Simcoe Muskoka Active Transportation Symposium
Building Linkages, Breaking Barriers
Orillia, Ontario
November 14, 2013

A Traffic Engineer's Perspective

By

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I Want To Talk About

A. Space and Time

B. Why Active Transportation Is Important To Me

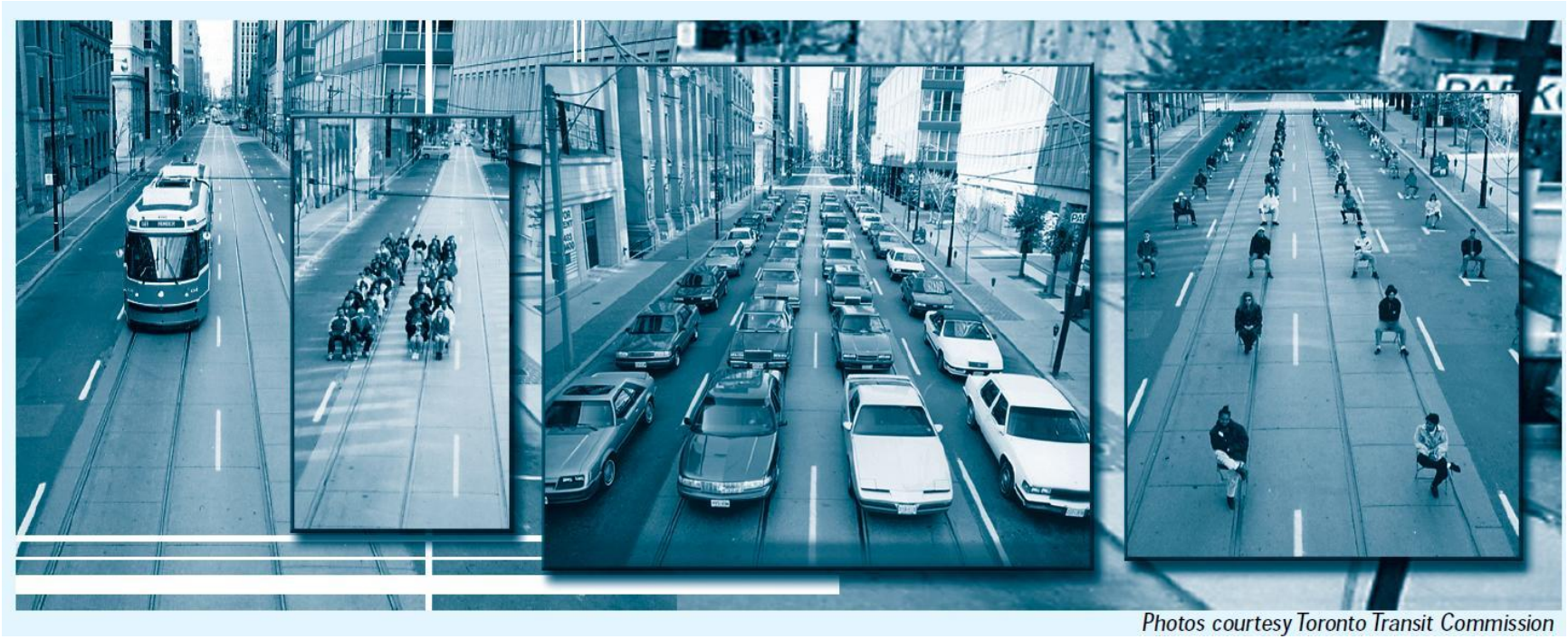
C. What Can We Learn From Others

D. Critical Inputs You Can Use

E. The Decisions You Have To Make

A. We Have Been Doing This For A Long Time

A. Space And Time



Photos courtesy Toronto Transit Commission

A. Objects Vary In Size

B) WIDTH OF VEHICLE - 2.6M

The maximum width allowed for any vehicle is 2.6m, HTA s109(1).

Exceptions

1. Mirrors extending up to 30 cm on either side of a motor vehicle are excluded from the measure, HTA s109(3);

2. Auxiliary equipment or devices that are attached to and extend no more than 10 cm from each side of a vehicle and are not designed or used to carry load are excluded from the measure, HTA s109(4). This applies to such items as rub rails, stake pockets, tiedowns, door hinges, handles, sliding tarps, marker lights, signs or placards, rollout awnings, etc. Rigid sidewalls of a cargo van are considered part of the truck or trailer structure and may not exceed the 2.6m width.

A. Legal Vehicles

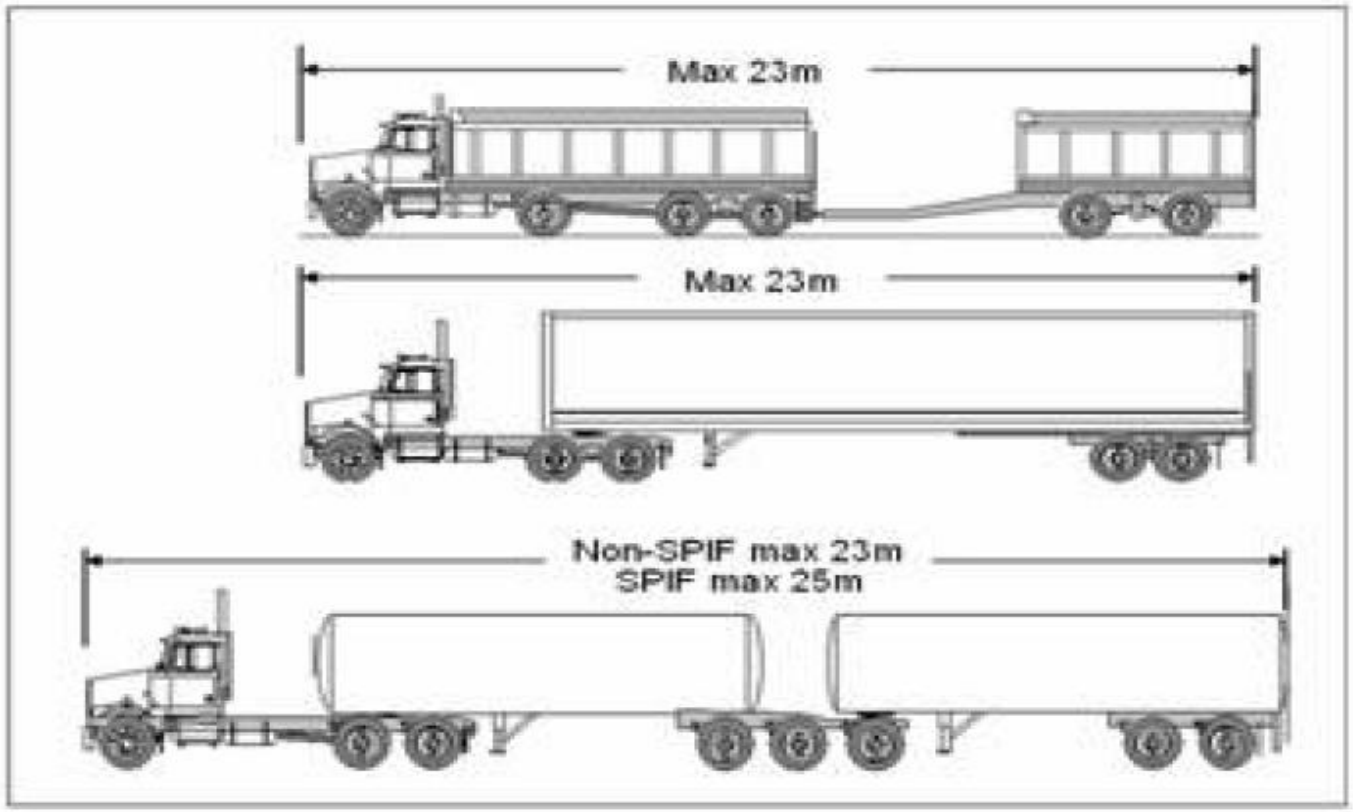


Figure 3: Length of Combination of Vehicles

A. Can Use Any Road – Unless You Restrict

A. Speed And Objects

Table 7
Minimum Sight Distance Requirements

Condition	Design Speed	Sight Distance	Applicability (Road Type)
Rural	70 km/h	110 m	I and II
	80 km/h	135 m	I and II
	90 km/h	160 m	I and II
Urban	50 km/h	130 m	III and IV
	60 km/h	165 m	IV and V
	70 km/h	200 m	IV and V
	80 km/h	235 m	VI

The minimum 'Rural' Sight Distance is a measure of the Stopping Sight distance on wet pavement. The minimum 'Urban' Sight Distance is a measure of the Decision Sight distance as identified in the TAC Manual, 1999 Edition. **In rural areas Decision Sight Distance is desirable; however, at an absolute minimum Stopping Sight Distance must be provided.**

A. You And I Cannot Change This

Table 4.3 Road Design Criteria

	Road Design Geometric Features				Industrial	Minor Collector	Local
Design Speed (km/h)	90	80	70	60	50	50	50
Min. Stopping Sight Dis (m)	170	140	110	85	65	65	65
Min. Horizontal Curve Radius (m)	340	250	220	125	115	115	65-115
K-Crest min. (m)	55	35	22	15	7	7	7
K-Sag min.(m)	20	20	15	10	6	6	6
Headlight ctrl.	40	30	25	20	11	11	11
Min. C/L Grade	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Max. C/L Grade	5	5	5	5	5	5	5

A. You Can Change This

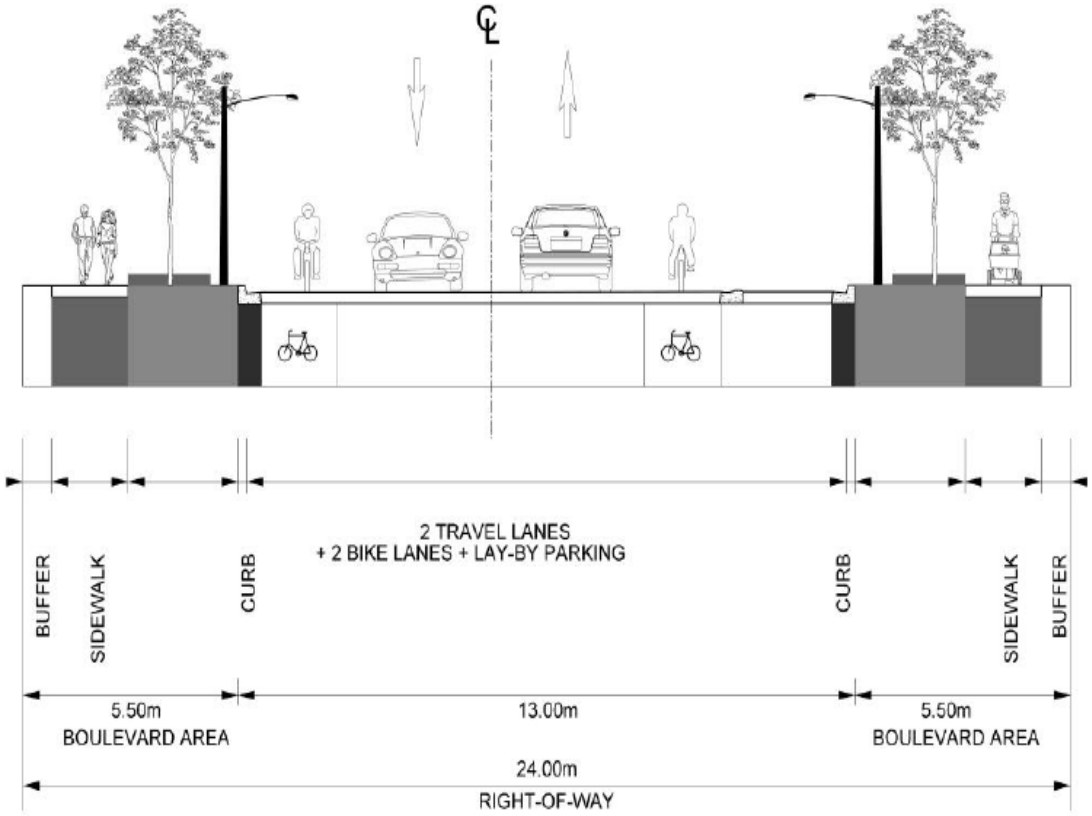
Table 3.1 ROW Width for Various Types of Roads in the City of Vaughan

Road Type	ROW Width (m)	Pavement Width (m) *	Standard Drawing Number
5-Lane Arterial Road	35.0	19.7	B-1 (pre-OPA 600)
4-Lane Arterial Road	30.0	15.7	B-2 (pre-OPA 600)
Major Collector Road	26.0	14.0	B-8
Industrial Road	23.0	11.5	B-4 (pre-OPA 600)
Minor Collector Road with 3 m Greenway	26.0	11.5	B-9
Minor Collector Road	23.0	11.5	B-10
Major Local Road	20.0	9.0	B-11
Local Road	17.5	8.0	B-12
Local Road	20.0	8.5	B-6 (pre-OPA 600)
Local Road (Cul-de-sac)	18.5	8.5	B-7 (pre-OPA 600)
Buffer Road	15.0	7.0	B-13
Laneway	8.0	6.0	B-14
Lay-by Lane (Minor Collector Road)	23.0	9.75	B-15
Industrial Cul-de-sac	23.0		C-1
Residential Cul-de-sac	18.5		C-2
Residential Cul-de-sac	17.5		C-3

*Note: * Includes gutter (measurements are from curb face to curb face)*

A. It Is About Space And How It Is Used

Figure 5-2 Typical Cross-Section – Minor Collector (With Bike Lanes)



AECOM

TYPICAL CROSS-SECTION
MINOR COLLECTOR (WITH BIKE LANES)

A. Does This Sound Like A Complete Street?

Home

What Are Complete Streets?

