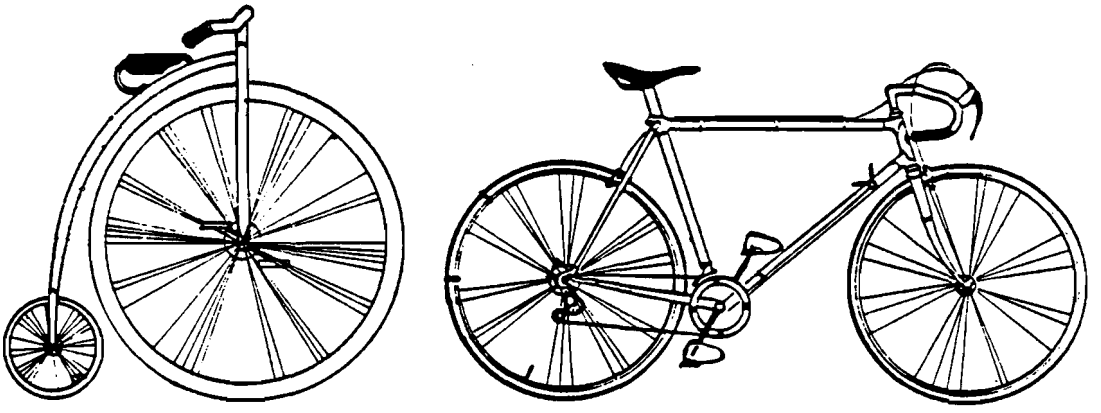
VANCOUVER COMPREHENSIVE BICYCLE PLAN



Engineering Department
July 1988

City of Vancouver

Inter-Office Correspondence

CITY ENGINEERING DEPARTMENT File No. 4271-5

July 29, 1988

MEMO TO: City Engineer

FROM: Assistant City Engineer - Transportation

SUBJECT: VANCOUVER COMPREHENSIVE BICYCLE PLAN

As directed by Council on July 30, 1985, the Transportation Division, in cooperation with the Bicycle Advisory Committee, has prepared the attached Vancouver Comprehensive Bicycle Plan.

The Vancouver Comprehensive Bicycle Plan analyses local cycling statistics and needs, and explores the four fundamental areas of cycling (Engineering, Education, Enforcement and Encouragement) in order to effectively reach cost-effective recommendations to integrate the cyclist into the existing transportation network and to promote and encourage the responsible use of the bicycle as a safe and convenient mode of transportation.

M. P. Brown, P.Eng.
Assistant City Engineer,
Transportation.

MP/DHR:mm

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Introduction

In recent years, the bicycle has become recognized as an efficient and convenient mode of transportation . No longer is its use confined to children and those without a drivers license. The popularity of cycling in Vancouver has increased to a point where over 47,000 bicycle trips are made on an average weekday.

The four fundamental approaches in providing a safe and convenient cycling environment in Vancouver include Engineering, Education, Enforcement and Encouragement. Otherwise known as the 4 E's, these fundamental areas must each be pursued in order to accommodate the present resurgence of cycling in our City.

Cycling and Cyclists in Vancouver

From the GVRD origin/destination survey and the Vancouver Bicycle Survey, we note that:

- Cycling in Vancouver is no longer confined to children or those who do not have a drivers license, nor is cycling primarily a recreational activity. Cycling has become a widely used mode of transportation and plays an increasingly important role in the urban transportation system.

- Approximately 2.3% of all vehicle trips in the Vancouver Central Metropolitan Area (CMA) are made by bicycle. Commuter trips during rush hours account for approximately 1.6% of all vehicle trips in the Vancouver CMA.

- Approximately 85% of all cycling trips made on an average weekday are made for non-recreational purposes such as commuting to/from work and school and shopping.

- Vancouver cyclists particularly dislike:
  - poor weather conditions
  - heavy motor vehicle traffic
  - poor road conditions
  - lack of end-of-trip facilities

- Vancouver cyclists want:
  - bicycle lanes/paths
  - cyclist/motorist education
  - improved on street conditions
  - increased enforcement
  - end-of-trip facilities
  - intermodal transit links/facilities

Accidents

- Each year in Vancouver, on average, there are:
  - 500 reported bicycle/motor vehicle accidents
  - one to two cyclist fatalities

- The number of reported bicycle/motor vehicle accidents has increased by over 200% since 1982.

- The majority of reported bicycle/motor vehicle accidents occur at intersections and at midblock driveways.

- Over 65% of all bicycle accidents, including falls, bike/bike and bike/dog accidents, go unreported.

- The 10-14 year age group has the highest number of bicycle accidents requiring hospital admission.

- The most common cyclist injury is the head injury.

Engineering

Cycling Transportation Engineering is the foundation on which a successful comprehensive bicycle plan is based. In summary, the cyclist requires two basic facilities. These are:

1) Direct, convenient and safe access to destination.
2) End-of-trip facilities.

The safest and most cost effective method of providing the cyclist with direct and convenient access to their destination is through shared usage of our existing transportation network. The Engineer ensures proper integration of the cyclist onto the roadway by planning for all road users including cyclist in the initial design of the roadway. Recommended provisions for bicycle traffic include sufficient lane width, cyclist conscious intersection design, improved signage, hazard location/elimination and proper location/configuration of on-street utilities, barriers, etc.

The provision of bicycle parking facilities plays an integral role in the promotion of bicycle use. Bicycle parking is relatively inexpensive, yet the benefits to the cycling public are substantial. Bicycle parking facilities must be designed for in the development permit stage in order to ensure new developments can meet the increased demand for bicycle parking. Design guidelines incorporated into the Parking By-Law would ensure minimum design specifications for various uses.

Existing developments should be permitted to place bicycle parking facilities on City property if off street space is unavailable and if the proposed on-street location does not pose a hazard to pedestrians, or parked cars, as determined by the City Engineer.

RECOMMENDATIONS:

1) That the street priority system, detailed in this report, be recognized as a system to determine where bicycle requirements should be considered in road design and future improvement projects.

2) That the City of Vancouver Engineering Department road design standards incorporate recommended lane widths, where practical, as outlined in this report.

3) That intersection design continue to assume cyclists perform safe standard vehicular left turns, as outlined in this report.

4) That all future interval clearance time calculations for signal installation utilize calculated bicycle clearance intervals in cases where they exceed that of a motor vehicle, where practical.

5) That special attention continue to be paid to vehicle-actuated signals on priority I and II streets (see Street Priority System) to ensure that bicycles are being detected.

6) That symbolic railway crossing signs (showing angle of tracks) and cyclist cautionary signs be placed before all shallow angle railway crossings.

7) That the City continue to negotiate with railway authorities to install rubber flange fillers at shallow angle railway crossings.

8) That roadside asphalt drainage diverters be marked, where practical, to improve detection under poor visibility circumstances.

9) That bicycle access through traffic barriers be considered on a site specific basis.

10) That all future roadway projects be designed to include cyclists on the road. In situations where such on-road access is unsafe that an alternative safe, direct, and convenient bicycle facility be provided, if practical.

11) That the City of Vancouver incorporate minimum bicycle parking requirements into the Vancouver Parking By-Law for all new developments.

12) That the Engineering and Planning Departments continue to pursue minimum recommended bicycle parking in all new developments at the development permit stage, using the existing floor space ratio exemption as an incentive.

13) That the existing Street and Lanes Maintenance Program continue to identify and repair bicycle hazards.

14) That the Park Board consider the following recommendations in order to alleviate present cyclist/pedestrian conflicts on the Stanley Park Seawall:

A) In order to alleviate cyclist/pedestrian conflicts at Second Beach, Third Beach and Lumberman's Arch, designated pedestrian crossings should be established. Pedestrian crosswalks should be painted on the cycle path with offset warning lines and traffic control signs requiring the cyclist to "stop". "Cyclist Dismount" signs should be removed.

B) On route conflicts can be minimized through the use of "cyclists use bell or voice when passing" signs, placed periodically along the route.

C) A printed, up-to-date safety code should be distributed along the route during peak use periods and posted at key locations. Such a safety code should be recommended reading for all bicycle renters.

D) A suggested speed limit for cyclists.

15) That B.C. Parkway consider the following recommendations for the 7-Eleven Bicycle trail:

A) Stop and Yield traffic control signs should be placed before all major intersections on the trail.

B) "Use bell or voice when passing" signs should be placed periodically on the trail.

C) Some on-street sections of the trail should be analysed for areas to reduce potential conflict and improve signage. In particular, the Grandview Highway to Clark Drive section should be reviewed.

D) Bicycle access in the False Creek to Clark Drive section should be considered during land development in this area.

16) That the Engineering Department and the Park Board consider the following recommendations for the Habitat Bicycle Route:

A) As on the Stanley Park Seawall, "cyclist use bell or voice when passing" signs should be placed periodically along the route in high pedestrian use areas. These areas include: Sunset Beach (and Burrard Street Bridge - COMPLETED).

B) That the Burrard Street Bridge signage and access ramps be improved as outlined in the Burrard Street Bridge Bikeway Report (COMPLETED).

C) Surface conditions, signage and conflicts should be reviewed in the Kitsilano area.

17) That facilities for recreational cyclists be progressively provided, wherever practicable, along railway reserves, ocean and river foreshores, and highway rights-of-way.

Education

Education plays an integral role in the success of a Comprehensive Bicycle Plan. Only through education of both the cyclist and the motorist can safe road sharing be achieved. Parents, teachers, police officers, engineers, planners, community leaders, bicycle retailers/renters, and the media all play an important role in education and must all have an appreciation of the rights and responsibilities of cyclists if they are to assist in the goal of safe and responsible cycling.

Prime target groups for education include young children, school age children, adult cyclists, and motorists. In order to ensure that each target group is receiving sufficient applicable education, a sound education network governed by a central education committee is recommended. Mandatory instructor

certification for on-road instruction, and the monitoring of in-class instruction being taught through Vancouver schools and community centres would achieve quality control and ensure a minimum level of competence.

Children below the age of nine account for approximately 17% of all bicycle/motor vehicle accident injuries. Parents have the most important role in the initial development of cycling skills for these children but, unfortunately, the majority of them lack the necessary information.

School age children between the ages of 9 and 18 account for over 35% of all bicycle accidents/injuries. Education of this target group should focus on traffic skills. In order to ensure that students are receiving structured, consistent information, education of this age group should be incorporated into the school curriculum.

Adult cyclists account for over 47% of all serious cyclist injuries. Adult cyclists must be made aware of the availability of bicycle courses and the need for special skill development required for cycling in traffic. Many motorists are unaware of proper bicycle lane positioning and passing procedures. Potential and existing motorists must be educated on the rights and responsibilities of cyclists as well as on road sharing techniques if safe road sharing is to take place.

RECOMMENDATIONS:

18) That the terms of reference of the Vancouver Bicycle Advisory Committee be expanded to include the role of a bicycle education advisory board for all bicycle education courses held by the Parks Board, the School Board and the Police Department.

AND

That the representation on the committee be expanded to include representatives from the School Board, the Park Board, and cycling associations knowledgeable in the area of bicycle education (COMPLETED).

19) That all bicycle education courses offered through the Vancouver School Board or Park Board, which include an on-road riding component, require that instructors of such courses be certified by the Canadian Cycling Association as qualified bicycle instructors.

20) That an informational brochure be made available for parents of children under the age of nine. This brochure can be distributed through schools, community centres, police and retailers.

21) That the Vancouver School Board work with the Bicycle Advisory Committee and involved agencies to introduce a basic bicycle safety course for children under nine years of age using 'Effective Cycling' techniques and CCA certified instructors.

22) That the Vancouver School Board work with the Bicycle Advisory Committee and involved agencies to introduce bicycle education as a compulsory part of the elementary school curriculum for grades 4 to 7.

23) That the Vancouver School Board work with the Bicycle Advisory Committee and involved agencies to introduce in-class bicycle education into existing high school courses.

24) That an adult cyclist brochure be made available for distribution through automobile associations, community centres and retailers.

25) That the Vancouver Park Board and community colleges and universities be encouraged to expand their present bicycle education program to include adult CCA Can-Bike courses at local community centres, campuses, etc.

26) That a 'road sharing' brochure geared towards motorists be made available outlining the rights and responsibilities of the cyclist and motorist on the roadway. And that this brochure be made available through ICBC, BCAA, B.C. Tel and bicycle organizations.

27) That driver training booklets and courses be revised to present cyclists as an integral part of the road user environment, outlining the rights and responsiblities of cyclists. And that the driving test itself be revised to test for such knowledge.

28) That a city-wide 'Share the Road' media campaign be introduced. And that promotional material in this campaign include posters, bumper stickers, T.V. and radio advertising.

29) That a city-wide helmet campaign be implemented to reduce present cyclist injuries.

30) That future mandatory helmet use be considered when the majority of cyclists are voluntarily wearing helmets.

Enforcement

The third component of a successful bicycle plan is enforcement. Cyclist behaviour is unlikely to improve unless the information reaching the cyclist is reinforced through the enforcement of existing traffic laws and regulations governing cyclists.

Existing laws and regulations are difficult to enforce due to staff constraints, the dilemma of minimum age of legal responsibility, and cyclist identification. For these reasons, a periodic short-term enforcement campaign coupled with high media coverage has proven most effective. Enforcement should be selective and continually re-evaluated to track conformance.

The licensing of cyclists/bicycles would be most effective province-wide. Locally, administration costs required to run such a program would be passed onto the cyclists as high licensing fees discouraging cycling. Licensing would, however, be feasible for commercial cyclists (bicycle couriers) as a means of identification and control. Such a licensing program for bicycle couriers has subsequently been approved by Council.

Bicycle thefts in Vancouver can be controlled most effectively through the RCMP Bicycle Identification Program, in which bicycles (including components) are marked with the owners/parents drivers license to ensure quick owner identification.

Enforcement on recreational facilities and in high volume traffic areas has proven effective through the use of police officers on bicycles. Versatility and manouverability in traffic account for the success of such "Bike Cop" programs in other cities.

RECOMMENDATIONS:

31) That a Commercial Bicycle Operator Licensing Program, as outlined in this report, be implemented in order to control the present downtown bicycle courier problem (COMPLETED).

32) That the Vancouver Police Department in cooperation with the Bicycle Advisory Committee run a One Week Bicycle Enforcement Campaign, as outlined in this report.

33) That the Vancouver Police Department consider working with local RCMP to initiate a Vancouver Bicycle Identification Program to reduce bicycle theft.

34) That the Vancouver Police Department prepare an informational memo to all on-street officers, outlining methods of identifying a stolen bicycle.

35) That an informational pamphlet, outlining cycling traffic laws and regulations, be supplied to all bicycle rental outlets for distribution to rental customers.

36) That the Vancouver Police Department consider the use of trained police officers on bicycles to enforce traffic laws and regulations governing cyclists on the Stanley Park Seawall and the English Bay area.

Encouragement

Just as the proper use of improved engineering facilities is dependent on cyclist education and education is dependent on enforcement, so is the success of all the proposed facilities and programs dependent on increased usage. Cycling can be encouraged in three ways:

- by improved end-of-trip facilities
- by promotional/informational programs
- by intermodal transit links/facilities

The provision of end-of-trip facilities, such as parking, lockers and showers at employment centres, can encourage an additional 2-4% of the workforce to commute to work by bicycle. Unlike motor vehicles, the bicycle has little protection against theft of it's components and no protection against weather. For this reason, proper bicycle parking facilities in new developments (as recommended earlier), and at public service outlets, play an important role in encouraging city-wide cycling.

Promotional media campaigns outline the substantial benefits cycling has for the individual and society and, at the same time, encourages the responsible use of the bicycle, both as a transport and recreational vehicle.

Opening transit links to cyclists overcomes the distance barrier and opens up the entire region to bicycle commuting.

RECOMMENDATIONS:

37) That the City of Vancouver provide secure bicycle parking facilities at Vancouver schools, libraries, community centres, parks, museums and other public buildings.

38) That private developers be encouraged to provide shower and locker facilities in the development permit application stage.

39) That the Park Board continue to hold Bicycle Sundays with the objective of encouraging safe cycling in Vancouver.

40) That fund raising cycling events be encouraged and supported by the City of Vancouver whenever possible.

41) That B.C. Transit be requested to upgrade bicycle parking facilities at all SkyTrain and Seabus stations as outlined in this report.

42) That B.C. Transit consider providing bicycle parking facilities at all Park and Ride locations and off-street transit exchanges.

43) That individual municipalities be asked to consider providing bicycle parking facilities at transit exchanges where off-street space is not available.

44) That B.C. Transit consider:

i) allowing cyclists to use the SkyTrain system during non-peak periods (similar to Montreal and San Francisco).

ii) permitting bicycles on the Seabus at all times to facilitate North Shore commuting.

iii) equipping express buses from Surrey and Delta with external bicycle racks to transport cyclists from major transit exchanges to designated unloading points in downtown Vancouver (similar to San Diego).

45) That B.C. Ferries Corporation consider providing improved bicycle parking facilities on ferry car decks in order to safely encourage the present increased trend towards recreational bicycle touring.

INTRODUCTION

In recent years, the popularity of cycling in Vancouver has increased. No longer is cycling an activity confined to children or those who cannot drive. Its popularity has now spread to adults as a convenient mode of transportation and recreational activity. On an average weekday, over 47,000 bicycle trips are made in the Vancouver Central Metropolitan Area (ref. 19). This resurgence of cycling accounts for over 2.3% of all vehicle trips.

The problems faced by Vancouver cyclists are unlike those faced by motorists due to the design of the bicycle, the vulnerability of the cyclist, and the diversified range of users in the cycling population. In order to safely integrate cyclists onto the roadway, four fundamental approaches must be addressed, these are:

1) Engineering
2) Education
3) Enforcement
4) Encouragement

The four E's of cycling are interdependent. The importance of each fundamental area can be compared to the weakest link analogy in that the success of a comprehensive bicycle plan is only as great as the weakest fundamental area. Education of the cyclist is aided by the provision of properly engineered facilities, enforcement is only effective in the long term through simultaneous education, and encouragement increases the cycling base to make use of the new and existing facilities and programs.

The difficulty encountered when designing bicycle facilities is the evident wide range of users. The fast commuter cyclist who may blend in nicely with traffic on our roadway system can cause havoc on a recreational route. And in turn the slow leisure/recreational cyclist who fits ideally on designated recreational routes can cause conflicts and congestion on the roadway system.

Since this mixing of these two types of cyclists is inevitable we must do our very best to design accordingly. No matter how ingenious the design, however, it can never fully accommodate both types of cyclists and problems can be expected. For this reason, a successful bicycle plan must not stop at good engineering, it must also follow up with strict enforcement and proper education. Disregard for traffic regulations must be dealt with by heavy fines in order to ensure compliance. The public must be aware of what they can and cannot do as cyclists. This is achieved through enforcement programs and bicycle education programs encompassing the full spectrum of cyclists from pre-schoolers to adults and motorists.

The final component of a successful bicycle plan is encouragement. New facilities and programs are needed to encourage cycling. Once this final step is achieved the full benefits of a bicycle conscious City are realized. Decreased traffic congestion, less pollution, and a City-wide increase in physical fitness are only a few of the many benefits.

GOALS AND OBJECTIVES OF COMPREHENSIVE BICYCLE PLAN

The City of Vancouver wishes to encourage and promote the safe use of bicycles for utilitarian and recreational purposes. Integration of the bicycle into the existing transportation network and acceptance of the bicycle as a safe and convenient mode of transportation is a primary goal and is achieved through Engineering, Education, Enforcement, and Encouragement goals.

ENGINEERING GOALS:

- To provide a safe and convenient cycling environment for the commuter, recreational and commercial cyclist.

- Improve the existing road network to better meet the needs of cyclists.

Objectives to achieve goals

1) Identify high volume cyclist commuter routes.

2) Ensure that all future planning and design for road construction include provisions for cyclists with priority given to high cyclist volume routes.

3) Integrate the cyclist into the existing transportation network.

4) Improve existing facilities and propose future facilities (including off-road bicycle paths) to accommodate the recreational cyclist.

EDUCATIONAL GOALS:

- Promote the safe and responsible use of bicycles for transportation and recreation

- Achieve widespread acceptance of the bicycle as a legitimate vehicle whose operator shares the same rights and responsibilities as that of a motor vehicle operator in the transportation network.

Objectives to achieve goals:

1) Define and encourage existing bicycle education programs.

2) Educate cyclists of all ages and all road users through existing communication networks to improve road sharing skills and attitudes.

ENFORCEMENT GOALS:

- Improve cyclist and motorist compliance with existing municipal and provincial laws.

Objectives to achieve goals:

1) Inform the cycling public of existing by-laws and regulations concerning the use of bicycles.

2) Expand existing bicycle enforcement to include a selective bicycle enforcement program.

ENCOURAGEMENT GOALS:

Encourage the use of bicycles for commuting and recreational purposes.

Objectives to achieve goals:

1) Improve end of trip facilities.

2) Improve intermodal transit links/facilities for cyclists.

CYCLING AND CYCLISTS IN VANCOUVER

In order to best improve the cycling environment for Vancouver cyclists, it is important to first define who our target group is, what volumes we are dealing with, and the unique requirements Vancouver cyclists may have. Statistical information on Vancouver cyclists was gathered from two surveys: The 1985 Greater Vancouver Regional District (GVRD) Origin/Destination Survey (ref. 19), and the 1987 Vancouver Bicycle Survey (see 'Vancouver Bicycle Survey'). The GVRD Survey consisted of a 5% telephone sampling of households in the Vancouver Central Metropolitan Area (CMA). The survey ran from September 9 to December 2, 1985 and was performed on weekdays (from Monday to Friday).

One in every three Canadians rides a bicycle (Fitness Canada survey). The number of adult cyclists across North America is increasing, while the number of child cyclists remains stable (ref. 20). This increase in adult cycling is generally due to the public's increasing awareness of cycling as an effective, enjoyable, inexpensive means of transportation. In Vancouver (CMA), over 47,000 bicycle trips are made on the average weekday (ref. 19). If we include all modes of transportation, we note that 1.4% of all trips are made by bicycle. If we convert this to vehicle trips including automobiles and buses* we note that approximately 2.3% of all vehicle trips in Vancouver (CMA) are made by bicycle**. This means that on an average weekday, 2.3% of all the vehicles on the road are bicycles. Since approximately 70% of these trips are made during the morning and afternoon rush-hours, we can conclude that the majority of the bicycle trips made in Vancouver are for commuting purposes (whether education or work) on an average weekday.

