



Kelowna Area Cycling Network

Off-Road Pathways Plan

July 2004





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EXECUTIVE SUMMARY

Although the on-street bicycle network within the City of Kelowna continues to develop and expand as part of the *Bicycle Network Master Plan (1995)*, off-road pathways have not been considered a significant component of the bicycle route network. In addition, the potential for interconnection between regions beyond the City of Kelowna's boundary has not been investigated in detail. The scope of this Off-Road Pathways Plan was to identify and evaluate potential pathway connections within the Kelowna area (City of Kelowna and Ellison specifically).

The high level of interest in developing the 'Rails with Trails' pathway connection, which is a proposed pathway adjacent to the existing rail line from Downtown Kelowna to the City boundary in Winfield, is a strong indicator of the appeal and benefits which off-road pathways can offer for cyclists and the community in general. The attraction of cycling as a viable and competing alternative to the automobile for commuting throughout the Region can be increased through improved safety of cycling. This can be achieved by providing more opportunities that are separate from roadways and away from increasingly higher volumes of vehicle traffic, as well as improving access by filling in gaps in the existing bicycle network. By providing pathways that may yield a significant time or distance advantage over on-road routes, the perceived attractiveness of cycling as an alternative mode can be increased.

Through an extensive process involving public consultation (in the form of two open houses and feedback surveys), a background review of previous work that had been completed, consultation with both Municipal and Regional representatives, and a detailed in-house review, a list of 103 potential pathway locations were identified. In developing this comprehensive list, focus was placed in three main areas:

- Identifying any gaps that may exist in the bicycle network plan including any discontinuity of existing and planned on and off-street bicycle routes, and providing access to all major pathways.
- Ensuring that all major bicycle generators and centres throughout the City of Kelowna and Ellison Areas are served by some form of bicycle facility.



- Alternative pathway locations to on-street routes on high volume arterials or roads with high vehicular travel speeds.

In order to filter out those pathways that are clearly high priority in the overall bicycle network, a screening process was undertaken where each pathway was given a rating of 'High', 'Medium' or 'Low' based on three criteria: **demand**, which is a measure of the existing usage in the corridor and potential future usage, **network function**, which is a measure of the relative significance of the pathway connection within the overall bicycle network and how it relates to the rest of the network, and **implementation feasibility**, which is a measure of the ease of constructing a pathway along the identified corridor and whether or not it will be achievable to the applicable design standards.

Pathways rated as 'High' were designated as priority pathways, and are essential links within the pathway network to be implemented over the next ten years. These pathways were evaluated in detail and form the basis of the overall off-road pathways plan. Pathways rated as 'Medium' are recommended for consideration beyond the ten year horizon of this study, and pathways rated as 'Low' were not pursued further within the scope of this study, and are not recommended for implementation. However, a list of these pathways was maintained as it is recognized that they may be of interest from a longer term perspective.

A total of 11 priority pathways were identified, as summarized in Table 1. Each pathway was evaluated and prioritized according to five criteria: Safety, Demand, Network Function, Design, Appeal, and Implementation Feasibility, as well as given a cost estimate. It should be noted that the 'Rails with Trails' pathway was deemed as having the highest priority in the pathway network as it essentially acts as the 'spine', providing a continuous link through the region which other pathways connect to, and was considered separately from the remaining 10 priority pathways.

The proposed pathways plan is shown in the following figure entitled 'Priority Pathways'.



Table 1 – Priority Pathway Summaries

Pathway	Description	Overall Ranking (/5.0)	Estimated Cost
Rails with Trails	<ul style="list-style-type: none"> Located adjacent to the active rail line through the City of Kelowna, from Downtown Kelowna to the City of Kelowna boundary at Winfield (approx. 21km) A critical link in the pathway network, acting as the 'spine' through the Kelowna area and as a major regional component providing a connection between Downtown Kelowna, Central Kelowna, Rutland and the Ellison Area. Essential in the overall pathway network plan 	n/a (considered separately)	\$7,400,000
OUC Connection	<ul style="list-style-type: none"> Provides a connection to OUC north campus from Glenmore via a short pathway link from the OUC parking lot to the private access lane around Robert Lake, and a shared on-road facility from the private access to the intersection of Valley Road with Scenic Road Expected to have a high demand and is a critical link in the pathway network May encounter opposition from property owners 	4.8	\$12,200
College Way/ Bulman Rd Connection	<ul style="list-style-type: none"> Will provide access from east of Bulman Road (Ellison Area) to OUC, with a connection to Rails with Trails To be implemented in conjunction with future grade separation of this intersection. 	4.8	n/a
Mission Creek Greenway to Rails with Trails Connection	<ul style="list-style-type: none"> Pathway would provide a critical link in the pathway network, connecting the Mission Creek Greenway to the Rails with Trails pathway through Central Kelowna via a pathway on the west side of Dilworth Drive Usage of this pathway is expected to be high 	4.5	\$570,000



Table 1 Continued – Priority Pathway Summaries

Pathway	Description	Overall Ranking (/5.0)	Estimated Cost
Gordon Drive	<ul style="list-style-type: none"> A major regional connection providing pathway access north-south through the Kelowna area Pathway would act as an extension of the existing pathway from Old Meadows Road to the south to Springfield Road in the north, providing connection to major east-west bicycle routes such as the Mission Creek Greenway, KLO Road, Springfield Road, and Casorso Road. 	4.5	\$1,359,000
Mayer Road Connection	<ul style="list-style-type: none"> Pathway connection along the south side of Mayer Road from Benvoulin Road, through the park and connecting with the Mission Creek Greenway Provides an important link from the on-road bike network to the Mission Creek Greenway 	4.5	\$97,000
Gerstmar Road Connection	<ul style="list-style-type: none"> Pathway adjacent to roadway from Springfield Road to Mission Creek Greenway Fills a gap in the existing network by providing an additional connection between Rutland and the Mission Creek Greenway 	4.4	\$38,000
Parkinson Rec Centre Connection	<ul style="list-style-type: none"> Pathway connection from Lawrence Avenue, through the park and Parkinson Rec Centre, along Parkinson Way to Spall Road Fills an important gap in the existing network and provides a time and distance savings to cyclists 	4.3	\$193,000
Highway 33 Alternative	<ul style="list-style-type: none"> An important regional connection, connecting Black Mountain with Rutland and providing an alternative route to Highway 33 Pathway would run from Springfield Road along Belgo Road, Lewis Road and Garner Road and would be a combination of off-road and on-road shared facilities as an interim measure 	4.3	\$311,000



Table 1 Continued – Priority Pathway Summaries

Pathway	Description	Overall Ranking (/5.0)	Estimated Cost
Old Vernon Road	<ul style="list-style-type: none">• Pathway adjacent to Old Vernon Road (North) from Spencer Road in east to Rails with Trails and Highway 97 in west• Acts as a regional connection, linking Ellison with the remaining network	4.3	\$267,000
North End Connection	<ul style="list-style-type: none">• Pathway would switch-back up the hill from the north end of Gordon Drive to Royal Pine Drive, with a shared on-road facility south on Gordon Drive to Clement Ave	3.7	\$123,000



1.0 INTRODUCTION

In 1995, the City of Kelowna developed a Bicycle Network Master Plan as a component of the City's multi-modal Transportation Plan. The implementation of the Bicycle Master Plan has created over 200 kilometres of bicycle lanes and routes along City streets (a very significant accomplishment), and the network continues to develop and expand.

The focus of the Bicycle Master Plan is bicycle lanes and other on-street routes. Until recently, pathways have not been considered a significant component of the bicycle route network. Pathways are multi-use facilities that are segregated from the road network. They can be stand-alone pathways through parks or either developed or undeveloped property, located adjacent to a roadway, or following a feature such as a rail line or a waterway. They are usually paved or made up of some sort of hard surface in order to accommodate as many different user types as possible.

As traffic volumes on the arterial roadway network continue to grow, interest has been developing regarding the inclusion of pathways as a significant component of the Bicycle Network Master Plan as a means of providing a reasonable range of alternative riding conditions. Momentum has been building behind the proposed 'Rails with Trails' pathway initiative that would extend from Downtown Kelowna to the east then north to at least the City of Kelowna boundary along the Kelowna Pacific Railway line, and would act as a major 'spine' in the pathway network. The need for supporting network pathways plan will grow in order to support this major facility.

The high level of interest in developing the 'Rails with Trails' pathway connection is a strong indicator of the appeal and potential benefits which off-road pathways can offer for cyclists and the community in general. The attraction of cycling as a viable and competing alternative to the automobile for commuting throughout the Region can be increased through improved safety of cycling. This can be achieved by providing more opportunities that are separate from roadways and away from increasingly higher volumes of vehicle traffic, as well as improving access by filling in gaps in the existing bicycle network. By providing pathways that may yield a significant time or distance advantage over on-road routes, the perceived attractiveness of cycling as an alternative mode can be increased.

In addition to the City of Kelowna Bicycle Master Plan, other initiatives to enhance the bicycle network beyond the City's boundaries have been undertaken. The Central Okanagan Regional District developed a Regional Bicycle Strategy in 1996 which identified a network of bicycle routes in Westbank, Lakeview and Ellison, including a number of proposed pathway locations. Within the Ellison Area specifically, the Ellison Area Parks Preplan, also prepared in 1996, proposed a series of bicycle routes, walkways and trails.

Within the Region, there are several pathways that already exist, and some examples of these are provided in the following figures.

Figure 1.1 - Pathway in a Linear Park (across from Mission Sportsfield)



Figure 1.2 - Pathway Adjacent to a Road (Spiers Road in South East Kelowna)



Figure 1.3 - Pathway Adjacent to a Creek (Mission Creek Greenway)





1.1 Methodology

There are three main objectives in the development of this plan:

- Identify potential off-road pathway locations within the City of Kelowna and the Ellison Area as well as links connecting them.
- Evaluate the potential pathways in order to isolate those that would have the highest priority and provide a prioritization, cost estimate, and implementation strategy for them.
- Develop appropriate pathway design guidelines applicable for pathway implementation within the study area.

The study area encompasses the City of Kelowna, and the Ellison Area which is located north of the City boundary and east of the Kelowna International Airport. The study area is shown in Map 1 – Study Area.

The process that was undertaken in the completion of this plan had four main components as discussed below.

1. Clarification of Issues – The first component of the study process involved a large amount of data collection and consultation which can be broken down as follows:

- ***Set the Context for the Study*** - Clarifying the objectives and focus of the study, creating and confirming some basic bicycle network and pathway planning principles, and reviewing the background and developments in the bicycle network within the City.



- **Public Consultation** – A significant amount of public consultation was undertaken in order to both educate the community and collect as much public feedback and input as possible. A stakeholder workshop was held with key cycling groups within the study area in order to discuss the plan, as well as a public open house where attendees were able to voice their concerns or ideas.
- **Develop an Inventory of Potential Pathway Locations** by reviewing any previous work that had been done in identifying potential pathway locations throughout the City of Kelowna and Ellison Areas, and maintaining a list of other suggested locations that were developed through consultation with various City and Regional representatives and the public consultation process. An additional review of potential pathway locations was then undertaken in order to identify other pathway connections that could strategically enhance the pathway network.

2. Pathway Design Guidelines – Through an iterative process which involved a presentation and discussion with municipal staff, a set of design standards applicable to pathway construction within the Region was developed.

3. The Plan – The development of the proposed pathway plan including establishing direction as to where future efforts in the implementation of off-road pathways should lie involved the following:

- **Classification and Prioritization of Potential Pathway Locations** – Each of the pathways was provided with a preliminary ranking in order to identify those which were clearly high priority. The high priority pathways were then investigated and evaluated in more detail.



4. Implementation Strategy – Recommendations for the implementation of the high priority pathways were made based on:

- **Cost Estimates** – For each of the high priority pathways, an order-of-magnitude cost estimate based on unit costs was prepared.
- **Detailed Evaluation and Ranking** – Each high priority pathway was evaluated in detail in order to produce an overall ranking.
- **Funding and Phasing Opportunities** – Opportunities for alternative sources of funding or cost-sharing, such as Provincial and Federal programs, and implementation, such as development and/or private sector interests were considered.

The process was undertaken in late 2003 and throughout the early spring of 2004.



2.0 PATHWAY PLANNING

Pathways are facilities that are segregated from the road network. They may act as stand alone pathways for commuter and recreational use, or as connecting links between existing or future bicycle facilities. Pathways are an important feature in a bicycle network as:

- They encourage more people to cycle by providing an automobile free environment that is attractive to cyclists of various ages and abilities who may not otherwise feel comfortable using on-street facilities,
- They can provide safer alternatives to on-road routes under certain circumstances, and,
- They can provide short-cuts and a time saving advantages to cyclists traveling from one destination to another.

In addition, pathways can also accommodate a wide range of other users such as pedestrians, in-line skaters, persons in wheelchairs or with strollers, skateboarders, or e uestrians, as illustrated in Figure 2.1.

Pathways are often located along prominent features where ROW and/or property ac uision may be facilitated such as adjacent to a roadway, creek or watercourse, through undeveloped or imminently developing lands, or along other established transportation corridors such as a rail line. Such features often form the starting point when attempting to develop a pathway network.

In addition to seeking this type of advantageous circumstance around which to develop a pathway network, there are several sets of principles that should be considered, which have formed the framework for this process, as outlined in the ensuing sections.

Figure 2.1 - Multi-Use Pathway (Boulder, CO)



2.1 Pathway Network Planning Principles

The network planning principles guide the selection of potential pathway locations. These principles were used in this exercise when developing and prioritizing the pathway inventory.

