SAINT JOHN

Final Draft Report

City of Saint John Transportation Strategic Plan Phase 2 – Pedestrian Strategy

IBI

Prepared for City of Saint John
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March 1, 2018

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1 Existing Saint John Pedestrian Movement Context

1.1 Existing City Policies and Practices

1.1.1 Sidewalks and Trails

The City has 402km of sidewalk within its limits.[1] The City provides sidewalks on one or both sides of most arterial and collectors streets and generally on both sides of streets in high pedestrian areas such as the Uptown Peninsula. Sidewalks are also typically provided on one side of local streets where curb is present (such as in residential subdivisions). Several local, collector and arterial streets in rural parts of the City do not have any sidewalks, the result of amalgamation and the City's ribbon-style historic development pattern. In response, the City has attempted to introduce a rural standard for residential development where there are resident concerns about the lack of sidewalks. One of PlanSJ's *Urban Design Monitoring and Review Metrics* is the **total kilometres of sidewalks improved or constructed in Intensification Areas and along Primary and Character Corridors.**

The City's General Specifications provides sidewalks standards by street classification as follows:

- Arterial Streets – Sidewalks on both sides, 1.5m in width, separated from the roadway by a 2.0m grassed boulevard;
- Collector Streets – Sidewalks on both sides, 1.5m in width, separated from the roadway by a 1.85-2.0m grassed boulevard;
- Local Streets – Sidewalk on one side, 1.5m in width, separated from the roadway by 2.0m grassed boulevard.
- Rural Road (without curb and gutter) – No sidewalks or paved shoulders.

Many existing streets do not match these standards, but the City attempts to improve sidewalk conditions (including renewals, adding boulevards, widening sidewalks, and improving accessibility) as part of other street reconstruction efforts and asphalt resurfacing program. Right-of-way is often a limiting factor for widening and achieving desirable boulevard widths, so many sidewalks remain monolithic to the curb. As a general practice, the City limits the addition of new sidewalks to control its inventory and ongoing maintenance. The City receives frequent requests to add sidewalks to roadways with a rural standard such as Golden Grove Road, Westfield Road, outer sections of Loch Lomond Road and other rural roads where there is no curb or gutter, but this becomes prohibitively expensive given the need to include curb and gutter and/or storm sewer systems.

Except for Harbour Passage, multi-use trails for transportation movement are limited in the City. Short trails are provided in some neighbourhoods to improve connectivity (e.g. Champlain Heights, Donaldson/Rae Street), while most other trails are mainly recreational (e.g. Rockwood Park, Irving Nature Park).

Urban trail construction is challenging in Saint John due to limited right-of-way, topography, and the haphazard patchwork of property boundaries throughout the City. The best opportunities for future multi-use trails are likely along established roadway corridors where street widths can be reduced and roadside areas allocated to trails and sidewalk. Extension of Harbour Passage is a

[1] Winter Management Plan for Streets and Sidewalks, City of Saint John Transportation and Environmental Services, October 2017

future goal (see Section 2.3) plus a pedestrian crossing of Route 1 to Rockwood Park. Trails along Main Street from Chesley Drive to Union Street and on the Crown Street overpass may also be candidates using potential "road diets" to reduce the number of existing travel lanes. Many of these pedestrian connection goals align with the South Central Peninsula Neighbourhood Plan.

The City's standard cross-section for a roadside multi-use trail consists of a 4.0m wide concrete surfaced trail with a 2.0m to 5.0m boulevard.

1.1.2 Street Crossing Warrants

The City generally follows the TAC Pedestrian Crossing Control Guide (2012) when assessing the need for a pedestrian crosswalk. The City has adopted the use of the Rectangular Rapid Flashing Beacon (RRFB) crosswalk system as an alternative to overhead flashing (RA-5) crosswalks. The City now has 15 RRFB crosswalks installed and is pleased with the results. RRFBs are also being added to the Manual of Uniform Traffic Control Devises for Canada. The RRFBs are significantly less expensive than the RA-5s. School zones are now the only locations where the City is still installing new RA-5 crosswalks, as conditions require them.

A 2015 pilot project by the City of Calgary concluded that given the significantly lower installation cost (approximately 1/3rd) compared to overhead flashers and yet similar results on yield compliance by motorists, this device could provide a cost-effective solution to improve pedestrian safety at crosswalks (both intersections and mid-block locations). Increased yield compliance at significantly low cost provides an opportunity to overcome budget constraints. The versatile nature of this device with options to power by solar batteries or by connecting to a permanent power grid provides a perfect opportunity to use this device in various climatic conditions, especially in the Canadian context.[2]

1.1.3 Safe School Zones

The City establishes School Zones and School Areas using the TAC guidelines for School and Playground Areas and Zones. Specific treatments within the City's school zones are as follows:

- An intent to support pending changes to the Provincial Motor Vehicle Act that will standardize speed limits in School Zones in municipalities at 30 km/h;
- The City uses digital speed feedback displays in school zones as a traffic calming and speed compliance measure;
- School crosswalks are generally only established at crosswalks that are directly in front of a school entrance or within a block away.
- Zebra crosswalk markings are not used at school crosswalks due to limited resources.

In 2013, Common Council endorsed a Safer School Zones Program to focus on traffic calming needs and solutions at the 24 elementary and middle schools within the City Limits. The program is a companion to the City's Traffic Calming Policy and prioritizes the 24 schools over a several years as resources allow. Projects implemented to date include upgraded or enhanced crosswalks, speed limit reductions, installation of digital speed feedback displays, and other improvements. Most of the City's traffic calming budget has been allocated to school zones through this program.

The City has also stated its need for a Crossing Guard policy, with a recommended policy included in Section 3.4 of this report. Given the lack of published guidelines, the process of

[2] Enhancing Pedestrian Safety – Lessons Learned from Calgary's RRFB Pilot, S. Mishra, G. Iwaskow, J. Domarad, 2015

determining the need for a crossing guard is subjective and makes it difficult to respond to public requests.

Provincial policies on busing and school consolidations is impacting City responsibilities and driving up demands for crosswalks and guards. The City needs to have an objective process for assessing the conditions under which a crossing guard should be considered. The average cost of a crossing guard to the City is $7,000 per year.

1.1.4 Traffic Signals

The City follows TAC's guidelines for Accessible Pedestrian Signals and aims to improve accessibility during intersection renewals. City staff consult with CNIB and the Saint John Ability Advisory Committee on priority locations for upgrades.

The City has also begun implementing pedestrian safety measures at signals such as leading pedestrian intervals. This strategy paper includes further recommendations on pedestrian scramble intersections (Section 3.3) and pedestrian intersection walking speed (Section 3.4).

1.1.5 Sidewalk Inspection

The City has a *Sidewalk, Curb, and Median Inspection Standards Field Manual* (2007) to assist staff in completing inspections of sidewalk, curb, and median infrastructure. The purpose is to identify defects that may cause injuries and create an accurate inventory and condition assessment of sidewalk assets. The manual provides an inspection process to collect information including:

- Sidewalk location;
- Sidewalk priority (sidewalks serving specific types of facilities are given priority. These facilities include arenas, churches, hospitals, schools, libraries, parks, recreational centres, seniors' complexes, and shopping malls);
- Sidewalk, Curb, and Median material, dimensions and condition;
- Trip Hazards, and
- Accessibility features.

1.1.6 Winter Maintenance

The City has a documented sidewalk winter maintenance plan as part of its *Winter Management Plan for Streets and Sidewalks*. Of the City's 402 km of sidewalks, 248 km (62%) are designated for winter service and these are divided in four priority categories. Priority descriptions are as follows:

- Priority 1: Major retail areas and major Saint John Transit bus stops;
- Priority 2: Immediate school areas;
- Priority 3: Remaining arterial streets; and
- Priority 4: Remaining local or subdivision streets.

Generally, sidewalk clearing operations focus on Priority 1 and 2 sidewalks first, then move to Priority 3 and 4. Priority objectives during a storm are to create a basic level of accessibility on Priority 1 and 2 sidewalks for emergency access. Priority service objectives after a storm are:

Priority	Service Objectives (Post Storm)
1	• 12 hours after end of storm – basic pedestrian passage • Within 2 days after end of storm – walking surface with salt or sand applied at least once.
2 / 3	• 24 hours after end of storm – basic pedestrian passage • Within 3 days after end of storm – walking surface with salt or sand applied at least once.
4	• 72 hours after end of storm – basic pedestrian passage • Within 4 days after end of storm – walking surface with salt or sand applied at least once.

It would be desirable to provide winter service to all sidewalks in the City. However, staff have found that resource limits make it impossible to provide consistent and satisfactory service to the entire inventory, which is common in other large New Brunswick municipalities. In the future, the City may explore requiring property owners to clear sidewalks in front of their property, as is done in other municipalities for example in Ontario, to provide a more consistent level of service given resource constraints. According to the City's Winter Management Plan (October 2017), currently the City's priorities for winter sidewalk clearing are:

1. Major retail areas and Saint John Transit bus stops;
2. Immediate school areas;
3. Remaining arterial streets; and
4. Remaining local or subdivision streets.

1.2 Trails & Bikeways Strategic Plan 2010

In this 2010 plan prepared by terrain[3], the Saint John approach to active mobility in a trails and bikeways network involves both a recreational and commuter network. The focus of this network is active residents using the trail and bikeway network for any form of human powered transportation such as walking, cycling, skate boarding, wheelchairs, rollerblading, snowshoeing and cross-country skiing.

