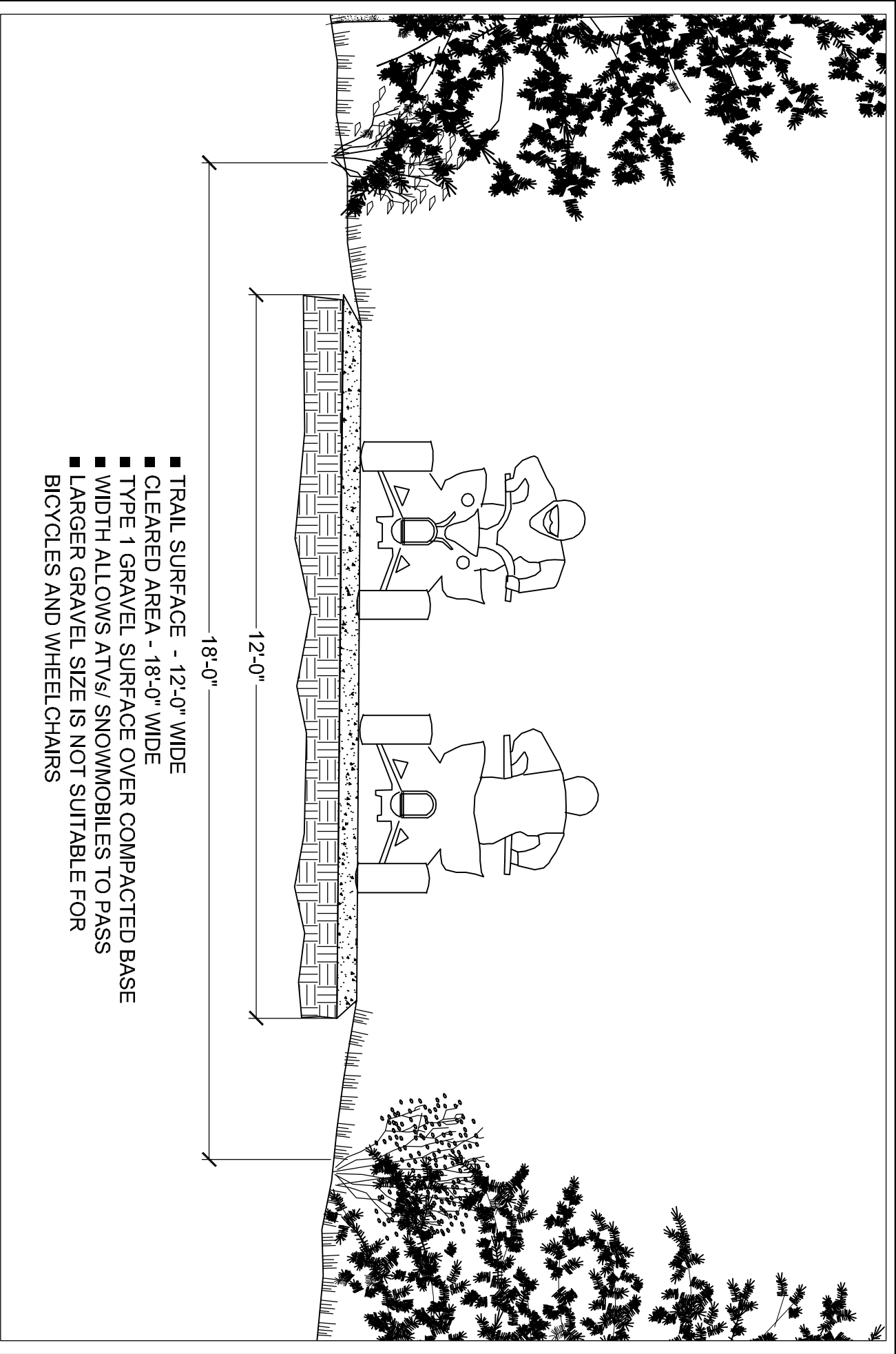


Appendix F: Trail Profiles



Gordon Ratcliffe
LANDSCAPE ARCHITECTS

5839B YOUNG STREET
 HALIFAX, NOVA SCOTIA
 CANADA, B3K 1Z7

PHONE: (902) 478 - 3883
 FAX: (902) 857 - 1108
 ghr@aestlltk.ca

project: WESTERN COMMON

title: SHARED USE TRAIL