- ***The Network Should Incorporate Different Types of Bicycle Facilities.***
Skill levels, physical capabilities, trip purposes and needs vary widely among cyclists, and consequently, different cyclists require or are attracted to different types of bicycle facilities. An experienced commuter cyclist may be comfortable riding along a high-volume multi-lane arterial road, and may prefer to ride along such a road in order to minimize travel times. On the other hand, a less experienced cyclist new to cycling may not feel comfortable riding along major roads, and may prefer pathways and local streets. To accommodate all types of cyclists, a range of different types of bicycle facilities are needed.



- ***Cyclists Should be Accommodated on Roadways Wherever Possible.***

This means that unless it is extremely difficult to do so, space should be provided for cyclists on all arterial and collector roads. This approach recognizes that cyclists fare best when they are treated as vehicles and integrated with other vehicle traffic. Numerous studies of crashes and safety issues indicate that cyclists are safer riding on roadways than on parallel pathways. As well, travel times for cyclists are generally also minimized when cyclists travel on roadways.

- ***Off-Street Pathways Should Complement, Not Replace, On-Street Bicycle Facilities.***

Because the potential for conflicts and crashes is higher on a pathway, and because pathways do not often directly serve many destinations to which cyclists wish to travel, many cyclists will end up riding on the roadway, either by choice or by necessity. Investing in pathways as an alternative to investing in on-street bicycle facilities means that in many cases there is no space for cyclists and motorists to safely share the roadway, and as a result, the safety of cyclists is compromised.

- ***Pathways Should Form a Continuous Connected Network.***

The pathway network can incorporate local streets where appropriate to bridge gaps in the pathway network. Many cyclists who are attracted to pathways are cyclists who would not be comfortable riding on arterial or collector roads due to a lowered perception of safety, which is often a function of the higher travel speeds and traffic volumes along these types of roadways. Recognizing this, these cyclists should be able to ride to destinations throughout the region on a combination of pathways and local streets, without the need to travel along arterial and collector roads. Although local streets may be used to complete gaps in the pathway network, desirably a continuous pathway connection is provided.

- ***The Bicycle Network Should Serve All Important Destinations.***

Just as the road network provides access to commercial, office, institutional, cultural and recreational destinations throughout the community, so should the



bicycle network. Desirably, each important destination is served by both an on-street bicycle route as well as a pathway connection to give cyclists options according to their ability and comfort level.

- ***The 'Quality' of the Cycling Experience is Most Important.***

The 'uality' of the cycling experience is more important than route characteristics such as directness of routing and steep grades and is determined by perceptions of safety, traffic volumes, noise and aesthetics. Although providing a direct route and avoiding steep grades are important, cyclists will generally prefer a longer route with steeper grades if it is perceived as significantly safer, has lower traffic volumes, and provides a more enjoyable cycling experience. For example, many cyclists would prefer a slightly longer ride along a pathway adjacent a river to a ride along an arterial road through an industrial area.

2.2 Pathway Network Design Principles

Although detailed and specific pathway design guidelines are provided later in this report, these more general principles are intended to provide some context and understanding to the most important design features as it relates to pathway network planning.

- ***Pathways Should Accommodate all Possible Non-Motorized Users.***

This means, for example, that pathway grades should not be so steep as to prevent use of the pathway by persons in wheelchairs. Similarly, the pathway surface should not be so uneven as to prevent use by in-line skaters. Pathways should be designed to accommodate all forms of non-motorized transportation.

- ***Multi-Use Pathways Should be Hard-Surfaced.***

Hard surfaces such as asphalt and concrete accommodate all users (including persons in wheelchairs and in-line skaters). Compacted aggregates (such as crusher dust) should be used only where softer, porous surfaces are necessary to minimize environmental impacts, or as an interim measure in suburban or rural areas where usage levels are low.



- ***Pathways Should Not be Segregated.***

Pathways are used by a wide range of users, including cyclists, pedestrians, in-line skaters, skateboarders, e uestrians, persons in wheelchairs, and persons with strollers and pets. It is generally not possible to restrict use of a pathway to specific users (such as bicycles only or pedestrians only), and conse uently the preferred approach is to construct a single pathway of sufficient width to accommodate all users.

- ***Pathways Should be Designed for Two-Way Travel.***

It is difficult to ensure compliance with one-way designations. This is particularly important where pathways intersect roadways, as pathway users must be accommodated travelling in both directions.

- ***Width is the Most Important Pathway Design Characteristic.***

The width of a pathway has a direct relationship to the potential for conflicts between users the wider the pathway for a given number of users, the lower the potential for conflicts. In order to minimize potential safety issues, pathways should be sufficiently wide to accommodate anticipated numbers of users during peak periods.

- ***Pathways Should be Designed With as Much Care as Roadways.***

In particular, pathways should be designed to provide ade uate sight distances, horizontal and vertical clearances, drainage, signage and illumination at crossings. Where it is not possible to meet minimum design guidelines, extra measures should be incorporated into the pathway, such as rest areas on steep grades, increased width through tight horizontal curves, and warning signs.

- ***Pathway Crossing Treatments are Essential.***

Crossings where pathways intersect roadways are where the majority of crashes and the most severe crashes occur. To maximize both the perceived and actual safety for pathway users, a range of crossing treatments should be used at arterial and collector road crossings.



3.0 KELOWNA AREA PATHWAY OPPORTUNITIES

In developing the off-road pathways plan, an incremental process was undertaken in which potential pathway locations were first identified and then evaluated, working toward a prioritized list of projects. This section outlines the results of this process, and is itemized as follows:

- *Pathway Inventory* – The development of an inventory of potential pathways.
- *Pathway Evaluation Process* – The process that was followed in screening all pathways to develop a list of high priority pathways, and the detailed evaluation that was undertaken for each high priority pathway.
- *High Priority Pathways* – A summary discussion and description of each of the high priority pathways that was identified.
- *Other Pathways* – A summary of the remaining pathways that remain of interest and future consideration, but were not identified as being high priority initiatives.

3.1 Pathway Inventory

One of the first steps involved in developing the recommended pathway network plan was identifying all possible locations where pathways could potentially be implemented. This was initially completed through the following:

- Background research on any previous work that had been completed on potential pathways within the City of Kelowna and Ellison Areas,
- Consultation with Municipal and Regional staff, including representatives from the respective Parks Departments, and



- Public consultation, which included a stakeholder workshop with key cycling groups within the Region, two open houses where the public were invited to contribute their ideas through the completion of a questionnaire, and an email address where the public could contribute their ideas at any time throughout the study.

In addition the Project Team undertook an in-house review and discussion of potential pathway locations that may be added to strategically supplement the existing and planned bicycle network. In doing so, focus was placed in three main areas:

- Identifying any gaps that may exist in the bicycle network plan including any discontinuity of existing and planned on and off-street bicycle routes, and providing access to all major pathways.
- Ensuring that all major bicycle generators and centres throughout the City of Kelowna and Ellison Areas are served by some form of bicycle facility.
- Alternative pathway locations to on-street routes on high volume arterials or roads with high vehicular travel speeds.

In total, 103 potential pathway links were identified through this process.

3.2 Pathway Evaluation Process

An inventory of 103 potential pathways and connections in the Kelowna area was identified. In order to provide guidance on where to focus the limited resources available, an evaluation process was developed and undertaken, which involved three steps: Classification, Screening, and Detailed Evaluation, with the intent to:

- Provide some organization of the pathway locations dependant on their function within the overall bicycle route network (Classification),
- Filter out those pathways that are clearly high priority (Screening), and



- Evaluate the high priority pathways in more detail to provide some guidance on their implementation order (Detailed Evaluation).

3.2.1 Pathway Classification

In order to provide an initial basis for comparison of the individual pathways, each pathway was classified into its primary function within the overall bicycle network. Although different pathways may serve several network functions, each pathway has one primary function. Each of the potential pathways was classified in one of the following three categories as follows:

- 1. Regional Connections** - These are major connections that link regions of the study area together. A good example of an existing regional connection in the Kelowna area is the Mission Creek Greenway.
- 2. Connections to Major Pathways** - These are the pathways that provide access from main cycling generators or areas of the City to the major pathway network.
- 3. Neighbourhood Connections** - These connections are shorter, and generally located within neighbourhoods. They fill a gap in the existing network and provide a convenience function based upon time savings or safety benefits.

Of note, the focus of this study is primarily on commuting cyclists, and cycling as a means of urban transportation. Therefore, potential pathways that do not serve a commuter function but only provide a recreational attraction were classified as *recreational pathways* and generally excluded from further analysis. A listing of these candidates was maintained, however, as it is recognized that they may be attractive from different perspectives (ie. parks, recreation and/or tourism development) and may provide a commuter network function in the long term, depending on future growth in these areas.



In total, 18 regional connections, 24 connections to major pathways, and 61 neighbourhood connections were identified, as illustrated in Map 2 – Pathway Inventory and Classification.

3.2.2 Pathway Screening

Within each category, a screening process was undertaken in order to determine which potential pathways were clearly high priority and should be evaluated in more detail as candidates for shorter term implementation. The screening process subjectively considered the following three criteria:

- 1. Demand** - A measure of the existing usage in the corridor (if any) and potential future usage.
- 2. Network Function** - A measure of the relative significance of the pathway connection within the overall bicycle network, and how it relates to the rest of the network.
- 3. Implementation Feasibility** - A measure of the ease of constructing a pathway along the identified corridor and whether or not it will be achievable to the applicable design standards.

Although there are other criteria that should be considered when comparing different pathways, such as the safety and appeal of the pathway, these three criteria are the most significant within the context of filtering out the highest priority pathways. A detailed evaluation with more criteria was completed later on in the process.

For each of the three general criteria, each pathway was subjectively evaluated and given a 'High', 'Medium' or 'Low' rating as illustrated in Table 3.1. In the evaluations, the following were considered:

- Existing property ownership and width of available right-of-way



- Surrounding land uses (ac uired from air photos, site visits, and local knowledge of the area)
- The existing and planned bicycle route network
- The locations of schools, community centres, parks, shopping centres and other potential generators
- Planned developments within the City of Kelowna and Ellison Area
- Any planned roadway realignments, extensions, or new construction projects

Table 3.1 – Criteria Used for Pathway Screening

DEMAND	
LOW	<ul style="list-style-type: none"> • Small intra-community generators (if any) • Little or no shift of usage from the on-road network
MEDIUM	<ul style="list-style-type: none"> • Medium generators such as neighbourhoods, schools, community centres and neighbourhood parks • Some expected shift in usage from the on-road network
HIGH	<ul style="list-style-type: none"> • Major generators such as OUC, shopping centres, large parks and the downtown area • Expect a significant shift from the on-road network
NETWORK FUNCTION	
LOW	<ul style="list-style-type: none"> • No significance in overall bike network • An alternative on a low volume road exists • Little or no time savings for commuters
MEDIUM	<ul style="list-style-type: none"> • Important link in the overall bike network, but not critical
HIGH	<ul style="list-style-type: none"> • A critical link in the overall bike network • Alternative routes, if any are on high volume arterials • May provide a significant time savings to commuters
IMPLEMENTATION FEASIBILITY	
LOW	<ul style="list-style-type: none"> • Privately owned property or highly developed • May be issues in building pathway to design standards • Implementation will be beyond 20 years
MEDIUM	<ul style="list-style-type: none"> • Property may be privately owned, but may be ac uired through redevelopment • May or may not lie within the ALR
HIGH	<ul style="list-style-type: none"> • Property is either already City owned or easy to ac uire • Pathway can be built to design standards

Each pathway was then given an overall preliminary ranking of 'High', 'Medium' or 'Low' as follows:

- **High** - A pathway was ranked as 'High' if it had a rating of high in all three categories, or a rating of high in two of the three categories, with the third being a medium.
- **Low** - A pathway was ranked as 'Low' if it had a rating of low in all three categories, a rating of low in both Demand and Network Function, or a rating of low in Implementation Feasibility with no high rankings.
- **Medium** - All other pathways were rated as 'Medium'.

Potential pathways which were rated 'High' overall are priority pathways which were evaluated and investigated in further detail. These were identified as essential links within the pathway network, and were designated as priorities for implementation within the next ten years. These include pathway connections which provide an important network function by completing gaps in the existing and planned pathway network, as well as pathway connections for which there would be relatively high potential demand.

Pathways which were rated as 'Medium' overall are recommended for consideration beyond the ten year horizon of this study, after the priority pathways have been implemented. In the interim, actions should be undertaken to protect corridors for 'Medium' pathways for future implementation. As well, land development, roadway projects and/or other projects may provide opportunities to implement some 'Medium' pathways at an earlier time.

Pathways which were rated as 'Low' overall should not be pursued further, and will not be considered for implementation within the scope of this study. Reasons for this conclusion include low potential demand and usage, significant obstacles to implementation such as property acquisition issues, and the presence of a nearby alternative pathway connection. However, a list of these pathways has been maintained as it is recognized that they may provide

opportunities from different perspectives, or be of interest from a longer term perspective.

The results of this segregation exercise are illustrated in Table 3.2.

Table 3.2 – Pathway Screening Results

Category	Overall Ranking (Priority)			TOTAL
	HIGH	MEDIUM	LOW	
Regional Connections	5	7	6	18
Connections to Major Pathways	8	9	7	24
Neighbourhood Connections	1	22	38	61
TOTAL	14	38	51	103

A total of 14 pathways were determined to be High Priority Pathways and are considered further in the ensuing sections. Details of the results of the screening process for each of the pathways are included in Appendix A.