* Assuming 60 passengers per bus (ref. 21)
** It should be noted that these figures may be under-representative of the true values due to the fact that of the 60 day GVRD survey period 30 days had rain and/or very cold temperatures.

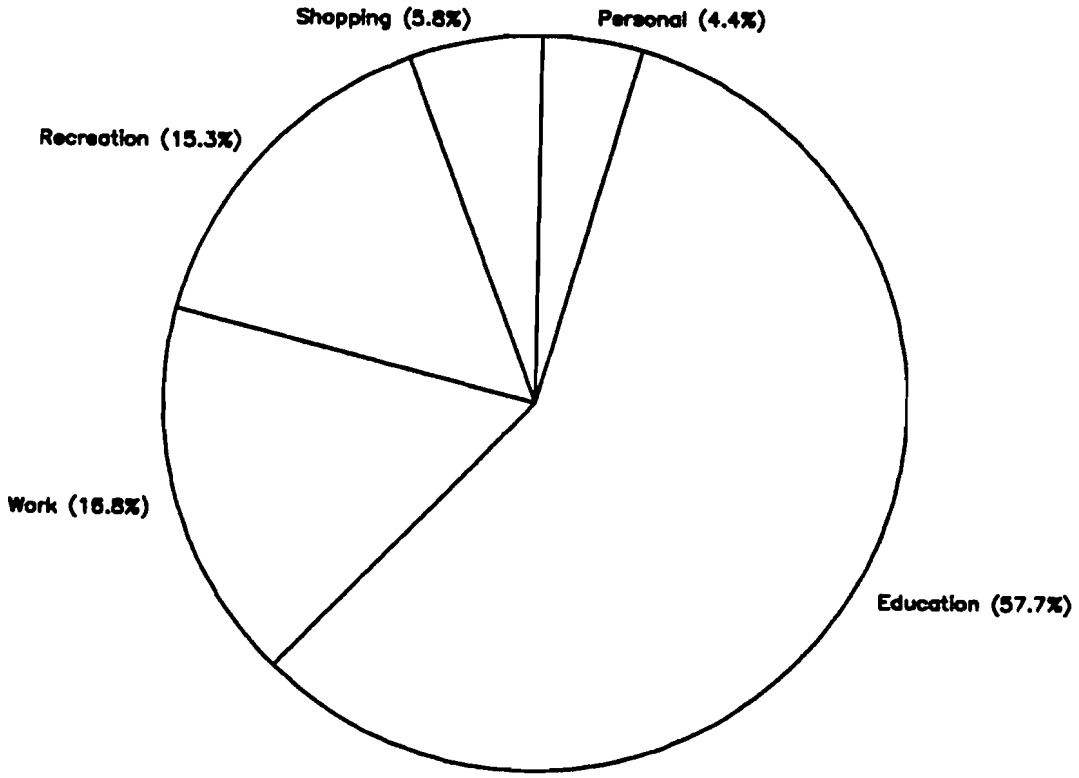


FIGURE 1 - BICYCLE TRIPS BY TRIP PURPOSE
VANCOUVER 1985 (ref. 19)

This fact is clearly reflected in Figure 1, where employment and education trips account for over 74% of all bicycle trips. Leisure or family cyclists make up a strong 15% during an average weekday, and shopping trips, personal trips and commercial cyclists make up the remaining 11% of all bicycle trips. The current local statistics further enforce the national trend towards commuting cycling. Contrary to popular belief, cycling is no longer an activity confined to children or those who do not have a drivers license. Figure 2 illustrates the fact that over 36% of Vancouver cyclists are aged 20 and over and an additional 16% are age 15 to 19 years.

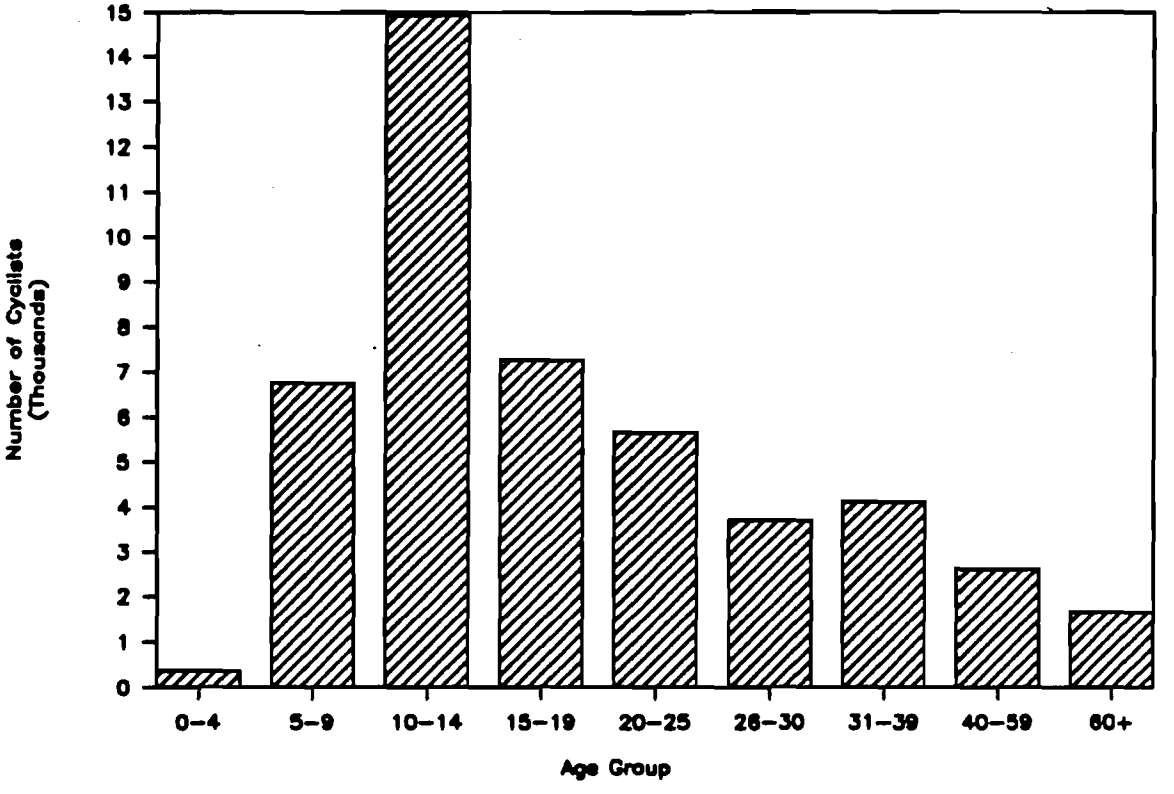


FIGURE 2 AGE STRUCTURE OF CYCLING POPULATION VANCOUVER 1985 (ref. 19)

CONCLUSION:

1) Cycling in Vancouver is no longer confined to children or those who do not have a drivers license, nor is cycling primarily a recreational activity. Cycling has become a widely used mode of transportation and plays an increasingly important role in the urban transportation system.

VANCOUVER BICYCLE SURVEY

The 1987 Vancouver Bicycle Survey was prepared and distributed specifically to provide input for the Vancouver Bicycle Plan. The survey was designed to find out how Vancouver cyclists perceive the present cycling environment, and specific ways of improving it. The survey also deals with safety issues and illegal practices in order to better tailor proposed Vancouver Education and Enforcement programs to Vancouver cyclists. The survey consisted of 11 questions (2 pages + map) and was distributed to all members of the Bicycling Association of B.C. (BABC), the Vancouver Bike Club (VBC), community centres, and bicycle shops. In order to help identify bicycle commuter routes, the survey also included a map on which respondents were to show their regular commuting route to and from work or school. The majority of survey respondents were adults and were bicycle association and/or club members.

Nearly 600 survey forms were completed and returned, the results of which are summarized in Figure 3. The average age of respondent was 32.7 years, with a gender breakdown of 70% male and 30% female cyclists. The majority of cyclists (83%) own multi-speed bicycles with a significant number (31%) of mountain bike owners. We can expect a further increase in mountain bike owners due to their present increase in popularity. A surprisingly high number of respondents have and use safety items such as helmets (60%), lights (65%), red rear reflectors (67%), and reflective vests (35%). This is partly due to the survey population which consisted of mainly cycling advocates who are aware of the benefits of safety equipment. In general, helmet use in most cities is below 10%. Helmet use in Vancouver is more realistically at 10%.

The majority of Vancouver cyclists surveyed stated they ride for fitness (85%) and enjoyment (83%). This response would hold for both commuter and recreational cyclists. Over half (54%) of the respondents ride their bicycle as an inexpensive means of transportation even though they may own a motor vehicle. This further enforces the earlier discussion that adult cyclists are choosing to ride their bicycle by choice and not because they have no other means of transportation.

City of Vancouver

VANCOUVER BICYCLE SURVEY 1987

Filling in this questionnaire can help us create a better cycling environment for all in Vancouver.

The Bicycle Program Coordinator of the City Engineering Department in conjunction with the Vancouver Bicycle Advisory Committee is preparing a Comprehensive Bicycle Plan for Vancouver. To do this we require your input in this user survey. Please fill out the questionnaire and return it to the City Engineering Department, City Hall, 453 West 12th Avenue, Vancouver, B.C., V5Y 9Z9 by October 19, 1987 in the attached envelope (no postage necessary).

1) What type of bicycle do you have?

10 (or more) speed 83% BMX 2% Mountain Bike 31% Single (or 3) Speed 5%

2) Which of the following safety items do you have and use:

Helmet 66% Lights Red Rear Reflector 65% Reflective Vests 35%

3) Why do you ride your bicycle?

Fitness 85% Inexpensive Transportation 54% Enjoyment 83%

No other means of transportation 10% Other _____

4) What discourages you from riding your bike?

Weather 51% Require Car for Job 11% No End of Trip Facilities (Parking, Showers) 23%

Fear of Traffic 35% Poor Road Conditions 24% Dislike Hills 3% Dislike Bridges 10%

Other _____

5) Do you combine other modes of transportation with bicycling on your trip to work? If so, which ones?

Bus 6% ALRT 2% Seabus 1% Car 14% Ferry 2% Other

Please turn over .....

6) Have you had any bicycle accidents? If so, what type?

Fall 42% Car/Bike 35% Bike/Bike 12% Bike/Pedestrian 5% Bike/Dog 7% Other ___

7) Do you engage in any of the following illegal practices?

		WHY
Running Red lights	21%	
Running Stop Signs	33%	
Riding through Crosswalks in Use	19%	
Riding on Sidewalk (or crosswalks)	44%	
Cycling at Night With No Lights	17%	
Riding against the flow of traffic	9%	

8) Have you ever had a bicycle stolen?

Yes 47% No 53%

9) What is your: M 70%

a) Age 32.7 Ave b) Sex F 30% c) Postal Code _____ (For sorting only)

10) If you commute by bicycle, show on the attached map your regular route.

11) How could we improve our City for cyclists? (specify problem areas on map below)

(SEE COMMENTS)

(Please attach page if more space is required)

For further information, please contact the Vancouver Bicycle Program Coordinator, Marty Pospischil, at 873-7917.

Figure 3 - Vancouver Bicycle Survey Results, 1987

Just over half of cyclists surveyed (51%) are discouraged from riding their bicycle in adverse weather conditions. A significant number (35%) have a fear of traffic. These facts express the need for adult educational programs which deal with heavy traffic skills and riding in adverse weather conditions. The need for improved road maintenance/design in some areas was perceived by a quarter of those surveyed since they are discouraged from riding due to poor road conditions (24%) and lack of end of trip facilities (23%).

The fact that intermodal transit use with cycling is so low is most likely due to the lack of cycling facilities at major transit nodes. The demand for such facilities increases with the availability of cycling facility.

Bicycle accident results were as expected with the two most prominent accident types falls (42%) and car/bike (35%). It was also observed that the majority of those respondents who had been involved in one or more types of accidents also noted that they frequently partake in one or more illegal practices. Riding on the sidewalk (44%) was the most common illegal practice with running stop signs (33%) close behind. One in every five cyclists runs red lights (21%), rides through crosswalks in use (19%) and cycles at night without lights (17%). Also, a significant number of cyclists are still riding against the flow of traffic (9%). These suprisingly high proportions of intentional violations justify the need for increased enforcement.

Almost half (47%) of those surveyed had had their bicycle stolen at one time. Theft prevention programs should be provided if Vancouver's high theft rate is to be reduced.

Additional written comments from the survey showed an overall concern with the provision and maintenance of cycling facilities.

* 37 percent of the respondents wanted more bicycle lanes/paths (this includes both on and off road segregated facilities), (see 'Cyclist Integration vs. Segregation' for a complete discussion of bicycle lanes).

* 35 percent wanted improved cyclist/motorist education programs. Most recommended public awareness programs, in-school education, and motorist pre-licensing education.

* 33 percent wanted improved on-street road conditions through wider lanes, improved road maintenance and removal of debris and glass. Areas of major concern were:

  - SW/NW Marine Drive (6%)
  - Cornwall Avenue/Point Grey Road (2%)

* 19 percent wanted increased enforcement of cyclists who violate existing traffic laws and regulations. Many cited downtown couriers as being the major offenders.

* 19 percent wanted improved bridge access and more frequent cleaning of debris and glass.

* 7 percent wanted improved bicycle parking facilities at major transit centres, community centres, libraries, schools, parks and other public service outlets.

* 4 percent wanted improved bicycle access to the Seabus, ALRT and express buses.

The high demand for bicycle lanes/paths is based on cyclists' experience with segregated bicycle paths kept in good condition and the fear of traffic experienced by novice cyclists who have not yet learned how to ride safely on busy streets. On-street bicycle lanes, which we presently do not have in Vancouver, are not recommended due to the cyclist/motorist conflicts they create and the increase in bicycle accidents which result from such lanes (see 'Cyclist Integration Vs. Segregation').

CONCLUSION:

1) Analysis of the survey route maps shows that all streets are being used as commuter routes, with bicycle traffic volumes greatest on major arterials. Major trip generators are UBC and the Downtown Core. Recreational routes show high usage of street to/from the UBC area (NW/SW Marine Drive, Cornwall Avenue, etc.) and to/from Stanley Park (Burrard Bridge, Beach Avenue, etc.). Vancouver cyclists express the need for improvement to the present cycling environment, improved on-street commuter facilities and off-street recreational facilities being of major importance. Vancouver cyclists strongly support the need for education and enforcement programs for cyclists and motorists in order to control the evident high disregard for traffic laws and regulations. A smaller, but still significant, number of Vancouver cyclists seek improved end of trip facilities and intermodal transit links.

BICYCLE ACCIDENTS

Reported accidents represent only a small proportion of serious injury accidents involving cyclists. One Australian survey has shown that for every reported accident involving a cyclist, there are approximately 30 which are not reported (ref. 1). In Vancouver the number of reported bicycle/motor vehicle accidents has increased by over 200% since 1982* (see Fig. 4). Even taking into account better reporting, increased bicycle use and insurance claims, this marked increase in the number of bicycle accidents provides cause for concern.

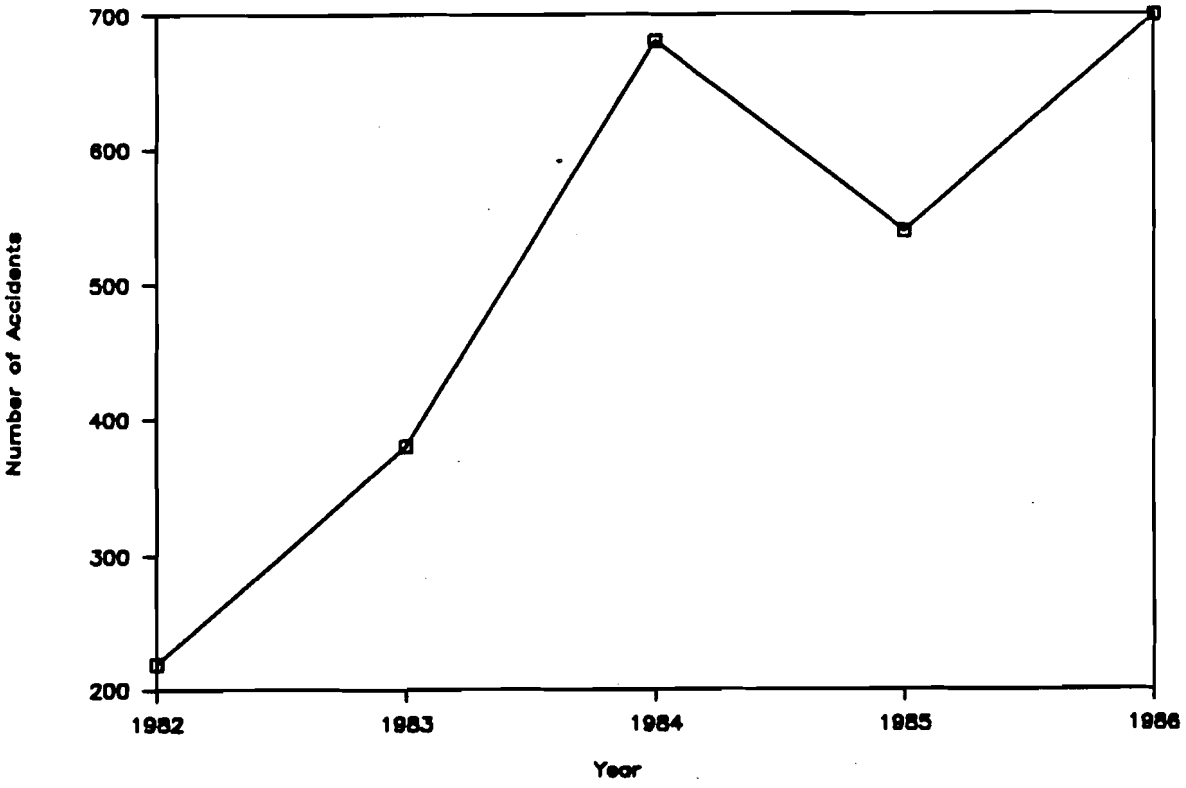


FIGURE 4 - ANNUAL REPORTED BICYCLE ACCIDENTS, VANCOUVER 1982-86 (ref. 28)

*The present VPD computer accident database fields are being expanded to include all bicycle accidents, not only those involving motor vehicles.

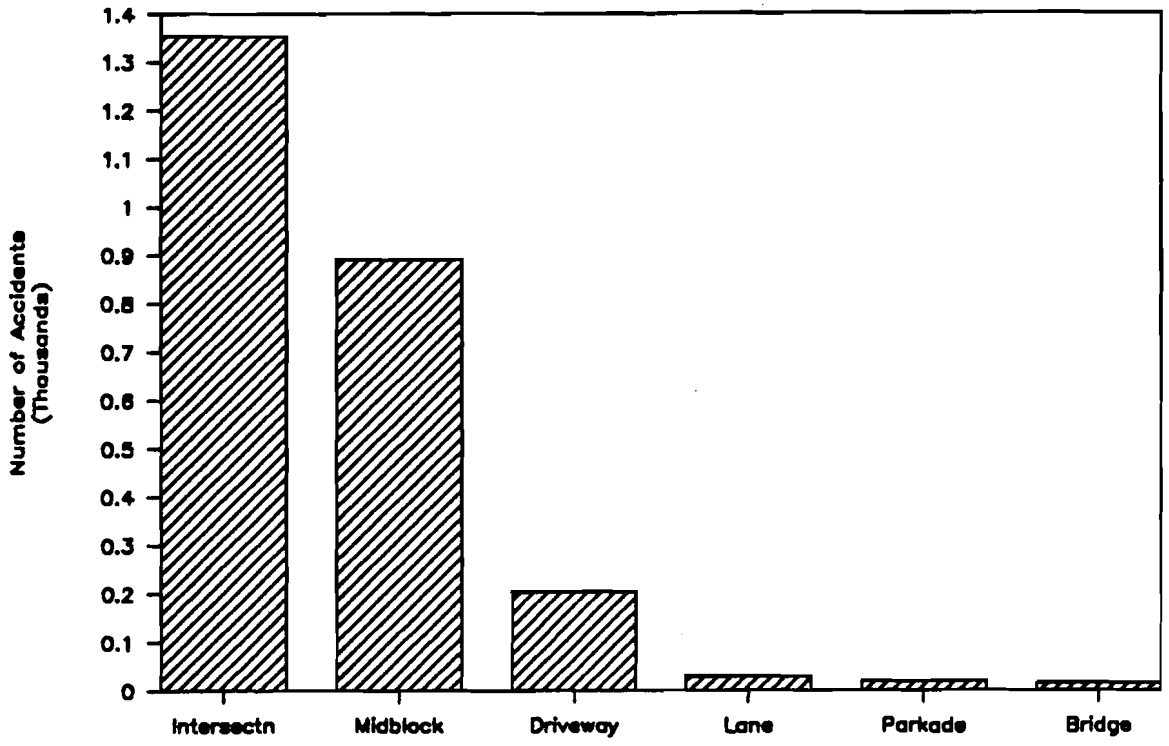


FIGURE 5 - BICYCLE ACCIDENTS BY STREET LOCATION, VANCOUVER (ref. 28)

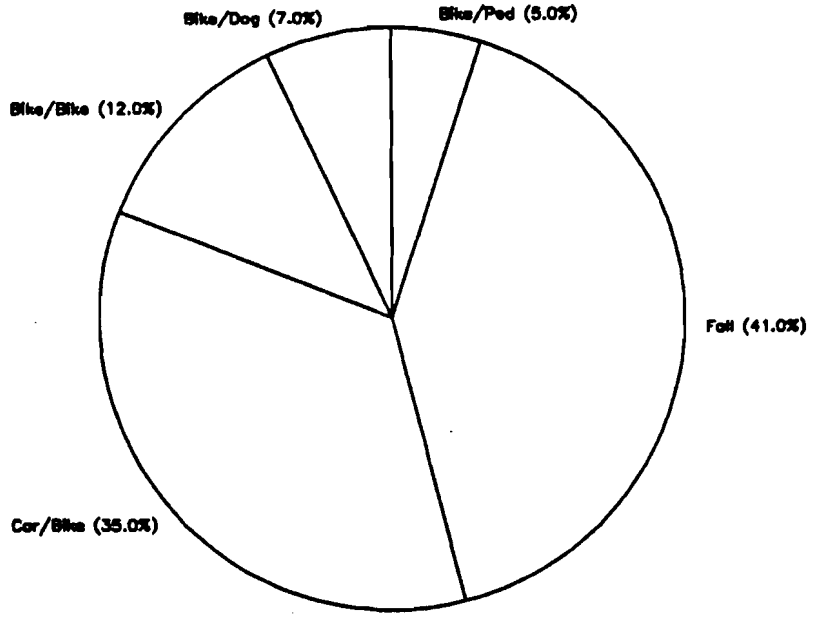


FIGURE 6 - BICYCLE ACCIDENTS BY ACCIDENT TYPE, VANCOUVER
(Vancouver Bicycle Survey, 1987)

In order to analyse accident cause, Figure 5 shows the street location of all bicycle accidents from 1982-86. From this figure we observe that the accident location distribution for bicycles parallels that of motor vehicles. 54% of all reported accidents occurred at intersections. 35% of all bicycle accidents occurred mid-block and 8% at driveways. The majority of bicycle accidents occurred at intersections and driveways due to the directional conflicts that occur at these locations. From the Vancouver Bicycle Survey, we note that the most common type of bicycle accident is the fall (42%) closely followed by the car/bike (35%) collision (see Fig. 6). Since car/bike accident types are the only form that are presently being reported on, we can conclude that approximately 65% of all other Vancouver bicycle accidents presently go unreported. Accordingly, the Vancouver Police Department accident database is being expanded to include all bicycle accidents, not only those involving motor vehicles. This will allow for future analysis of falls, bike/bike, bike/pedestrian and bike/dog accidents.