What are Complete Streets?

A Complete Street is designed for all ages, abilities, and modes of travel. On Complete Streets, safe and comfortable access for pedestrians, bicycles, transit users and the mobility-impaired is not an afterthought, but an integral planning feature.

A Complete Streets policy ensures that transportation planners and engineers consistently design and operate the entire street network for all road users, not only motorists.

Complete Streets offer wide ranging benefits. They are cost effective, sustainable and safe.

Photo Credit:
Ontario Growth Secretariat, Ministry of Infrastructure

The link between Complete Streets and public health is well documented. Jurisdictions across North America already include Complete Streets policies in their suite of preventative health strategies. Complete Streets also promote livability. Human-scale design treatments such as street furniture, trees and wide pedestrian rights-of-way animate our public realm and encourage people to linger.

Complete Streets can exist in communities of all shapes and sizes; from downtown Montreal to Corner Brook and more suburban communities such as Surrey. There is no singular approach to Complete Streets. However, Complete Street policies ensure that transportation planners and engineers design and manage infrastructure for all ages, abilities, and modes of travel across the entire transportation network.

A. Traffic Impact Studies

- Have changed to include all modes, but;
- Will continue to change, until
- All modes require a mandatory and balanced insertion, to determine;
- A roadway's "true" operating capacity condition.

A. Highway Capacity Manual Is Evolving

Highway Capacity Manual 2010

PAUL RYUS, MARK VANDEHEY, LILY ELEFTERIADOU, RICHARD G. DOWLING, AND BARBARA K. OSTROM

Ryus is Associate Engineer, Kittelson & Associates, Inc., Svendborg, Denmark; Vandehey is Managing Principal, Kittelson & Associates, Inc., Portland, Oregon; Elefteriadou is Professor of Civil Engineering and Director of the Transportation Research Center, University of Florida, Gainesville; Dowling is

The fifth edition of the *Highway Capacity Manual* (HCM 2010), recently released by the Transportation Research Board (TRB), incorporates results from more than $5 million of research completed since the publication of the HCM 2000. This latest edition significantly updates the methodologies that engineers and planners use to assess the traffic and environmental effects of highway projects.

HCM 2010 introduces several firsts, including

- An integrated multimodal approach to the analysis and evaluation of urban streets from the points of view of automobile drivers, transit passengers, bicyclists, and pedestrians;

PHOTO: MINNESOTA DOT

Among the new features of HCM 2010 is updated material on the impact of weather and work zones on freeway capacity.

the operation of an actuated controller. A new incre-

A. TRB Notes We Still Have Work To Do

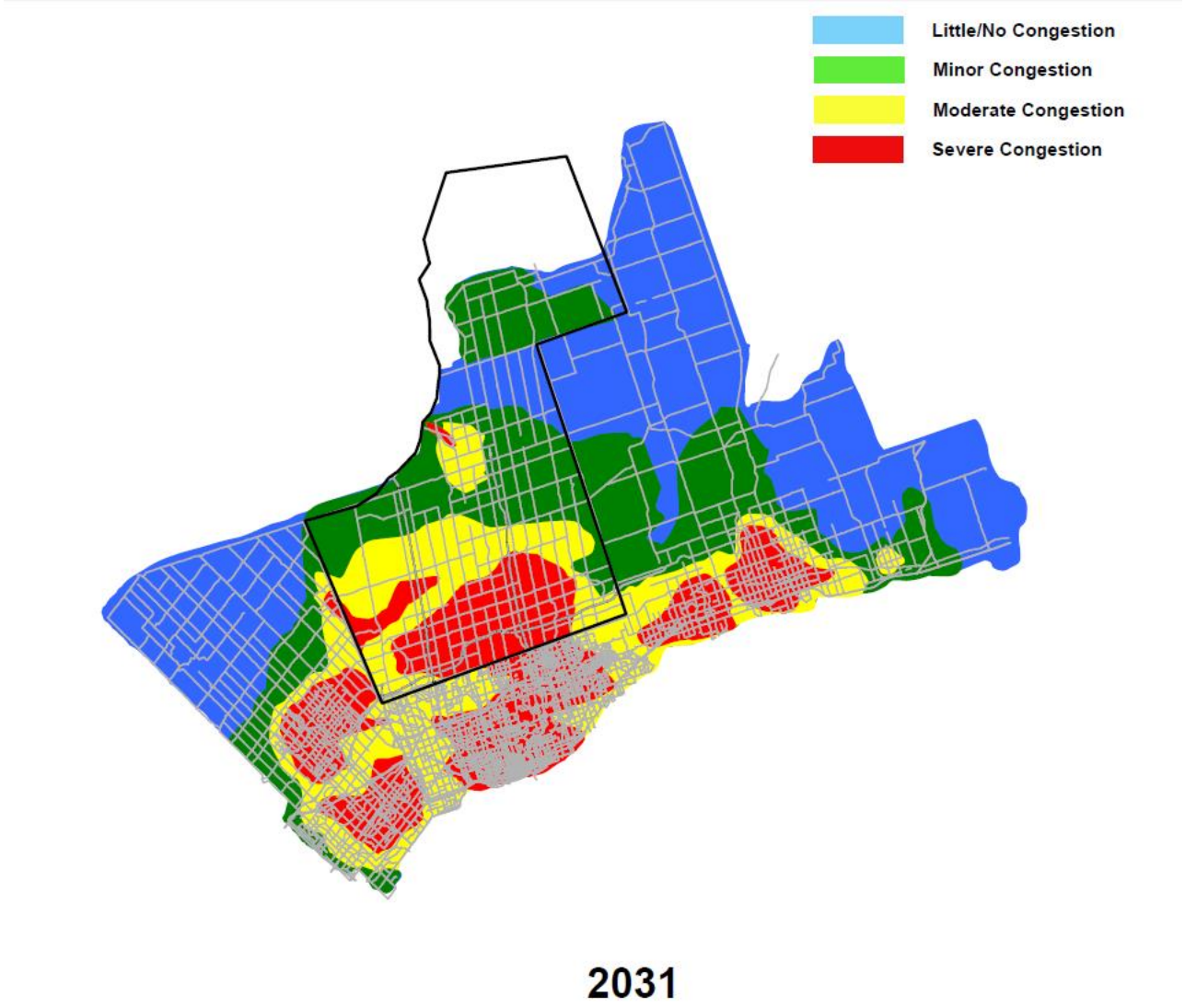
Exhibit 20. Evaluation of Major LOS Manuals Against NCHRP 3-70 Framework Objectives.

Framework Objective	HCM	TCQSM	FDOT Q/LOS
1. National Application	Designed for Nation	Designed for Nation	Designed for State
2. LOS is Travelers' Perspective	Claimed, but no proof	A blend of traveler and operator perspectives	A blend of HCM, TCQS and traveler surveys
3. Applicable to Urban Streets	Yes	Yes	Yes
4. Considers All factors within ROW	Many factors considered, but not all	Many factors considered, but not all	Many factors considered, but not all
5. Safety and Economic Factors	No	No	Perceived safety included
6. Comparable Modal LOS	Uses speed for auto, bike, and pedestrian, but not transit	Only considers transit	Different LOS measures by mode
7. Modal Interactions	Some but not all–See table below.	Some but not all–See table below.	Some but not all–See table below.
8. LOS Reflects All Movements	Only Through	Yes, all bus service on arterial is counted	Only Through
9. No Averaging Across Modes	Does not average	Considers only single mode	Does not average
10. Not Limited by HCM Limits	Limited by HCM	HCM limits not applicable	Limited by HCM

