Prepared for

City of St. John’s

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Consulting Services for

Cycling Master Plan

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Executive Summary

The City of St. John's has a growing population representing 20% of the larger province with an active cycling, walking and running community despite often challenging local geography and weather conditions. Currently there are no official cycling facilities in the City and road travel conflicts with motorized vehicles are a common complaint that continues to hamper the growth of active transportation (AT) modes. The Cycling Master Plan represents a comprehensive strategy to address these needs and to build an AT foundation for St. John's that will provide increased opportunities for physical fitness, greenhouse gas emission reductions, less urban sprawl and more efficient land use, economic growth, and a viable alternative to motorized travel across the Municipality.

As provided in Section 1.4 of this report, widening a two lane arterial roadway can cost up to $1.3 million per kilometer. AT facilities are far less expensive to construct and maintain than standard transportation routes and can also have significant positive economic impacts ranging into the tens of millions per year. At full build out, the City of St. John's Cycling Network will encompass a total of 226 kilometers of cycling and multi-use trail facilities connecting all areas of the City and providing an excellent resource for residents and an attractive amenity for visitors to the area. Total probable costs for network construction are estimated to be $6,482,600 in 2007 dollars over the life of the initiative. This total represents costs for 43 kilometers of dedicated bicycle lanes, 54 kilometers of paved shoulder facilities, 73 kilometers of signed-only bicycle routes and 56 kilometers of multi-use trail route upgrades as well as 6 gateway facilities and 20 bicycle parking areas across the City.

This report provides extensive network route and cycling facility type mapping and detailed, practical design guidelines to assist with steering Plan development through various construction and user challenges with an emphasis on encouraging multi-modal travel and the mitigation of potential user conflicts. Through the application of the recommended policies and municipal standards and the pursuit of effective promotion, education and funding opportunities as outlined in Section 6, the City of St. John's Cycling Master Plan effectively addresses the vision, goal and objectives of the project Steering Committee and will create a greener, more sustainable, accessible and economically vibrant future for the City.

As noted by St. John's City Council members and elsewhere in this document, achieving full build-out of the Master Plan will be accomplished utilizing a phased approach over approximately 20 years with the Master Plan document acting as a guideline and further public involvement a key component of the larger process.

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1 Introduction

1.1 Project Objective and Scope

In May, 2007, Hatch Ltd. in association with Marshall Macklin Monaghan and Nova Consultants was retained to develop a Cycling Plan for the City of St. John's. Hatch was acquired by Hatch Mott MacDonald (HMM) over the course of the project and all documents now reflect the change. The HMM Team reports to a Technical Advisory Committee of City Staff and officials.

The overall intent of the Cycling Plan was to develop a user-friendly network of on-road and off-road facilities primarily for cycling based, non-motorized movement within the City. The network includes trails, bikeways, parks, environmental and recreation corridors as well as designated streets that work together to provide alternative and desirable methods for moving around St. John's with the system working in a cohesive and integrated manner.

The overall goal of the initiative was to create a well-connected, safe and functional Cycling Plan. In this context, the HMM Team was instructed by the Technical Advisory Committee to follow an integrated system approach to the preparation of the Plan that included the involvement of the general public as well as bicycle and other stakeholder groups. Through this approach, the Plan is intended to meet the needs of all age groups and user types by enhancing choices and opportunities for multi-modal travel and recreational pursuits that promote physical activity and healthy lifestyles. Throughout its implementation, the Cycling Plan will enhance facilities for current cyclists as well as create a network that is responsive and attractive to new users. The intent is to increase ridership and develop cycling as a viable travel alternative for residents and visitors.

1.2 Active Transportation Defined

The Cycling Plan is about multi-modal based Active Transportation (AT). AT is normally defined as any form of self-propelled (non-motorized) transportation that relies on the use of human energy such as walking, skiing, cycling, inline skating and jogging. These travel modes can utilize on-road and off-road facilities (sidewalks, bike lanes, multi-use trails) and may also be combined with public transit, especially for trips to and from work, shopping and entertainment areas, schools and other community facilities like recreation centers.

Active Transportation is generally defined by four categories. They are:

- *Active Commuting* which involves journeys to and from work.

- *Active Workplace Travel* which includes trips during working hours such as the delivery of materials or attending meetings.
- *Active Destination Oriented Trips* which includes trips to and from school, shops, visiting friends and running errands.
- *Active Recreation* which involves the use of an AT mode for fitness or recreational pursuits, such as hiking or cycling.

In addition to the four categories, any portion of any trip that involves non-motorized transportation modes is considered a form of Active Transportation. In this context, AT involves maximizing the use of active travel modes and methods and reducing the dependence on motorized modes that include private automobiles and motorcycles. In some cases, a liberal interpretation of these definitions may be appropriate when examining the travel needs of certain groups such as the university population. As an example, a student at Memorial University who attends classes and also has a part-time job on-campus that involves regular trips to downtown St. John's is engaged in a combination of active commuting, active workplace travel and active destination oriented trips.

The focus within the broader AT theme for St. John's was on creating a cycling based plan that worked in conjunction with existing pedestrian facilities and transit. St. John's has the advantage of being a relatively compact city within the immediate urban area that enjoys a centralized downtown with many shops, attractions and employment locations. This has created an environment conducive to AT travel between more heavily urbanized locations and when combined with the existing off-road trail network, an opportunity for the Cycling Plan to provide a comprehensive alternative travel mode for the City.

1.3 Existing and Planned Routes

St. John's currently has no on-road bicycle lanes or designated off-road bicycle facilities in use. Through the municipal park system, the Trailway Council and the Grand Concourse organization there are however, numerous off-road walking trails that provide often uninterrupted access to much of the City. These trails provide travel routes mostly in a generalized southwest-northeast direction linking many City parks and lakes such as Mundy Pond, Quidi Vidi Lake, Long Pond, Kents Pond, Kennys Pond and Virginia Lake. Designed mainly for recreational use, the existing walking trail system focuses on providing access to leisure destinations but was an excellent starting point for the Cycling Plan to build upon.

The following map illustrates existing and planned AT routes throughout the City that were either currently constructed or at a reasonable level of planning at the time of writing. This information was gathered from a

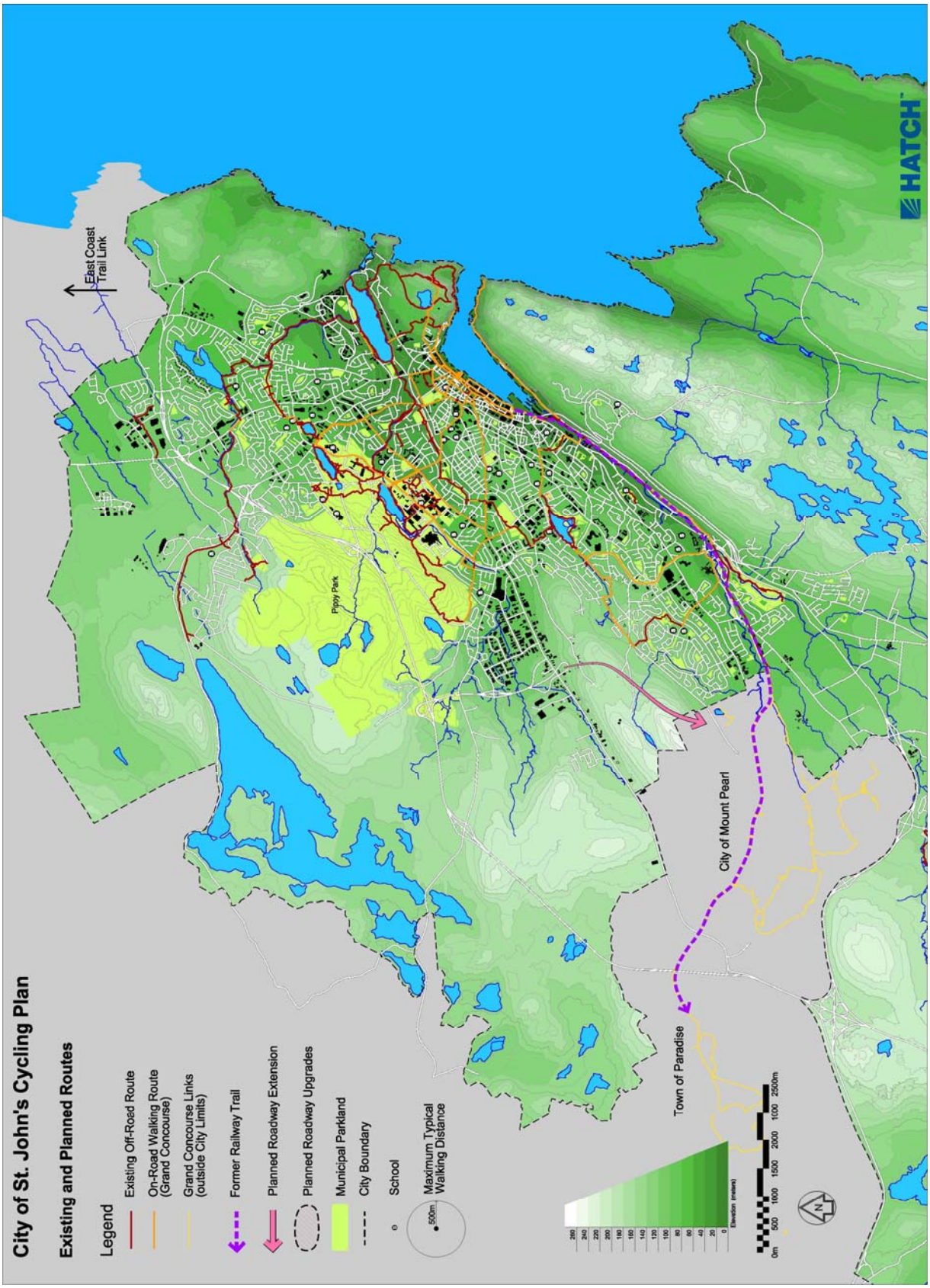
number of sources including background field data, trails mapping, air photos and discussions with staff and area stakeholders. It is important to note that while presently no on-road bicycle facilities exist in St. John's, the map shows on-road walking routes as provided and promoted by the Grand Concourse Authority. Although these routes hold no official status they represent important thoughts on an integrated AT system and have been provided for information.

Many existing trails are located within Municipal parks and/or provide direct access to them. The centerpiece of the City's parkland is the 3400 acre Pippy Park Land Reserve located in the heart of St. John's. This unique reserve is managed by the Provincial Crown Corporation Pippy Park Commission which is made up of representatives of the provincial government, Memorial University, the City of St. John's, landowners and residents of the park, and the Pippy Family. Pippy Park contains numerous off-road walking trails and is home to events such as the Pippy Park Summerfest and SummerDance 2007. The park also hosts a number of significant facilities such as libraries, a golf course, Memorial University facilities, the Institute for Oceans Technology, the Art Gallery of Newfoundland and Labrador, the Aquarena and the Confederation Building.

The mapped information in Exhibit 1.1 includes existing off-road trails that are formally recognized by the City as trail routes. It does not however, include any unofficial bicycle routes or off-road riding locations that may be used by residents and visitors. While locations for unofficial cycling routes of a touring, utilitarian, general recreational or "extreme" hill riding nature are noted in the Plan at a later point, issues with land ownership and the legality of the uses made it inappropriate to include these routes at the outset of the process. The map also indicates elements of planned roadway transportation infrastructure expansions that could be developed in tandem with on or off-road cycling facilities.

In order to illustrate pedestrian needs and the importance of integrating these into the Cycling Plan, all Master Plan mapping contains a visual representation of a typical maximum walking distance of an average person. This distance can be applied to the location of cycling facilities, separation of routes and destinations, distance to transit stops, etc. The distance chosen was based on the average person walking 50 metres per minute for 10 minutes (or a 20 minute round trip) which translates into a 500 metre distance. Taking into consideration an overall aging population and different user characteristics, a 500 metre "tipping point" (preferred maximum distance from the cycling network) is considered a reasonable distance for St. John's benchmark.

Exhibit 1.1
Existing and Planned Routes



Hatch Mott MacDonald

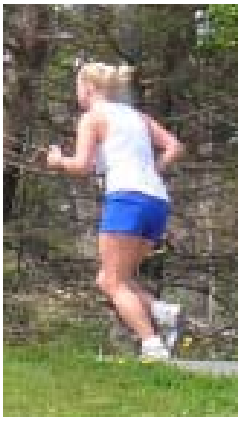
1.4 Benefits to St. John's

Governmental bodies across the country and national governments world wide are experiencing a significant modification in how they look at climate change in the light of continued scientific pressure and shifts in public opinion. Healthy lifestyle promotion, especially in relation to rates of childhood obesity and an overall aging population has also been acknowledged in public policy as priorities at the municipal, provincial and national levels. While the public policy debate about workable solutions to global issues like greenhouse gas emission targets and reducing obesity in children is ongoing, the professional and academic evidence on the benefits of a Cycling Plan for urban areas such as St. John's is significant.

Benefits of the Cycling Plan are grouped into the three basic themes: physical fitness, environmental health and economic opportunities.

Physical Fitness

According to the Newfoundland and Labrador Department of Health and Community Services 2006-2008 Strategic Plan, the province has among the highest rates of heart disease, cancer, diabetes and stroke in Canada. The Plan goes on to outline major health issues facing the province and the need for comprehensive efforts by governments to address many of these through promoting lifestyle changes such as encouraging active living.



The Cycling Plan will enhance fitness and provide options for residents and visitors to enjoy physical activity, outdoor recreation and to gain physical fitness through more practical use of the network for commuting and daily errands. Use of the network's recreational routes can also improve mental outlook and social relationships and provide a mechanism for building ties within neighbourhoods and larger communities. According to medical research, a more active population can also reduce risk rates for certain diseases such as coronary heart disease which in turn, then reduces the costs of medical care, workplace absenteeism and institutional care requirements especially for an aging population[1].

The fitness and overall health benefits of increased participation in cycling and active transportation generally, are many. Examples of direct benefits may include things such as:

- A reduction in disease rates. Research shows that 36% of heart disease, 27% of osteoporosis, 20% of stroke, hypertension, Type 2 diabetes and colon cancer, and 11% of breast cancer are attributed to physical inactivity[2].

[1] The Cost of Physical Inactivity in Halifax Regional Municipality, GPI Atlantic, 2004.
[2] Ibid

- A reduction in cognitive decline among the elderly. In a 2001 study published in the Internal Medicine Journal, a total of 5,925 women over 65 and experiencing cognitive decline were examined for factors which would slow or reverse the process. Among other findings, the study found that for every 10 blocks walked per day (approximately 1 mile), the women had a 13% lower rate of cognitive decline.

- According to the 2004 Canadian Community Health Survey (CCHS), obesity rates for youth (aged 12-17) and adults have risen from three to nine percent and from 14% to 23% respectively from 1978/79 to 2004. These rates are now acknowledged as a major public health issue[3].

- According to the Public Health Agency of Canada, age population studies in the U.S. and Canada have shown that general well-being is somewhat greater and depression much less frequent in people who exercise regularly as opposed to those who get little or no exercise.

Environmental Health

The Cycling Plan focuses on providing options for personal movement by non-polluting, energy efficient travel modes as opposed to motorized transportation such as an automobile. Personal automobile ownership and use has been climbing steadily for decades and the promotion of AT offers a significant tool to combat the resulting air, water, noise, and visual pollution associated with motorized transportation. As an example, according to the Harvard University School of Public Health, air pollution contributes to the deaths of 60,000 people nationally in the United States and if five million Canadians walked or cycled instead of using their automobiles for short trips (3 kilometres per week), emissions would be reduced by 30 metric tones in only six months[4]. Other environmental factors and benefits include:

- *Reducing Greenhouse Gas Emissions* - According to Transport Canada, road transportation accounts for 70% of transportation related greenhouse gas emissions with 45% originating from light cars and trucks. Short distance motor vehicle trips are the least fuel-efficient and generate the most pollution per kilometre. These are also the most likely to be replaced with cycling trips.

- *More Efficient Land Uses and Less Sprawl* - According to the Institute of Transportation Engineers, automobile dependant urban development patterns are very land intensive and typically require three times as much space as pedestrian oriented communities.

[3] Canadian Community Health Survey. Health Canada and Statistics Canada, 2004.
[4] Go For Green, 1994.

- *Reduced Demand For Hydrocarbon Fuels* - If half of the workers in Canada who lived within walking distance of their workplaces left their cars at home, 22 million litres of fuel would be saved per year[5].

- *Providing A Viable Alternative To The Car For Urban Travel* - In addition to recreation, AT is also efficient, affordable and accessible. In urban core areas, cycling is often the fastest travel mode for shorter distances up to 10 kilometres[6].

Economic Opportunities

The provision of active living facilities such as cycling routes is a growing concern for developers, municipalities and businesses wishing to attract or locate skilled workers and residents to new areas and communities. The organization 'American Trails' works on behalf of trail development across the United States and in a 2002 survey, co-sponsored by the National Association of Home Builders and the National Association of Realtors, found that trail and AT facilities ranked second from a list of 18 most important community amenities. Of those surveyed, 36% picked walking or biking trails as important or very important to their choice of where to buy a home with facilities such as golf courses and baseball fields ranking much lower in fifteenth and thirteenth place respectively.

In addition to encouraging growth and economic development in a general sense, cycling facilities and AT initiatives provide many direct economic benefits to municipalities. Examples include:

- *Lower Costs* - Cycling facilities are far less expensive to build and maintain than conventional roadway systems; require much less land and are an attractive, cost effective component of a multi-modal system. Greater motor traffic volumes often necessitate continuous roadway expansions and according to a 1996 report in Victoria, B.C., widening a two lane urban arterial to four lanes can cost in the range of $1.3 million per kilometre.

- *More Local Jobs* - According to the New Brunswick Trails Council, trails in New Brunswick employ around 1500 people for an average of six months of the year.

- *Tourism Anchor Project* - The San Antonio Riverwalk in San Antonio Texas is considered to be the anchor of the local tourism industry and contributes an estimated $1.2 billion annually to the local economy.

- *Positive Local Economic Impacts* - The combined economic impact from the construction and operation of the *Welland Canal Parkway and Trails*

[5] Ibid
[6] Ibid

System (Regional Municipality of Niagara) will grow from approximately $40 million in Year 1, to $65 million by Year 5, approximately $120 million by Year 10 and reach over $200 million by Year 15[7].

- *Increased Value Of Real Estate* - The results of surveying real estate agents that sell properties in the Bruce Trail (Ontario) area revealed that 80.5% felt that this major trail will either make a home easier to sell or that the presence of the trail would have no negative impact[8].

Another benefit to St. John's is the City's image and identity as a leader in Active Transportation and environmental initiatives. In November 2006, the Halifax Regional Municipality approved in principal $100 million to implement HRM's AT Plan over a 20-year period and the City of Fredericton approved a Trails/Bikeways Master Plan in the fall of 2007. St. John's would become the third capital city in the region to complete a similar AT initiative.

1.5 Vision, Goal and Objectives

All actions under the Cycling Master Plan have been guided by a vision (preferred future) with the necessary supporting programming. The goal and supporting objectives adhere to the vision. Based on work completed-to-date, the vision for the Cycling Master Plan is:

A sustainable and connected cycling network of on-road and off-road facilities that are accessible to all, attractive to residents and visitors alike, and support cleaner and healthier multi-modal transportation choices.

Framed by the vision, the goal of the Master Plan is:

To develop and promote a comprehensive network consisting of off-road facilities wherever possible and complemented by on-road cycling links and multi-modal transportation options where needed and desired.

The above goal is supported by the following objectives:

1. To develop a city-wide cycling network consistent with the overall vision of the project, the City of St. John's Municipal Plan, other local strategic plans and Provincial legislation.

2. To recognize and capitalize on the unique geographical conditions of St. John's wherever possible.

[7] IMC Consulting, 1996.
[8] Schutt, 1997.

3. To create conditions for network users that promotes safety of use and accessibility for all ages, skill levels and mobility types.

4. To develop and regularly update a long term implementation plan for the overall network that is consistent with the City's financial priorities and resources.

5. To continuously review and recommend improvements to both content and delivery of efforts and materials promoting cycling in the City. This objective should include educating road users including pedestrians, cyclists, inline skaters and motorists on intersection policies, right-of-way policies, signing plans, parking and end-of-trip facilities and promotion.

2 Framing the Master Plan

2.1 Introduction

The Cycling Master Plan contains on-road and off-road facilities with supporting programming. Although many cities that pursue cycling development plans choose to craft new municipal policies in their land use designations, development controls and regulations, the City of St. John's presently has a number of strategic goals as well as some specific requirements for cycling and other AT infrastructure outlined in the St. John's Municipal Plan. Perhaps the most significant point in the Municipal Plan is that bicycles have been recognized as street vehicles and a part of the larger transportation system. This provides cyclists with status and gives more legal weight to efforts to develop the Cycling Master Plan.

This section reviews the City of St. John's Municipal Plan (2003) and existing conditions (2007 and projected) as building blocks for the Master Plan. Excerpts of Province of Newfoundland and Labrador legislation related to the development and future use of the Plan are included in Appendix A.

2.2 St. John's Municipal Plan

The City of St. John's Municipal Plan (2003) contains strategies and policies that establish a pattern of intended growth for the City in physical terms as well as healthy lifestyle promotion, environmental protection and the continued functioning of municipal infrastructure and transportation systems. It also recognizes important heritage areas of St. John's and offers insights into how they can be protected and enhanced.

The remainder of this section is a summary of excerpts from the Municipal Plan that support the planning process of the Cycling Plan initiative and the future development of the network. Plan sections reference various official policy statements as well as providing more area specific guidelines for certain geographic areas of the City. The Municipal Plan's overall intent is shown on the Municipal Future Land Use Map while the Zoning Map indicates existing land use designations.

It is also important to note other key policy documents such as the City of St. John's Downtown Strategy for Economic Development and Heritage Preservation which addresses the unique built form of the traditional downtown area. This document establishes a vision for enhancing the historic urban area of the City through economic and physical planning and offers a series of recommendations for strategic investments, urban planning and physical development. The integration of applicable goals and key recommendations of the Cycling Plan and the Downtown Strategy has the

potential to create synergistic relationships during the implementation phase of the project.

2.2.1 Section III, City-wide Objectives and Policies

This portion of the Municipal Plan contains the following cycling related statements.

1. Urban Form

"The broadest objective of land use policies is to facilitate an efficient pattern of development. Generally, this means building a compact city. A compact city makes better use of its infrastructure and needs less roadways. With shorter distances to travel to work and shopping, car trips are reduced and transit use is facilitated. Often too, parks, schools, and facilities can be used more intensively, meaning the same investment will serve more people. A compact city, furthermore, reflects the traditional character of much of St. John's, exemplified by such areas as the Downtown, Georgetown, and Churchill Park."

1.2.7 Reduce Automobile Trips

The City shall provide a greater concentration of interrelated land use functions by:
1. integrating all basic residential services (shopping, school, recreation, and work) on a neighbourhood basis; and
2. encouraging alternatives to the car such as walking, cycling, or use of transit.

1.2.8 Public Transit Service

The City shall assist in increasing the use and viability of public transit by working with the St. John's Transportation Commission, which operates Metrobus.

1.2.9 Walking

To encourage walking for transportation and recreation the City shall provide sidewalks, pedestrian lanes, and walking trails where determined to be appropriate within neighbourhoods to connect neighbourhoods as part of the Grand Concourse, the East Coast Trail Route, and similar planned walkway and trail networks.

1.2.10 Bicycling

Bicycles shall generally be used on city streets as part of street traffic.

1.3.1 All Land Use Districts

Permitted Uses
The City may permit the following uses to support residents and businesses in any District:
1. public works and services;
2. utilities;

3. open space uses, including parks, walkways and trails, and cemeteries

6.2.3 Pedestrian Trails and Paths

To encourage walking for transportation and recreation, the City shall review the need and desirability of sidewalks, paths, and lanes within neighbourhoods, and walking trails to connect neighbourhoods in accordance with the plans of the Grand Concourse Authority, the East Coast Trail Association, and similar organizations involved in walkway and trails planning.

Within and between neighbourhoods, where deemed appropriate, sidewalks, paths and lanes shall provide access to and from bus stops, schools, churches, shopping areas, and places of employment. They should provide direct connection where possible, to minimize walking distances. Bicycles shall generally be used on city streets as part of street traffic.

6.2.5 Cooperation to Provide Parks and Recreation Services

The City shall:
5. Encourage the use of land use buffers and Environmentally Valuable Areas to meet passive recreation needs, particularly for pedestrian paths and trailways, provided such use does not compromise the primary purpose of these designations to protect land uses and/or the environment.

2.2.2 Section IV, Planning Area Development Plans

This portion of the Municipal Plan establishes area specific policies for various identified development plans as they relate to active transportation and the development of the cycling network.

3.2.2 Quidi Vidi Village

The general policy is to protect the basic character of historic Quidi Vidi Village and surrounding scenic and historic sites without jeopardizing reasonable opportunities for development. To this end, the developed part of the Historic Village around the Gut shall be developed so as to retain uses and densities of uses that presently characterize the area.

3. Lands at the eastern extremity of Quidi Vidi Lake are retained as public open space to protect an historical site and an important part of the Quidi Vidi - Rennie's River trail and park system.

5. Open Space Areas are set out to achieve:

Preservation of Open Space
The preservation of the scenic setting of the Village by reserving all surrounding hills as Open Space, particularly the coastal hills and the foreshore of all nearby ponds and lakes, the linkage between Quidi Vidi Lake and Signal Hill National Historic Park, and the East Coast Trail between Robin Hood Bay and the Village;

Preservation and Development of Historic Sites

The preservation and development of historic sites and providing them with a suitable setting by retaining the surrounding natural landscape and linking them where possible by landscaped corridors, so that "historic trails" can be developed.

3.2.3 East Coast Trail

The City shall work with the East Coast Trail Association to preserve, protect, and buffer portions of the East Coast Trail passing through Planning Area 2.