Age

The number of accidents varies considerably with the age and experience of the cyclist (see Figure 7). It is observed that the 10-14 year age group has the highest number of bicycle accidents requiring hospital admission. In addition to the fact that the 10-14 year age group has the highest bike use (32%), the increasing rate of accidents up to this age group can also be attributed to an increase in trip lengths and exposure to more severe traffic conditions. (see Fig. 2). Increased on-road experience and the development of peripheral vision, physical conditioning and reflexes account for the gradual decrease in the accident rate following the 10-14 year peak. The obtainment of a drivers license and a general increase in traffic awareness further account for the drop in accidents for the 15-19 year age group. Accidents in the 50+ age group may be mainly attributed to deteriorating physical condition and reflexes. It has been found in an Australian survey that accidents involving child cyclists were usually (70%) initiated by the cyclist, whereas adult cyclist accidents were usually (60%) initiated by the motorist (ref. 2).

Weather

If we look at weather as a contributing factor (see Figure 8) we observe that 73% of all reported accidents occurred in ideal, dry weather conditions and only 26% occurred in wet or muddy conditions. Winter conditions resulted in only 0.6% of all accidents. This is most likely due to the fact that the majority of cyclists are fair-weather cyclists who do not ride in wet or winter weather conditions. It is therefore impossible to draw conclusions from the above data without the percentage of cyclists who are fair-weather-only cyclists.

TABLE 1

CYCLIST FATALITIES INVOLVING HEAD INJURIES - B.C. & VANCOUVER (ref.3)

(YEAR: 1982 - 1986)

YEAR OF	HEAD	- 10		10 - 19		20 - 29		30 - 39		40 +		TOTAL	
DEATH	INJURY	(BC)	VANC	(BC)	VANC	(BC)	VANC	(BC)	VANC	(BC)	VANC	(BC)	VANC
1982	NO	(1)		(6)		(2)	1	(1)	1	(3)		(13)	2
	YES					(1)	1	(1)		(3)	1	(5)	2
1983	NO	(3)		(1)		(2)		(1)		(1)		(8)	0
	YES			(4)	1					(1)		(5)	1
1984	NO	(1)		(6)		(2)	1	(1)		(1)		(11)	1
	YES	(1)		(2)								(3)	0
1985	NO	(2)		(7)		(4)				(1)		(14)	0
	YES	(1)		(1)		(1)				(1)		(4)	0
1986	NO	(3)		(4)		(3)	1			(1)	1	(11)	0
	YES			(1)		(2)				(1)		(4)	0
TOTAL	NO	(10)	0	(24)	0	(13)	3	(3)	1	(7)	1	(57)	5
	YES	(2)	0	(8)	1	(4)	1	(1)	0	(6)	1	(23)	3

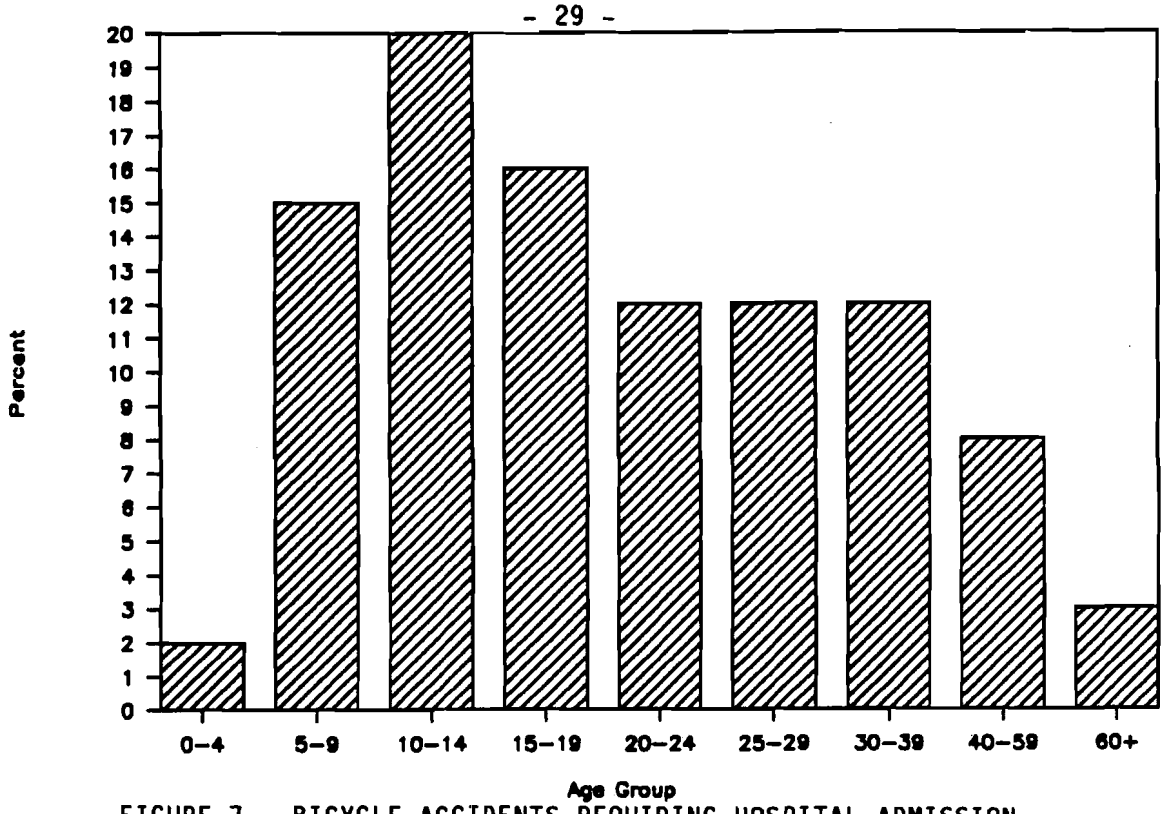


FIGURE 7 - BICYCLE ACCIDENTS REQUIRING HOSPITAL ADMISSION BY AGE GROUP (ref. 27), Vancouver, 1985-86

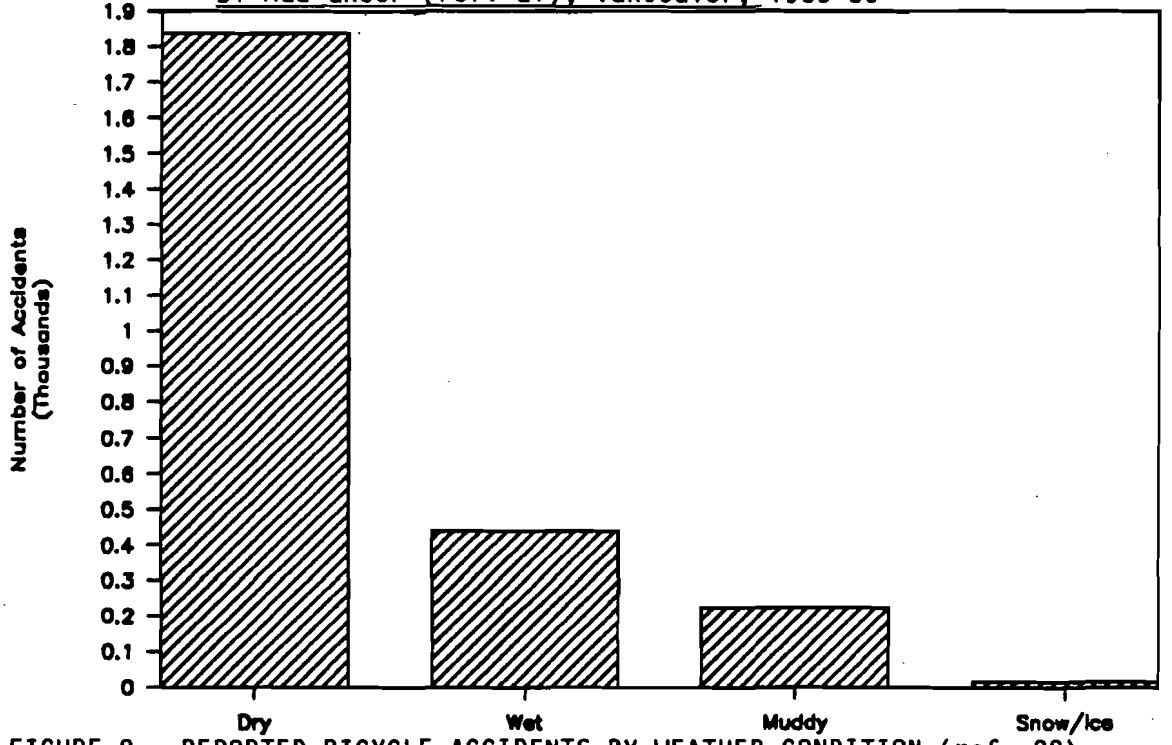


FIGURE 8 - REPORTED BICYCLE ACCIDENTS BY WEATHER CONDITION (ref. 28) Vancouver 1982-86

Night Riding

Only 8% of all the bicycle trips in Vancouver are made at night between the hours of 7:00 P.M. and 7:00 A.M. (ref. 19). For the purpose of our analysis we have assumed that on average the hours of darkness fall between 7:00 P.M. and 7:00 A.M. In actual fact the true hours of darkness vary throughout the year. Despite this fact, over 19% of all reported accidents in Vancouver in 1986 occurred at night between the hours of 7 P.M. and 7 A.M. Accidents which occur during the hours of darkness are significantly more likely to be fatal (Ref. 1). Despite these facts only 65% of the cyclists surveyed in Vancouver have both an operational front light and rear reflector, and only 35% own a reflective vest. The cycling public must be encouraged to own and use the appropriate safety equipment for night riding in order to decrease these accident statistics.

Injuries

Over 36% of all bicycle accidents in Vancouver requiring hospital admission resulted in some type of head injury whether it be a fractured skull, intracranial or an open head wound (see Fig. 9, Appendix B). From 1982-86, 60% of all cyclist fatalities in Vancouver involved head injuries (see Table 1). This value drops to 40% province wide.

It is very fortunate that the most common cyclist injury, the head injury, is also one that can be most easily prevented through the use of an approved hard-shell helmet. The two approving authorities of bicycle helmets in North America are the Snell Memorial Foundation and the American National Standards Institute (ANSI). The Canadian Standards Association (CSA) are in the process of preparing a Canadian standard for bicycle helmets. The CSA helmet standard is due to be completed in 1988. Various safety conscious cities across North America have introduced helmet or bicycle safety campaigns in order to encourage the use of helmets (see 'Helmet Campaign').

Fractured limbs result from 46% of all cyclist accidents and fractured spine, dislocations, internal chest, open wound and superficial injuries account for the remaining 18% of all bicycle accident injuries. These injuries are generally unpreventable by means of protective safety equipment, except when visibility is considered. Proper education of the cyclist and the motorist are essential elements in the prevention of all accidents.

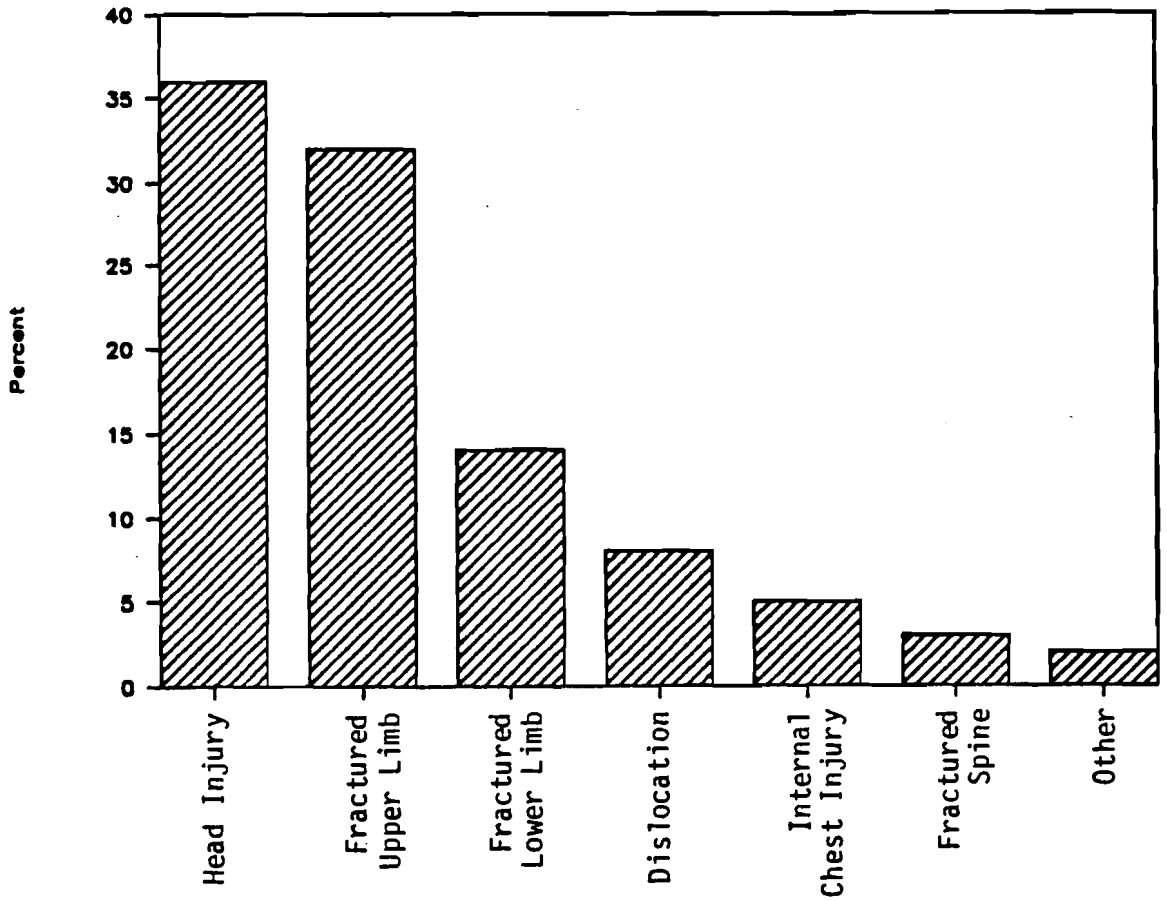


FIGURE 9 - CYCLIST INJURIES BY INJURY TYPE, VANCOUVER 1985-86 (ref. 27)

ENGINEERING

The engineering component of a successful comprehensive bicycle plan is the foundation on which the entire plan is supported. The essential facilities which the cyclist requires can be provided through proper cycling transportation engineering. Only when a strong engineering foundation has been established, can proper education, enforcement and encouragement take place. In summary, the cyclist requires two basic facilities, these are:

1) Direct, convenient, and safe access to destination.

2) End of trip facilities.

CYCLIST INTEGRATION VS. SEGREGATION

As noted earlier, a major objective of the plan is to integrate the cyclist into the transportation network by having cyclists share the road safely with motor vehicles. Integration (onto the roadway) or segregation (through separate pathways) has, in the past, divided cycling advocates in their beliefs of the route to proper cycling transportation engineering. Only today, through years of trial and error in a number of North American cities, has integration of the cyclist onto the roadway proven to be the most successful. This is the case for many reasons. For example, separated bike lanes (pathways) have proven to present the following disadvantages:

- Give the cyclist a false sense of security (over-confidence) resulting in less cautious traffic behaviour and a lower awareness of the traffic situation.

- Place the cyclist in unexpected positions, especially at intersections and mid-block driveways.

- Encourage wrong way riding, placing cyclists in more unexpected locations for motorists and other cyclists.

- o Increase difficulty for motorists in negotiating turns at intersections by adding to the turning arc.

- o Require excessive right-of-way (disproportionate share of street).

As a result, bicycle accidents have been shown to increase by 2 1/2 times where separated bike lanes have been introduced (ref. 11).

Integration of the cyclist onto the roadway on the other hand promotes the bicycle as a vehicle. Only through shared usage of existing roadways can the cyclist obtain widespread acceptance by the motorist.

The Engineer ensures proper integration of cyclists onto the roadway by planning for all road users, including cyclists, in the initial design of the roadway. Recommended provisions for the cycling component of traffic include sufficient lane width, improved signage, hazard location/elimination and proper location/configuration of on-street utilities, barriers, etc.

A cost-effective integration program requires the identification of Vancouver's major cycling commuter routes so that improvement decisions can be based on a street priority system.

COMMUTER ROUTES

Since there are over 1,400 km (900 miles) of roads within Vancouver city limits it would seem only practical to improve our existing network to provide safe and convenient commuter routes for cyclists rather than to construct a segregated bicycle path network. Since funding is not available to improve every street in Vancouver for cyclists, we must prioritize our street network. In order to prioritize high-use cyclist commuter routes in the City of Vancouver, the following steps were taken:

1) Identification of existing usage levels on all streets.

2) Location of major trip generators.

3) Analysis of reported bicycle/motor vehicle accidents and locations.

EXISTING USAGE LEVELS

Bicycle origin/destination trip data was plotted on a City map (see Figure 10). The data used in the bicycle trip survey plot is from the 1985 Metropolitan Vancouver Origin/Destination Survey carried out by the Greater Vancouver Regional District (GVRD). As noted earlier, the survey includes an approximate 5% sampling of the population. The survey gives a good indication of commuter trips as it was performed on weekdays only. Each response is multiplied by an expansion factor to represent the true population. Accordingly, each trip segment shown in Figure 10 represents approximately twenty trips. Trip purposes include to/from work, education, leisure and shopping. The origins and destinations of each trip are designated by GVRD traffic zones. Some origin traffic zones have been grouped together (as shown) for clarity.

The trends shown in Figure 10 are supported by respondents of the Vancouver Bicycle Survey in which commuter route maps were included. From Figure 10 and the Vancouver Bicycle Survey responses, the following conclusions can be drawn.

PRIORITY I

1) All the downtown bridges serve as major cyclist commuter links to and from the downtown area. In particular the following bridges are considered major cyclist commuter links:

   Burrard Street Bridge, Granville Street Bridge, and Cambie Street Bridge.

2) The Point Grey area and Kitsilano area support heavy east-west cyclist commuter traffic and some north-south traffic. In particular the following streets are considered major cyclist commuter routes:

- Cornwall Avenue
- Point Grey Road
- 4th Avenue
- Broadway
- 10th Avenue
- 12th Avenue
- 16th Avenue
- Burrard Street
- Arbutus Street.

3) University Endowment Lands Access roads support heavy east-west cyclist commuter traffic. In particular the following streets are considered major cyclist commuter routes:

- 4th Avenue
- 10th Avenue
- 16th Avenue
- 41st Avenue
- S.W. Marine Drive

4) The Dunbar, Arbutus, Shaughnessy, South Cambie, Riley Park, and Kensington areas in Central Vancouver support heavy cyclist commuter traffic in both the north-south and east-west directions (see Appendix A for Local Areas). These areas generate large volumes of commuters internally and also support downtown through traffic from South Vancouver in addition to east-west through traffic.

PRIORITY II

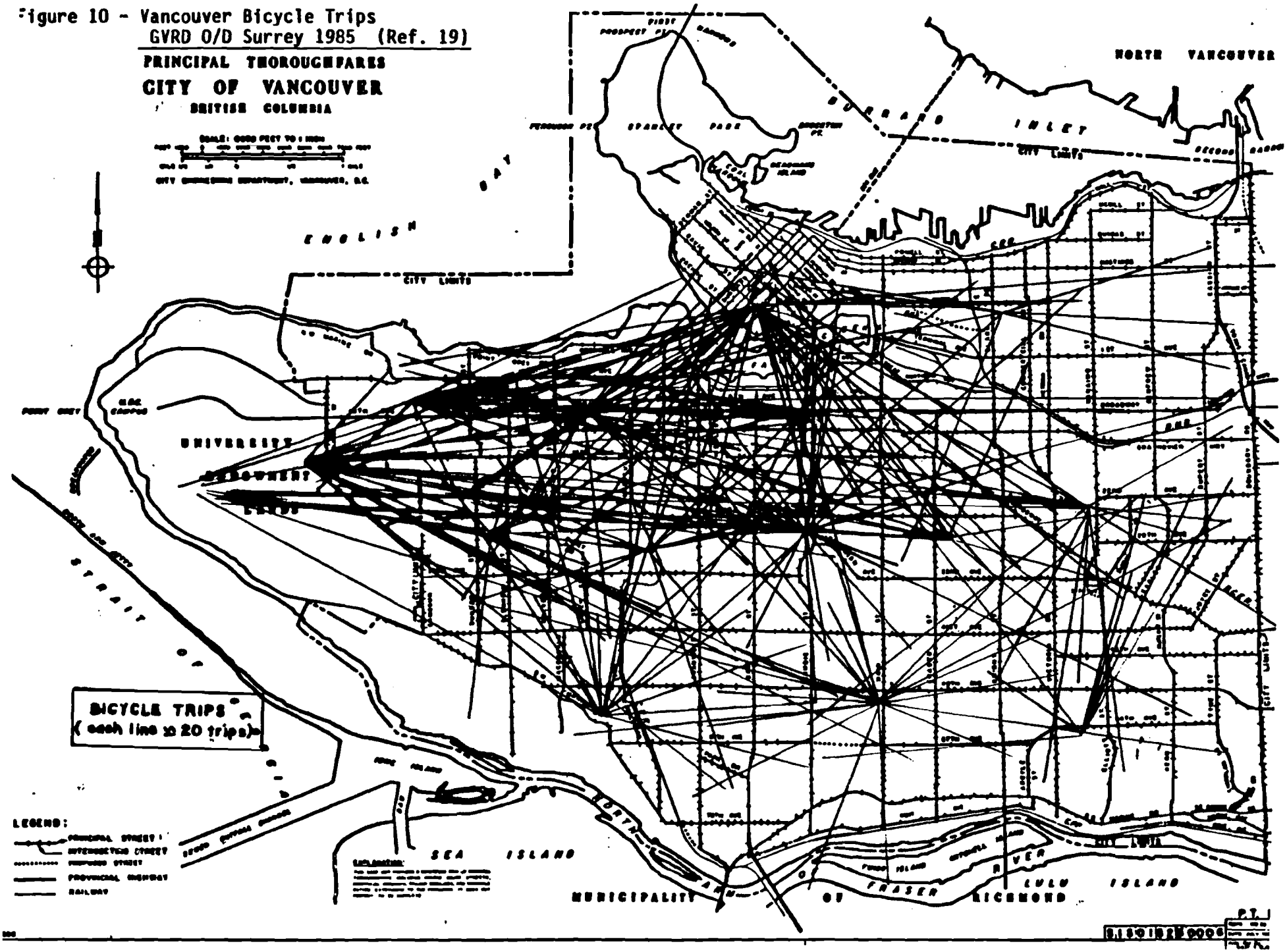
5) The Southlands, Kerrisdale, Oakridge, Marpole, Sunset, Victoria-Fraserview, Killarney, and Renfrew-Collingwood areas support moderate cyclist commuter traffic in all directions.