ROW = Right of Way
HCM = Highway Capacity Manual
LOS = Level of Service

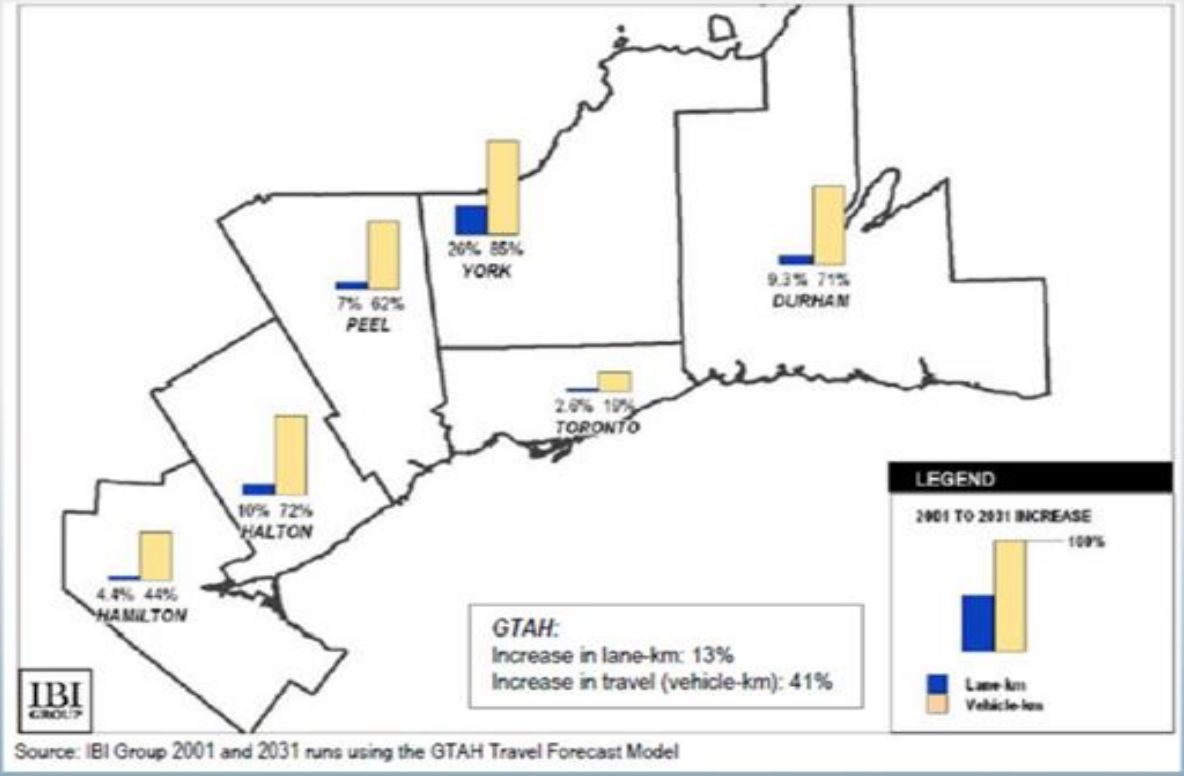
Comic Relief

B. We All Have A Big Problem



B. If No Roads Then……. ?

We Will Not Provide Roads To Meet The Vehicle Demand



Source: IBI Group 2001 and 2031 runs using the GTAH Travel Forecast Model

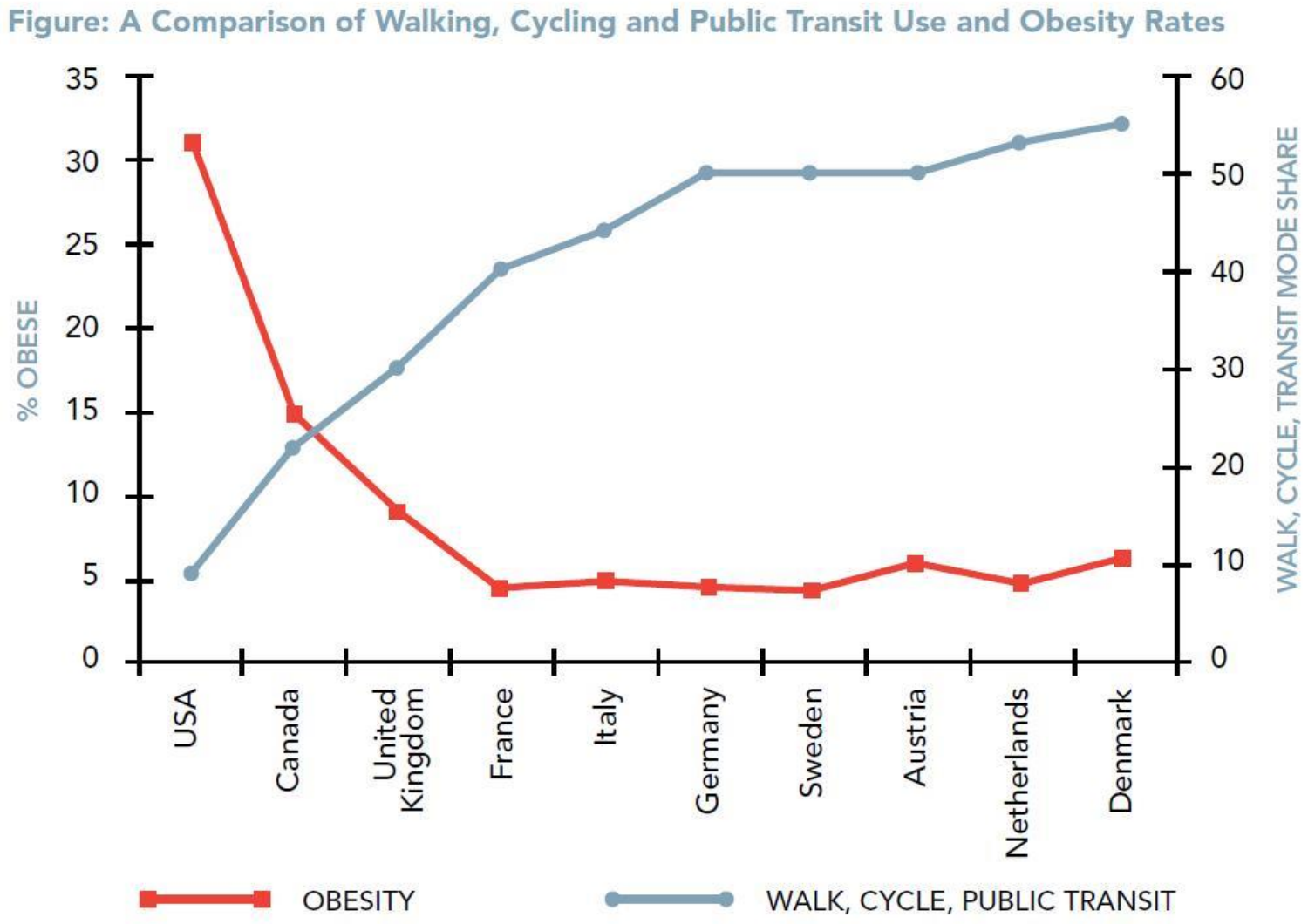
Auto Travel Demand versus Supply Trends by Region

B. Why Can't Active Transportation Take – 1% or 5 % ?

Table 1: 2001 to 2011 Period Total Vehicle Change

Screenline	Number of Vehicles 12-Hour Period			Change 2001-2011	Change 2006-2011	Number of Vehicles AM Peak Period			Change 2001-2011	Change 2006-2011
	2001	2006	2011			2001	2006	2011		
Toronto Screenline	910,990	1,012,240	1,074,180	17.9%	6.1%	252,270	269,030	271,430	7.6%	0.9%
Peel Screenline	169,510	192,990	186,930	10.3%	-3.1%	50,970	58,970	48,690	-4.5%	-17.4%
Durham Screenline	61,790	80,210	86,460	39.9%	7.8%	18,560	25,470	23,840	28.4%	-6.4%
Simcoe Screenline	86,200	107,000	100,320	16.4%	-6.2%	24,070	28,180	24,280	0.9%	-13.8%
South York Screenline	225,540	277,210	290,170	28.7%	4.7%	70,410	82,820	75,710	7.5%	-8.6%
Highway 400 Screenline	260,190	320,310	330,130	26.9%	3.1%	73,960	91,790	84,150	13.8%	-8.3%
Highway 404 Screenline	278,700	321,450	380,220	36.4%	18.3%	77,050	91,860	98,790	28.2%	7.5%
East Gwillimbury Screenline	61,650	66,450	87,210	41.5%	31.2%	16,710	18,750	23,000	37.6%	22.7%
Ravenshoe Screenline	32,280	37,250	39,100	21.1%	5.0%	9,660	11,250	10,410	7.8%	-7.5%

B. We Understand The Health Benefits



B. We Understand That There Is A Land Use Relationship

Travel Choices & Obesity – Toronto & the Outer GTA

The residential preferences survey revealed significant differences between the Toronto residents and outer GTA residents surveyed in terms of their levels of obesity, their levels of physical activity, and their travel choices. It suggests that, relative to residents in the outer GTA, Toronto residents:

- Walk about twice as often for utilitarian reasons;
- Use public transit almost four times as often;
- Travel almost half the distance by automobile; and
- Are much less likely to be obese (18% compared to 25%).
- The study results suggest that residents in Toronto walk for exercise, and bicycle, as often as their counterparts in the outer GTA (see Table 15).

Table 15: Travel Choices & Obesity - Toronto & Outer GTA

Variable	Toronto	Outer GTA
Obese (BMI>30) (%)	18.2	24.6
Walk for exercise (days/week)	2.8	2.8
Walk for utilitarian reasons (days/week)	3.4	1.7
Walk for any reason (days/week	4.8	3.7
Bicycle for any reason (days/week)	1.3	1.3
Use Public Transit (days/week)	2.3	0.6
Use Automobile (days/week)	3.4	5.7
Vehicle kilometres travelled (VKT)	192	344

B. We Know Walking To Transit Is Healthy

Mobility Hubs And Walking Distance

12.3 WALKING DISTANCE TO TRANSIT

Studies have shown that most people will not walk more than 400 m—five minutes—to a bus stop. The service standards of many Canadian transit systems reflect this. A 2001 survey of Canadian transit systems found that the two most common standards, each upheld by seven transit systems, were "95 percent of the population within 400 to 500 m" and "90 percent of the population within 400 and 450 m" of a bus stop (CUTA 2001).

B. But We Still End Up With This

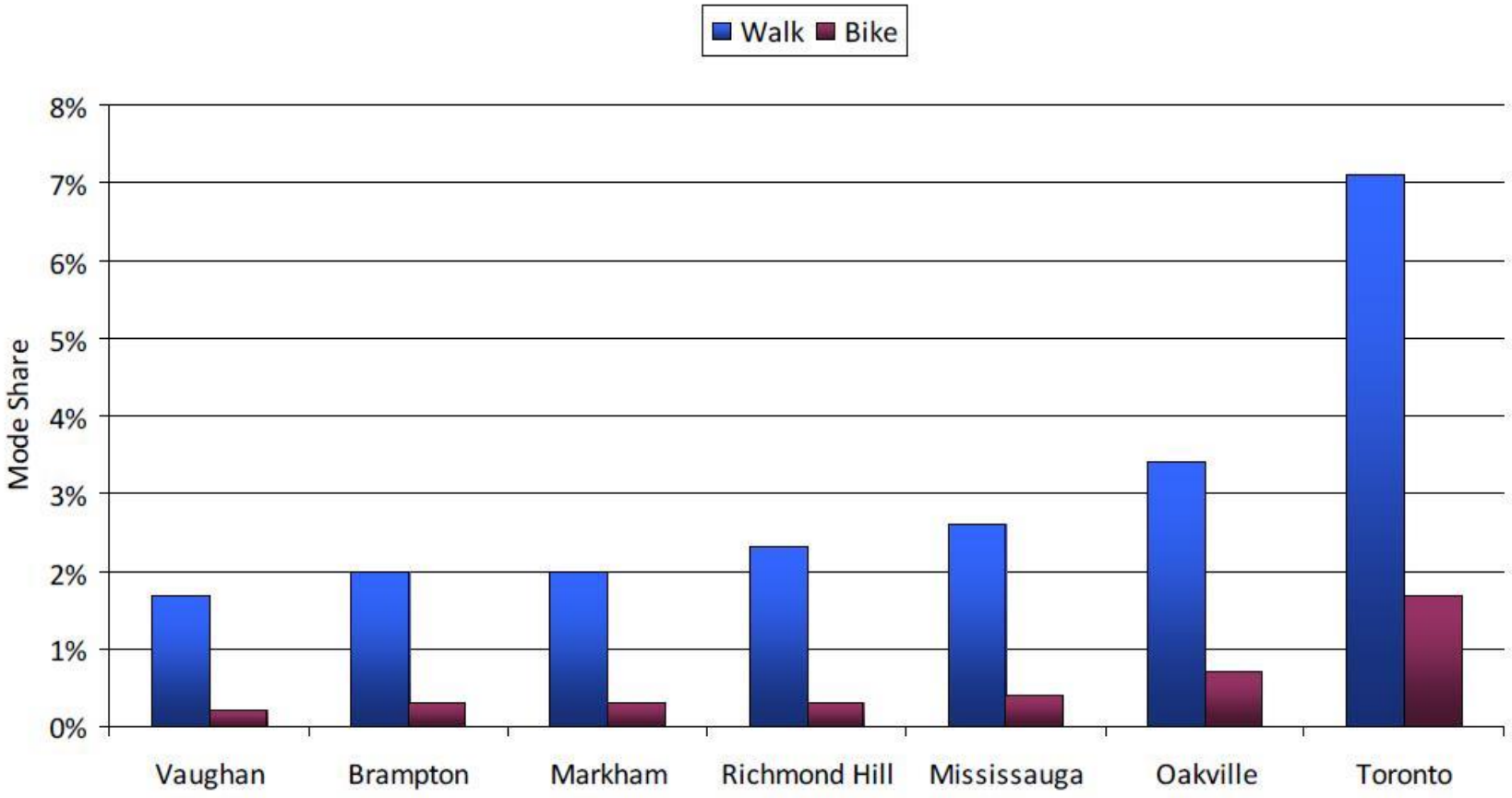


Figure 31 Mode to work using AT – GTA municipalities, 2007

B. What Is Toronto Telling Us?

- We have to put more people closer to more transit, and:
- We have to give them viable modal choice options.

B. We Have To Retrofit

Obstacles

B. We Have To Be Responsive - I Want People Walking

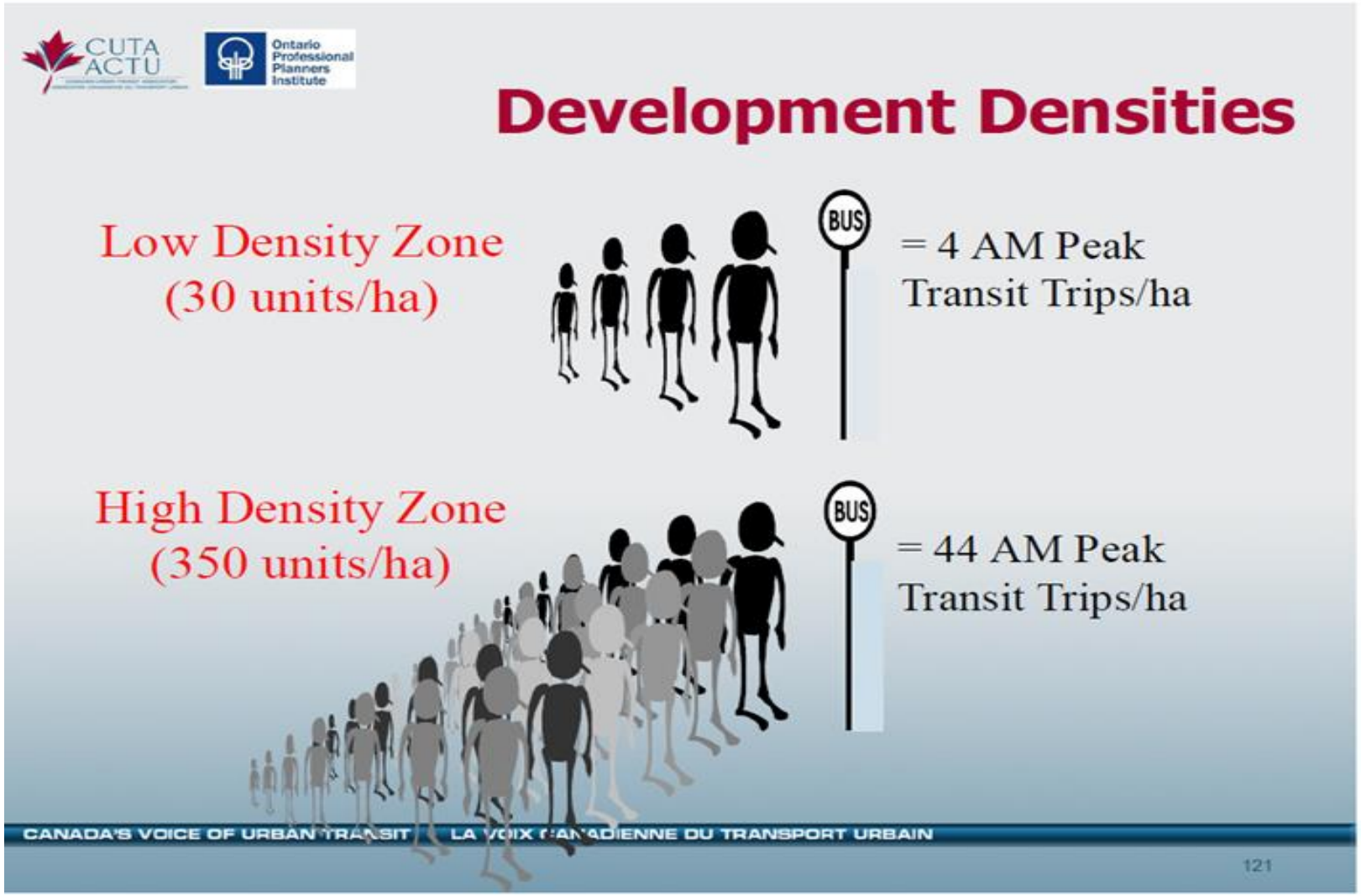
B. I Am Telling You

Where We Have To Go - Target Transit Modal Splits Are Stated

Exhibit 5-1: 2031 Transit Mode Share Targets

Areas	Jurisdictions	
	Regional Targets	*City Targets*
VMC	50%	50%
Rapid Transit Corridors	none specified	40%
City-Wide	30%	30%