In this Plan, the City of Saint John trails and bikeways are comprised of three components:

1. Urban/suburban sidewalks and trails;
2. Bike routes; and
3. Local trail systems.

This plan focuses on how to link the urban/suburban sidewalks and trails to the bike routes to create a comprehensive trail and bikeways network that connects Saint John. The intent of this network is to provide non-motorized access to key destinations around the City including the local trail and parks system.

[3] terrain: The Science of Practical Solutions, May 12, 2010

1.2.1 Goals, Objectives and Principles

According to the previously noted 2010 report, the long-term goal of the Trails and Bikeways Strategic Plan is to promote a sustainable and healthy lifestyle by providing opportunities for active lifestyles and mobility options for all of the City's residents.

The Trail and Bikeways Plan serves three key objectives:

1. To identify key recreational and active transportation and corridors;
2. To provide recommendations for implementation and development of the Saint John trails and bikeway network; and
3. To provide direct input into the development of the Saint John Municipal Plan process underway at that time.

The Trails and Bikeways Plan is guided by four guiding principles:

1. Safety
2. Accessibility
3. Connectivity and Walkability; and
4. Aesthetics.

1.2.2 The Planned Network

According to the 2010 Plan, the location of the key elements in the City's Trails and Bikeway network was developed through an analysis of the existing network of active transportation infrastructure, trails, roadways and destinations within the City. At that time, this 183 km network was classified into Neighbourhood routes, Community routes, Citywide corridors and Recreational loops that use existing and proposed trails and links to create a comprehensive connectivity web for all of Saint John. This analysis was supplemented with feedback from community stakeholders and residents, which was incorporated into the development of the routes. The result was the Bikeways and Trails Strategic Plan shown on Exhibit 1.1.

1.2.3 Plan Recommendations

The 2010 Plan made specific recommendations for primary local trails to be further studied to develop a comprehensive trail master plan for the following destinations:

Rockwood Park	Little River Reservoir	Shamrock Park
Blueberry Hill	Seaside Park	Dominion Park
Mispec Park	Tucker Park	Irving Nature Park

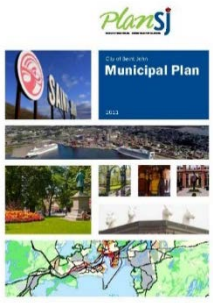
Exhibit 1.1: 2010 Trails & Bikeways Strategic Plan

Since the university and the hospital are one of the largest single concentrations of employment in Saint John, it was recommended that a trail/corridor be located to link the proposed University Avenue Community route north to the hospital and university, also creating a link to the north-end of Rockwood Park.

It was also recommended that to foster partnerships to develop the Marsh Line trail, the proposed trail was identified as a Long term city-wide corridor project. This corridor would provide an essential off road spine to the entire Trails and Bikeways network, providing key access to residential and commercial areas while also providing an excellent off road system for all levels of network users.

Other administrative recommendations are made in the 2010 Plan, including formation of an active transportation advisory committee, bikeway corridor implementation, capital budgeting, policy integration into the Municipal Development Plan and other City planning processes, parkland dedication for linear facilities, review of active transportation-related bylaws and network development, operations and maintenance.

This Plan outlines a “transportation network of trails and interlinking corridors” that creates a central spine or active transportation corridor through the city, connecting one end of the city to the other. However, because it was created prior to the completion of the Municipal Plan 2011, the Trails and Bikeways Strategic Plan did not have the benefit of the goals and direction of the Municipal Plan 2011, and therefore, does not fully align with those goals and direction.[4]



1.3 PlanSJ Municipal Plan

The City’s 2011 PlanSJ Municipal Plan includes active transportation policies that for pedestrian movement largely reflects the 2010 Trails and Bikeways Strategic Plan. Once of the key pedestrian policies, Policy TM-21 is to improve pedestrian amenities and infrastructure giving particular attention to[5]:

a. Effective winter sidewalk and trail maintenance, as resources allow;

b. Appropriate street furniture;

c. Barrier free access; and

d. Visible and safe pedestrian crossings.

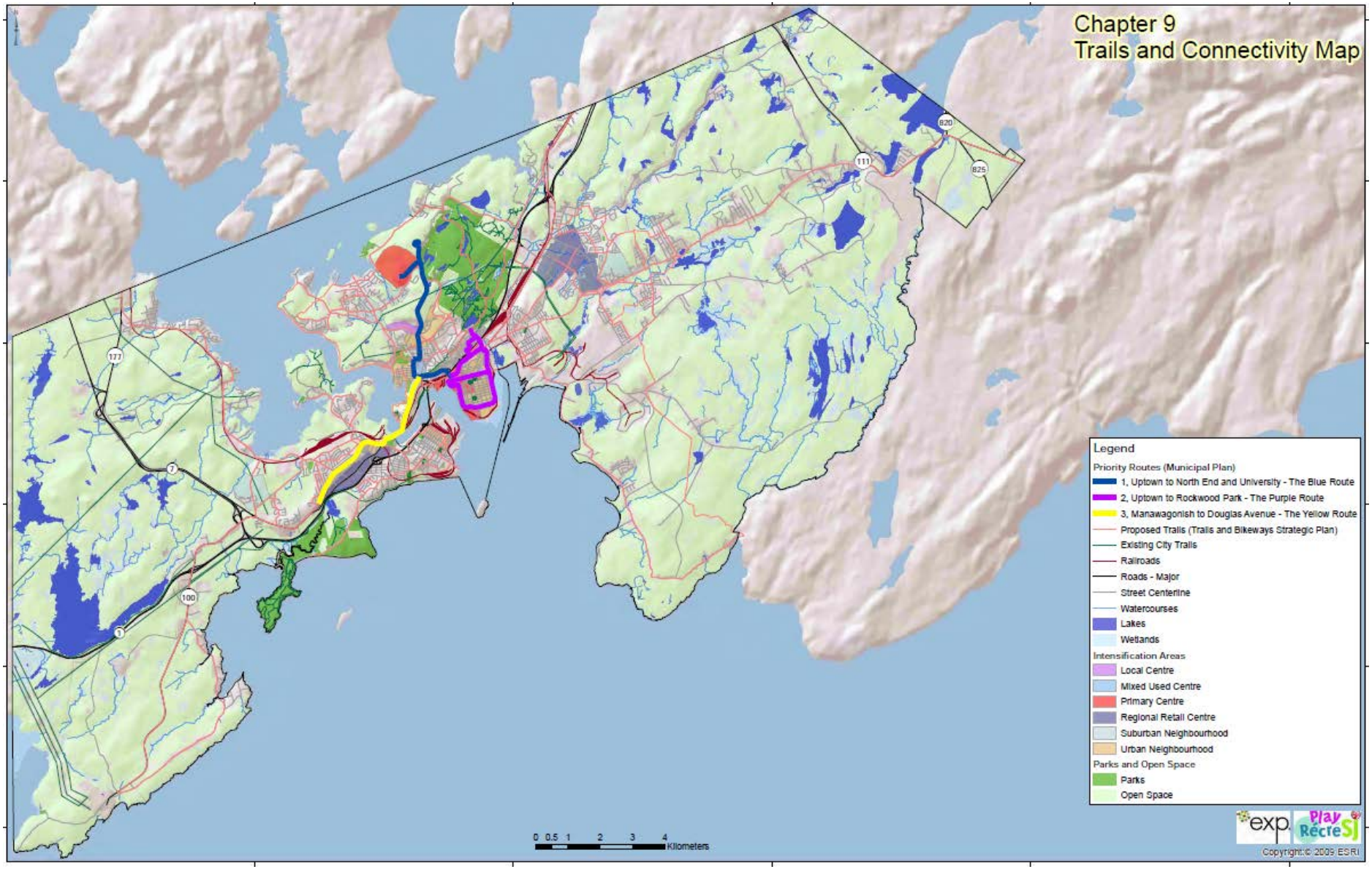
1.4 PlaySJ

The active transportation and especially the pedestrian movement components of the City’s PlaySJ largely reflect the recommended trails projects in the City’s Trails and Bikeways Strategic Plan from 2010 shown on Exhibit 1.2, and recommend the following associated actions:

- Develop trail planning and management plans based on sound ecological practices;
- Participate in regional trail and AT initiatives;
- Add AT routes including Harbour Passage, Rockwood Park to Uptown, Irving Nature Park and Sheldon Point Hiking Trail, and Little River Reservoir Trails;
- Implement a Neighbourhood Walkable Communities initiatives;
- Assist in development of Safe Routes to Schools;
- Coordinate with the City’s Traffic Calming Policy; and
- Safe AT infrastructure in School Zones.

[4] PlanSJ Parks & Recreation Strategic Plan, City of Saint John, 2012
[5]PlanSJ Municipal Plan 2011

Exhibit 1.2: PlaySJ Trails and Connectivity Map



1.5 Barriers to Pedestrian Movement

In Phase 1 of MoveSJ, several key barriers to active transportation in Saint John were identified. However, barriers to walking can be very different than those to cycling (i.e. road space, terrain slope), so this Phase 2 report focuses only on key barriers to walking.

The first key pedestrian barrier in the City is the sheer physical size of the urban and sprawled suburban areas and associated walking distances. Transportation planning typically uses a maximum comfortable walking distance of 2 km in a city. While walking in the higher density core can be conveniently accommodated within this distance, it can be exceeded in the suburbs, leading to more reliance on alternative modes, especially private automobiles for these short trips.