 MOTORIZED VEHICLES

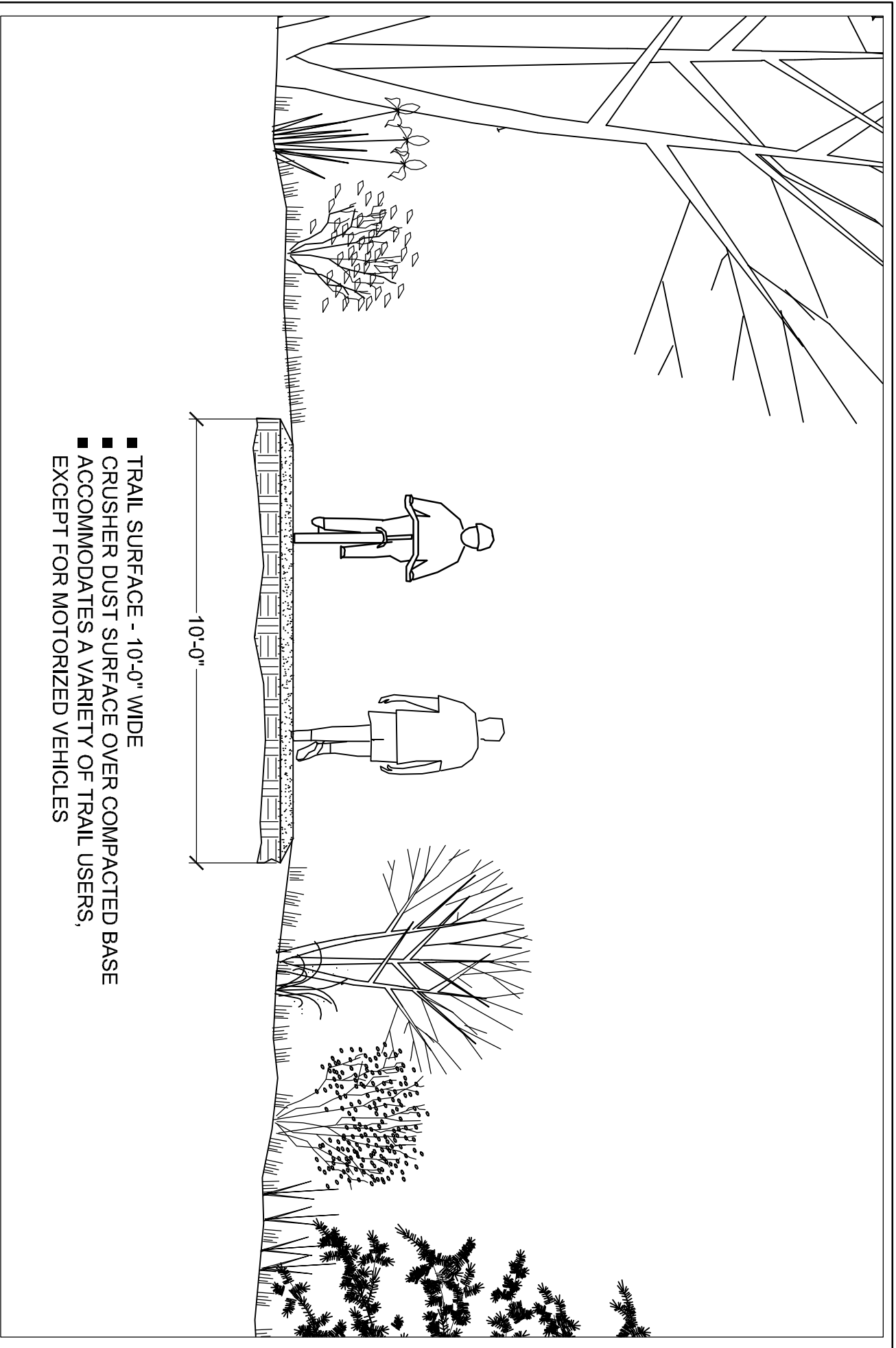
date: MAY 4, 2009

scale: NTS

drawn by: MDP

detail:

LSK-1



- TRAIL SURFACE - 10'-0" WIDE
- CRUSHER DUST SURFACE OVER COMPACTED BASE
- ACCOMMODATES A VARIETY OF TRAIL USERS, EXCEPT FOR MOTORIZED VEHICLES