3.2.3 Detailed Evaluation of Priority Pathways

Each of the priority pathways identified in the screening process was investigated and evaluated in detail in order to prioritize and estimate the cost of their implementation. The criteria which were used in prioritizing the high priority pathways included the following:

- **Safety** (*weighting 3*) - This is a measure of the potential for improvement in safety which construction of the pathway connection could provide. It considers current safety conditions on bicycle routes and roadways which cyclists currently use in the absence of the pathway connection.
- **Demand** (*weighting 2*) - This is a measure of existing usage in the corridor (if any) and potential future usage. It includes an assessment of usage and



demand on nearby bicycle routes and roadways which might shift to the pathway connection.

- **Network Function** (*weighting 2*) - This is a measure of the relative importance of the pathway connection within the overall bicycle network. High-rated pathway connections would be those which provide a critical link in the pathway and bicycle route network, whereas low-rated connections would be those with minimal network importance.
- **Design** (*weighting 1*): This is a measure of how well a pathway constructed in the corridor would meet applicable design guidelines. This recognizes that in some cases, it may not be possible to meet all applicable design guidelines, and that alternative design treatments and warning signage can be used to address design constraints.
- **Appeal** (*weighting 2*) - This is a measure of the potential appeal of a route to cyclists, and considers aspects such as aesthetics, grade and other factors affecting the quality of the cycling environment. High-rated connections would be those which would have strong appeal to all cyclists (skilled and novice, adult and child, transportation and recreational cyclists), whereas low-rated connections would have negligible appeal to most cyclists.
- **Implementation Feasibility** (*weighting 1*) - This is a measure of the ease of constructing a pathway along the identified corridor. This will consider issues such as property acquisition, need for other projects to be completed first, environmental implications, and jurisdictional issues.

Candidate pathways were rated on a scale of 1 through 5 for each criterion, where 5 reflects an excellent rating and 1 reflects a poor rating. Criteria were weighted as indicated to emphasize the most important criteria. Appendix B provides a summary of the rating values used for each criteria.



3.3 High Priority Pathways

As noted, 14 out of the 103 potential pathway locations were rated as being 'high' priority through the initial screening process and were evaluated in further detail. Through this evaluation, links which served the same network function were narrowed down to the most feasible alternative, and the pathway alignments were refined.

Of note, the 'Rails with Trails' pathway is the pathway with the single highest priority for implementation, effectively functioning as the 'spine' servicing the rest of the network. A list of the other high priority pathways follows and the result of their detailed evaluation is summarized in Table 3.3. Note that they are presented in no particular order at this point in time.

- *Rails With Trails*
Pathway adjacent to current railway line from Downtown Kelowna north to Ellison (Regional Connection)
- *Gordon Drive*
Pathway adjacent to roadway from existing pathway in south to Mill Creek in the north (Regional Connection)
- *OUC Connection*
From Glenmore to OUC North Campus (Regional Connection)
- *Highway 33 Alternative*
From Springfield Road along Belgo Road / Lewis Road / Garner Road (Regional Connection)
- *Old Vernon Road*
From Spencer Road to Rails With Trails and Highway 97 in North Ellison (Regional Connection)
- *Mayer Road Connection*
To Mission Creek Greenway (Connection to Major Pathway)



- *Gerstmar Road Connection*
To Mission Creek Greenway (Connection to Major Pathway)
- *North End Connection*
From Gordon Drive to Royal Pine Drive or From Ethel Street to Royal View Drive (Connection to Major Pathway)
- *College Way / Bulman Road Connection*
To 'Rails with Trails' (Connection to Major Pathway)
- *Mission Creek Greenway Connection*
To Rails With Trails Connection through Central Kelowna (Connection to Major Pathway) on Leckie Road or Banks Road or Dilworth Drive
- *Parkinson Rec Centre Connection*
From Lawrence Avenue to Spall Road (Neighbourhood Connection)

Because the 'Rails with Trails' pathway was identified as having the single highest priority, it was not evaluated further with the remaining high priority pathways.

Table 3.3 – High Priority Pathways Evaluation Summary

<i>Weighting:</i>	Evaluation Criteria						Overall Rating (/5.0)
	Safety	Demand	Network Function	Design	Appeal	Implementation Feasibility	
	<i>3</i>	<i>2</i>	<i>2</i>	<i>1</i>	<i>2</i>	<i>1</i>	
OUC Connection	5	5	5	5	5	3	4.8
College to Bulman	5	5	5	5	4	5	4.8
Dilworth	4	5	5	4	5	4	4.5
Gordon	4	5	5	3	5	4	4.5
Mayer	4	4	5	5	5	4	4.5
Gerstmar	4	4	4	5	5	5	4.4
Parkinson Rec Centre	4	4	4	5	5	4	4.3
Belgo/ Lewis/ Garner	5	3	5	3	4	5	4.3
Old Vernon (N)	4	3	5	5	5	4	4.3
Gordon to Royal Pine	4	3	4	4	3	5	3.7



The high priority pathway locations proposed for the off-road pathways and connections plan are shown in Map 3 – High Priority Pathways.

The remainder of this section provides analysis summaries on each of the proposed high priority pathways. For further details on each pathway, refer to Appendix C.

3.3.1 Regional Connections

The regional connections are the most important pathways within the study area in terms of network function. They connect different regions of the City, and provide direct routes for commuting cyclists. Currently, the Mission Creek Greenway acts as a Regional Link connecting the lake in the west to Central Kelowna and further east.

It is proposed to augment the regional capacity of the pathway network within the City of Kelowna and Ellison Area with the main connections listed in the ensuing paragraphs.

Rails with Trails

- The Rails with Trails pathway would be located adjacent to the active rail line from Ellis Street in Downtown Kelowna, all the way to the City of Kelowna boundary at Winfield, for a total length of approximately 21 kilometres.
- A study was completed in 2002 which examined the feasibility of implementing a pathway along the existing rail corridor (*Rails with Trails Feasibility Study*). A review of this study was undertaken in order to identify further enhancements that could be made to the proposed pathway design as per the pathway design guidelines provided as part of this plan. It is proposed to update the pathway width from 3.0 metres to 4.0 metres in order to accommodate the expected usage. In addition, the proposed crossing treatments were reviewed with

further suggestions for the major crossings along the pathway, the crossings being an important component of the overall pathway concept. A detailed summary of the findings of this review is included in Appendix D.

- As discussed previously, the Rails with Trails pathway would be a critical link in the pathway network, acting as the 'spine' through the Kelowna Area. It would be a major regional component of the pathway network, providing a connection between Downtown Kelowna, Central Kelowna, Rutland, and further north to the Ellison Area. By running almost parallel to Highway 97 and Harvey Avenue, it offers a safe and direct 'expressway' alternative to the highway and other major east-west arterials (i.e. Enterprise Way and Springfield Road) for commuting cyclists. This is especially important north of Old Vernon Road (south) where bicycle access to the OUC North Campus, Airport and Winfield is limited to the travel along the shoulder of the Highway 97. Because the rail line has no significant grades and few crossings, it would appeal to all levels of cyclists.

Figure 3.1 – Existing Rail Line (east of Dilworth Drive)





Gordon Drive Pathway Extension – Pathway adjacent to roadway from existing pathway in south to Springfield Road (Figure 3.2 and Figure 3.3)

- Approximately 5 kilometres long, this pathway would tie in at Old Meadows Road in the south to Springfield Road in the north. It would run on the east side of Gordon Drive between Old Meadows Road and Cameron Avenue, then cross over and run on the west side for the remainder of the length where there is more right-of-way and less cross streets and driveways. The pathway would be a predominantly 4.0 metre wide paved facility, but north of KLO Road, an interim facility 3.0 metres wide would be provided due to limited available width. A short segment of the pathway currently exists on the east side of Gordon Drive, and a bridge would have to be built over Mission Creek
- The results of the pathway evaluation provided a rating of 4.5/5.0. It provides a critical link in the pathway network by acting as a major north-south route in the Kelowna area, and high usage is expected due to the large generators along the route. The pathway will tie in with several major east-west bicycle routes on Springfield Road, KLO Road, and Casorso Road, as well as the Mission Creek Greenway.

Figure 3.2 - Gordon Drive (north of Mission Creek)



Figure 3.3 – Gordon Drive Pathway (where interim width would be required)





OUC Connection – From Glenmore to OUC North Campus

- A short 25 metre pathway connection from the OUC parking lot to the private access lane around Robert Lake. A shared on-road facility from the private access to the intersection of Valley Road with Scenic Road, a total length of approximately 2500 metres.
- The results of the pathway evaluation provided a rating of 4.8/5.0. It provides a critical link for cyclists accessing OUC from the south west and is expected to have a high demand. Although it is understood that OUC has legal access to the private access lane (as a result of the property backing out onto the lane), there may be opposition from other property owners to open the lane for general cyclist access as it is not an existing public road.
- In addition to this option, the use of the 30 metre wide City owned right-of-way (Old Highway 97 by-pass) as a link between OUC and Glenmore was also considered. However, if the use of the existing private lane can be negotiated, it represents the least costly and most feasible solution.

Figure 3.4 - Proposed OUC Pathway Link



Highway 33 Alternative – From Springfield Road along Belgo Road, Lewis Road and Garner Road

- A facility which would be located on local roads and would act as an alternative to cycling on Highway 33. The facility would be composed of a 4.0 metre pathway adjacent to the road alternative with two sections of shared on-road facilities as an interim measure, for a total length of approximately 2.3 kilometres.
- The detailed evaluation resulted in an overall rating of 4.3/5.0 for this pathway. It is an important regional connection, connecting Black Mountain with Rutland, and it would improve the safety of the network by providing an alternative to Highway 33.

Figure 3.5 - Hwy 33 Alternative Pathway (Garner Road)



Old Vernon Road – Pathway adjacent to roadway from Spencer Road to Rails With Trails and Highway 97 in north Ellison

- An 1100 metre long pathway adjacent to the north side of Old Vernon Road. The pathway would be 4.0 metres wide, separated from the edge of the pavement by 3.0 metres. Construction of the pathway would require a bridge across Mill Creek and a signalized railway crossing corresponding with the existing on road crossing where Old Vernon Road meets the railway just east of Highway 97.
- The pathway had an overall rating of 4.3/5.0. It is an important regional connection, linking the Ellison Area into the remainder of the bicycle network by way of Rails with Trails.

Figure 3.6 - Old Vernon Road



3.3.2 Connections to Major Pathways

Although Regional Connections are the main skeleton to the pathway network, it is equally as important to provide adequate access to and between these major pathways. All major centres and generators throughout the City and Ellison should have a connection to the main regional connections in some form of designated bicycle facility.

The following connections to major pathways were determined to be high priority:

Mayer Road – Connection from Benvoulin Road to Mission Creek Greenway

- A 4.0 metre wide pathway stretching in a straight line from the intersection of Benvoulin Road and Mayer Road, on the south side of Mayer Road and through the park until connecting in with the Mission Creek Greenway, for a total length of 450 metres.
- The detailed evaluation provided an overall rating of 4.5/5.0 for this pathway. It provides an important link to the Mission Creek Greenway, a major regional pathway, and will connect in with the existing bicycle route on Benvoulin Road.

Figure 3.7 - Mayer Road



Gerstmar Road Connection – Pathway adjacent to roadway from Springfield Road to Mission Creek Greenway

- A 4.0 metre wide pathway approximately 150 metres long providing a connection between the on-road bicycle routes on Springfield Road and Gerstmar Road north of Springfield with the planned Phase II of the Mission Creek Greenway.
- The pathway received an overall rating of 4.4/5.0 in the detailed evaluation and is expected to have a high usage. It fills a gap in the existing network by providing an additional connection between Rutland and the Mission Creek Greenway.

Figure 3.8 - Gerstmar Road



North End Connection – From Gordon Drive to Royal Pine Drive

- This alignment was chosen as it provides continuity from the proposed major north-south pathway along Gordon Drive south of Springfield Road. There is already a worn pathway at this location showing a high demand.
- The pathway would be 4.0 metres wide and would switchback up the hill from the end of Gordon Drive to Royal Pine Drive for an approximate length of 200 metres. An on-road facility is proposed to tie in with the planned on-road facilities up to Clement Avenue.
- An overall rating of 3.7/5.0 was given, which is a result of its lower appeal due to challenging topography and only medium expected demand.

Figure 3.9 - North End Connection (from Gordon Drive)



College Way / Bulman Road Connection – Pathway to provide access from east of Bulman Road to OUC, with a connection to Rails with Trails

- A 4.0 metre wide pathway to be constructed in unison with the planned grade separation of the junction at OUC. The pathway will tie in Bulman Road with the existing bicycle lanes on College Way, connecting both with the Rails with Trails pathway.
- The evaluation of the pathway resulted in an overall rating of 4.8/5.0. This is a critical link to provide access to Ellison within the pathway network, and removes the need for cyclists to use Highway 97 to access OUC.

Figure 3.10 - OUC junction with Highway 97





Mission Creek Greenway to Rails With Trails Connection through Central Kelowna – Pathway adjacent to the roadway along Dilworth Drive

- The alignments of both Leckie Road and Banks Road were also considered for this link, but Dilworth was deemed the most feasible in terms of property acquisition, safety, and network function.
- The pathway would be 4.0 metres wide and located on the west side of Dilworth Drive. The total length of pathway is approximately 1450 metres, with the southern 250 metres running adjacent to the new Dilworth Drive alignment, yet to be constructed, and tying in with Mayer Road and Mission Creek. A bridge over Mill Creek would be required, and the pathway is dependant on the cooperation of adjacent property owners.
- The overall rating of this pathway is 4.5/5.0. It provides a critical link between the Mission Creek Greenway and Rails With Trails and is expected to have high usage.