Several key bottleneck areas were also identified in the *Trails and Bikeways Strategic Plan* that present barriers to implementation and usage of the city-wide trails and bikeways network. These areas, described below, continue to present pedestrian movement barriers today and would be candidate projects to focus on in the network improvement plan:

- Rothesay Avenue – Rothesay Avenue is proposed in the *Trails and Bikeways Strategic Plan* as an ideal east-west Citywide Corridor, linking east Saint John to the rest of the network. However, it is a four lane corridor serving high traffic volumes and with little to no space for addition of bike lanes or a multi-use trail for pedestrians within the public ROW. Also, most of Rothesay Avenue has sidewalks on both sides, separated by a grass boulevard. Although these pedestrian facilities exist along Rothesay Avenue, the key pedestrian issue is availability of crossings. There are long gaps between signals and any new crossing treatments would generally require signalization due to the street width and volume. Crossing demand is random so there are no obvious places for new crossings.

  A road diet for Rothesay Avenue has been proposed as a possible solution, reducing the street from four lanes to three lanes with bike lanes which would make addition of crossings much easier, for example with median refuges. . Traffic volumes on Rothesay Avenue have dropped following opening of the One Mile House interchange, but still remain at or above 20,000 vehicles per day which is a common upper threshold for a road diet. This issue requires further investigation to determine feasibility. Traffic modeling planned in Phase 3 of MoveSJ will provide more accurate long term volume projections.

  It is also worth noting that the sidewalk on the east side of Rothesay Avenue ends abruptly just north of McAllister Drive. It should be extended to the end of Rothesay Avenue to serve businesses and neighbourhoods on the east side of the street. Priority for this extension would be low as this area of the City would not support significant growth, and a sidewalk on the west side of the street currently exists.

- Reversing Falls Bridge – Although the bridge provides sidewalks on each side, and shared bikes lanes are being added, it would ultimately be desirable to have separated pedestrian and cycling facilities physically separated from motorized traffic.

- Courtenay Bay Causeway – Traffic speeds and no separation for the south side sidewalk were identified as the greatest issue along the Causeway. A multi-use pathway on one side of the Causeway has been identified in MoveSJ Phase 1 as an option.

- Main Street Viaduct – The *Trails and Bikeways Strategic Plan* proposes the Main Street Viaduct as the long term route from the North End into the Uptown Core. However, the corridor has a six-lane cross-section with a sidewalk on one side, and features several on/off-ramp conflict zones and limited opportunities to cross to the

south side of Main Street. Traffic volumes do not appear to warrant the 6-lanes. It was proposed that the corridor be reduced to four traffic lanes and the remaining space be utilized as a multi-use trail/linear greenway. The Main Street corridor from Chesley Drive to Union Street needs to be reviewed in terms of lane reductions and dedicating more space to pedestrians and cyclists.

- The City's South Central Peninsula Neighbourhood Plan includes a proposed road diet on Main Street North. Details of this road diet such as number of traffic lanes and specific treatments along the street need to be reviewed in more detail, including long term opportunities using the City's pending travel demand forecasting model in Phase 3 of MoveSJ.
- Route 1 Throughway – The Throughway bisects the City and separates north end neighbourhoods from the South Central Peninsula. Crossings are limited to the Main Street Viaduct, Somerset Street, Crown Street and a pedestrian overpass at Stanley Street. It is desirable to improve the walkability, accessibility and connectivity of these crossings to be more attractive to pedestrians better connected to the north and south neighbourhoods. This should be considered in any required upgrades or replacement of this infrastructure.
- Crossing Opportunities on Key Corridors – There are several four-lane and five-lane arterial and collector streets where pedestrian crossing opportunities are somewhat limited. These include Bayside Drive, Rothesay Avenue, McAllister Drive, Main Street and Fairville Boulevard.
- Signalized Intersection Crossings – Many signalized intersections do not provide pedestrian crossings on all legs. This reduces access and creates longer walking distances and increased delays for pedestrians.

2 Pedestrian Policy Directions

As confirmed in Phase 1 of MoveSJ, the City of Saint John installs and maintains sidewalks on one or both sides of most arterial and collector streets in the Primary Development Area, and generally on both sides of streets in dense urban areas such as the Uptown Peninsula, Lower West Side, and Old North End. In residential areas, sidewalks are generally provided on at least one side of the street, although some streets may not have any sidewalks (usually where vehicle volumes are low or generally outside the Primary Development Area). The City has been making sidewalk renewal a capital priority in recent years to improve the condition and standard of sidewalks, replacing asphalt sidewalks with concrete, and adding accessibility features. The following are further policy directions on pedestrian planning.

2.1 Complete Streets

Complete Streets is a relatively new and growing transportation planning concept endorsed by many municipalities where public streets are designed to accommodate all modes of travel, including walking and cycling.

For Saint John, a Complete Streets policy can assist the City in implementing its PlanSJ Transportation and Mobility goals to:

> *"Develop and maintain a balanced transportation system that meets the needs of all community members with a variety of options …"*

The importance of Complete Streets lies in the function of streets and roadways within the community fabric. Access to adjacent lands, whether they are residential, employment, commercial, institutional or recreational is oriented to the streets. Streets are meeting places for social and business interaction through access and mobility. Unlike corridors that solely serve rail, water, utilities, recreation, or natural areas, streets integrate many elements of our society and therefore need to provide access to the broad range of citizens within that society.

A Complete Streets policy is intended to shift Saint John from the previous focus on providing streets to move cars, to a focus on streets where people can interact and move about whether they are on foot, on a bicycle, on a new or alternative form of transportation[6], in a bus or in a car. Every street needs to accommodate pedestrians at a basic level with the provision of sidewalks, walkways or "safe space".

The needs of pedestrians with cognitive, mobility or visual impairments must also be incorporated into the design of those pedestrian facilities.

A Complete Streets policy can empower and direct citizens, elected officials, government agencies, employers, businesses, developers, bureaucrats, planners, architects and engineers. It requires a change in policies and practices to ensure that the entire public road right-of-way is routinely planned, designed, constructed, operated and maintained to enable safe access for all users that are appropriate for local context and needs. It can include:

- Principles of Complete Streets into all transportation projects except where cyclists and pedestrians are prohibited by law, or where there is a demonstrated absence of need.
- Safe crossings of facilities that prohibit use by pedestrians and cyclists. All exceptions should be justified and approved at a senior City staff level.

- Integrating Complete Streets with complementary pedestrian and cycling Active Transportation policies for a variety of non-street corridors such as parkland, natural areas, woodlands, river and creek corridors, stormwater management facilities, utility corridors, transit and rail corridors, etc.
- Incorporating the principle of Complete Streets into all aspects of the City's responsibilities for streets including planning and design, maintenance and operation, and asset management.

Based on these recommended actions, the City should undertake pilot "Complete Street" initiatives that first align with the South Central Peninsula Neighbourhood Plan through road dieting and other related measures.

2.2 Safe Places to Walk

Streets without designated places to walk put people at risk. Busy roads can be significant barriers, especially if there are no or few places to safely cross. Walking trips are generally shorter than trips by car (<2 Km). Thus, pedestrians are often more concerned about direct connections to their destinations. Even streets with sidewalks on one side of the road put people at risk because they put pedestrians in potential conflict as they are required to cross the road to access the sidewalk.

Pedestrians have a 45% likelihood of death when struck at 50km/h, and this rises dramatically to 85% when struck at 60km/hr. Residential areas with no sidewalks are shown to have 23% of pedestrian crashes, but only 3% of pedestrian traffic[7]. In rural areas, paved shoulders reduce pedestrian crashes up to 80% and motor vehicle crashes up to 50%. Streets with no sidewalks also have 2.6 times more pedestrian crashes than the average rate.

Thus, to improve pedestrian safety, policies may not preclude the construction of sidewalks on streets with low pedestrian activity. The lack of safe places to walk can also discourage the potential for walking, yet overall higher levels of walking is associated with regions that tend to have lower traffic fatalities.[8] There is "safety in numbers"; and people who are walking are less likely to be hit by motorist in areas where there are more people walking[9]

According to the AASHTO[10] Guide for the Design, Planning and Operation of Pedestrian Facilities, sidewalks on only one side of the road are not generally recommended. Sidewalks on one side may be acceptable as an interim condition; however streets with sidewalks only on one side showed to have had 1.2 times more pedestrian crashes than the average rate. While streets with no sidewalks are a priority, safety can be further improved with the installation of sidewalks on both sides of the street.

This conclusion must be compared to the City's ability to fund such infrastructure as a limiting factor with limited financial resources.

Thus from a safety perspective, it is important to construct sidewalks on both sides of urban streets, and to provide direct crossing opportunities. Paved shoulders generally provide the best space to walk along roads in rural areas.