Gordon Ratcliff
LANDSCAPE ARCHITECTS

5539B YOUNG STREET
 HALIFAX, NOVA SCOTIA
 CANADA, B3K 1Z7

PHONE: (902) 478 - 3883
 FAX: (902) 857 - 1108
 grife@eastlink.ca

project: WESTERN COMMON

title: SHARED USE TRAIL
 NO MOTORIZED VEHICLES

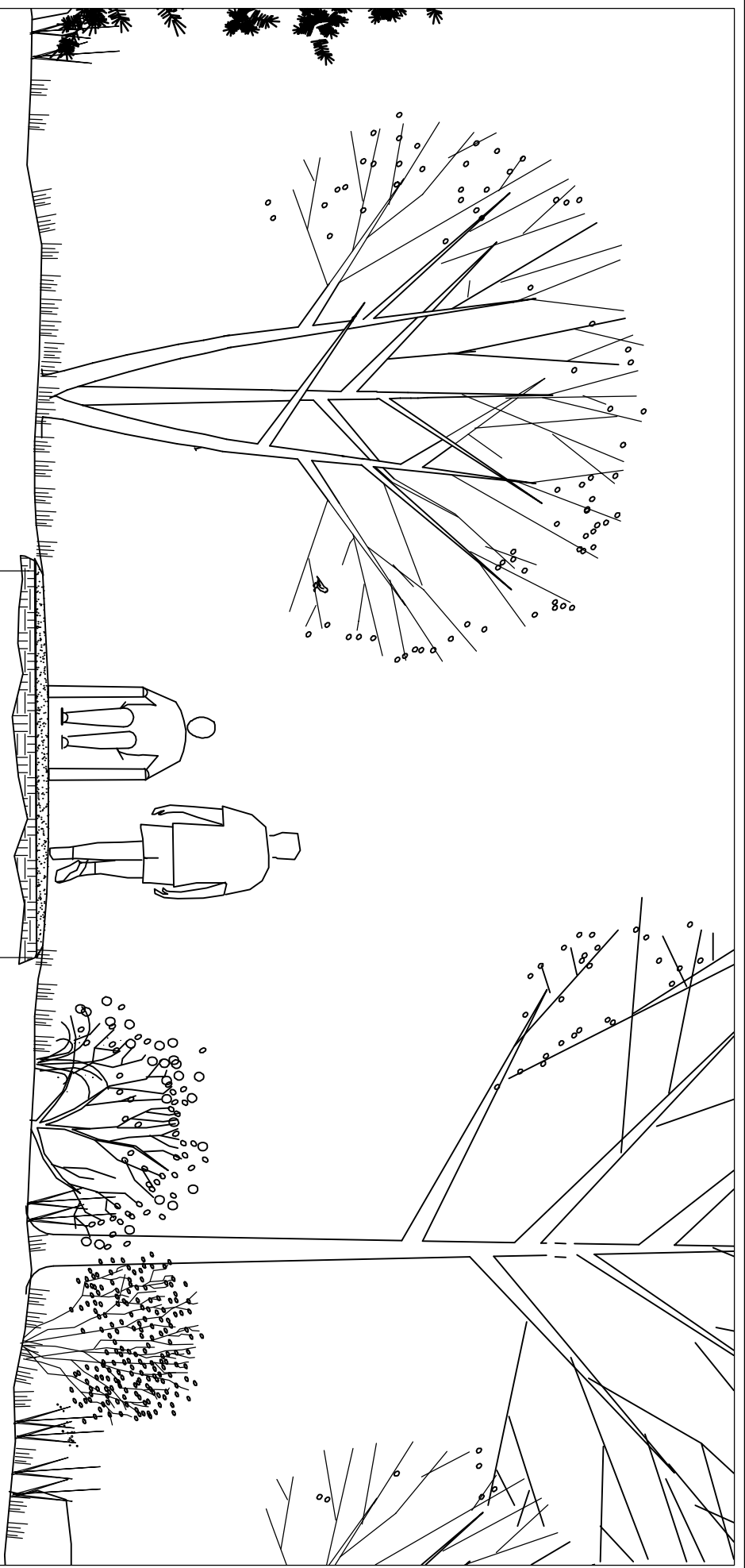
date: MAY 04, 2009

scale: NTS

drawn by: MDP

detail:

LSK-2



- TRAIL SURFACE - 6'-0" WIDE MIN.
- ASPHALT / BOARDWALK / CRUSHER DUST SURFACE OVER COMPACTED BASE
- ACCOMMODATES WHEELCHAIRS AND OTHER WHEELED CARRIERS (IE. STROLLERS)
- WIDTH ALLOWS TWO WHEELCHAIRS TO PASS