Figure 3.11 - Dilworth Drive



3.3.3 Neighbourhood Connections

Finally, although not acting overall as critical links in the pathway network, there are areas within the City of Kelowna where gaps in the current bicycle network exist, and due to a high expected usage, are also important. The following neighbourhood connection was found to be high priority:

Parkinson Rec Centre Connection – Pathway connection from Lawrence Avenue to Spall Road

- A 4.0 metre wide pathway connecting the on-road route on Lawrence Avenue with the on-road route on Spall Road, and providing access to Parkinson Rec Centre. The pathway will be approximately 500 metres long and would run through the park, along the front of Parkinson Rec Centre, then adjacent to Parkinson Way on the north side.

- The pathway had an overall rating of 4.3/5.0. It fills an important gap in the existing network and provides a time and distance savings for cyclists using this route.

Figure 3.12 - Pathway through Parkinson Rec Centre



3.4 Other Pathways

As discussed, pathways that were not rated as 'High' overall, were maintained in a list of 'Medium' priority pathways (recommended for consideration beyond the ten year horizon of this study), or 'Low' priority pathways (may provide a connection or network function in the long term, depending on future growth).

Both of these lists of pathways were maintained, as actions could be undertaken sooner to preserve right-of-way for their implementation, and although not recommended within the next 10 years, may become important links in the future. The 'Medium'



priority pathways are shown in Map 4 – Medium Priority Pathways and the 'Low' priority pathways are shown in Map 5 – Low Priority / Long Term Pathways.

3.5 On-Road Bicycle Network Enhancements

Although the scope of the Off Road Pathways and Connections Plan was on off-road pathway facilities only, throughout the study process improvements that could be made to the existing on-street bicycle network were also brought to attention through both consultation and pathway evaluation. These were identified through the following means:

- Potential pathway locations which upon screening, were identified as having a low implementation feasibility as an off-road pathway, but would be important links in the bicycle network with significant demand, and instead, were designated as potential on-road facilities.
- Other on-road bicycle network enhancements, independent from the pathway network, that were suggested throughout the study process.

A list of these other potential network improvements was maintained for reference as shown in Map 6 – Other Network Enhancements.

4.0 PATHWAY DESIGN GUIDELINES

The following Pathway Design Guidelines are applicable in the Kelowna area and are an important component of the Kelowna Area Off-Road Pathways Plan. The intent of these guidelines is to maximize safety, access and efficiency for all pathway users.

These design guidelines address all design aspects related to off-road pathways. Throughout this document, the term pathway is used to describe an off-road facility used by cyclists and other non-motorized users, including pedestrians, runners, in-line skaters, skateboarders, persons in wheelchairs, e uestrians, persons pushing strollers, and persons walking dogs, for example. Generally, pathways are hard-surfaced using concrete or asphalt which means that all non-motorized users can be accommodated, as well as all trip purposes commuter trips and recreational trips. Pathways may be located within a road right-of-way or parallel to a road, as illustrated in Figure 4.1, or may be located away from any roads, as illustrated in Figure 4.2.

Figure 4.1 – Pathway Within Road Right-of-Way (Richmond BC)



Figure 4.2 – Pathway Adjacent to Creek (Boulder CO)



These design guidelines do not address on-road bicycle facilities or off-road trails. On-road facilities include bicycle lanes as well as signed routes along local streets. Off-road trails are typified by hiking, mountain biking and e uestrian trails. They are often narrow, winding and steep, with soft natural surfaces, and are used primarily for recreational purposes. Pathways with crushed aggregate surfaces are distinguished from trails by wider cross-sections, gentler grades and straighter alignments, and are used for commuter trips as well as recreational trips.

4.1 Key Design Considerations

There are several key considerations in the design of off-road, multi-use pathways, as summarized below:

- Width
- Surface materials
- Horizontal alignment



- Crossings at intersections with major roads
- Grades
- Clearances
- Illumination

The most important consideration is the width of the pathway width has a significant effect on the potential for conflicts between pathway users, and as a result has a significant effect on the safety and attraction of a pathway. The second-most important and most-overlooked consideration is crossings where pathways intersect major roads. Crossings and the lack of crossings also have a significant effect on the safety and attraction of a pathway.

These pathway design guidelines recognize that in many cases, pathways will be retrofit within existing road right-of-ways and utility corridors, and in these locations constraints may mean that some design guidelines cannot be met. In recognition of this, these guidelines also include interim guidelines where applicable. The intent of these interim guidelines is to indicate minimum acceptable conditions for pathways in retrofit situations. It is expected that at some time in the future when the opportunity arises (such as through road reconstruction or redevelopment of adjacent land uses, for example), a pathway constructed to interim guidelines would be upgraded to meet the full guidelines described in this document.

4.2 Sources

The guidelines identified in this document reflect the state-of-the-art in bicycle planning in North America. Rather than reinventing the wheel, the guidelines are based on guidelines and experience in communities across Canada and the United States. Design guidelines adopted by the Transportation Association of Canada (TAC) form the basis of the designs incorporated in these Pathway Design Guidelines, as provided in the following TAC publications:



- *Geometric Design Guide for Canadian Roads*, Transportation Association of Canada, 1999.
- *Bikeway Traffic Control Guidelines for Canada*, Transportation Association of Canada, 1998.
- *Pedestrian Crossing Control Manual*, Transportation Association of Canada, 1998.
- *Manual of Uniform Traffic Control Devices for Canada*, Transportation Association of Canada, 1998.
- *Canadian Guide to Neighbourhood Traffic Calming*, Transportation Association of Canada/Canadian Institute of Transportation Engineers, 1998.
- *In-Line Skating Review: Phase 2*, Transportation Association of Canada, 1997.

In cases where TAC has not provided guidelines for specific situations encountered when planning for bicycles, other key resources were used in a supplemental capacity in developing the Pathway Design Guidelines, including:

- *Cycling Guide*, British Columbia Ministry of Transportation, 2000.
- *Guide for the Development of Bicycle Facilities*, American Association of State Highway and Transportation Officials, 1999.
- *Minnesota Bicycle Transportation Planning and Design Guidelines*, Minnesota Department of Transportation, 1996.
- *Oregon Bicycle and Pedestrian Plan*, Oregon Department of Transportation, 1995.

4.3 Width

Width is the most important design consideration for off-road pathways. In order to minimize the potential for conflicts between pathway users, the width of a pathway should be sufficient to accommodate the numbers and types of expected users.

Pathway Width:

The minimum desired width for a multi-use pathway is 4.0 m, as illustrated in Figure 4.3.

Figure 4.3 – 4 metre Wide Pathway (UBC)



Widths of 6.0 m or more may be necessary on high-use pathways. A reduced width of 3.0 m is acceptable on low-use pathways with less than 200 persons per hour during peak periods. A constrained width of as little as 2.4 m is acceptable for short sections



where there are physical constraints on the pathway width, such as trees, rocks and other objects.

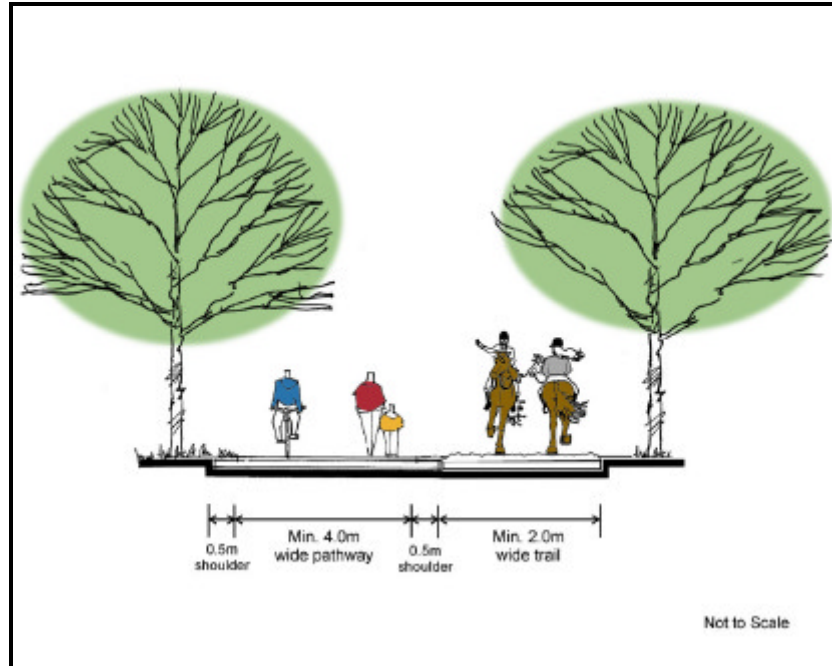
Where multi-use pathways are expected to accommodate significant numbers of in-line skaters, a minimum width of 4.0 m is required, regardless of the usage of the pathway. The width required by an in-line skater reflects the width of the skating stride as well as a manoeuvring allowance.

As an interim condition, for pathways constructed in a retrofit situation, pathway widths of 3.0 m are acceptable. In low-use applications, widths of 2.5 m are acceptable as an interim condition.

Shoulder Width:

Shoulders a minimum of 0.5 m wide should be provided adjacent multi-use pathways, as illustrated in Figure 4.4.

Figure 4.4 – Width of Pathway Elements



Separation:

Pathways should be designed for two-way travel, as it is difficult to ensure compliance with one-way designations. Separated pathways should be avoided. In communities which have attempted to separate users, pedestrians frequently use the pathways designated for cyclists and in-line skaters, and vice-versa, defeating the purpose of separated pathways. The preferred approach is to construct a single pathway of sufficient width to accommodate all users.

Painted centrelines should not be used to separate directions of travel on a multi-use pathway. Centrelines can contribute to conflicts which arise when faster-moving pathway users cross the centreline to pass slower-moving users. Many pathway users also disregard centrelines, which also creates conflicts. The use of centreline should be restricted to horizontal curves with limited sight distances, as described in Section 4.5.



An adjacent, soft-surfaced trail can be provided to accommodate runners, pedestrians, e uestrians and others. For pedestrians, an aggregate or crushed bark trail a minimum of 1.0 m wide should be provided. For e uestrians, a minimum 2.0 m wide dirt trail should be provided, as illustrated in Figure 4.4.

4.4 Pathway Surface

The choice of the pathway surface is important, as it determines whether or not some people will be able to use the pathway.

Generally, multi-use pathways should be hard-surfaced using asphalt or concrete as hard surfaces accommodate all users, including persons in wheelchairs and in-line skaters.

Compacted aggregates can be used where porous surfaces are necessary to address environmental issues. It is important to recognize that aggregates prevent use by in-line skaters, cyclists with narrow tires, and some persons with disabilities.

Pathway Structure:

Dimensions for pathway structures are summarized in Table 4.1. Indicated minimum dimensions are sufficient to accommodate occasional use by lightweight vehicles such as automobiles and pick-up trucks for which single axle loads do not exceed 1000 kg. If a pathway is to be used by heavier service vehicles, dimensions should be increased as indicated.

Table 4.1 – Pathway Structure Dimensions

Criterion	Asphalt Pathway	Concrete Pathway
Minimum requirement	<ul style="list-style-type: none"> • 50mm asphalt • 100mm crushed stone • Compacted subgrade 	<ul style="list-style-type: none"> • 100 mm concrete • 100 mm sand • Compacted subgrade
Medium trucks (single axle load 3,000 kg)	<ul style="list-style-type: none"> • 75mm asphalt • 150mm crushed stone 	<ul style="list-style-type: none"> • 125 mm concrete • 150 mm sand
Heavy trucks (single axle load 6,000 kg)	<ul style="list-style-type: none"> • 100mm asphalt • 150mm crushed stone 	<ul style="list-style-type: none"> • 150 mm concrete • 150 mm sand

Shoulder Structure:

Shoulders should be constructed using 20 mm minus crushed stone (compacted), with a minimum 50 mm depth, as illustrated in Figure 4.5.

Figure 4.5 – Aggregate Pathway Shoulder (Tukwila, WA)





Crossfall:

Pathways should incorporate crossfall, to provide positive drainage. The crossfall on an asphalt pathway should be a minimum of 2 ‰ and a maximum of 3 ‰. The crossfall on a concrete pathway should be a minimum of 1.5 ‰ and a maximum of 2 ‰.

A crowned pathway is preferred, rather than a pathway with a constant cross-slope. A maximum 3 ‰ superelevation should be used on horizontal curves.

Vegetation:

All vegetation, including roots, should be removed in the preparation of the subgrade. To control new growth, soil sterilant or lime treatment of the subgrade can be used. Plants that can cause other problems should be controlled, such as plants with thorns that can puncture bicycle tires.

Pathways located adjacent to trees are at risk from damage from tree roots. Methods of preventing damage by roots include removing vegetation, realigning the pathway away from trees, and placing root barriers along the edge of the pathway. An effective root barrier can be created with a 300mm deep metal or plastic shield. Greater depth may be required for some trees such as cottonwoods.

4.5 Pathway Alignment

The horizontal alignment of a pathway determines sight distances along the pathway, and as a result has a significant effect on the potential for conflicts between pathway users.

Design Speed:

Pathway alignments should be determined based on design speeds of 35 km/h for pathways on level ground, and 50 km/h for pathways with grades of more than 4%. These speeds reflect the maximum speeds which cyclists on pathways can be expected to attain.