[7] Knoblauch, R.L., B.H. Tustin, S.A. Smith and <.T. Pietrucha. Investigation of Exposure Based Pedestrian Areas: Crosswalks, Sidewalks, Local Street and Major Arterial Roads. Report No. FHWA ED-88-038, U.S. Department of Transportation, Federal Highway Administration, September 1988.
[8] Surface Transportation Policy Partnership, www.transact.org. 2000.
[9] Jacobsen, P.L. "Safety in Numbers: more walkers and bicyclists, safer walking and bicycling" Injury Prevention 205-209. 2009.
[10] American Association for State Highway and Transportation Officials

2.3 Primary Pedestrian Routes

The centrepiece of the City's pedestrian and active transportation system is Harbour Passage, a series of inter-connected waterfront parks, recreation spaces and heritage sites. Harbour Passage features over 3 km of multi-use pathways bordering the inner harbour from Bentley Street to the south end of Prince William Street as shown in Exhibit 2.1 Harbour Passage – Existing and Future Alignment. An existing piece of Harbour Passage on Market Place West was built when the street was reconstructed several year ago. The current intention is to connect Harbour Passage at Bentley to and into Lower West at Market Place via a future improvement at Fallsview and Reversing Falls Park. Saint John Development Corp estimates that Harbour Passage serves over 2,500 users per day. The agency has plans to extend Harbour Passage around the perimeter of the South Central Peninsula over a multi-year construction program, with potential for eventual connection to Rockwood Park. There are also future plans to continue Harbour Passage to the west, with linkages to the future Reversing Rapids Lower River Passage.

Other significant networks of recreational trails are found in Rockwood Park and Irving Nature Park. Rockwood Park encompasses an area of 890 ha and is one of Canada's largest urban parks. Located in the heart of the City, Rockwood Park has a variety of recreational amenities including 55 trails and footpaths. Irving Nature Park is a 240 ha privately owned and maintained nature reserve, open to the public. Located in the City's west side, Irving Nature Park is situated directly on the Bay of Fundy and is a popular destination for residents and tourists.

Exhibit 2.1: Harbour Passage - Existing and Future Alignment

2.4 Pedestrian Safety Strategy

2.4.1 Designing for Safety

Design principles for safe urban streets recognize the role that streets play in our cities:

People come first. Cities are built by and for people, and street design needs to embrace this, including supporting multi-modal travel and places that are attractive to be in, not only to travel through. This notion is reinforced throughout PlanSJ which includes key policy recommendations intended to:

> **"***encourage alternative travel by creating an urban environment that encourages walking, cycling and transit use and increases opportunities to live close to work and satisfy day-to-day needs locally without relying on the automobile*." PlanSJ Urban Design Goal #4

Design for safety. Create street designs that encourage appropriate road user behaviour. Be mindful of the potential implications of each design decision not only on drivers but also on vulnerable road users. When people make mistakes on the road, death should not be an outcome.

Street context is crucial. Street design needs to respond to and influence the desired character of these public corridors. Saint John can provide direction through Municipal Plan goals and

policy, and an understanding of the vision of the communities that the streets serve. Transportation objectives must be aligned in order to support overall safety objectives.

Flexibility is an asset. Urban streets are continually evolving, and design needs to adapt as we learn more about accommodating different users and the value streets have as public places. Guidelines and standards are intended to support, rather than restrict, the professional judgement of planners and engineers. As demographics shift over time, and Saint John's urban form intensifies to focus development within existing urban areas, the design of streets and transportation planning must also evolve.

Planners and designers are responsible for exercising good professional judgement and experience in the best interests of public health, accessibility and safety. Any design guidelines should be applied with care and consideration for the local conditions. Effort should be made by planners and designers to strive to comply with guidelines, but guidelines are not a substitute for good professional judgement. Where a design solution is proposed that does not comply with current guidelines, a more rigorous justification of the design decisions should be provided along with incorporating appropriate mitigation measures.

2.4.2 Key Considerations

Historically, roadway design has focused on driver safety. Now, an effort is underway to shift the balance towards better protections for vulnerable road users including pedestrians and especially children, seniors, those with disabilities, and cyclists of varying skill levels.

Key considerations in designing roads for safety are:

- Encourage appropriate road user behaviour;
- Give road users the information that they need to make good decisions; and
- Be forgiving when road users make errors in action or judgment.

2.4.3 Common Pedestrian Collision Types

Understanding the types of collisions that occur most frequently on streets allows a designer to target specific interventions to address common conflicts. The following collision types shown in Exhibit 2.2 are most common with respect to vehicle/pedestrian impacts (and are also similar for vehicle/cyclist interactions).

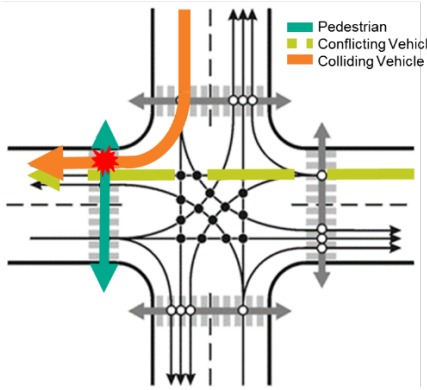
2.4.4 Potential Contributing Factors

With these various collision types, it is important to assess how elements of the roadway environment and human factors can influence the associated risks. Some basic examples of diagnostic questions are provided below.

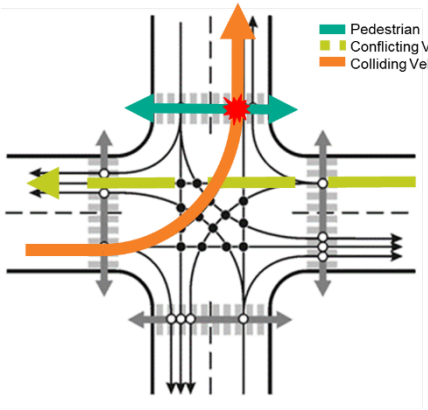
Driver

- Can drivers see pedestrians before they reach the edge of the road?
- Does roadway design help motorists to spot pedestrians waiting to cross?
- Is this an area where pedestrians are expected?
- Is this an area where a specific population of pedestrians is expected (e.g., school zone, retirement home area, hospital, bars, etc.)?
- Will drivers be focused on some other hazard?

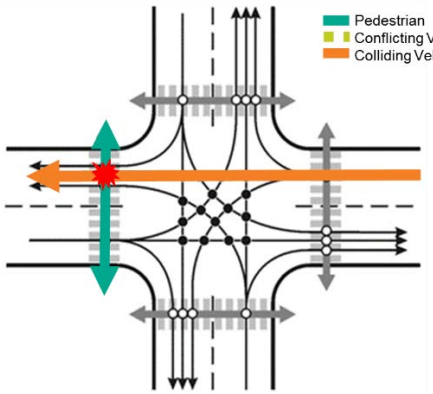
Exhibit 2.2: Common Collision Types Between Vehicles and Pedestrians



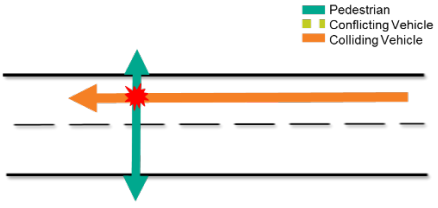
Right-turn collisions. -Driver focus is on selecting a gap in cross traffic to their left so they often do not notice pedestrians crossing to their right.



Left-turn collisions. Driver focus is on selecting a gap in on-coming traffic so they often do not notice pedestrians crossing to their left.



Red-light running/Jay-walking collisions. Driver or pedestrian enters the intersection against the traffic controls and there is insufficient time or space for the driver or pedestrian to take evasive action.



Midblock Collision - Pedestrian enters the roadway in the path of approaching vehicle and there is insufficient time or space for the driver to take evasive action.

Pedestrian

- Will pedestrians be able to easily use safety features?
- Is this an area where driving speeds are high or highly variable?
- Are there gaps in the traffic stream to allow pedestrian crossings?
- Can pedestrians see approaching vehicles?

2.4.5 Importance of Vehicle Speed for Pedestrians

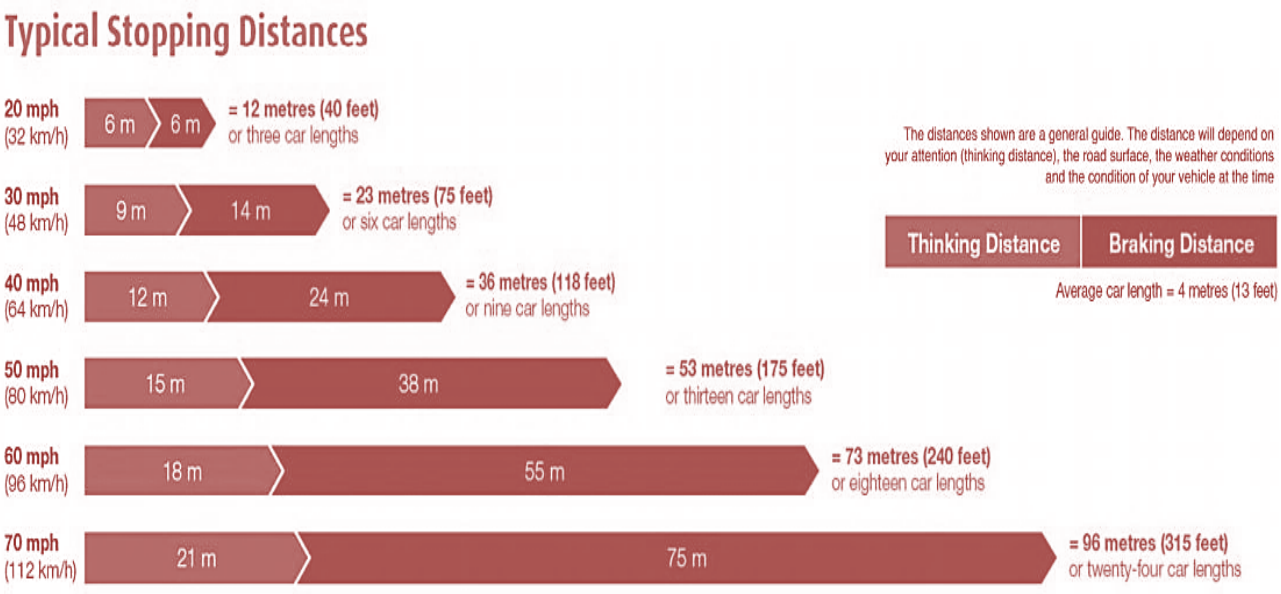
Operating speeds have a significant impact on driver perception-reaction time and braking distance. Typical perception reaction times for auto drivers are:

- Expected hazard or expected response: 0.7 to 1.0s
- Unexpected, simple, clear hazard ahead: 1.1 to 1.5s
- Standard road design applications: 2.5s

Add increase time for:

- Multiple stimuli: add ~0.25 to 0.5s each
- Complex decisions: add ~0.5 to 1.0s
- Air brakes: add 0.3s for vehicle response
- Peripheral vision required: add ~0.25 to 0.5s
- Visual barrier or masking: add time or possibly no response
- Low light: add time or possibly no response
- Alcohol/drug use: add time

Doubling the speed of a vehicle from 30 km/h to 60 km/h triples the stopping distance from three car lengths to nine car lengths as shown next:



Operating speeds also play a major role in collision severity. At higher operating speeds, drivers tend to narrow their field of view, which reduces their ability to detect pedestrians that may be entering the roadway.