Gordon Ratcliffe
LANDSCAPE ARCHITECTS

5539B YOUNG STREET
 HALIFAX, NOVA SCOTIA
 CANADA, B3K 1Z7

PHONE: (902) 478 - 3683
 FAX: (902) 857 - 1108
 gha@eastlink.ca

project: WESTERN COMMON

title: SHARED USE TRAIL
 BARRIER FREE TRAIL

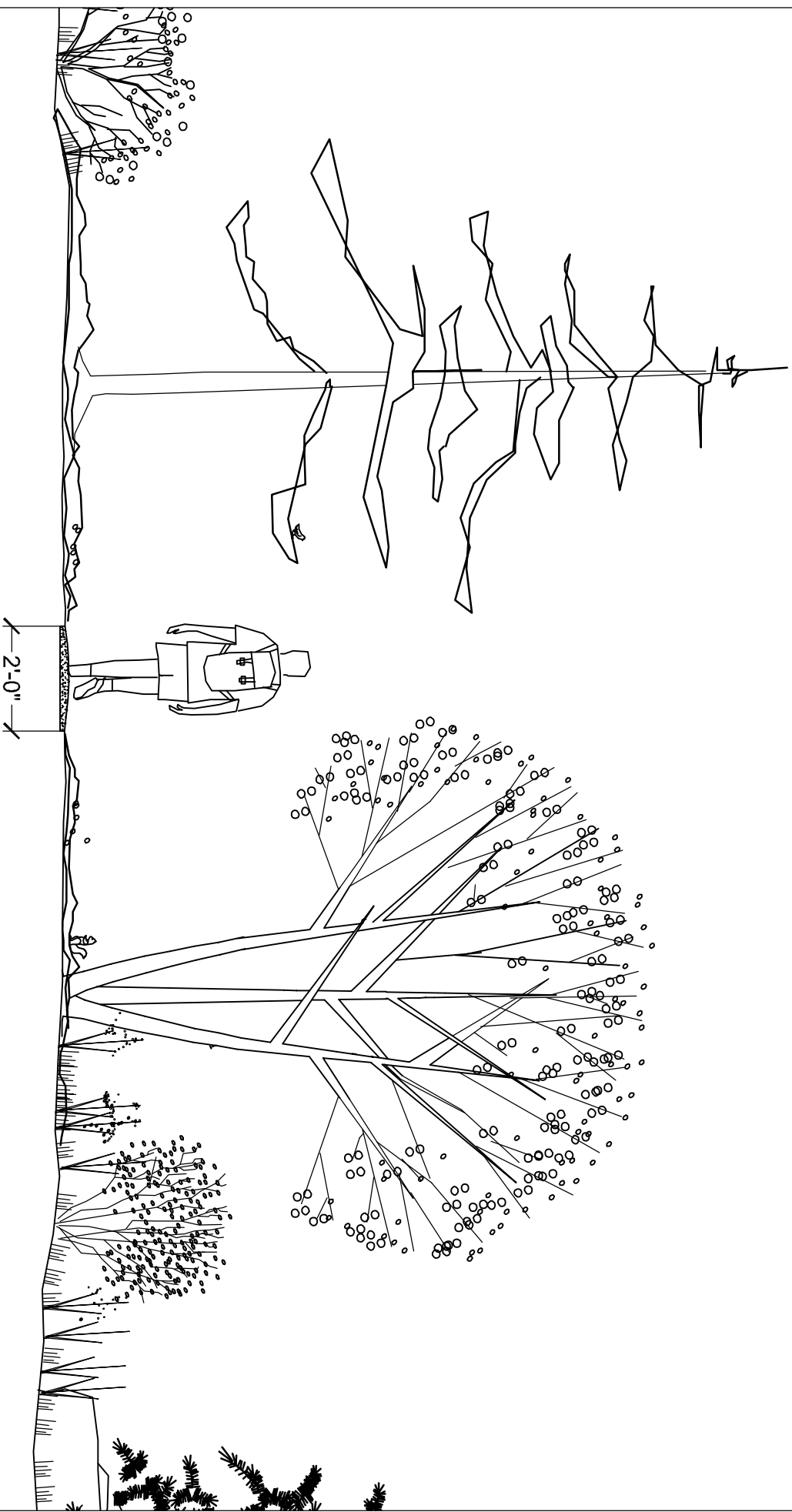
date: MAY 04, 2009

scale: NTS

drawn by: MDP

detail:

LSK-3



- TRAIL SURFACE - 2'-0" WIDE MIN. WITH MINIMAL SITE DISTURBANCE
- SURFACE IS MADE FROM NATURAL MATERIALS OR IMPORTED GRAVELS WHERE REQUIRED
- DESIGNED ONLY FOR WALKING

Gordon Ratcliffe
LANDSCAPE ARCHITECTS

5539B YOUNG STREET
 HALIFAX, NOVA SCOTIA
 CANADA, B3K 1Z7

PHONE: (902) 478 - 3683
 FAX: (902) 857 - 1108
 grla@gsalflnk.ca

project: WESTERN COMMON

title: SHARED USE TRAIL
 BACK COUNTRY HIKING TRAIL

date: MAY 04, 2009

scale: NTS

drawn by: MDP

detail:

LSK-4

Western Common Recommended Trail Construction Costs July 20, 2009

Trail construction costs will be determined by topography and drainage conditions along the selected route. The following recommended costs are based on average unit rates from recent experience with trail construction and provided for budget and planning purposes only.

Shared-Use Trail (Motorized Vehicles, max. design speed 50 km/h)

- avg. width 12 feet
- trail surface compacted Type 1 gravel
- route selected to avoid gradients steeper than 15%
- allowance made for design / construction to “off-road vehicle” standards including
- engineering of plan and profile, cut and fill, stabilization of side slopes, subsurface drainage
- no allowance for water / wetland crossings
- recommended unit rate: \$130.00 / lineal foot

Shared-Use Trail (No Motorized Vehicles, max. design speed 20 km/h)

- avg. width 10 feet
- trail surface crusher dust on compacted Type 1 gravel base
- route selected to avoid gradients steeper than 10%
- no allowance for water / wetland crossings
- recommended unit rate: \$40.00 / lineal foot

Barrier-Free Trail

- avg. width 6 feet
- trail surface crusher dust on compacted Type 1 gravel base
- route selected to avoid gradients steeper than 5% (i.e. no ramps, curbs or rails required)
- no allowance for water / wetland crossings
- recommended unit rate: \$25.00 / lineal foot

Back-Country Hiking Trail

- avg. width 24 inches
- trail constructed with natural / site materials
- minimal site disturbance
- allowance included for access to remote locations
- recommended unit rate: \$10.00 / lineal foot

Bridges

- wood deck, steel span with abutments
- recommended unit rate: \$170.00 / square foot

Wetland Crossings

- boardwalk on piles
- recommended unit rate: \$100.00 / square foot

Appendix G: Tables 4.1 and 4.2 from the Point Pleasant Park Plan, October 2008.

Excerpt of Chapter 4 from the *Point Pleasant Park Comprehensive Plan*. Ekistics Planning & Design/NIP paysage, October 2008.