Sight Distance:

Stopping sight distances are determined based on the following equation:

$$S = \frac{V^2}{255(F - G)} = 0.695V^2, \text{ where:}$$

V = design speed (km/h)

F = coefficient of friction (use 0.25)

G = grade (decimal, negative for downhill grades, e.g. -0.04)

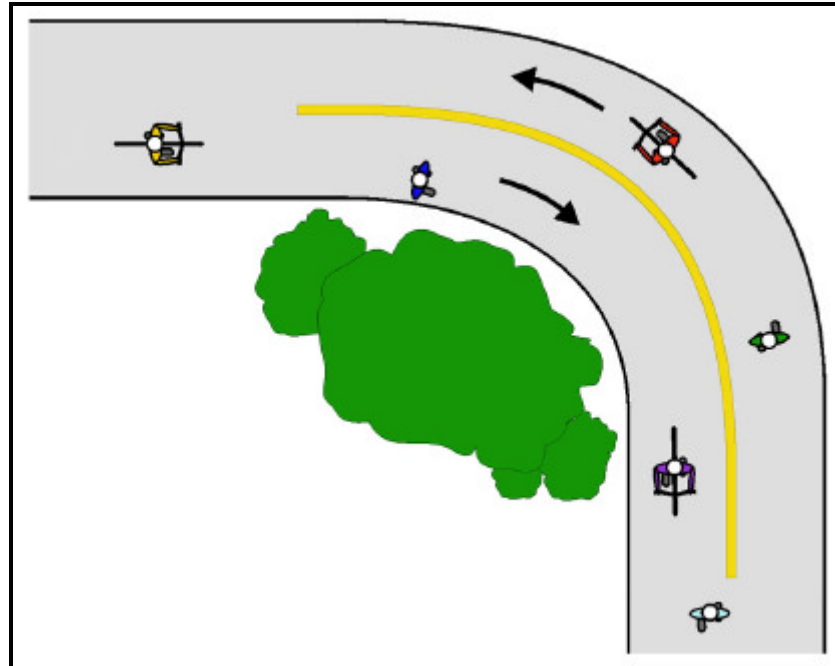
Table 4.2 provides a summary of minimum sight distances for various conditions.

Table 4.2 – Stopping Sight Distances

Design Speed	Level (no grade)	4% Downhill Grade	6% Downhill Grade	8% Downhill Grade	10% Downhill Grade
35 km/hr	44 m	47 m	50 m	53 m	56 m
40 km/hr	53 m	58 m	61 m	65 m	70 m
50 km/hr	74 m	81 m	86 m	92 m	100 m
60 km/hr	98 m	109 m	116 m	125 m	136 m

Where minimum sight distances cannot be achieved at horizontal curves, a centreline should be painted on the pathway with arrows indicating that pathway users are to stay to the right, as illustrated in Figure 4.6. As appropriate, Limited Visibility signs can also be used to alert pathway users of visibility limitations and potential hazards.

Figure 4.6 – Centreline on a Curve with Limited Sight Distance



Horizontal Curves:

Minimum radii for horizontal curves are determined based on the following equation:

$0.0079V^2 / E F$, where:

V design speed (km/h)

E Superelevation (decimal, e.g. 0.02)

F coefficient of friction

Table 4.3 provides a summary of minimum horizontal curve radii for various design speeds.

Table 4.3 – Horizontal Curve Radii at 2% Superelevation

Design Speed	Coefficient of Lateral Friction	Minimum Curve Radius
35 km/hr	0.27	33 m
40 km/hr	0.25	47 m
50 km/hr	0.22	82 m
60 km/hr	0.18	142 m

Where horizontal curves are less than the required minimum radius, the pathway should be widened by at least 1.0 m through the curve so as to provide additional room for pathway users to manoeuvre through the curve.

4.6 Crossings

Crossing treatments are applied where off-road pathways intersect major roads. Crossing treatments are often required to enable cyclists and pathway users to safely cross major roads, and to minimize potential conflicts with motor vehicles. Type of crossing treatment depends on the width of the intersecting road, the volume of motor vehicle traffic, and the number of cyclists, pedestrians and others using the crossing.

Types of crossings include:

- Marked crossing
- Median island
- Flashing lights
- Signalized crossing
- Grade separation

Marked Crossings:

A marked pathway crossing resembles a marked pedestrian crossing, with signage and pavement markings identifying the crossing as illustrated in Figure 4.7.

Figure 4.7 – Marked Pathway Crossing (Nanaimo, BC)



Marked crossings can be supplemented with curb extensions and/or raised crosswalks as illustrated in Figure 4.8 and Figure 4.9, in order to reduce the crossing distance, slow motor vehicles at the crossing, increase motorist awareness of the crossing and increase the visibility of cyclists and pedestrians. Marked crossings can also be enhanced with flashing lights, and with overhead internally-illuminated signs which shine light onto the crossing area.

Figure 4.8 – Pathway Crossings with Curb Extensions

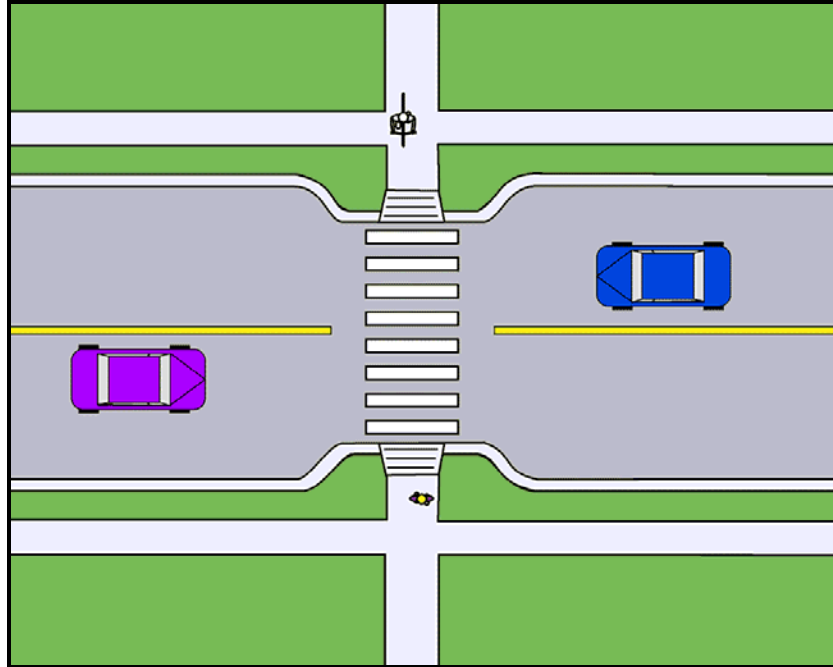


Figure 4.9 – Pathway Crossing with Raised Crosswalk (Boulder, CO)

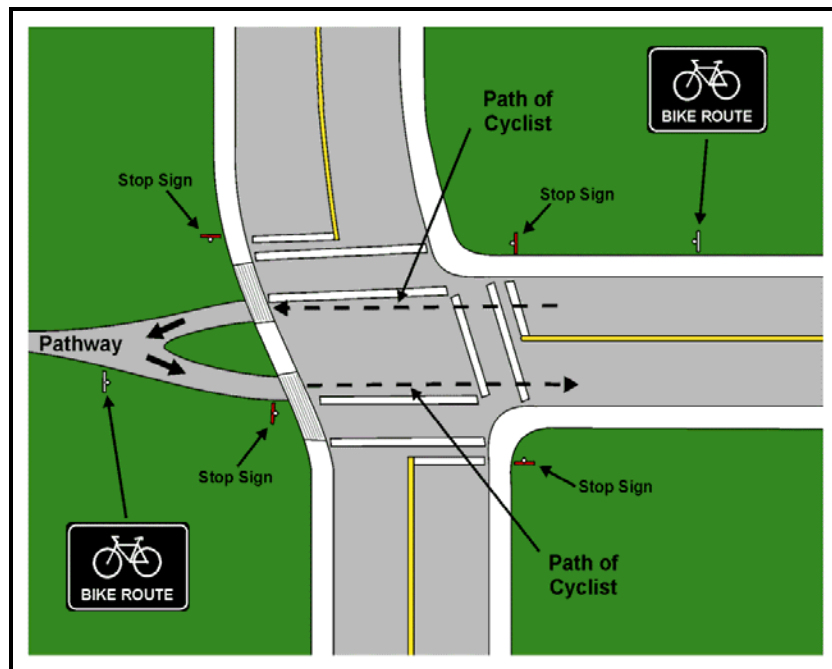


Marked pathway crossings are applicable in the following conditions:

- Relatively low-volume roads up to 5,000 vehicles per day local streets, neighbourhood collector roads.
- Posted speed of 50 km/h or less.
- Consistent gaps in traffic flow.
- Low number of cyclists and others crossing road.

Marked pathway crossings can be located at intersections. Pathway crossings located at T-intersections should be configured as shown in Figure 4.10.

Figure 4.10 – Marked Pathway Crossing at a T-intersection



Adequate sight distance is required at a pathway crossing so that motorists approaching the crossing can see the crossing from a sufficient distance away that they can stop if



the crossing is occupied.. Minimum sight distances on the roadway are determined based on the following equation:

$V(W + 4)/4.32$, where:

V Motor vehicle speed (km/h)

W Crossing width (roadway width, m)

To prevent parked vehicles from obstructing sight distances at pathway crossings, on-street parking should be prohibited within at least 6 m of the nearside of the crossing.

Sight distances for pathway users approaching crossings and intersecting roadways are determined as described in Section 4.5.

Yield signs or stop signs should be used to control pathway traffic at marked pathway crossings. Yield signs are generally used at low-volume intersections such as driveways and local streets with little traffic, as illustrated in Figure 4.11.

Figure 4.11 – Yield Signs at a Marked Pathway Crossing (Seattle, WA)



Where a pathway parallel to a roadway crosses an intersecting road, the pathway should be aligned so as to direct pathway users to cross in crosswalk, as illustrated in Figure 4.12. This configuration maximizes the visibility of pathway users to motorists. Existing pathways which cross intersecting roadways away from an intersection should be realigned so as to direct pathway users to cross at intersection, as illustrated in Figure 4.13. Crossing Ahead signs should be used on the parallel road to alert motorists to the pathway crossing, as illustrated in Figure 4.14 and Figure 4.15.

Figure 4.12 – Parallel Marked Pathway Crossing

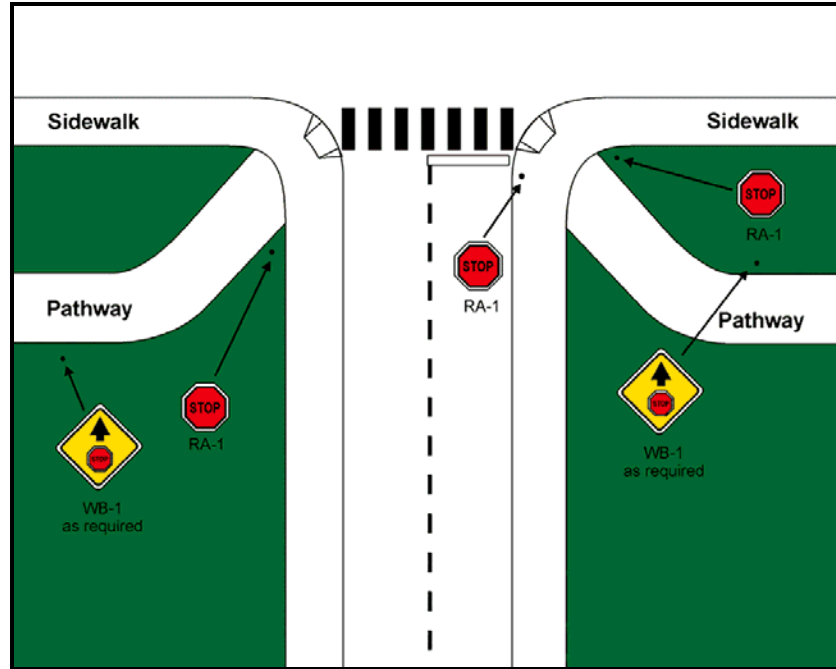


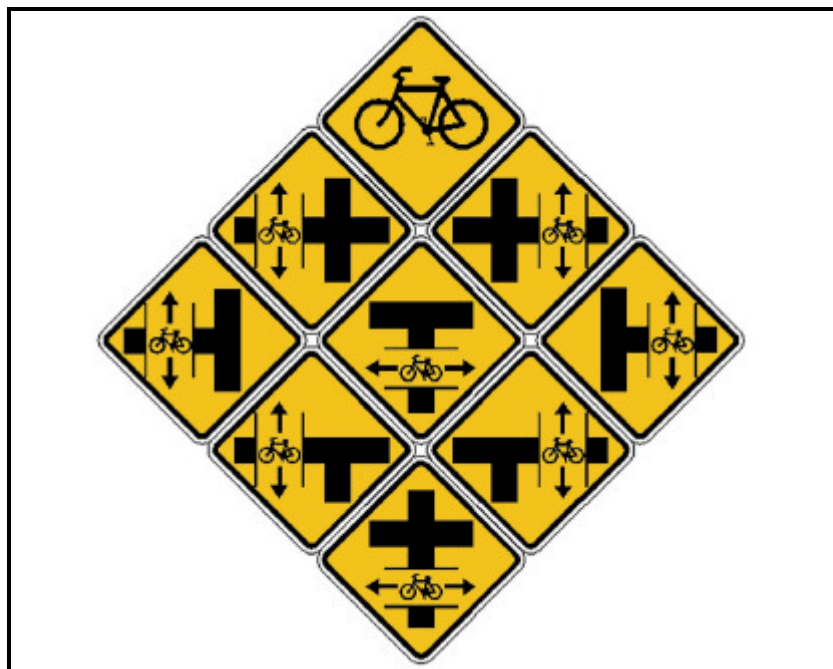
Figure 4.13 – Parallel Pathway Redirected to Intersection (Seattle, WA)



Figure 4.14 – Crossing Ahead Sign (Denver, CO)



Figure 4.15 – Crossing Ahead Sign Configurations



Median Islands:

A median island crossing incorporates a raised island located on the centreline of the road, separating opposing directions of traffic. The median island allows cyclists and other pathway users to cross one direction of traffic at a time, thereby reducing crossing delay.