B. This Is Coming



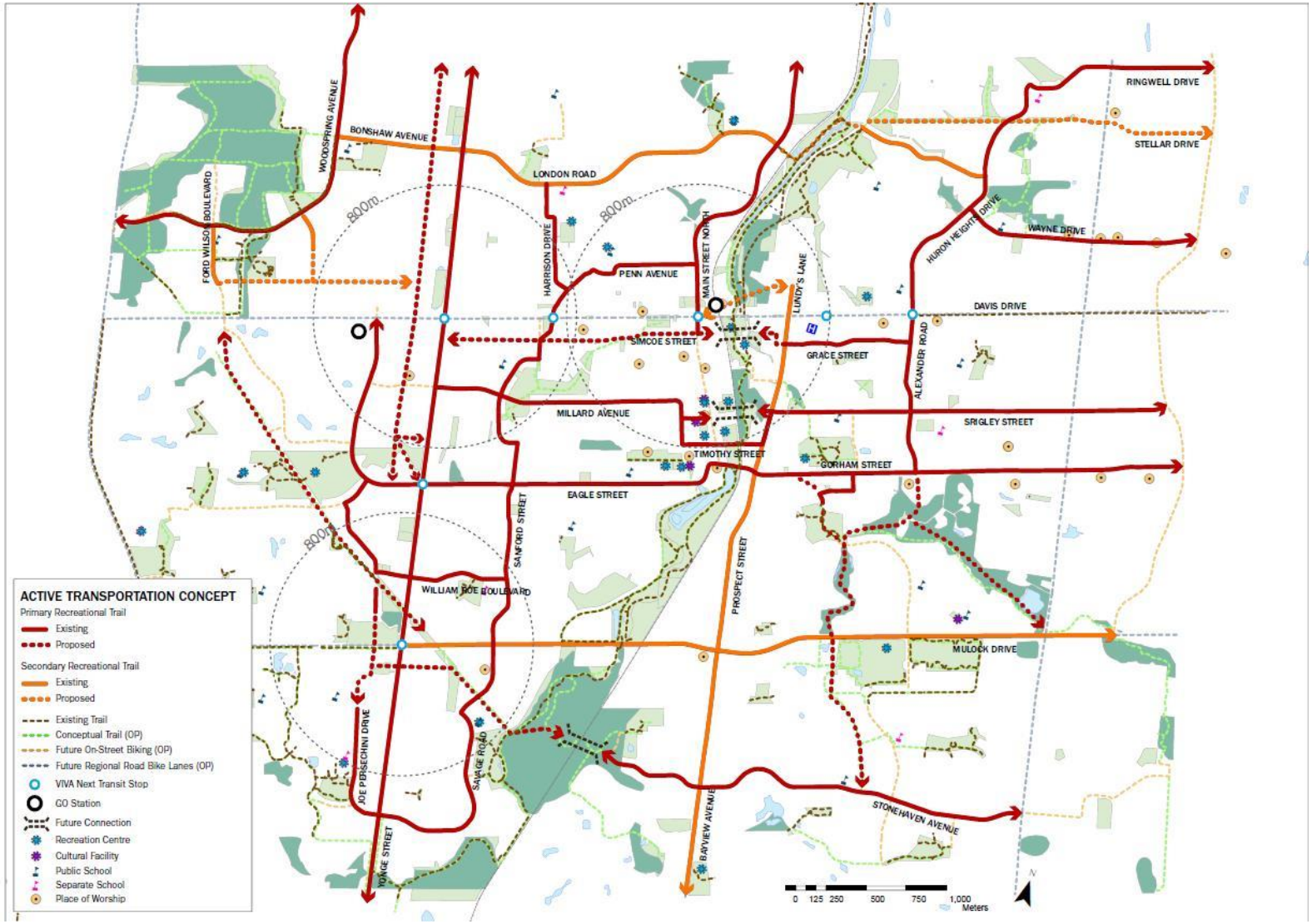
B. Did You Know?

- That 15 % to 25 % of total traffic generated in the AM Roadway Peak Hour in a neighbourhood and between adjacent neighbourhoods is children being driven to school;
- At least half of this traffic uses the adjacent arterial road to complete trip;

B. You Must Deliver Proper Land Use Patterns

Providing people with destinations to walk to, as well as safe, continuous, and interesting pathways on which to travel, can have an enormous impact on individuals' decision to incorporate physical activity into their daily lives.

B. You Must Deliver An Active Transportation Network



B. People Will Respond

C. There Is Something To Learn From Berlin

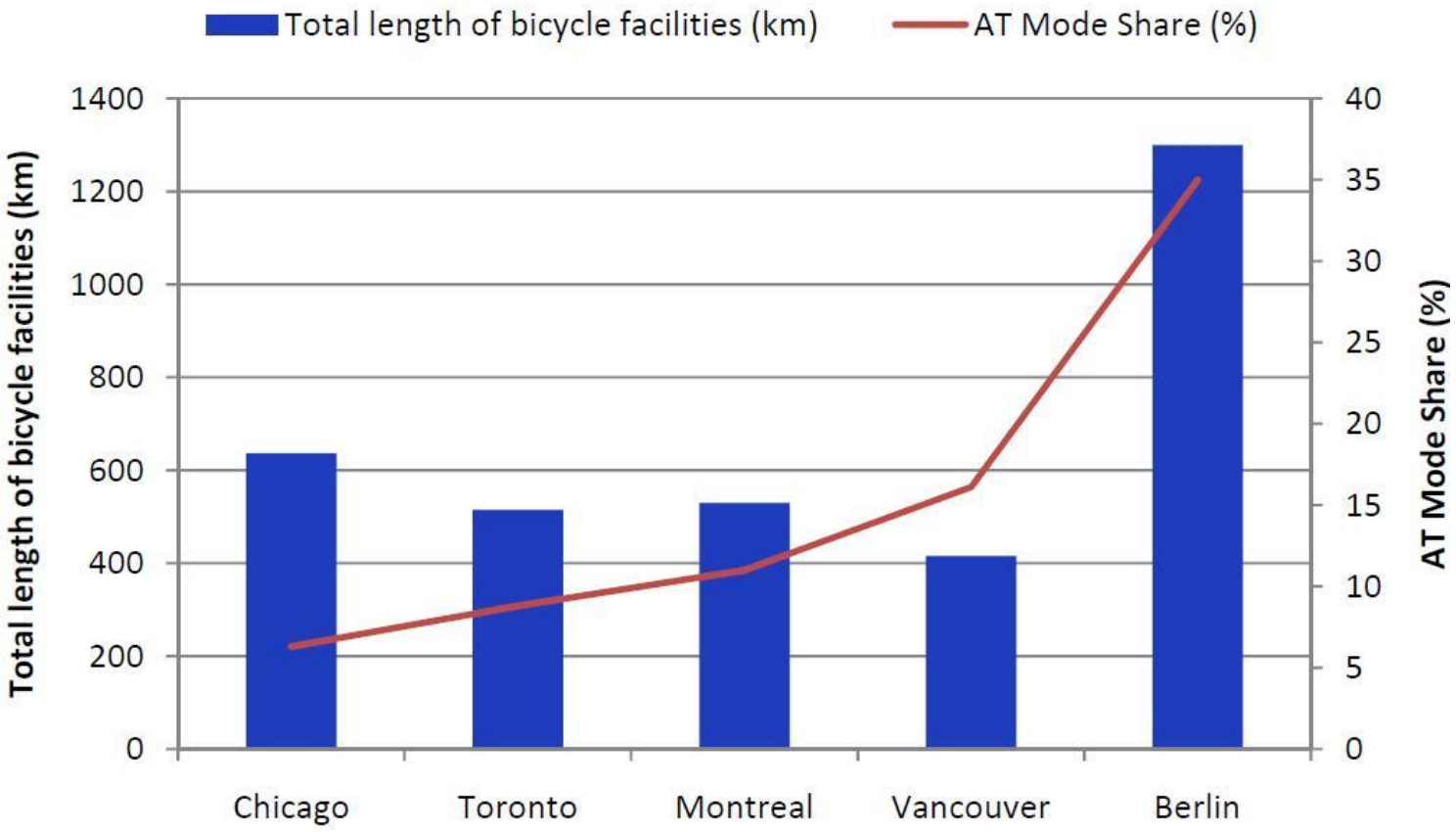
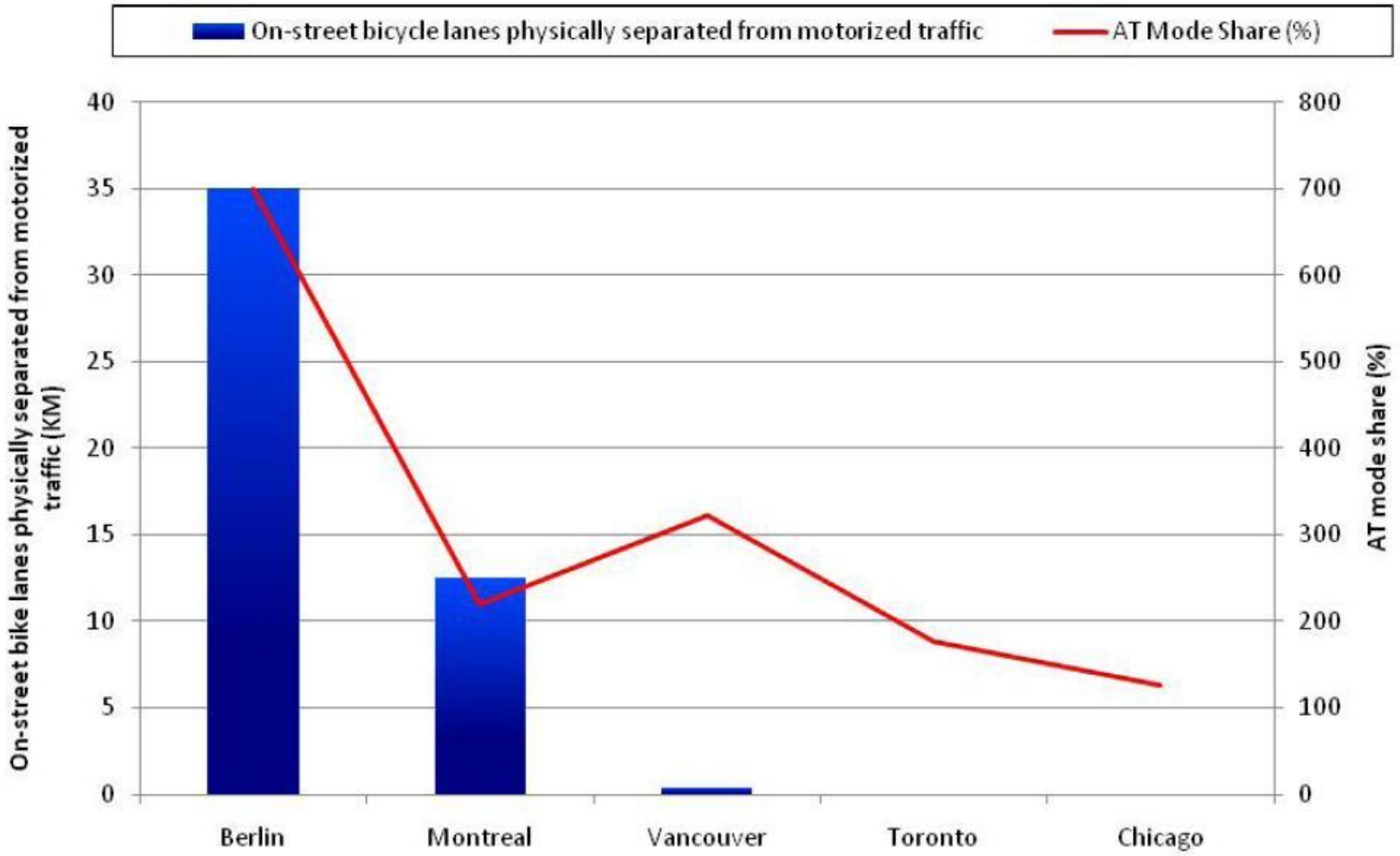