Objectives, Indicators, Targets

It seems clear that HRM citizens and other Park stakeholders would like a naturalized forest to be the dominant ecosystem of Point Pleasant Park. The management plan takes the view that the widest range of people’s values—consistent with the concept of an urban park—should be satisfied. Those values must include ecological, social and economic components, the three pillars of sustainable development.



Following the United Nations Conference on Environment and Development in 1992, the Canadian Council of Forest Ministers (CCFM) embarked on a process to define sustainable forests in a Canadian context. The CCFM’s framework is led by six criteria that define the broadest spectrum of possible forest values (Table 4.1). The CCFM also developed elements to define the criteria; they were modified by the Canadian Standards Association (CSA) to be applied at the local level. In addition, the CSA developed a framework for translating local values into objectives, indicators and targets so that forest managers could be clearly guided in determining what management actions could

Table 4.1. Criteria, elements and values for sustainable forest management in Point Pleasant Park.

SFM Criteria (adapted from CCFM, 2003)	SFM Elements (adapted from CSA, 2002)	Values Associated with PPP (inspired by various PPP-related documents, forums and discussions)
1. Biological Diversity	Ecosystem diversity	1.1 diverse forest ecosystems
	Species diversity	1.2 natural species abundance and distribution
	Genetic diversity	1.3 native species of trees and other organisms
	Sites of special biological significance	1.4 sites of special biological significance
2. Ecosystem Condition and Productivity	Forest ecosystem resilience	2.1 resilient forest ecosystems
	Forest ecosystem productivity	2.2 productive forest ecosystems
3. Soil and Water	Soil quality and quantity	3.1 nutrient-rich soils free of toxins 3.2 soils kept in place
	Water quality and quantity	3.3 sediment and toxin-free freshwater 3.4 abundant groundwater
4. Role in Global Ecological Cycles	Carbon uptake and storage	4.1 high rates of carbon uptake 4.2 large carbon reservoirs in soil and plants
	Forest land conversion	4.3 minimum amount of land not forested
5. Economic and Social Benefits	Non-timber benefits	5.1 diverse recreational opportunities
		5.2 preserved cultural heritage
		5.3 rich cultural heritage appreciation
		5.4 diverse opportunities for nature appreciation 5.4 diverse educational opportunities
6. Society's Responsibility	Respect for Aboriginal Forest Values, Knowledge and Uses	6.1 respectful appreciation of Aboriginal forest values, knowledge and uses
	Fair and effective decision-making	6.2 fair and effective processes for stakeholder and public engagement in Park decision-making
<p>Criteria are large groupings of forest values and elements are smaller groups of forest values. Values are attributes associated with the Point Pleasant Park forest that will assist in achieving stakeholder satisfaction. The values are formulated as completions to the following sentence: “We value: . . .”</p>		

be designed and implemented. While the CSA’s framework was developed mainly for timber-producing forests, it also applicable in the management of “protection forests,” of which Point Pleasant Park is one.

Thus, the framework for sustainable forest management that guides the future development of the Park’s woodland includes criteria, elements, values, goals, indicators, targets and actions. The first step was to organize a series of forest values into the CCFM and CSA framework (Table 4.1). The second step

was to identify appropriate goals, indicators and targets for the identified values (Table 4.2). The final step was to identify the kinds of actions Park managers would need to take to satisfy the targets and thus move Point Pleasant Park in directions that satisfy the public’s values (Table 4.3).



Table 4.2. Values, objectives, indicators and targets for Point Pleasant Park.