PRIORITY III

6) The Hastings-Sunrise, Grandview-Woodlands areas support relatively low volumes of cyclist commuter traffic. Very few trips originate or terminate in these areas.

From the above observations we are able to prioritize all streets within the City in terms of degree of usage. We must, however, question why some areas have lower usage than others. The fact that cyclists are not using some areas may be due to the fact that the existing facilities are inadequate. Should this be the case, a priority system based on usage alone may further discourage commuting along potential routes. For this reason, potential upgrading in low priority areas should always be considered when the opportunity presents itself. Nevertheless, as an encouragement objective, street improvements will be pursued more rigorously on the high priority commuter routes.

Figure 10 - Vancouver Bicycle Trips
GVRD O/D Survey 1985 (Ref. 19)



TRIP GENERATORS

The major trip generators in Vancouver are:

1) The Central Business District

2) The University of British Columbia (UBC).

Accordingly, a high priority should be given to improving bicycle access to and from these areas. As noted in the previous discussion, these above two major trip generators create heavy east-west flow in the West Point Grey and Kitsilano areas in addition to heavy east-west and north-south flow in the central Vancouver areas.

The minor trip generators in Vancouver include:

1) Elementary schools.

2) High schools.

3) Community centres and recreation areas.

Due to their abundance in Vancouver, minor trip generators are generally responsible for only short distance trips. Such trips usually fall within one traffic zone utilizing local residential streets as opposed to arterial commuter routes. As a result, minor trip generators do not have a direct impact on the development of a street priority system. Local cycling access concerns to/from minor trip generators should be included, however, when local street improvements are considered.

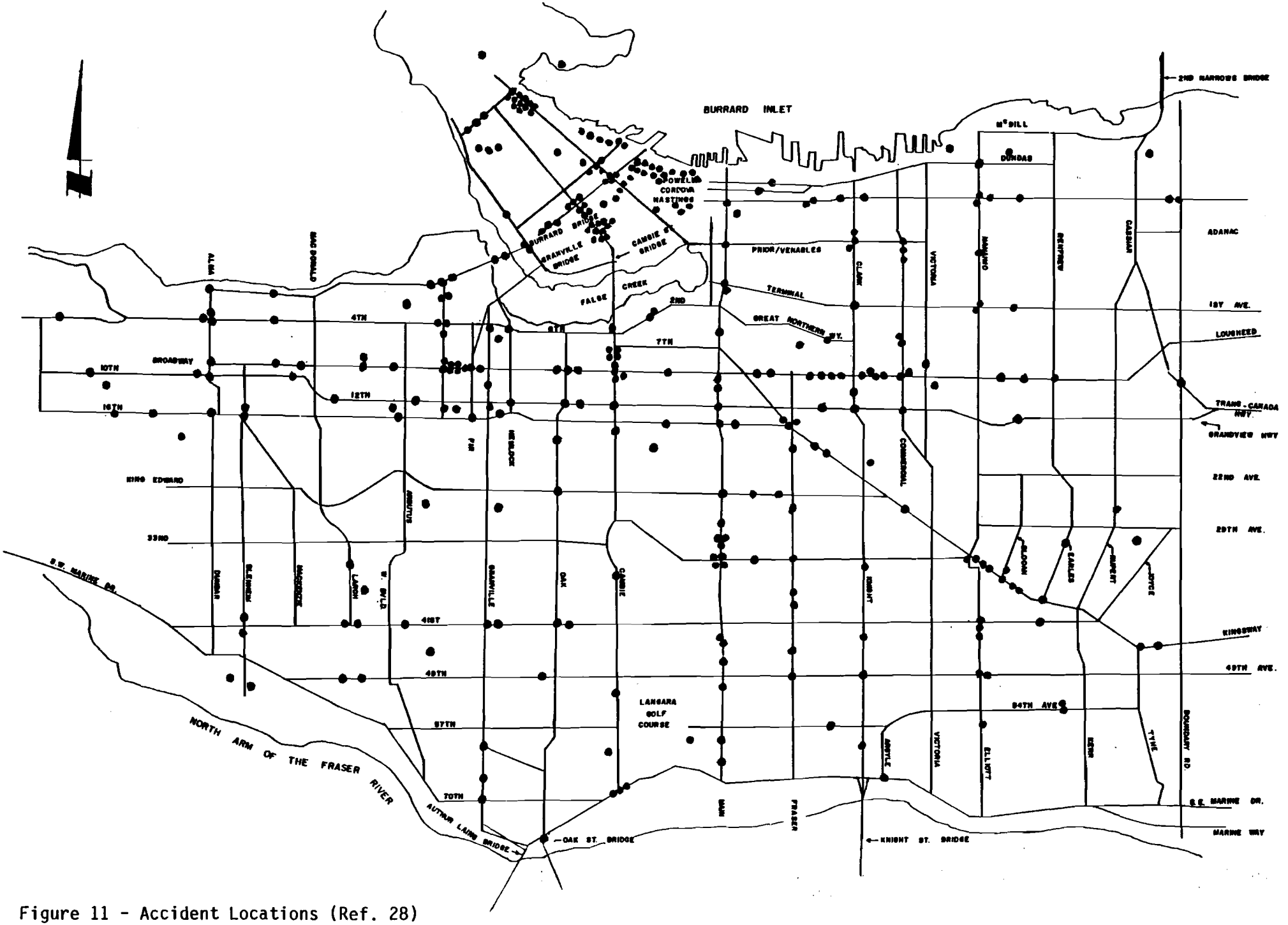


Figure 11 - Accident Locations (Ref. 28)
Vancouver, 1987

ACCIDENT LOCATION

In order to locate high accident areas, all reported bicycle/motor vehicle accidents in Vancouver for 1987 were plotted on a City map (see Figure 11). Following an analysis of Figure 11 we note that the majority of all reported bicycle accidents take place on major arterials. The high accident rate areas do not directly coincide with high volume bicycle use areas (see Figure 10) but instead are found to be those areas supporting high motor vehicle traffic flows and medium to high bicycle traffic flows. The high accident rate in the Central Business District can be mainly attributed to the large number of downtown bicycle couriers (see 'Bicycle Couriers'). The combination of heavy motor vehicle traffic and moderate to high bicycle traffic results in a high proportion of bicycle accidents. These areas include all major streets located in the Central Business District, Broadway (East of Arbutus), Burrard Street (north of Broadway), Cambie Street (north of King Edward), and Main Street. It can be concluded that moderate to high volume bicycle flow routes located on high volume motor vehicle routes should be considered high priority routes due to the evident increase in danger to the cyclist and motorist in these areas.

STREET PRIORITY SYSTEM

Combining our observations of present priority I, II and III usage levels, major trip generators, and reported accident locations, the street priority system map can be generated (see Figure 12). This mapping process allows for more detailed decisions to be made as to the location and types of required bicycle improvements. The street priority system can be used as a guideline for all future street design/construction and improvement projects.

RECOMMENDATION:

1) That the street priority system, detailed in this report, be recognized as a system to determine where bicycle requirements should be considered in road design and future improvement projects.

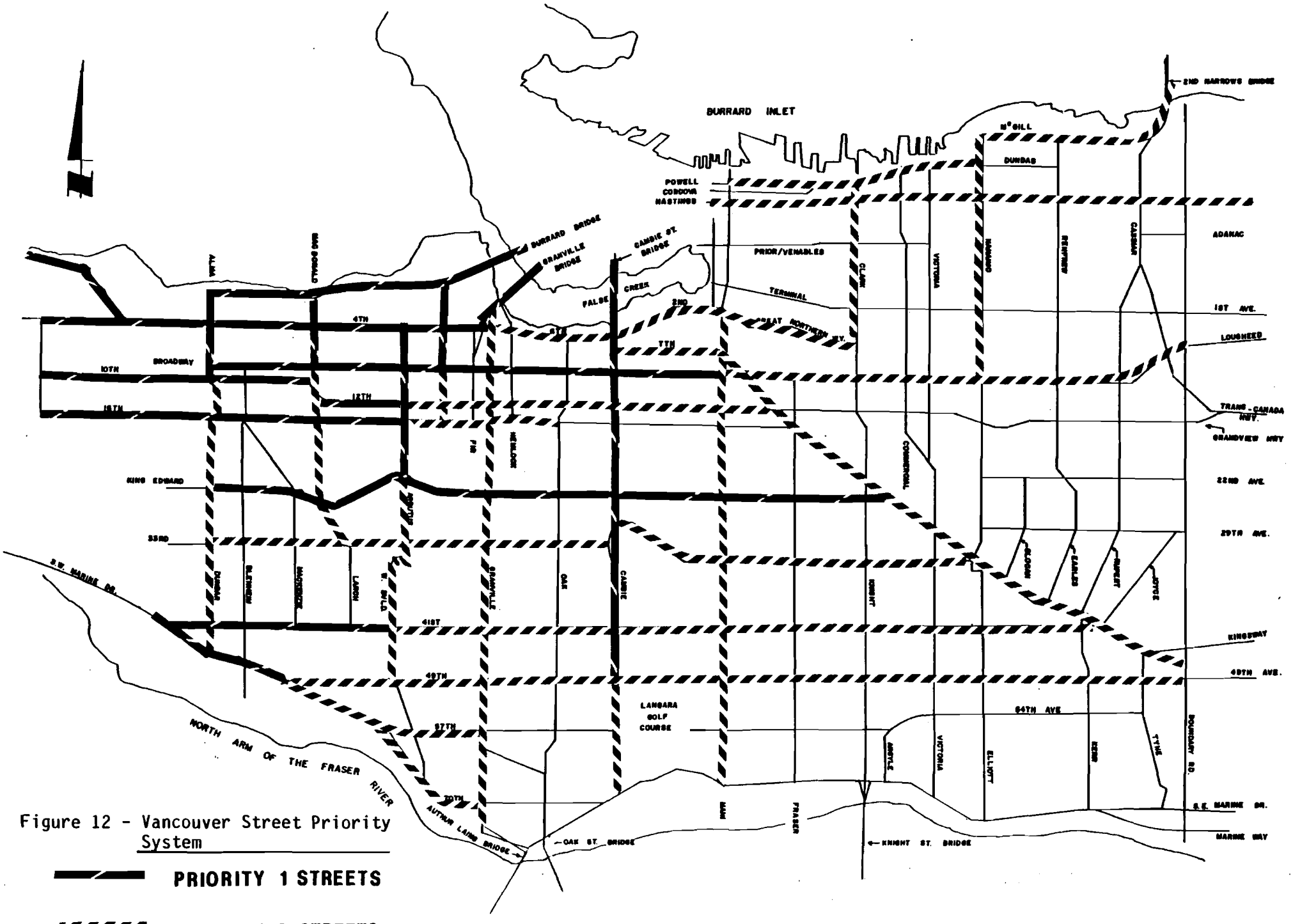


Figure 12 - Vancouver Street Priority System

PRIORITY 1 STREETS

PRIORITY 2 STREETS

REVIEW OF DESIGN/CONSTRUCTION STANDARDS

The design standards to which new roads in Vancouver are built are derived from the Roads and Transportation Association of Canada (RTAC) Manual of Geometric Design Standards for Canadian Roads. RTAC does deal with separated bicycle facilities in its publication "Guidelines for the Design of Bikeways", 1983. As noted earlier our main objective of this plan is to integrate the cyclist into the existing transportation network without the means of separated bike facilities. The RTAC design guidelines for streets are derived to best meet the needs of motor vehicle traffic under various situations. The RTAC design guidelines do not deal explicitly with the needs of the cyclist when shared usage is concerned but recommended widths are adequate. RTAC guidelines are desirable goals which are not always possible to meet in a developed urban area like Vancouver. For this reason, Vancouver has developed its own policy manual for street widths. However, to accommodate the shared use of bicycle traffic, particularly high priority routes, revised design standards for Vancouver should be implemented.

Lane Widths

Wider outside lanes are required to facilitate the safe integration of cyclists onto the roadway. Wider outside lanes have the following benefits:

1. motorists are able to overtake cyclists more safely.
2. eliminate motorist delay.
3. reduce tension between motorists and cyclists.
4. increase the attractiveness of cycling through increased safety.
5. increased maneuverability for trucks and buses.

Without sufficient lane width, motorist delay and unsafe passing conditions are unavoidable. Motorist delay increases with increased combined motorist and cyclist volume. Wider outside lanes reduce the tension between motorists and cyclists since there is sufficient room for passing and the motorist is not delayed. With wider outside lanes, the novice cyclist is not required to sacrifice safety by riding as close to the curb as possible, and more

importantly, can ride at a safe distance from parked vehicles avoiding parked car door collisions. Experienced cyclists will not sacrifice safety and are certainly not required to do so. The width at which a lane is considered safe for motorists and cyclists is a function of two factors; these are:

1. whether we are considering a two lane or multilane roadway, and
2. the speed limit on the roadway.

In Vancouver, all roadways are designed to be 4 or 6 lane roadways. Speed limit is important since motorists tend to wander more at higher speeds and more clearance is required to alleviate dangerous air turbulence from passing cars/trucks. The lane width must also account for such decreased driving accuracy control at higher speeds.

The recommended lane widths published in Cycling Transportation Engineering, and Bicycle Transportation (ref. 4, 5 respectively) range from 12 feet to 16 feet, depending on speed and the number of lanes. In Vancouver, since we are dealing with a blanket 50 Km/hr. speed limit and multilane roadways, the recommended 12 foot or 3.66m lane width applies (ref. 5). This 12 foot minimum is also recommended in AASHTO's Guide for the Development of Bicycle Facilities (ref. 29).

From field observations in Vancouver, we note that a 3.6m minimum curb lane width should be adopted for all future road construction. This allows for a minimum width in which safe road sharing can take place between motor vehicles and bicycles. In cases where the curb lane is used for parking only and no stripping of this parking is anticipated, this minimum curb lane width may be reduced to 3.5m.

In addition, in order to ensure proper lane painting procedures to reflect our findings, the Transportation Division Policy Procedure Manual (Section E.12 Traffic Lane Widths) should be amended as shown in Appendix K.

In Vancouver it is standard practice to measure the curb lane width to the curb face. This practice is acceptable in the design only if there is a

smooth transition between the asphalt edge and the gutter. Even a small elevation change is not desirable to the cyclist. For this reason it is important to ensure a smooth transition from asphalt edge to gutter on streets designated as priority 1 and 2 routes (see Fig. 2). If this is not attainable the lane widths should be increased.

RECOMMENDATION:

2) That the City of Vancouver Engineering Department road design standards incorporate recommended lane widths, where practical, as outlined in this report.

INTERSECTION DESIGN

As discussed under 'Bicycle Accidents', we noted that over 54% of all reported accidents in Vancouver occur at intersections. This is the case due to the large number of turning and crossing movements that occur at intersections. The solution to reduce this high accident rate is not simply to provide separate cyclist light phases or bike lanes due to the many constraints already on the designer. The intersection capacity is controlled by the green time and the number of lanes in each direction, among other factors. The designer must vary the green time and the number of lanes in each direction in order to obtain the optimum design. The more exclusive turning lanes, the less lanes available for through movements. The more separate green phases allotted, the less time available per phase.

PRINCIPLE:

The designer must incorporate the cyclist into the design without disrupting the delicate balance of green time and lane allocation and without violating any of the accepted intersection design principles.

The cyclist should be integrated into the flow of traffic without the use of designated bicycle traffic lights or bicycle lanes. Bicycle traffic lights and lanes not only encroach on the already delicate balance in the design of the intersection, resulting in further traffic jams and delay, but also put the cyclist in unexpected and unsafe positions (see also 'Cyclist Integration Vs. Segregation'). The cyclists must also conform to the first traffic principle in that he/she should make as many directional movements as possible

before reaching the intersection (see Fig. 13). Cyclists making a right turn should be in the right side of the right lane. Cyclists travelling straight through should be in the centre (or left side) of the right lane, allowing right-turning vehicles to proceed without delay. This practice depends on right turning volume and lane designation. Cyclists turning left should be as close to the centre-line as possible to allow through traffic to proceed, unless this lane is a designated left-turn lane, in which case the cyclist should be in the right side of this lane when making a left-hand turn. This practice makes the cyclist visible and alerts motorists of the cyclists' intention.

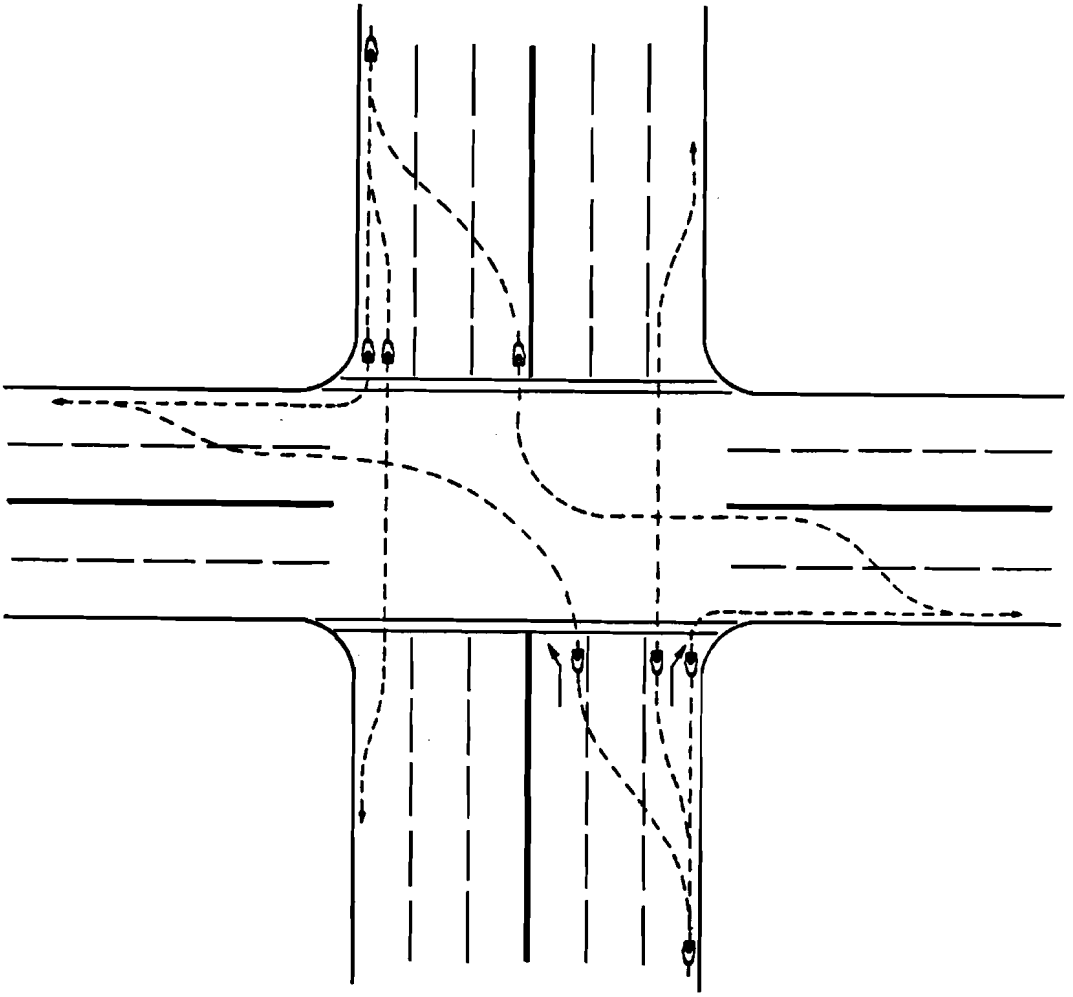


FIGURE 13 - CYCLIST LANE POSITIONING FOR VARIOUS TURNING MOVEMENTS

Curb Lane (through movements and right-turn movements)
The curb lane at an intersection accommodates through movements and right turn movements for both the motorist and the cyclist. Ideally the motorist should merge right well before the intersection to allow the cyclist sufficient space to merge left. Heavy through cyclist movements should be a factor in the determination of the warrant of a right turn only lane. As both the motorist and cyclist are continuing to share the same lane, the lane width approaching the intersection should be maintained throughout the intersection (see 'Lane Widths'). Parking should also be prohibited well before the intersection to allow for proper merging.

Centreline Lane (left-turn movements)
The left or centreline lane at an intersection accommodates left-turn and through movements for both the motorist and the cyclist. This is assuming all cyclists perform a standard vehicular left turn from the left lane as opposed to the alternate left turn method where the cyclist crosses the intersection in the right lane, stops at the far corner, repositions the bicycle, and proceeds in the new direction when clear. The alternate wide left turn (or "perimeter left turn") is commonly used by children and less experienced cyclists at high volume traffic periods since it requires multiple lane changes.