4.2.7 Mundy Pond Park

Develop Mundy Pond as a District Park that becomes a true focal point of the area (attractive, well landscaped, well endowed with facilities, and well used); and provides opportunities for fishing, hiking, cycling, skiing, skating and softball.

5.2.6 Access and Circulation

Access points for development of lands in the South West Expansion Area will be set by the City along Kenmount Road and Thorburn Road. These access points will require bridges to cross Ken Brook. Temporary access points along Kenmount Road may be considered subject to approval by the City for the purposes of accommodating initial development in the area. These temporary access points would eventually be required to be removed and the access points remediated subject to requirements of the City.

The road network prepared by the City as part of this Development Plan is designed to limit stream crossings, to provide acceptable access to commercial sites and to limit the amount of non-resident through traffic in the residential areas, while linking internal residential neighbourhoods. The right-of-way widths for collector roads in the South West Expansion Area have been increased to allow for greater setbacks for snowclearing operations and appropriate pedestrian movement.

5.2.7 Recreational Uses

A site has been set aside for a neighbourhood park in a centrally-located area within the South West Expansion Area. Trails System

Where appropriate and feasible, walking trails will be constructed to link individual areas within the South West Expansion Area to each other and to other trail systems outside the area.

6.2.1 Planned Unit Development

Development in Planning Area 13 shall comply with the following requirements:

4. The PUD Plan shall, where appropriate, recognize and accommodate developed and planned portions of the East Coast Trail not only preserving routes and corridors but ensuring visual buffering from urban and industrial uses.

6.2.2 East Coast Trail

The City shall work with the East Coast Trail Association to preserve, protect, and buffer portions of the East Coast Trail passing through Planning Area 13.

7.2.5 Public Walkways and Trails

The City shall preserve and, as appropriate, extend the network of walkways and trails in Planning Area 16.

East Coast Trail
The City shall work with the East Coast Trails Association to preserve, protect, and buffer the portions of the East Coast Trail through Planning Area 16.

Public Trail System
Within the framework of policies provided by Part III, Section 6 of the Municipal Plan, consideration may be given to setting out a public trail system for the Goulds Planning Area that will make use of the natural corridors along the major watercourses and make provision for linkages with the ponds of the community, as well as the hills forming part of the coastal area. These trails shall be developed to appropriate standards and linked wherever possible into the larger regional network of trails between Freshwater Bay and Cape Spear.

8.2 Policies

Policies for Planning Area 17 identify areas for specific land uses. In this framework policies seek to preserve the character of the established community, and provide trails and similar amenities for the benefit of residents and tourists.

8.2.5 Trails Development and Natural Open Spaces

The City shall preserve and, as appropriate, extend the network of walkways and trails in Planning Area 17.

East Coast Trail
The City shall work with the East Coast Trails Association to preserve, protect, and buffer the portions of the East Coast Trail through Planning Area 17.

Public Trail System
Recreation trails and scenic lookouts may be developed in coastal areas for use by residents and visitors. These trails shall be developed to appropriate standards and linked wherever possible into the larger regional network of trails between Freshwater Bay and Cape Spear.

2.2.3 Greenhouse Gas Emissions Reduction Strategy

City of St. John's Local Action Plan 2006-2010

This initiative of the City of St. John's Engineering Department provides a climate change action plan for the Municipality. An excerpt from the Executive Summary appears below along with recommendations for new initiatives.

The City of St. John's has committed to reducing GHG emissions by 20% within the corporate structure of the municipality, and by 6% for the community, including commercial businesses and institutions. This climate change action plan presents the 1994 baseline of the City's corporate and community emissions, a forecast of emissions in 2010 using the business as usual (BAU) model, statement of reduction targets and three action plans, for the City's corporate structure, for the community, and for waste management. The action plans contain action items which generally can be implemented quickly, and which were designed to help reduce GHG emissions immediately. Reducing GHG emissions is not only good for our environment, it also helps our health, and makes our City a better place to live.

The action plan includes new initiatives such as:

Community Action Plan

Active Transportation - Conceptual. Increase awareness and modes of active transport during, Spring, Summer and Fall.

Corporate Action Plan

Pedestrian and Bicycle Initiatives - Conceptual. The Traffic department will continue to research the feasibility of bicycle lanes on major roads, and near Memorial University.

2.3 Existing Conditions

Movement Systems and Land Use Patterns

The City of St. John's is the oldest English founded city in North America and has a unique community form which evolved in response to local geography, economic needs and a long history of pre-automobile transportation. The Cycling Plan acknowledges this unique form and attempts to build upon the already existing off-road trail system to provide for essential new on and off-road linkages that work in tandem with the transit system. Through an approach that recognizes the present and expected future form of the City, the Master Plan will be an integral part of daily movement by residents and visitors.

The Plan is framed by the City's geography, historic settlement patterns, legacy transportation systems and expected future conditions as expressed in the Municipal Plan.

Today, the City's movement systems and land use patterns range from narrow urban streets on often steep slopes to modern highways and post World War II styled suburban-type community design. Current land use patterns are a reflection of:

1. A strong relationship with the harbour and ocean going shipping.

2. Relatively rigid geographical constraints.

3. Senior government transportation and infrastructure decisions.

4. Multiple major historic fires.

5. Past and current municipal planning decisions.

6. Market demand.

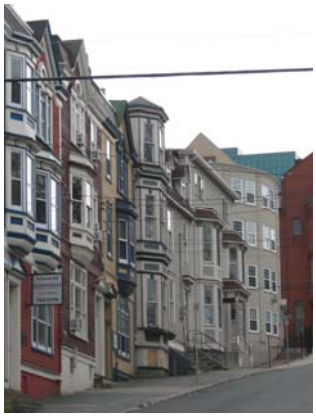
Older (Pre 20th Century) Areas

The history of human habitation in Newfoundland stretches back thousands of years and includes Dorset and Beothuck Native sites, early Norse settlement and later European settlements from differing nations. Although the earliest settlements on the site of the current City of St. John's are disputed, early expeditions by English, French Portuguese and Spanish ships all may have visited the harbour. A "St. Jehan" is shown on Nicholas Desliens world map of 1541 and San Joham in João Freire's Atlas of 1546. It was during this time that Water Street was first developed, making it the oldest street in North America. The first permanent European settlers arrived in the St. John's area in 1605. Older areas of the current City developed

from the harbour and inland as necessary and throughout its long history, sea traffic shaped much of the focus of the City's design.

The eighteenth century saw major changes in the City with new population growth, the beginnings of larger Provincial government, the establishment of new churches, reinforcement of commercial ties with North America and the continued development of the offshore fisheries. St. John's grew slowly and although it was still primarily a fishing community, it was also a garrison, a centre of government and, increasingly, a commercial hub.

The core of the City has been destroyed by fire multiple times most notably in 1892 when a fire which began at a farm spread to the downtown Water Street commercial core and then to much of the City. In the years following the fire, the most prominent architect of the era in St. John's was John Thomas Southcott. He designed numerous Second Empire-styled buildings that had distinctive mansard roofs with bonnet-topped dormers protruding from the concave-curved roof surface. His name became so associated with new construction that the "Southcroft Style" of architecture is still significant in the City.



The basic form of the historic core or downtown of St. John's developed largely without the assistance of professional engineers or planners and today offers a sometimes eccentric and irregular design pattern with narrow streets, comparably higher densities than surrounding areas and an urban design that appears unconcerned with many of the dictates of current urban and transportation planning principles. The result is a very unique planning environment that is enjoyed by residents and visitors alike.

Post War Developments

As with many North American cities, during the post World War II boom in residential development, St. John's experienced more rapid suburban-style growth built on the promise of safer, cleaner communities with larger building lots and fueled by increased private auto ownership. The resulting changes to commuter patterns and community design have produced a modern urban and suburban form of development that is based around the automobile as an essential element of daily life. Newer development of this nature is typified by a curvilinear street patterns, generous numbers of cul-de-sacs, separation of residential and commercial development, a hierarchical street system and a far less permeable community form for either pedestrians or vehicular traffic.

The contrast between the old and the new post-war development in St. John's however was far greater than in most cities. Most planning regulations at the time paid little attention to existing local conditions and principles were adopted in an attempt to expedite traffic flow and increase economic development. The goals of these efforts were intended to solve many of the

problems or issues associated with adapting a more mechanized economy to a pre-automobile City and while well intentioned, often resulted in a stark difference in urban form and a loss of certain desirable qualities of the older areas to achieve certain qualities in the new developments.

Areas of St. John's with this development pattern include neighbourhoods to the north and west of the Downtown Core and most development ringing the older core of the City. It is worth noting that sections of the City have also experienced lot-by-lot linear development along rural highways such as during the same time period with the emphasis in private automobiles as the dominant mode of transportation. Implementing an AT network in these areas can be particularly challenging because walking and wheeling infrastructure is not common and the distances between residences and local destinations can be significant.

It is essential that future planned development areas in St. John's include bicycle planning from the beginning of the planning and regulatory approval process, and that new growth areas are identified in the Cycling Plan. In order to avoid a future that requires retrofitting automobile-centric community design with AT facilities, the City must take a proactive approach to the issue and encourage the construction of appropriate infrastructure as it would require the development of any effective transportation system.

Pippy Park

Pippy Park is key feature of the urban form of St. John's. At 3400 acres, it is a very large park by usual municipal standards (approximately 18 times the size of Halifax's Point Pleasant Park) and offers many more features than those found in a standard park environment. According to the park website, Pippy Park incorporates the main campus of Memorial University of Newfoundland and the Memorial University of Newfoundland Botanical Garden at Oxen Pond, as well as the Ridge Road campus of the Marine Institute of Memorial University of Newfoundland and the Ridge Road and Prince Phillip Drive campuses of the College of the North Atlantic. The park also includes the Confederation Building complex, which houses the Newfoundland and Labrador House of Assembly and numerous offices of the Provincial Government.

The park is a popular camping, hiking and recreational park within the city, and incorporates numerous groomed and wilderness-style hiking/skiing trails as well as a golf course and camping facilities and is operates trail links in conjunction with those of the Grand Concourse Authority. Pippy Park is a dominant recreational feature of St. John's and a major destination for AT users in the city. It is also important to note that because the Park contains the main campus for Memorial University's nearly 18,000 students, the

southern portions of the Park is both a home and destination for a demographic which often contains high percentages of cyclists and AT users.

2.4 Gradient Challenges

The challenges of implementing a successful Cycling Plan in a City such as St. John's are significant. This is mainly due to a combination of the major downtown district being located on a relatively small portion of land with undulating topography and significant issues with the gradients of streets. Issues with grades are found in nearly all areas of the City but with the downtown being such an important destination for residents and visitors it is most pronounced in this area.

There are two major considerations when designing grades: the effort to ascend or climb, and conditions required for safe descent. Guidelines for gradients differ between on-road systems and off-road systems. With respect to on-road systems, it is widely accepted that pedestrians can stop almost immediately while traveling on foot, regardless of the type of grade on which they are traveling but the stopping distance for cyclists is not nearly as immediate.

For cyclists without a gear-shifting system, it may be almost impossible to climb a 50m long 10% grade while bicycles equipped with simple gear shifting systems allow almost every cyclist to climb a 50m 15% grade. However, grades greater than 5% would normally be avoided and it is desirable for grades to be less than 3%, especially long uphill grades. Where possible, on long steep grades, it is desirable to introduce relatively flat rest area approximately every 100 meters of horizontal distance. Where one-way bicycle operation is proposed and cyclists will be traveling in the downhill direction, steeper and/or longer grades are not as much of a concern. It should be recognized however, that speeds and stopping distances increase when traveling downhill and that the available sight distances must be checked accordingly.

Most cyclists, especially utilitarian cyclists, prefer to ride on relatively flat routes to avoid climbing hills. When hills must be climbed, cyclists tend to require a wider operating area to accommodate the increased side-to-side movement or "wobble" that often occurs when exerting the additional effort necessary to power up a hill. With respect to on-road cycling routes, many recreational cyclists often prefer moderate variations in topography (rolling hills) when cycling.

The conditions in St. John's are generally such that some of these standard grade considerations are not practical to apply to the network in certain areas although efforts should be made wherever possible to avoid excessive grades and to provide flat rest areas for cyclists at regular intervals. On steep road segments where motor vehicle volumes or the percent of commercial traffic

exceed a desirable threshold for a cycling facility type, consideration may also be given to reducing the posted speed limit or selecting an alternative route for cyclists if possible and practically available. Other methods which may assist with accommodating bicycle travel over steep grades may include widening of paved shoulders or designated bike lanes by 0.5 meters if possible or providing for single direction cycling routes when necessary.

Bicycle Lift Option

One of the major objectives for the Cycling Plan is to create a network that is accommodating for all users and to therefore encourage greater use of cycling as a viable means of transportation in the City. Topographical gradients found in St. John's offer one of the most significant barriers to achieving this goal and especially to encouraging the uptake of new users.

In most North American and European cities the issue of grade for bicycle use is less significant and can be overcome through simply choosing alternative or less direct network routings to destinations. It is also worth nothing that in many well known cycling countries such as Holland, topographical challenges are virtually nonexistent by comparison and targeting similar user rates for the St. John's network may require "out of the box" thinking. If rerouting portions of the network is not viable the alternative is generally to attempt to engineer a solution through the development of bridge structures or underpasses which can usually overcome localized barriers although representing often substantial cost outlays. As the cycling network is developed, these options must be considered but it may also be worth examining the use of a Norwegian solution to the issue currently in use in the City of Trondheim.

As illustrated in Exhibit 2.1, Trondheim has developed a Bicycle Lift system which allows individual cyclists to operate a foot lever which then assists users with the climb up excessively steep portions of their network.

Exhibit 2.1 - Trondheim Bicycle Lift

Since the installation of the Bicycle Lift, cycling in this particular area of Trondheim has increased by 150% and more personal trips are now being made by bike than by public transport. According to an evaluation report by Jarle Wanvik, "..Trondheim has a general increase in cycling which rates the highest in Norway. We can hardly credit the lift alone (the prototype is not more than 130 m long) for this positive effect, but there is no doubt that the lift has raised the general image, attention and motivation of cycling in Trondheim. The promotion effect is perhaps the most important contribution from the Bicycle Lift."

A Bicycle Lift option may initially seem like an unorthodox solution to the issue of network gradients in St. John's but it is a worthwhile consideration that may be applicable to a single key portion of the network and could significantly raise the profile of the efforts by the City to institute the Cycling Plan. Although the installation of a bicycle lift system is not a direct recommendation of the master Plan it is recommended that the City continue to explore alternative thinking options such as the City of Trondheim has pursued, in order to accommodate cyclists in what is a unique and challenging urban environment.

2.5 Summary

The desire to develop a functioning and attractive Cycling Plan is evident in the City of St. John's Municipal Plan and supported by various Provincial Acts. The City has the opportunity to significantly add to the character and attractiveness of St. John's and to capitalize on fitness and healthy environmental lifestyle movements which will add to the quality of life for its residents and the vibrancy of visitor and tourism experiences in the City.

St. John's also faces challenges in the implementation and full development of a successful Cycling Plan and strategic decisions as to how best to address key concerns must be made. Existing conditions of geography and urban form have made St. John's a unique and a nationally recognized destination and if completed in a sensitive and practical manner the Cycling Plan will become a successful and well used feature that will greatly add to the vibrancy of life in the City.

3 Developing the Network

3.1 Introduction

This section outlines the process that has been followed to arrive at the recommended on and off-road cycling network and final end network plan. The process initially involved a literature review and a straightforward inventory development and assessment of conditions for both existing and planned cycling and AT routes generally. The results of this inventory produced the Candidate Routes map that was considered by the project team, Advisory Committee and local Stakeholders.

The candidate network was refined and then "ground proofed" by the project team to gain first hand knowledge of the road and trail conditions and to evaluate potential cycling links for practical application. Once completed, the candidate routes were reassessed and refined to produce a Draft Network Map. This was posted on the City website for public review and comments and together with additional technical assessments, Committee review and staff input, the draft Cycling Network and Facility Types maps were produced for approval by the City.

The development of the initial Candidate Routes map consisted of a network approach and evaluation criteria system that was reapplied throughout the project in order to address new routing options as they became evident.

3.2 Network Approach

A six step approach was used to prepare the Cycling Plan. The steps included:

1) *Developing A Route Selection Process:* which includes a set of principles that derive qualitative and quantitative criteria to assist in selecting a preferred route and facility type.

2) *Completing an Inventory and Assessment of Existing Conditions:* which compiles and digitally maps all existing or previously planned trails and on-road and off-road cycling facilities to establish a base condition. This included a mapped inventory of user destinations and barriers to AT travel within St. John's.

3) *Identifying and Assessing Candidate Routes:* which involves selecting and investigating potential AT routes and evaluating each to determine its feasibility of inclusion as part of the recommended network.

4) *Suggest Route Networks:* which involves mapping out each network and system for review.

5) *Determining Facility Types for Selected Routes*: which involves choosing an appropriate facility type for each route or system and illustrating this on a map.

6) Selecting the Network Plan.
Once work is complete on route selection and facility type determination, these system segments are re-amalgamated to form the recommended cycling network plan.

Steps 1-5 are nearly complete. The approval of the draft Cycling Network and Facility Types maps will allow the process to move into Step 6 and the final implementation strategy for the Master Plan.

3.3 Route Selection and Evaluation Criteria

The route selection process was based on a set of principles from which the location of appropriate routes and the preferred facility type were selected. The following is the list of principles that was used to evaluate the existing network and recommend new or upgraded routes:

Attractive: Routes should take advantage of attractive and scenic areas, views and vistas.

Diverse: The network should provide a diverse range of route options and experiences for users.

Visible: The network should be a visible component of the transportation system.

Connected: All routes should be connected to form an overall AT network that fully services existing and future developments. The network should connect key destinations throughout St. John's and the surrounding region.

Accessible: Routes and facilities should be easily accessible within local districts and neighborhoods.

Safe: Care should be taken to plan a network which is an attractive and practical option for a variety of users. The network should strive to minimize risk while accommodating a range of ages, experience levels, security concerns and overall travel desires.

Accommodating: New and existing on-road and off-road rights-of-way should be designed to accommodate cycling and active transportation modes, wherever feasible.

Integrated: The network should be integrated with other modes of transportation, particularly public transit. Primary routes should provide direct access to transit nodes and other major transportation facilities.

Supported: Support services and facilities such as bicycle parking or rest areas should be available along cycling routes and at destinations. Routes should be selected that provide opportunities to develop supporting facilities.

Distributed: The density of the recommended network will be higher in more heavily urbanized areas in order to maximize access to as many destinations by as many users as possible. In downtown areas, cycling facilities should be located at a density comparable to the existing arterial and collector road network and provide efficient connections to major transit facilities. Non-route amenities such as rest should occupy key travel locations and urban entry points that will take advantage of both resident and visitor travel desires.

As illustrated in Exhibit 3.1, a point scale ranking (poor to excellent) was applied to information gathered during field assessments (ground proofing). Various evaluation factors and criteria were considered by the project team when selecting or rejecting a potential candidate route and weighed against each other. For example, "Risk Assessment" was viewed as having greater importance in selecting a route relative to "Cost".

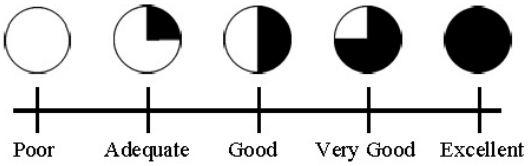
In summary, route selection was based on the experience of the HMM Team, decisions made in the field regarding the application of the route selection criteria as well as information such as observed traffic volumes, road and rights-of-way width, distance from key destinations and from the next nearest proposed route. Potential routes were screened using this approach and those routes that, in the opinion of the team, were less desirable compared to a similar route, were eliminated from further consideration.

The development of a connected, visible, core cycling system that is integrated into the larger St. John's transportation network and accessible to as many users as possible was the goal of network development. It is also recognized that budgeting and other concerns create an environment which favors the development of a well defined and effectively designed system that all parts of the City can feed into. In this context, the recommended network is the "backbone" and all other AT infrastructure (e.g. sidewalks, streets and trails) even if not officially designated in the Cycling Plan, reaches into neighborhoods and communities and still forms an integral part of the larger system.

Exhibit 3.1

Recommended Route Selection Evaluation Criteria

FACTOR	EVALUATION CRITERIA	ROUTE ASSESSMENT	
		Route A	Route B
Risk Assessment	♦ Are there numerous mid-block or railway track crossings? ♦ Is there a high volume of automobiles, trucks and transit vehicles? ♦ Is there sufficient right-of-way width to accommodate trail connections? ♦ Does the route provide a safe crossing of major barriers? ♦ Are there poor sight-lines? ♦ What is the posted speed limit of the route, if applicable? ♦ Can the route accommodate any preferred facility type?		
Connectivity/ Access	♦ Does the route provide a vital connection to existing routes and trails? ♦ Does the route provide direct access to major destinations and connect major nodes throughout the town? ♦ Does the route connect to municipal networks, supporting services and facilities?		
Convenience	♦ Does the route include adequate traffic control devices to cross intersecting roads? ♦ Are mid-block crossings possible where demand warrants? ♦ Is the route a potential part of the "Spine" network? ♦ Does the route provide a direct path to the destination(s)?		
Attractiveness	♦ Does the route provide access to Fredericton's scenic routes, vistas and destinations? ♦ Is the route highly visible? ♦ Does the route provide diversity of user experience?		
Cost	♦ Is the route the most cost-effective solution? ♦ Is there the ability to reduce costs by combining route development with existing road works?		
Route Alignment	♦ Is the road right-of-way width sufficient to accommodate cycling facilities or does it require widening? ♦ Can potential existing barriers be overcome? ♦ Is the location suitable with respect to adjoining land uses, potential environmental considerations or other land use issues?		
DECISION		 Route Recommended	 Route Not Recommended



3.4 Barriers and Destinations

Exhibit 3.2 provides a summary of major destinations and physical barriers to route development in St. John's. The Municipal Plan, parks mapping, air photos, tourism maps, topographical mapping sources, physical site visits and local team knowledge were among the major resources consulted during the development of the map. Comments from stakeholders and City Staff were invaluable in confirming and supplementing the initial findings as we moved forward.

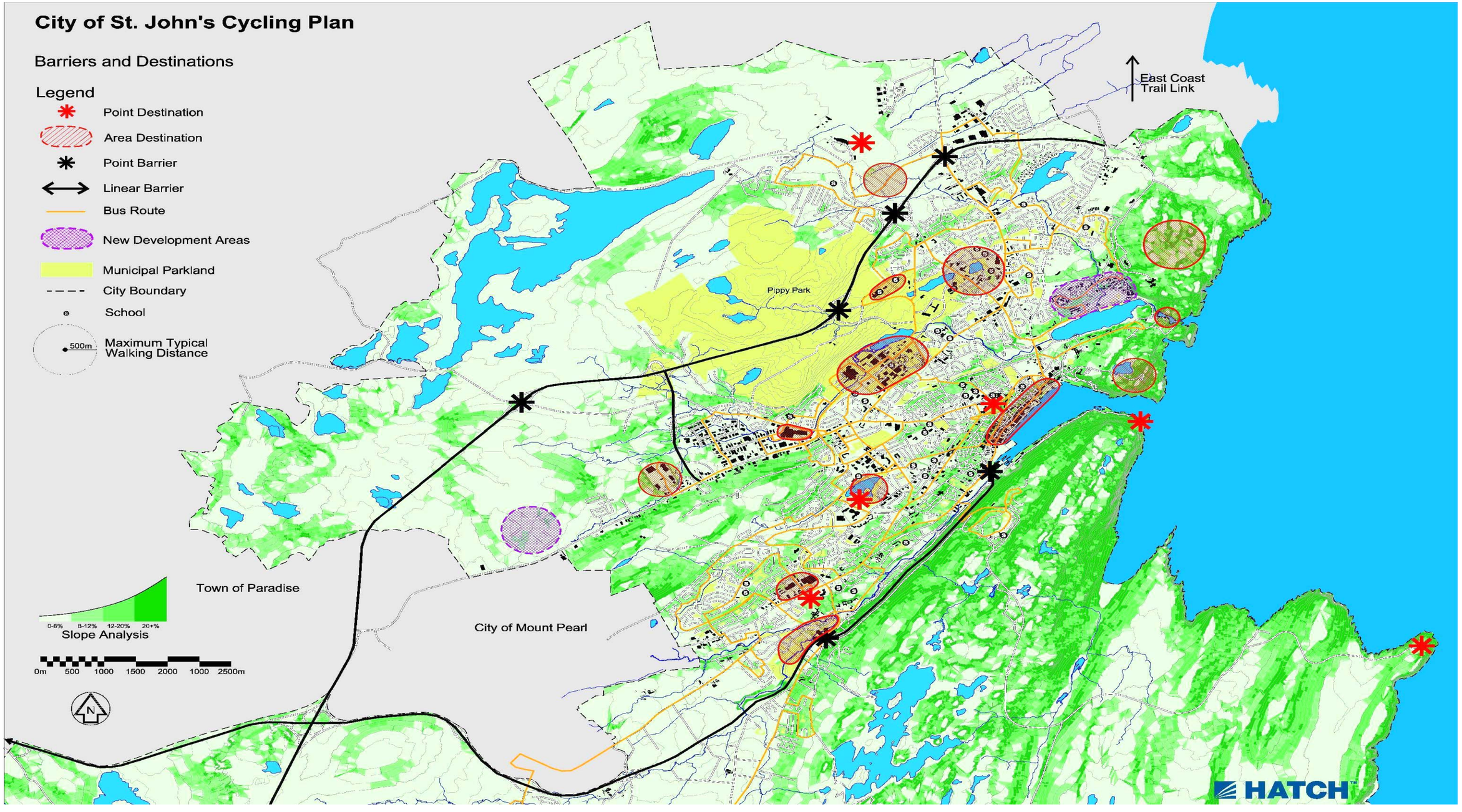
Mapped destinations took in a wide range of point specific and larger area based destinations that appeal to a variety of users. Major commercial and employment areas, the MUN campus, the downtown and historical and tourist areas were identified. Major residential and commercial/employment growth areas were also mapped to provide information on the future cycling needs of the City.