Values Associated with PPP (see Table 4.1)	Objectives	Indicators	Targets
1.1 diverse forest ecosystems	<ul style="list-style-type: none"> establish diverse forest ecosystems across the Park landscape 	<ul style="list-style-type: none"> degree of concordance of Park forest ecosystems with applicable Acadian forest types 	<ul style="list-style-type: none"> all forest ecosystems in Park conform to applicable Acadian forest types in NS
1.2 natural species abundance and distribution	<ul style="list-style-type: none"> encourage natural abundances and distributions of native species 	<ul style="list-style-type: none"> population status of all native plant and animal species 	<ul style="list-style-type: none"> healthy populations of all native plant and animal species except those that cannot survive in a small urban-isolated forest
1.3 native species of trees and other organisms	<ul style="list-style-type: none"> except in the case of adaptation to climate change, foster establishment and growth of species native to the Acadian forest 	<ul style="list-style-type: none"> number of non-native plant and animal species with expanding populations within the park 	<ul style="list-style-type: none"> zero non-native species with expanding populations
1.4 sites of special biological significance	<ul style="list-style-type: none"> conserve sites of special biological significance such as wetlands and ponds 	<ul style="list-style-type: none"> status of sites of special biological significance 	<ul style="list-style-type: none"> stability (non-decline) of sites of special biological significance
2.1 resilient forest ecosystems	<ul style="list-style-type: none"> maintain resilience of forest ecosystems 	<ul style="list-style-type: none"> adequacy of regeneration of all forest sites 	<ul style="list-style-type: none"> full regeneration success of all forest sites
2.2 productive forest ecosystems	<ul style="list-style-type: none"> maintain processes of primary productivity 	<ul style="list-style-type: none"> rate of net primary productivity 	<ul style="list-style-type: none"> NPP to conform to the average of similar sites in rural NS
3.1 nutrient-rich soils free of toxins 3.2 soils kept in place	<ul style="list-style-type: none"> maintain soil nutrient pools increase soil organic matter prevent soil erosion 	<ul style="list-style-type: none"> soil pools of Ca and Mg average thickness of surface organic soil horizon rate of soil loss from forest ecosystems 	<ul style="list-style-type: none"> minimize reductions in Ca and Mg pools increased average thickness of surface organic soil horizon minimize rate of soil loss from forest ecosystems
3.3 sediment and toxin-free freshwater 3.4 abundant groundwater	<ul style="list-style-type: none"> maintain clean stream waters maintain maximum groundwater recharge rates 	<ul style="list-style-type: none"> turbidity of stream flow depth to water table 	<ul style="list-style-type: none"> clear stream flow minimize depth to water table
4.1 high rates of carbon uptake 4.2 large carbon reservoirs in soil and plants	<ul style="list-style-type: none"> maximize net carbon uptake maximize carbon pools 	<ul style="list-style-type: none"> net carbon flux total carbon stocks 	<ul style="list-style-type: none"> forest ecosystems are net carbon sink increased total carbon stocks
4.3 minimum amount of land not forested	<ul style="list-style-type: none"> maximize land area in forest cover 	<ul style="list-style-type: none"> net land area in forest 	<ul style="list-style-type: none"> net maintenance or increase in forested land area (see note below)
5.1 diverse recreational opportunities 5.2 preserved cultural heritage 5.3 rich cultural-heritage appreciation 5.4 diverse opportunities for nature appreciation 5.5 diverse educational opportunities	<ul style="list-style-type: none"> provide diverse opportunities for foot based (and wheelchair accessible) recreation preserve/maintain selected sites of cultural heritage provide diverse opportunities for appreciation of cultural heritage provide diverse opportunities for nature appreciation provide diverse opportunities for all levels of education 	<ul style="list-style-type: none"> satisfaction of Park users with opportunities for recreation, education and appreciation of cultural and natural heritage 	<ul style="list-style-type: none"> majority of Park users satisfied (or better) with opportunities for recreation, education and appreciation of cultural and natural heritage
6.1 respectful appreciation of aboriginal forest values, knowledge and uses	<ul style="list-style-type: none"> respect Aboriginal values, knowledge and uses associated with the PPP lands 	<ul style="list-style-type: none"> satisfaction of Aboriginal stakeholders with park management 	<ul style="list-style-type: none"> Aboriginal stakeholder leadership satisfied or better with respect for Aboriginal values, knowledge and uses
6.2 fair and effective processes for stakeholder and public engagement in Park decision-making	<ul style="list-style-type: none"> implement fair and effective processes for stakeholder and public engagement in Park decision-making 	<ul style="list-style-type: none"> satisfaction of HRM residents and other Park stakeholders with Park decision-making processes 	<ul style="list-style-type: none"> majority of HRM residents and other Park stakeholders satisfied (or better) with opportunities for participation in Park decision-making processes
	<p>Values are attributes associated with the Point Pleasant Park forest that will assist in achieving stakeholder satisfaction. Objectives are qualitative directional statements for the values. Indicators are ways to measure the state of the value. Targets are directional statements for the respective indicators.</p>		

Table 4.3. Targets and generic actions for management of Point Pleasant Park.

Targets	Generic Actions
<ul style="list-style-type: none"> all forest ecosystems in Park conform to relevant FEC types in NS 	<ul style="list-style-type: none"> create a soils map, with topographic data also shown establish FEC vegetation types consistent with the soil types
<ul style="list-style-type: none"> healthy populations of all native plant and animal species except those which cannot survive in a small urban-isolated forest 	<ul style="list-style-type: none"> as above encourage diverse habitat conditions, including large snags and downed woody debris maintain diversity of sizes within stands, consistent with silvics of the respective species
<ul style="list-style-type: none"> zero non-native species with expanding populations 	<p>Tree species – for all non-natives except Norway maple, remove regenerating plants while maintaining mature individuals where there are no neighbouring mature native species individuals; for Norway maple, implement a gradual program of removal of all sizes of individuals</p> <p>Non-tree species – implement program to reduce stands of Japanese knotweed; prevent heather patches from increasing beyond their current extent</p>
<ul style="list-style-type: none"> stability (non-decline) of sites of special biological significance 	<ul style="list-style-type: none"> take site-specific actions to maintain, enhance, restore and recreate wetlands and ponds
<ul style="list-style-type: none"> full regeneration success of all forest sites 	<ul style="list-style-type: none"> where necessary (e.g., grassy areas), plant seedlings of native species appropriate to the site; where necessary, use manual weeding to reduce vegetative competition and maintain viability of planted seedlings
<ul style="list-style-type: none"> NPP to conform to the average of similar sites in rural NS 	<ul style="list-style-type: none"> keep forests in natural conditions for species balances and age-class structures of trees
<ul style="list-style-type: none"> minimize reductions in Ca and Mg pools increased average thickness of surface organic soil horizon minimize rate of soil loss from forest ecosystems 	<ul style="list-style-type: none"> keep all fine and coarse woody debris on site minimize site disturbance during woodlands operations
<ul style="list-style-type: none"> clear stream flow minimize depth to water table 	<ul style="list-style-type: none"> minimize site disturbance during woodlands operations channel road runoff to holding ponds
<ul style="list-style-type: none"> forest ecosystems net carbon sink increased total carbon stocks 	<ul style="list-style-type: none"> keep forests in natural conditions for species balances and age-class structures of trees keep all forest litter on site
<ul style="list-style-type: none"> net maintenance or increase in forested land area 	<ul style="list-style-type: none"> keep the forest at its present extent, or allow it to increase if forest area within the Park is converted to non-forest cover, increase its extent elsewhere in the Park
<ul style="list-style-type: none"> majority of Park users satisfied (or better) with opportunities for recreation, education and appreciation of cultural and natural heritage 	<ul style="list-style-type: none"> implement an annual satisfaction survey of Park users improve facilities (paths, signage, other amenities) and information programs to improve satisfaction if warranted
<ul style="list-style-type: none"> Aboriginal leadership satisfied with respect for aboriginal values, knowledge and uses 	<ul style="list-style-type: none"> implement a satisfaction survey (by interview) of Aboriginal leaders improve actions associated with respect for Aboriginal values, knowledge and uses, if warranted
<ul style="list-style-type: none"> majority of HRM residents and other Park stakeholders satisfied (or better) with opportunities for participation in Park decision-making processes 	<ul style="list-style-type: none"> implement an annual satisfaction survey of HRM citizens and other Park stakeholders implement improved participatory processes if warranted
<p>Targets are directional statements for the respective indicators. Generic actions are the types of management actions, activities or treatments that will help Park managers meet the targets.</p>	