The vehicular left turn is preferred by experienced cyclists over the wide left turn for several reasons, these are:

- the wide left turn places the cyclist in very dangerous locations at corners A and B (see Figure 14) as a result of right turning motorists. This conflict is further aggravated if more than one cyclist is attempting to complete the wide left turn at one time.

- the wide left turn tends to take a longer amount of time to complete than the vehicular left turn due to the fact that a second green phase is required for the wide left-turning cyclist to proceed from corners B to C.

- the vehicular left turn places the cyclist in a highly visible expected position whereas the wide left turn does not.

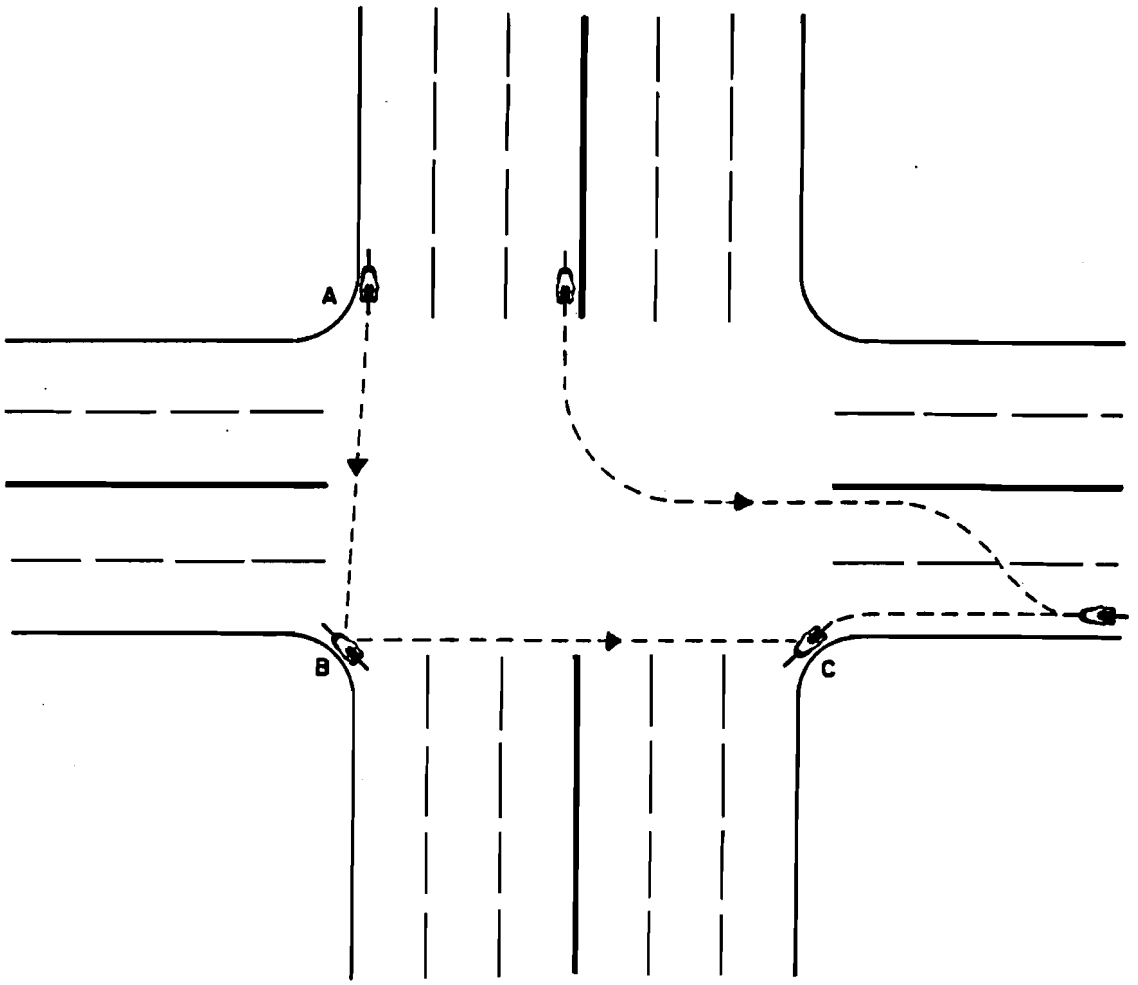


FIGURE 14 - LEFT TURN CYCLIST MOVEMENTS

Vehicular style left turns do not require any special design considerations, except when side by side lane sharing is considered (see 'Turning Lanes'). Nevertheless, separate left turn signal phases are a real benefit to cyclists where the cyclist/motorist volume justifies their use.

Turning Lanes (mid-intersection)

Existing turning lane widths are generally acceptable. Narrow turning lanes (3m, 10 ft.) will require the cyclist to turn nose-to-tail with the motorist. Where high cyclist volumes justify the need for side-by-side sharing, a turning lane width of 3.6m (12 ft.) is recommended (ref. 4).

RECOMMENDATIONS:

3) That intersection design continue to assume cyclists perform safe standard vehicular left turns, as outlined in this report.

Traffic Signals

Present traffic signal timing is generally sufficient for cyclists when green time is considered. In Vancouver the minimum green time for through traffic is 8 seconds with some separate turning phases at 6 seconds. Both of these green times are sufficient for a cyclist to cross an intersection from a stationary position. Green times should be a minimum of 5 seconds for cyclists (ref. 4).

Clearance time is defined as the time period from which the amber light appears to when the opposing green appears. This interval includes 'amber time' and 'all-red time'. In Vancouver, clearance times are calculated using the process shown in Appendix D.

If we calculated the required clearance times for bicycles at various sized intersections, we note that in some cases a bicycle requires more time to clear an intersection than does a motor vehicle (see Appendix D). This is due to the shorter vehicle length and lower velocity of the bicycle.

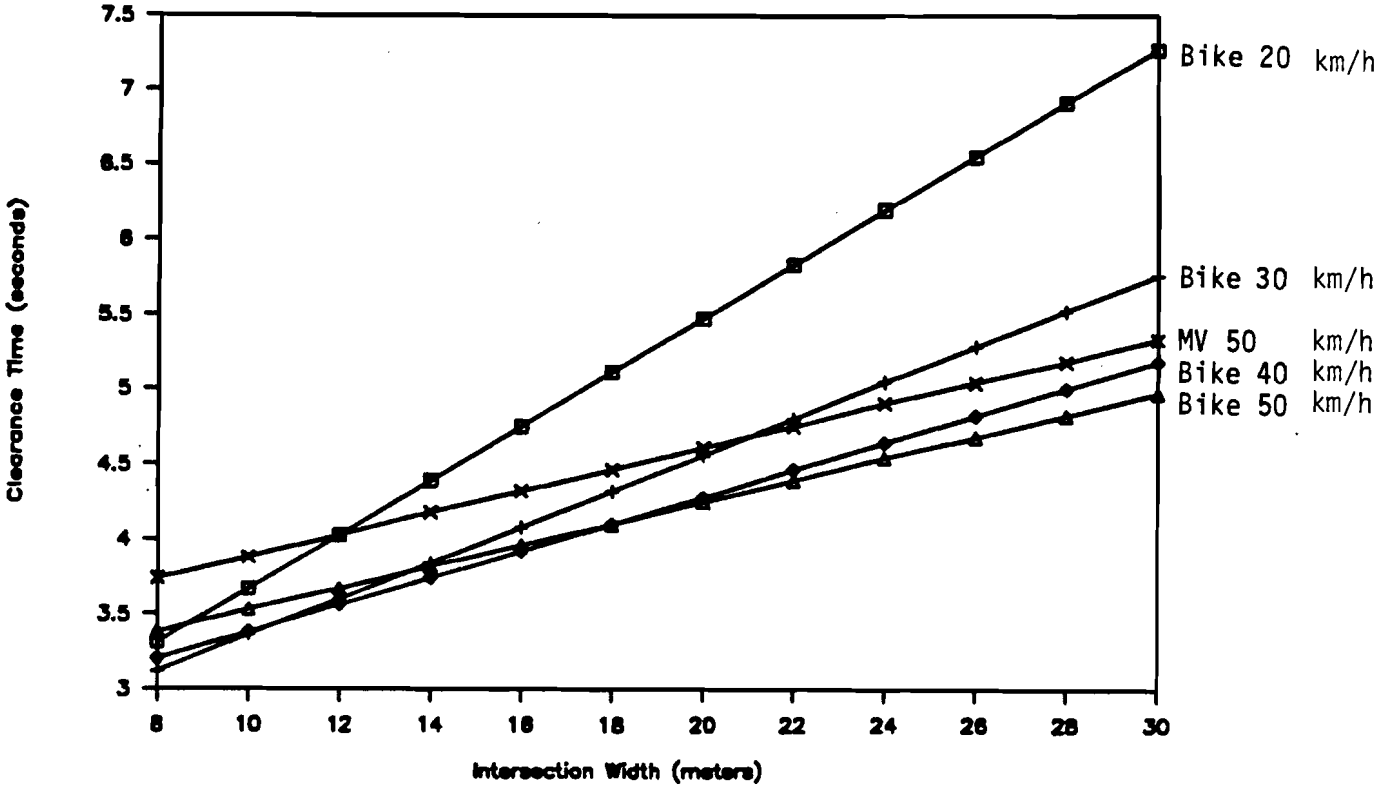


FIGURE 15 - INTERSECTION CLEARANCE TIMES

From Figure 15 we observe that required clearance times for a bicycle exceed that of a motor vehicle at an intersection width of 14m for a 20 km/h bicycle approach velocity and 22m for a 30 km/h bicycle approach velocity. The 20 km/h bicycle approach velocity would apply to cyclists on non-arterial residential streets. Cyclists are generally not able to obtain a greater velocity on residential streets due to the many frequent stops required at stop signs and equal intersections. The 30 km/h bicycle approach velocity would apply to cyclists on major arterial streets. The cyclist is able to maintain a higher velocity on major arterials due to the fewer interruptions and increased riding intervals. Accordingly, it is recommended that the required bicycle clearance times be used in the amber/all red interval settings in cases where these clearance times exceed that required by a motor vehicle. Due to the demand for signal timing and the cost of resetting signal intervals it is recommended that this procedure be implemented on new signals and where the opportunity presents itself on existing signals with emphasis given to priority I and II routes.

RECOMMENDATION:

4) That all future interval clearance time calculations for signal installation utilize calculated bicycle clearance intervals in cases where they exceed that of a motor vehicle, where practical.

Detector Loops

Traffic detector loops are buried indicator loops which generate an oscillating magnetic field. Metallic vehicles obstructing the magnetic field create a current which is used to actuate a traffic signal. Traffic detector loops are generally installed at intersections of major and minor streets. Semi-actuated signals always refer to the cross-street signal only utilizing a vehicle actuated controller as opposed to the main street. Fully actuated signals are where both the main street and cross street are utilizing vehicle activated controllers. The decision to use fixed time, semi-actuated, or fully actuated controllers is based on the vehicle flow variation on both the main street and the cross street. If the traffic flow varies greatly (20%) from average to peak then an actuated signal is considered for that leg. This is outlined in Table 2.

TABLE 2

SIGNAL CONTROLLER-TYPE DECISION TABLE (ref. 6)

Factor	Fixed Time	Semi-Actuated	Fully Actuated	Volume Density
a) Main street average to peak	Any value	Less than 20%	More than 20%	More than 30%
b) Main street average hour variation	Less than 20%	Less than 20%	More than 20%	More than 30%
c) Cross street average hour variation	Less than 20%	More than 20%	More than 20%	More than 30%
d) Cross street volume	More than 25%	Any value	Any value	More than 30%

In Vancouver, of a total 448 signalized intersections, 250 run on fixed time, 73 are semi-actuated, 10 are fully actuated, and 115 are pedestrian actuated signals.

Vancouver loop detectors are installed as a 6'x12' quadruple loop (or figure eight loop) at approximately 3"-5" below the road surface. Figure eight pattern loops are ideal as the magentic field from one loop is circled into the adjacent loop eliminating stray fields. This double looping pattern is more receptive to objects overtop and eliminates the detection of objects outside of the loop. This is beneficial to cyclists since municipalities with single loop detectors have had to turn the sensitivity down in order not to detect vehicles in adjacent lanes. This, of course, makes it difficult to detect bicycles.

The ability of our detectors to detect bicycles is good. From past experience we note that our detectors are activated by properly located bicycles.

Our loop detectors are tested annually and following each complaint. During testing, the frequency response is measured and checked for accuracy.

One problem encountered with detector loops is that cyclists who are positioned close to the curb, or the centreline, at intersections are usually outside the loop (see Figure 16). This is due to the fact that the detectors are installed in the centre of the lane. In a 12' lane this leaves three feet on either side where the loop may not detect vehicles. In the few circumstances where this occurs, a solution may be that a loop marking be painted on the roadway informing 2-wheeled vehicles where to be located for detection. Such loop markings could be used by cyclists when there is no motor vehicle to activate the loop. The loop marking shown in Figure 17 is presently used in Santa Rosa, California and has proven successful.

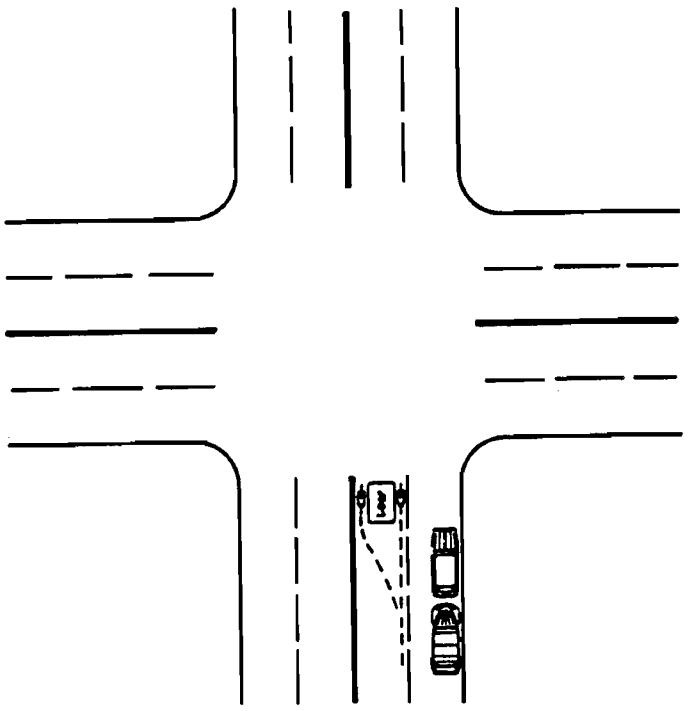


FIGURE 16 - UNDETECTED BICYCLE POSITIONING

FIGURE 17 - TYPICAL LOOP MARKING

Loop markings may also aid in the non-locking detector problem. Some detectors are set with a non-locking feature which prevents unnecessary green time for right turning motorists who turn right on the red phase. A vehicle must remain on the non-locking detector in order to activate the signal. If the vehicle arrives after a new signal cycle has begun, he must wait the entire cycle before he will receive a green phase. Since this can take up to 90 seconds, some motorists and cyclists tend to creep forward onto the crosswalk deactivating the signal change. Loop markings would eliminate this problem as motorists and cyclists would be informed:

1. That the signal is vehicle activated.
2. Where the detector loop is located.

RECOMMENDATION:

5) That special attention continue to be paid to vehicle-actuated signals on priority I and II streets (see Street Priority System) to ensure that bicycles are being detected.

MISCELLANEOUS ROADSIDE HAZARDS

The majority of the minor roadside hazards could be dealt with through the Spot Improvement Program (see 'Spot Improvement Program'). Nevertheless, some design/construction standards will have to be reviewed and updated to ensure railway crossings, drainage grates, and drainage diverters, etc. are properly installed initially in order to eliminate future spot improvement costs. In addition, the impact of future surface traffic control devices, such as raised reflective lane markers, should be analysed with respect to all road users, including cyclists, before installation.

Railway Crossings

Railway crossings, particularly those intersecting the roadway at a shallow angle, present a serious hazard to cyclists. Any ridge or slot diagonal or parallel to the roadway has a tendency to steer the front wheel out from under the cyclist, resulting in a fall in mid-stream traffic. The cyclist must ride across the slot or ridge at right angles in order to avoid dropping into it.

This practice becomes even more difficult in poor lighting conditions and wet weather. This is only achieved if the cyclist is visually forewarned of the situation so he/she can prepare a proper approach. In order to achieve this, the following ideas can be incorporated in the City of Vancouver

Symbolic signs showing approximate angle and direction of tracks are and should continue to be placed before all railroad crossings. This is achieved through existing standard warning signs showing a perpendicular crossing, and a 45^{o} crossing in each direction (see Figure 18). In cases where the crossing angle is small, a cyclist cautionary sign should accompany the crossing sign.

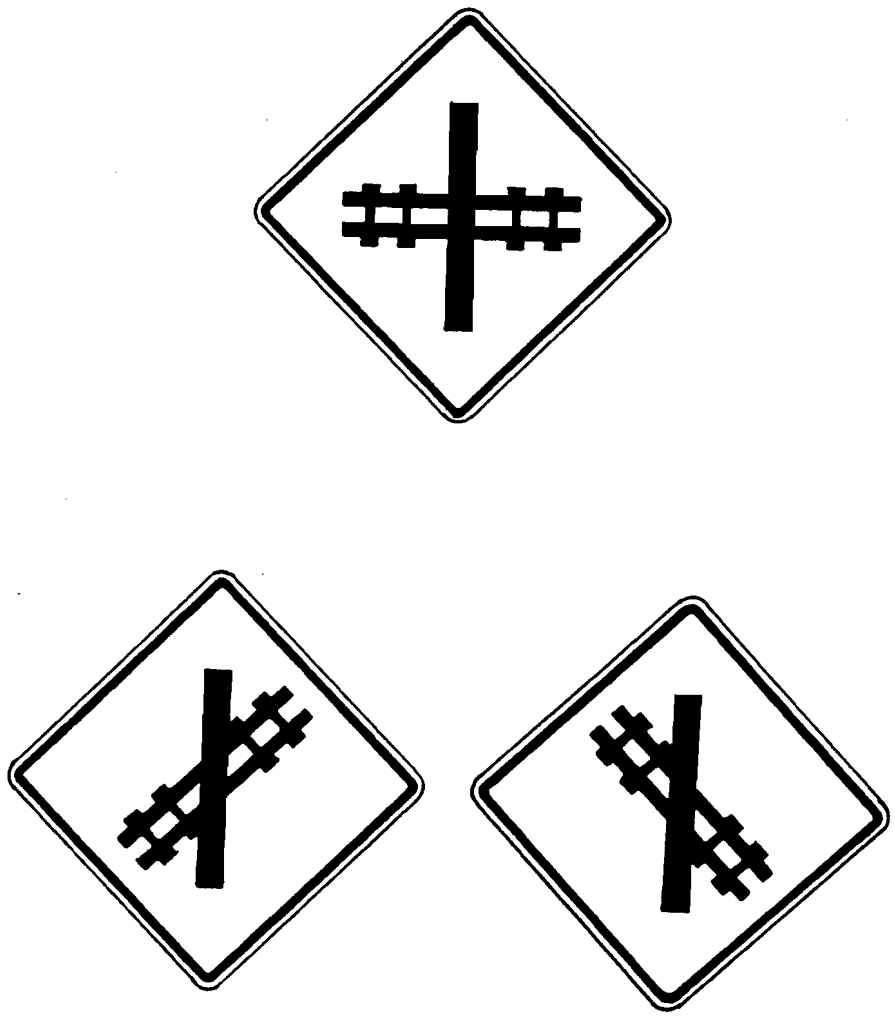


FIGURE 18 - RAILWAY CROSSING SIGNS

In addition, cyclist cautionary signs can be placed directly below the symbolic sign. The use of signs requiring the cyclist to dismount are generally ignored by the majority of cyclists and are also in contradiction with one of the plan's goals, which is to promote the bicycle as a safe and convenient mode of transportation. However, until such time that the extremely hazardous crossings are improved, dismount signs may be required for liability reasons.

A safe approach can also be marked on the roadway where width permits safely guiding the cyclist to a 90^{0} crossing. Guiding the cyclist into traffic should be avoided. Such roadway stencils have proven effective in Eugene, Oregon.

Proven rubber fillers should be used at locations where the tracks run at a very shallow angle to the road. These systems work by filling the wheel flange groove of both rails with a rubber filler material allowing bicycles to pass over the rails safely and easily. The rubber material flexes downward when the flange of the train's wheels pass over the rubber strip. Toronto is presently using Goodyear's Super Cushion Crossing System. Costs of rubber fillers are dependent on the material used and the method of installation. The cost and maintenance factors will have to be analyzed along with other priorities. The above recommended signage may be sufficient at most locations.

Drainage Grates

Drainage grates or catch basins installed with vanes parallel to the flow of traffic present a serious hazard to cyclists. This is the case due to the fact that many bicycle rims are narrower than the grate openings allowing the entire bicycle wheel to enter the grate. As with the railway crossings, this has a tendency to steer the front wheel out from under the cyclist, resulting in a fall in mid-stream traffic. Parallel grates are found to be especially dangerous in the following locations:

- in the shadow of neighbouring structures (underpasses, bridges, etc.).
- at busy intersections which demand the cyclist's full attention.
- on steep downgrades where speed reduces available reaction time.
- on narrow roadways where the grate forces the cyclist further into the travel lane.

- where grates are set out from the curb.
- situations where the grates are obscured by leaves or other debris.

In Vancouver, it is now standard to install all catch basins perpendicular to the flow of traffic. With the exception of those on Granville Island, all catch basins in Vancouver are properly aligned to accommodate cyclist traffic. There may still exist some isolated circumstances, however, where a catchbasin may constitute a minor hazard to a cyclist travelling in a direction different from the normal flow of traffic.

Asphalt Drainage Diverters

During the construction of a new street or the reconstruction of an old one, the final layer of asphalt is occasionally not placed until the surrounding developments are completed. This is the case since some services may still need to be installed and crossings may be added. Once the City is assured that no further damage will occur to the roadway, the final layer of asphalt is placed. In this intermediate, unfinished stage, small asphalt drainage diverters are sometimes constructed in order to direct water into the catch basin. The asphalt diverters, which are usually one to two feet long and may be a half-inch high, are not a serious hazard to the cyclist if the cyclist is aware of their existence. An unexpected collision with these diverters can throw the cyclist off balance. In order to ensure visibility of the asphalt drainage diverters in all weather and lighting conditions, it is recommended that they be marked to improve detection. This procedure may not be possible, however, where weather or time does not permit.