Barriers, as with destinations, are also generally defined as either physically linear or point specific in nature. Physical barriers create challenges to the creation of an effective cycling network but can often be overcome through engineered solutions or alterations to the existing transportation system. Making the system attractive and practical enough to attract and retain new users is more a function of the overall strategy. Topographical barriers within St. John's can be somewhat extreme and are less straightforward to overcome. In addition to physical barriers, it is worth noting that social barriers can also be significant obstacles to the success of the Plan. Social barriers can include such things as:

- Inadequate knowledge of safe and convenient cycling routes to schools and other destinations;
- Inadequate skills on the part of cyclists to safely share the roads with automobiles;
- Limited awareness on the part of motorists of the needs and rights of cyclists;
- Lack of support in the workplace for cyclists and users of AT generally;
- Lack of encouragement of youth to make regular trips by bicycle;
- Inadequate institutional support, such as inadequate shower facilities or insecure bicycle parking;
- Continued high degree of culturally reinforced dependency on the automobile; and
- Perception of cycling as purely a recreational activity.

Exhibit 3.2

Barriers and Destinations



3.5 Crime Prevention Through Environmental Design (CPTED)

Although St. John's is an extremely safe city with a low incident rate of violent crime, Crime Prevention through Environmental Design (CPTED) was another significant consideration in preparing the network. CPTED is based on the idea that portions of our physical environment can be manipulated to produce behavioral effects in the people that use and interact within a space. Specifically, it refers to the application of a range of design initiatives and principles to an area or site in order to reduce the incidence and fear of crime and thereby improve quality of life. This can be accomplished by reducing or eliminating aspects of the physical environment that lend themselves to supporting criminal behavior.

According to the Design Against Crime Research Centre of Central Saint Martins College of Art & Design in London England, the application of CPTED has been shown to reduce crime and the fear of crime in numerous evaluations and to even increase property values and investment in the area it has been applied to. The fear produced by the possibility of crime can be at times as much of a barrier to cycling and AT activities as any physical barriers and depending on the situation, can be more difficult to address.

This psychological barrier becomes even more pronounced within certain groups such as women, children, the physically challenged and senior citizens. While is cannot replace policing efforts, CPTED offers a unique approach that creates "built in" physical crime prevention elements that exist in and of themselves and are not dependant on the continued vigilance of active organizations, residents or police forces. CPTED can in fact, lend a sort of passive assistance to police forces for example, through avoiding the creation of "bad areas" creating facilities with higher visibility, easier access and generally less opportunity for criminal activity.

There are four main CPTED principles:

1) Natural Surveillance – Areas that maximize the visibility of users are less likely to be targets of crime. Design features include adequate lighting, doors and windows facing onto streets and paths, and pedestrian-friendly street and sidewalk design.

2) Territorial Reinforcement – Physical design can help define the limit of public and private spaces. By doing this, facility users develop a sense of territorial control while potential offenders, sensing this control, are deterred.

3) Natural Access Control – Reduces the opportunity for crime by denying access to potential targets and creating a sense of risk in potential offenders. This is gained by designing streets, sidewalks, building entrances and neighbourhood gateways to clearly indicate public routes and to discourage access to private areas.

4) Maintenance – Facilities that are properly maintained are more inviting to users than those that are run down. Well maintained facilities also generally provide a safer environment for users.

CPTED and the Cycling Plan

Multi-modal pathways in particular are often through their very nature, large, linear and sometimes removed from the public eye. Many users such as hikers and cyclists among others may also specifically seek out experiences that are not strongly urban in nature and may not follow all CPTED principles such as nature trails and off-road hiking routes. In these cases, it must be remembered that the strict application of crime prevention principles may in fact reduce the quality of a space and discourage use.

It also should be noted that when incorporating CPTED principles into the overall design of a cycling network, care should be taken to avoid creating sterile and un-interesting routes with little or no natural features. A balance should be struck between aesthetics and safety in both urban and rural segments of the network. The application of CPTED principles to purely on-road cycling routes does not pose as much of a concern as these are generally already in the public realm, highly visible and usually well lit. Care should be taken though, to designating a cycling route in an area that may appear quite safe and acceptable for automobile use but may not be so for cyclists.

There are examples of various CPTED principles that have been successfully applied to natural and urban cycling systems in many municipalities across North America and Europe, and aspects of the Cycling Plan should be examined against these ideas during the detailed design and construction stage and adjustments made as may be necessary.

In order for a network to be effective, users must feel safe and secure. More specifically:

- Users of the network should be easily visible to people on adjacent roadways where possible.

- Bushes or other shrubbery can provide hiding places for potential offenders; caution should be exercised in their placing. Bushes that are planted further back from paths and sidewalks make it more difficult for people to move unseen.

- Routes should be located in areas with significant street frontage (and the associated doors and windows) as opposed to streets with few buildings fronting onto them.

- Network facilities should be well maintained. Burned out lights, overgrown paths, or damaged sidewalks/bike routes indicate a general state of disrepair and detract from the feeling of security of the area.

CPTED offers a relatively inexpensive and effective crime prevention tool but should not be thought of as a flawless system. Researchers at the Design Against Crime Research Centre have found that the efficacy of CPTED can be reduced (or increased) by demographic factors (e.g. high densities of people) and socio-economic factors. Social conditions in some circumstances may nurture fear, reduce the inclination of people to intervene in criminal activity and result in the withdrawal of people into the home, which can become heavily fortified.

Any design process is also a continuous learning experience that must be adapted to the local environment and culture in order to be effective. Certain past CPTED measures have resulted in a failure to anticipate criminal actions such as when communal entrance porches encouraged to permit neighbourhood visibility, have allowed adaptable burglars to reach upper windows of residences. St. John's should apply CPTED principles as appropriate to the local culture and community. In the more developed urban areas of St. John's, the application of CEPTD principles should also be considered as part of a larger urban design strategy. Successful implementation will then serve to help reduce opportunities for criminal behavior but also enhance and beautify the urban fabric of the Municipality and create even more successful urban spaces.

Benefits Of Incorporation

The application of detailed CPTED design guidelines can require a fairly extensive examination of criminal activity by Municipal districts, building forms and design challenges to reach maximum effectiveness. Without this level of examination, it is still possible to incorporate safety principles that should be considered when designing any public space and as CPTED is an evolving system, attention should be paid to advances in the field and new research that could impact the effectiveness of design measures.

By incorporating CPTED principles and/or auditing procedures into the design of the AT Network, the safety of users (both perceived and real) may be increased. If people feel secure using the network, they are likely to use it more often and in greater numbers. It is recommended that St. John's adapt generalized CPTED procedures and design awareness when developing the cycling network but implement specific auditing practices as may be necessary and on a site by site basis.

3.6 The Grand Concourse

When considering the development of any active transportation or cycling plan it is generally most desirable to create a network which is comprised wherever possible, of off-road routes. This is mainly due to the fact that the removal of bicycles from traffic systems created and maintained for automobiles creates a safer cycling environment with fewer potential user conflicts. Establishing an extensive off-road routing system also usually allows for greater opportunities to design routes in keeping with purely cycling or multi-use trail requirements.

Without having to operate within the confines of the roadway network, routes can be designed with larger cycling space envelopes (vertical and horizontal) and include amenities such as rest areas, benches, signage and maps which are often more difficult and more expensive to implement in on-road situations. Off-road cycling routes also offer the potential advantage of being more scenic and desirable routes for users to travel and so may positively impact the uptake of would-be new users who may be uncomfortable traveling on roadways.

In the case of St. John's, the City is served by the high quality, extensive and well used Grand Concourse trail system which comprises the vast majority of potential off-road cycling routes in the Municipality. In addition to the City of St. John's, the 120 km Grand Concourse system also links into the neighboring Municipalities of Mount Pearl and Paradise and provides pedestrian access to destinations such as schools, parks, scenic areas, playgrounds and residential neighborhoods.

According to the Grand Concourse website "The Grand Concourse Authority has been dedicated to creating a walkway system that would be in place for generations to come. Civic planners across Canada have recognized their standards and use of technology as among the finest in North America.". Ongoing support for the vision and reality of the Grand Concourse is provided by the City of St. John's, City of Mount Pearl, Town of Paradise, Atlantic Canada Opportunities Agency, Province of Newfoundland and Labrador, Human Resources Development Canada and the Johnson Family Foundation.

The Grand Concourse is currently a pedestrian based walking trail system that has not made provisions for bicycle based users in its design parameters and priorities for many of its routes. When developing the Candidate Routes Map the project team did, however, include all available Grand Concourse as well as any available Municipal and East Coast Trails Association existing and planned off-road trails in order to gain a full understanding of potential off-road cycling routes which might be incorporated into the master plan and of how decisions regarding on-road cycling routes may be influenced by them. The purpose of the Cycling Plan is not to supplant the priority of

walkers and hikers in many of these areas but to recognize and incorporate as multi-use facilities, select off-road routes which will benefit the overall network as well as strengthen the AT environment in St. John's as a whole.

3.7 Candidate Network Routes

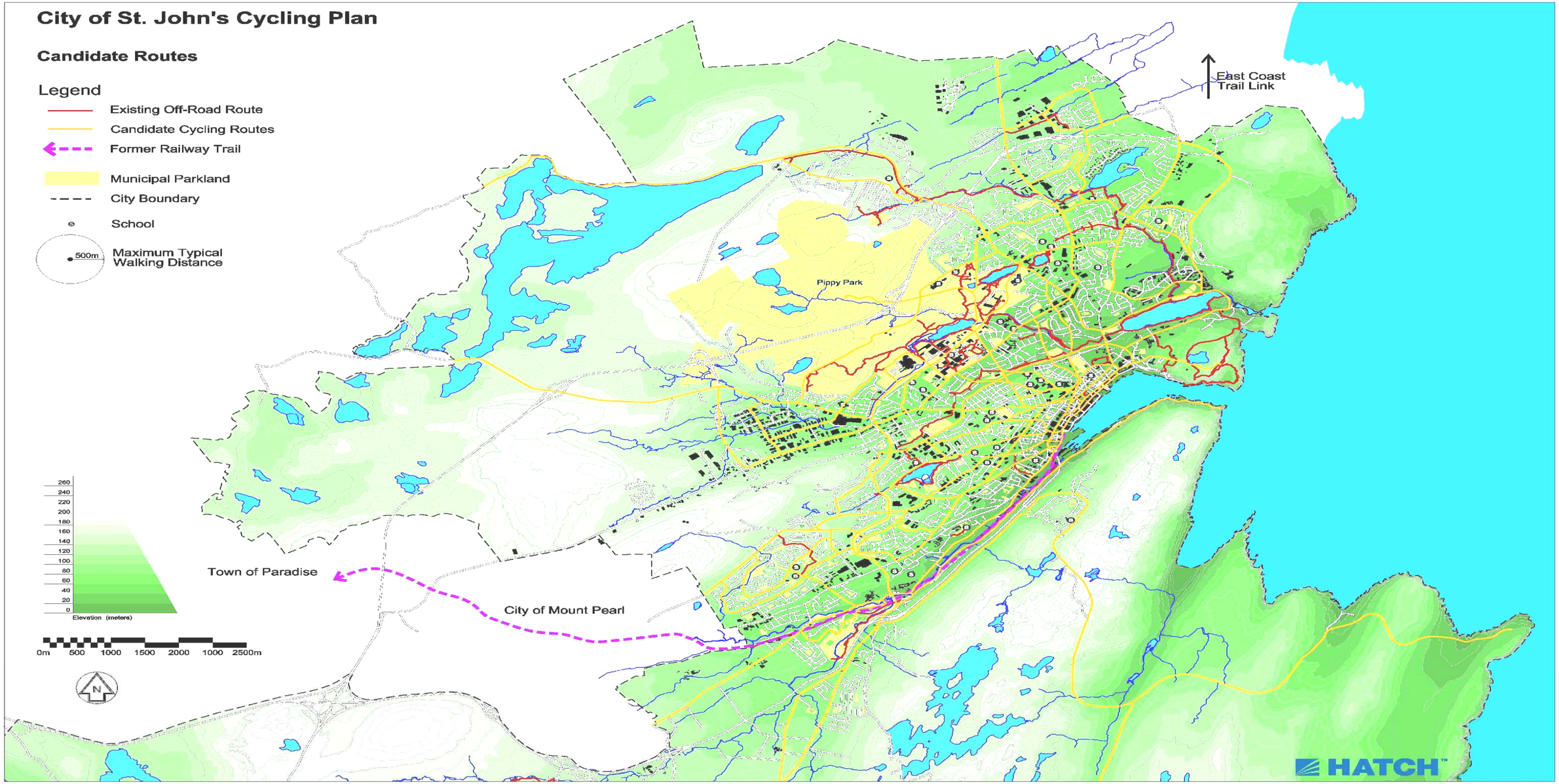
Exhibit 3.3 represented the first attempt by the project team at developing a network that was later further refined through Committee, staff and stakeholder inputs into the Draft Cycling Network Map. The Draft Cycling Network Map was made available for public input and comments through the City's website.

The candidate routes were intended to be fairly exhaustive and to act as a conversation point rather than a strict network. Based on the cumulative work at the time, background research, staff input and strategic municipal planning documents, the Candidate Routes Map provided a starting point from which the larger network could grow and develop. The on-road candidate cycling routes were physically traveled by members of the project team during early August 2007 in order to determine their suitability from an "on the ground" perspective and to gain first hand knowledge of existing conditions which impact cycling route choices such as traffic levels, speed, visual attractiveness, general safety, ease of implementation and so on.

The project team members carrying out the "ground proofing" of the candidate routes completed field assessment sheets for traveled portions of each route with allowances made for any changes to the linear physical environment of each route while they were being traveled as well as potential integration possibilities with transit and both on-road (sidewalks) and off-road (trails) walking facilities. Candidate routes were ranked out of a possible 65 points with additional opportunities provided for the field workers to add their own personal observations and physical sketches. Less quantifiable measures such as these, along with photographs of the candidate routes provided an essential "human" element to the process that is not easily codified but is no less important to the development of a successful network.

Exhibit 3.3

Candidate Routes



4 Recommended Network

4.1 Community Connectivity

Decreased automobile traffic on local streets, replaced by increased cycling use will improve the safety of residents and assist in creating an improved sense of community. For there to be increased cycling use, there must then be safe, connected routes from where people live to where they wish to go. It is essential for neighborhoods across the City be connected both internally and to the larger system.

The Cycling Master Plan acknowledges that the majority of people who will use AT options will likely do so most often in the immediate proximity of their home, work/school, or shopping locations. Any trip that requires five minutes or less is almost always easier by foot than by car while walking/riding trips of up to 30 minutes in length are common for engaged walkers/riders. The 500 metre typical one-way walking distance included on all project mapping, provides a basis from which to build future links and maintain connections with the larger network.

To assist with travel distances, access to and links with, transit facilities and proposed transit hubs will be provided in the network wherever possible. All transit stops should ideally be connected to walkways, sidewalks or cycling specific routes. Cycling routes must be developed on par with sidewalks and roadways for the future system to reach full potential.

Ideally, in new development areas, cycling facilities should be constructed prior to or in conjunction with the construction of other infrastructure and built structures. Where trail and on-road construction does not follow this level of priority, there can be conflicts with existing residents who may have misconceptions about the effects of AT development on their lifestyles and property values. This is most often found in retrofitting an existing community with a multi-use trail system resulting in the common belief that it may facilitate criminal activities or result in a lack of privacy or property enjoyment. Regardless of studies aimed at understanding the effects of trail retrofits, it is best to avoid the situation where possible through the incorporation of cycling and AT facilities during development.

4.2 Cycling/AT Facility Types

The cycling network includes routes throughout the City based on a series of hierarchical facility types. Facility types are broken into two basic categories of on-road routes and off-road routes and are further subdivided according to type of use expected and encouraged, expected volume of users, available space and ROW constraints, type of route (commuter vs. neighborhood, etc.), and relationship to the overall Plan in terms of maintaining important City-wide connections and ease of transition from one facility type to another.

Skateboarders, inline skaters and cross-country skiers have special design requirements which should be considered when designing a trail or other off-road facility but for the purposes of this Plan, cyclists are used as the primary "design vehicle". This is due to the fact that cyclists make up the vast majority of potential system users and the design requirements for cyclists are more accommodating in terms of space requirements and network needs. In certain areas of the network it may be appropriate to design facilities to accommodate other users but this should occur on a "special case" basis.

The recommended facility types for cycling routes in St. John's include:

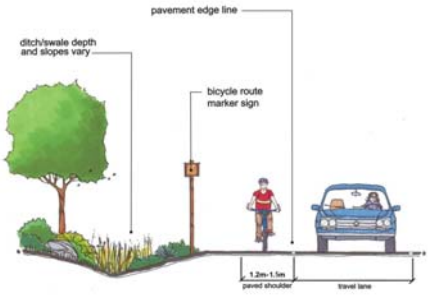
Off-Road

1. Multi-use Trail.

   This facility type is normally a hard top, asphalt or concrete surfaced trail intended to be used by both bicycles and pedestrians. It is the preferred facility type for all network routes where feasible due to it being off-road and therefore inherently less likely to cause conflicts with motor vehicles. It can also usually be built to a higher design standard due to less ROW space restrictions.

On-Road

1. Bicycle Lanes (standard lanes, contra-flow facilities and lanes with on-street parking as may be necessary).
2. Paved Shoulders (usually most suitable for rural highways and commuter routes where space exists).
3. Signed-only Routes (most suitable for routes that are "local" in nature and consist of no formalized separation of cycle traffic from automobile).



Recommended design guidelines for each facility type as well as various other features and network requirements are included in Section 5 of this document.

4.3 Multi-modal Travel

It is important to remember that while the Cycling Network is intended to provide for a bicycle friendly City of St. John's, part of that strategy must operate in conjunction with public transit in order to capitalize on potential trip connections as well as to service potential user desires. New users in particular may wish to utilize new bicycle facilities for only a portion of their trip due to distance for example and with obvious grade challenges, users may also wish to embark on a unidirectional AT trip while traveling on favorable grades and make their return trip via public transit (Metrobus). This amounts to a "bike down and bus back" approach that can be observed in various hilly urban areas across the country and may be especially

attractive to bicycle commuters in St. John's. As many residential areas in the City exist at higher elevations than the urban core for example, commuters may choose to cycle to work and take the bus back therefore avoiding bicycling up steep grades after a full day of work. It should also be noted that multi-modal AT trips still qualify as an AT trip even if completed in conjunction with motorized travel modes. In addition to the "bike down and bus back" trip, multi-modal AT travel systems must also consider the fact that users may choose to bicycle to and from a transit stop or terminal and wish to leave their bicycle in a secure environment at or near the stop for extended periods.

When considering a bus based transit system such as exists in St. John's, the primary measures to be considered to accommodate bike-and-ride traffic include equipping present and/or future busses with external bicycle racks and the provision of bicycle parking and bicycle security features at transit stops and major terminals. For cities such as Toronto, Ottawa, Vancouver and Seattle, decisions to move toward full integration of bicycles with public transit have generally been quite successful. As an example, according to the City of Toronto Bike Plan, the City of Seattle's transit system now carries an average of 60,000 bicycles every month.

Providing bicycle racks, lockers, or even sheltered parking facilities at major transit stops is a significant part of a successful multi-modal strategy and one that may have a major influence on the potential for commuters to choose to switch to AT travel. A pilot project conducted in Vancouver to determine the effectiveness of these facilities, for example, concluded that users of the new lockers had previously been car-based commuters 25% of the time. It is therefore recommended that Metrobus and the City of St. John's work together to continue to explore and build upon current initiatives for the facilitation of a seamless multi-modal based travel system across the City.

4.4 Mitigating Potential User Conflicts

Challenges to creating effective and enjoyable multi-use (bicycle and pedestrian) routes can be broadly summarized as maintaining user safety, protecting natural resources, and providing high-quality user experiences. To address these challenges, a wide array of physical and management options such as trail design, information and education, user involvement, and use regulations may be developed and enforced as needed both individually or in a combination designed to achieve the most productive results.

In the United States, The Federal Highway Administration and The National Recreational Trails Advisory Committee sponsored an in-depth study of the issue resulting in the publication "Synthesis of the Literature and State of the Practice" which defined user conflicts as resulting from "goal interference attributed to another's behavior". The document outlines multi-use trail use issues as resulting from conflicts among different user groups, among different users within the same user group, and as a result of factors not

related to users' trail activities at all. Despite common assumptions that AT multi-modal travel may result in direct physical conflicts, the research also found that no actual physical contact between users was necessary for conflict to be felt. Specifically, the document states that, "Conflict has been found to be related to activity style (mode of travel, level of technology, environmental dominance, etc.), focus of trip, expectations, attitudes toward and perceptions of the environment, level of tolerance for others, and different norms held by different users. Conflict is also often asymmetrical (i.e., one group resents another, but the reverse is not true)".

When completing the detailed design of various portions of the multi-use network in St. John's numerous methods and practices may be employed to create safer and more enjoyable environments for AT users of all types. It is best to approach each potential conflict area as a unique situation which may then require site and user specific examinations to create a workable area plan. It is recommended that wherever possible, potential conflict areas, i.e. areas of heavy use, constrained access, frequently different user types, etc, be identified early in the process of route construction/upgrading and that the following twelve principles as outlined in the "Synthesis of the Literature and State of the Practice" be followed.

1. Recognize Conflict as Goal Interference -- Do not treat conflict as an inherent incompatibility among different trail activities, but goal interference attributed to another's behavior.

2. Provide Adequate Trail Opportunities -- Offer adequate trail mileage and provide opportunities for a variety of trail experiences. This will help reduce congestion and allow users to choose the conditions that are best suited to the experiences they desire.

3. Minimize Number of Contacts in Problem Areas -- Each contact among trail users (as well as contact with evidence of others) has the potential to result in conflict. So, as a general rule, reduce the number of user contacts whenever possible. This is especially true in congested areas and at trailheads. Disperse use and provide separate trails where necessary after careful consideration of the additional environmental impact and lost opportunities for positive interactions this may cause.

4. Involve Users as Early as Possible -- Identify the present and likely future users of each trail and involve them in the process of avoiding and resolving conflicts as early as possible, preferably before conflicts occur. For proposed trails, possible conflicts and their solutions should be addressed during the detailed planning and design stage with the involvement of prospective users. New and emerging uses should be anticipated and addressed as early as possible with the involvement of participants. Likewise, existing and developing conflicts on present trails need to be faced quickly and addressed with the participation of those affected.

5. Understand User Needs -- Determine the motivations, desired experiences, norms, setting preferences, and other needs of the present and likely future users of each trail. This "customer" information is critical for anticipating and managing conflicts.

6. Identify the Actual Sources of Conflict -- Help users to identify the specific tangible causes of any conflicts they are experiencing. In other words, get beyond emotions and stereotypes as quickly as possible, and get to the roots of any problems that exist.

7. Work with Affected Users -- Work with all parties involved to reach mutually agreeable solutions to these specific issues.

8. Promote Trail Etiquette -- Minimize the possibility that any particular trail contact will result in conflict by actively and aggressively promoting responsible trail behavior. Use existing educational materials or modify them to better meet local needs. Target these educational efforts, get the information into users hands as early as possible, and present it in interesting and understandable ways.

9. Encourage Positive Interaction Among Different Users -- Trail users are usually not as different from one another as they believe. Providing positive interactions both on and off the trail will help break down barriers and stereotypes, and build understanding, good will, and cooperation. This can be accomplished through a variety of strategies such as sponsoring joint trail-building or maintenance projects, filming trail-sharing videos, and forming Trail Advisory Councils.

10. Favor "Light-Handed Management" -- Use the most "light-handed approaches" that will achieve area objectives. This is essential in order to provide the freedom of choice and natural environments that are so important to trail-based recreation. Intrusive design and coercive management are not compatible with high-quality trail experiences.

11. Plan and Act Locally -- Whenever possible, address issues regarding multiple-use trails at the local level. This allows greater sensitivity to local needs and provides better flexibility for addressing difficult issues on a case-by-case basis. Local action also facilitates involvement of the people who will be most affected by the decisions and most able to assist in their successful implementation.

12. Monitor Progress -- Monitor the ongoing effectiveness of the decisions made and programs implemented. Conscious, deliberate monitoring is the only way to determine if conflicts are indeed being reduced and what changes in programs might be needed. This is only possible within the context of clearly understood and agreed upon objectives for each trail area.

4.5 Rest Areas and Gateways

Rest Areas and Gateways are important stationary positions that serve to both inform users and highlight the cycling system, amenities and other items as may be appropriate. They normally indicate network locations that may be significant access points, are a main transition area from one type of travel experience to another and/or promote the system and destinations it leads to. In the case of St. John's these facilities may serve the network through being applied on an as needed basis for steeply graded areas and/or to take advantage of particular views from higher elevations. When used in this manner, they may be of particular use to both new system users and visitors to the city.

Rest Areas and Gateways offer opportunities to convey safety information, provide user facilities, and promote tourism and general area attractions. They can be designed very simply as signage only or be created as more elaborate areas with washrooms, seating, landscaping or even telephone and drinking water access. For example, if designed with consideration for local historic attractions, gateways can also be themed to passively promote segments of the travel route or link with larger system or Municipal branding initiatives.

4.6 The Cycling Network Plan

The Cycling Network map (Exhibit 4.1) is intended to illustrate a complete (full build-out) future cycling system and includes existing, currently proposed and various new routes. The overall system is based upon the principle of providing neighborhood connectivity within a framework of on-road and off-road routes that connect communities within St. John's as well as adjacent Municipalities and destinations.

The primary "bones" of the network are represented by off-road cycling routes which take advantage of existing facilities wherever possible and seek to provide a top quality cycling experience to residents across the City. The designation of the former rail line trail in the eastern end of the City as well as portions of the Grand Concourse system and sections of Municipal parkland routes as multi-use cycling and walking trails creates a strong base for the larger plan to grow from. Building on these routes, the network has a significant on-road cycling element that permeates residential, commercial and employment areas across the City and can operate independently of the off-road designations if needed. Off-road network routes run mainly in a southeast – northwest direction with one link providing off-road access to the north of the city.