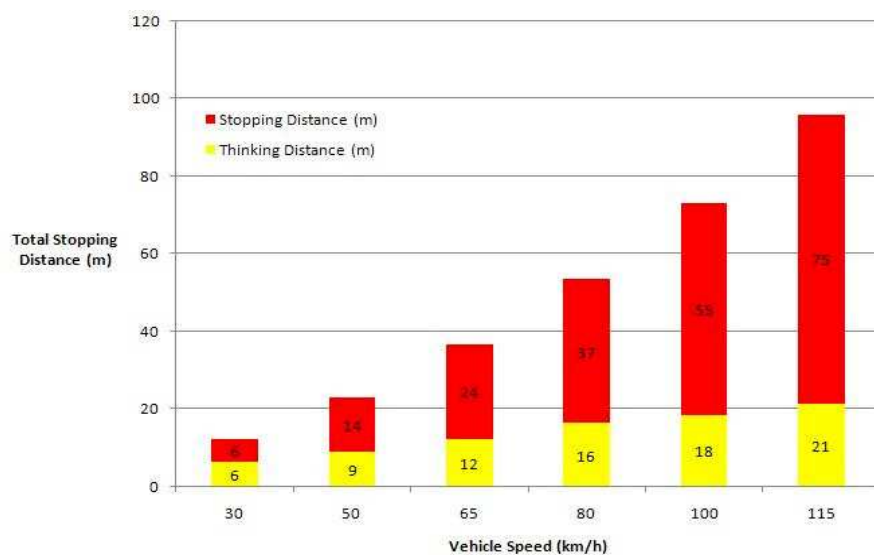
Chapter 1
Chapter 2
Chapter 3
Chapter 4
Chapter 5
Chapter 6
Appendix A
Appendix B
Appendix C
Appendix D

Appendix H: Active Transportation Routing Safety

Cycling infrastructure in Canada varies between and within cities, but commuter cycling generally follows a strong pattern of being on road, beside both moving and parked motor vehicles. The construction of dedicated AT shoulder lanes as part of a comprehensive trails system within Kings has inherent risks involving bringing active transportation users and vehicles into close proximity.

One study found that in Canada, between 2000 and 2004, 44 per cent of cyclist fatalities occurred in rural areas on roads with posted speed limits of 80 km/h or higher.⁴⁹ The reason for this is simple - for both stopping distances and the severity of crashes, speed matters.

Minimum Stopping Distance vs. Speed



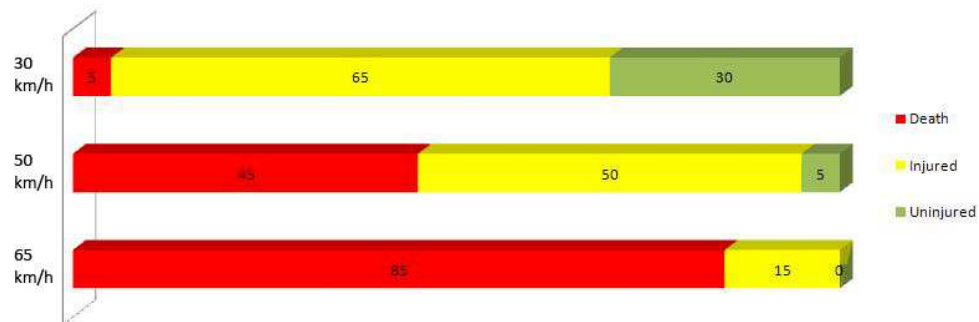
The above graph illustrates that as speed increases, thinking distance—the time required to process the situation and begin braking—increases at a steady rate while stopping distances increase dramatically. For example, at 80 km/h, a driver who spots a pedestrian in the road 50 metres ahead will simply not have enough time to analyse the situation and stop in time. That same driver, driving at 50 km/h, will have stopped long before the pedestrian is at risk.⁵⁰

A doubling in vehicle speed results in a stopping distance four times as long and in four times as much kinetic energy absorbed during an impact. Driver response times further increase overall stopping distances. As a result, a small increase in roadway traffic speeds results in a disproportionately large increase in pedestrian fatalities.