Traffic Barriers

Traffic barriers are placed at intersections at the community's request if approved by City Council. If at all possible, other alternatives are used. Traffic barriers have been installed at various locations.

1. prevent commuter shortcutting
2. pedestrian safety
3. prevent motor vehicle accidents

The installation of traffic barriers can have negative effects on cycling in the area. These areas are usually residential streets paralleling major arterials. Unfortunately such streets are commonly used by commuting cyclists and unexperienced cyclists as alternative routes when traffic on the arterial street is heavy. Accordingly, many cyclists believe that traffic barriers should be designed to permit bicycle access. This, however, is situation-dependent and may not always be in the best interest of the cyclist.

Disadvantages of Bicycle Access

1. As noted in the goals/objectives section, a major objective of the Bicycle Program is to "achieve widespread acceptance of the bicycle as a legitimate vehicle whose operator shares the same rights and responsibilities as the operator of a motor vehicle in the transportation network". Allowing bicycle access where motor vehicles are not allowed contradicts this objective and further widens the "mental" gap between motorists and cyclists. If the bicycle is to be considered a vehicle in street design and road sharing, the cyclist should obey the same rules and regulations imposed on motorists, the exception being designated off-street recreational facilities. It should be kept in mind, however, that limited access is not a new concept. Resident access only, buses only and height and weight restrictions are commonly used through the City in certain circumstances.

2. The safety factor must also be considered. Allowing exclusive bicycle access through traffic barriers in some cases places the cyclist in a position where he is not expected by other motorists (one of the major arguments against bike lanes). For example, a cyclist travelling through a one-way closure places him in an unexpected position for opposing motorists from two approaches (see Figure 19A). Travelling through a diagonal barrier places the cyclist in a dangerous position because motorists are not expecting any through traffic (see Figure 19B). Total closure access puts the cyclist in an unexpected position when left-turning into the barrier (see Figure 19C).

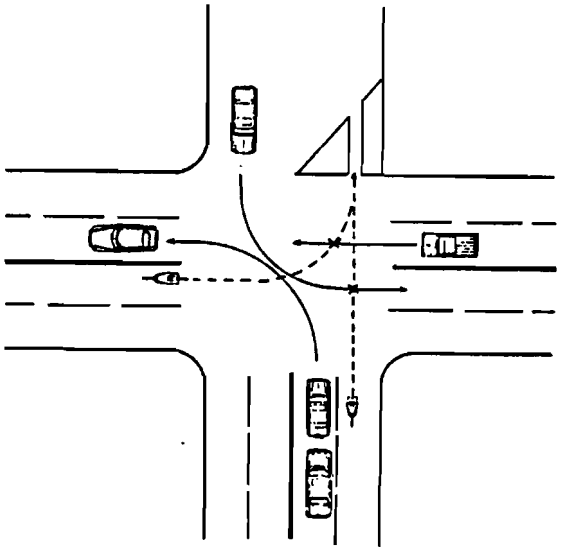


FIGURE 19A
ONE WAY CLOSURE TRAFFIC BARRIER

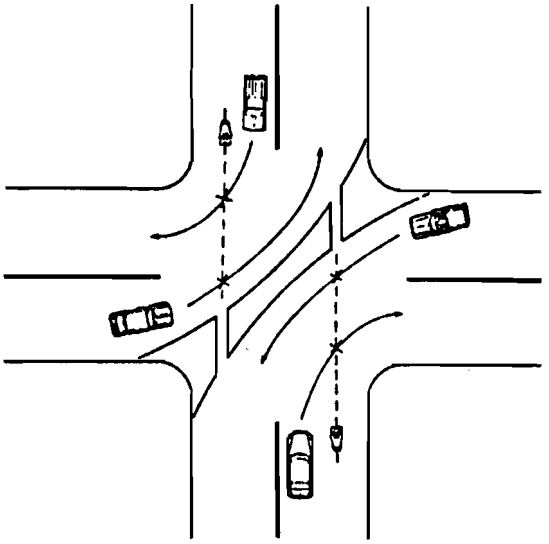


FIGURE 19B
DIAGONAL TRAFFIC BARRIER

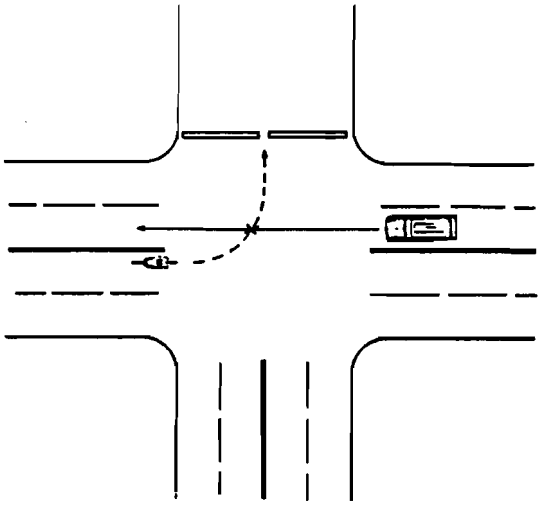


FIGURE 19C
TOTAL CLOSURE TRAFFIC BARRIER

3. Pedestrian safety is the final consideration. If bicycle access is permitted through barriers which are used as pedestrian walks then cyclist/pedestrian conflicts may arise. Cyclist/pedestrian conflicts can result in serious injuries to both the pedestrian and the cyclist and are also bad for the public image of cyclists.

Advantages of Bicycle Access

1. Non-arterial roadways are often used by cyclists during heavy traffic periods. Traffic barriers are often placed on such roadways which parallel major arterials to eliminate shortcutting. As these are the same alternative routes that cyclists use, access is justifiable.

2. In many circumstances where traffic barriers are in place, cyclists continue to proceed through them on the sidewalk (jeopardizing pedestrian safety) and in the opposing traffic lane (creating dangerous situations). Access would relieve this dangerous activity.

For the above reasons, bicycle access through traffic barriers can only be considered on an individual basis due to the unique factors in each location. Fortunately, traffic circles are generally preferred to traffic barriers as they solve the perceived problem of local neighbourhood access. The use of such alternate traffic control devices should be further encouraged over traffic barriers.

RECOMMENDATIONS:

6) That symbolic railway crossing signs (showing angle of tracks) and cyclist cautionary signs be placed before all shallow angle railway crossings.

7) That the City continue to negotiate with railway authorities to install rubber flange fillers at shallow angle railway crossings.

8) That roadside asphalt drainage diverters be marked, where practical, to improve detection under poor visibility circumstances.

9) That bicycle access through traffic barriers be considered on a site specific basis.

CONTROLLED ACCESS HIGHWAYS AND STREETS

It has been general practice in the past to prohibit cyclists from riding on designated freeways. Unfortunately, when these prohibitions were made no steps were taken to provide alternative facilities for cyclists. As noted in the B.C. Highways Act (as amended May 15, 1986) cyclists are prohibited access to the George Massey Tunnel, the Port Mann Bridge, Highway 99 (between Richmond to the border), Highway 1 (Vancouver to Chilliwack) and Highway 91 (Queensborough Bridge to Highway 99).

It is noted that some U.S. jurisdictions allow cyclists on freeway shoulders. For example, in California 1500 km of freeway are open to cyclists on the shoulder; the State of New Jersey allows cyclists on all of its freeways with the exception of 150 km of the interstate system; Maryland allows cyclists on all of its controlled-access highways with the exception of 120 km of highway; cyclists are also allowed on the majority of the I5 shoulder in Washington State. No safety problems have been reported with any of these uses (ref. 2).

It should be noted that such regional prohibitions against cycling discourages the use of the bicycle as an alternative mode of transportation. Before such prohibitions are even considered, it must be proven conclusively that cyclist access is unsafe and that there is no engineering solution that would make the roadway safe for all users. In Vancouver all roadways are used by cyclists and in cases where bicycle access is to be restricted, the design must provide alternative on or off-road facilities for cyclist access. Alternative cyclist access should be safe, direct and convenient to be effective.

RECOMMENDATIONS:

10) That all future roadway projects be designed to include cyclists on the road. In situations where such on-road access is unsafe that an alternative safe, direct and convenient bicycle facility be provided, if practical.

BICYCLE PARKING

As discussed in the Encouragement Section of this report, bicycle parking facilities play an integral role in the promotion of bicycle use (see 'End of

Trip Facilities'). Furthermore, the availability of secure bicycle parking facilities on public and private developments discourages the use of City parking meters, boulevard trees, etc. as places to secure bicycles. Bicycle parking is relatively inexpensive, yet the benefits to the cycling public are substantial. One bicycle parking facility costing a *few hundred dollars can accommodate anywhere from 8-12 bicycles, whereas the cost of supplying parking facilities for 8-12 motor vehicles can range from $80,000 to $120,000 in the downtown core (assuming a cost of $10,000/stall).

Bicycle parking is presently being included in various neighbourhood beautification projects. In all cases, bicycle parking facilities should be placed off-street on private property. Where such space is unavailable, bicycle parking facilities can be placed on-street provided they do not pose a hazard to pedestrians or parked cars, as determined by the City Engineer. Unused racks can pose a hazard to some pedestrians if placed on the travelled portion of the sidewalk. Racks placed too close to the curb in parking areas may result in damage to car doors. In order to ensure sufficient bicycle parking facilities, appropriate design guidelines must also be incorporated into the Parking Bylaw. Incentives to encourage the provision of bicycle parking facilities already include exemptions from new development's floor space ratio calculations where bicycle parking areas are supplied. This FSR exemption was decided through the Development Permit Board in 1981 and as a result is now general policy. As paralleled in the RTAC standards (ref. 7), there exist three types (or classes) of bicycle parking facilities. The appropriateness of a particular type of facility is dependent upon:

i) the time duration for which it is used;

ii) the need for anti-theft protection; and,

iii) the required weather protection.

We define the three classes of Bicycle Parking Facilities as follows (see also Figure 20):

CLASS 1 - For long term parking (overnight parking).

- Provides excellent protection from theft and damage to the entire bicycle and its components and accessories.

- Provides total protection from weather, including wind driven rain.

- Lockers, check-in facilities, monitored parking and controlled access parking areas are a few examples of this class of facility.

*The cost of bicycle parking facilities varies with design and capacity. Cost can increase when property costs are included.

CLASS 2

- For short term parking (not for overnight use).
- Provides protection from theft of frame and wheels of the bicycle but does not protect components or accessories (such as the seat, air pump, water bottle, etc.).
- Can provide protection from weather by a special structure, existing building overhang, or roof.
- The facility is a stationary bicycle rack capable of securing the frame and wheels with a user-provided lock. This facility should be designed so as not to promote wheel damage.

CLASS 3

- For short term convenience parking only (less than 4 hours).
- Provides little protection against theft.
- No weather protection is offered.
- The facility is a stationary object to which the bicycle can be secured with a user provided (1.8m/6 ft.) cable (or chain) and lock. The object can range from a lamp-post to a simple bike rack. This facility should be designed/located so as not to impede the flow of pedestrian traffic.

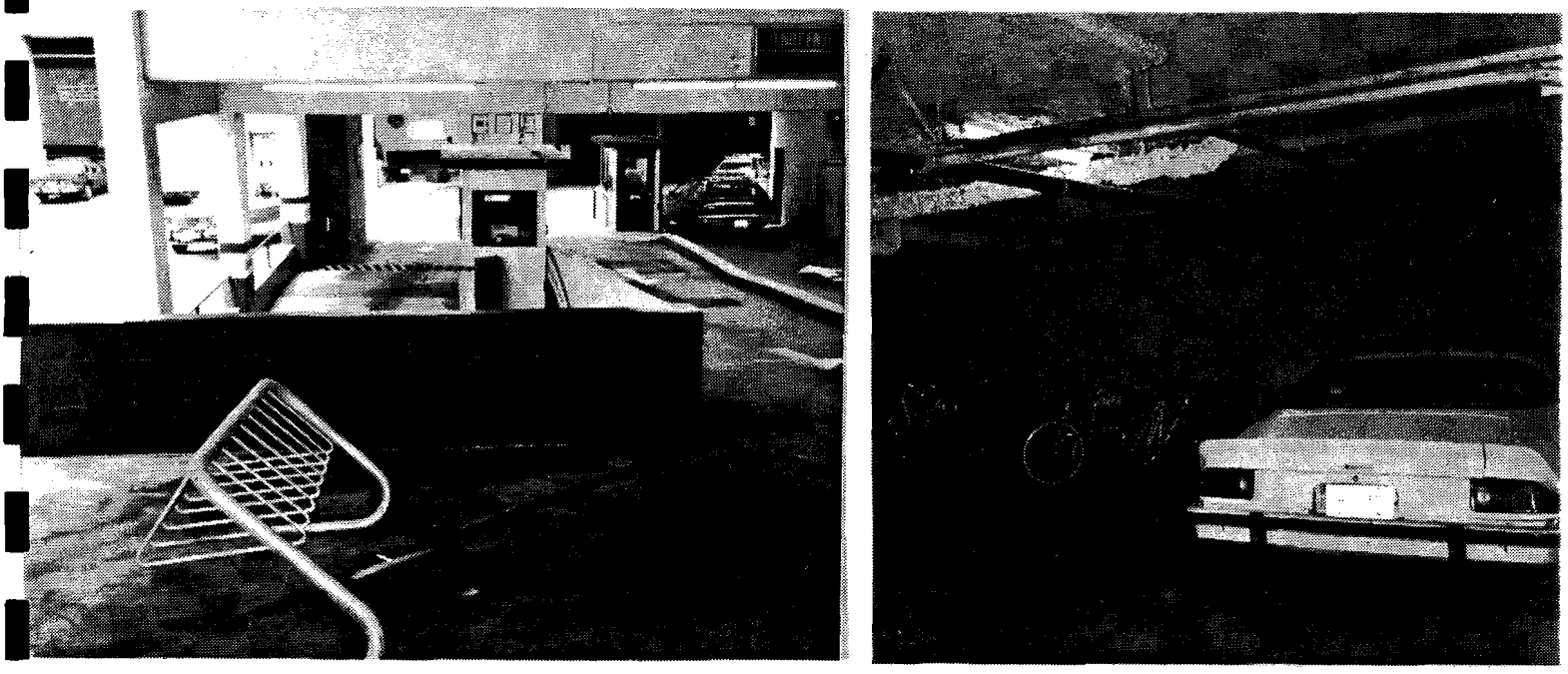


FIGURE 20A - TYPICAL CLASS 1
BICYCLE PARKING FACILITY

FIGURE 20B - TYPICAL CLASS 2
BICYCLE PARKING FACILITY

25% of the auto parking on-site. Recreational developments are conducive to cycling and thus require a higher bicycle parking requirement. In the case of such developments, a minimum recommended bicycle parking requirement of 15% is recommended. Varying classes of facilities are further defined by the particular use of the site (see Appendix J). In general, it is recommended that the following minimum bicycle parking requirement be encouraged in all new developments at the Development Permit stage:

General Building Classification	Minimum Bicycle Parking
Residential	25% of total # of units
Commercial	5% of auto parking
Recreational	15% of auto parking

When designing for the above minimum bicycle parking requirements, the following regulations should be observed:

(1) A higher class of facility may be substituted for a minimum required class.

(2) Safe and convenient access shall be provided to all bicycles using the facility.

(3) Parking facilities shall secure bicycles in such a manner so as not to damage the wheels, frame, or components.

(4) Class 2 and 3 facilities should be located in a high visibility area so as to discourage theft and vandalism.

(5) Parking facilities should be located so as not to impede the flow of pedestrian traffic.

(6) The Director of Planning and the City Engineer shall have the authority to review the design of all proposed bicycle parking facilities.

RECOMMENDATION:

11) That the City of Vancouver incorporate minimum bicycle parking requirements into the Vancouver Parking By-law for all new developments.

12) That the Engineering and Planning Departments continue to pursue minimum recommended bicycle parking in all new developments at the development permit stage, using the existing floor space ratio exemption as an incentive.

SPOT IMPROVEMENT PROGRAM

The design of bicycles is different from motor vehicles in that they have two very narrow wheels, a light frame, and a chain transmitting power directly from the pedals to the rear wheel. Accordingly, bicycles have no suspension and do not have the same capacity as a motor vehicle to absorb shock caused by irregularities on the road surface. As a result, cyclists try to avoid potholes, uneven surfaces, cracks, railroad crossings, raised/depressed drainage grates, utility caps, gravel, etc. A skilled cyclist will shoulder check and move safely around such obstacles unless they are difficult to see or obscured by debris. Emergency avoidance of such roadside hazards can cause the cyclist to manoeuvre the bicycle into the path of another vehicle. Such manoeuvres are generally unexpected and erratic and can result in accidents.

For these reasons, the maintenance of our roadways and the removal or repair of roadside hazards is essential to the safe integration of the cyclist onto the roadway. Vancouver presently has an extensive road maintenance program which has been expanded to include the unique road maintenance requirements of cyclists within the confines of approved budgeting. Small improvement requests including signs, ramps, and minor street modifications can be made to the Engineering Department or the Bicycle Advisory Committee and may be carried out depending on other priorities and the availability of funds.

The present road maintenance inspection program is coordinated through the materials branch of the Engineering Department. Public spot improvement requests can be made by written requests or by telephone to the Traffic Management Branch of the Engineering Department. All requests are sorted in terms of priority and type of improvement. The priority of an improvement request is determined through commuter route priority of the street and accident frequency of the location (see 'Street Priority System').

There are three major types of improvements. These are:

1) Surface Improvements - pothole repair, crack filling, utility riser installation, railroad crossing rubber fillers, drainage improvements, gravel, sand, water, leaves, glass.

2) Signage/Hazard Marking - regulatory signs, warning signs.

3) Structural Improvements - ramps, traffic barriers, bicycle parking, short asphalt paths, lighting.

The spot improvement request, once prioritized, is forwarded to the appropriate branch for action. Larger requests can be reviewed and budgeted for, if required.

The present road maintenance program is an effective means of eliminating potentially hazardous situations at relatively low cost. It provides a direct communication link with the appropriate branches of the Engineering Department allowing for the repair/removal of roadside hazards.

RECOMMENDATION:

13) That the existing street and lane maintenance program continue to identify and repair bicycle hazards.

RECREATIONAL ROUTES

Up to this point the plan has dealt mainly with the commuter cyclist and road sharing. A large component of the cycling community, however, is made up of pure recreational cyclists. Recreational cyclists include families, children, middle-aged and elderly people wishing to enjoy the virtues of cycling without dealing with motor vehicle traffic. The recreational cyclist may utilize on-street facilities but only in off-peak periods such as evenings and weekends. Usage of a vergeside path is highest (over 95%) where the path is an alternative to a road with motor vehicle traffic in excess of 30,000 vehicles/day (ref. 22). Generally, the true recreational cyclist seeks out separated bike paths. It is therefore clear that recreational cyclists prefer segregation to integration.

Segregation can only be safely achieved in certain circumstances, these are:

(1) The proposed separate facility should have little or no cross traffic.

(2) Pedestrian traffic should be minimal.

It is difficult to locate areas in which these two criteria are met. Some examples in which separate facilities have proven successful are as follows:

- Abandoned railway rights-of-way
- Lakeside, riverside, or oceanfront property
- Parallel major highways

One of the most successful segregated bicycle facilities, The Burke-Gilman Trail, is located in Seattle, Washington. The 12.5 mile Burke-Gilman Trail is located on an abandoned railway right-of-way along Lake Washington. The Trail is a success due to the innovative and safety-conscious design. Some outstanding design features of this facility are as follows:

- street traffic control signs (stop/yield) used on trail at intersections
- rumble strips before intersections warning cyclists
- all hazards are clearly marked
- all cyclists are strongly encouraged to "use bell or voice when passing" through on route signage
- facility safety code was developed and promoted for all users of the trail (see Appendix E)

The Burke-Gilman Trail should be used as a model for all segregated bicycle facilities in Vancouver.

EXISTING RECREATIONAL ROUTES

There are many existing recreational routes in Vancouver. The following is a brief overview of existing recreational routes and some recommendations for improvement:

STANLEY PARK SEAWALL

The Stanley Park Seawall Cycle Route is an 8.0 km shared pedestrian/cyclist path (see Appendix F). The cycle route runs in a counterclockwise direction around the Park. The cycle route is separated from the pedestrian walkway by means of a painted line and in some cases through a grade separation. The cycle route is a very picturesque, well-maintained facility. Even though this facility has no cross traffic, it does have very high pedestrian volumes. This leads to a number of inevitable cyclist/pedestrian conflicts. The most evident areas of conflict are at Second Beach, Third Beach and Lumberman's Arch, where pedestrians tend to congregate. Other conflicts occur along the route during passing and with cyclists travelling too fast or the wrong way.

RECOMMENDATIONS:

14) That the Park Board consider the following recommendations in order to alleviate present cyclist/pedestrian conflicts on the Stanley Park Seawall:

A) In order to alleviate cyclist/pedestrian conflicts at Second Beach, Third Beach and Lumberman's Arch, designated pedestrian crossings should be established. Pedestrian crosswalks should be painted on the cycle path with offset warning lines and traffic control signs requiring the cyclist to "stop". "Cyclist dismount" signs should be removed.

B) On route conflicts can be minimized through the use of "cyclist use bell or voice when passing" signs, placed periodically along the route.

C) A printed, up-to-date safety code should be distributed along the route during peak-use periods and posted at key locations. Such a safety code should be recommended reading for all bicycle renters (see 'Enforcement on Recreational Routes').

D) A suggested speed limit for cyclists.

B.C. PARKWAY (7-ELEVEN BICYCLE TRAIL)

The 7-Eleven Bicycle Trail completed in 1986 parallels the new Automated Light Rapid Transit line, which runs from the New Westminster Waterfront to False Creek in downtown Vancouver (see Appendix G). Designers of this 21 km bicycle path had the difficult task of designing a recreational based segregated bicycle facility through a heavily used transportation network. Busy intersections, arterials and high volume pedestrian areas make this task difficult to achieve without some cyclist/motorist and cyclist/pedestrian conflicts. The trail is lined with 1500 trees and connects 32 municipal parks. As a result, the 7-Eleven bicycle trail does provide a highly scenic route for the traffic-conscious recreational cyclist.

Presently, heavy use of the trail is confined to the Burnaby and New Westminster areas. This is partly due to the undeveloped termination point in False Creek. Future False Creek developments are expected to greatly increase cyclist/pedestrian volumes on the Vancouver section of the 7-Eleven Trail. Accordingly, some areas of the trail can be improved in order to safely handle the expected increased volume.