Gaps may be provided in the island to accommodate pathway users, and can be offset to discourage cyclists from riding across the crossing without checking for on-coming traffic on the far side of the island, as illustrated in Figure 4.16.

Figure 4.16 – Median Island Crossing (Surrey, BC)

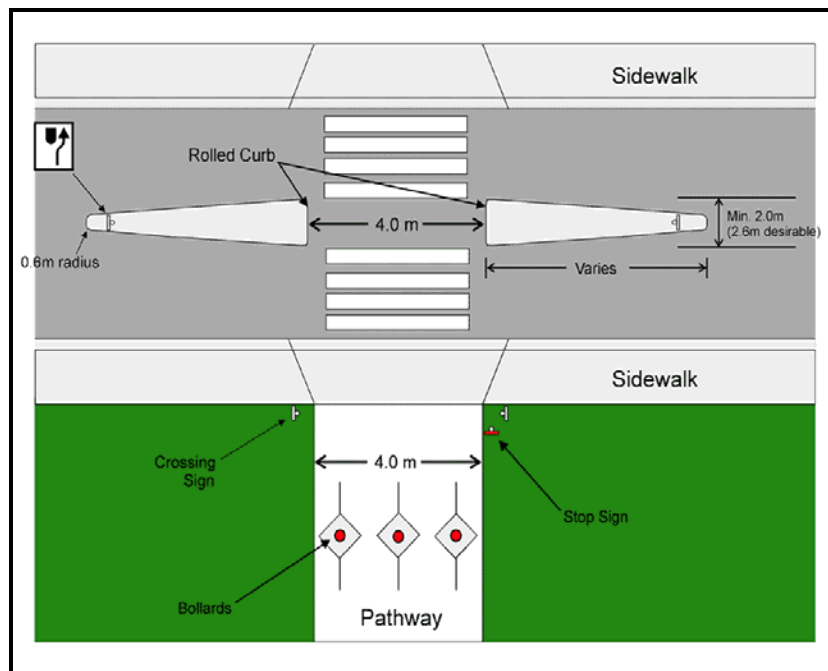


Median islands are applicable in the following conditions:

- Moderate-volume roads up to 10,000 vehicles per day collector and arterial roads
- Few simultaneous gaps in both directions of traffic
- Interruption of traffic flow with signals is not desired
- Moderate number of cyclists and others crossing road

Dimensions and signage requirements for median island crossings are illustrated in Figure 4.17. To minimize the potential for signs on the median islands to obstruct motorists' view of pathway users on the island, the length of the island indicated in Figure 4.17 as varies should be at least 3.0 m.

Figure 4.17 – Median Island Crossing



Flashing Lights:

Flashing lights can be used to enhance marked pathway crossings and median island crossings. Flashing lights are activated by pathway users prior to crossing the road, and provide additional indication to approaching motorists that the crossing is occupied. Although flashing lights may be located either in the roadway, at the side of the road or overhead, the preferred location is at the side of the road (as illustrated in Figure 4.18) in order to maximize visibility and minimize maintenance issues.

Figure 4.18 – Flashing Lights at Side of Road (Saanich, BC)



Flashing lights are applicable in the following conditions:

- Moderate-volume roads up to 10,000 vehicles per day collector and arterial roads.
- Two-lane and four-lane roads.



- Interruption of traffic flow with signals is not desired.
- Signalization requirements would result in lengthy delays to pathway users.
- Moderate number of cyclists and others crossing road.

Flashing lights may be used as an alternative to signalized crossings. Advantages of flashing lights as compared with signalized crossings include:

- No delay for pathway users. Pathway users may cross without any significant delay once they have pressed the button and activated the flashing lights.
- Reduced delay for motorists. Once the crossing is no longer occupied by pathway users, motorists may proceed.

Signalized Crossings:

Where high traffic volumes and/or traffic speeds on a major road mean that cyclists and other pathway users cannot safely cross the road, even with a median island, a traffic signal may be required. An example of a signalized pathway crossing on an arterial road is illustrated in Figure 4.19.

Signalized crossings are applicable in the following conditions:

- Higher-volume roads – arterial roads, expressways and highways.
- Higher traffic speeds on major road – posted speeds of 50 km/h or more.
- Consistent flow of traffic with few gaps.
- High number of cyclists and others crossing road.
- Greater crossing distance (four or more lanes).
- Limited visibility of crossing location for motorists.

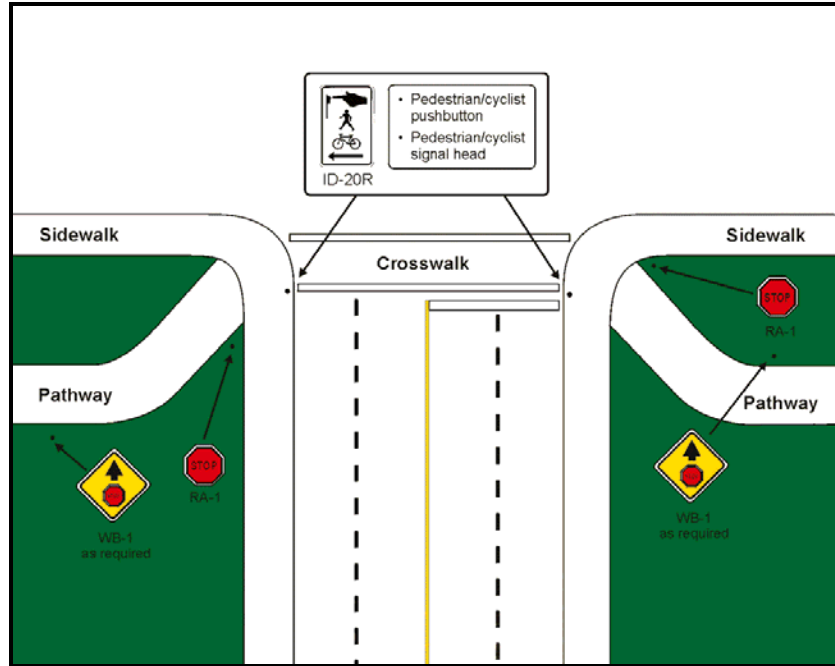
Figure 4.19 – Parallel Pathway Signalized Crossing (Seattle, WA)



The traffic signals can be actuated via pushbuttons, in-ground detectors and/or video detection. A minimal delay in signal actuation is desirable to minimize cyclists and others crossing in advance of the signals changing.

Where a pathway parallel to a roadway crosses an intersecting road at a signalized intersection, the pathway should be aligned so as to direct pathway users to cross in the crosswalk, as illustrated in Figure 4.20. This configuration maximizes the visibility of pathway users to motorists.

Figure 4.20 – Parallel Pathway Signalized Crossing



Grade Separated Crossings:

Grade-separated crossings are provided where it is not possible or desirable to provide an at-grade crossing. Grade-separated crossings include overpasses (Figure 4.21) and underpasses (Figure 4.22).

Figure 4.21 – Overpass (New Westminster, BC)



Figure 4.22 – Underpass (Boulder, CO)





Grade separated crossings are applicable in the following conditions:

- High traffic volumes on major road being crossed.
- High traffic speeds on major road.
- Consistent flow of traffic with few gaps.
- High number of cyclists and others crossing road.
- Greater crossing distance (four or more lanes).
- Limited visibility of crossing location for motorists.
- Interruption of traffic flow with signals is not desired.

Due to the relatively high cost (often more than \$1 million), grade-separated crossings are generally used only where there is a high volume of high-speed motor vehicle traffic. They are also used to cross railway tracks.

Key design guidelines for overpasses include:

- Minimum 4.0 m width.
- 1.4 m railings with rub rails.
- Minimum 5.7 m clearance over roadway.
- Minimum 7.0 m clearance over railway tracks.
- Maximum 5% grade on approach ramps in order to accommodate disabled users. This requirement often means that significant amount of property are required on each side of road for access ramps.

Key design guidelines for underpasses include:

- Minimum 4.0 m width.
- Minimum 3.0 m vertical height.
- Maximum 5% grade on approach ramps.
- A high level of illumination to minimize personal safety concerns.



4.7 Grade

Grades on pathways create the potential for some wheeled pathway users to gain speed or lose control, and consequently pathway grades should be minimized and steep grades avoided.

Maximum Grades:

Guidelines for maximum pathway grades include:

- Maximum 3% for sustained sections.
- Maximum 5% for sections 30 m or less.
- Maximum 10% for sections 15 m or less.
- Maximum 3% for aggregate surfaces to avoid instability for users and to minimize erosion.

Where pathway grades exceed the maximum grades specified above, Steep Grade warning signs should be placed at the top of steep sections, as illustrated in Figure 4.23. No part of a pathway should exceed a 15% grade.

Figure 4.23 – Steep Grade Warning Sign (Burnaby, BC)



A minimum 0.6 % grade should be incorporated in the design of a pathway if no crossfall or drainage facilities are provided.

Recovery Areas:

Recovery areas are level sections of pathway provided on grades greater than 5 % and 10 m in length, as illustrated in Figure 4.24. A series of several recovery areas may be provided on longer or steeper grades.

Figure 4.24 – Recovery Area on a Steep Grade (Saanich, BC)



Each recovery area should incorporate a level section a minimum of 2.0 m in length, as well as additional pathway width so that users who stop to recover can do so out the way of other pathway users.

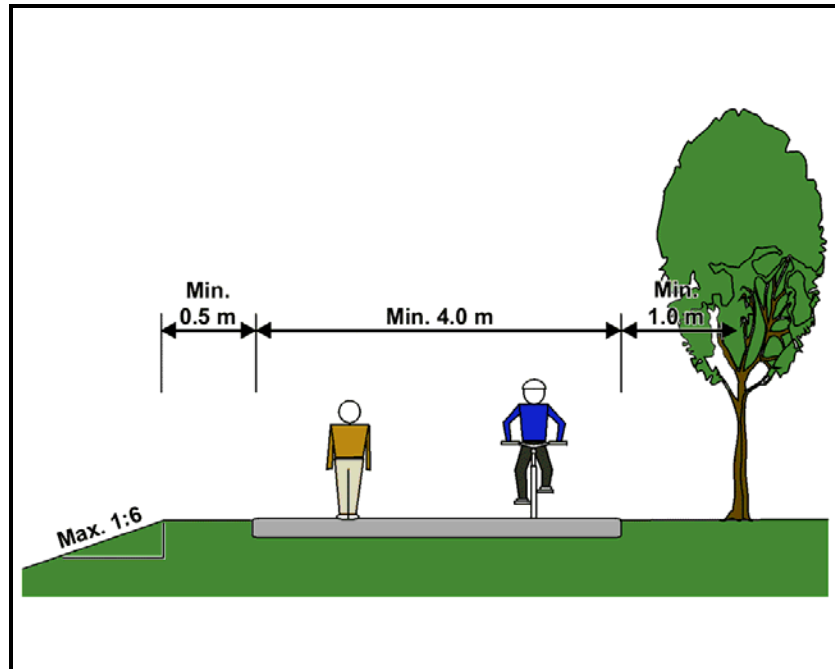
4.8 Clearance

Pathways should be designed to be free of obstructions within and adjacent the pathway, both in terms of horizontal and vertical clearances.

Horizontal Clearance:

The minimum horizontal clearance from the edge of the pathway to a fixed object greater than 150 mm in height – a tree or signpost, for example – should be a minimum of 1.0 m, as illustrated in Figure 4.25. A minimum 0.5 m horizontal clearance is required adjacent a railing, wall or other barrier.

Figure 4.25 – Horizontal Clearances



As an interim condition, for pathways constructed in a retrofit situation, horizontal clearances of 0.5 m are acceptable.

Side Slopes:

Where a side slope exists adjacent a pathway, a minimum of 0.5 m clearance is required, as illustrated in Figure 4.25.

The desirable maximum slope of a side slope is 1:6. For side slopes steeper than 1:4, the pathway edge should be a minimum of 1.5 m from the top of the slope, and safety railings should be used as illustrated in Figure 4.26. To provide adequate horizontal clearance, safety railings should be a minimum of 0.5 m from the edge of the pathway.

Figure 4.26 – Safety Railing Adjacent Steep Side Slope (Minneapolis, MN)



Adjacent Roads:

Pathways adjacent roads with urban cross-sections (roads with curbs) should be separated from the roadway by the distances indicated in Figure 4.27 and described below:

- Minimum 0.5 m separation adjacent on roads with low traffic volumes and posted speeds of 50 km/h or less
- Minimum 0.75 m separation adjacent roads with parked vehicles
- Minimum 1.0 m separation adjacent roads with moderate traffic volumes and posted speeds of 60 km/h
- Minimum 2.0 m separation adjacent roads with high traffic volumes and posted speeds of 70 km/h or more

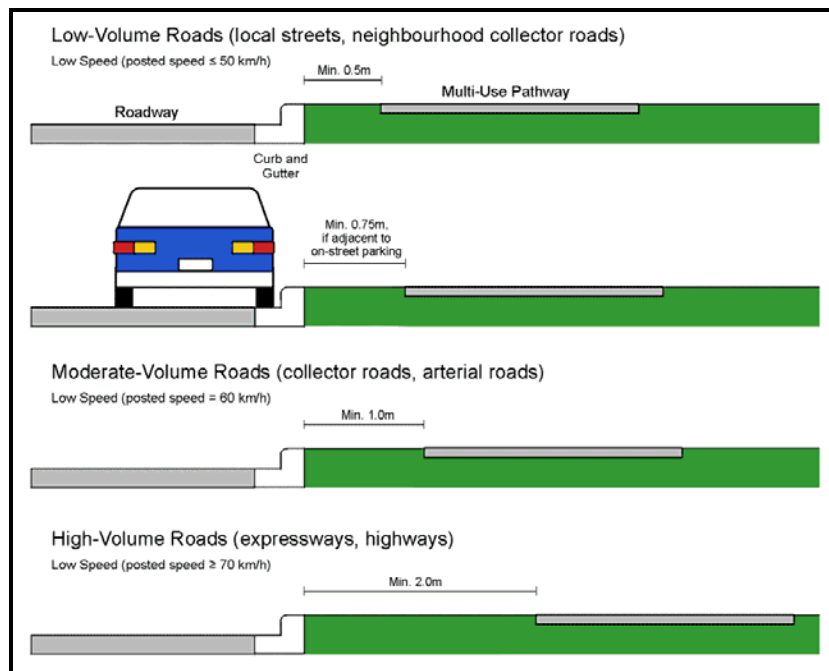
The separation area between the pathway and road may be grass, crushed stone or other aggregate, or a hard surface. If a hard surface is used, colour and texture (such

as coloured, stamped asphalt) should be used to differentiate the separation area from the pathway. Signs, utility poles, trees and other objects should not be placed in the separation area between the pathway and road, where minimum horizontal clearances cannot be achieved as previously described.