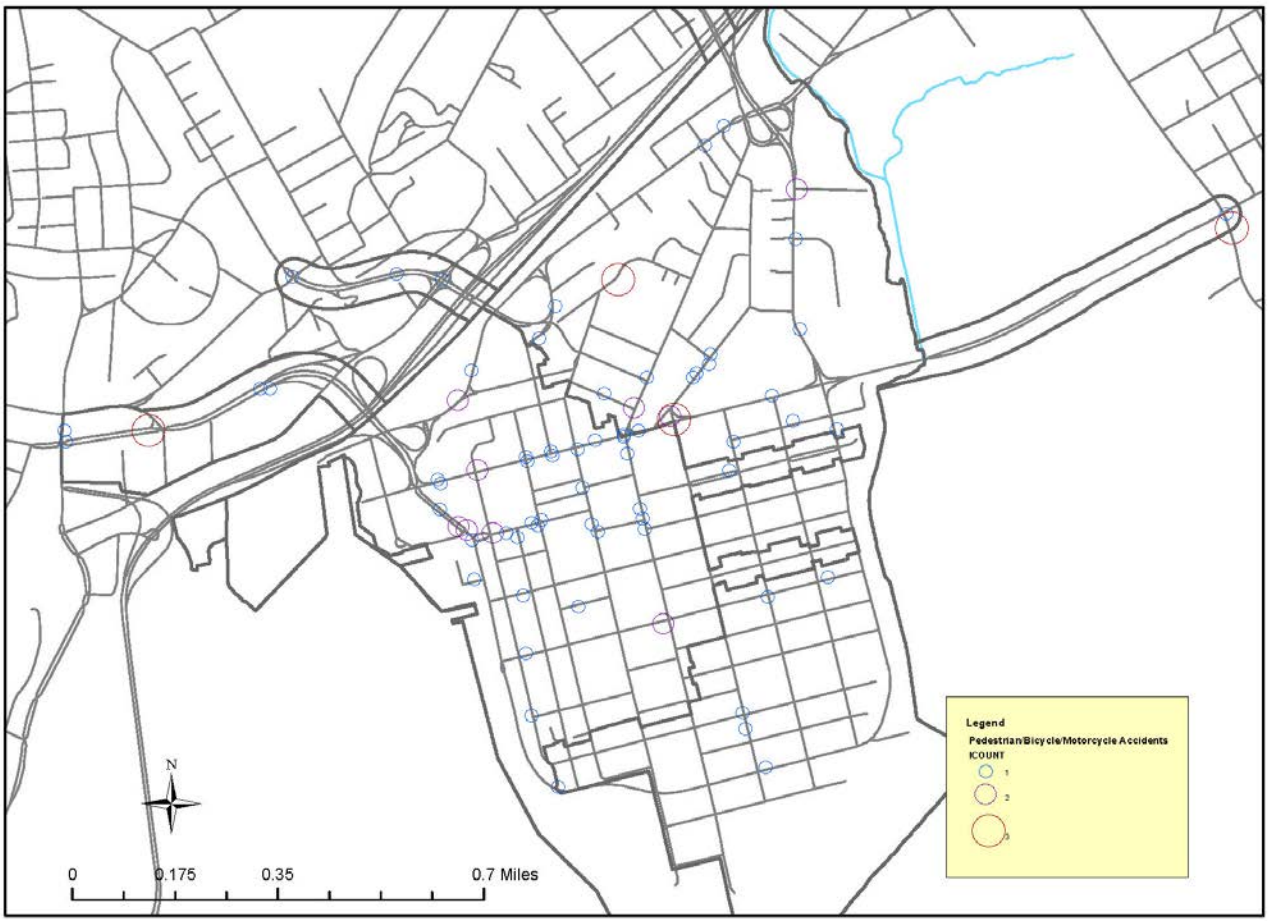
Resources are available to policy-makers, planners and designers about safety on roadways, for example at the following two key references:

- **FHWA's Pedestrian & Bicycle Safety** web site provides tools and resources for identifying and treating pedestrian and cyclist safety issues:
  http://safety.fhwa.dot.gov/ped_bike/tools_solve/
  http://safety.fhwa.dot.gov/provencountermeasures/
- **Collision Modification Factor Clearinghouse:** A crash modification factor (CMF) is a multiplicative factor used to compute the expected number of crashes after implementing a given countermeasure at a specific site. The Crash Modification Factors Clearinghouse houses a Web-based database of CMFs along with supporting documentation to help transportation engineers identify the most appropriate countermeasure for their safety needs. One can search to find CMFs or submit own CMFs to be included in the clearinghouse.
  http://www.cmfclearinghouse.org/index.cfm

2.4.6 Incident Patterns in Saint John

Available locational data on traffic incidents involving pedestrians, cyclists and motorcyclists were provided by the City as plotted on Exhibit 2.3 in the Southern Peninsula from 2012 to 2016. The Southern Peninsula plot shows a pattern of pedestrian, cyclist and motorcycle incidents primarily at intersections along Union Street, King Street and Sydney Street, all in high pedestrian areas.

Exhibit 2.3: Southern Peninsula Pedestrian, Cyclist and Motorcycle Incidents 2012-2016



3 Pedestrian Planning and Warranting

The Trails and Bikeways Strategic Plan prepared by Terrain in 2010 was reviewed, and contains pedestrian planning guidelines for most elements of a pedestrian system, including:

- Design Guidelines for safety, connectivity, walkability and aesthetic; and
- Design Standards for trails, sidewalks, streets, intersections, crosswalks and signage.

The following additional pedestrian planning and warranting topics were also identified that should be included in this pedestrian strategy, and are discussed in the following sub-sections based on industry best standards and practices:

- School crossing guard warranting;
- Traffic calming;
- Pedestrian scramble intersections;
- Pedestrian clearance and walking speed;
- Transportation Impact Study considerations; and
- Pedestrian street design strategies.

3.1 School Crossing Guard Warranting

A school crossing is a location supervised by a school crossing guard that has been recommended through a combination of a site inspection and a warrant evaluation process. These designated school crossings are identified by pavement markings and signage.

The intent of this strategy is to provide guidance in determining whether or not a school crossing guard should be provided at a specific location in Saint John. The City does not currently have criteria for locating school crossing guards. Without such criteria, the process of determining the need for a crossing guard is subjective and makes it difficult to respond in a consistent manner to public requests. Provincial policies on busing and school consolidations is also impacting City responsibilities and driving up demands for crosswalks and guards. The City needs to have an objective process for assessing the conditions under which a crossing guard should be considered. The average cost of a crossing guard to the City is $7,000 per year.

Most municipalities that employ school crossing guards have some sort of criteria for selecting the guards themselves and what their duties are, but criteria for locating guards is somewhat less common where done on a case by case basis.

School crossing guard warranting can be developed for the following types of student crossings at:

- Signalized intersection;
- All-way Stop Controlled Intersection;
- Minor Street Stop Controlled Intersection;
- Pedestrian Signals;
- Pedestrian Crossovers;
- Mid-Block Locations; and
- Removal of a Student Crossing Guard Location.

There are two basic methods of warranting school crossing guard locations depending on the type of crossing:

1. **Exposure Index Method**: is used in the transportation industry as a screening tool to determine the need for safety-related initiatives. For example, many municipalities use an Exposure Index as the primary screening tool to evaluate the need for grade separations at railroad crossings by relating the rail and vehicular volumes. In the context of school crossings, the Exposure Index method examines the level of interaction and conflict between vehicular and student pedestrian volumes. The Exposure Index Method generates a graph based on historical trends at existing crossing guard locations. The graph is then used as the threshold for future crossing locations where a school crossing guard may be required. It is suitable for controlled crossing facilities that have conflicting movements between vehicular and student volumes.

   The **Ontario Traffic Council's School Crossing Guard Guide** (May 2017) includes an Exposure Index for each type of crossing facility discussed below. The Guide includes step-by-step instructions on how to apply the Exposure Index method to each of these crossing types.

