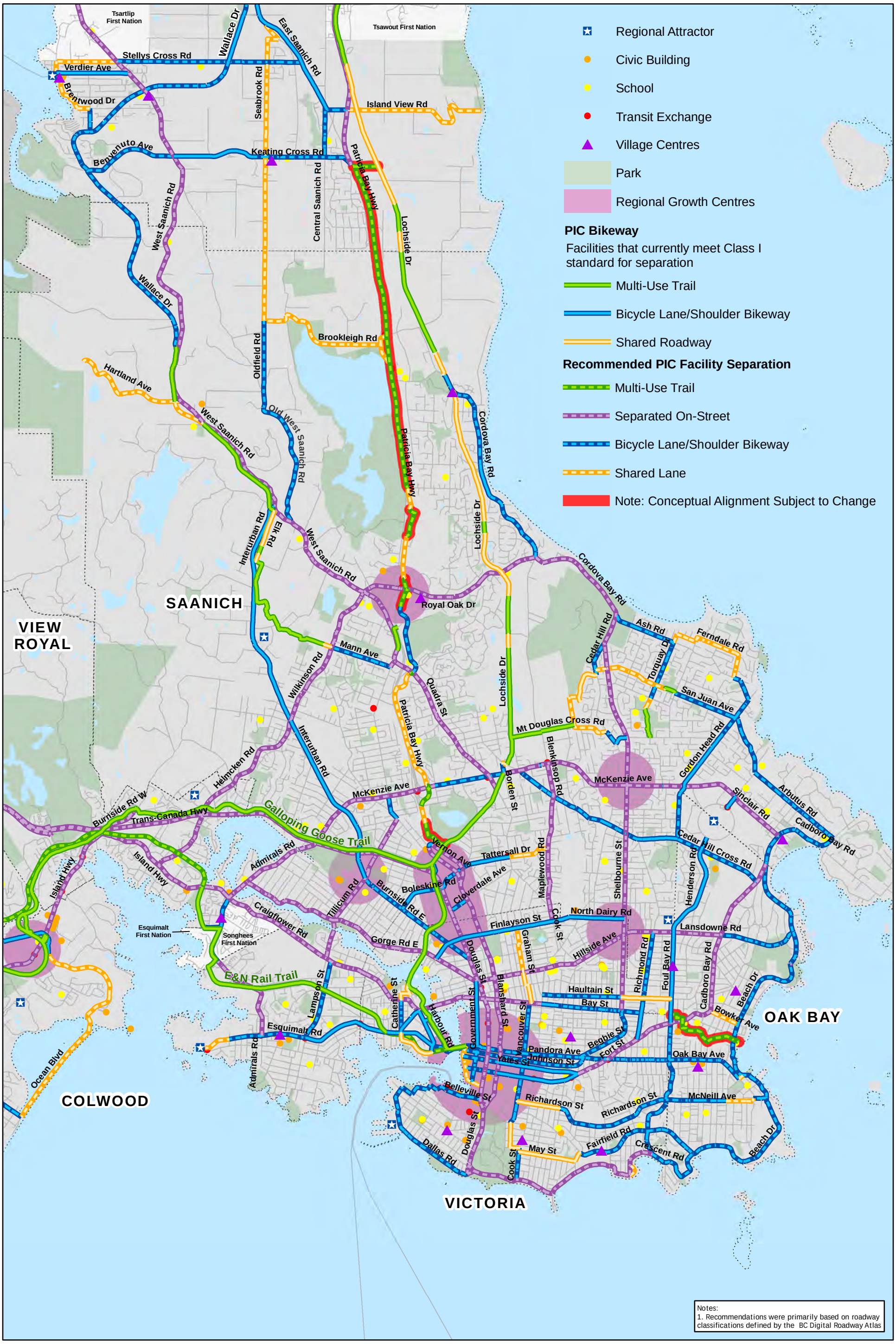
Facility Selection

The following continua show the range of bicycle facilities that are appropriate by road classification. Engineering judgement, traffic studies, previous municipal planning efforts, community input, and local context should be used to refine facility recommendations for a particular street. In some corridors, it may be desirable to construct facilities to a higher level of development than those recommended in this Masterplan to enhance user safety and comfort. For example, in areas where a paved shoulder is the recommended facility type, there may be an opportunity to build a separated multi-use trail, providing greater separation from the roadway. In other cases, the recommended level of separation is not warranted by motor vehicle speeds and volumes, and a lesser treatment may be acceptable.