Pathways adjacent roads with rural cross-sections (roads with shoulders rather than curbs) should be separated from the edge of the paved portion of the roadway by a minimum of 3.0 m, where the posted speed on the road is 60 km/h or less. A minimum 7.0 m separation should be provided where posted speeds are 70 km/h or greater.

Horizontal separation requirements for rural roads can be reduced to the dimensions for curbed roads with the addition of a concrete curb 150 mm in height, anchored to the edge of the road.

Figure 4.27 – Horizontal Clearances Adjacent to a Curbed Road





Vertical Clearance:

The vertical clearance to tree branches and other objects should be a minimum of 2.5 m above the multi-use pathway surface. In underpasses and under structures more than 2.0 m in length, the minimum vertical clearance should be 3.0 m. A minimum 3.0 m vertical clearance is required for e uestrians.

4.9 Other Design Considerations

Other design considerations include illumination, the use of barrier posts, special considerations for bridges, and designing stairs to accommodate bicycles.

4.9.1 Illumination

Generally, illumination of multi-use pathways is not necessary, and may not be considered desirable by residents adjacent to a pathway. Locations where illumination is essential include intersections with roadways, underpasses and locations where night time security is considered an issue.

The following illumination levels are recommended for multi-use pathways. Horizontal illumination is measured at pavement level, and the uniformity ratio is calculated by dividing the average illumination level by the minimum illumination level.

Pathways:

- Multi-use pathways should have a minimum average horizontal illumination level of 5 lux, with a minimum uniformity ratio of 6:1.



- Light standards should be located no closer than 1.0 m to the edge of the pathway, and if positioned over the pathway, should provide a minimum 2.5 m vertical clearance.

Intersections:

- Pathways should be illuminated for a distance of 25 m on either side of intersecting roads.
- At intersections with arterial and collector roads, illumination levels should be increased to a minimum average horizontal illumination level of 15 lux, with a minimum uniformity ratio of 4:1.

Underpasses:

- Illumination levels in pedestrian/bicycle underpasses should be a minimum average horizontal illumination level of 45 lux, with a minimum uniformity ratio of 4:1.

Figure 4.28 - Illumination of a Pathway (Kelowna, BC)



4.9.2 Barrier Posts

Barrier posts also known as bollards are used to obstruct motor vehicle access to a pathway. They may be tubular or square, and should be 100 mm to 150 mm in diameter, as illustrated in Figure 4.29. Barrier posts should not incorporate any protrusions.

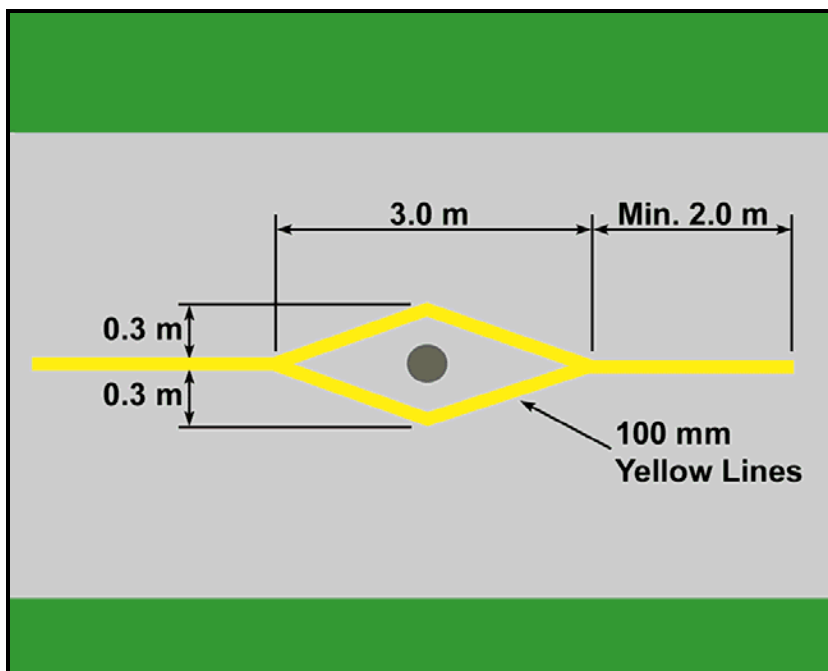
A single barrier post is preferred. Where multiple barrier posts are used, they should be used in odd numbers to encourage users to stay right when passing between barriers. Barrier posts should be spaced a minimum of 1.5 m apart to allow passage by cyclists, bicycle trailers and wheelchair users. Additionally, barrier posts should be placed a minimum of 8 m from the edge of an intersecting roadway.

Barrier posts should be painted with bright, light colours for visibility (preferably with reflective markings). Pavement markings should be used to divert pathway users away from barrier posts, as illustrated in Figure 4.30.

Figure 4.29 – Barrier Posts (Penticton, BC)



Figure 4.30 – Pavement Markings for Barrier Posts



To accommodate service vehicles, one or more barrier post may be removable. These removable barrier posts should be padlocked or otherwise secured to prevent unauthorized access.

4.9.3 Bridges

With respect to the width of a bridge located on a multi-use pathway, the same guidelines for pathway widths apply, plus appropriate horizontal clearance. This means, for example, that a bridge located on a pathway 4.0 m wide should be at least 5.0 m wide 4.0 m to match the width of the pathway, plus 0.5 m horizontal clearance on each side of the bridge where railings are provided, as illustrated in Figure 4.31.

Figure 4.31 – Bridge with Additional Horizontal Clearance (Seattle, WA)



Railings should be a minimum of 1.4 m in height. For existing railings, a height of at least 1.1 m height is acceptable.

Railings on bridges should incorporate a rub rail, as illustrated in Figure 4.32. The purpose of a rub rail is to prevent bicycle handlebars from catching on vertical supports of railing. A rub rail should be 200 mm high, and be installed between the heights of 0.9 m and 1.1 m. A rub rail should provide a smooth surface along the length of the railing, and should be designed to function as a handrail for pedestrians.

Figure 4.32 – Railing with Rub Rail (Toronto, ON)



Railings at the end of a bridge should be continued a minimum of 2.0 m beyond bridge end, and should be flared as illustrated in Figure 4.33.

Figure 4.33 – Railing Flared at Bridge End (Eugene, OR)



4.9.4 Stairs

Where cyclists would be required to climb or descend stairs to reach a pathway, a ramp should be provided on at least one side of the stairs to enable cyclists to roll their bicycle up or down the stairs (Figure 4.34).

Handrails should be provided as specified in local building codes, and should be located so as to avoid obstructing cyclists rolling their bicycles up or down the ramp. One means of accomplishing this is to provide a handrail in the centre of the stairs, as illustrated in Figure 4.34.

Figure 4.34 – Stair with Bicycle Ramp (New Westminster, BC)





5.0 PATHWAY IMPLEMENTATION

The order and timing of the implementation of each of the high priority pathways that are considered for the proposed off-road pathway network plan are dependant on several factors in addition to the detailed evaluation that was completed in Section 3.0. This includes the cost of each of the pathway and the available funding within the 10 year horizon proposed for this plan, as well as other phasing and timing issues that may arise.

In this section, the estimated pathway costs for each of the high priority pathways are presented, along with discussions on funding, phasing and timing for their implementation.

5.1 Cost Estimates

Cost estimates were prepared for each of the proposed high priority pathways. The assumptions made and unit costs used are discussed in this section, along with a summary of the estimated costs involved in the implementation of each pathway, as shown in Table 5.1.

Although a detailed cost estimate for the Rails with Trails pathway was prepared as part of the *Rails With Trails Feasibility Study* in 2002, several enhancements to the proposed pathway design have been suggested as part of the Off-Road Pathways Plan (Appendix D). An updated cost was prepared for this pathway to account for the wider pathway (4.0 metres versus the 3.0 metres proposed) and additional crossing treatments as discussed. No other elements of the cost estimate were refined at this point. The total new estimated cost for the Rails with Trails pathway is approximately \$7.4 million.



Table 5.1 - Estimated Pathway Costs

ITEM	COST
<i>Gordon Drive Pathway Extension</i>	
Site Preparation	\$136,500
Pathway Construction	\$372,000
Crossings	\$25,000
Amenities and Landscaping	\$158,000
Intersection Lighting	\$39,000
Signage and Markings	\$9,000
Bridge (Mission Creek)	\$100,000
Retaining Wall	\$75,000
Design and Engineering (10 %)	\$91,500
Contingency (35 %)	\$352,000
TOTAL	\$1,359,000
<i>OUC (North Campus) Connection</i>	
Site Preparation	\$1,000
Pathway Construction	\$2,000
Amenities and Landscaping	\$200
Signage and Markings	\$5,000
Design and Engineering (10 %)	\$1,000
Contingency (35 %)	\$3,000
TOTAL	\$12,200
<i>Highway 33 Alternative – Belgo Rd / Lewis Rd / Garner Rd</i>	
Site Preparation	\$54,000
Pathway Construction	\$128,000
Crossings	\$4,000
Amenities and Landscaping	\$13,000
Intersection Lighting	\$6,000
Signage and Markings	\$5,000
Design and Engineering (10 %)	\$21,000
Contingency (35 %)	\$81,000
TOTAL	\$311,000



Table 5.1 Continued - Estimated Pathway Costs

ITEM	COST
<i>Old Vernon Road</i>	
Pathway Construction	\$88,000
Crossings	\$2,000
Amenities and Landscaping	\$9,000
Intersection Lighting	\$9,000
Signage and Markings	\$2,000
Bridge (Mill Creek)	\$50,000
Railway Crossing	\$20,000
Design and Engineering (10)	\$18,000
Contingency (35)	\$63,000
TOTAL	\$267,000
<i>Mayer Road Connection to Mission Creek Greenway</i>	
Site Preparation	\$8,000
Pathway Construction	\$36,000
Crossings	\$2,000
Amenities and Landscaping	\$15,000
Intersection Lighting	\$3,000
Signage and Markings	\$1,000
Design and Engineering (10)	\$7,000
Contingency (35)	\$25,000
TOTAL	\$97,000
<i>Gerstmar Road Connection to Mission Creek Greenway</i>	
Site Preparation	\$5,000
Pathway Construction	\$12,000
Amenities and Landscaping	\$5,000
Intersection Lighting	\$3,000
Signage and Markings	\$300
Design and Engineering (10)	\$3,000
Contingency (35)	\$10,000
TOTAL	\$38,000



Table 5.1 Continued - Estimated Pathway Costs

ITEM	COST
<i>North End Connection from Gordon Drive</i>	
Site Preparation	\$3,000
Pathway Construction	\$16,000
Crossings	\$4,000
Amenities and Landscaping	\$3,000
Intersection Lighting	\$6,000
Signage and Markings	\$1,000
Retaining Walls	\$50,000
Design and Engineering (10)	\$8,000
Contingency (35)	\$32,000
TOTAL	\$123,000
<i>Dilworth Drive Connection Through Central Kelowna</i>	
Site Preparation	\$96,000
Pathway Construction	\$116,000
Crossings	\$6,000
Amenities and Landscaping	\$49,000
Intersection Lighting	\$24,000
Signage and Markings	\$3,000
Bridge (Mill Creek)	\$90,000
Design and Engineering (10)	\$38,000
Contingency (35)	\$148,000
TOTAL	\$570,000
<i>Parkinson Rec Centre Connection</i>	
Site Preparation	\$8,000
Pathway Construction	\$41,000
Crossings	\$15,000
Amenities and Landscaping	\$9,000
Intersection Lighting	\$6,000
Signage and Markings	\$1,000
Bridge (Mill Creek)	\$50,000
Design and Engineering (10)	\$13,000
Contingency (35)	\$50,000
TOTAL	\$193,000

An estimated cost for the high priority pathway linking College Way and Bulman Road across the Rails With Trails pathway was not included as it is assumed it will be implemented with the planned construction of a grade separated crossing at this location.

The following main elements were considered in preparing each cost estimate:

- *Site Preparation* – Site preparation included any changes that had to be made along the length of the pathway alignment in advance of the actual construction. Changes could include removal or relocation of trees, the removal of the existing sidewalk or the relocation of street lights, utility poles and fire hydrants. In addition, an estimate of the required cut and fill was also made. The unit costs assumed for site preparation are included in Table 5.2.