2. **Gap Study Method:** is an objective process using site observations to establish the safe gap threshold for pedestrians to cross a roadway by measuring the available gaps along the roadway to determine if there is a sufficient number of safe gaps. Based on a best practice review, the Gap Study method is most effective for

evaluating school crossing guard needs at minor street stop controlled and mid-block uncontrolled locations. It is typically not suitable for fully controlled intersections because the gaps provided at these locations are a natural by-product of the control. The exception for this is at more urban locations where conflicting movements are high even when the pedestrian has the right-of-way. Under these circumstances, the gaps available for pedestrians to cross safely should be evaluated.

The step-by-step method of the Gap Study methodology at minor street stop-controlled intersections and at mid-block locations are outlined in the Ontario Traffic Council's School Crossing Guard Guide.

Other Factors: In addition to the Exposure Index and Gap Study methods, other factors should be considered to determine if and where a school crossing guard is needed. If a location doesn't meet the Exposure Index or Gap Study warrant, it may be warranted for other reasons. In other cases where warranted, a crossing guard may not be needed. The traffic authority must review the following factors in making these decisions:

- Minimum student crossing volume;
- Collision hazard reporting frequency;
- Motorist behaviour;
- Posted speed limit and speed adherence;
- Number of lanes on each approach;
- Sightline distance for drivers;
- Sightline distance for students;
- Proximity to a school;
- Walking route preference of students;
- Presence of pedestrian facilities; and
- Proportion of students that would require longer reaction times.

3.1.1 Developing the Exposure Index

The school crossing guard warrant at a signalized intersection, all-way stop controlled intersection, pedestrian signal crossing or pedestrian crossover is best evaluated with the Exposure Index method, along with the consideration of other factors.[11] The application of the Exposure Index method is done in two phases. The initial phase is to develop an Exposure Index for signalized intersections. The second phase is to use the Exposure Index method to evaluate candidate signalized intersections as to the need for school crossing guards.

First, the Exposure Index for the intersection(s) under study is developed in the following nine steps which are common to each of the six intersection types included in this guideline (with some modifications based on crossing type):

1. Review similar type intersections with guards;
2. Review supervision duration at other guard crossings;
3. Identify conflicting vehicular movements;
4. Count conflicting vehicle volumes during peak school period;

[11] Ontario Traffic Council School Crossing Guard Guide, May 2017, page 23

5. Count student crossing volumes;
6. Multiply student crossings by conflicting vehicle volume for intersection under study and for each school period being evaluated;
7. Select highest school period with student crossings and conflicting vehicle volumes;
8. Input this data into the Exposure Index; and
9. Compare to 85th [percentile curve to determine crossing need.

3.1.2 Applying the Exposure Index

Next, the following warranting methodology is used if the Exposure Index identifies a crossing guard need:

1. Establish the leg of the intersection that would be most suitable for a school crossing guard based on observed “natural desire lines”.
2. Identify the conflicting vehicular movements for the leg of the intersection that was established in Step 1.
3. Count the conflicting vehicular volumes and student crossing volumes during the school peak periods on typical school days.
4. Compare the conflicting vehicular volume and student crossing volume to the Exposure Index, and if the location being evaluated is located above the 85th percentile line, then the Exposure Index warrant is met. If below the line, then the signalized intersection being evaluated does not meet the Exposure Index threshold for requiring school crossing guards and may need to be further considered.

   Note: If Saint John is unable to develop its own Exposure Indices, it is recommended that the City consult other municipalities that have similar characteristics such as population, density, school structure, or school arrival and dismissal periods.

Other factors and indices recommended for consideration based on a review of practices in other cities are:

Exposure Index Factor	Indices
Minimum Student Crossing Volume	Minimum 40 students crossing during school peak periods
Collision Hazard Reporting Frequency	Average of more than two reported collisions/year over previous three years
Inadequate Visibility	Presence of vertical or horizontal road geometry, permanent or temporary physical barriers such as trees, shrubs, billboards, bus shelters or building, and high frequency of heavy vehicles
Number of Gaps Available in Urban Locations	Based on a Gap Study that measures the actual number of gaps in traffic during the pedestrian phase
Proximity to a School	Subject school is visible or in proximity to crossing guard, and crossing location is on a preferred student route

3.1.3 Gap Study Method

At minor stop controlled intersections and mid-block crossings, it is usually best to warrant crossing guards using the following Gap Study method. This is because these intersections do not create traffic gaps as a natural by-product of the crossing. It is typically conducted in two phases:

Phase 1: Safe Gap Time is the time required during a traffic break that permits students to cross the road safely, and is typically calculated as[12]:

Safe Gal Time (G) = Perception & Reaction Time (P) + Crossing Time + Group Factor Time

Or

$$G = P + (W/S) + T\ (N-1)$$

Where:

P = time it takes a student to decide if it is safe to cross (or use 4 seconds);

W = width of roadway being crossed usually from sidewalk to sidewalk;

S = average student walking speed (or use 1.0 m/s);

T = student group crossing factor (or assume 2.0 seconds); and

N = group factor time affecting crossing (i.e. 3 students = 1, 8 students = 2, etc.).

Phase 2: Gap Surveys and Analyses (for Minor Street Stop Controlled Intersections)

1. Record and time traffic gaps in 5 minute intervals during morning, mid-way and afternoon school periods;
2. Record number of students crossing during the gap survey (Step 1);

[12] Ontario Traffic Council School Crossing Guard Guide, May 2017

3. Count number of gaps recorded that is equal to or greater than the Safe Gap Time calculated above;
4. Count number of five minute intervals where there are less than 4 surveyed gaps that are equal to or greater than the Safe Gap Time;
5. Count the number of 5 minute intervals surveyed;
6. Calculate the proportion of five minute intervals with less than 4 Safe Gap Times;
7. If less than 50% of the five minute intervals surveyed had less than 4 Safe Gaps, then a crossing guard is warranted.

Other factors to consider in this warranting include minimum student crossing volume (30-40), collision frequency, visibility limitations and proximity to a school.

3.2 Traffic Calming Update

Effective traffic calming on the street benefits pedestrian comfort and safety. The City's Traffic Calming Policy dated April 10, 2012 has been reviewed, and no significant omissions or updating needs were identified. The implementation process shown next is found to be very complete and consultative. Pedestrian movement and crossing of traffic calming devises should be included a standard evaluation criteria in selecting appropriate calming measures.

Consideration could also be given to updating the Traffic Calming measures to include speed 'cushions' as shown here that allow large emergency vehicles such as a fire truck with wider wheel bases to pass over these cushions at faster speeds compared to standard passenger vehicles that must slow to travel over them. Also, use of roundabouts can differentiate between larger modern roundabouts, and smaller mini-roundabouts or buttons that are located within the standard road right-of-way.

3.3 Pedestrian Scramble Intersersections

Pedestrian priority crossings, commonly referred to as scramble intersections or crossings, can operate at intersections that have a very high number of pedestrian crossings in all directions. In Saint John this may not be applicable even at the main core area intersections and those in proximity to large institutions that generate relatively high pedestrian traffic. This would be where the volume of pedestrians is so high that it blocks turning traffic during the entire "GREEN" signal phase. In such cases, an exclusive pedestrian phase can be introduced.

During this phase, all vehicles are stopped on all approaches to the intersection, allowing pedestrians to cross the intersection either diagonally or conventionally as shown here. In order to further improve pedestrian safety, vehicles may not be permitted to make a right turn on a red light at any time at these intersections.

In Canada, scramble intersections have been installed at very busy intersections in Toronto (seen here at Yonge/Dundas Streets), Kingston at Queen's University and in Ottawa where pedestrian crossing volumes are over 2,000/hour. This type of phasing usually requires the addition of pavement markings and signs to communicate that crossing diagonally is permitted. Pedestrian signal heads are installed facing the diagonal crossing direction. Case studies have shown that pedestrians and motorists have become accustomed to the new phasing quickly, the level of service at tested scramble intersections has remained within acceptable levels, and collisions between vehicles and pedestrians has decreased.

Motorists are not permitted to proceed in any direction during the scramble crossing when the all-direction walk signal and all-direction red traffic signals are displayed. Therefore, motorists can expect increased delays at such an intersection since the red signals will be longer in order to accommodate the pedestrian priority/scramble crossing. When the green light is displayed, motorists can proceed as usual and travel straight through the intersection or turn left or right when safe to do so.

3.4 Pedestrian Clearance and Walking Speed

The minimum pedestrian "walk" interval is the time that allows pedestrians to notice the change of the signal indication and to cover a sufficient distance into the crosswalk. The minimum pedestrian clearance interval (i.e. Flashing Don't Walk – FDW) should allow pedestrians who entered the crosswalk at the very last moment of the "walk" interval to reach a designated pedestrian refuge or the other side of the roadway before the start of a conflicting green interval. The total "walk" plus FDW interval should be used to determine the walk speed across the entire crossing.[13]

Based on this and other municipal references, a 1.0 metres/second (m/s) walk speed is usually used to accommodate the general population. This can be reduced across an entire crossing to accommodate older pedestrians or pedestrians using assistive devices. A value greater than 7.0 seconds can be used for the minimum "walk" duration in the following situations:

- Where pedestrian volumes are high and/or pedestrian storage is an issue (e.g. in a downtown or at special events where pedestrians queue for the pedestrian signal and need additional time to enter the crossing);
- Where an Accessible Pedestrian Signal (APS) is installed; and
- Where the pedestrian "walk" plus FDW interval equal walk speeds of :

[13] Traffic Signal Operation Policies and Strategies, City of Toronto, May 2015

- 0.9 m/s in cases where at least 20% of pedestrians crossing the signalised intersection are older pedestrians (65 years of age or older);
- 0.8 m/s in cases where at least 20% of pedestrians crossing the signalised intersection use assistive devices for mobility.