RECOMMENDATIONS:

15) That B.C. Parkway consider the following recommendations for the 7-Eleven Bicycle Trail:

A) Stop and Yield traffic control signs should be placed before all major intersections on the trail.

B) "Use bell or voice when passing" signs should be placed periodically on the trail.

C) Some on-street sections of the trail should be analyzed for areas to reduce potential conflict and signage. In particular the Grandview Highway to Clark Drive section should be reviewed.

D) Bicycle access in the False Creek to Clark Drive section should be considered during land development in this area.

THE HABITAT BICYCLE ROUTE

The Habitat bicycle route is a signed on-street recreational bicycle route which runs from Stanley Park to The University of British Columbia. The bike route was established in 1976 through a joint effort of Engineering and Park Board Staff at a cost of $68,000. The bike route begins in Stanley Park from the existing Stanley Park Seawall Cycle Route. The route runs along Beach Avenue to a point south of the Bathhouse where it joins up with the seawall again. The route is run along Beach Avenue to avoid the heavy pedestrian volumes on English Bay Beach in Summer. 40% of the cyclists are using the wide west sidewalk instead of the road at this point along the route. The bike route runs along the seawall and returns to Beach Avenue at the Aquatic Centre. The Habitat Bicycle Route continues over Burrard Street Bridge to an on-roadway route into the Kitsilano area and eventually the University Endowment Lands. Future development along False Creek may allow for a continual seawall link to the B.C. Parkway 7-Eleven Trail. This would provide a continuous recreational bicycle facility link from Stanley Park to New Westminster.

RECOMMENDATIONS:

16) That the Engineering Department and the Park Board consider the following recommendations for the Habitat Bicycle Route:

A) As on the Stanley Park Seawall "cyclists use bell or voice when passing" signs should be placed periodically along the route in high pedestrian use areas. These areas include: Sunset Beach (and Burrard Street Bridge - (COMPLETED).

B) That Burrard Street Bridge signage and access ramps be improved as outlined in the Burrard Street Bridge Bikeway Report (COMPLETED).

C) Surface conditions, signage and conflicts should be reviewed in the Kitsilano area.

POTENTIAL RECREATIONAL ROUTES

As noted earlier there are certain areas in which segregated recreational routes are feasible. Ocean and River Foreshores, Railway Reserves and lands parallel to major highways/freeways all serve as ideal locations due to the little cross traffic. Developing a segregated recreational bicycle facility can be a major financial undertaking but the benefits of a well-designed facility through increased cycling and public appreciation can quite easily justify the costs involved. In cases where a major highways or development project is to take place, a recreational bicycle facility can "piggyback" the project providing a highly favourable aspect of the project benefiting local neighbourhoods. In some cases a public controversy over a project can be solved by beautification. Beautification through the addition of a bicycle facility can greatly improve the livability of the area.

RAILWAY RESERVES

Abandoned railway reserves are ideal for recreational bicycle facilities as they are generally isolated from other traffic and in most cases are not located in heavy use pedestrian areas. In addition, most railways are built not to exceed a maximum grade of 1.5 to 3% making them even more appealing for recreational use.

The American Rails To Trails program has been very successful in converting abandoned railway rights-of-way into recreational facilities. The Burke-Gilman Trail in Seattle is an excellent example of a successful Rails to Trails Project (see 'Recreational Routes').

In Vancouver, the Canadian Pacific's Arbutus line may serve as an ideal location for a segregated recreational facility in conjunction with any transit improvements. Canadian Pacific may abandon the line some time in the future.

OCEAN & RIVER FORESHORES

In Vancouver, several ocean and river foreshores exist which have a great potential for segregated bicycle facilities. Such foreshores are ideal locations for a segregated facility due to the fact that there is little or no cross traffic into the water (with the exception of boat launches, docks, and waterfront developments). Ocean and River Foreshores are generally heavily used by pedestrians in the summer months. For this reason, any recreational facility in these areas should be designed so as to minimize cyclist/pedestrian conflicts. Some areas which show potential for such a project are:

1. False Creek
2. The North Arm of the Fraser River
3. Burrard Inlet (Fraserlands)

Future False Creek Developments could include a segregate bicycle/pedestrian facility. A major objective of such a facility would be to link the existing seawall cycle route with the BC Parkway 7-Eleven Trail providing a continuous facility from Stanley Park to New Westminster. The Fraser River Foreshore shows some potential for recreational development in the Southland area and east of Knight Street. Remaining areas along the river are under heavy industrial use and would be difficult to develop without some upgrading of present usage.

HIGHWAY RIGHTS-OF-WAY

Some future major highway projects could include the construction of a parallel bicycle facility as beautification to enhance livability in the area, and provide direct, convenient access for cyclists. In Seattle, $22 million of the $1.2 billion I90 project (from Seattle to Bellevue) will be devoted to a separate bicycle facility. This facility will include a separate bicycle tunnel, and on-bridge bicycle paths, to total over 10 miles of bicycle path. Some projects where a parallel facility may be considered include the following:

1. The Cassiar Connector

2. Burrard Inlet Transportation Corridor
3. Stanley Park Roadway
4. False Creek Connection (7-Eleven Extension)

The proposed Cassiar Connector project would provide an excellent opportunity to improve bicycle access to 2nd Narrows Bridge. Possible development along Burrard inlet as a Transportation corridor could also include wide shoulders for cyclists or a segregated bicycle facility for use by recreational and commuter cyclists. Stanley Park roadway improvements should also include either on-street or off-street bicycle facilities due to the large number of both recreational and commuter cyclists using the roadway.

In order to be fully-effective all recreational facilities should be designed so as not to promote pedestrian/cyclist conflict and must allow safe, easy access from the existing roadway. It should also be noted that any off-road facility which parallels a roadway requires all cyclists, by-law, to use it. In cases where such a facility falls on a major commuter corridor commuter time and access may be sacrificed. In supporting the needs of one group of cyclists we should try not to infringe on the rights of another. Informational brochures, maps and other promotional material ensure proper use of all such facilities.

RECOMMENDATIONS:

17) That facilities for recreational cyclists be progressively provided, wherever practicable, along railway reserves, Ocean and river foreshores, and highway rights-of-way.

EDUCATION

The education of the general public plays a vital role in the success of a comprehensive bicycle plan. Only through education can we be assured that the cyclist and the motorist will safely share our roadways.

Many people believe that riding a bicycle in traffic is dangerous. This fear is based on the fact that the cyclist is more vulnerable to injury than the motorist in bicycle/motor vehicle accidents. Even though this is indisputably the case, records show that, on average, in 1985 2.3% of all vehicle trips in Vancouver (CMA) were made by bicycle and that only 2.2% of all reported accidents in 1985 involved cyclists. We can therefore conclude that, on average, cyclists are not more likely to be involved in motor vehicle accidents than motorists are.

Bicycle accidents are more likely to result in serious injuries and tend to involve young children as well as adults (see 'Accidents'). Cyclists can greatly reduce the likelihood of being involved in an accident by increasing their traffic cycling and bicycle handling skills through proper education. Bright reflective clothing and lights for riding at night further reduce the likelihood of an accident. Should an accident occur, an approved bicycle helmet will protect against head injuries. A successful bicycle education program must therefore have the objective of encouraging the use of helmets, lights, reflectors, safety vests, the need for a mechanically safe bicycle, and most importantly the development of traffic skills. This program should reach all ages with priority given to high risk age groups. Each age group requires a unique program that will directly deal with cycling errors common to that group. Young children, school age children, adult cyclists and motorists, are all included as prime target groups in a successful comprehensive bicycle education program.

Other relevant groups include parents, teachers, motor vehicle instructors, police officers, engineers, planners, and bicycle retailers/renters. The

network through which the prime target groups are educated would require the direct involvement of the Parks Board, the Police Department and the School Board (see Fig. 21). In order to be effective all education programs run through the above bodies should be monitored and approved through one central bicycle education advisory committee (the Bicycle Advisory Committee). Such a committee would consist of representatives from various organizations and associations knowledgable in the area of bicycle education. This includes The Canadian Cycling Association (CCA), The Bicycling Association of B.C. (BABC), and others. The Vancouver Education Program would be designed to educate the public using two methods, direct instruction, and Public Awareness Programs using brochures and the media. For quality control and safety purposes the education committee would ensure that CCA certified instructor trainers would be available to train and certify teachers, police officers and private instructors. Mandatory instructor certification for on-road instructors is the only way to achieve quality control and ensure a minimum level of competence.

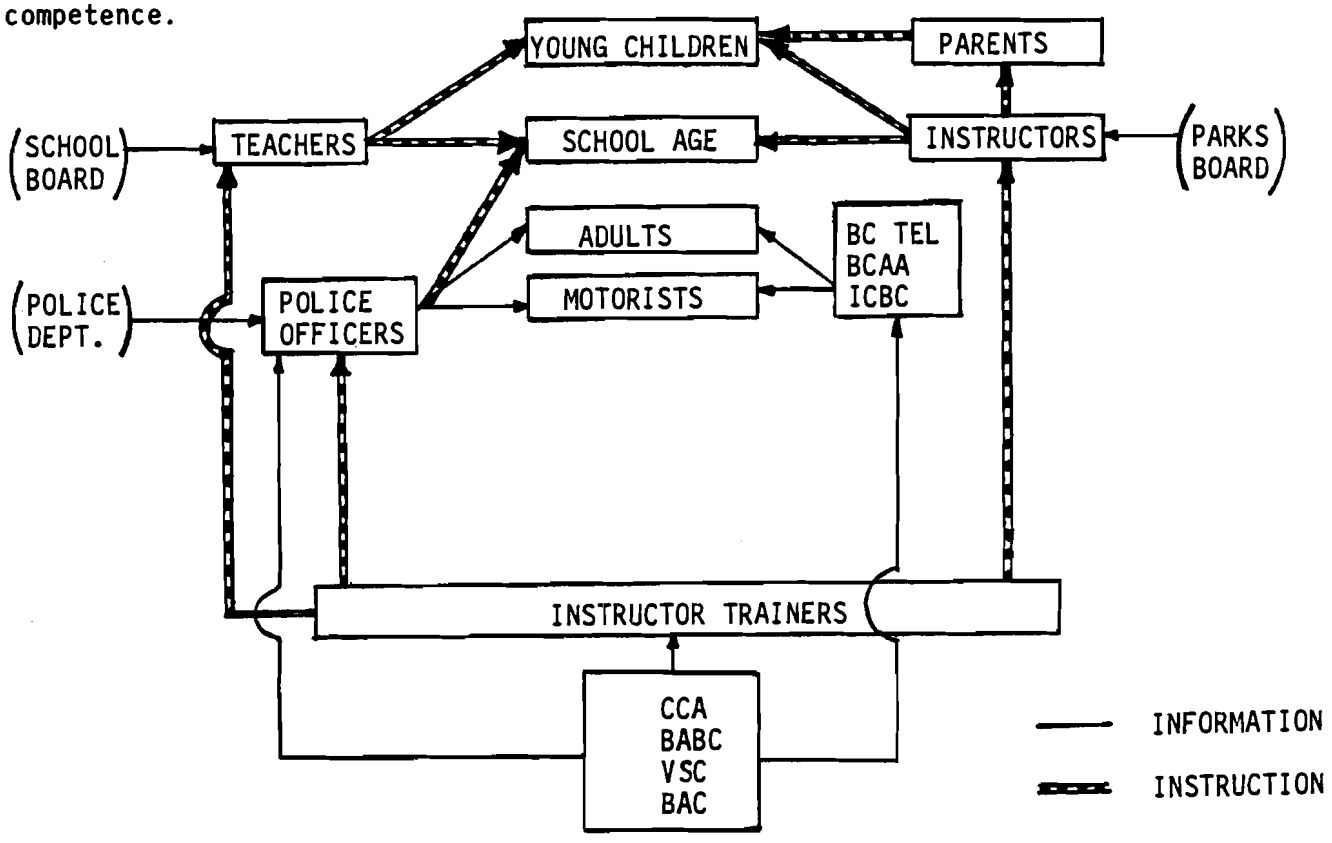


FIGURE 21 - PROPOSED VANCOUVER BICYCLE EDUCATION PROGRAM STRUCTURE

Informational brochures designed for individual target groups would be checked for content by the committee and distributed through various organizations. The proposed network would ensure each target group would be exposed to bicycle education with emphasis given to the direct instruction of young children and school children, and information transfer to adult cyclists and motorists.

RECOMMENDATIONS:

18) That the terms of reference of the Vancouver Bicycle Advisory Committee be expanded to include the role of a bicycle education advisory board for all bicycle education courses held by the Parks Board, the School Board, and the Police Department.

AND

That the representation on the committee be expanded to include representatives from the School Board, the Park Board and cycling associations knowledgeable in the area of bicycle education (COMPLETED).

19) That all bicycle education courses offered through the Vancouver School Board or Park Board, which include an on-road riding component, require that instructors of such courses be certified by the Canadian Cycling Association as qualified bicycle instructors.

SUMMARY OF EXISTING PROGRAMS

There are a number of independent programs presently being taught to children and adults in Vancouver. These existing programs range from independent instruction to community or school based programs. Unfortunately, the majority of the existing programs do not require any instructor qualifications to teach on-road classes. Many of the following programs do not deal directly with the major accident causes and instead veer off the objective of accident prevention (which is the basis on which all bicycle education courses should be structured). Fortunately, the Canadian Cycling Association has produced a number of well structured, effective courses which teach real world cycling skills and accident prevention. The CCA Can-Bike Program should be used in the Vancouver Education Program and should serve as a model for the restructuring of existing inadequate programs. The following is a brief summary of each of these programs.

CANADIAN CYCLING ASSOCIATION CAN-BIKE PROGRAM

The Canadian Cycling Association is the only recognized national sport governing body for cycling. Established in 1882, the CCA is funded by both

Sport Canada and Fitness Canada to promote safe and efficient cycling as well as to maintain the rights and duties of cyclists. The CCA provides a number of national guidelines from which regional courses can be structured by CCA certified instructors. The Can-Bike Program was developed by the Canadian Cycling Association Education Committee in 1984 in order to provide the Canadian cycling public with a well structured CCA approved program. The Can-Bike Program, based on John Forester's Effective Cycling course and text (ref. 11), focuses on increasing cycling skills through in-class and on-road instruction by nationally certified instructors. The Program presently consists of two courses: Can-Bike Skills 1 and Can-Bike Skills 2. Future additions to the program include Touring I & II and Maintenance I & II courses.

Can-Bike Skills 1

Background: Can-Bike Skills 1 is a basic course designed for inexperienced cyclists who want to improve their cycling confidence, knowledge and ability. This course was adapted from the course 'Cycling Freedom for Women' designed by Barbara Bernhardt.

Scope: Course content is basic and designed for beginners and occasional cyclists. The course touches on bicycle maintenance, touring and Effective Cycling Techniques (ref. 11). Upon completion of the course, participants should feel confident enough to ride regularly and safely for utilitarian and recreational purposes.

Length: 16 Hours (five to eight two-hour courses)

Content:
- o Prevention of Bicycle Accidents
- o Using gears efficiently
- o Improving bike handling skills
- o Tailoring bike to suit specific needs
- o Basic maintenance skills

Instructor Qualifications:

Instructors require CCA Can-Bike instructor certification.

Can-Bike Skills 2

Background: Can-Bike Skills 2 is an advanced course of cyclists who want to ride confidently and safely in traffic or who require CCA Can-Bike certification. This course is based on The Effective Cycling Program by John Forester (ref. 11).

Scope: Graduates of the Can-Bike Skills 2 course will be able to ride confidently and competently through any conditions of traffic or terrain.

Length: 21 hours (often five three-hour sessions and one dayride)

Content:
- o Advanced traffic cycling skills
- o Safe group riding techniques
- o Emergency avoidance techniques
- o Wet weather and night-time strategies
- o Dealing with all kinds of traffic and terrain
- o Bicycle maintenance

Instructor Qualifications:

Instructors require CCA Can-Bike instructor certification.

Bicycling Safe Start

Background: Bicycling Safe Start is a local program, created (and taught) by Christine Code. It was designed to complement the Kids on the Road program (see below) by providing quality bicycle education for children who are too young to begin on-road instruction. Classes are for children between the ages of five and eight (Separate classes: 5 & 6, 7 & 8). Bicycling Safe Start uses a variety of bicycle skill drills, games, songs, rhymes and visual aids to make learning fun for children. The program is available through some Vancouver community centres and upon request to community groups.

Scope: Bicycling Safe Start teaches and refines basic cycling skills and safety concepts in a protected, off-road environment. To begin the program students must be able to start, pedal, and stop their bicycles by themselves. Students completing the course will have improved their coordination and judgement for cycling. They will be able to shoulder check properly while riding in a straight line and will be able to demonstrate correct behaviour for cyclists at stop signs and driveways in a simulated off-road environment.

Length: Usually taught in five one-hour classes

Content:
- o Helmets
- o Bike checks
- o Straight line riding
- o Shoulder checks
- o Smooth starts, stops and turns
- o Hazard awareness
- o Driveways
- o Stop signs
- o Skill building drills

Instructor Qualifications:

Instructors require CCA Can-Bike instructor certification (and some additional training).

Kids On The Road

As with the Bicycling Safe Start program, Kids On The Road program is a local program created (and taught) by Christine Code. Students are required to have safe bicycles and must wear properly adjusted approved helmets (helmets provided). Kids On The Road consists of two on-road levels: an introductory level and an advanced level.

Introductory Level

Background: This level of Kids On The Road is designed for children between the ages of 9 and above. This program teaches on-road cycling skills on residential streets with low traffic volume. This program is very effective due to its high student involvement and the fact that the content is set up to teach real world skills for on-road cycling. Kids On The Road teaches children the skills they need in order to prevent the accident types most common for their age group. Students completing this level are graduated to the advanced level of the program.

Scope: Students are judged to have completed the first level of Kids On The Road when they are able to ride safely and confidently on residential streets.

Content:
- o Helmets
- o Safe bikes and accessories
- o Riding on the right
- o Yielding to cross traffic when entering roadway
- o Shoulder checking before moving laterally on street
- o Hand signals/communicating with other road users
- o Road placement
- o Destination positioning
- o Hazard identification/avoidance

Instructor Qualifications:

Instructors require CCA Can-Bike instructor certification (and some additional training).

Advanced Level

Background: The advanced level of Kids On The Road requires all registering students to pass an on-road exam before admittance. The advanced level continues to emphasize vehicular cycling principles and teaches students how to apply their skills to more complex

situations. After the screening test and a review of level one, advanced Kids On The Road students begin riding on arterial streets.

Scope: Upon completion of the course students should be able to ride confidently and competently on most Vancouver streets and in varied traffic conditions.

Length: five one and one half to two-hour sessions.

Content: Similar to introductory level.

Instructor Qualifications:

Instructors require CCA Can-Bike instructor certification (and some additional training).

THE CANADIAN RED CROSS SOCIETY BIKE FOR LIFE PROGRAM

The Canadian Red Cross Society, established in 1859, is a volunteer based organization which provides emergency relief and humanitarian service to the public. The Society became first involved in bicycle education in the late 1970's.

Background: The Bike for Life Program was prepared by the Canadian Red Cross Society in 1978. The Program is designed for children from grades 2 to 7 and is generally taught by teachers, Red Cross Cross Volunteers or Community Groups. The program includes two learning sections, a classroom bicycle safety program and a Roadeo. Bicycle safety theory covers the seven content items listed below, and bicycle handling skills are tested during the Roadeo. The Bike for Life Program differs from other programs in that it includes a first aid lesson in which students are taught some basic first aid for bicycle accidents. Major revisions are required, however, to bring the existing program up to date and in line with the concepts involved in Effective Cycling (ref. 11). The existing program kit may be purchased and taught by anyone.

Scope: The program's objective is to reduce bicycle related accidents through the introduction of some basic traffic safety concepts. Bike For Life endeavours to create an increased awareness among students of the importance of becoming safe and skilled bicyclists. It is designed to instruct students in bicycle safety and to provide them with an opportunity to practise what has been taught in a controlled environment (the bicycle roadeo).

Length: Undefined

Content:
- o Defensive driving
- o Your place on the road
- o Intersections
- o Mechanical safety
- o Being a good rider
- o Signs and signals
- o First aid for bicycle accidents

Instructor Qualifications:

No certification is required of the instructor.

VANCOUVER POLICE DEPARTMENT BICYCLE SAFETY PROGRAM

The Vancouver Police Department, through their School Safety Patrol Squad, has been providing a bicycle safety program in Vancouver elementary schools since 1951. Our Police Department is active in bicycle and traffic education through its Grade Three Program, The Ceperley Park traffic safety playground, and the Petro Canada Rodeo.

Grade 3 Program

Background: The Grade 3 Bicycle Safety Program is taught by a School Safety Patrol Officer and is approved by the Vancouver School Board. The program is theoretically based and is taught in class. The program differs from other programs in that it deals with the rules of the road and bicycle theft as two major parts of its three part structure.

Scope: The Program is designed to educate young children on basic safe bicycle riding tactics, the law and theft prevention.

Length: 40 minutes

Content:
- o The Rules of the road (Motor Vehicle Act, City By-Laws)
- o Safe bicycle riding tactics (18 minute film)
- o Bicycle theft prevention

Instructor Qualifications:
Instructor must be a School Safety Patrol Officer of The Vancouver Police Department.

CEPERLEY PARK TRAFFIC SAFETY PLAYGROUND

(see Bicycle Rodeos)

PETRO CANADA RODEO

(see Bicycle Rodeos)

VANCOUVER SAFETY COUNCIL BICYCLE SAFETY PROGRAM

The Vancouver Safety Council is a non-profit, public service agency devoted exclusively to accident prevention. Incorporated in 1985, the Safety Council is affiliated and co-operates with official agencies having legal responsibility for safety. The Safety Council has been offering elementary school bicycle safety education courses since the early 1970's and has been involved with a number of bicycle rodeos (see 'Bicycle Rodeos'). The Safety Council offers three programs which are taught by Safety Council staff.

Grade 2 Program

Background: The Grade 2 Bicycle Safety Program is a short in-class program designed to meet the short attention span of children in this age group.

Scope: The course is set at a very basic introductory level introducing some basic concepts applicable to children in this group.

Length: 20 minutes

Content:
- o Introduction of the bicycle as a vehicle
- o Importance of choosing the right size bicycle
- o Being visible
- o Watching for hazards

Instructor Qualifications:
No certification is required of the instructor.