Table 5.2 – Unit Costs for Site Preparation

Site Preparation	Unit Cost Assumed
Removal/relocation of tree	\$750/tree average
Removal of sidewalk	\$7.50/m ²
Relocation of street light / utility pole	\$1500 each
Relocation of fire hydrant	\$1500 each
Excavation (includes disposal)	\$6/m ³
Fill	\$10/m ³

- *Pathway Construction* – For the purpose of consistency, a pathway width of 4.0 metres was assumed for all pathway construction. The components and unit costs used are summarized in Table 5.3 and amount to a total cost of \$80,000 per kilometre of pathway.

Table 5.3 – Unit Costs for Pathway Construction

Pathway Component	Unit Cost Assumed
Compacted subgrade (5.0 metres wide)	\$1/m ²
150 mm crushed gravel base (5.0 metres wide)	\$7/m ²
50 mm asphalt (4.0 metres wide)	\$10/m ²

- *Crossings* – Crossings were assumed as a single unit price for each type, as summarized in Table 5.4.

Table 5.4 – Unit Costs for Crossings

Type of Crossing	Unit Cost Assumed
Marked Crossing	\$2,000
Median Refuge	\$15,000
Signalized Crossing	\$60,000
Railway Crossing (signalized)	\$20,000

- *Amenities and Landscaping* – An allowance for the beautification of the pathway and amenities adjacent to the pathway was included in each cost estimate with the understanding that the pathway appeal will be a significant factor in attracting cyclists to the facility. A combination of grass boulevard on either side of the pathway, trees and benches were included in the cost estimate, dependent on the location and nature of the pathway in question (Table 5.5).

Table 5.5 - Unit Costs for Amenity and Landscaping Allowance

Type of amenity / landscaping	Unit Cost Assumed
Grass boulevard, both sides (1.0 metre wide)	\$8/metre
Trees	\$500 each
Benches	\$1500 each

- *Illumination* – The illumination of pathways at intersections with roadways was included in the cost estimates. It was assumed that illumination of the pathway for a distance of 25 metres on either side of the road would be provided by a single light on each side of the crossing, at approximately \$3,000 each. Illumination of the pathway between intersections is not required and was not included in the cost estimates.
- *Signage and Markings* – A unit rate of \$2,000 per kilometre was included in each cost estimate to account for the required signage and pavement markings for the pathway.
- *Bridges* – Where a bridge crossing for the pathway was required, a unit cost of \$2,000 per square metre of bridge deck was used.

All cost estimates were Class D and are order-of-magnitude estimated costs only. A contingency of 35% was included with each estimate, along with a 10% design and engineering allowance. As these are preliminary costs only, details such as driveways, fences, and any additional drainage requirements (above and beyond the drainage provided by the pathway crossfall, as described in Section 4.0) are assumed to be absorbed by the contingency. It should be noted that land acquisition was not included in the cost estimates.

Detailed cost summaries are provided in Appendix E.



5.2 Phasing and Timing

Ideally, the construction of all of the high priority pathways would occur in their entirety within the next 10 years. However, it is understood that this may not be possible due to funding constraints, property issues, or some other unforeseeable reason. With many of the pathways, the phasing of their construction may be a viable alternative.

This section outlines some implementation options for each of the pathways, including possible phasing opportunities and recommended timing for their construction.

Rails With Trails

As stated, the Rails With Trails pathway is the ultimate priority in the proposed pathway network plan and once the negotiations with the rail company have been resolved, it should receive the highest priority for construction. However, at an estimated cost of \$7.4M, it may not be feasible to fund the construction of its entire length right away. Therefore, it is recommended that phasing of its construction be considered, with immediate focus on the section of the pathway between Downtown and Central Kelowna (Ellis to Gordon, Gordon to Spall, and Spall to Dilworth), and future focus east and north to OUC (North Campus).

Gordon Drive Pathway Extension

This pathway continues for a considerable length, and there is a chance that some property acquisition may have to occur, which may stall its construction. However, the following options to phase this pathway implementation could be considered:

- As discussed, north of KLO Road the available width adjacent to the curb is limited and an interim facility of a 3.0 metre wide pathway should be considered in the short term. When Gordon Drive is repaved at this location, there is the option to retrofit the road to widen the available pathway width within the existing right of way by eliminating the centre median.



- This pathway could also be constructed in sections, as the on-road bicycle lanes can be used as an alternative for the sections that have yet to be constructed.

OUC Connection

The pathway link at the OUC parking lot to the private access lane is a simple implementation, and can be completed once the legal issues for access to the private lane at the end of Curtis Road have been resolved. The on-road facility leading from the pathway connection to Valley Road, and corresponding signage can be phased in later if it cannot be constructed in conjunction with the pathway.

Highway 33 Alternative (Belgo Road to Lewis Road to Garner Road)

Because this pathway will be located on what are currently rural, low volume roads, the option to construct this as an on-road shared facility as an interim measure could be considered, with the eventual pathway construction occurring with development or road reconstruction along the route.

Gerstmar Road Connection to Mission Creek Greenway

It would be ideal to implement this pathway in conjunction with Phase II of the Mission Creek Greenway, which is scheduled for completion in Spring 2005, as it provides additional access to the new portion of the Greenway.

College Way / Bulman Road connection

At the junction of Highway 97 and College Way, a grade separated interchange is planned for construction. The pathway connection should be implemented in conjunction with this upgrade project.

Dilworth Drive Connection from the Mission Creek Greenway to Rails With Trails

This pathway also has the potential to be constructed in several phases. The portion north of Springfield Road should be constructed as soon as possible, dependant on the



cooperation of land owners on the west side of the road. There is the option to construct the portion south of Springfield Road as a separate phase, in conjunction with the planned extension of Dilworth Drive to Mayer / Benvoulin Road.

Parkinson Rec Centre Connection

This pathway connection can also be split into several phases, with an on-road facility along Parkinson Way as an interim measure.

At the remaining pathway locations, there are no known construction projects or interim facility options that would lead to the consideration of phasing their implementation. All of the high priority pathways should be considered for construction as soon as possible within the 10 year time frame.

5.3 Funding

With the exception of the Mission Creek Greenway Project, which is a Regionally (Central Okanagan Regional District) driven initiative, funded from a combination of both public and private sector sources, the majority of the bicycle infrastructure initiatives delivered within the study area have largely been borne through existing City of Kelowna programs where opportunities to achieve economies of scale exist (ie. adding a bicycle lane on a rural road in conjunction with the asphalt overlay program) or through a specific allocation of the City of Kelowna's 10 Year Capital Plan, which offers an capital annual allowance of \$500,000 to fund bicycle network improvements that are not able to be captured within other programs. As no other new local government sources of funding have been identified as being likely during the development of this plan, this level of funding will be used as the benchmark for further reference in this document.

To date, the 10 Year Capital Plan allocation has largely met the needs of the on-street bicycle network interests, in conjunction with other City programs and initiatives as well



as Provincial cost-sharing programs (which no longer exist). While opportunities to continue to invest and enhance the on-street system remain, many of the key facilities are in place, and many others await advancement of ancillary interests (typically development related). With interests in the pathway network advancing, an opportunity to shift the focus of this allocation from the on-street system to the proposed pathway network exists. The current allocation will meet the needs of the short term program identified over a ten year period, with the exception of the Rails With Trails Project, which is a special entity that will require consideration in the form of 'stand alone' capital project.

It should be noted, however, that many of the proposed initiatives are Regional in their nature, and potentially offer significant benefits to other interests beyond the intent of this one funding stream. Partnership opportunities abound, with the Central Okanagan Regional District, other municipal departments (eg. Parks Department), private interests, stakeholder groups and/or even neighbourhoods. Alternatively, new or alternate senior level government funding sources exist which may be applicable, particularly with a larger and more significant initiative such as the Rails with Trails corridor. Some potential funding sources and relevant descriptions include:

Canada-BC Infrastructure Program

This program involves a partnership between the federal, provincial and local governments. The aim of the program is to renew and build infrastructure in rural and urban municipalities across Canada.

The first priority is green municipal infrastructure – projects that improve the quality of the environment and contribute to our national goals of clean air and water. Priority projects target water and wastewater systems, water management, solid waste management and recycling. Other program priorities include local transportation, roads and bridges, affordable housing, telecommunications and tourist, cultural and recreational facilities.



Municipal Rural Infrastructure Program

This \$1-billion Fund has been structured to provide a balanced response to local infrastructure needs in urban and rural Canada, and will ensure that all Canadians, whether they live in large, small or remote communities, will share in the benefits of infrastructure investments. It will build on past successes in partnership infrastructure funding of over 3,000 projects that have directly benefited Canadians.

The Municipal Rural Infrastructure Fund will improve and increase the stock of core public infrastructure in areas such as water, wastewater, cultural, recreation, and those very things that make communities vibrant and productive places to live and work and raise families.

Public transit projects are now eligible for funding under the federal government's Municipal Rural Infrastructure Fund (MRIF). In order to achieve a balance between the infrastructure needs of urban and rural Canada, 80 per cent of funding under the MRIF will be dedicated to municipalities with a population of less than 250,000. On average across Canada, 50 per cent of the funding will target green infrastructure, specifically including public transit. The MRIF will be administered through a joint federal-provincial/territorial management committee in each province and territory, and will be delivered federally through five regional agencies. Project selection for the MRIF will be guided by the management committees and will involve a key role for municipal associations.

Climate Change Plan for Canada

Partnership with provincial and territorial governments is an essential part of the *Climate Change Plan for Canada*. Canada's provincial and territorial governments are already taking action to reduce emissions, and the Government of Canada is committed to introducing measures that can enhance these efforts, and to working with its provincial and territorial partners in a way that recognizes their



specific priorities, and allows for complementary and coordinated action on GHG emissions.

The \$160 million *Opportunities Envelope* included in this new investment will provide additional flexibility to the provinces and territories as they continue to develop solutions that meet their specific needs and circumstances, and support national climate change goals at the same time. The Opportunities Envelope will also allow the Government of Canada to contribute to cost-effective emissions reduction initiatives brought forward by its provincial and territorial partners.

Provinces and territories will have further opportunities to undertake collaborative efforts with the Government of Canada through the \$300 million being invested in *emissions reduction measures*, in areas such as buildings and transportation. All of these investments are designed to encourage partnership, build on existing efforts and reflect areas where there is agreement that further action is required.

The \$500 million federal investments in *technology and innovation* will also create opportunities for new partnerships, as will new Government of Canada investments in infrastructure. Budget 2003 allocated an additional \$3 billion to the Government of Canada's ongoing investment in the nation's infrastructure. This program will place an enhanced focus on projects that relate to helping meet Canada's climate change goals.



Moving on Sustainable Transportation

Transport Canada has established a Moving on Sustainable Transportation (MOST) Program to support projects that produce the kinds of education, awareness and analytical tools we need if we are to make sustainable transportation a reality. The MOST Program will provide funding to help support projects that will:

- provide Canadians with practical information and tools to better understand sustainable transportation issues,
- encourage the creation of innovative ways to promote sustainable transportation,
- and achieve quantifiable environmental and sustainable-development benefits.

BC EcoAction

The EcoAction Community Funding Program is an Environment Canada program that provides financial support to community groups for projects that have measurable, positive impacts on the environment. Non-profit groups and organizations are eligible to apply to the Funding Program. This includes, but is not limited to: community groups, environmental groups, aboriginal groups and First Nations councils, service clubs, associations and youth and seniors organizations.

EcoAction encourages projects that protect, rehabilitate or enhance the natural environment, and builds the capacity of communities to sustain these activities into the future. Projects require matching funds or in-kind support from other sponsors. Priority for funding is given to projects that will achieve results in the following areas: Clean Air and Climate Change, Clean Water, and Nature. Submission deadlines to the Funding Program are February 1st and October 1st annually.



6.0 SUMMARY

Through the screening of over 100 potential off-road pathways and connections, a final list of 11 high priority pathways was developed.

The planned Rails With Trails pathway from Downtown Kelowna north to the City of Kelowna's boundary was considered separately from the remaining pathways as it is the most important in the proposed pathway network and would have the ultimate priority. Acting as the 'spine', this pathway is crucial for the overall pathway network.

The proposed off-road pathway and connections plan includes 10 additional pathways as summarized in Table 6.1.

Ideally, these 10 pathways would be implemented in their overall ranking order which reflects criteria such as safety, demand, network function, implementation feasibility, design, and appeal. However, cost, phasing options as described, or the coordination of the pathway construction with other construction projects should also be considered.



Table 6.1 – Recommended High Priority Pathways

Pathway	Overall Ranking	Cost	Implementation Comments
OUC Connection	1	\$12,200	<ul style="list-style-type: none"> Implementation easy once legal issues are resolved. Timing immediate.
College Way to Bulman Rd	2	–	<ul style="list-style-type: none"> Implement in conjunction with grade separation of Highway 97 / College Way junction
Dilworth Drive	3	\$570,000	<ul style="list-style-type: none"> Construct south of Springfield in conjunction with Dilworth Drive road extension
Gordon Drive Extension	4	\$1,359,000	<ul style="list-style-type: none"> Can construct in segments Interim facility north of KLO Road
Mayer Road	5	\$97,000	
Gerstmar Road	6	\$38,300	<ul style="list-style-type: none"> Implementation with Mission Creek Greenway Phase II
Parkinson Rec Centre	7	\$193,000	<ul style="list-style-type: none"> Segment on Parkinson Way can be on-road as an interim measure
Belgo/ Lewis/ Garner Road	8	\$311,000	<ul style="list-style-type: none"> Consider on-road shared facility as interim measure
Old Vernon Road (north)	9	\$267,000	
Gordon Dr to Royal Pine Dr	10	\$123,000	