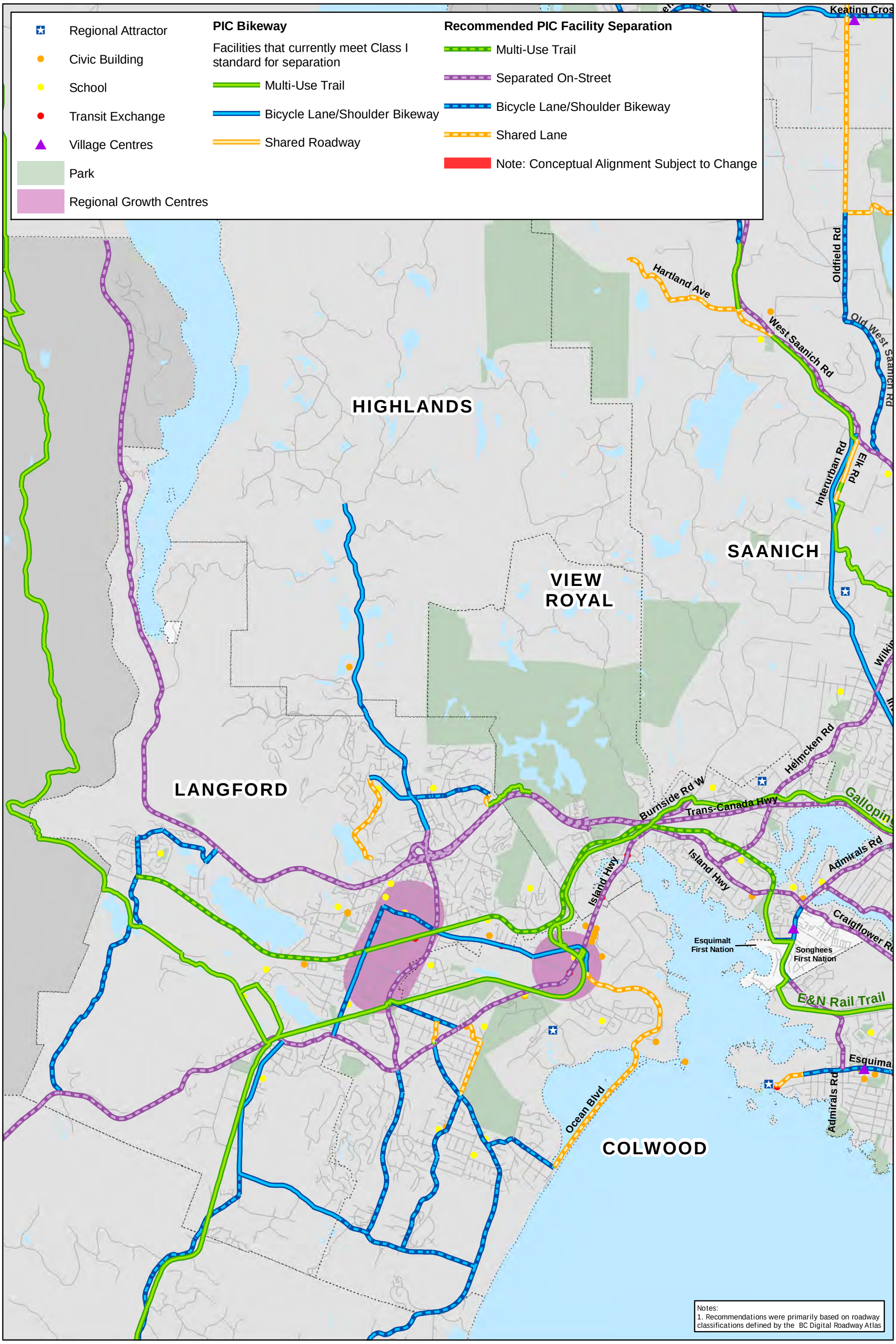
Map 7. Recommended Facility Separation on PIC Bikeway Corridors - Peninsula