Figure 1 Total length of bicycle facilities by study city, 2010

C. So What Is Berlins Secret?



C. Exclusive Active Transportation Space Makes A Difference

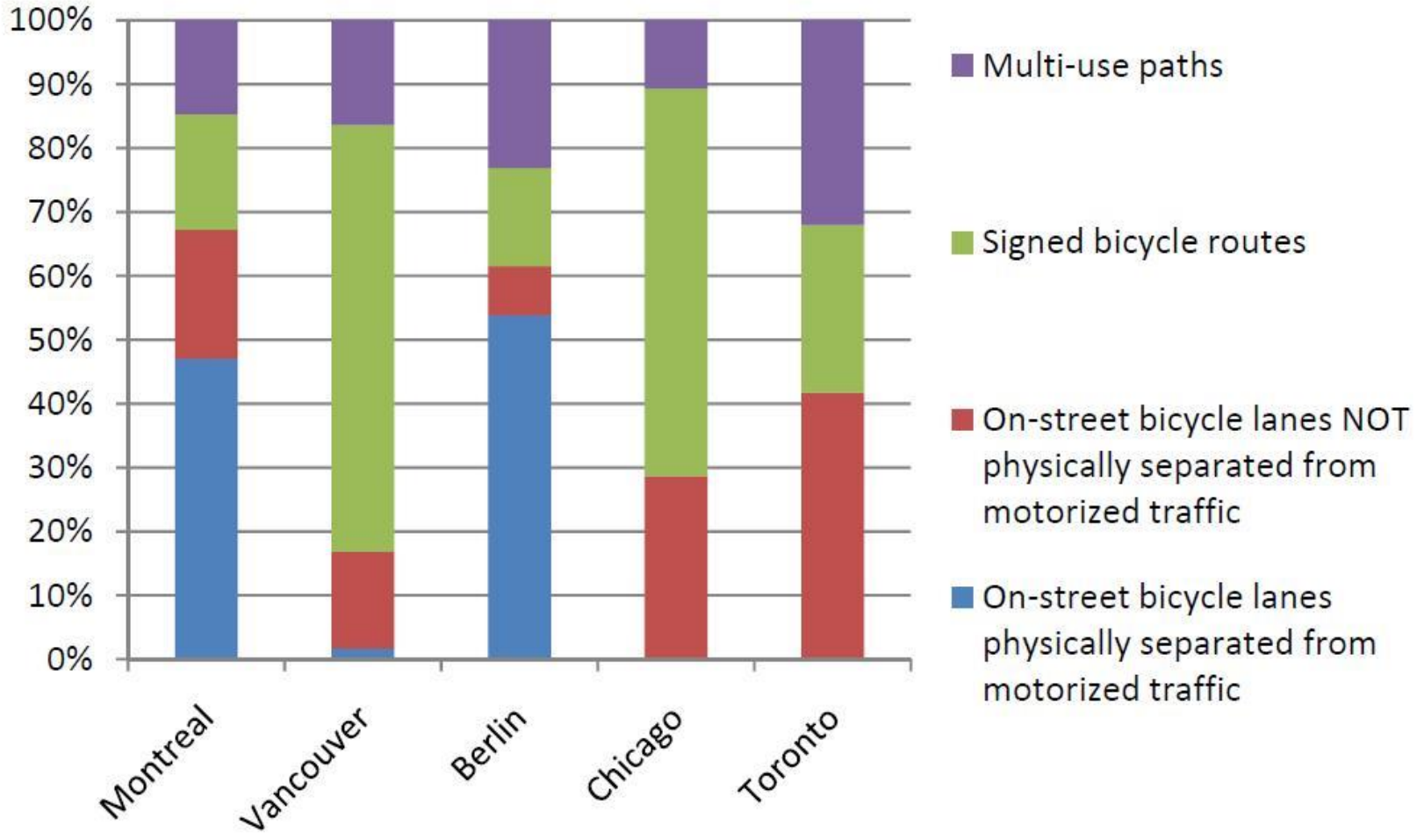


Figure 3 Bicycle facility types by study city, 2010

C. The Real Shift Needs To Be Between Cars and Active Transportation

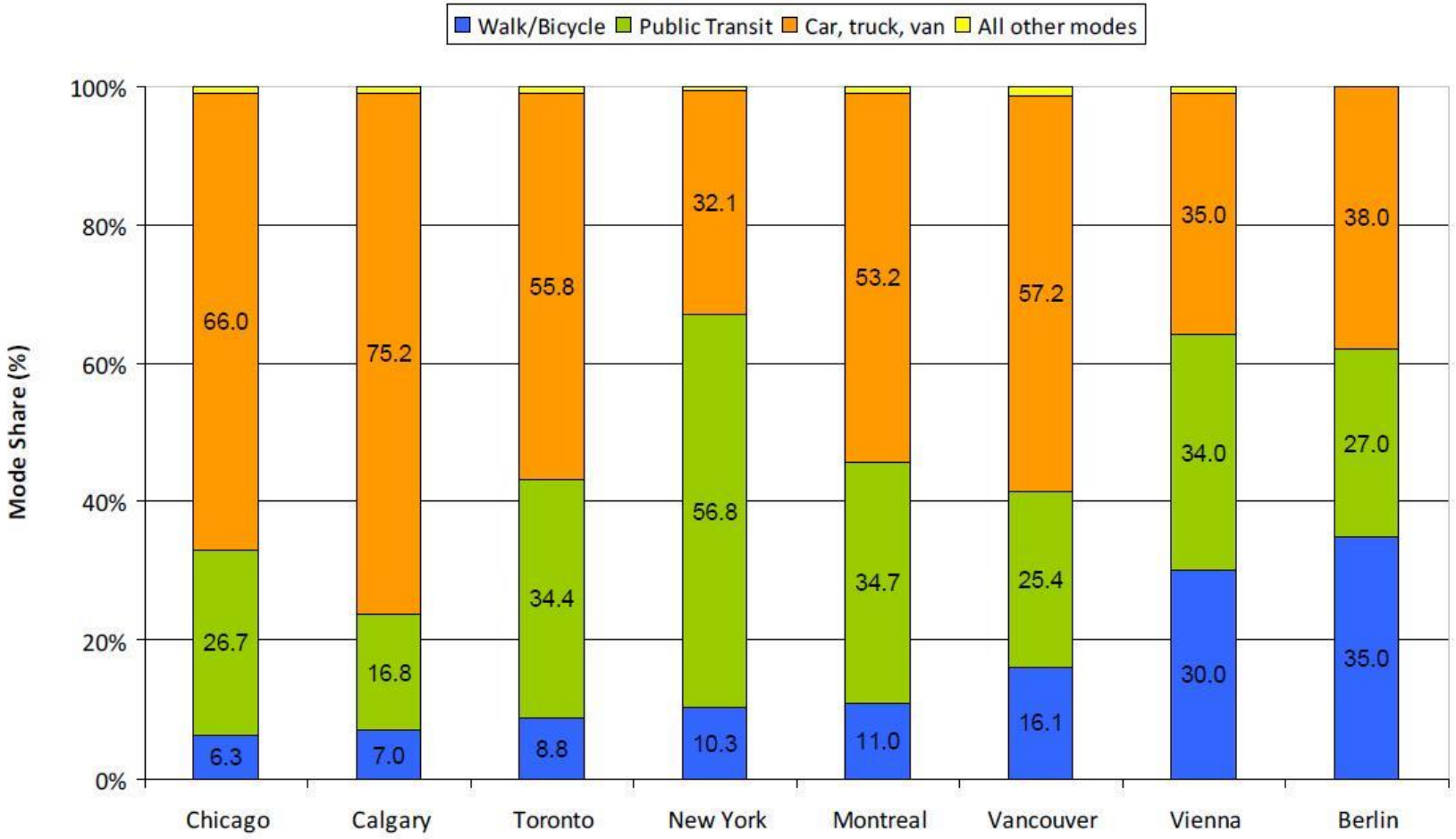


Figure 11 Complete modal breakdown for all study cities, 2007

C. The Most Important Determinants Are

- Land Use Formation;
- Viable Transit Walking Distance To Increased Transit Services;
- Viable Active Transportation Network;
- And, I Don't Mean Recreational And Passive Trails and Paths.

D. MTO'S Drivers Handbook Is Clear

III. Sharing the road with other road users

Sharing the road with cyclists

Bicycles and mopeds travelling at a lower speed than other traffic are expected to ride about one metre from the curb or parked cars, or as close as practical to the right-hand edge of the road when there is no curb. However, they can use any part of the lane if necessary for safety, such as to:

- Avoid obstacles such as puddles, ice, sand, debris, rutted or grooved pavement, potholes and sewer grates
- Cross railway or streetcar tracks at a 90° angle
- Discourage passing where the lane is too narrow to be shared safely
- A bike lane may exist adjacent to parking bays (See Diagram 2-10)

Diagram 2-10

Cyclists are not required to ride close to the right edge of the road when they are travelling at or faster than the normal speed of traffic at that time and place, or when they are turning left, or getting in position to turn left. (Cyclists are permitted to make a left turn from a left-turn lane, where one is available.)

When passing a cyclist, as a best practice, allow at least one metre between your vehicle and the cyclist. (See Diagram 2-11.) Whenever possible, you should change lanes to pass.

Do not follow too closely behind cyclists. They do not have brake lights to warn you when they are slowing or stopping.

Diagram 2-11

Intersections – To avoid collisions with bicyclists at intersections, remember the following:

D. Handbook Is Clear – Bikes Share The Road

- When turning right, signal and check your mirrors and the blind spot to your right to make sure you do not cut off a cyclist.
- When turning left, you must stop and wait for oncoming bicycles to pass before turning.
- When driving through an intersection, be careful to scan for cyclists waiting to turn left.

Do not sound your horn unnecessarily when you are overtaking a cyclist. It may frighten them and cause them to lose control. If you feel that you must use your horn, tap it quickly and lightly while you are still some distance away from the cyclist.

Bike lanes are reserved for cyclists. They are typically marked by a solid white line. Sometimes you will need to enter or cross a bike lane to turn right at a corner or driveway. (See Diagram 2-12) Take extra care when you do this. Enter the bike lane only after ensuring that you can do so safely, and then make the turn.

Diagram 2-12

Watch for cyclists' hand signals. A cyclist may indicate a right-hand turn by extending their right arm.

Try to make eye contact when possible with cyclists.

Bike boxes help prevent collisions between motorists and bicycles at intersections. It is typically a painted box on the road with a white bicycle symbol inside. Bicycle lanes approaching and leaving the box may also be painted. As a driver, you must stop for a traffic signal behind the bike box. Do not stop in the box. See (Diagram 2-13)

Diagram 2-13

Sharrows A bicycle sharrow, two chevrons painted above a bicycle symbol on the road, indicates the lane is shared. Vehicle or bicycle traffic may be in the lane. Although you should always keep on the lookout for bicyclists, this serves as an additional warning to watch for them in the lane. See (Diagram 2-14)

Children riding bicycles on the street may lack the necessary training and skills for safe cycling. They may not be aware of all the dangers or the rules of the road. Watch for children on oversized bicycles, as they may not have the ability to control it. When parked on the side of the roadway, look behind you and check your mirrors and blind spots for a passing cyclist before opening a door.

Diagram 2-14

D. Traffic Control Devices Can Be Employed

CYCLING SKILLS
Ontario's Guide to Safe Cycling

Previous page | Next page

Riding in Traffic

Signs and Traffic Signals

Key traffic signs and signals for cyclists.

Bicycles are permitted on this road.

No bicycles permitted on this road.

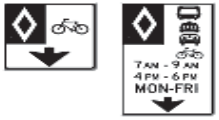
Stop and wait until the way is clear before entering the intersection.

Yield to traffic in the intersection or close to it. Stop if necessary and go only when the way is clear.

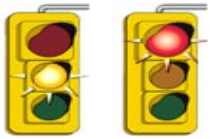
Roadwork ahead. The speed limit and lanes may be reduced.

Railway crossing ahead. The sign also shows the angle at which the railway tracks cross the road.

One-way road. Travel in direction of arrow.



These signs indicate lanes (Diamond Lanes) for specific types of vehicles, either all the time or during certain hours.
They can include buses, taxis, bicycles and vehicles with three or more people.



Flashing yellow: Slow down and proceed with caution through intersections

Flashing red light: Stop and move through the intersection when it is safe to do so.