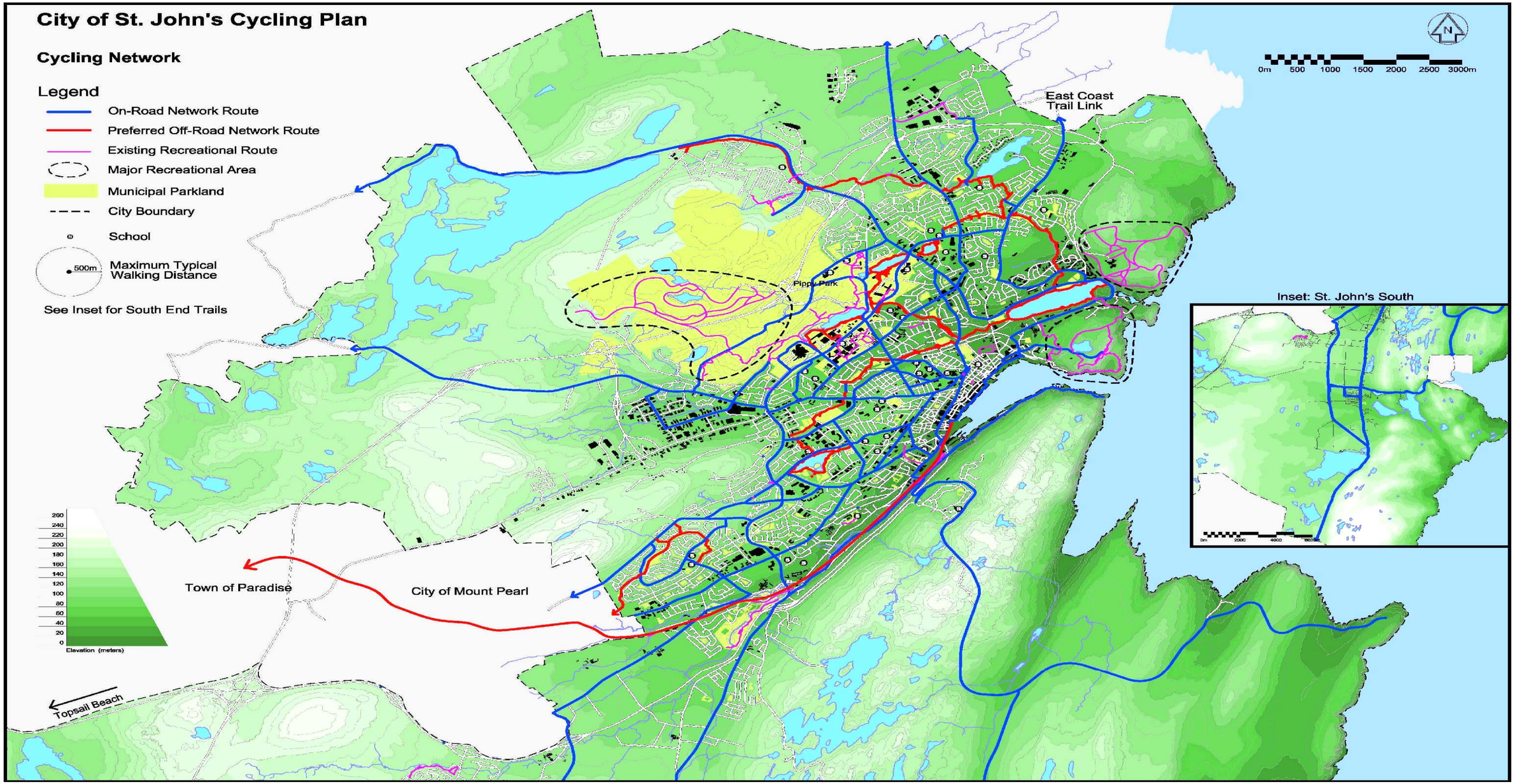
During the course of network development, it also became apparent that a significant desire existed in St. John's to have off-road recreational cycling, hiking, cross country skiing and walking routes included as part of the

Cycling Master Plan in some form. Due to issues with often extreme grades, the types of recreation now occurring on some of these routes and the fact that some Grand Concourse routes are unsuitable and/or undesirable for official Cycling Plan designation, they are not included as parts of the official network.

In order to acknowledge the importance of these routes to the people if St. John's however, and to demonstrate how the Cycling Plan responds to them, certain routes have been included in the Network Plan Map as "recreational routes". These routes have no official designation under this plan and are included to serve an advisory and informational purpose. Major recreational areas for many of these activities as well as more "extreme cycling" (i.e. BMX biking) have also been identified on the plan but do not form official parts of the network.

Exhibit 4.1

Cycling Network Map



The Facility Types Plan

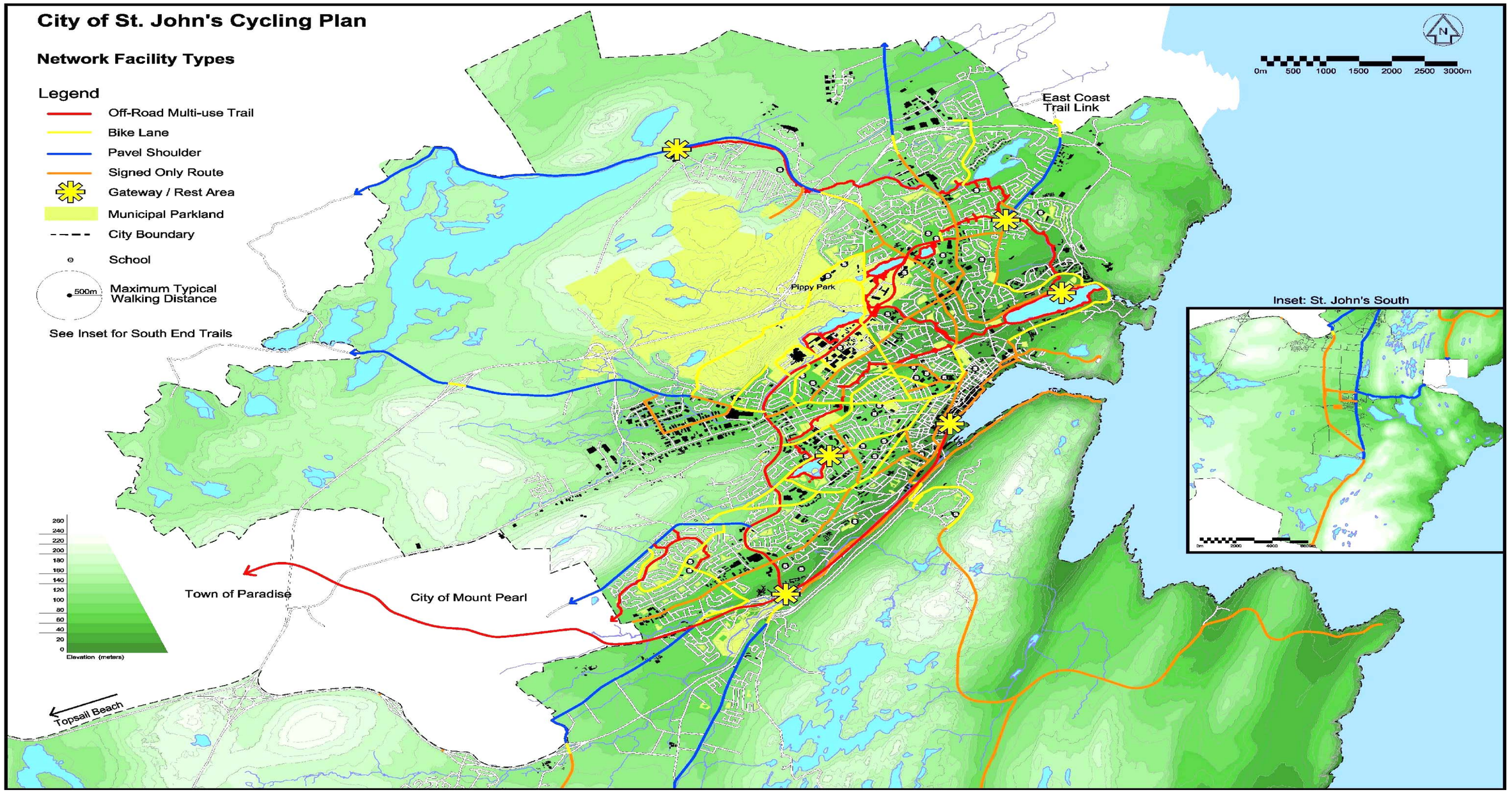
The Network Facility Types Map (Exhibit 4.2) moves the Master Plan from the designation of cycling routes to the determination of what sort of "on the ground" form those routes will take. As discussed in Section 4.2, route facilities take the four basic forms of: off-road, multi-use trail, designated bicycle lane, paved shoulder and signed only route. It is important to note that proper design of the transition area from one facility type to another is a vital consideration in the construction of the cycling network. If approached on a case by case basis and utilizing the design guidelines provided, the user experience should be one of seamless integration across the network.

While every effort was made to create a cycling network based on off-road routes wherever possible, on-road bicycle lanes and other facilities make up a large part of the system. Where opportunities such as sufficient right-of-way width existed, designated bicycle lanes were generally the on-road facility of choice. In other instances, paved shoulders, especially in areas with rural road cross sections were determined as preferable and in highly constrained areas or where strict delineation of bicycle facilities were not necessary, signed only routes were chosen to complete the network.

Implementation of the Cycling Master Plan routes and designations is addressed in more detail later in this report but in addition to physical design requirements and opportunities, cost is also a major factor in the development of the network and in particular, the choice of facility types. If budgeting concerns may require the postponement of higher level, future bicycle facility construction it is recommended that signed only routes be implemented as temporary measures. This tactic will raise awareness of the Master Plan overall but also of the chosen network route(s) and potentially help to ease any conflicts with drivers that may arise with the construction of higher level facilities at later dates. Exhibit 4.2 also provides recommended locations for gateway/rest area development across the city in conjunction with recommended network facility types.

Exhibit 4.2

Network Facility Types



5 Design Guidelines

5.1 Network Facilities

As with all design guidelines, it is important that the recommendations in this section be applied as evenly as possible across the network to ensure maintenance of standards but that they also be viewed as a "toolbox" to be used by City staff and others to apply as may be appropriate and in response to localized conditions. The effective application of cycling network guidelines requires that standards be established wherever possible and practical but that they remain fluid and open to new opportunities and transportation realities.

St. John's is a city of diverse urban form and unique AT challenges. Above all else, the priorities of network development must remain focused on the creation of a functional, attractive and connected cycling system which responds to the evolution of the City and to the present as well as future desires of residents and visitors.

St. John's cycling facilities include off-road and on-road facilities with various design sub-groupings within them. Off-road facilities refer to routes that operate on their own right-of-way, independent of the existing street network, while on-road routes refer to network facilities that operate on or along existing roads and are incorporated into the present or future street system. Off-road routes typically operate through open spaces, woodlots, valley and parklands, as well as power or transportation utility corridors and stormwater retention areas. As has been shown with the inclusion of the former rail line trail in the Master Plan, rail corridors can make particularly useful locations for off-road trails and AT amenities.

Design standards associated with each class of facility are subject to a number of factors including site conditions, location, potential level of use, and existing or appropriate materials. Specific connections between different facility types should be provided at locations where the two different classes of facilities intersect and may require special design treatments such as ramping or pavement markings to assist with the transition from one to another. This section sets out a series of design guidelines for each class of facility and the sub-groupings as identified on the Network Facility Types map.

5.2 Standard Bicycle Lanes

Standard bicycle lanes are defined on the road through pavement markings and signage. They are located in the traveled portion of the street or roadway and are designed for one-way cyclist traffic. The following guidelines relating to bike lanes are presented as options, and may not necessarily indicate the final treatment that would be appropriate in parts of St. John's as

this would depend on local conditions such as gradients and traffic flow factors.

It is recommended that St. John's adopt bicycle friendly design and construction guidelines for all streets in order to promote higher rates of riders regardless if a street, park or any publicly managed facility has been designated as part of the network. Bicycle friendly roadway features typically include, among other things, wide curb lanes plus drainage grates and possibly street furniture that is bicycle friendly. Other features may include traffic control devices that are programmed with bicycles in mind, particularly detector loops that have their sensitivity adjusted to allow bicycles to actuate a traffic signal.

Points were raised during the public consultation portion of the project regarding the dangers of cycling on painted surfaces due to slipperiness in periods of rain. In this regard it may be useful for bicycle lane and other pavement markings to be completed using some type of non-slip paint or other materials that would help to minimize the danger of falls. Some municipalities have chosen to delineate bicycle lanes through the use of colouring the entire lane to help separate them from automobile traffic and while this can be an effective and attractive approach, coloured asphalt is recommended over the use of paint in this regard.

As provided in Exhibit 5.1, the minimum design width for a bike lane on a street with an urban cross-section without on-street parking should be 1.5 m from the face of the curb. A preferred width of 1.8 m is recommended, especially on roadways with higher AADT's, speed limits, and commercial vehicle volumes (trucks / buses) such as those on busy arterial roadways. This is consistent with TAC guidelines.[9] Bike lane widths of 2.0 m should be considered on roads with motor vehicle operating speeds, or posted speed limits between 60km/h and 80 km/h. Bike lane widths should not exceed 2.2 m because the excess width may encourage motorists to drive in the bike lanes, since they will be wide enough to accommodate a motor vehicle.

Lane widths less than 1.2 m should not be designated or signed as bike lanes except for short distances when constraints may make it necessary. When the available lane width narrows below 1.2 m, bike lane signs and pavement markings should cease, and a Bike Lane Ends sign posted (refer to TAC Bikeway Traffic Control Guidelines for Canada).[10] Table 5.1 summarizes the widths of bike lanes recommended for various circumstances.

[9] Geometric Design Guide for Canadian Roads, TAC, 1999. (TAC Table 3.4.6.2)
[10] Bikeway Traffic Control Guidelines for Canada, Transportation Association of Canada (TAC), (1999).

Exhibit 5.1 Bike Lane Classification

Classification	Minimum Width	Desired Width
Standard Bike Lane.	1.5 m	1.8 m
Bike Lane Adjacent to On-Street Parking Aisle.	1.5 m	1.8 m
Bike Lanes on Rural Roads with Posted Speed Limit between 60 - 80 km/h.	1.5 m	2.0 m
Bike Lanes in Constrained Right-of-way.	1.2m	1.5 m

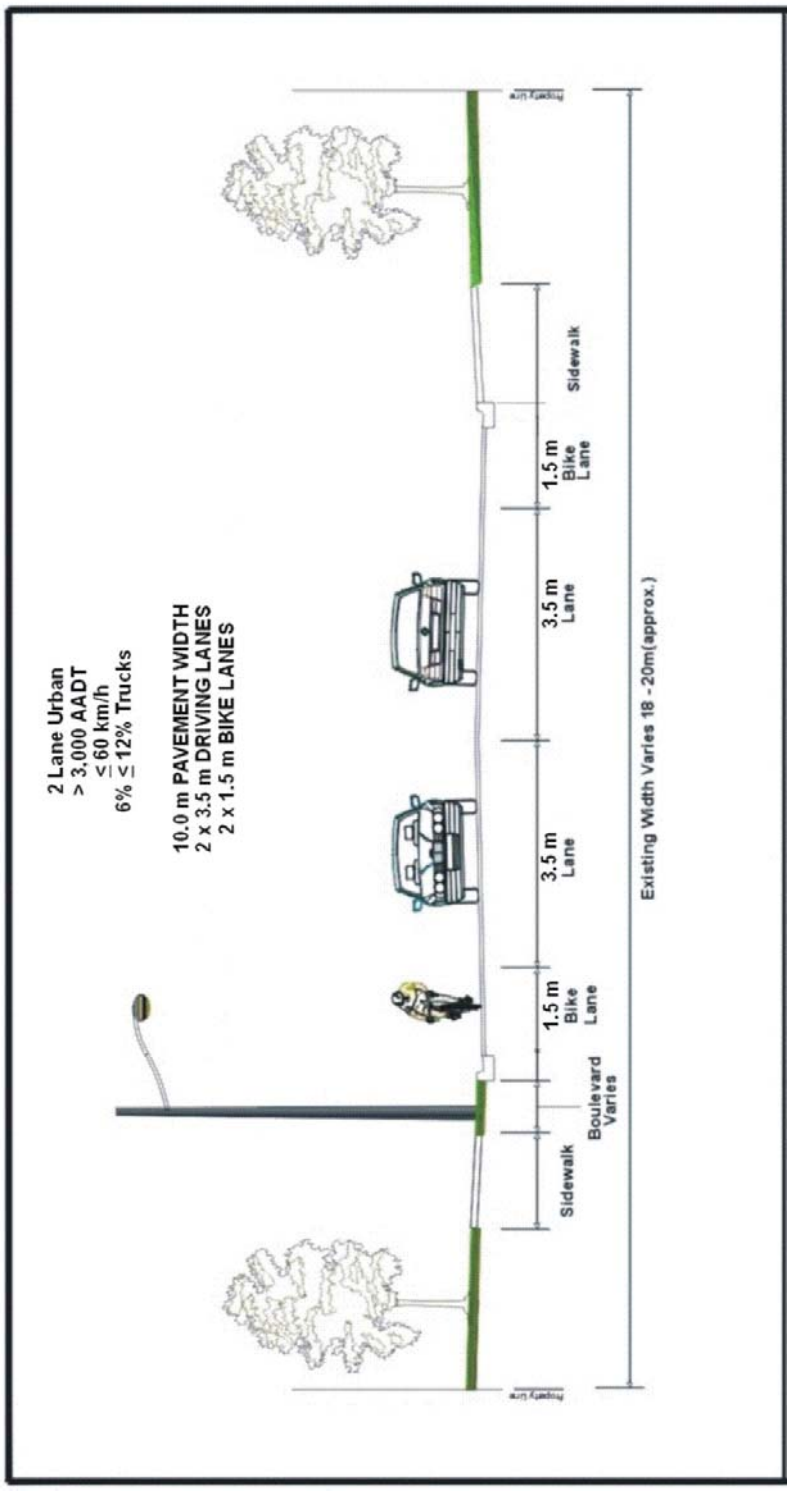
On-road cycling facilities are not recommended on roadways with posted speed limits greater than 80 km/h and bike lanes in constrained rights-of-way are not recommended on high-speed roads (>50 km/h) with heavy commercial vehicle or truck percentages (> 12%) and/or AADT's (>3000).

If the edge line does continue along a roadway following the termination of a bike lane along with the cycling route, and the available lane width between the edge line and the shoulder / curb of the roadway is less than 1.2 m, then the edge line should be removed or, as a minimum, be allowed to wear off. The risk is that cyclists may attempt to ride in the space provided by the edge line although it is less than 1.2 m in width. Cyclists should not be encouraged to ride in this constrained space since a cyclist who accidentally strikes a curb may "bounce" back into the motor vehicle travel lane. Therefore, curbed roadways with edge lines less than 1.2 m from the face of the curb should not be signed or marked as bike lanes. Once the edge lines have been removed or have worn away, bicycle route signs supplemented by "share the road" signs should be implemented.

Exhibit 5.2 illustrates a typical urban road cross-section standard modified to accommodate bike lanes.

Whenever possible, it is recommended that bike lanes be provided on all collector and arterial roads designated to have cycling facilities, provided that there is sufficient roadway width and AADT volumes and commercial vehicle percentages are within acceptable limits. After review, in locations where a bike lane may not be deemed feasible, consideration should be given to providing a Signed Bicycle Route.

Exhibit 5.2 Example of an Urban Cross Section with 1.5m Bike Lanes



Bike lanes are typically recommended where feasible for collector and arterial roads designated to have cycling facilities. As illustrated on the Network Facility Types Map (Exhibit 4.2) in locations where a bike lane was not deemed feasible, consideration was given to providing a wide curb lane. When this was not possible, as a minimum, a Bicycle Signed-Only Route was provided. Efforts should be made to provide as high level of facility as possible at all times.

Although not an official part of the Cycling Master Plan, inline skaters as well as other potential future travel modes should be passively and/or actively accommodated by the network wherever possible. Considering the additional space requirements, it is recommended that any future official inline skating routes be ideally designated as portions of the off-road network only. The standards and route choices recommended in this report are focused on bicycles as the "design vehicles" and no efforts have been made to plan for the additional space requirements of inline skaters. That being said, inline skaters may still choose to use the bicycle network and an awareness of the operational requirements of all potential users is prudent.

Inline skaters typically require more maneuvering space than bicycle, pedestrians or wheelchair users to allow for the avoidance of hazards and other users. The minimum recommended operating space for an inline skater is 2.3m. This is based on the average pedestrian space requirement, plus an additional maneuvering allowance of 0.4m on either side. Exhibit 5.3 from the Design, Signage and Maintenance Guidelines, Waterfront Regeneration Trust, 1997, illustrates the typical operating envelope for an inline skater.

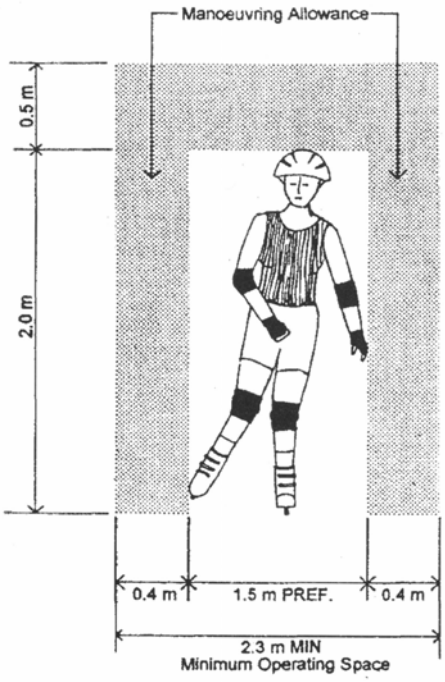


Exhibit 5.3: Inline Skater Operating Space

5.3 Bicycle Lanes with On-Street Parking

Bike lanes on roads with on-street parking are located to the left of and adjacent to parked vehicles along the curb. Designing this type of cycling facility must take into consideration the potential hazard to cyclists of car doors opening into the traveled portion of the bike lane and overall, the facility is not as desirable as a standard bicycle lane designation. In order to allow clearance for vehicle doors, and to minimize collisions with cyclists, the combined bicycle/parking lane should be a minimum of 4.0 m wide. This width allows for a 1.8 m bike lane and a 2.2 m wide curbside-parking stall. The extra distance added to the typical 2.0 m wide parking stall provides space for the opening of car doors, and encourages cyclists to travel a safe distance from the parked vehicles. Exhibit 5.4 illustrates an example of bike lanes adjacent to on-street parking. As an alternative, the width of the bike lane may be reduced if the parking aisle is greater than 2.4 m wide.

Bike lanes on roads with on-street parking should be considered in commercial and residential areas where the demand for and turnover of parking is high, and where commercial and residential property owners may not accept the reduction or prohibition of on-street parking.

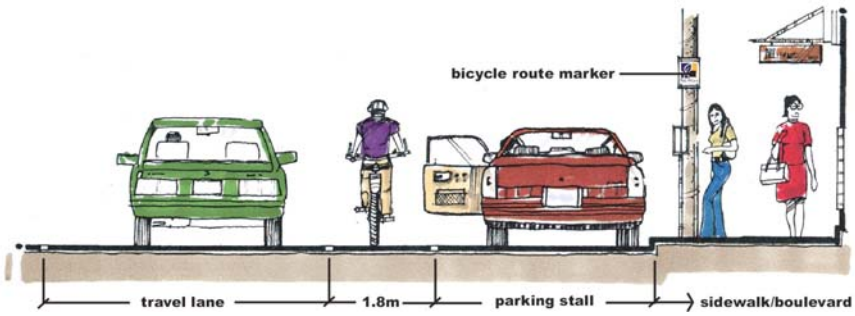


Exhibit 5.4 Typical Bike Lane with On-Street Parking

Where the road right-of-way or other factors limit the opportunity to provide parking bays, standard on-street curb parking should be assumed. For both applications, the desired width of the parking lane should be a minimum of 2.2 m, with the adjacent bike lane 1.8m.

As found in many denser urban "downtown" areas, sometimes the provision of delineated bicycle lanes is not feasible but due to higher levels of pedestrians, relatively narrow roadways and slower traffic and multiple micro-destinations such as shops and offices, a signed-only route for bicycle traffic can operate well. Alternatively, it also may be desirable to avoid the creation of an official cycling network route in downtown areas at all and instead choose to locate a route near to the generalized area. This would permit cyclists to access the downtown as a whole and then either walk or ride their bicycles as the law may allow, within higher traffic, core districts.

5.4 Two-way Bikeway Boulevards/Multi-use Trails

Two-way bikeway boulevards are constructed within a road right-of-way, typically in place of a sidewalk, though where space permits a separate facility adjacent to a sidewalk may be considered.

Two-way bikeway boulevards are typically located on one side of a roadway, as illustrated in Exhibit 5.5. Although constructed within the road right-of-way, boulevard bikeways should be separated from regular motor vehicle travel lanes through either a change in roadway elevation (a boulevard bikeway is usually placed at the same height as a sidewalk) and / or by concrete barriers, medians or bollards.

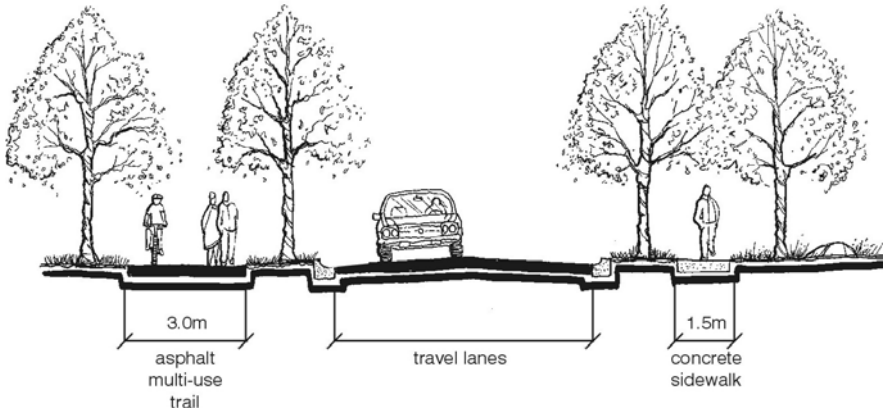


Exhibit 5.5: Schematic of a Roadway with a Two-Way Bikeway Boulevard

Where possible, two-way bikeway boulevards can make excellent spine bicycle routes along higher traffic roadways where bicycle lanes may not be desirable. More costly than other cycling facility types to implement and maintain, the application of two-way bikeway boulevards should be used along primary recreational/transportation corridors, reverse frontage lotting, and segments where there are few if any mid-block driveways.