3.5 Transportation Impact Studies Pedestrian Considerations

Transportation Policy TM-3 of the City's Municipal Plan requires developers to undertake a transportation impact study to assess impacts of a proposal on the street network. The City should require that such studies include an analysis of sidewalk requirements (new, infill or rehabilitation) and other pedestrian infrastructure such as road crossing, intersection treatments for pedestrians, accessibility features for the disabled and/or signage.

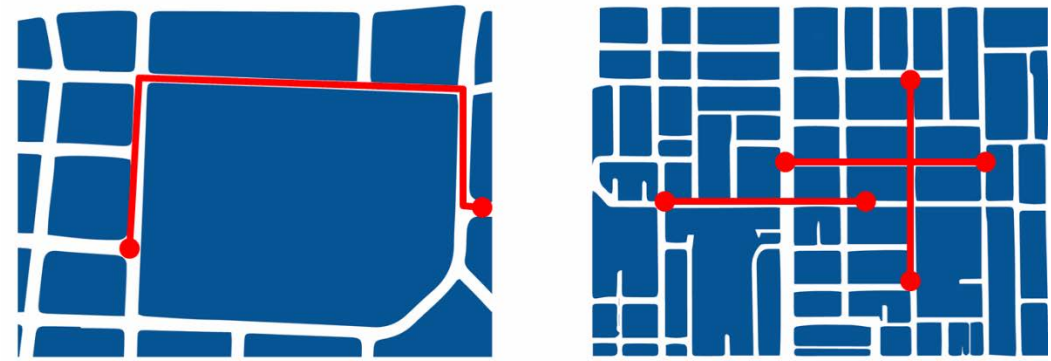
In the case of urban development proposals that are not connected to existing sidewalks, warrants for sidewalks should be addressed in transportation impact studies. Major streets are the first priority due to their proximity to more walking destinations, and exposure to traffic (both higher speeds and volume). Other warranting factors can include:

- Number of pedestrian fatalities and injuries with the past 3 years;
- Lack of nearby alternative walkways;
- Volume of existing and future pedestrian activity (high, medium, low);
- Volume of vehicular traffic;
- Vehicle operating speed;
- Access to schools and services to seniors; and
- Proximity to transit stops (where provided).

3.6 Pedestrian Street Design Strategies

Designing for safety is about creating streets that reduce the risk of driver error and impose controls to protect vulnerable road users. Key strategies that can improve safety outcomes for all road users are as follows.

- **Reduce traffic speeds.** Lowering operating speeds can reduce the likelihood and severity of collisions and attract new road users. Speeds can be lowered through redesign of the standard geometric elements of the roadway such as lane widths, or by adding physical traffic calming measures.
- **Keep cities compact.** A compact road network can encourage active transportation, increase routing options, reduce operating speeds, and reduce the frequency of midblock crossings. Compact roadway cross-sections and intersections can reduce pedestrian crossing distances and further reduce operating speeds. Also, wherever possible in new more compact subdivision designs, reduce the walking distance between point A and point B in the street layout as shown here.



- **Create streets that are for people, not just cars.** In environments where speeds are slow, road users can share the space with less risk. Where operating speeds are higher, exclusive space may be required for each user group.
- **Make public transportation safe, affordable, and convenient.** Collision frequency is directly related to the volume of traffic on a given roadway. By providing alternatives to private automobile trips, collisions and conflicts between vehicles and pedestrians can be reduced simply as a function of lowered exposure.

Use data mapping techniques to identify problem spots and target design fixes. By leveraging new data analysis and visualization tools as shown in Exhibit 2.3, collision concentrations and the influences of network elements can be identified and communicated in ways that were not previously possible. Traditional collision analysis can then be used to diagnose and identify treatments for problem locations.

4 Pedestrian Maintenance Strategy

Maintaining on-pedestrian sidewalks, recreational trails and multi-use paths is important for user safety, enhancing the longevity of the facilities, reducing hazards, minimizing risk and injury to all users and encourages usage of facilities. Current winter maintenance practices are summarized in Section1.1.6. But as the Saint John transportation system continues to evolve and change, the City needs to ensure that it maintains and operates the system effectively and efficiently to meet the needs of all users. This requires a maintenance strategy that changes levels of service in one area and need for additional resources in other areas. Recommended strategy elements for consideration in updating maintenance practices are reported as follows.

4.1 Clearing and Maintenance

4.1.1 Sweeping

Accumulated debris along pedestrian routes (sidewalks, trails and paths) on surfaces and in curbs and gutters is one of the most common obstacles to the safe use of these facilities. After long winter months sand, dirt and debris accumulates along roadway gutters and the surfaces of sidewalks, boulevards, recreational trails and multi-use pathways. Not only is this unsightly, but it is a cause of concern for pedestrians using these facilities (this was noted in the consultation held for the Trails and Bikeway Strategic Plan).

As soon as practical after the completion of the winter maintenance program, a spring sweeping program should commence. Where possible, designated trails, paths and sidewalks should be prioritized such that they are completed prior to sweeping of minor routes.

4.1.2 Litter

Litter is an on-going concern for most municipalities. It is an eyesore within public spaces. Litter pick-up is initiated in the spring and is generally undertaken as part of the spring cleanup program and commences as soon as practical at the end of the winter season. Many municipalities have instituted awareness programs that encourage citizen groups to adopt a road or trail to assist in litter control. Garbage bins should be conveniently located at the start of recreational trails and multi-use paths. They should be regularly monitored and emptied at least once a week or on an “as required” basis.

4.1.3 Vegetation Control

Plantings such as shrubs along the side of sidewalks, trail or paths may encroach or cause sight distance problems for users at driveways or intersections. Ove grown shrubs blocking motorists' views may cause them to extend their vehicles further into the travel lane or block a sidewalk in order to see. This may cause motorists to make unsafe crossings in front of oncoming vehicles, cyclists and or pedestrian traffic.

Trees and shrubs along road edges, sidewalks, recreational trails and multi-use paths should be pruned to prevent encroachment from branches and ensure the safety of cyclists and bikeway users. Trained staff should inspect and identify potential hazards and the extent of work required to make it safe. Trimming of trees and shrubs to provide adequate sight distances at street intersections must be maintained. Particular attention should be given to driveways and road intersections to ensure visibility is maintained between pedestrians and drivers. Special attention should also be given to trimming tree limbs that obstruct signage.

Tree roots can be a source of pedestrian tripping and contribute to surface damage. Preventative measures such as root barriers should be considered at the time of trail construction. If roots pose a hazard along a trail, consideration to judiciously cut back intrusive tree roots may be necessary to provide a safer surface. Weeds or plants growing through the trail surface can result in pavement damage. Appropriate preventative treatments should be taken to mitigate underlying problems prior to completing the final surface repair.

4.1.4 Surface Repair

Surface maintenance and repair are the result of a number of factors that in combination create surface defects that require mitigation. Frequent freeze thaw cycles, insufficient drainage, tree roots, aging and deferential settlement of the subgrade all play a role in the longevity of the pavement. Maintenance of sidewalks, recreational trails and multi-use paths is essential in sustaining a viable and safe pedestrian network free of defects for all users. The desired outcomes of an effective maintenance program are smooth surfaces free of bumps, cracks, pavement or surface drop-offs, potholes and ridges.

4.2 Recreational Trail and Multi-Use Path Surfaces

There are several types of surfaces used in the construction of off-road recreational trails and multi-use paths. Each surface type requires specific maintenance considerations. An overview of the characteristics, potential defects, suggested inspection frequency and associated maintenance and repair requirements for various surface types are discussed below.

4.2.1 Asphalt

Asphalt surface is used in the construction of recreational trails and multi-use paths to provide a smooth comfortable ride quality for users. Asphalt trails are durable and suitable for high traffic areas. A minimum width of 3 meters, where it can be achieved, allows adequate access to all users. Asphalt surfaces are used where grades exceed 5% or where deemed appropriate. Well-constructed trails provide for a granular base, a minimum cross fall of 2% and drainage ditches along the trail to allow for the collection of surface and subgrade drainage. Typical life span of asphalt trails is approximately 10 years. Surface defects that may be hazardous to users include cracking such as alligator, longitudinal, transverse; potholes, pavement drop-offs, depressions and utility cut patches.

4.2.2 Stonedust / Gravel

Stonedust/gravel trail serve various users such as cyclists, walkers and runners. While some runoff may be absorbed through the surface, it should be properly graded to allow surface flow. The grade of stonedust trails should not exceed 5%. Stonedust / gravel are more susceptible to erosion and potholes, and as such after a major storm event, they should be inspected for surface defects that may result in user injury. Calcium chloride may be used as a soil stabilizer and may also help in reducing dust. Grooming as required will help maintain a smooth and comfortable riding and walking surface for trail users.

4.2.3 Concrete

Concrete is the common sidewalk surface, but not a preferred trail surface material except where there is significant traffic, near buildings or connection between facilities as an example. Concrete can have a significantly longer life span than other surface types, in excess of 30 years. They are susceptible to deferential settlement that can result in discontinuities and trip hazards.