A flashing green light or left-pointing green arrow with a green light, permits you to turn left, go straight ahead or turn right from the

D. Engineers Finally Found A Way To Deal With Bikes And Intersections

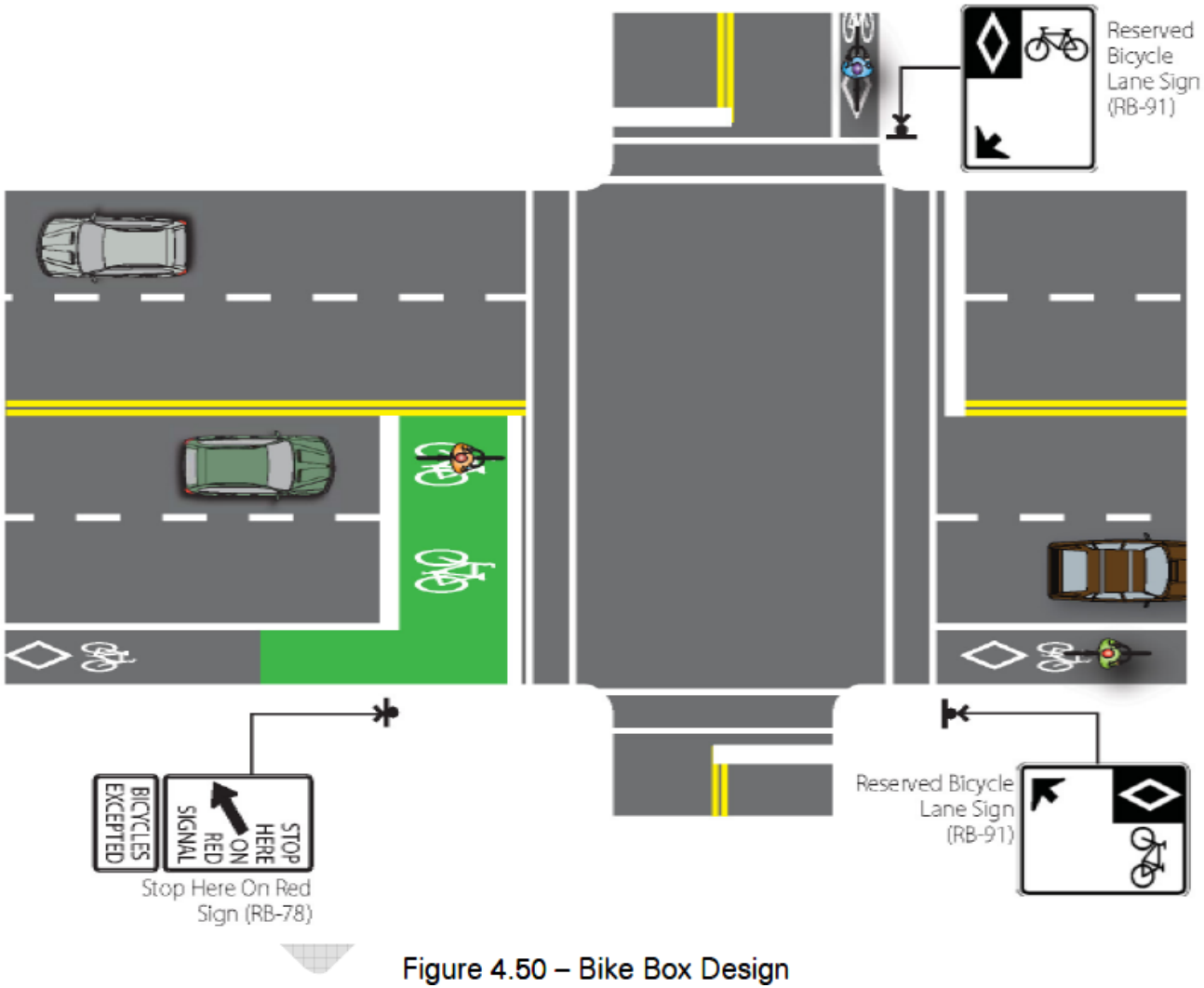


Figure 4.50 – Bike Box Design

D. Book 18 Is Dealing With Every Bike User Type

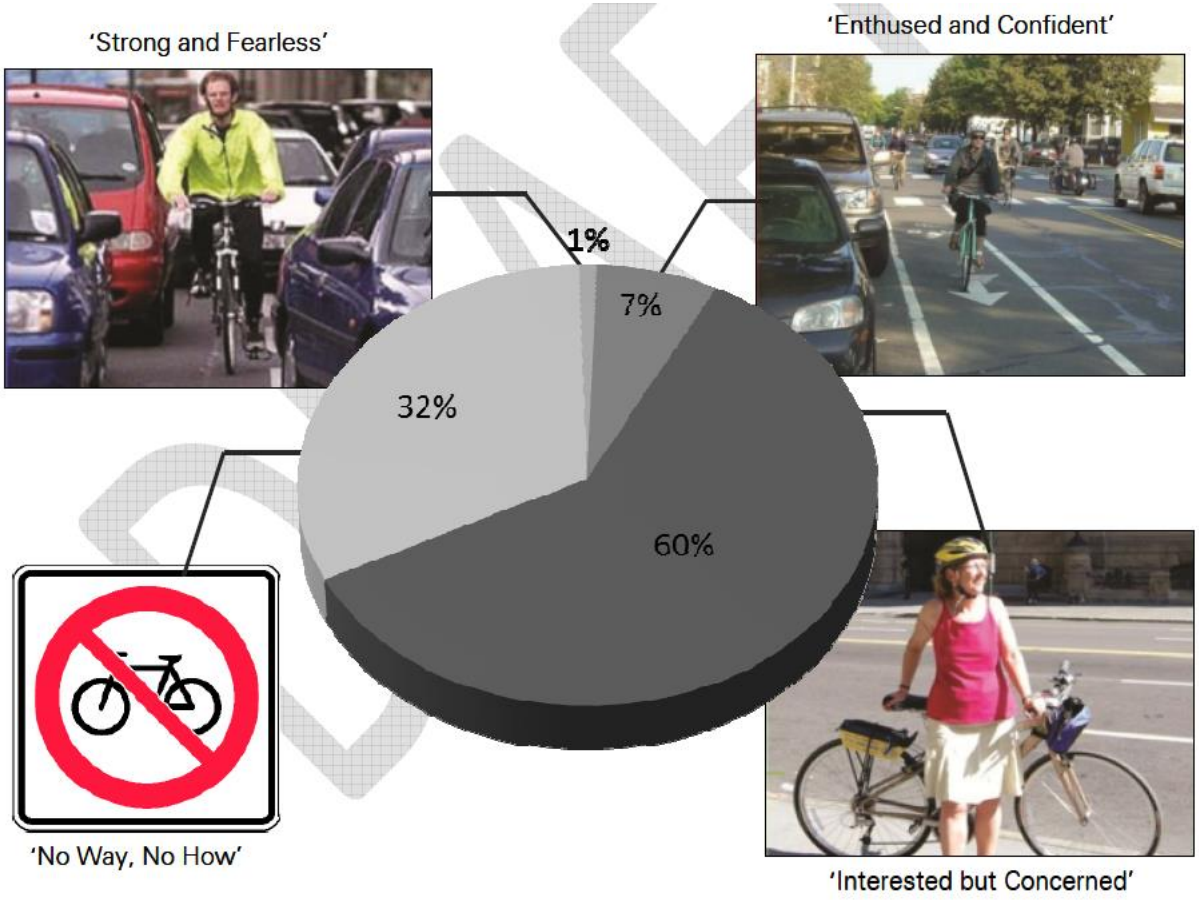
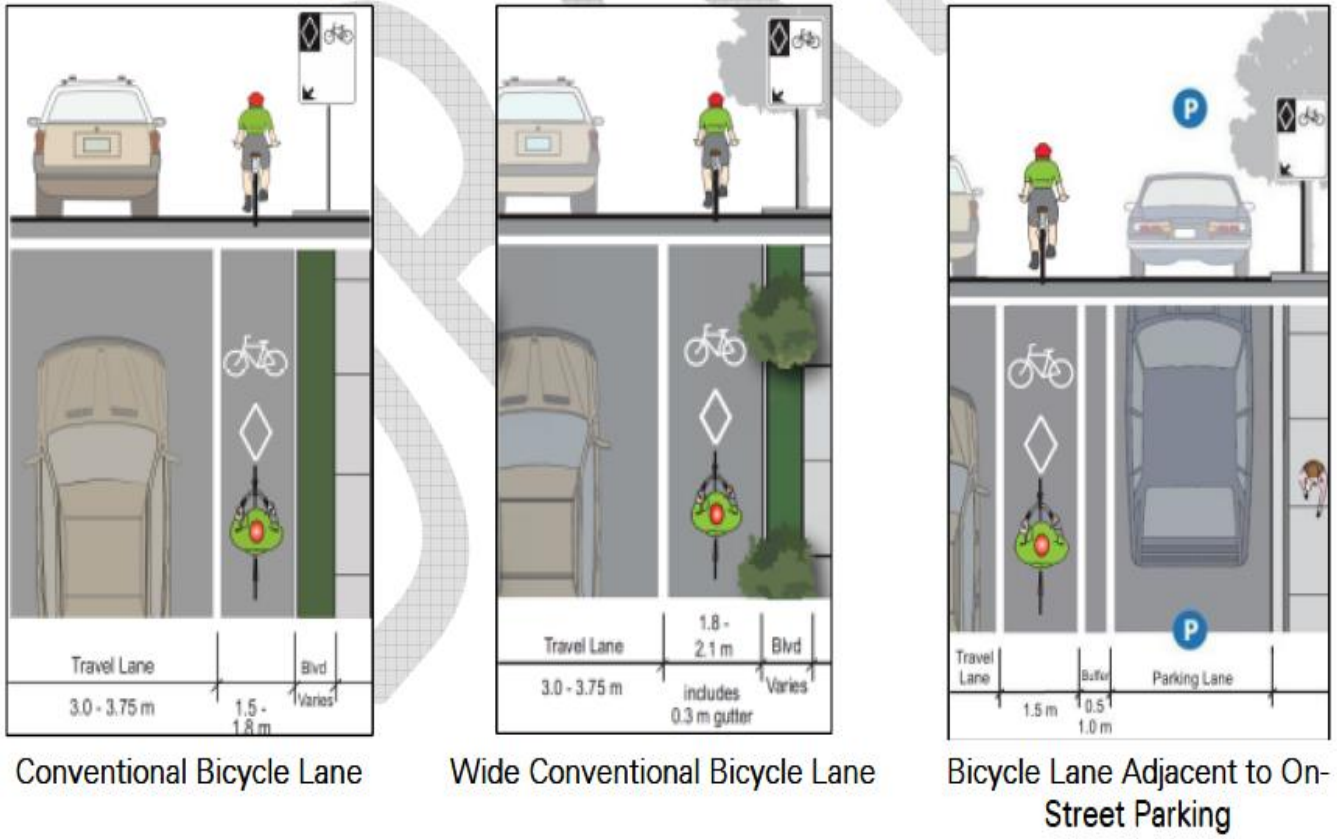


Figure 2.1 – Four Types of (Potential) Cyclists

Source: ALTA Planning & Design, 2010 - Based on information from the City of Portland, Oregon, 2010

D. On-Street Dimensions Are Given

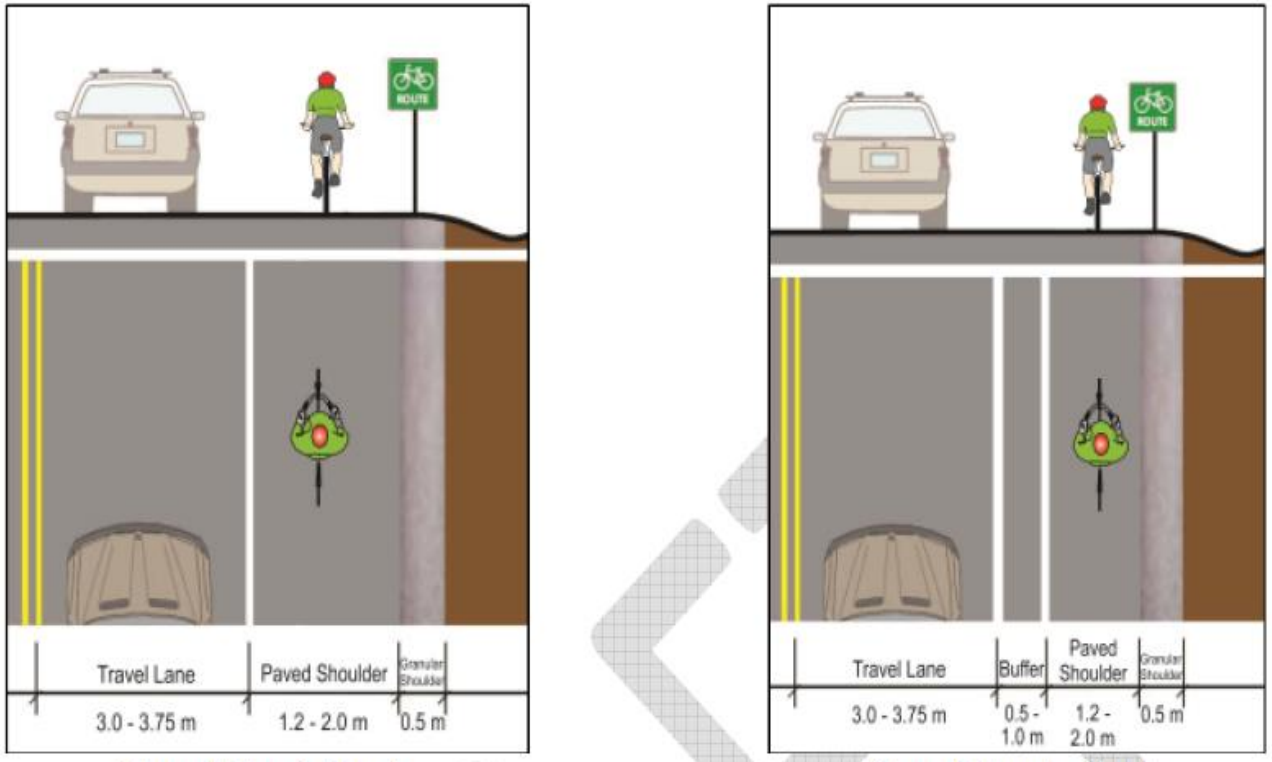
Figure 4.18 – Examples of Conventional Bicycle Lanes