Capital Regional District
Regional Pedestrian and Cycling Master Plan



Map 8. Recommended Facility Separation on PIC Bikeway Corridors - Core

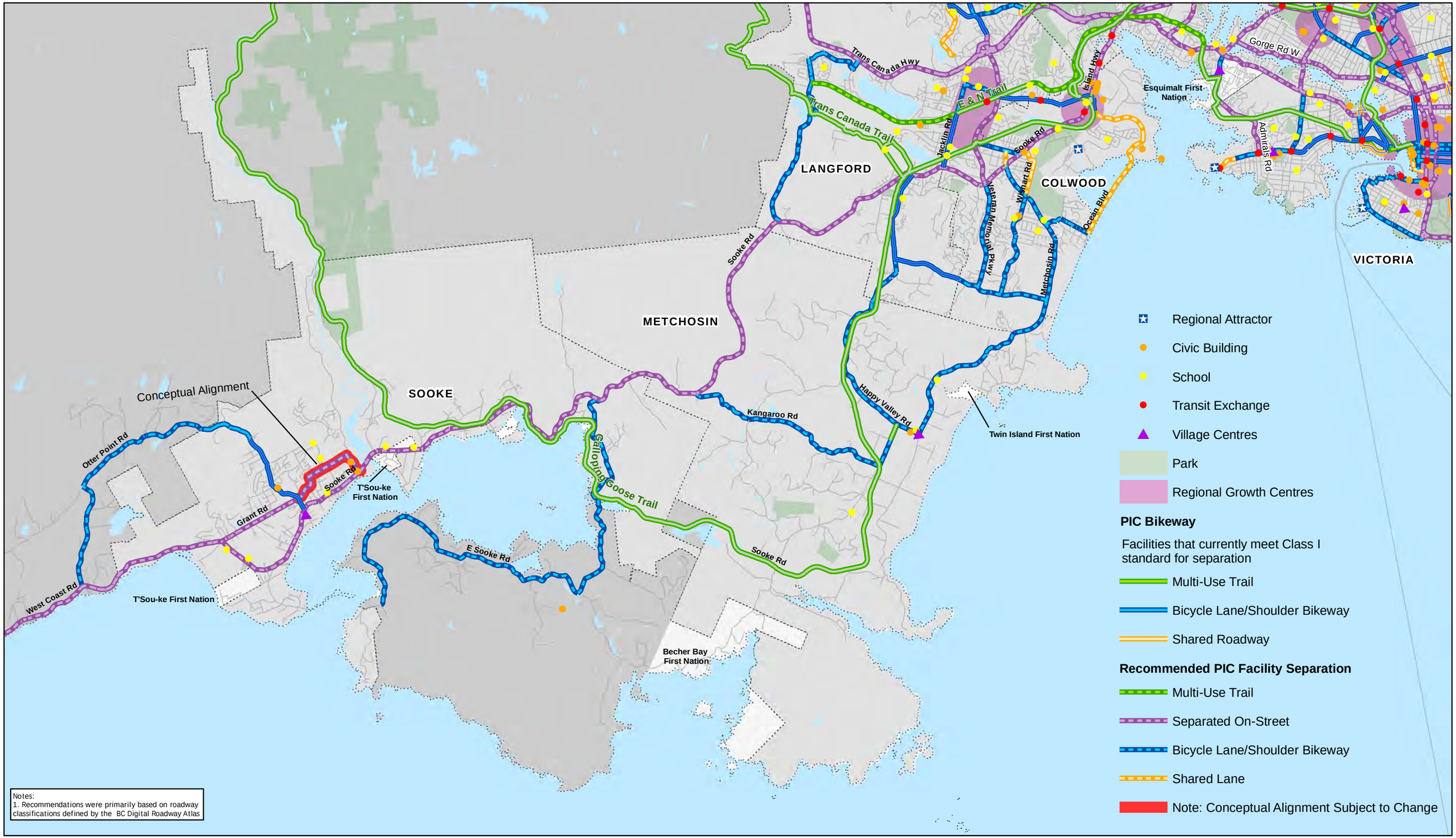
Capital Regional District
Regional Pedestrian and Cycling Master Plan