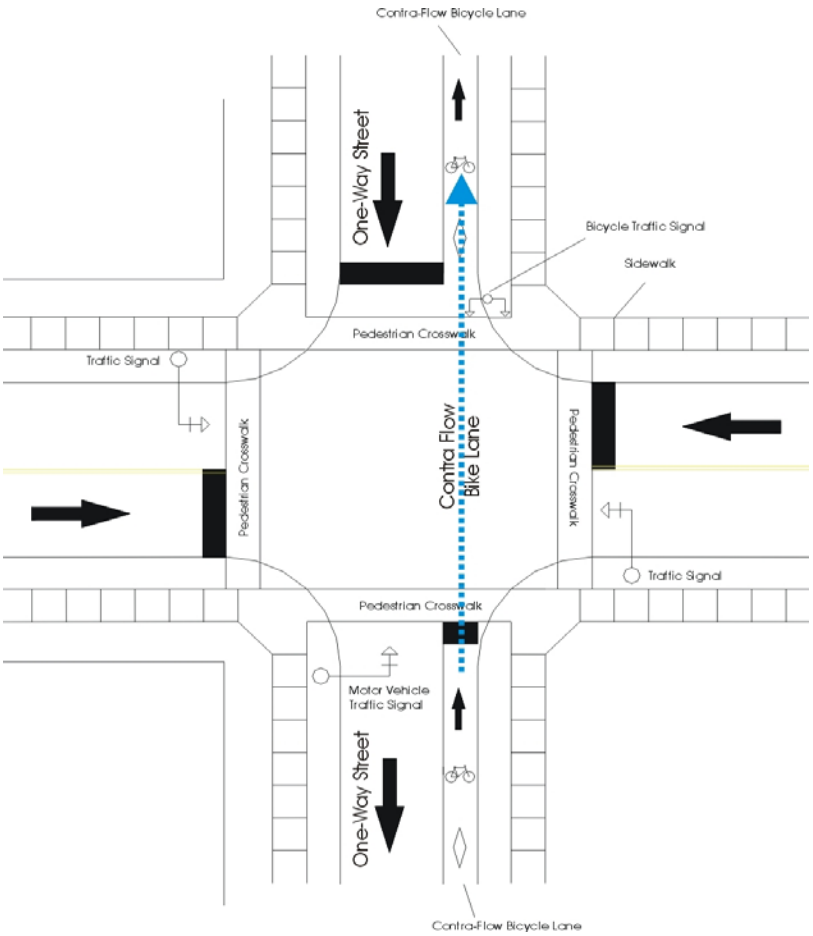
Appropriate signing at intersections where two-way bikeway boulevards are present is very important to warn and provide clear direction to both motorists and cyclists as to where they should proceed when traveling through an intersection. Travel corridor widths for bikeway boulevards need to accommodate multi-modal, bi-directional traffic usually consisting of both pedestrians and cyclists and should therefore reflect the same basic requirements of an off-road multi-use trail. A minimum width of 3.0 – 3.4 metres is recommended.

5.5 Contra-flow Bike Lanes

Contra-flow bike lanes on one-way streets carry cyclists in the direction opposite motor vehicle traffic. These lanes may be considered in locations where there are a series of one-way streets and no other feasible alternate cycling route connections exist. Design considerations such as lane widths, horizontal and vertical curves for contra-flow bike lanes are similar to those of standard bike lanes with the exception that signing along the route indicates that the lane is contra-flow. One-way streets with two-way cycling facilities allow cyclists to travel in both directions along the roadway with a contra-flow lane on the left side and a standard bike lane or shared roadway facility on the right. Exhibit 5.6 illustrates a typical schematic for a contra-flow bike lane.

St. John's has numerous streets, particularly in older core areas, located in a fairly indiscriminate pattern which can make both driving and cycling navigation difficult, especially for visitors. When coupled with the nature of a contra-flow bicycle lane, it is recommended that these be used sparingly in order to avoid user confusion but to maintain network continuance as may be needed.

Exhibit 5.6 Contra-flow Bicycle Lanes



Hatch Mott MacDonald

5.6 Paved Shoulders

A Paved Shoulder cycling route is located on roads with rural cross sections and no curbs. When off-road routes are not feasible or desirable, paved shoulders or bike lanes should be considered to establish key connections between adjacent systems and to facilitate utilitarian use. On rural roads, a marked edge line should designate a paved shoulder. Signs should also be used to indicate the presence of cyclists. Exhibit 5.7 illustrates a typical paved shoulder bicycle route facility.

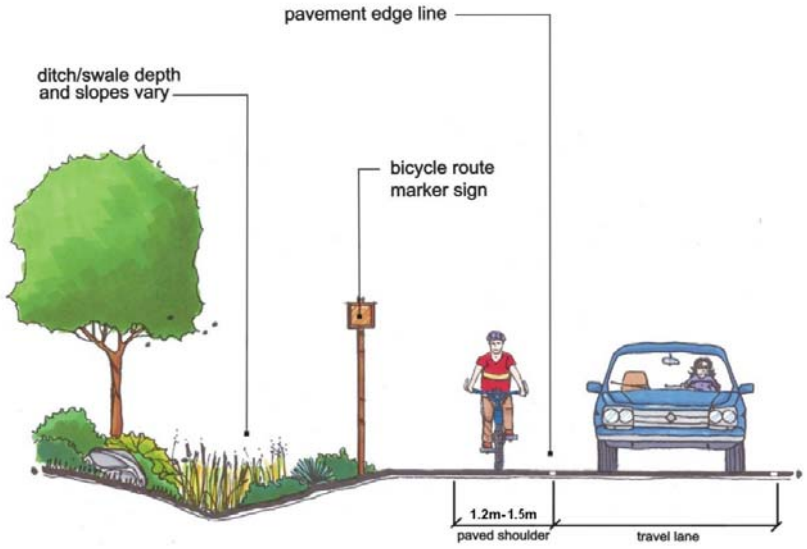


Exhibit 5.7 Typical Paved Shoulder

The TAC (Geometric Design Guide for Canadian Roads, GDGCR) provides standards for shoulder widths for undivided rural highways based on design speed and AADT volumes. Although these standards are not specifically intended to incorporate on-road cycling facilities, the widths recommended are in some cases sufficient to accommodate a 1.2m to 1.5m paved shoulder cycling route and 0.5 m to 1.0 m for additional granular shoulder width. On rural roads with speed limits in excess of 60 km/h, a 2.0m paved shoulder with and adjacent 0.5m granular shoulder width is preferred. Exhibit 5.8 illustrates the shoulder of a typical roadway platform.

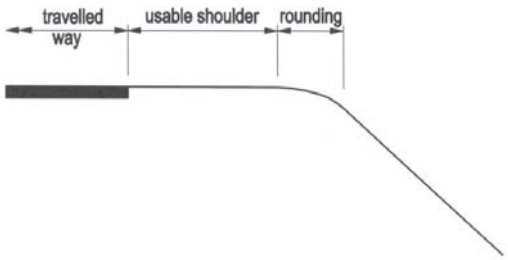


Exhibit 5.8 Typical Roadway Shoulder

Paved shoulder cycling routes should have a preferred design width of 2.5 m, including 1.5 m to 2.0 m of paved section and 0.5 m to 1.0 m of gravel shoulder. In locations where 1.5 m paved section for a paved shoulder cannot be achieved, especially in constrained rights-of-way, a minimum paved shoulder width of 1.2 m with an adjacent granular shoulder of at least 0.5 m is a reasonable compromise. If this cannot be achieved, any additional paved shoulder width is better than none at all in situations where no curbs are present.

The decision on whether to sign a road with paved shoulders that are less than 1.2 m in width as a signed-only bicycle route should depend on the AADT volume and percentage of commercial vehicle traffic that the road experiences, as well as a number of other factors such as roadway geometry, gradients, horizontal/vertical curves and sight lines. Some roads that do not have adequate paved shoulder widths may be designated as signed-only cycling routes if the roadway characteristics permit. Although not to be encouraged, if a paved shoulder width is significantly less than 1.2m, and a cyclist chooses to ride to the right of the edge line, an adjacent gravel shoulder would still provide a "recovery" area.

Paved shoulders also offer an added bonus in the reduction of maintenance costs associated with grading of gravel shoulders. They serve as a refuge for disabled vehicles, accommodate emergency vehicles and extend the life of the vehicle lanes through improving the lateral support for the roadway structure. They can also reduce run-off-the-road collisions. Paved shoulders are recommended on all arterial roads with rural cross sections designated for cycling facilities if exclusive bike lanes cannot be provided.

Paved shoulders on rural roads should not be denoted as reserved bicycle lanes since they must still be used as a refuge for disabled vehicles. If a rural road is upgraded to an urban section (with curbs) the paved shoulders should be converted into bike lanes.

5.7 Signed-Only Cycling Routes

Signed-Only cycling routes are typically installed on local / collector streets. Apart from "bicycle route" or "share the road" signs, there are generally no changes made to the roadway and no separation of a specific bicycle travel route indicated. Signed-Only routes are the least desirable facility type in terms of visibility, potential safety and willingness of new users to travel on them, but they are also the least infrastructure intensive and therefore, the least costly and time consuming network designation to implement.

It is recommended that paved shoulders or bike lanes be provided on all collector and arterial roads designated for cycling facilities which have an adequate ROW. However, Signed-Only Routes can be used on lower volume roads, or on collector or arterial roads or where a road segment has an insufficient ROW or where other constraints may exist.

Streets with signed-only cycling routes should typically only be signed as on-road bike routes if there is adequate pavement width to safely accommodate both motor vehicles and cyclists, and when adequate sight lines, road repair conditions and acceptable AADT volumes exist. Otherwise, alternative routes should be investigated or paved shoulders / bike lanes implemented when the opportunity presents itself at a future date. Roads that are presently not suitable for on-road cycling facilities but are recommended for installation in the future should be upgraded to at least minimum standards before being signed as part of the cycling network.

Signed-Only routes may also be implemented as a temporary measure across the network in place of other facility types if immediate construction is not possible. This is a highly visible yet relatively inexpensive method of delineating routes ahead of the construction of bicycle lanes for example and can be reasonably easily reversed when situations permit scheduled facility upgrades.

5.8 Signed Only Cycling Routes with Wide Curb Lanes

Signed-Only cycling routes within wide curb lanes are similar to signed-only cycling routes, with the exception that the travel lane shared by motorists and cyclists is wider than a standard motor vehicle travel lane (> 3.5 metres).

Wide curb lanes should have sufficient width to allow motorists to pass cyclists without encroaching on an adjacent travel lane (if one exists). Wide curb lanes should be encouraged for all road classifications to provide cycling friendly streets, whether they are designated as part of the cycling network or not.

Research indicates that as lane widths begin to exceed 4.0 m, this tends to increase confusion and improper lane use by motor vehicles in congested

urban environments, and may encourage unsafe passing maneuvers in rural environments. In general, it has been concluded that a wider lane will provide a greater level of safety than a narrower lane. The recommended wide curb lane width for roads that are proposed for designation as on-road cycling routes is 4.2 m and 4.5 m.

Signed-only cycling routes along wide curb lanes greater than 4.0m in width should have pavement markings added to the curb lane, such as those illustrated in Exhibit 5.9, to help to deter unsafe passing maneuvers by motorists and increase driver awareness of cyclists on the road. Bicycle route signing should also be applied along the cycling route in the same manner as for a standard signed route.

Exhibit 5.9 Wide Curb Lane with Bicycle Pavement Markings and Signing (City of Ottawa)

A schematic illustration of a typical signed-only cycling route in an urban area with a wide curb lane is provided in Exhibit 5.10

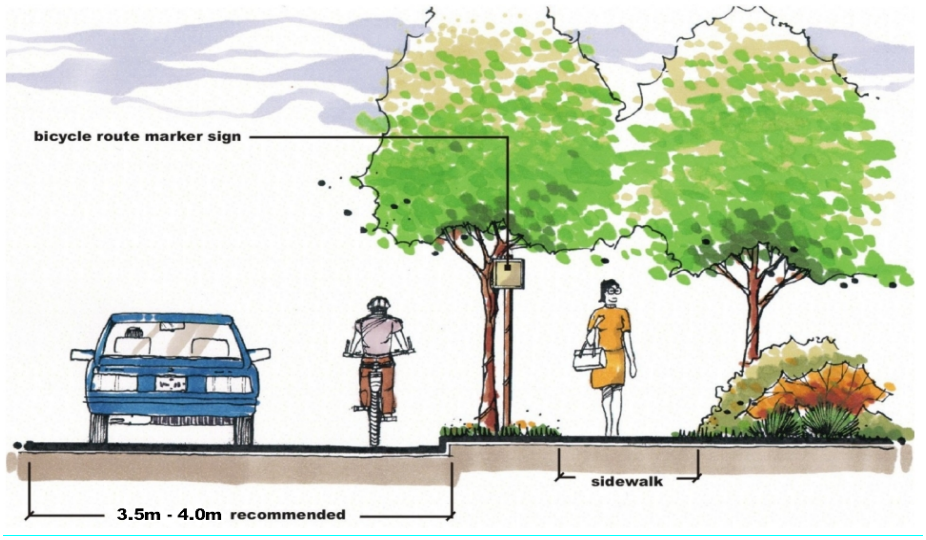


Exhibit 5.10 Signed-Only Cycling Route with Wide Curb Lane

5.9 Multi-Use Trails

A review of various multi-use trail design guidelines from across North America indicates that standards vary depending upon local geography and climate, the route's location, the anticipated number of users and the permitted uses. Multi-use trails represent the highest quality route of the Cycling Master Plan and should be designed with care to accommodate as wide a variety of users as possible (cyclists, walkers, wheelchair users, people with strollers, etc) while minimizing potential conflicts between them.

As a general approach gravel surfaces for multi-use trails are recommended for off-road segments of the proposed Cycling Network although it may be advantageous to pave selected sections of segments such as along Prince Philip Drive and Columbus Drive. This will accommodate as many users as possible in adherence with the objectives of this Plan. A gravel surface similar to existing trails will create a travel environment that is accessible for walkers, runners and cyclists but also for people operating strollers, and children on bicycles. Granular surfaces are naturally somewhat slower to travel on, and they are often associated with a more recreational environment.

It should be noted that hard surface routes are the most accessible for the growing number of elderly and more user-friendly for touring bicycles and long distance cycling based tourists and offer the additional psychological advantage of creating an easily used and highly visible route for commuters to take advantage of, however, this is not seen as necessary for the proposed City Cycling Network. Hard surfaces have an added legitimacy for users and in particular daily commuters.

Multi-use, bi-directional trails that are capable of accommodating cyclists should have a minimum width between 3.0m and 3.4m. On popular, heavily traveled multi-use trails, minimum widths of 4.0m to 5.0m are recommended to allow for a wider variety and greater number of users. As multi-use trails can accommodate all users and by their nature allow for minimal conflict with motorized vehicles, they should be considered as the preferred facility type for all routes in St. John's and especially within parks and open spaces as well as rural areas where sufficient space and construction opportunities exist.

Considering the variety of users of a multi-use trail, it is important that the route be viewed as a three dimensional corridor rather than only a surface facility. Sufficient clearance from trees and vegetation, overhead signs, public utilities and other features must be provided both in terms of horizontal measurements as well as vertical. CPTED considerations should also be a part of any multi-use trail design especially those located away from heavily traveled areas and public view. It is important that safety be a primary concern when developing detailed route designs but as has been mentioned previously, the creation of an enjoyable travel route is also vital. A balance must be struck between aesthetic and natural amenities and user safety. As a starting point, the recommended minimum clear height for a multi-use trail is 2.4m – 3.0m.

A typical cross-section for a multi-use recreational trail is illustrated in Exhibit 5.11.

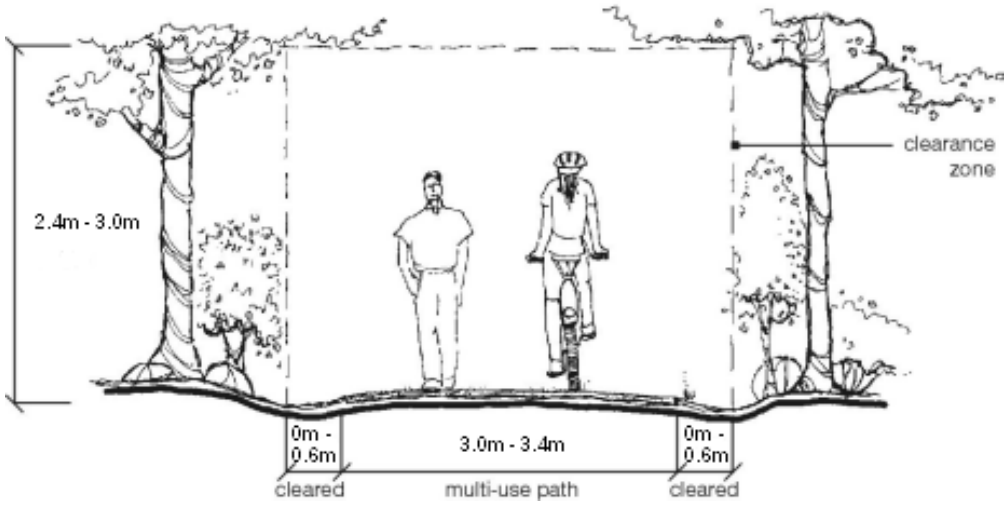


Exhibit 5.11 Off-Road Multi-Use Trail

In the case of St. John's, many recommended off-road multi-use trails which will form parts of the Cycling Master Plan are current Grand Concourse routes. Although these links represent an excellent opportunity to create a strong off-road cycling system, the trails as they now exist, may not have

been constructed to meet multi-use AT standards. As the network is constructed over a period of years, it is essential that any current off-road routes scheduled to be upgraded to cycling/multi-use standards consider the following design elements (Sections 5.9.1 – 5.9.4) during the detailed site assessment and design stages.

5.9.1 Route Alignment Elements

The alignment elements discussed in this section are based on requirements for cyclists since bicycle operations typically define the alignment elements of a multi-use off-road route. In general, route alignments for cyclists would also be sufficient for pedestrians and limited inline skating. Any routes intended primarily for pedestrian use and not part of the Cycling Master Plan can have lower minimum standards, especially with regard to horizontal curves.

Horizontal Alignment

With respect to horizontal alignments, the design of on-road cycling facilities is typically governed by the controls and design considerations for accommodating motor vehicles. The horizontal alignment of a roadway is the configuration of tangents plus circular and spiral curves.

Controls such as design speed, classification, topography, climate, traffic volumes and soils will influence the horizontal alignment of the roadway. Design considerations such as safety, driver expectation, cost, aesthetics and environmental factors are also taken into account. Roadway design standards set out in the TAC Geometric Design Guide for Canadian Roads with respect to horizontal curves, exceed the minimum requirements for cyclists. Although a number of existing roadways in St. John's proposed for bicycle facilities may not have been designed to current standards, it is expected that the existing horizontal alignment should be adequate to accommodate cyclists. Where this condition does not occur, appropriate signing should be considered.

The minimum radius of a curve on an off-road route depends on the bicycle speed, super-elevation and coefficient of friction between the bicycle tires and the bikeway surface. The following formula should be used to determine the minimum radius of horizontal curves:

$R=V2 / (127 \times (e + f))$

Where: R = radius, m
V = speed, km/h
e = super-elevation, m/m
f = coefficient of lateral friction.

For most applications and conditions, the coefficient of lateral friction varies from 0.3 at 25 km/h to 0.22 at 50 km/h, and for unpaved surfaces is reduced

to 50% of those of paved surfaces. Exhibit 5.12 provides the coefficient of lateral friction and minimum radius for a range of design speeds and super-elevation rates. Horizontal curves must be of sufficiently large radius to ensure that cyclists can safely negotiate the curve at the design speed. When horizontal curves are of very small radius, bikeway widening should be considered to compensate for the tendency of cyclists to track toward the inside of the curve.

Exhibit 5.12

Minimum Radii for Paved Trails

Design speed, km/h	Coefficient of lateral friction	Minimum radius, m	
		e=0.02 m/m	e=0.05 m/m
25	0.30	15	14
30	0.28	24	21
35	0.27	33	30
40	0.25	47	42
45	0.23	64	57
50	0.22	82	73

Source: Geometric Design guide for Canadian Roads, TAC, 1999. (TAC Table 3.4.5.2)

Widenings are not necessary for curves over a 32m radius, and will therefore not usually be a consideration for on-street routes. Exhibit 5.13 shows the recommended widening of the riding surface on curves. It should be noted that the Nova Scotia Trails Federation generally recommends that trails be widened by 61cm to 1.2m on curves.

Exhibit 5.13

Widening of the Riding Surfaces on Curves

Curvature (m)	Extra width required (grade = 0 to 3%)
24 to 32	250 mm
16 to 24	500 mm
8 to 16	750 mm
0 to 8	1,000 mm

Source: Technical Handbook of Bikeway Design, Velo Quebec, 1992. (Table 4.5, pg. 52 of Source)

Horizontal curves must also be checked to ensure that there are no obstructions located on the inside of the curve, which could block the cyclists' line of sight and reduce available stopping sight distance. Vegetation should be cut back such that it does not obscure the line of sight around a curve.

Vertical Alignment

With respect to on-road facilities, the vertical alignment or profile of a roadway defines the vertical dimension of the facility. In roadway design, standards regarding gradients, cross-slope, location of passing and climbing

lanes, vertical curves and clearances are defined by both the City of St. John's and TAC (Geometric Design Guidelines for Canadian Roads).

Generally, all vertical alignment standards with respect to roadway design are based on accommodating motor vehicles, and exceed the requirements for bicycles. Despite geographical challenges it is still expected that the vertical alignment of sub-standard roads will still be adequate to accommodate cyclists in St. John's.

Regarding off-road facilities, the minimum length of crest vertical curves for off-road, multi-use and/or bicycle routes depends on the minimum stopping sight distance for the design speed of the facility. This is calculated to satisfy the safety requirements of bringing a bicycle from full speed to a full stop when an obstacle is spotted on the cycling surface.

Exhibit 5.14 shows vertical curve lengths for different design conditions for paved surfaces under wet conditions. Stopping sight distances for unpaved surfaces should be adjusted accordingly to satisfy reduced lateral friction conditions equal to 50% of those for paved surfaces.

Above the line, stopping sight distances are greater than the curve length, and L=2S-274/A, where S = the minimum stopping sight distance from Table 2.3, A = the algebraic difference in grades in %. Below the line, stopping sight distances are less than the curve length and L=AS2/274.

Exhibit 5.14

Crest Vertical Curve Lengths

Change of Grade %	Minimum Curve Length, m — Design Speed, km/h								
	10	15	20	25	30	35	40	45	50
2	-	-	-	-	-	-	-	-	11
5	-	-	-	-	15	32	51	71	100
10	-	-	13	27	44	69	102	145	199
15	-	10	22	40	67	104	153	-	-
20	3	14	30	54	-	-	-	-	-
25	6	18	37	-	-	-	-	-	-

Source: Geometric Design Guide for Canadian Roads, TAC, 1999. (TAC Table – 3.4.5.4)

Exhibit 5.15 provides a guideline on the extra cycling route width that may be required on grades as a function of steepness and length.

Exhibit 5.15

Extra Cycling Route Width Required on Grades

Grade, %	Length, m		
	25-75	75-150	150+
3-6	-	20 cm	30 cm
6-9	20 cm	30 cm	40 cm
9+	30 cm	40 cm	50 cm

Source: Technical Handbook of Bikeway Design, Velo Quebec, 1992. (Table 4.3, p. 50 of Source)

Cross Slope

Cross slope is necessary to provide positive drainage of a trail surface. A route may have a crown or continuous cross slope. It is preferable to use a balanced cross slope on two-way trails for drainage purposes, and also to direct cyclists to the right side of the route. Typical cross slopes depend on the surface type. Exhibit 5.16 provides guidelines on typical cross slopes

Exhibit 5.16

Typical Cross Slopes

Surface	Range of cross slope
Concrete	1.5% to 2%
Asphalt	2% to 4%
Gravel, crushed stone, earth	2% to 4%

Source: Geometric Design Guide for Canadian Roads, TAC, 1999. (TAC – Table 3.4.6.4) Bikeway Design Guidelines

5.9.2 Sight Distance

Stopping sight distances for off-road trails should be governed by the distance required for cyclists since pedestrians can typically stop nearly immediately while walking or jogging, regardless of the trail configuration. Although wheelchair users cannot typically stop as immediately as pedestrians, the distance required for persons in wheelchairs or other mobility devices is often much less than that required for a cyclist since persons using these mobility devices do not travel as fast as cyclists.

Therefore, basing stopping distance on the distance required for a cyclist would in essence accommodate all other expected network users. The minimum stopping sight distance for cyclists, both on-road and off, is the distance required to bring a bicycle to a full controlled stop upon spotting an obstacle. It is a function of the cyclists' perception and reaction time prior to braking, the initial speed of the bicycle, the coefficient of friction between the tires and the trail surface, and the braking capacity of the bicycle.

Exhibit 5.17 illustrates minimum stopping sight distances for a range of speeds and grades for bicycles. It is based on 2.5 seconds of perception-reaction time and a coefficient of friction (f) of 0.25 that accounts for paved surfaces during wet weather plus typical braking characteristics of bicycles. The coefficient of friction for unpaved surfaces should be reduced to 50% of those for paved surfaces.