Conventional Bicycle Lane | Wide Conventional Bicycle Lane | Bicycle Lane Adjacent to On-Street Parking

Figure 4.19 – Cross-Sections of Conventional Bicycle Lanes

D. Rural Conditions Are Dealt With



Signed Bicycle Route with Paved Shoulder

Signed Bicycle Route with Buffered Paved Shoulder

Figure 4.12 – Cross-Sections of Signed Bicycle Routes with Paved Shoulder

Source: MMM, 2013

D. Even Separate Space Is Dealt With

Marked Buffer
Credit: City of Burlington

Concrete Curb
Credit: City of Ottawa

Planters
Credit: MMM, 2012

Parking Lane
Credit: Kyle Gradinger

Flex Bollards
(Guelph)
Credit: MMM, 2013

Medians
Credit: Erica Barnett of SLOG News & Arts

Figure 4.53 – Examples of Separated Bicycle Lanes

D. Sharrows Are Dealt With

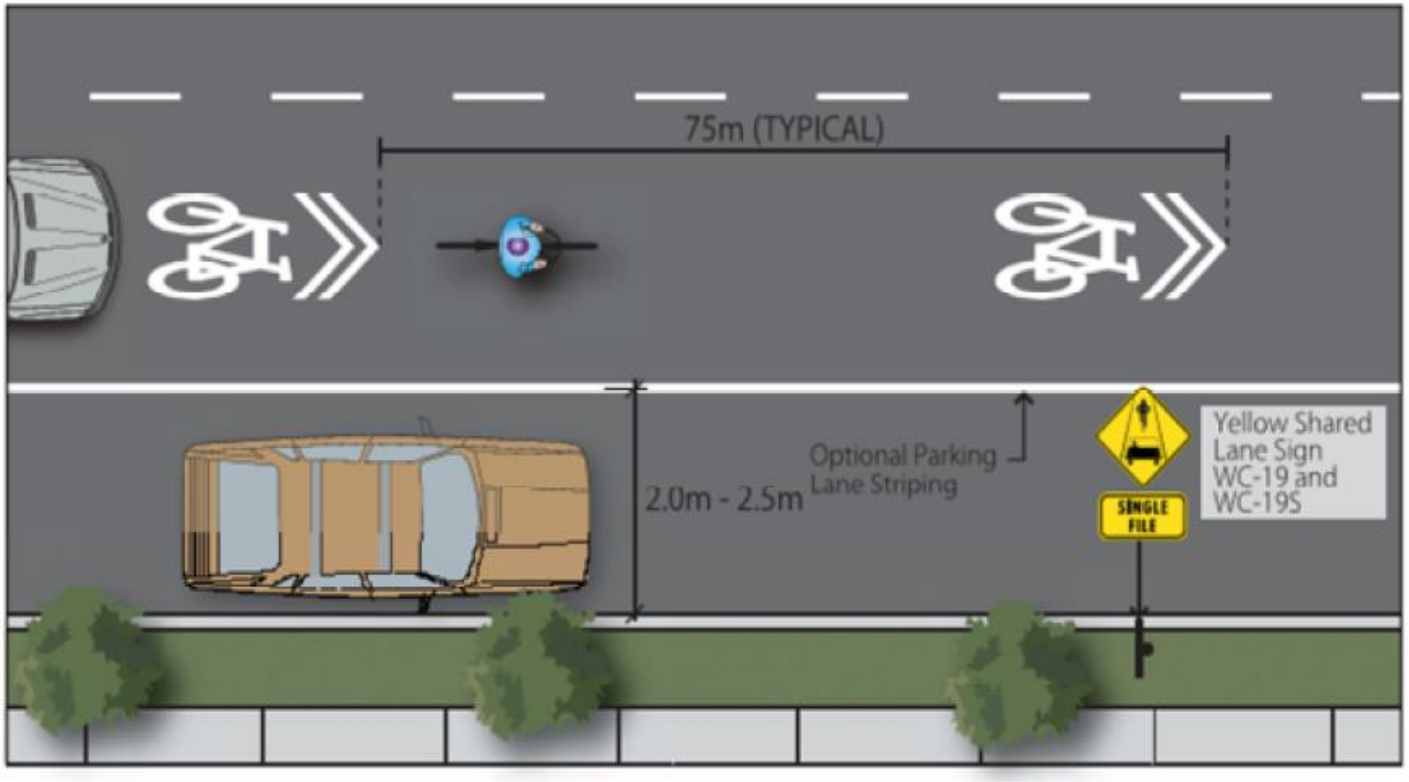


Figure 4.10 – Narrow Signed Bicycle Route with On-Street Parking

(See Table 4.1 for more details)

Source: MMM/ALTA, 2013

D. Solutions To Constrained Areas Are Brought Forth

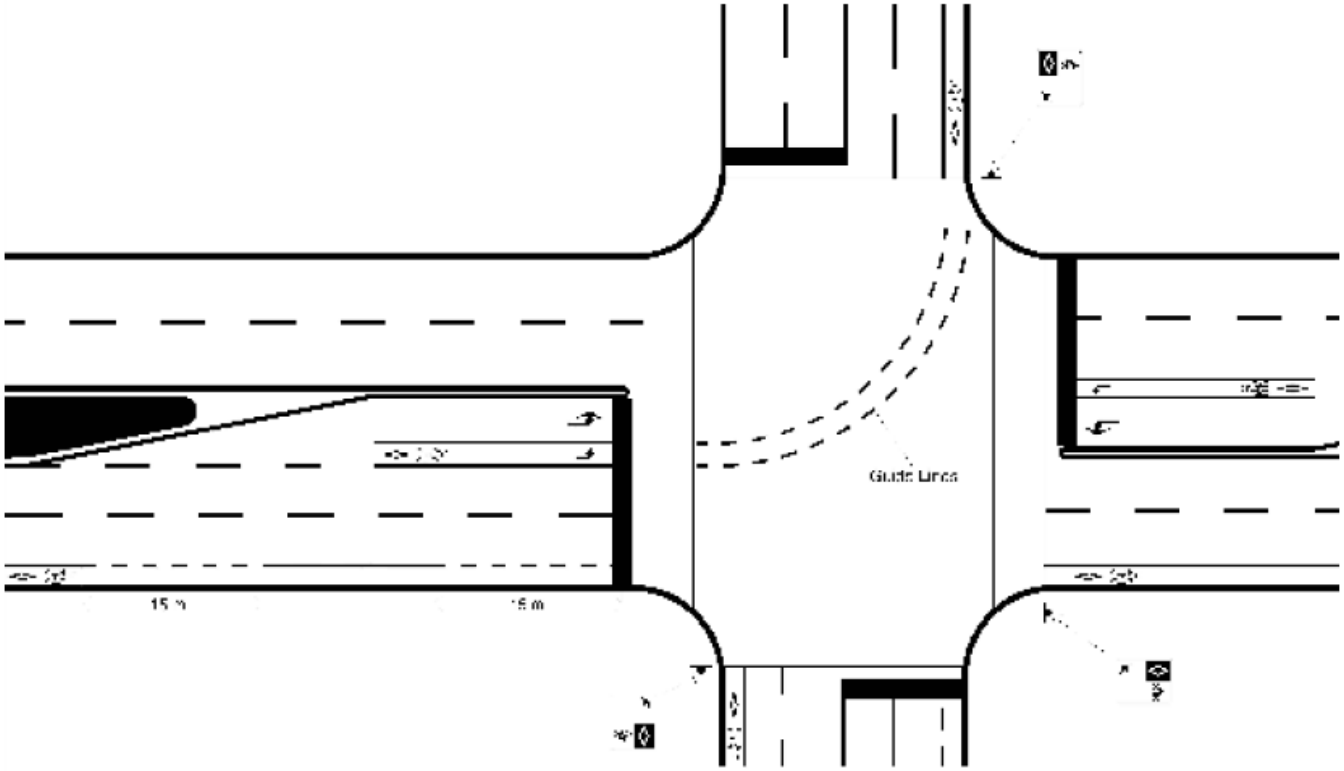


Figure 4.49 – Left-Turn Bicycle Lane Guide Lines Through Intersection

(On roads with multiple through lanes in each direction, practitioners may consider the application of left-turn queue boxes to assist less confident cyclists.)

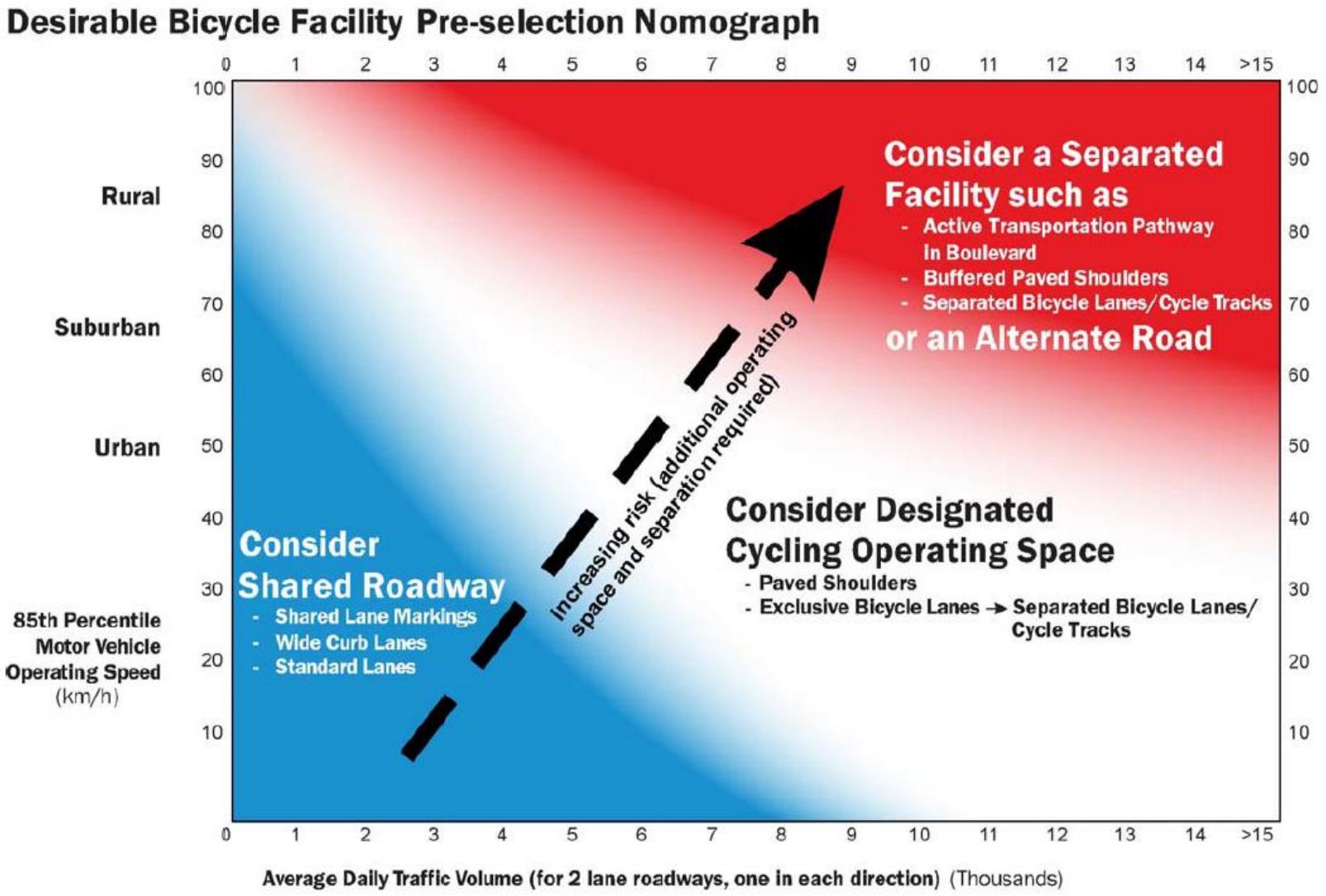
Source: Based on the TAC Bikeway Traffic Control Guidelines for Canada, 2012 (Figure 24, p. 73)

D. Even In Constrained Locations There Is Compromise

Figure 5.20 – Cycle Facility at Transit Stop
(Roncesvalles Avenue, Toronto)
Credit: Google, 2013

Figure 5.21 – Cycle Facility at Transit Stop
(Sherbourne Street, Toronto)
Credit: City of Toronto