Map 9. Recommended Facility Separation on PIC Bikeway Corridors - West Shore One

Capital Regional District
Regional Pedestrian and Cycling Master Plan

0 0.45 0.9 Kilometers



Map 10. Recommended Facility Separation on PIC Bikeway Corridors - West Shore Two

Capital Regional District
Regional Pedestrian and Cycling Master Plan

0 2 4 Kilometers

Notes:
1. Recommendations were primarily based on roadway classifications defined by the BC Digital Roadway Atlas

Pacific Marine Rd

Pacheedaht First Nation

West Coast Rd

Trans Canada Trail

Galloping Goose Trail

Conceptual Alignment

Otter Point Rd

Sooke Rd

T'Sou-ke First Nation

T'Sou-ke First Nation

Becher Bay First Nation

METCHOSIN

SOOKE

- Regional Attractor
- Civic Building
- School
- Transit Center
- Village Centres
- Park
- Regional Growth Centres

Regional Bikeway

Facilities that currently meet Class I standard for separation

- Multi-Use Trail
- Bicycle Lane/Shoulder Bikeway
- Shared Roadway

Recommended Regional Facility Separation

- Multi-Use Trail
- Separated On-Street
- Bicycle Lane/Shoulder Bikeway
- Shared Lane
- Note: Conceptual Alignment Subject to Change

0 2.5 5 Kilometers

Map 11. Recommended Facility Separation on Regional Bikeway Corridors - Juan de Fuca

Capital Regional District
Regional Pedestrian and Cycling Master Plan

Relationship with Previous Planning Efforts

TravelChoices Strategy and Implementation Plan

The 2002 *TravelChoices* process initiated the PCMP by laying out the scope of the PCMP in the Subcommittee's final report. The *TravelChoices* planning process identified a recommended PIC network, while the *TravelChoices Implementation and Investment Plan* (TIIP) prioritized specific corridors for implementation. This section describes how the *TravelChoices* network and TIIP prioritization criteria were integrated into the PCMP planning process.

Recommended Network

Early development of the PCMP network and *TravelChoices*-recommended Regional Cycling Network (RCN) were quite similar; both processes drew on previous planning efforts (e.g., OCP's) and identification of routes currently used by cyclists but not designated as official bikeways. Both planning processes created a large pool of potential bikeways that were ranked to select a strategic network. After the network selection step, the network development processes diverge. A group of cyclists, municipal staff, and regional staff ranked the potential RCN facilities on criteria such as existing function and latent demand, while the PCMP network used an objective GIS-based analysis to develop a preliminary network, which was refined through significant municipal and stakeholder consultation.

Map 1 shows the RCN network in comparison to the PCMP network. The networks share many common corridors, including the Galloping Goose and Lochside Regional Trails and key roads such as Shelbourne Street, McKenzie Avenue, and Sooke Road. While the RCN designates more regional corridors in the core, the PCMP provides a more even distribution of facilities throughout the region. This approach provides a robust inter-community network with access to regional destinations that is augmented by local municipal bikeway networks.

Map 13. Comparison of TravelChoices Recommended Cycling Network and PCMP Regional Bikeway Network

Prioritization

In general, the TIIP prioritizes investments along the RCN in areas where more people are likely to use the facilities; e.g., focusing investments in areas with higher population numbers. This represents a broader view of bikeway network developments than the priorities identified in the *TransportationChoices Bicycle Strategy*, which only identifies priorities in the four core municipalities of Saanich, Victoria, Oak Bay, and Esquimalt. The PCMP expands on the TIIP prioritization schema focused on a broad network that provides access and options for people across the region. The expectation is that, by creating a comprehensive network of facilities that are comfortable and attractive to users of all ages and abilities, the pool of potential users grows exponentially.

The TIIP prioritizes specific bicycle projects based on level of improvements and expected number of beneficiaries; improvements that are more significant receive a higher score.