Exhibit 5.17

Minimum Sight Stopping Distances

Grade %	Design Speed (km/h)								
	10	15	20	25	30	35	40	45	50
	Minimum Stopping Sight Distance (m)								
+12	8	13	18	-	-	-	-	-	-
+10	8	13	18	24	-	-	-	-	-
+8	8	13	19	25	32	-	-	-	-
+6	8	13	19	25	32	40	-	-	-
+4	8	13	19	26	33	41	49	-	-
+2	8	14	20	26	34	42	51	61	-
0	9	14	20	27	35	44	53	63	74
-2	9	14	21	28	36	45	55	66	77
-4	9	15	21	29	38	47	58	69	81
-6	9	15	22	30	39	50	61	73	86
-8	9	16	23	32	42	53	65	68	92
-10	10	16	24	34	44	56	70	84	100
-12	10	17	26	36	48	61	76	92	110

Source: Geometric Design Guide for Canadian Roads, TAC, 1999. (TAC Table 3.4.5.1)

5.9.3 Off-Road Barriers

Barrier protection may be required along a multi-use, off-road trail for a number of reasons: to protect the trail, the user or the natural environment. Most commonly, fence or railing type barriers are provided to protect users from dangerous situations or to discourage access to sensitive areas. In the case of St. John's and their potential use on Grand Concourse trails, barriers may also be used to separate portions of the system which are designated as part of the Cycling Network from those which are purely pedestrian based.

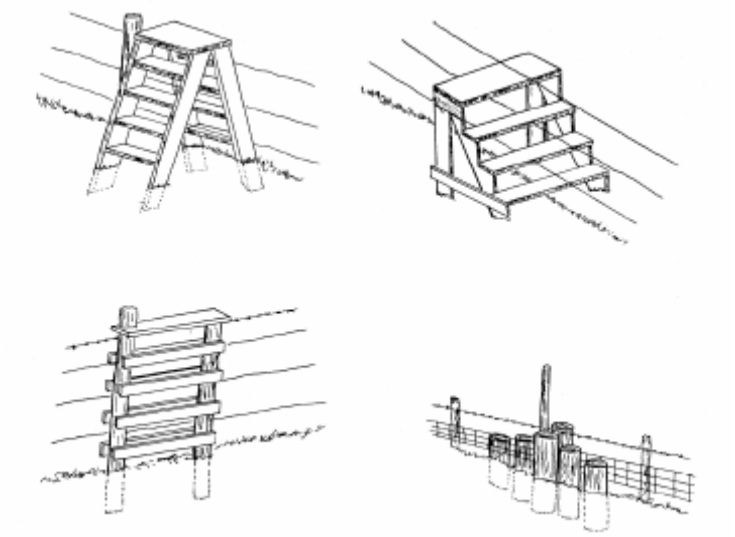
To prevent access by unauthorized users such as motor vehicles, barriers should be installed at trail entrances. Barriers should be clearly marked and visible, otherwise they can become a hazard to trail users. Trailside signage alerting users of the upcoming barriers should be appropriately located to provide adequate time to slow down and/or stop as required. Care should be taken to ensure that barriers do not make access difficult for those with disabilities or for inexperienced users wherever possible. The Nova Scotia Trails Federation recommends five different types of barriers: bollards, gates, fences, stiles and "dodgeways".

Bollards should be located at trail access points where vehicle access must be restricted. Where it is required that maintenance or emergency vehicles have access to trails, a collapsible or knockdown bollard is a suitable alternative. In a natural situation, timber bollards are preferred; metal is suited to urban environments. Bollards should also have reflective surfaces facing a cyclist's direction for night time visibility and be generally easily visible during daylight hours as well.

Swinging gates can be used to prevent motorized vehicles (including ATV's) from accessing trails, but do not prevent many other activities unless locked. Gates should be easy to open and should be well marked, particularly for night time visibility. Railings and fences are required to protect the user from a hazardous situation, and should be constructed to conform to local building codes. Timber or stone construction is best suited to natural situations while metal or a combination of wood, metal and in some situations stone may be more appropriate for urban and heavy use areas. Stiles provide access to the other side of a fence along a trail. While allowing hikers/walkers to cross the fence, it prevents other undesired users from doing so. Stiles may be particularly suited to separation of cyclist and pedestrian traffic in St. John's.

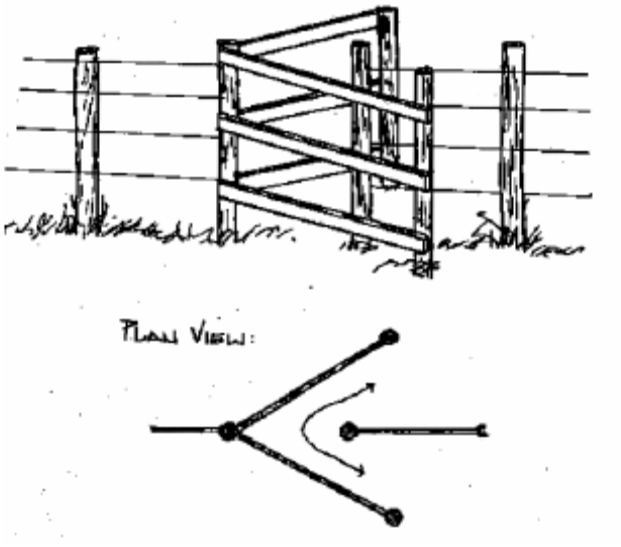
Four examples of stiles from the Nova Scotia Trails Association are provided in Exhibit 5.18

Exhibit 5.18 Typical Stile Examples



Similar to a stile, a dodgeway acts as a break in a fence and allows selected AT users to pass through. Landscaping treatments such as the strategic placement of stones can also provide a natural barrier that can successfully deter undesired access. Exhibit 5.19 provides an example of a dodgeway.

Exhibit 5.19 Dodgeway Example

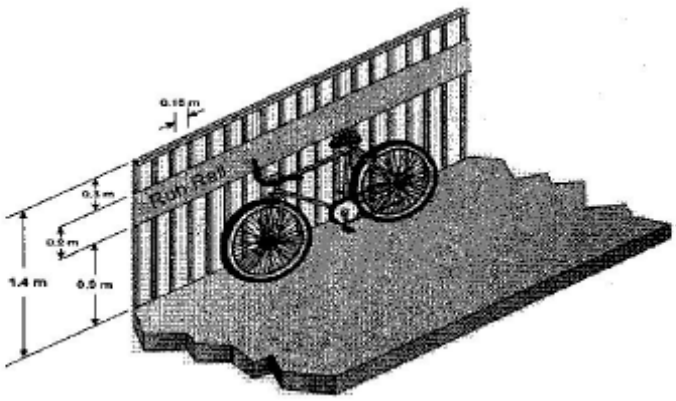


Overall, while physical barriers and user controls may be necessary to implement at certain points in the Cycling Network, it should also be remembered that user education and respect for other AT travel types is a vital factor in creating a system that is both enjoyable and has a minimum of conflicts.

5.9.4 Rub Rails

Along off-road multi-use trails or bridges with railings, a "rub-rail" should be provided to prevent cyclist's handlebars from catching the vertical supports of the railing. Exhibit 5.20 illustrates a "rub-rail" from the 2003 Bicycle Facility Design Guidelines of the City of Nanaimo. A rub-rail should be a minimum 20cm strip of smooth surfacing along its length, laced at a height ranging between 0.90 m and 1.1 m.

Exhibit 5.20 Rub Rail



5.10 Bridge Standards

The design of new structures or the modification of existing bridges must now comply with the standards of the Canadian Highway Bridge Design Code (2002). The following is an excerpt relating to the structure geometry:

"Roadway and sidewalk widths, curb widths and heights, together with all other geometrical requirements not specified in the Code, shall comply with the standards of the Regulatory Authority, or in their absence, with the TAC Geometric Design Guide for Canadian Roads."

"Sidewalks and cycle paths shall be separated from traffic lanes by a barrier or guide rail, or by a curb having a face height of at least 150 mm and a face slope not flatter than one horizontal to three vertical. Sidewalks and cycle paths not so separated shall be designed as part of the roadway."[11] While not specific to off-road cycling facilities, it is recommended that the same guidelines are followed wherever possible.

The TAC Geometric Design Guide for Canadian Roads and the Canadian Highway Bridge Design Code do not provide details on the side clearances required on bridge decks. Side clearances are the distance between the edge of the traveled way and adjacent curb or barrier. Where side clearances on a bridge are wider than the approach roadway shoulder width / side clearance, the bridge side clearance should match that of the approach roadway.[12]

Given that the Canadian Highway Bridge Design Code does not prescribe structure clearances and cross section dimensions, examples of best practices are provided from the Ontario Ministry of Transportation's (MTO) August 2002 document, "Revision Information Sheet for Geometric Design Standards for Ontario Highways".

Section D.7.2.3 of this document, which now forms part of the Geometric Design Standards for Ontario Highways, provides the following direction with regard to sidewalks, curbs and bicycle routes on bridges.

- Where required, the widths of sidewalks and bicycle routes on bridge decks should meet the following requirements:
- The edge of a sidewalk adjacent to the roadway on a bridge should match that of the approach sidewalk.
- Where the approach roadway is not provided with a curb, the sidewalk width should be at least 1.5 m.

[11] CAN/CSA-S6-00 Canadian Highway Bridge Design Code, Section 1.6.2.1
[12] Revision Information Sheet for Geometric Design Standards for Ontario Highways, Section D.7.2.2.

- Where paved bike lane and bicycle route are incorporated, widths should be in accordance with the Ministry's Ontario Bicycle Routes Planning and Design Guidelines.

- Bicycle routes should be at least 1.5 m wide for one-way traffic.

- The height of curbs should not be less than 150 mm above the adjacent roadway except to match the height of curbs on the approach roadway.

- Curbs should not be used in conjunction with barrier walls except where the curb and the barrier wall are separated by a sidewalk. [13]

Section D.7.2.5 of the same source also states that where practicable, underpassing roadway cross-sections should match that of the approach roadway. Horizontal clearances from the edge of the through traveled way to the face of an abutment or pier should also meet or exceed the minimum clear zone widths specified in the Ministry's Roadside Safety Manual.

Exhibit 5.21 sets out the minimum side clearances at bridges prescribed by MTO.

Exhibit 5.21 Minimum Side Clearances at Bridges

		Urban Roads			Rural Roads		
	Design Speed (km/h)	Left	Right		Left	Right	
			No Sidewalk	Sidewalk		No Sidewalk	Sidewalk
FREEWAY 4-LANE DIVIDED	100 to 120	2.5a	3.0 a		2.5a	3.0 a	
FREEWAY MULTI-LANE DIVIDED	100 to 120	2.5 a	3.0 a		2.5 a	3.0 a	
ARTERIAL DIVIDED	90 to 110	2.0 a	2.5 a	1.5	2.0	3.0 a	
	80	2.0 a	2.5 a	1.5	1.5	2.5 a	
ARTERIAL UNDIVIDED	90 to 110	-	2.0	1.5	-	3.0 a	2.5 a
	80	-	2.0	1.5	-	2.5 a	2.0 b
COLLECTOR UNDIVIDED	90 to 100	-	1.25 c	1.0	-	2.5 a	1.5 c
	70 to 80	-	1.25 c	1.0	-	1.5 d	1.25
	60	-	1.0	1.0	-	1.5 d	1.25
LOCAL UNDIVIDED	60 to 80	-	1.0	0.5	-	1.25	0.5 d

Notes:
1. If a barrier is to be placed between the sidewalk and roadway, then clearance should be the same as when there are no sidewalks.
2. All clearance should meet requirements for sight distance.
3. The width of a median on a bridge should match that of the approach roadway.
4. L = Length of bridge between centreline of abutment bearings.

a - For bridges with L>50 m, consideration can be given to decreasing the clearances to 1.5 m.

b - For bridges with L>50 m, consideration can be given to decreasing the clearance by up to 0.5 m.

c - For bridges with L>50 m, consideration can be given to decreasing the clearance by 0.25 m.

d - For bridges with L>50 m, consideration can be given to increasing the clearance by up to 0.75 m.

e – The values of the clearances given above are the minimum values. Consideration may be given to providing more than the minimum if justification is provided.

[13] Revision Information Sheet for Geometric Design Standards for Ontario Highways, Section D.7.2.2.

Source: Ontario Ministry of Transportation, Geometric Design Standards for Ontario Highways, Revision Information Sheet, February 8, 2002, Table D7-1, pg. D7-2.

Additional guidance is provided by the Ministry's Ontario Bicycle Routes Planning and Design Guidelines (1996). The following is an excerpt from this provincial guideline reference related to accommodating cyclists on existing bridges:

To allow cyclists to cross an existing bridge safely, the structure may require alterations to provide adequate width for all bridge users. A bicycle route can be routed across the bridge in one of three ways:

1. Creating a bike lane or shoulder bikeway on the traveled way;
2. Reserving a sidewalk for cyclists only, or for shared use with pedestrians if there is adequate width; or
3. Widening the roadway to permit shared use of the right lane by motor vehicles and bicycles.

The creation of a bike lane on a bridge is an option if the bridge has shoulders, or if the traffic lanes are wide enough to permit the creation of a wide curb lane to accommodate bicycles on the traveled way.

5.11 Advance Stop Bars and Bike Boxes

The issue of the safety concerns of cyclists in St. John's was raised multiple times during the course of the project. In addition to structural concerns with things such as hazardous road drainage grates, there is a generalized feeling that the Cycling Master Plan should address the issue of bicycle – motor vehicle conflict in order to provide for more driver awareness of cyclists and to assist with the understanding that bicycles are road vehicles which have a legitimate place in the transportation system.

The following two options may be implemented in particularly high traffic or problem intersections which may require that bicycles receive higher visibility than they normally might or in situations where the needed movements of bicycles may need a structural element to operate efficiently. Advanced stop bars and bike boxes may be considered at locations here cyclist volumes are high and measures are being considered to give cyclists more priority at intersections, for example by adjusting signal timings or phasing sequences.

Advanced stop bars allow cyclists to stop closer to the intersecting roadway than other motor vehicles by placing the bicycle stop bar about 2 m closer to the cross street than the stop bar for other motor vehicles. This practice allows cyclists to be more visible to motorists that are queued at a traffic signal, and also to get a "head-start" or queue-jump" over motorized traffic. Exhibit 5.22 illustrates the application of an Advanced Stop Bar.

Exhibit 5.22 Advanced Stop Bar - Australia

Bike Boxes are used at locations where left-turning cyclist volumes may be very high approaching an intersection. In this situation, the motor vehicle stop bar is set back approximately 4 m, helping cyclists move from the curb lane and turn left by positioning themselves in front of the motor vehicles. Exhibits 5.23 and 5.24 show applications of bike boxes at intersections. It should be noted that the application of bike boxes restricts right turns on red displays for motor vehicles.

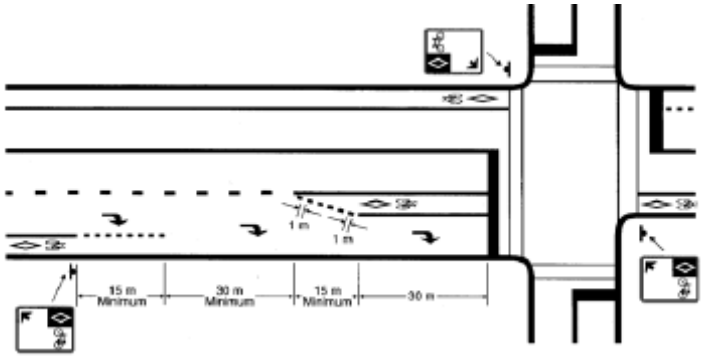
Exhibit 5.23 Bike Box – NYC, USA

Exhibit 5.24 Bike Box – London, UK

5.12 Bike Pockets

"Bike pockets" can be defined as a discontinuous dedicated space on he traveled portion of the roadway intended for use by cyclists that are delineated by pavement markings. An example of a bike pocket used in conjunction with a bicycle lane is illustrated in Exhibit 5.25

Exhibit 5.25 Bike Pocket



Source: Bikeway Traffic Control Guidelines for Canada – TAC, 1998, Figure 3.

It should be noted that bike pockets have been effectively used in a variety of locations where no bike lanes are present or where a bicycle lane ends. The most common use for a bicycle pocket is to show where cyclists should position themselves when adjacent to a right turn lane or a right turn channel.

The critical dimension, as illustrated in Exhibit 5.25 is the 60m segment between end of the curbside bike lane and the beginning of the bike lane on the left side of the right turn lane. This minimum 60m transition zone should be maintained between the curbside cycling facility and the bike pocket, left of the right turn lane / channel, whether the curbside facility is a bike lane, paved shoulder or signed only route.

5.13 Cycling Routes at Intersections

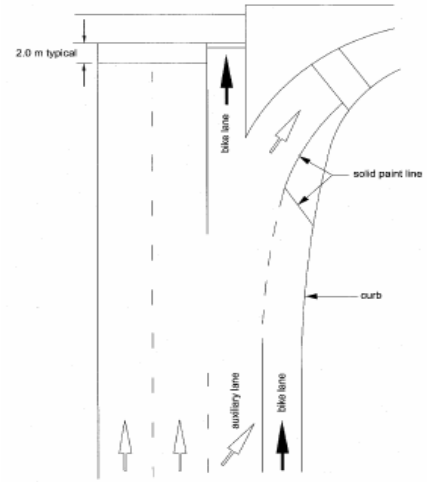
Intersections are the most likely area for conflicts between various users of the roadway and care should be taken to design and mark the intersection approach such that all users understand and can anticipate the potential movements of other road users. This is particularly true for cyclists as many drivers may not be expecting to navigate an intersection accounting for anything besides automobile traffic on the roadway. In addition to the techniques outlined in Sections 5.11 and 5.12, general intersection treatments should adhere to the following design guidelines.

One of the most common conflicts at intersections occurs between right turning motor vehicles and cyclists proceeding straight through, since it is necessary for these two road users to cross paths. Pavement markings and appropriate signing should be installed at intersections to encourage such crossings in advance of the intersection, rather than within it (e.g. through the provision of an exclusive right-turn lane or an advanced stop bar for cyclists). Left turning cyclists must also undertake a similar weaving maneuver through vehicular traffic. Cyclists may elect to undertake a "vehicular style" left turn by using the motor vehicle left turn lane, or they may choose to complete a "pedestrian style" turn by proceeding straight through the intersection, then turning left to cross again on the intersecting road.

In the case of both paved shoulders and bike lanes, pavement markings should change from a solid to a broken line on the approach to the intersection. Alternatively, though not preferred, the bike lane can be discontinued if there is insufficient pavement width. The bike lane or edge line markings should be discontinued at the start of the taper when right turn lanes or channelizations are provided, or otherwise a broken line should be used, a minimum of 30 m from a signalized intersection and 15 m from an unsignalized one. This allows cyclists to merge with other traffic and prevents right turning motorists from having to cross through a bike lane to make their turn, thereby cutting off cyclists at the intersection. By discontinuing the solid bike lane / edge line pavement marking, both the cyclists and motorists are made aware of the fact that they are sharing a common lane and should react accordingly.

Exhibit 5.26 illustrates a recommended intersection configuration with on-road bike lanes or paved shoulder cycling facilities taken from the Ontario Traffic Manual. Although the OTM is a guidebook for Ontario, it can also be applied to situations in St. John's.

Exhibit 5.26 Intersection Treatment #1

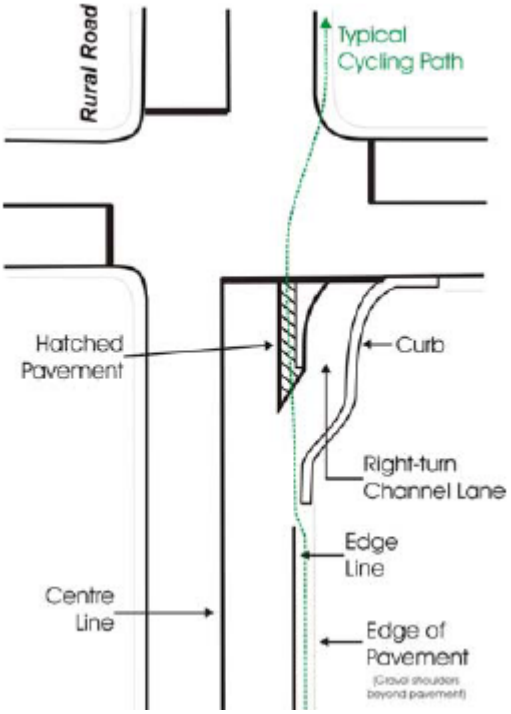


Hatch Mott MacDonald

While paved shoulders may be designated as cycling facilities, there are also paved shoulders that are not specifically designed for cyclists but are used by them. Paved shoulders that are not designed as specific cycling facilities either have no pavement marking treatment, or have pavement markings applied for other uses not related to cycling facilities. For example, if a rural road with a paved shoulder along its length has a curb added on its approach to an intersection, and a right turn channelization lane is also present without a deceleration zone, the paved shoulder would typically end at the point where the right-turn channel begins. The remaining section of roadway leading to the stop bar is then marked with cross-hatching.

Exhibit 5.27 illustrates this situation. Cyclists would typically ride in this hatched section, but it is not designated as a cycling facility.

Exhibit 5.27 Intersection Treatment #2



This "hatched" pavement area typically forms a substandard cycling facility and is not intended for cycling use. However, cyclists will often use this area regardless. In these situations, St. John's would not be responsible for cyclists using such shoulders since they are not designated cycling facilities, and this may be reflected in the design through the use of inappropriate pavement markings or inadequate width to deter cycling use.

If the width of the hatched area is less than 1.2 m, it should not be designated as an on-road cycling facility. However, if the width of the hatched area is equal to or greater than 1.2 m, consideration may be given to removing the

hatch striping and applying bicycle stencils, diamonds and arrows to designate the area as a bike lane. This, however, is dependent on the type of cycling facility that is present on the approach to the intersection and on the far side. If sub-standard cycling facilities were present on the approach and far side of this short bike-lane, it would not make sense to designate the "hatched area" as a bike lane since it would be a stand-alone segment that is not connected to any other formal cycling route.

If a situation arises where bicycle lanes along roadways become substandard in widths at intersections due to spatial constraints, all pavement markings and official delineations of the lane should end and be replaced with bicycle route signage at the intersection. It is recommended that if an intersection with substandard widths is upgraded at any point in the future, accommodations be made to incorporate space for bicycle lanes at that time.

5.14 Signage

It is recommended that all routes included in the system be signed with a common themed visual indicator or indicators. Indicators may include such things as a Trail/Bikeways logo, a common colour scheme and/or a particular shape of signage to be used throughout with the primary purpose of visually linking routes into the larger system and providing an easily identifiable cue for users. One advantage of choosing a logo as opposed to text as a system identifier is that it is universally understandable and not reliant on language.

When choosing a system identifier, simplicity is advantageous over complexity and, if possible, something transferable from colour to black and white is desirable in terms of multi-media applications and use. Many well known corporate brands offer examples of successful identifier design. Care should be taken to avoid multiple signs in a single location and/or signage with excessive amounts of detail. Cyclists generally need only a few pieces of key information such as the direction they are moving, identification of the route they are traveling and so on as they move through the network. More detailed information is better presented at rest stops and gateway locations.

Bicycle Route signs can be used to "brand" or identify routes that constitute the system. This type of sign may be designed in various sizes depending on its intended application. Designation signs may be mounted alone or with other signs at logical, highly visible locations on both on and off-road network route segments. The National Capital Commission (NCC) has been very successful at "branding" the Ottawa Area's Capital Pathway network through its signing system. An example of an NCC pathway sign is shown in Exhibit 5.28.

Exhibit 5.28 NCC Branding Sign

Way-Finding signs may include the network logo or "brand" and communicate other information to AT users such as directional arrows and distances in kilometres to major attractions, trail access points and settlement areas. Way-finding signs should be mounted on standard sign poles and be located on all legs of an intersection or off-road trail junction, as well as at gateways. Way-finding signs should also be integrated with any printed versions of the Cycling Plan for public use to provide clarity and a consistent look.

Regulatory signs are intended to control particular aspects of travel and use along the road or off-road AT system. Signs restricting or requiring specific behaviour is not legally enforceable unless it is associated with a provincial law or municipal by-law. Where applicable, it is recommended that authorities discreetly include any applicable by-law number on signs to reinforce their regulatory function.

Warning signs are used to highlight bicycle route conditions that may pose a potential safety or convenience concern to AT system users. Examples are steep slopes, railway crossings and surface changes. These signs are diamond in shape, with a black legend on a yellow background. Exhibit 5.29 illustrates examples of warning signs.

Exhibit 5.29 Examples of Warning Signs

Interpretative signs provide specific information about points of ecological, historical, cultural and general interest, as well as current land uses along the system. They represent a broad range of possible sign formats and applications, depending on the interpretative program and complexity of information to be communicated.

In order for a particular route segment to be designated as a bicycle route, it should be signed as such to create safe and user-friendly routes. There may also be legal liability issues if a route is designated as a bike route, but is not signed. In order to maximize the ease of understanding for system signage, signage for routes in St. John's should be both consistent in type and format as well as visually linked through a prominent system identifier/logo. It is recommended that the City consider implementing TAC (Transportation Association of Canada) recommended advance trail crossing signs at mid-block locations where grade or sign line concerns exist.

5.15 Snow Clearing

The issue of winter maintenance of on and off-road cycling systems can be contentious as the decision not to maintain network routes effectively closes the system for much of the year while the decision to plow, salt/sand and generally maintain a year-round cycling network in northern climates carries significant associated costs and liability concerns. The locations of on-road facilities such as paved shoulders and bicycle lanes are also often currently used for snow storage during roadway plowing and the plowing of off-road trails can require specialized equipment due to their more remote locations and access requirements.