4.2.4 Pavers

Concrete pavers are used between and leading up to facilities and at focal points. Pavers are durable, however they require a well compacted granular subbase and sufficient cross fall to allow for surface water to runoff to minimize settlement. Special attention should be given to supporting the paver edge along the path to maintain the integrity of the trail.

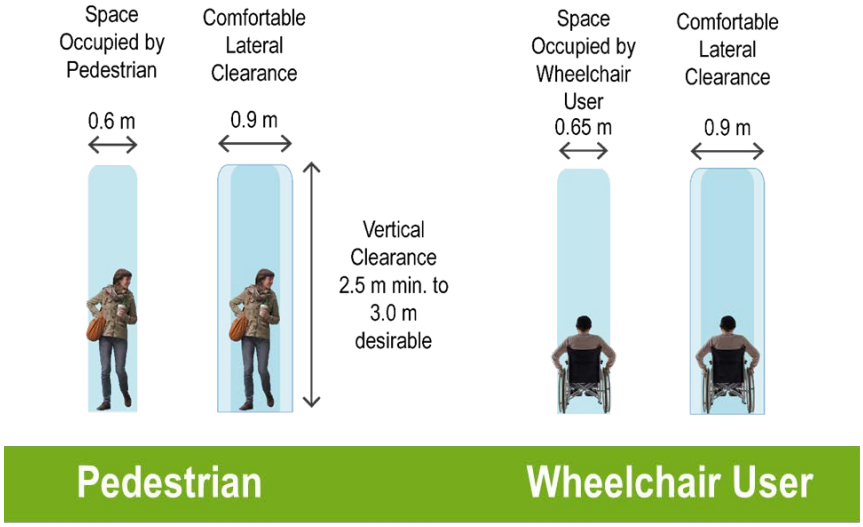
4.2.5 Woodchip/Mulch on Compacted Earth

Compacted earth and wood chip /mulch trails can serve walkers, runners, hikers and mountain bikers. These trails require more frequent attention and maintenance due to natural degradation of the materials. They are more susceptible to erosion and should be checked at the end of severe weather events.

5 Accessible Pedestrian Design Strategy

5.1 Designing for Vulnerable Users

The design of pedestrian facilities must account for the operating space and lateral clearance of vulnerable users, just as roadway designs consider operating space for motor vehicles.



Design actions that should be taken to accommodate vulnerable users of pedestrian systems include:

- Account for the most vulnerable street user by selecting a safe operating (target) speed suitable for the complexity of the urban setting;
- Select a design vehicle that is a frequent user of the street for determining overall geometrics such as lane width and corner radius;
- Select a control vehicle that is the infrequent large vehicle at “crawl speeds” to modify the design of intersections where required to allowing full use of multiple lanes or the full intersection for turns;
- Design public transit routes for the efficient operation of the transit vehicles while accommodating vulnerable users (i.e. bus stop and transit shelter design);
- In designing designated truck routes, consider the needs of vulnerable users in terms of separation to travel lanes (i.e. boulevard space) and pedestrian crossing timing at signals; and
- Incorporate the comfortable lateral clearance (see previous graphic) for pedestrians and the disabled in the design of their facilities.

5.1.1 School Crossing

See Section 3.1.

5.1.2 Active and Safe Routes to Schools

The Active and Safe Routes to School (ASRTS) program has existed in Canada since 1996. ASRTS initiatives promote the use of active transportation for the school journey, through educating school communities about the benefits, and encouraging walking and cycling through special events and activities. Saint John does not offer this program, but has prepared a brochure on safe walking routes to schools that is distributed through schools to parents/guardians.

5.2 Barrier Free Design Legislation – New Brunswick

In New Brunswick, Regulation 2011-61 Barrier-Free Design Building Regulations (Community Planning Act) provides design requirements and standards for accessibility for those with mobility disabilities. This legislation must be followed in the planning and design of pedestrian systems in the City.

6 Sidewalk Infill Strategy

Within the Primary Development Area (PDA) of Saint John there are numerous locations where historically there has been no sidewalks or other pedestrian space provided. The most direct way to address the lack of sidewalks in any city is to build more sidewalks. However, in a historic setting such as the Saint John PDA, this is often not physically possible owing to building placement and public road allowances.

To address missing sidewalks, some municipalities enact policies and programs to petition for new sidewalks (infill sidewalks). In some cases, such a policy has challenges involving public acceptance of infill sidewalk implementation that may present barriers towards developing a complete pedestrian network. In other cases, a municipality can infill missing sidewalks on the basis of the "Overall Public Good". Each case is different but there are some common features of sidewalk infilling that can be considered in Saint John.

6.1 Sidewalk Infill Prioritization

Generally, a sidewalk infill program is focused on construction of new sidewalks along residential streets and collector streets within established residential areas where no sidewalk exists. These infill sidewalks are constructed typically in the capital program as part of roadway improvement projects. The main goals of a sidewalk infill program are to improve:

- Safety,
- Continuity of the sidewalk system,
- School connectivity,
- Recreation and park connectivity,
- Transit access, and
- Multiple land use connectivity.

Infill sidewalks are constructed for the benefit of the overall neighbourhood and the community in which the sidewalk is situated. So in many cases, the needs of the community and sidewalk users are considered over any opposition from affected property owners when a City decides when and where to build infill sidewalks on existing roadways.

Missing sidewalks along local streets may also be considered in the program, but major streets are usually the focus due to proximity to more destinations, exposure to traffic (both higher speeds and volume) and potential to connect with transit routes. Other candidate infill projects along local streets may be added through a resident petitioning or request process.

In general, the priority for sidewalk infill projects should focus on arterial and collector roads that:

- Have no existing sidewalks on either side; and
- Are located within a major activity area (i.e. employment nodes, commercial areas, school or other institutions, seniors centres and open spaces), within walking distance (i.e. 800m) of a transit stop or along a transit route.

However, it is also recognized that many criteria must be considered when developing priorities for sidewalk infilling. A priority framework is provided for Saint John in Exhibit 6.1 to facilitate the consideration of multiple criteria that can influence sidewalk infill priority. The criteria are taken from examples in other jurisdictions that apply a point system reflecting safety, traffic volume and destination criteria. Candidate infill locations with the most points will have a higher implementation priority.

Exhibit 6.1: Priority Framework for Sidewalk Infill Program in Saint John

Objective	Priority Criteria	Point Recommendations	Points
Pedestrian Safety and Comfort	No sidewalk on either side of the street	Maximum points given where no walkways on both sides of the street	10
	Pedestrian fatalities within the late 3 year	Set maximum point score per fatality	10
	Pedestrian injuries within the last 3 years	Set maximum point score per non-fatal injury	10
	Lack of nearby alternative walkways	Set point score if alternate walkway not in proximity (e.g. beyond 800m)	10
	Existing or future pedestrian activity	Ascending point score for low, medium and high pedestrian activity	0-2
	Existing and future vehicle traffic volume	Ascending point score for medium and high range AADT (e.g. <5,000, 5K-10K, 10K-15K, 15K-20K, >20,000 vpd)	0-4
	Operating Speed	Ascending point score for medium to high range of operating speeds (e.g. <50kph, 50-60kph, 60-70kph, 70-80kph, >90kph)	0-4
Maximum Score			**50**
Pedestrian Demand	Within major activity centre (i.e. employment nodes, commercial areas, institutions, parks and open spaces)	Set point score if within boundary of activity area or within proximity to major destination (e.g. 800m)	10
	Concentration of destination areas	Ascending point score for low, medium and high concentration of destination areas	0-2
	Access to elementary schools	Set point score for within elementary school proximity (e.g. within 400m)	15
	Access to secondary school	Set point score for within secondary school proximity (e.g. within 800m)	3
Maximum Score			**30**
Access to Transit	Proximity to transit stops	Set point score for within transit stop proximity (e.g. within 800m)	10
	Location along transit route	Ascending point score for no, partial, full transit route along infill sidewalk	0-2
	Request from the public	Set point score for record of public support	8
Maximum Score			**20**
Maximum Overall			**100**

Note that the actual scores for each priority factor are not final, but should be simple and produce desired outcomes. Assigned points for each criteria are intended to reflect relative level of importance. This approach allows for flexibility in the framework based on available data.

6.2 Sidewalk Infill Program Funding

Designated, recurring funding is necessary to effectively implement a sidewalk infill program. Funding individual sidewalk infill projects on a case-by-case basis can be inefficient, and there is the risk that less engaged neighbourhoods are overlooked even when there is a clear need for sidewalks. The priority framework can streamline the process not only by identifying need areas, but by providing guidance on how to allocate funding City-wide. The framework helps free up time required from City staff and Council to assess the trade-offs of each individual project. Instead, it provides a transparent policy-based approach to review proposed sidewalk retrofit projects on a multi-year and City-wide level.

The primary objective of a sidewalk infill program is to address pedestrian needs for safe places to walk by ensuring there are sidewalks on at least one side, and preferably both sides of all urban streets in the City. The total length of missing sidewalks would have to be measured, and the cost to install an infill sidewalk can range from to $250,000 to over $400,000 per kilometre depending on site conditions (such as the need to relocate utilities). Commitment to this level of investment is expected to be beyond the resources available to the City without resulting in a significant compromise to other City services and programs. Therefore, if the City supporting a sidewalk infill strategy, it also requires a strategy to manage the scope of a sidewalk infill program.

While infill funding would be dedicated primarily to new concrete sidewalks in urban areas, it can also fund pedestrian-dedicated asphalt walkways and multi-use trails along roads in more suburban locations as provided for in the Trails and Bikeways Strategic Plan.