Table 6. Relationship of TravelChoices Implementation and Investment Plan (TIIP) and PCMP Prioritization Schemas

Criteria	*TravelChoices*	PCMP
Safety	ICBC Safer Cities Initiative safety index to identify high-risk locations	Makes recommendations for Class I facilities given context of bikeway corridor
Destinations	Sum of employment and post-secondary enrolment per acre (by traffic zones)	Connections to key regional destinations, including regional centres, village centres, parks, and schools
Multi-Modal	Provision for pedestrian use; multi-use trails receive higher score	Prioritized projects that provide access to transit centres and bus stops
Connectivity	Projects providing regional connectivity receive high score, projects providing inter-municipal connectivity receive medium score	Recommends a continuous priority regional network based on municipal and stakeholder priorities

The PCMP has similarly promoted projects that have a high expectation of increasing bicycling in the region by prioritizing projects where no bicycle facilities exist first, followed by improvements on designated shared bikeways. Additionally, municipal partners were surveyed to identify high priority corridors for cycling improvements in an effort to capitalize on current planning efforts.

Finally, high-priority projects identified in the *TravelChoices Implementation and Investment Plan Phase 2* (TIIP; 2006) were prioritized in the PCMP network.

Pedestrian Projects

The TIIP recommends that pedestrian projects in fast-growing municipalities receive a high priority. The PCMP recommends focusing on regional centres, areas with anticipated high pedestrian use, and high priority regional corridors, including access to transit.

The TIIP also recognizes that, "pedestrian activity is influenced far more by mixing land uses... than it is by the provision of additional pedestrian facilities." This statement supports the PCMP recommendation to provide good design guidelines for pedestrian 'priority areas,' which are within proximity of regional and village centres, schools, and transit centres.

Transportation Corridor Plan

The draft final report of the *Transportation Corridor Plan* (2010) recommends a series of corridors for primary use by particular modes of transportation; the strategic cycling network is afforded primary modal importance on the Galloping Goose and Lochside Regional Trails. Separated bicycle facilities (e.g., bike lanes) are not considered for roadways in many situations when transit is classified as the priority use (e.g., Government Street, Douglas Street, Carey Road, Lansdowne Road, and portions of the Island Highway).

Cycling Network

The cycling network for the *Transportation Corridor Plan* was developed using the E&N Rail Line, the Galloping Goose Trail, and the Lochside Regional Trail as the backbone of the network. The *Transportation Corridor Plan* recommends bicycle lanes in many on-street corridors. In some situations, bicycle use is defined as a 'local' need and dedicated bicycle facilities are not proposed; examples include portions of McKenzie Avenue, Lansdowne Road, and Yates Street.

The PCMP cycling network recognizes most of the cycling corridors designated by the *Transportation Corridor Plan* and many additional corridors identified by both RCN and municipal partners as priorities for bikeway improvements (Map 14). This variation stems, in part, from the different philosophies used to designate bikeway networks. While the PCMP-designated network is based on the idea of providing a robust network aimed at increasing the size of the potential user pool, the *Transportation Corridor Plan* focuses instead on the existing facility usage and assumptions about modal exclusivity within existing transportation corridors.

The greatest point of variation between the PCMP network and the *Transportation Corridor Plan* bikeway network lies in the lack of integration between the cycling and transit networks. The PCMP recognizes that integration of transit trips and cycling trips is integral if the CRD is to reach the ambitions mode share goals. Cyclists and transit vehicles can and should be accommodated within many transportation corridors, though attention to detail is imperative to maximize corridor function and safety. Innovative solutions, such as buffered bicycle lanes that increase separation between cyclists and transit vehicles, can be effective in shared transit/bicycle corridors.

Pedestrian Network

The *Transportation Corridor Plan* recommends that Level 1 priority pedestrian corridors provide pedestrian sidewalks with a minimum width of 2.4 metres, while Level 2 corridors have a minimum sidewalk width of 1.8 metres. The *Transportation Corridor Plan* notes that an exception can be made in the case where there is no pedestrian-related development. The PCMP pedestrian priority areas methodology identifies areas where pedestrian accommodation is particularly critical, and can be combined with the Corridor Plan methodology to target key locations for areas that require a high level of pedestrian design.

Map 14. Comparison of Transportation Corridor Plan Strategic Bikeway Network and PCMP Regional Bikeway Network