Refraining from a heavy snow clearing and maintenance schedule on off-road trails allows recreational walkers and cross-country skiers to continue to use and enjoy the trail systems while not expending significant resources to accommodate what may be a small winter cyclist or utilitarian pedestrian user group at these times. For these reasons, it is recommended that the St. John's Cycling Network not be maintained through the winter months

excepting select, higher use, off-road links as may be determined at a later date. In order to promote the safe use of the network the City should include statements on any cycling publications warning users that routes will not be maintained from month A to month B or during severe weather events.

Select off-road multi-use trails may receive snow clearing only when they form an essential segment of the urban network linking into sections of the on-road network for pedestrian use, (sidewalks) and/or if highly used. In order to limit potential liability for the majority of the off-road network not designated to receive snow and ice removal services, the City should erect seasonal signs each winter advising that trails are not maintained and the public uses them at their own risk. This could also be achieved through inclusion of warnings on permanent network signage.

Following the end of winter, AT use can be delayed due to accumulated piles of snow that may be present in locations where the sun does not reach until later in the season. Should a small section of the AT system be blocked by snow and debris accumulation, it could effect an entire area. Several weeks of system use could be added to the year with one well-timed snow and debris cleaning per year that would effectively open up much of the system to Spring use.

5.16 Bicycle Parking

Bicycle parking facilities are an important tool for encouraging more bicycle use and increased users of the network. A lack of adequate parking supply or type can deter many from considering using their bicycle as a basic mode of transportation. There are four basic components to providing effective parking for bicycles that should be considered in St. John's.

They include:

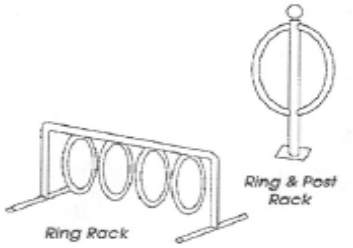
- The bicycle rack element;
- The rack;
- The rack area; and
- The rack area site.

1. Bicycle Rack Element

The bicycle rack element is the portion of a bike rack that supports the bicycle. Bicycle rack elements can be joined on any common base or arranged in a regular array and fastened to a common mounting surface. The racks may be used to accommodate a varying number of bicycles securely in a particular location. Examples of various types of available bicycle rack designs include the "Ring" rack and the "Ring and Post" rack. Exhibit 5.30 illustrated these particular rack designs. Other designs can run into the more flamboyant and whimsical but care should be taken to ensure a rack element

that is compatible with the site, durable, simple for cyclists to use and safe for potential conflicts with automobiles and pedestrians.

Exhibit 5.30: Bicycle Rack Designs



The rack element should:

- Support the bicycle upright by its frame in two places;
- Prevent the wheel of the bicycle from tipping over;
- Enable the frame and one or both wheels to be secured;
- Support bicycles without a diamond-shaped frame with a horizontal top tube;
- Allow front-in parking: a U-lock should be able to lock the front wheel and the down tube of an upright bicycle; and
- Allow back-in parking: a U-lock should be able to lock the rear wheel and seat tube of the bicycle.

Bicycle racks should not only allow for a secure lock between the bicycle and the rack, but should also provide support for the bicycle frame itself. The rack element should also be designed to resist being cut or detached by common hand tools such as bolt and pipe cutters, wrenches and pry bars.

2. Bicycle Rack

Bicycle racks should consist of a grouping of the rack elements either by attaching them to a single frame or allowing them to remain as single elements mounted in close proximity to one another. Racks, whether as single units or grouped together, should be securely fastened to a mounting surface to prevent the theft of a bicycle attached to a rack. Another alternative is to create a bicycle rack that is so large that it cannot be easily lifted or moved from its position with bicycles attached.

Easy and independent bike access should be provided to the bicycle rack. Inverted "U" rack elements should be mounted in a row and placed on 750 mm (approximately 30") centres to allow enough room for two bicycles to be secured to each rack element. Bicycle racks should be arranged in a way that is quick, easy and convenient for a cyclist to lock and unlock their bicycle.

3. Bicycle Rack Area

This refers to what is essentially the "bicycle parking lot" and includes the area where more than one bicycle rack is installed. Bicycle racks are separated by aisles, much like a typical motor vehicle parking lot. The recommended minimum width between aisles should be 1.2 m to provide enough space for one person to walk with one bicycle. Aisle widths of 1.8 m are recommended in high traffic areas where many users may retrieve their bicycle at the same time, such as after a school class. A 1.8 m depth should be provided for each row of parked bicycles since conventional bicycles are just less than 1.8 m long and can be accommodated in that space.

Rack areas with a high turnover rate of arriving and departing cyclists such as in high traffic trailheads, tourist attractions or educational facilities should ideally have more than one entrance to help facilitate user flow. If possible, the rack area should be sheltered to protect the bicycles from the elements and may be developed in conjunction with AT trip staging areas and amenities.

4. Bicycle Rack Area Site

Bicycle racks area sites are generally designated to serve urban or built up areas as opposed to rural areas due to the common behaviors of urban and rural cyclists. The exception may be locating rack sites near to major destination points such as trailheads, tourist attractions or rest sites that experience high user volumes and are also of a nature which encourages cyclists to stop for more extended periods while knowing their bicycles are secure.

In general, most rural cyclists are traveling significant distances without stopping to do things such as shop, etc. and if they do choose to stop it is often in are area of low population and pedestrian traffic. In these cases, cyclists may not perceive bicycle security to be of a major concern and may ignore any racks provided.

Urban area bicycle rack sites should be located to serve higher density buildings, shopping areas, major pedestrian streets, recreational destinations, employment zones, and institutional facilities such as schools and government offices with an emphasis on high traffic, visible sites so as to increase passive security. CPTED principles should be consulted prior to the creation of any new rack site. Bicycle racks should be placed as close as possible to the entrance that it serves, but not in a location where they would inhibit pedestrian flow in and out of any building or in violation of any fire or safety codes.

Urban rack areas should be no more than 15 metres from a building entrance, and should be clearly visible along a major building approach line. Bicycle

rack areas that are hard to find or that are located far from a building entrance are generally perceived as vulnerable to vandalism and will generally not be used by cyclists to a significant degree. To encourage use of a bicycle rack by cyclists, the rack site should be clearly visible and well lit if within urban areas. Lighting may be forgone if sites are located in more rural parts of the network.

Multiple buildings in an area should not be served by one larger, distant bike rack. Rather, smaller bike racks should be placed in a convenient location at each building, but not in a manner that would obstruct utility access openings, garbage disposal bins, doorways or other building access points. Bicycle racks can be placed on concrete, asphalt or brick surfaces and should be securely fastened to the surface to prevent shifting or removal. If they cannot be fastened to the surface, then they should be large and heavy enough so that they cannot be easily moved.

Bicycle racks placed on grass surfaces typically cannot be securely fasted to the ground or suffer from footing erosion over time especially in areas prone to flooding or runoff. If placed on grassed surfaces, they should also be heavy enough so that they cannot be moved and not be of a material that floats if within a floodplain. To avoid excessive bicycle riding on the grass, bicycle racks should only be placed on grass surfaces located within close proximity to a paved or granular surface cycling route, such as on off-road multi-use trail, or an on-road route. Bicycle racks on grass surfaces should be considered temporary, and every effort should be made to relocate them to a permanent, hard surface area.

Bicycle racks should not be placed within the following areas:

- Bus loading areas;
- Goods delivery zones;
- Taxi zones;
- Sensitive environmental areas;
- Emergency vehicle zones;
- Hotel loading zones;
- Within 4.0 m of a fire hydrant;
- Within 2.5 m of a driveway or access lane; and
- Within 10.0 m of an intersection.

6 Implementation and Education

6.1 Policy Direction Recommendations

The Cycling Master Plan will require a series of implementation policy decisions at varying levels in order to successfully become part of the development "culture" within the Municipality. In order to facilitate the development of this new corporate culture and as larger scope policy directives to assist with the implementation of the Cycling Master Plan, the following policy recommendations are put forward for immediate consideration upon approval of the Plan.

1. The vision, goals and objectives contained in this report should be formally adopted by St. John's City Council and be reviewed on an annual basis during implementation. To facilitate implementation, the Route Selection Evaluation Criteria (Exhibit 3.1) should be either formally or informally adopted as an internal policy document and planning tool for use in the detailed route planning stages.

2. Public Transit organizations (i.e. Metro Bus) within the City of St. John's should make cycling and other AT modes more convenient and less risky by removing barriers to walking and cycling and improving connections to the Cycling Network wherever possible.

3. Design guidelines contained in Section 5 of this report should be formally adopted as an internal planning and design tool to guide network implementation and to establish set standards of AT development. The design guidelines should be implemented on a case by case basis.

4. Recreational trail routes not included in the official Plan as well as unofficial "extreme cycling", hiking, and other AT related areas currently in use by residents and visitors should be examined in relation to the Plan and determined if feasible for possible future inclusion in some form. This evaluation may also include more urban AT uses such as skateboard parks if demand for their use is deemed sufficient.

5. The City of St. John's should tailor and implement a system of monitoring cyclists as well as pedestrians and automobile drivers with the goal of increasing trips and general use by residents and visitors as the Plan implementation moves forward. The focus should be on gaining insights into the evolving desires of cyclists and as outlined in Section 4.4, the mitigation of potential conflicts between users.

6. An interdepartmental Cycling Implementation Advisory Committee should be established by the City of St. John's early in the implementation process to ensure compliance with the Cycling Master

Plan and to discuss budget requirements and partnering opportunities annually.

7. Efforts should be made to secure potential funding sources for the implementation and expansion of the cycling network as soon as possible and utilizing private, government and non-governmental sources.

8. The City of St. John's should identify possible key geographical areas as soon as possible and commence formal discussions with private land owners to secure easements, options or agreements of purchase and sale where any network connections may be required.

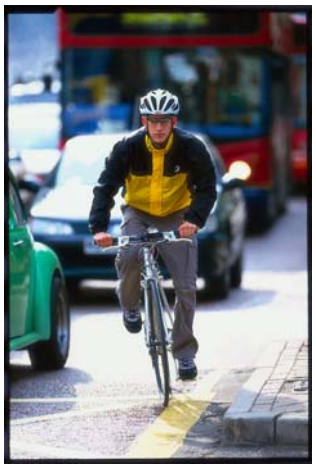
9. The Grand Concourse Authority staff, current users and associated stakeholders should be formally involved on an ongoing basis with the implementation and development of the Master Plan. Existing resources and expertise should be utilized in a collective effort to help to produce an attractive, safe and functional network that provides a successful multi-user environment for any Grand Concourse routes included in the final network.

10. As addressed in more detail in Section 6.2, a comprehensive and wide reaching education and promotional campaign should be undertaken by the City of St. John's immediately upon final approval of the Plan. As has been expressed multiple times throughout the consultation process with the public, staff and stakeholder groups, an "information gap" surrounding the proper and acceptable use of bicycles, especially within the existing automobile network may exist that requires attention for the plan to begin to move forward. The education of cyclists, pedestrians and drivers in their responsibilities, the rules of the road, the advantages of AT travel, and how to safely navigate the on and off-road network is a fundamental step toward achieving increased user rates and making the Plan an accepted part of life in the City.

6.2 Cycling Promotion and Education

The success indicators for the Cycling Master Plan (more active population, healthier environment and lower rates of obesity as well as potentially increased tourism, less traffic congestion and a more attractive environment for residents) must be incorporated into a formal "roll-out" of an educational and promotional framework. This section contains examples and ideas that City Staff can utilize strategic direction recommendations as to how best achieve the goals of the Plan.

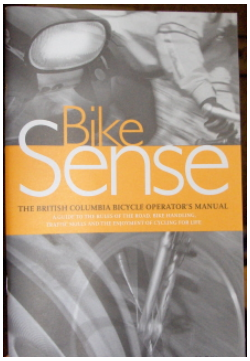
As the City does not currently have either an official on or off-road cycling system and the existing cycling community may be viewed as unimportant compared to automobiles in the eyes of many drivers, an educational campaign for St. John's must start with addressing likely misconceptions



surrounding how cyclists are viewed, how they interact with drivers and how cycling and AT in general is a legitimate, attractive and desirable form of transportation that can exist in tandem with and complementary to the current motorized system.

Social barriers arising from preconceived notions represent one of the major disincentives for travel by AT modes (such as cycling) and public transit. As an example, a focus group for youth that was conducted as part of the 2005 National Active Transportation Survey by the non-profit organization *Go for Green*, identified public transit busses as the "loser cruisers", and the majority agreed that their parents considered it "unsafe" for them to travel to school by walking/wheeling. Adults, commenting in similar focus groups held in other Canadian cities, indicated that the general attitude from non-walkers and non-wheelers ranged from viewing them as "fitness fanatics" to eccentric. It is also significant to note that many people not currently using AT understand the health and environmental benefits of it but have great difficulty imaging switching from motorized transportation to something else such as cycling.

When misconceptions surrounding how cyclists operate and the benefits of increased cycling use have been identified and addressed, it is then important to educate potential new users in the basics of system use. Engineered elements of the network and various design solutions are very important to ensuring a safe and functioning system but education is equally important and becomes a significant barrier if not in place. If cyclists and motorists do not know how to respond correctly to a travel indicator or safety device such as a traffic signal or flasher, for example, the crossing will not operate safely. Engineered elements must be in place but unlike motorized vehicles, people often receive little or no training in cycling "rules of the road" and can be very unclear as to how they should approach interaction with a cyclist.



Educational programs generally take three basic approaches that are aimed at permanently changing perceptions and achieving ongoing awareness. We recommend that these approaches be incorporated into the City of St. John's framework.

1. General Public Awareness Campaigns - These programs involve increasing knowledge and motivating positive behavioral changes. They can sensitize motorists to their responsibilities toward pedestrians, cyclists, and other AT uses as well as educating cyclists as to how they are expected and required to act within the road network.

2. Campaigns to Targeted Groups and Situations - These may include educational materials targeting groups such as older adults, children, cyclists or motorists. They may also focus on specific issues such as crosswalks, school zones, or crossing at signalized locations. To obtain the best results, it is important for targeted campaigns to be

institutionalized within an organization so they can be implemented on a long-term basis.

3. Individual Campaigns - Similar to targeted campaigns, these differ in that the target audience is reached through an intermediary such as a pediatrician, parent, or a grandparent and on a one-on-one basis. For example, school crossing guards or classroom teachers may instruct students about safe behavior when getting on or off the school bus or how to cross streets safely. This approach has been used with success for many years within school systems to achieve a variety of goals.

While the City enjoys an active cycling community, St. John's is essentially starting from scratch in terms of providing for an official cycling network and any educational campaigns operating under one of the three approaches listed above must ultimately work to create positive perceptions of all users. Perhaps the most significant barrier to a successful cycling or AT network is based in the attitudes and perceptions of cyclists, pedestrians and drivers of each other and of themselves in terms of rights, responsibilities and in how they ultimately interact with each other.

There can be, for example, an underlying assumption in many drivers that walkers and wheelers should not be in the road, and the City St. John's (including educators and law enforcement officers) needs to work to change these views if all modes of transportation are to be accepted as legitimate users of the street. At the same time, cyclists need to become more aware of the rules of the road, their responsibility for their own safety as well as proper and permitted interaction with motorized vehicles. Cyclists in particular often navigate in an environment designed primarily for automobile use and a lack of knowledge surrounding road etiquette can be dangerous and promote negative feelings between the two travel modes. While motorists may feel cyclists "should not be on the road", cyclists may also antagonize motorists if they do not operate as they should. Educational campaigns must address these issues with all users in a clear and simple manner.

A large number of innovative educational campaigns have been undertaken in different municipalities across the country to achieve similar goals. Effective examples that can be transferred to St. John's include:

- Flyers could be sent to households along with utility bills or recycling information. The flyers provide safety tips for bicycle users and motorists and address some of the common causes of conflicts and how to avoid them.

- Large highway signs erected at locations where they would attract the most attention and provide feedback on the number of motorist-cyclist conflicts during the past month along with the lowest on record. These

signs could alternatively point out area Cycling Plan intersection improvements and/or indicate the amount of greenhouse gas reduced by people switching to bicycle use in St. John's. The number based on approximate numbers of cyclists could be changed every few months.

- A classroom intervention which is designed for all elementary and junior high students. This intervention could include a special folder with a summary of the program, an "I SHARE THE ROAD" bumper sticker, a copy of an information pamphlet for each pupil to take home, and a 20-minute lesson plan explaining the proper way to walk and bike on the streets prepared for each home room in the target community.

- School Boards can be approached to conduct safety audits of their neighborhoods. The school boards could work with parents, students and teachers, organizing public meetings to review the situation around all of their schools. These meetings can determine both the safest routes for walking, cycling and so on and areas where improvements are required. A "Walking School Bus" (http://www.walkingschoolbus.org) and other programs to promote greater student activity could also be implemented.

A number of excellent hard copy and online publications have become available in other parts of the country and abroad that may also be considered for promotion of the Master Plan in St. John's. These include the following:

- Pedestrian and Bicycle Information Centre (www.pedbikeinfo.org) - This American organization has operated since 1999 with a mission to improve the quality of life in communities through the increase of safe walking and bicycling as a viable means of transportation and physical activity.

- Sprockids (www.sprockids.ca) – An associated program of Bicycle Newfoundland and Labrador and the Canadian Cycling Association, this program teaches bicycle etiquette, riding (1st and 2nd Gear) and bicycle maintenance to children with an emphasis on participation and bicycle use promotion.

- Bike Sense - This guide to skills of the road, bike handling, traffic signals, and other issues is a 34-page booklet is published by the Greater Victoria Road Coalition. It provides very detailed information about cycling and traffic skills.

- Bicycles at Rest - This pamphlet is produced by Capital Bike and Walk of Victoria, BC. (www.capitalbikeandwalk.org/). It features guidelines on bike rack choices and efficient site planning.

- National Centre of Biking and Walking (www.bikewalk.org) - This US based NGO maintains up-to-date inventories of walking guidelines, bicycle policies, and other technical resources.

- Vélo Québec (www.velo.qc.ca) – This organization has continuously encouraged the use of the bicycle, whether for tourism purposes or as a means of clean and active transportation, so as to improve the environment and the health and well being of the public. They have developed a series of technical guides for biking and offer workshops in the basics of facility design and operation.

Educational information delivery should take advantage of multi-modal opportunities such as public transit station advertisements as well as being focused on the delivery of a healthy and environmentally sustainable advertising product (i.e. recycled paper pamphlets) to deliver the message. The delivery of educational information as part of the roll-out and on-going implementation of the Master Plan should be prepared to reach a wide range of residents of varying ages and demographics by taking advantage of a variety of media in a multi-faceted communications strategy that has support from a stable level of annual funding.

Promotion

Current attitudes toward active modes of travel will mean that the public may be slow to respond to improvements in infrastructure that makes cycling more convenient although research shows that people will use facilities once they are put in place and effectively promoted. In the end, a strong marketing program aimed at changing behavior is required to encourage more use of the Master Plan and especially to increase new user uptake.

Examples that can be reviewed to prepare the strategy include the following:

- Active and Safe Routes to School – This is a national program that encourages students to walk, bike or use other human-powered modes of transportation to travel to and from school. The benefits of this program include increased physical activity, less traffic congestion around schools, safer streets, and improved air quality in our communities. This program should be encouraged in every school possible.

- Commuter Challenge – The Commuter Challenge is a friendly competition between Canadian communities to encourage the use of sustainable modes of transportation to and from work.

- International Trails Day – International Trails Day, held the first Saturday of June, is dedicated to celebrate trails, their development, uses and the healthy lifestyle they encourage.

- International Walk to School Week – During International Walk to School Week, children walk to school with parents, school staff and community leaders. They learn safe routes to school, and safe pedestrian and cycling

skills. Typically held in the first week of October, this program can be linked with the Active and Safe Routes to School Program.

St. John's can also follow a number of "Municipality specific" efforts to promote the Cycling Master Plan such as:

- Integrate the Trails/Bikeways Network into Municipal Maps - City street maps should have the network included as an integral part of its featured information. This should also include the off-road system, important links with transit and locations of dedicated bicycle parking and other amenities. This profiling raises the status of the system and helps to make it an accepted transportation alternative as opposed to a being strictly recreational option. In general, it is recommended that the City of St. John's begin treating cycling and AT generally as a concrete consideration in all transportation engineering and operations decisions as well.

- Encourage the utilization of Hospitals and Health Facilities to Promote Active Transportation Among Their Clients - These institutions already operate under a mandate to build healthier communities and believe in both improving lifestyle behaviors and in addressing the underlying conditions that lead to poor health choices. Measures could include constructing bicycle parking facilities, including AT information in flyers, advertising on websites, etc.

- Award System – A number of Canadian cities have instituted annual awards for the outstanding participation of individuals in biking or walking. This system is a very low cost method of highlighting participation and shifting public perception. Schools and businesses that make significant investment in AT policies or facilities such as bicycle racks or employee changing facilities should similarly be recognized.

- Work Closely with School Boards – School boards should provide elementary grades with walking and wheeling education that would result in AT becoming an integral part of life at school. All schools could be encouraged to take part in Walk to School Week. Courses such as the CAN-BIKE bicycle-training program could be incorporated into the physical education curricula.

- Institute an Annual Bike To Work Day For Municipal Employees – Various cities such as San Francisco have begun promoting an annual "bike to work day" across the city with encouraging results. The 2007 event was promoted to people everywhere in the city and even the Major took part. St. John's could set an example for the rest of the City by promoting the event among City staff and elected officials.

Effective efforts to raise awareness and educate users, businesses, facility administrators and motorists about the advantages of cycling/AT, rules of the

road and how they can participate in the development of the network is a key building block to achieving full build-out of the system and a healthier, more productive population.

6.3 Municipal Standards and Enforcement

The issue of the enforcement of Municipal cycling goals is something that should be approached in a variety of ways. Issues of enforcing safety, reducing undesirable user actions, possible illegal activity within the network and so on, are recommended to be approached in partnership with law enforcement agencies as they have the expertise, resources and personnel to decide upon a "best practices" approach to matters such as these and are familiar with updated transportation and public safety law among others.

The City should take a proactive regulatory role through the enactment of appropriate cycling use by-laws, user behavioral standards, trail use regulations and so on as necessary. If needed, the City may also consider petitioning law enforcement agencies for new or increased bicycle patrols of the network and especially of off-road portions of the system which may remain hidden from public view.

Another approach to enforcement of appropriate behavior by cyclists, drivers and pedestrians who may interact with the network is the promotion of passive social regulation. This approach should be attempted in conjunction with any marketing or promotional campaigns that the City may undertake and centers on creating a series of publicly accepted "dos and don'ts" that can have very effective results in creating a self regulating cycling environment.

An example of how this sort of approach can be effective can be seen in various anti-littering campaigns over the past few decades. In most public circumstances, it is now no longer acceptable for people to litter and due to the social pressure to follow accepted norms many or even most communities have been able to reduce the incidents of littering to such a degree that the campaigns themselves are no longer necessary. It is, however, in the regulation of building practices and infrastructure development that the City of St. John's has the most potential to effect positive movement toward achieving the goals of this plan.

Toward achieving that end, it is recommended that all new developments in the City of St. John's be designed and planned to include AT elements consistent with the Canadian Institute of Transportation Engineers' "Promoting Sustainable Transportation Through Site Design: An ITE Proposed Recommended Practice". This should include all new construction of housing and commercial subdivisions as well as individual building such as schools, public facilities, recreation centers, government offices and new commercial developments.

Adopting municipal standards and regulations such as development controls, zoning requirements and by-laws that will better support the Cycling Master Plan is an extensive process unique to each municipality but one that can be very effective in creating a future development model that is responsive to AT users. Examples of potential zoning requirements that could be adopted include:

- Lowering building square footage based parking stall requirements to account for on-street parking if applicable and the installation of bicycle support facilities such as racks, lockers and employee change facilities.

- Requiring carpool parking to be located nearest to retail building entrances.

- Integrating transit route and stop planning into site development to encourage easy access and use.

- Encouraging mixed-use development that minimizes the need for car based trips to and from destinations.

It is recommended that the City adopt a policy of regular reviewing of zoning standards and applicable by-laws against policies provided in "Promoting Sustainable Transportation through Site Design: An ITE Proposed Recommended Practice" and to make updates as necessary and appropriate for local needs.

In terms of encouraging the implementation of AT/cycling friendly infrastructure elements, it is also recommended that the City of St. John's lead by example wherever possible. This effort could include installing bicycles parking facilities at all municipally owned or operated buildings, requiring any new municipal construction to address "trip end" needs such as change/shower facilities and retrofitting any existing AT routes where they interact with Municipal property to fully accommodate cycling or multi-use AT activities, i.e. route paving, signage, pavement markings, etc.

6.4 Preliminary Cost Estimates

Exhibit 6.1 illustrates an attempt at determining a preliminary estimate of probable costs for complete build out of the cycling network. It is intended as a cost breakdown and end dollar amount that would be spread over the expected 20 year implementation schedule of the plan. It assumes no cost-sharing opportunities or potential allocations from existing Municipal budgets or development driven charges and that no major engineering structures such as pedestrian overpasses will be required. Maintenance costs of a cycling network is a wide ranging variable and should be based on existing City of St. John's practices and future goals.

Costing data should be considered flexible and as future public input to the Plan and additional revisions to the network may be required; the totals provided are intended to illustrate general projections and should not be considered final.

Cost estimates calculated for full network build out include a total of $6,482,600 to completely develop the Cycling Master Plan. It should be noted that substantial savings were accomplished through the utilization of existing Grand Concourse off-road routes. New construction costs for the over 56 km of off road, multi-use, hard surface facilities now included in the Master Plan were estimated to total $8,400,000 alone and if constructed instead of the recommended paving of these designated routes, would increase the total estimate of probable costs by $5,880,000 or from $6,482,600 to approximately $12,362,600.

Maintenance and Liability

Specific bicycle facility maintenance costs vary widely between Canadian cities depending on size, climate, user rates, and the adopted maintenance practices of each municipality. The same is true of off-road facility maintenance costs depending as well on where a facility may be located and what it may be intended for as its primary use, i.e. nature trail vs. commuter route. Maintenance costs for signed-only routes can be assumed to be minimal as signed-only routes do not generally require particular maintenance beyond standard street care practices.