Pedestrian Injuries at Impact Speeds (adapted from Transport Canada data)

⁴⁹ Increasing your odds of avoiding bike injuries, accessed July 26, 2009 at <http://www.cbc.ca/health/story/2009/07/22/f-bicycle-safety-avoiding-accidents-injury.html>

⁵⁰ Vehicle stopping distance and time, accessed on July 29, 2009 at <http://www.csgnetwork.com/stopdistinfo.html>



Pedestrian crash severity is also much lower at low motor vehicle speeds. If a pedestrian is struck by a motor vehicle traveling at 65 km/h there is an 85 percent likelihood that the pedestrian will be killed. This percentage drops to 45 percent at 50 km/h and 5 percent at 30 km/h. Thus, slowing motor vehicle speeds not only reduces the chance of a crash due to the shorter stopping distance required, but also reduces the chance of a pedestrian fatality or serious injury.

Another factor to be considered is the tendency for vehicles to drift into opposing lanes in order to avoid AT traffic, even when more than enough room has been engineered into the design of the road to accommodate all traffic. One study found that cars and especially larger vehicles can move as much as 4 feet into the opposite lane, leaving enough space for an entire car to pass between them and the cyclist being avoided. A clearly delineated, marked bike lane was found to lessen this effect by as much as 40%.⁵¹

For urban roads with many junctions, accident analysis suggests that segregated cycling facilities are likely to produce a 12-fold increase in the number of collisions. These conclusions are supported by the experience of countries that have implemented segregated cycling facilities.⁵² At a 1990 European conference on cycling, the term Russian roulette was used to describe the use of roadside cycle paths. Increased speeds, reduced sight lines from hills and turns, the presence of farm machinery and transport trucks impinging on the lanes are all factors that must be taken into account in the design phase for any potential projects that will place the AT user in harm's way.

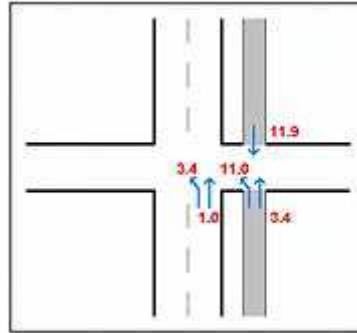
In contrast to the common North American design, European cities often offer a more dedicated cycling infrastructure alongside roads, but separated from motorized traffic (e.g., with medians, curbs, or other barriers).⁵³ There are also design issues with this methodology, as separated trails dramatically increase the risk of collision at intersections.

⁵¹ Evaluation of On-Street Bicycle Facilities Added to Existing Roadways, Hallett, Ian, Luskin, David and Machemehl, Randy. Center for Transportation Research, Texas Department of Transportation. 2006

⁵² [Risk factors for bicycle-motor vehicle collisions at intersections](#), Wachtel, A. and Lewiston, D., Journal of the Institute of Transportation Engineers, pp 30-35, September, 1994.

⁵³ "Russian roulette" on sidepaths - sidepaths are the target of criticism, accessed on July 29, 2009 from <http://www.bikexpert.com/bikepol/facil/sidepath/adfc173.htm>

Separated AT Path-Roadway Intersection Risk Increases



At points where a roadway crosses a trail system, the conditioned behavior of drivers is to look both ways on the intersecting road, overlooking the trail system. Cyclists too, can be accustomed to having a free rein within their own lane, and can be unprepared for making stops at intersections, especially over terrain that allows for increased speeds. Simple design techniques can be incorporated into the trail system, such as the placement of steel or concrete bollards at road junction points to ensure that AT traffic is stopped and chicanes can be worked into the design of the pathways in order to minimize “tunnel vision”. Even placing clear signage at intersections, so that both vehicular and AT traffic is aware of the risk, can greatly reduce the risk.

While long stretches of rural highways, such as Highway 333 connecting Tantallon, Peggy’s Cove and the Western Common, are one of the more risk-prone places to put shoulder lanes for AT traffic, and in-town AT paths (where intersections are many) are not easily placed off the road, there should be a discernable point at which these two styles of AT enhancement can be employed in a logical manner.

Juxtaposing the aforementioned fatality vs. speed figures with those demonstrating the ability of drivers to respond to hazards at varying speeds, there is a point around 50km/h at which it becomes too risky to place AT users into traffic. As the speed limit in Nova Scotia is limited at 50 km/h within most communities (which is also where the risk of intersection collisions is the highest), one strategy that could be employed would be to place bikes on the streets within communities in their own lanes. For all other roadways where an AT connection is desired, a separate AT trail should be used, taking care to minimise intersections with roads.