D. Are You Prepared To Take Action?



D. Key Steps Must Be Followed - If You Want To Work With Me

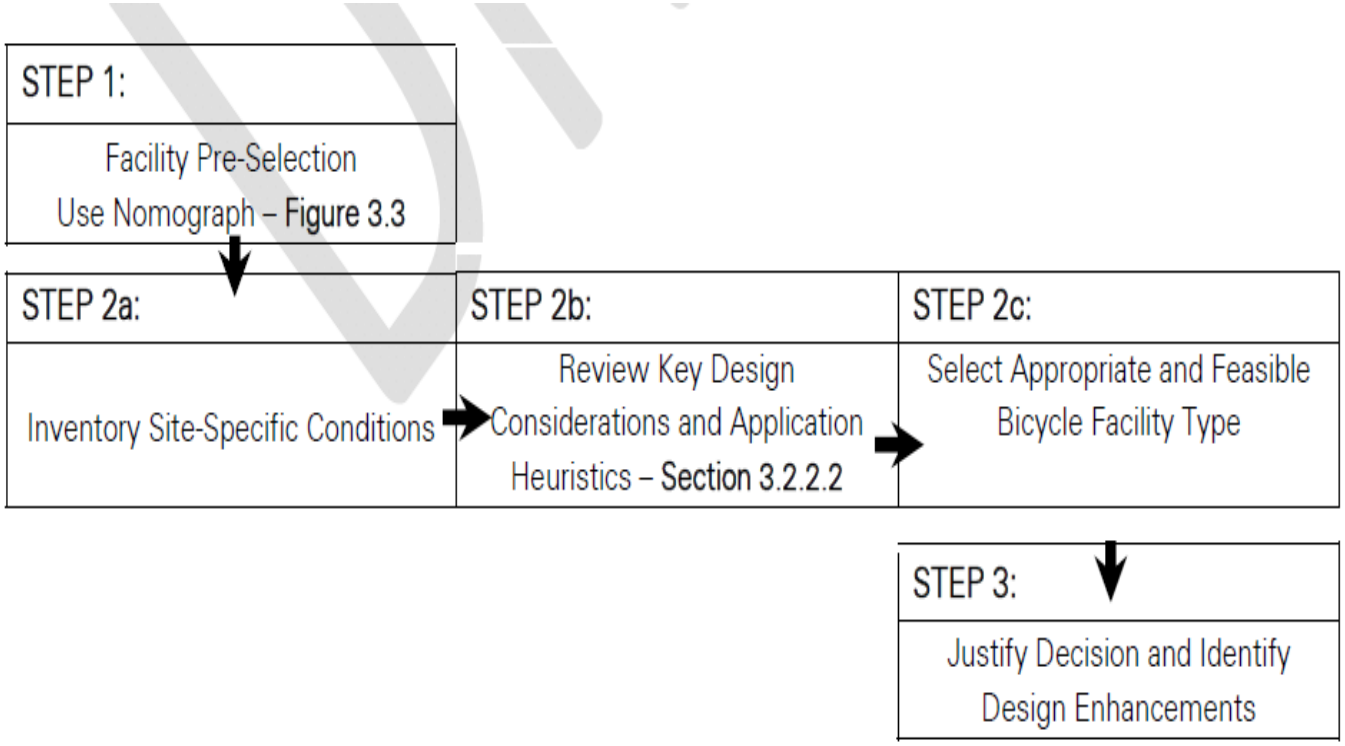


Figure 3.1 – Bicycle Facility Type Selection 3-Step Process Flow Chart

D. Engineers Can Make It Work

D. As Long As There Is A Plan And A Network Results

D. In Any Corridor

D. I Can Find A Solution By Allocating Space

Sheppard LRT

D. How Willing Are You To Create Space In New Plans?

D. Be Smart About What You Want To Influence

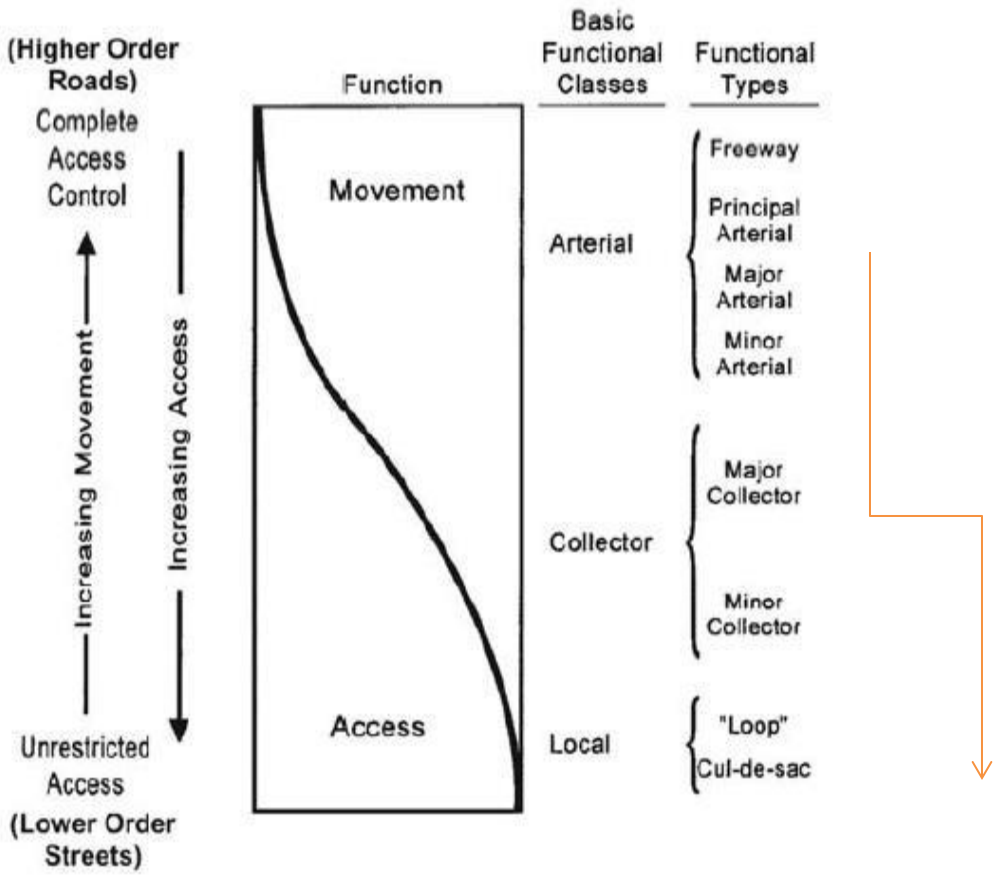


FIGURE 2 - BASIC FUNCTIONAL CLASSES and ROAD TYPES

(Source - Adapted from *Transportation and Land Development*, Institute of Traffic Engineers, 2002, pp. 4-4 and 4-5)

D. 90% Of What You Want To Do Is

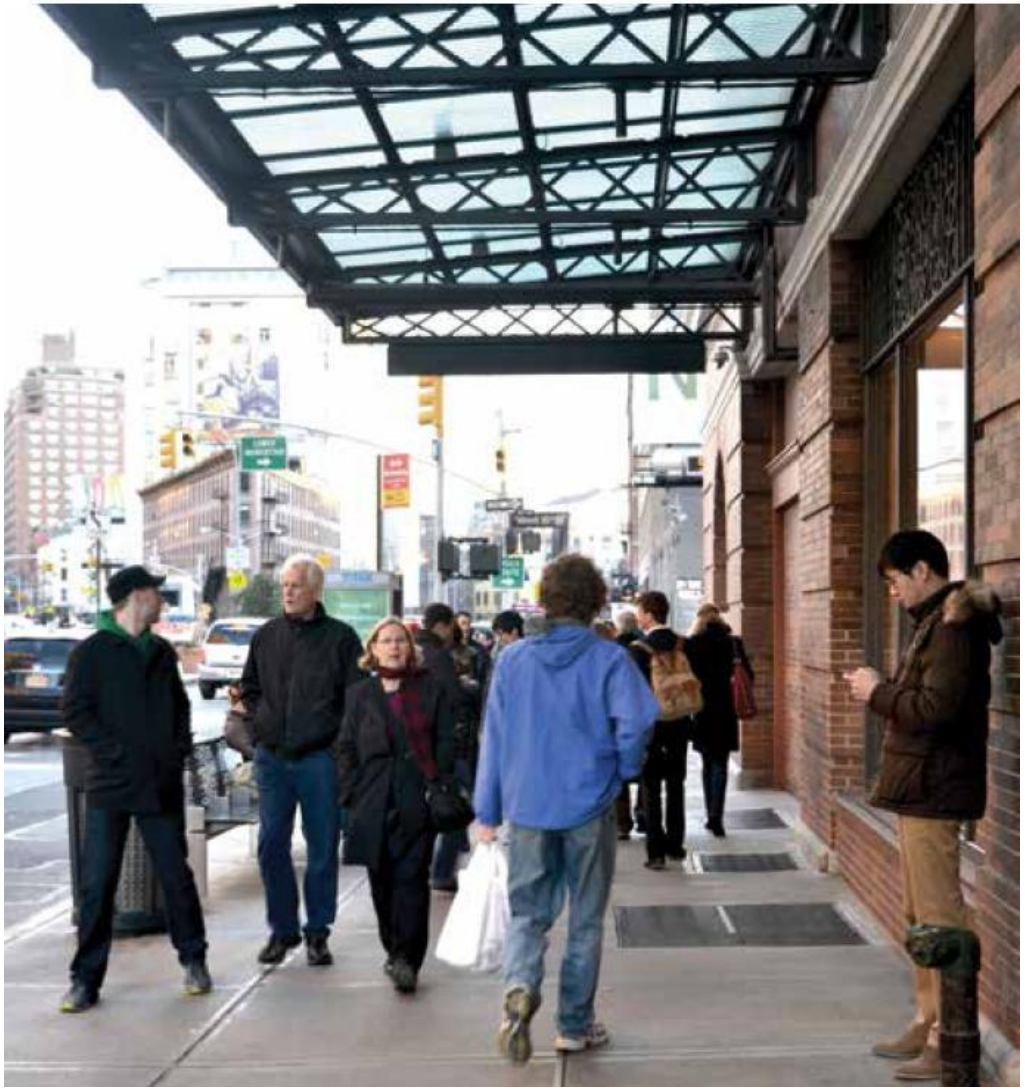
- Between a Municipality and County;
- Between a Municipality and Region, or;
- Mostly in the Municipality;
- MTO is involved when you cross or intersect with Controlled Access Highways.

D. Book 18

- Is and will be the most important and useful tool.
- Just don’t come and tell me about isolated and unique locations;
- I need to create viable AT networks if you want me to share the space;
- And you had better deliver the land use formations to support transit;
- We should use Book 18 now.

E. You Have To Work With Me

E. But I Expect From You



E. I Further Expect

E. If Your Are Serious About AT Then Deal With The School Boards

METROLINX
An agency of the Government of Ontario
Une agence du gouvernement de l'Ontario

September 28, 2012

To the Healthy Kids Panel:

Subject: Submission to the Healthy Kids Panel entitled "Stepping Up Against Childhood Obesity Through School Travel Planning"

Metrolinx is pleased to provide the attached submission (Attachment A) to the Healthy Kids Panel, entitled "Stepping Up Against Childhood Obesity Through School Travel Planning", prepared with the organizations listed in Attachment B of this letter.

Metrolinx supports this submission. The listed organizations, which have provided letters (Attachment C) endorsing the submission, believe that supporting children and families to use physically active methods of transportation as part of their daily routine is a key component in combatting childhood obesity.

The submission fits well with Metrolinx's vision, goals, and priority actions in *The Big Move*, our Regional Transportation Plan for the Greater Toronto and Hamilton Area (GTHA), which include:

- Transforming the way people move in the GTHA, supporting healthy and active living
- Having 60% of children walking and cycling to school by 2033
- Walking and cycling as attractive and realistic choices for all, including children and seniors
- Increasing parents comfort with allowing and encouraging their children to walk, cycle or use public transit to school, and
- Developing a Transportation Demand Management policy and strategy for provincial ministries and agencies such as school boards, that include actions, timelines and targets

E. What Is The AT Network You Want?

- Is it for recreational purposes, or is it truly;
- To shift from the car to walking and bicycling,

  if that is the case, then;

E. Don’t Talk To Me About Road Diets

Table 3.1 ROW Width for Various Types of Roads in the City of Vaughan

Road Type	ROW Width (m)	Pavement Width (m) *	Standard Drawing Number
5-Lane Arterial Road	35.0	19.7	B-1 (pre-OPA 600)
4-Lane Arterial Road	30.0	15.7	B-2 (pre-OPA 600)
Major Collector Road	26.0	14.0	B-8
Industrial Road	23.0	11.5	B-4 (pre-OPA 600)
Minor Collector Road with 3 m Greenway	26.0	11.5	B-9
Minor Collector Road	23.0	11.5	B-10
Major Local Road	20.0	9.0	B-11
Local Road	17.5	8.0	B-12
Local Road	20.0	8.5	B-6 (pre-OPA 600)
Local Road (Cul-de-sac)	18.5	8.5	B-7 (pre-OPA 600)
Buffer Road	15.0	7.0	B-13
Laneway	8.0	6.0	B-14
Lay-by Lane (Minor Collector Road)	23.0	9.75	B-15
Industrial Cul-de-sac	23.0		C-1
Residential Cul-de-sac	18.5		C-2
Residential Cul-de-sac	17.5		C-3

*Note: * Includes gutter (measurements are from curb face to curb face)*

E. It Seems To Me

- That Planners have successfully and efficiently implemented road diets, but;
- Just what happened to the space for bicycles and let’s not forget about land use formations.

E. If You Truly Want Active Transportation To Work

- Then it starts with the schools, and incorporates;
- A true AT network connecting local attractors and generators (and to transit), with;
- A high percentage of the AT Network length containing exclusive bike space, (rural area = shoulder) and;
- Land use patterns that place more people closer to more transit.