When considering maintenance cost budgeting, potentially offset costs for road widening that may be unnecessary with increased AT users as well as environmental and health benefits described in Section 1.4 of this document should also be considered. Maintenance costs for various segments of the network should be based on current City standards and budgeted cost outlays for similar facilities.

Regarding potential liability issue or costs, a well-constructed and signed system that is free of potholes, ruts and obstructions allows the user to travel reasonably safely. As with any transportation system, including the automobile, travel can be an inherently dangerous activity and as the City cannot be reasonably expected to monitor all AT users all of the time, construction of a well functioning system is the most rational approach to addressing the issue as well as to providing an enjoyable user experience.

Regular inspection and repair will keep route surfaces in a smooth and level condition and signing throughout the system should be designed to warn the off-road users of road crossings, steep grades and low clearance underpasses. The ultimate goal is to provide a safe system through effective design, construction, monitoring, and maintenance techniques as with any transportation system.

An annual review and inspection of on-road facilities and off-road trails that comprise part of the cycling network should occur and especially after a major weather event. Trail erosion is often a result of high water and the undermining of off-road trail structures. Extra care should be taken with respect to ensuring sight lines are not compromised. Acts of vandalism should be addressed as soon as possible. Ensuring the system is safe and litter free will help promote its use to residents and visitors. Trails that are intended to be challenging and/or "natural" and that would be compromised by sweeping should be exempt from this policy and users notified through either permanent or seasonal signing.

The following maintenance standards are recommended to the City of St. John's as starting points for the development of standards for the Cycling Network. It is recognized that due to unique climate, geography and potential user characteristics these standards may need to be updated according to the needs of the Municipality and to best serve the users of the system.

Trash Clean-Up and Grass Cutting

Trashcans should be emptied on a weekly basis. This maintenance can occur in conjunction with any grass cutting. The grass should typically be cut down to approximately two inches on either side of a trail or in boulevard spaces adjacent to sidewalks.

Vegetation

Vegetation should be routinely cut back since overgrown shrubs and low-hanging branches can obscure signs and pose a hazard to AT users. Adequate clearance and sight distances should be maintained at any driveways and intersections so that users are visible to motorists. Installing root barriers during trail and sidewalk construction may assist in preventing premature break-up of the surfaces. Maintenance of vegetation originating on private property should be required through other by-laws.

Surface Maintenance

Asphalt trails are most suitable for intense high traffic multi-use areas. Asphalt has a life span of approximately eight to 15 years and requires a base of properly compacted granular 'A'. Asphalt trails must be graded at a minimum of two percent to allow for drainage. Drainage swales may also be required next to asphalt trails. Inspection of asphalt trails should be undertaken once per year, especially for potholes and cracks in the spring.

Gravel surfaces are suitable for general recreational multi-purpose use and are reasonably easy to maintain. A layer of fine stone works well as exists today on the Grand Concourse trails. Drainage issues must be dealt with during design and operations and on going grooming and maintenance and wash-out repairs will be needed.

Leaf Removal

Piles of wet leaves can be a serious obstacle to AT users when encountered on trails, sidewalks or in roadway gutters especially in highly traveled areas. It is difficult for cyclists to stop on leaves, and falls can occur. Pedestrians and those requiring mobility aides may also have a difficult time maintaining their footing on slippery leaf covered surfaces. Leaves can also hide potholes, debris and drainage inlets. It is recommended that excessive fallen leaves be removed from the traveled portion of routes and systems as soon as possible to prevent accidents.

Signage and Route Markers

Any directional, warning, etc signs placed within the Cycling Network should be subject to the same level of maintenance and care as signs are currently within the automobile roadway network.

Exhibit 6.1 Network Development Cost Estimates

City of St. John's - Cycling Master Plan
Network Development - Preliminary Estimate Of Probable Costs

ITEM	PROPOSED	UNIT	UNIT PRICE 2007 DOLLARS	NETWORK SEGMENT/ TOTAL COSTS
On-Road Bike Lanes				
1. Bike Facilities (Both Sides) - Pavement Marking Treatment	43.0	per km	$20,000	$860,000
2. Bike Lanes Associated With New Road Construction (for information)	0.0	per km	$150,000	$0
Subtotal Bike Lanes	**43.0**			**$860,000**
On-Road Paved Shoulders				
3. Paved Shoulders (assumes sufficient road platform)	54.0	per km	$55,000	$2,970,000
4. Paved Shoulders Associated With New Road Construction (for information)	0.0	per km	$55,000	$0
Subtotal Paved Shoulders	**54.0**			**$2,970,000**
On-Road Signed Only Routes				
5. Signed Only Routes (Average of 8 Per Km)	73.0	per km	$1,200	$87,600
Subtotal On Road Signed Only Routes	**73.0**			$87,600
Off-Road Multi-Use Trails				
6. Multi-Use Soft Surface Trails (New)	3.0	per km	$150,000	$450,000
7. Multi-Use Hard Surface Trails (Upgrading)	5.0	per km	$45,000	$225,000
8. Multi-Use Soft Surface (Upgrading)	48.0	per km	$20,000	$960,000
Subtotal Off Road Trails	**56.0**			**$1,635,000**
Network Amenities				
9. Gateway Facilities *	NA	x6	$5,000	$30,000
10. Bicycle Parking Facilities **	NA	x20	$150 - $750	$15,000
Subtotal Network Amenities				**$45,000**
Full Network 20 Year Build-out Costs				**$5,597,600**

NETWORK STATISTICS (KM)	TOTAL
Bike Lane	43.0
Paved Shoulder	54.0
Signed Routes	73.0
Multi-Use Trails (hard and soft surface, new and existing)	56.0
Totals	**226.0**

Additional Notes:
Unit Prices Reflect 2007 Dollars, and do not include the cost of property acquisition, utility relocations, major roadside drainage works or applicable taxes. Measurements are approximate and rounded to the nearest kilometre
Multi-use Trail calculations assume only conversions of existing soft surface facilities
* Cost varies widely depending on facilities - washrooms, garbage receptacles, signage, etc
** Cost based on 20 bicycle rack facilities at $750 per unit. $150 per unit is estimated for post and ring units (not included)

6.5 Network Phasing and Funding Opportunities

The implementation of the Cycling Master Plan will be a long-term and high profile undertaking requiring multi-year budgetary commitment and inter-departmental involvement. Implementation phasing should be approached with the objective of creating reasonably immediate, tangible, short-term impacts as well as a multi-year program of further development that becomes an ongoing aspect of corporate policy and culture within the Municipality.

Successful implementation of non-traditional transportation systems such as this requires a three pronged approach. As discussed in Sections 6.2 and 6.3, standards and regulations as well as education and promotion are essential elements that should not be forgotten even though the tendency in many municipalities is to focus on capital projects and engineering needs. While implementing concrete capital programs are indeed essential, these efforts will be more effective and efficient when completed in tandem with "softer" promotional and educational elements and reinforced by a supportive regulatory environment.

In the context of various supporting campaigns, it is recommended that capital and otherwise project phasing of the overall Master Plan consist of three segments:

High Priority - Phase I
Phase I should first consist of the identification of "stand alone" capital projects which are highly visible to the public and strategically chosen to both illustrate what form the future network will take and/or to complete significant portions of the cycling system. They may be constructed at key points which seek to connect currently separated AT routes or routes which are highly visible and desirable for current cyclists.

Ideally, Phase I projects should also act as "talking points" for the general public and City staff to encourage excitement about the project, test construction and design techniques for future use and illustrate the level of commitment the City has to the Plan. Where possible, Phase I projects might also be constructed in conjunction with a network gateway as noted in Exhibit 4.2. This provides a backdrop for the installation of more permanent cycling promotional materials as well as a trip starting point for users and can be an excellent opportunity to launch the project in the media.

Any identified high priority, Phase I initiatives should have a target date for completion within two years of final approval of the Master Plan. They should be undertaken in conjunction with any short term (Phase II) initiatives as may be appropriate but receive elevated attention as capital investments and promotional tools in comparison.

Short Term – Phase II

This portion of the phasing schedule is perhaps the most important to achieving full build-out of the network and to establishing the processes, funding and user traits which will assist with completion of Phase II and beyond. Certain management structure initiatives as well as more easily implemented tasks such as installing bicycle signs should occur in tandem with Phase I efforts within the first two years of approval while others should be phased in between year three and year seven. The following recommendations are included for Phase II and should be targeted for completion by year seven after Plan approval:

- Formally adopt the Master Plan, make changes in City standards and regulations, and commence implementation of the education and promotional program.

- Designation of all on-road facility types of any sort that have been identified under the Master Plan, to become signed routes as soon as possible. This approach is high impact, highly cost-effective, requires comparably little time and establishes the routes as a bicycle route. It also raises both AT and automobile user awareness and establishes precedent for the future improving of the identified routes to bicycle lanes and paved shoulders at later dates.

- Installation of some bicycle lanes as soon as possible where adequate ROW exists.

- Petitioning senior levels of government for the inclusion of AT facilities in any plans for new roadway construction, improvements, resurfacing, etc. even if not officially designated as part of the network.

- Scheduling network implementation improvements with already planned and/or scheduled capital road and servicing projects.

- Designation of AT corridors for those parts of the networks within areas expected to be developed within the next five to ten years as needed. This does not require specific alignment decisions but should be included as official policy.

- Commencement of formal discussions with the Provincial and Federal Governments to establish a potential AT funding arrangement and/or permit changes to relevant legislature that would promote the use of AT and ease implementation of the Master Plan.

- Completion of major strategic linkages (both on-road and off-road as needed) within the existing system to help facilitate increased use of the

system and raise the profile of the Master Plan. The strategic linkages should work together to form a functionally connected cycling system even if complete build-out of the network has not yet been achieved. By year seven, the City should have in place, a "skeleton" plan which can be used by cyclists to travel to most major destinations even if travel options are less than they will be in future years. Priority should also be given to the possibility of partnering with outside organizations such as the Trans Canada Trail Foundation and East Coast Trail Association both in terms of construction scheduling and potential funding.

• Connection of existing AT facilities with transit routes and major destinations such as shopping areas and schools wherever possible.

Long Term – Phase III

Establishing the initial phases to the Master Plan provides the City with the time to gain the knowledge and experience of working with AT infrastructure issues and solidifying partnering opportunities that it will need to accomplish full build-out in Phase III. Years eight to twenty are designated for Phase III but this timeframe may be reassessed after Phases I and II are completed and either divided into shorter management phases at that time or a progressive pattern of work based on yearly measurable and budgeted goals.

Goals for Phase III are more general in nature than earlier stages due to the more significant time and less accurately known future conditions and Municipal priorities. They are recommended to include:

• Extension of existing and recently constructed facilities to connect with each other in order to create longer, more complete routes and continuous service for as much of the network as possible.

• Construction of all key gateway areas that would operate in conjunction with network links completed by the end of Phase II. These may be promoted much in the way that any Phase I showcase projects are and intended to produce useful and attractive pieces of municipal infrastructure as well as to reinvigorate interest in and use of the system.

• Completion of the full integration of those Grand Concourse off-road routes that are designated as part of the cycling network. Please note that all GCA trails under consideration for upgrading to multi-use facilities should be subject to a complete feasibility review which would include a design brief and full public consultation. Trail segments should only be designated as multi-use and placed into service after that consultation process is completed and the necessary physical upgrades have been done in the field. This phased-in integration approach provides the City with opportunities to address any user, administrative and overall management concerns should they arise once a route is in use.

Funding

Funding opportunities for the Cycling Network which may be available are generally increasing along with public awareness of climate change issues, environmental stewardship and energy use issues. Examples of potential funding sources which are recommended to be explored include:

1. ecoMOBILITY – "The ecoMOBILITY Program seeks to cut urban-passenger transportation emissions by encouraging commuters to choose public transit or other sustainable transportation options like car-pooling. Working with cities and municipalities across Canada, this initiative will help develop programs, services and products that are used in cities around the world, to improve choice and quality of life for Canadians in urban areas across the country." (http://www.ecoaction.gc.ca/ecotransport/ecomobility-ecomobilite-eng.cfm)

2. Moving on Sustainable Transportation – "Transport Canada has established the 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." (http://www.tc.gc.ca/programs/environment/most/aboutmost.htm)

3. Green Municipal Fund – "The Fund provides low-interest loans and grants, builds capacity, and shares knowledge to support municipal governments and their partners in developing communities that are more environmentally, socially and economically sustainable." (http://sustainablecommunities.fcm.ca/GMF/)

4. Ecoaction – "Non-profit groups are eligible to apply to the 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. Private sector organizations, educational institutions, and municipal, provincial/territorial and federal governments are not eligible applicants, but are encouraged to partner with non-profit organizations." (http://www.ec.gc.ca/ecoaction/what_is_e.html)

5. Atlantic Canada Opportunities Agency – ACOA has relatively recently taken a more inclusive approach to regional development matters that has included the highlighting of projects by the East Coast Trail Association and the Gros Morne Institute for Sustainable Tourism. According to the following statement by the Minister of the Atlantic Canada Opportunities Agency, it is reasonable to examine the possibility of gaining funding for urban based initiatives. "Sustainable development is not something that can be achieved in isolation – it requires the support of all Atlantic Canadians. ACOA works closely with businesses and associations in a variety of economic sectors. These partnerships are crucial in managing our region's future and in fostering prosperity in Atlantic communities. ACOA is well-

positioned to bring awareness of, and promote action on, sustainable development issues and initiatives of the private sector, research institutions and communities throughout Atlantic Canada." (http://www.acoa.ca/)

Appendix A

Provincial Legislative Framework

Appendix A – Provincial Legislative Framework

Newfoundland and Labrador Provincial Statutes

There are various Provincial statutes that will influence or partially define the Cycling network and supporting polices and programs under the Master Plan. Each is summarized in this section within the context of potential cycling, and alternative modes of transportation links.

Newfound and Labrador does not currently have an Act specifically addressing active transportation or cycling as it does with motor vehicles but certain Acts do make reference to non-motorized transportation and contain the de facto basis for AT/cycling regulation in the Province. The major Provincial Acts creating an AT regulatory framework in the context of this Plan include the Municipalities Act, the City of St. John's Act and the Highways Traffic Act. More minor legislation which also has an impact on the Plan includes the: Environmental Protection Act, Pippy Park Commission Act, St. John's Municipal Council Parks Act and the Works, Services and Transportation Act. The applicable portions of all of these Acts are provided in the following sections.

Municipalities Act

Council regulations

414. (1) A council shall make regulations

(jj) prohibiting or controlling

(i) coasting, skating or sliding on snow or ice on public highways, bridges or sidewalks,

(ii) the use of, riding or driving of children's wagons, push carts, inline skates, skateboards, tricycles and other similar objects on public highways or sidewalks,

(iii) the wearing of bicycle helmets and bicycle and other safety equipment necessary for activities referred to in this paragraph, and

(iv) the operation of recreational and other vehicles not licensed under the Highway Traffic Act on public highways, bridges or sidewalks;

(kk) respecting the operation of bicycles within the municipality and the licensing of bicycles operated in the municipality;

(ll) prohibiting or controlling vehicular or pedestrian access onto or over a public highway or bridge;

City of St. John's Act

Sidewalk traffic

163. A person shall not within the city limits draw, drive, or carry a truck, sleigh, wheelbarrow, bicycle or other vehicle in or upon a sidewalk, except directly across the sidewalk on necessary occasions, or lead, ride, or drive on a sidewalk a horse or other beast, except directly across

the sidewalk and on necessary occasions, or tie or fasten a horse, or other beast, or allow the horse to stand, on or across the sidewalk, under a penalty not exceeding $25, or imprisonment for a period not exceeding 30 days.

Rules of the road

165. (1) All carriages, motor cars, carts, wagons, sleighs and other vehicles shall, by the person in charge of them, on meeting another carriage, motor, car, cart, wagon, sleigh or other vehicle, be conducted and kept on the right side of the street, as far as the state of the street will permit, and each person conducting a vehicle shall give 1/2 of the street to the other, under a penalty not exceeding $10.

(2) A carriage which is driven or is on a street within the city limits during the period between 1 hour after sunset and 1 hour before sunrise shall be provided with lamps which shall be so constructed as to exhibit a light in the direction in which the carriage proceeds, and so lighted and kept lighted as to afford adequate means of signalling the approach or position of the carriage.

(3) The owner of a carriage who allows a carriage to be driven or to be on a street without lamps, in accordance with subsection (2), shall be liable to a penalty not exceeding $10 for every offence.

(4) The driver or other person in charge of a carriage provided with lamps, in accordance with subsection (2), who drives the carriage, or allows the carriage to be driven or to be upon a street, shall, where the lamps are not placed, lighted and kept lighted in the manner and during the period prescribed by this section, be liable to a penalty not exceeding $10 for every offence.

(5) For the purpose of this section the term "carriage" shall include a wagon, van, carriage, motor car, chaise, buggy, dogcart, cab, omnibus, char a banc, wagonette, brake, stagecoach, tramcar, or other similar conveyance, and a bicycle, tricycle, velocipede, or other similar machine, but not common carts or drays, or sleighs, however nothing in this section shall be held to alter, vary or affect an existing law relating to motor vehicles.

Control of bicycles

169. The council shall have power by rules, regulations or by-laws

(a) to regulate and control the operation of bicycles in the city;

(a.1) to regulate and control the use of skateboards in the city;

(b) to require all residents in the city owning and using a wheeled vehicle of any kind or class, other than a motor vehicle and a trailer as defined in the Highway Traffic Act , to obtain a licence before using it in or upon streets of the city;

(c) to limit the weight or size of loads that may be carried on the bicycles; and

(d) to regulate the issuing of licences and the collecting of fees for the licences, which annual fee shall not exceed $10 for each licence; and

(e) to fix different scales of fees for different vehicles.

Highway Traffic Act

Definitions

2. In this Act

(e) "bicycle" means a device propelled by human power upon which a person may ride, having 2 wheels in tandem.

(yy) "pedestrian" means a person on foot, a handicapped person in a wheelchair or a child in a carriage or a sleigh.

(mmm) "sidewalk" means that portion of a highway lying between the curb lines or the lateral lines of a roadway and the adjacent property lines set apart for the use of pedestrians and, includes a part of a highway set apart or marked as being for the exclusive use of pedestrians and is considered to include an area of a highway lying between the curb lines or the lateral lines of a roadway and that portion of a highway set apart for the use of pedestrians.

(ffff) "vehicle" means a device in, upon or by which a person or thing may be transported or drawn upon a highway, but does not include devices used exclusively upon fixed rails.

Bicyclists

129. (1) Except as provided in this section, a person riding a bicycle upon a highway has the same rights and duties as a driver.

(2) A person who is riding a bicycle,

(a) shall not ride on a sidewalk;

(b) subject to paragraph (a), shall ride as near as practicable to the right-hand curb or edge of a roadway;

(c) shall not ride abreast of another person who is riding a bicycle upon a roadway;

(d) shall keep at least 1 hand on the handle bars;

(e) shall not ride other than upon or astride a regular seat of the bicycle;

(f) shall not use the bicycle to carry more persons at one time than the number for which it is designed and equipped;

(g) shall not carry on the bicycle an object of a kind which is of a size, weight or shape or so placed that it may interfere with the proper operation or control of the bicycle;

(h) shall not ride a bicycle on a highway where signs prohibit its use; and

(i) shall not ride a bicycle on a roadway where there is a usable path intended for the use of bicycles adjacent to the roadway.

Towing of bicyclists, etc. prohibited

130. A person whether on foot or riding upon a bicycle, motor cycle, coaster, sled, toboggan, play vehicle or upon skates, roller skates, skis or skateboard or similar device shall not attach it or them or himself or herself by hand or other means to a vehicle upon a roadway.

Racing on highways

168. A person shall not drive a vehicle or bicycle in a race with another vehicle or bicycle on a highway.

Regulations respecting equipment

195. (1) The minister may make regulations for the better administration of Parts II and III

(a) regulating the equipment and appliances which shall be installed in or form part of a vehicle to ensure its safe operation and control, to protect passengers being carried in the vehicle and other persons and vehicles using the highway, and to eliminate or reduce noise or other nuisances incidental to the operation of the vehicle and in particular regulating

(iii) the installation and operation of lights, including headlights, tail lights, brake lights, identification lights, parking lights, clearance lights, directional lights, spotlights, fog lamps and other auxiliary lights, distinguishing lights for use on emergency vehicles and other classes of vehicles which may be specified in the regulations, lights on animal-drawn vehicles and lights on bicycles,

Penalties

129(2)(a)	Riding bicycle on sidewalk	180	25	6 days	1 day
129(2)(b)	Failing to ride close to the edge of the highway	180	25	6 days	1 day
129(2)(c)	Riding bicycle abreast of another bicycle rider	180	25	6 days	1 day
129(2)(d)	Riding bicycle without at least one hand on handle-bars	180	25	6 days	1 day
129(2)(e)	Riding bicycle and not astride regular seat	180	25	6 days	1 day
129(2)(f)	Carrying	180	25	6 days	1 day

	more persons on bicycle than designed for				
129(2)(g)	Carrying object which may interfere with operation or control of bicycle	180	25	6 days	1 day
129(2)(h)	Driving bicycle on highway where signs prohibit use of bicycles	180	25	6 days	1 day
129(2)(i)	Riding bicycle on roadway when bicycle path provided	180	25	6 days	1 day
168	Racing vehicles or bicycles on highways	900	180	30 days	4 days
169(6)(a)	Bicycle operator failing to remain at accident scene	400	100	14 days	2 days
169(6)(b)	Bicycle operator failing to render assistance	400	100	14 days	2 days
169(6)(c)	Bicycle operator failing to give name and address	400	100	14 days	2 days
169(7)	Bicycle operator failing to make written report	400	100	14 days	2 days

170(1)	Driver of vehicle failing to make report Subsequent offence	400 450	100 180	14 days 15 days	2 days 4 days

Pedestrians to comply with signals

124. Except where a traffic authority has otherwise provided, where traffic-control signals are operating, pedestrians shall comply with them in the manner provided in accordance with section 106.

Pedestrian in crosswalk

125. (1) Where traffic control signals are not in place or not in operation where a pedestrian is crossing the roadway within a crosswalk, a driver of a vehicle approaching the crosswalk in either direction shall yield the right of way to the pedestrian.

(2) A pedestrian shall not leave a curb or other place of safety and walk or run into the path of a vehicle that is so close that it is impracticable for the driver of the vehicle to yield.

(3) Where a vehicle is stopped at a crosswalk to permit a pedestrian to cross the roadway, the driver of a vehicle approaching from the rear shall not overtake and pass the stopped vehicle.

Pedestrian to yield

126. Where a pedestrian is crossing a roadway at a point other than within a crosswalk, the pedestrian shall yield the right-of-way to an approaching vehicle.

Pedestrians to use sidewalks

128. (1) Where there is a sidewalk that is reasonably passable on either or both sides of a highway, a pedestrian shall not walk on a roadway.

(2) Where there is no sidewalk, a pedestrian walking along or upon a roadway or the shoulder of a highway shall, where practicable walk only on the left side of the roadway or the shoulder of the highway facing traffic approaching from the opposite direction and no more than 2 persons shall walk abreast on the roadway.

(3) A person shall not be on a roadway for the purpose of soliciting a ride, employment or business from the occupant of a vehicle.

Environmental Protection Act

Air quality standards and controls

22. The minister may

(h) adopt overall provincial emission caps, production goals and product manufacturing, sale and use restrictions with respect to air quality issues of regional or global significance;

(k) enter into agreements respecting air quality management issues;

(l) prepare model by-laws and otherwise cooperate with municipalities to promote improved air quality; and

(m) establish requirements with respect to the design, operation or maintenance of equipment, devices or services that may emit or limit the issuance of contaminants into the air and require alterations to them where they are not functioning in the manner that the minister considers to be appropriate.

Pippy Park Commission Act

Power to make regulations

27. (1) The commission, with the approval of the Lieutenant-Governor in Council and without prejudice to the rights and powers conferred on the commission under section 25, may make regulations

(a) regulating the use of land and the construction or alteration of an improvement on that land, consistent with the master plan;

(b) notwithstanding the Highway Traffic Act , controlling traffic, including the regulation of speed and the parking of vehicles;

St. John’s Municipal Council Parks Act

Establishment of public parks

3. The council may, by gift, purchase, expropriation or otherwise, acquire lands either inside or outside the city and establish, equip and operate public parks on those lands.

Financial provisions

4. The council may spend out of the revenues of the city sums that may be required for the maintenance and operation of a public park and for the proper carrying out of this Act.

Joint operation of public parks

7. The council may operate a public park jointly with a person, firm, corporation, agency or service club and may receive revenue from that person, firm, corporation, agency or service club to be used in either the establishment of a public park, or for the equipping, operation or maintenance of a public park, or for the repair or construction of buildings or other erections in a public park.

Regulations

9. (1) The council may make regulations

(f) for regulating, controlling and governing, subject to laws of the province or of Canada, air, land and water traffic, including pedestrian traffic, in public parks and prohibiting the use of defined classes of aircraft, boat or land vehicles whether power-driven or not;

Works, Services and Transportation Act

Power of municipal authority

20. The minister has and may exercise within the limits of a municipal area along the course of a highway all the powers which may be exercised by the municipal authority exercising jurisdiction in that municipal area to lay out, construct or maintain a highway.

Sidewalks, etc.

22. A municipal authority may within its municipal area construct or put down a sidewalk or carry out other improvements along a highway, but no work shall be undertaken without the consent of the minister, and a municipal authority constructing a sidewalk or other improvement along a highway shall conform to requirements or conditions imposed by the minister and is responsible for injury or damage arising from the construction or presence of the sidewalk or improvements.
Agreements with municipal authority

23. The municipal authority of a municipal area through, in or upon which a part of a highway is located or an owner of property adjoining the highway may enter into an agreement with the minister for the construction of a pavement or roadway of greater width than or with different specifications from those of the remainder of the pavement or roadway, and the minister may construct a pavement or roadway of an additional width or varied specifications that may be agreed upon and may agree as to the apportionment of costs in that case.