Grade 4 In-Class Program

Background: The Grade 4 In-Class Bicycle Safety Program is also a short in-class program which presents some additional basic safety concepts. The program consists of a slide show, a student activity and a film.

Scope: The course is set at a basic introductory level.

Length: 40 minutes

Content:
- o The place of the bicycle on the road
- o Being visible
- o Watching for hazards
- o Hand signals (includes film)

Instructor Qualifications:
No certification is required of the instructor.

Grade 4 On-Road Program

Background: The Grade 4 On-Road Bicycle Safety Program takes place on quiet residential streets in the vicinity of the school. Students are

supplied with helmets and have a bicycle safety check before they are taken out on the road in groups of seven under the supervision of the instructor.

Scope: The course is designed to improve on road confidence and safety for young cyclists through a heightened awareness of traffic and communication.

Length: 1 1/2 - 2 hours

Content:
- o Riding on the right
- o Right-of-way (looking and yielding to traffic/stop signs)
- o Shoulder checking (looking behind before acting)
- o Communicating with other road-users (hand signals)

Instructor Qualifications:

No certification is required of the instructor.

BICYCLE RODEOS

In general Bicycle Rodeos are a one or two day event in which large numbers of young cyclists are run through a series of exercises in order to improve their bicycle handling skills. These events are occasionally corporate sponsored and often hosted by local safety organizations and police departments. Bicycle Rodeos are held off-street in large open parking lots or paved areas to facilitate learning without traffic concerns. Traditionally, bicycle rodeos didn't deal directly with any of the known causes of bicycle accidents (ref. 12). As a result, such events have often been criticized by knowledgeable bicycle educators. One must however, consider the potential value of such a mass event if it could be improved to reflect major safety concerns of those experienced in the field. A properly run rodeo can have the following benefits:

1. Increase child and parent awareness of the need for cycling skills.

2. Evaluate child's bicycle handling skills and identify areas requiring improvement.

3. Improve cycling skills that relate to on-street traffic skills.

4. Evaluate existing education programs/test new lessons.

There are a number of bicycle rodeos presently being run, the following is a short description of each of these.

Petro-Canada Bicycle Rodeo

Background: At the 1986 P.N.E., Petro-Canada ran a Bicycle Roadeo and in 1987 they ran a "Right Riders Road Show". Endorsed by the Canadian Association of Chiefs of Police, the program has involved over 34,000 children aged three to thirteen years. All participants are given a safety brochure and participate in a safety contest before taking part in the rodeo. The Right Riders course consists of a junior and senior track with road signs and intersection. The junior track uses electric three wheeled cycles (ATV's) and the senior track uses four wheeled gasoline powered cycles. The rodeo includes a taped 5-8 minute audio visual show exemplifying bicycle safety regulations. This program is geared more towards general traffic safety and does not focus on bicycle safety skills.

Content:
- o Hand signals
- o Stopping at Stop signs/pedestrian crossings
- o Safety tips, regulations (video)

AAA Bicycle Rodeo

Background: The AAA Guide to Bicycle Rodeos (ref. 12 was prepared in December 1985 by John Williams (Missoula BPC) and Dan Burden (Florida BPC). This particular rodeo is similar in appearance to other rodeos but is designed to teach real world skills that

relate to on-road cycling. The skills course is broken up into nine stations, each set up to deal with known causes of children's bicycle accidents. All participants ride bicycles in order to simulate, as close as possible a real on-road situation.

Content:
- o Basic bicycle sizing and maintenance
- o Parent orientation to 'cycling and sense'
- o Seeing and being seen
- o Reasons for traffic laws
- o Avoidance of 'driveway rideout' accidents
- o Stopping at stop signs
- o Looking behind for traffic (shoulder check)
- o Control and balance
- o Avoiding hazards

CEPERLEY PARK TRAFFIC SAFETY PLAYGROUND

Background: The Park Board, in cooperation with the Police Department, operates the traffic safety playground at Ceperley Park every summer. The Program is run for children between five and eight years of age. The children practice the rules of the road by driving miniature pedal cars on a layout designed to imitate real roads, intersections, traffic lights and stop signs. Over 3,200 children took part in the program in 1987. The program follows a basic rodeo structure in that it teaches children basic traffic skills in a controlled off-street environment. This program is geared more towards general traffic safety and does not focus on bicycle safety skills.

Content:
- o Rules of the road
- o Stopping at stop signs/traffic lights

VANCOUVER BICYCLE EDUCATION PROGRAM

The City of Vancouver can promote bicycle education in a number of ways. The School Board, Parks Board and the Police Department can all work together through the central Bicycle Education Advisory Board to establish a city-wide education program. The prime target groups on which to focus such a program are:

1) Young Children
2) School Age Children
3) Adult Cyclists
4) Motorists

To be most effective, the education of each prime target group should be analysed and approached separately.

YOUNG CHILDREN

Children under the age of 9 represent a significant percentage of the cycling population. This age group accounts for approximately 17% of all bicycle/motor vehicle accident injuries requiring hospitalization (see 'Accidents'). Children in this age group have not fully developed their reflexes and peripheral vision and are therefore more likely to be in an accident. Fortunately, the majority of children in this age category are not exposed to heavy traffic conditions but rather ride in local neighbourhoods on residential streets and sidewalks. Accordingly, the majority of child bicycle accidents occur near the child's home. Parents have the most important role in the initial development of cycling skills for these children, but unfortunately the majority of them lack the necessary information. For this age group it is therefore important that the necessary information be presented to parents in such a manner that it can be easily relayed to their children. Some examples that can be used are:

- pamphlets (given to children at school, mail outs, kindergartens, community groups, police, attached to new bicycles)

- educational promotions on radio, newspaper, etc.

The introduction of basic cycling skills and safety equipment through the school system would also be beneficial in establishing a positive, safe attitude towards cycling at this impressionable age. As with the information provided to parents, such a program would have to be concise, and entertaining to grasp the short attention span of children in this age group.

RECOMMENDATIONS:

20) That an informational brochure be made available for parents of children under the age of nine. This brochure can be distributed through schools, community centres, police and retailers.

21) That the Vancouver School Board work with the Bicycle Advisory Committee and involved agencies to introduce a basic bicycle safety course for children under nine years of age using 'effective cycling' techniques and CCA certified instructors.

SCHOOL AGE CHILDREN

Children between the ages of 9 and 18 account for over 35% of all bicycle accidents in Vancouver requiring hospitalization (see 'Accidents'). The accident rate increases with this age group due to the increased exposure to heavy traffic conditions and increased trip length. Education in this target group should focus on traffic skills. In general children in the 9-18 age group are becoming increasingly independent and the role of the parent often decreases as a vital information source. The school must therefore play a more prominent role in bicycle education. As noted earlier under 'Accidents', the 10-14 year age group has the highest number of accidents. In order to be most effective bicycle education for this age group must be incorporated into the school curriculum between grades 4 and 7. This would ensure that all students are receiving structured, consistent information. One time courses have proven ineffective in the long term.

Bicycle education courses are not presently a part of school curriculum for several reasons, some of which are:

1. lack of staff support and funding

2. lack of available time
3. lack of bicycles

With increasing support of bicycle education and the noted increase in cycling in our city, school based programs may be feasible with some program restructuring and funding. Children in grades 4 to 7 require comprehensive bicycle education which deals with the development of on-road traffic skills and accident prevention. The most effective means of providing this education is through on-road training by certified CCA instructors. It is recommended that the School Board work with the bicycle education advisory committee (Bicycle Advisory Committee) to incorporate a 20-30 hour cycling course into the school curriculum for the fourth grade with annual refresher courses to grade seven.

High school students are also in need of bicycle education but using a different approach. Since most high school students will also become motorists, it is important that they become aware of the cyclists rights and responsibilities on the roadway. Programs outlining safe traffic skills and road sharing can be introduced into existing transportation studies. High school bicycle programs need to have a structured content yet be flexible upon implementation. Trained community relations officers and teachers are best suited to run such programs. Bicycle education in our school system will require an increased awareness of the need for such programs by all administration and staff. Some example steps in such a program are:

- compulsory course for grades 4 to 7
- provide instructional bicycle education kits for use in existing transportation studies.
- introduce bicycle education input into existing high school road safety courses.
- instructor training for designated teachers, school liaison officers
- prepare refesher courses through school, community centres
- educational promotions on radio, newspaper, television, posters, etc.

All programs should be continually evaluated for their success and updated accordingly. Instructors should be trained and certified to be effective.

RECOMMENDATIONS:

22) That the Vancouver School Board work with the Bicycle Advisory Committee and involved agencies to introduce bicycle education as a compulsory part of the elementary school curriculum for grades 4 to 7.

23) That the Vancouver School Board work with the Bicycle Advisory Committee and involved agencies to introduce in-class bicycle education into existing high school courses.

ADULT CYCLISTS

Adults make up a significant portion (over 36%) of the cyclists on the road. The adult cyclist is one of the most difficult target groups to reach. Unlike children, there are no common associations or clubs through which all adults can be reached. If we are to depend only on primary school education programs to educate cyclists it wouldn't be until the year 2050 before we have a bicycle-educated population (ref. 1). A successful education program must therefore reach all cyclists including adults. Only a small percentage of adult cyclists will seek out and attend bicycle education courses. This is mainly due to the fact that most adult cyclists consider themselves experienced road-users and that they don't require any further education. Unfortunately, the statistics prove otherwise. Adult cyclists currently account for over 47% of all serious cyclist injuries (requiring hospitalization) in Vancouver (see 'Accidents'). Furthermore, it was found that about 75% of all bicycle/motor vehicle accidents were either the direct or indirect result of the bicyclist's selection of a suboptimal course (ref. 30). Adult cyclists must be made aware of the availability of bicycle courses and the need for special skill development required for cycling in traffic. Adult educational brochures/courses, for Vancouver cyclists, should be geared towards improving cycling skills in heavy traffic, dealing with the fear of traffic, and riding in adverse weather conditions (see 'Vancouver Bicycle Survey'). Some examples that can be used are:

- Adult cyclist brochures (distributed through BCAA, ICBC, BC Tel, community centres, attached to new bicycles)
- provide police patrol cars with brochures for convenient distribution

- educational promotions on radio, newspaper, television
- promote adult bicycle education courses

RECOMMENDATIONS:

24) That an adult cyclist brochure be made available for distribution through automobile associations, community centres and retailers.

25) That the Vancouver Parks Board and community colleges and universities be encouraged to expand their present bicycle education program to include adult CCA Can-Bike courses at local community centres, campuses, etc.

MOTORISTS

The education of motorists is vital if cyclists are to safely share the roadway. Many motorists are unaware that cyclists belong on the roadway. Those motorists who are aware of road sharing are generally unfamiliar with bicycle lane positioning and proper passing procedures. The motorists must be educated on the rights and responsibilities of cyclists. The most direct and efficient method is to incorporate bicycle related material into driver training programs. Booklets provided to potential motorists and driver training courses should give active consideration to cyclists. In addition, the driving test itself (both written and on-road) should require the candidate to express knowledge of the rights and duties of a cyclist. Such a program would be slow in penetration, but it would ensure that all new motorists are bicycle conscious. In order to reach the existing motorist, a city-wide program similar to Toronto's 'Bicycles Belong' program and Australia's 'Be Aware of Bike Riders' program using the mass media and posters seems to be most effective. Media education in this manner has an immediate impact and is effective. For long term results, however, informative road sharing tips should be relayed to the motorist periodically throughout the year. Some examples are:

- road sharing brochure distributed by ICBC, BC Tel
- provide police patrol cars with brochures for convenient distribution

- information "share the road" PSA's on the radio, in the newspaper, and on T.V. through public service announcements, etc.
- 'Share the Road' bumper stickers

RECOMMENDATIONS:

26) That a 'road sharing' brochure geared towards motorists be made available outlining the rights and responsibilities of the cyclist and the motorist on the roadway. And that this brochure be made available through ICBC, BCAA, BC Tel, and bicycle organizations.

27) That driver training booklets and courses be revised to present cyclists as an integral part of the road user environment, outlining the rights and responsibilities of cyclists. And that the driving test itself be revised to test for such knowledge.

28) That a city-wide 'Share the Road' media campaign be introduced. And that promotional material in this campaign include posters, bumper stickers, T.V. and radio advertising.

OTHERS

A final touch for a successful bicycle education program is the education of those who may or may not be cyclists but who have a direct impact on cyclists in our City. This group includes parents, teachers, motor vehicle instructors, police officers, engineers, planners, bicycle retailers/renters and pedestrians. Figure 21 outlines some channels through which some of these groups can be reached. However, there is no formal channel through which they can all be reached. Comprehensive distribution of informational brochures and use of the media will be generally the most effective means of educating these remaining groups of cyclists requirements, rights and responsibilities. City of Vancouver Staff can be educated internally through bicycle videos and informational brochures.

HELMET CAMPAIGN

The human skull is very vulnerable - an impact of only 7 to 10 km/h can shatter it. A child's skull is even more vulnerable with a lower tolerance to impact trauma and the likelihood of severe head injury is quite high from even a short distance fall (ref. 9). In Vancouver over 36% of all bicycle accident injuries requiring hospitalization included head injuries (see 'Accidents'). In Canada 90% of all cyclists fatalities involved head injuries. It has been suggested that between 70-90% of the deaths due to head injuries would be prevented through the use of a helmet effective in cushioning a severe blow (ref. 9). With these staggering statistics it is surprising to see that only a small percentage of most cyclists wear helmets. A helmet campaign encouraging the use of helmets is required in order to effect a drop in these accident statistics. Information outlining why one should wear a helmet and what kind to buy should be relayed to the public. Some examples that can be used are:

- helmet safety brochures (given to children at school, attached to new bicycles, community centres)
- promotions in printed and electronic media (public service announcements)
- helmet with a new bicycle promotional campaign
- school bulk helmet purchase campaigns
- helmet promotion posters (schools, community centres)
- encourage all film production houses and advertising agencies to include helmets in bicyle-riding sequences
- compulsory helmet use for all school cycling activities
- encourage helmet use by students riding to school
- helmet subsidy scheme

Helmet campaigns have proven successful in Seattle, Washington; Missoula, Montana; Eugene, Oregon; and Melbourne, Australia (see Figure 22). In order to achieve this goal, a Bicycle Helmet Committee consisting of representatives from ICBC, the Bicycling Association of B.C. (BABC) and the B.C. Medical Association (BCMA) has been formed. The Helmet Committee's primary objective is to produce promotional material that can be used across the province.

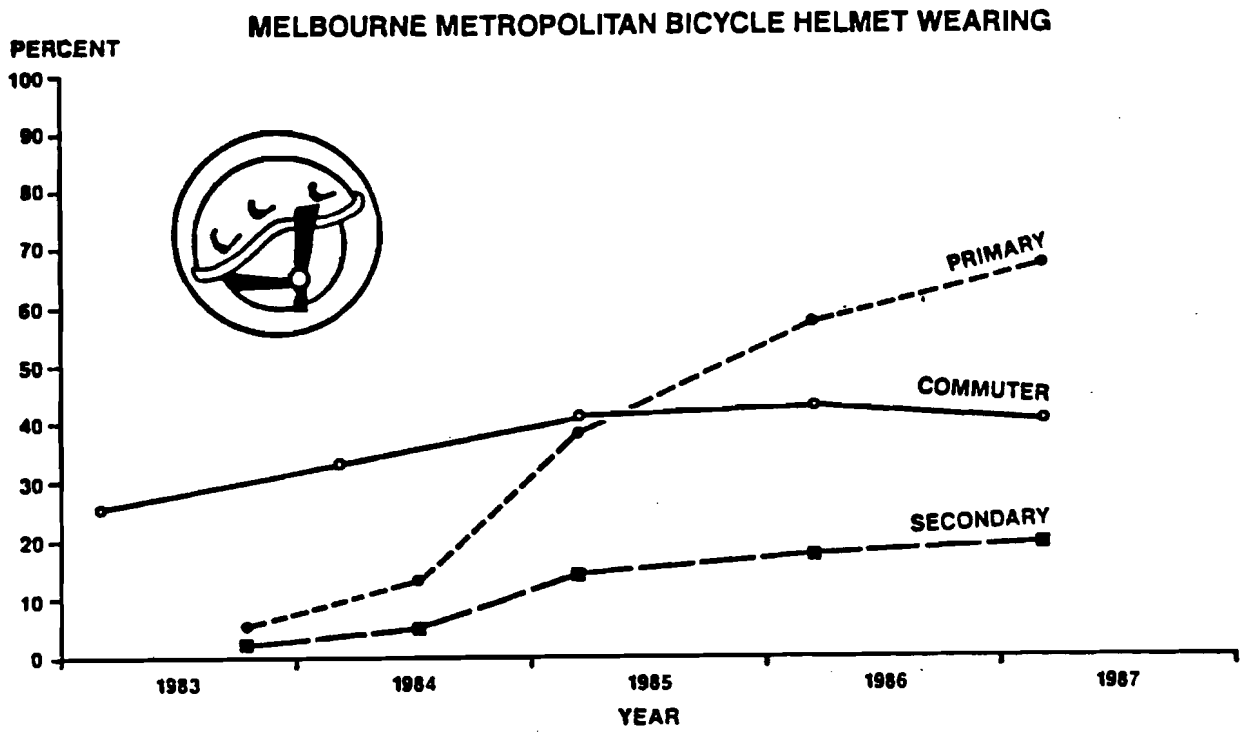


Figure 22 - Melbourne, Australia Helmet Campaign Impact (ref/ 10)

The question of mandatory helmet use is an issue commonly raised in safety conscious communities. Before mandatory helmet use is considered, however, one must look at the feasibility of enforcing such a regulation. In Vancouver, that would mean dealing with the majority of cyclists. Our Police Department would not have the staff to enforce mandatory helmet use. It has been Australia's experience that mandatory helmet use can only be effective once 70% voluntary helmet use is achieved. Accordingly, cyclists must first be encouraged to wear helmets through the previously mentioned programs until a majority of the cyclists use helmets. Only then is it feasible to consider mandatory usage.

RECOMMENDATIONS:

29) That a City-wide helmet campaign be implemented to reduce present cyclist injuries.

30) That future mandatory helmet use be considered when the majority of cyclists are voluntarily wearing helmets.

ENFORCEMENT

The third vital component of a successful bicycle plan is enforcement. Without a strict enforcement program education efforts will be to no avail. Cyclist behaviour is unlikely to improve unless the information reaching the cyclist is reinforced through the enforcement of existing traffic laws and regulations governing cyclists.

As noted earlier, over 52% of Vancouver Cyclists are under the age of 16 (see 'Cycling and Cyclists in Vancouver'). With this being the case, an enforcement program must be structured to deal with violations made by children of various ages. Presently, bicycle enforcement has not been a high priority for the Vancouver Police Department partly due to the dilemma of minimum age of legal responsibility and partly due to manpower constraints. In Vancouver we note that a large percentage of the cycling population are knowingly committing traffic offences (see 'Vancouver Bicycle Survey'). In particular we summarize the most common offences as follows:

44% ride on sidewalks
33% run stops signs
21% run red lights
19% ride through crosswalks in use
17% cycle at night with no lights
9% ride against the flow of traffic

With the increasing number of bicycle accidents and an increase in public awareness of the problem, bicycle enforcement should be reconsidered as a higher priority. To be effective, increased enforcement should be geared towards the prevention of certain types of behaviour and should be continually re-evaluated to track conformance. Such a selective traffic enforcement program (STEP) allows for a more efficient use of manpower.

Other road users must also be made aware that the rights of cyclists will also be protected by enforcement of present traffic laws and regulations. The prevention of bicycle thefts through Bicycle Identification/Registration programs also plays an important role in a successful bicycle enforcement program.

EXISTING TRAFFIC LAWS AND REGULATIONS

As detailed in Appendix H, Vancouver cyclists are governed by both the provincial regulations of the B.C. Motor Vehicle Act and the municipal regulations of the Vancouver Street and Traffic By-Law (see Table 3). In general, a cyclist has the same rights and duties as a driver of a vehicle with some additional duties. Most provincial and municipal regulations have proven effective. Some minor refinements may be considered, however, to reflect some present day accepted practices. Present interpretation of the Street and Traffic By-Law (sect. 59) and the Motor Vehicle Act (sect. 185-26) is not open for a cyclist to claim an entire lane for his or her own safety. In addition, the feasibility of allowing the extended right arm right-turn signal for cyclists should also be investigated. Traffic regulations in many American states has been updated to allow cyclists to claim an entire lane when required, as is extended right arm right turn signals, when preferred. In cases where both the provincial and municipal regulations overlap, the regulations set by the higher level of government supersede those of any lower level of government (BC MVA governs). The police officer may, however, issue a ticket under either of the regulations.

TABLE 3
SUMMARY OF TRAFFIC LAWS AND REGULATIONS GOVERNING CYCLISTS

Offense	Section		Fine($)
Riding on sidewalk	185-2-a	MVA	75.00
Must ride on right side of roadway	185-2-b	MVA	75.00
Riding two abreast	185-2-c	MVA	50.00
Riding without at least one hand on handle bars	185-2-d	MVA	50.00
Fail to ride on seat	185-2-e	MVA	50.00
Carrying passenger on cycle	185-2-f	MVA	50.00
Riding when prohibited by signs	185-2-g	MVA	50.00
Fail to ride on bike pathway	185-3	MVA	50.00
Riding while attached to vehicle	185-4	MVA	50.00
Fail to have headlight at night	185--5	MVA	75.00
Fail to have taillight or reflector at night	185-5	MVA	75.00
Riding without due care and attention	185-7	MVA	75.00
Bicycle must be equipped with a bell	55	By-law 2849	15.00
Cycle on sidewalk	60	By-law 2849	25.00
Cycle on sidewalk footpath	14(h)	Parks By-law	25.00
Cyclist wearing head-phones (both ears)	60(A)	By-law 2849	15.00
Cyclist fails to state correct name & address	60(B)	By-law 2849	Arrest
Obstruct Police Officer in course of duty	118	Criminal Code	Arrest

Whether to ticket under the MVA or a City By-law generally depends on the seriousness of the offence and the attitude of the offender. As seen in Table 3, By law fines are generally much lower than MVA fines. In some cases, a traffic violation committed by a cyclist may not be listed as requiring a fine, but rather points. These violations are generally reserved as fines since a point violation committed on a bicycle cannot be transferred to the cyclist's driving record. The cyclist must state his/her proper name and address and can be arrested if he/she fails to do so (Section 118 - Criminal Code, Section 108 - By-law 2849). If a cyclist receives a ticket for violating a City By-law the collection procedure is different from that of a

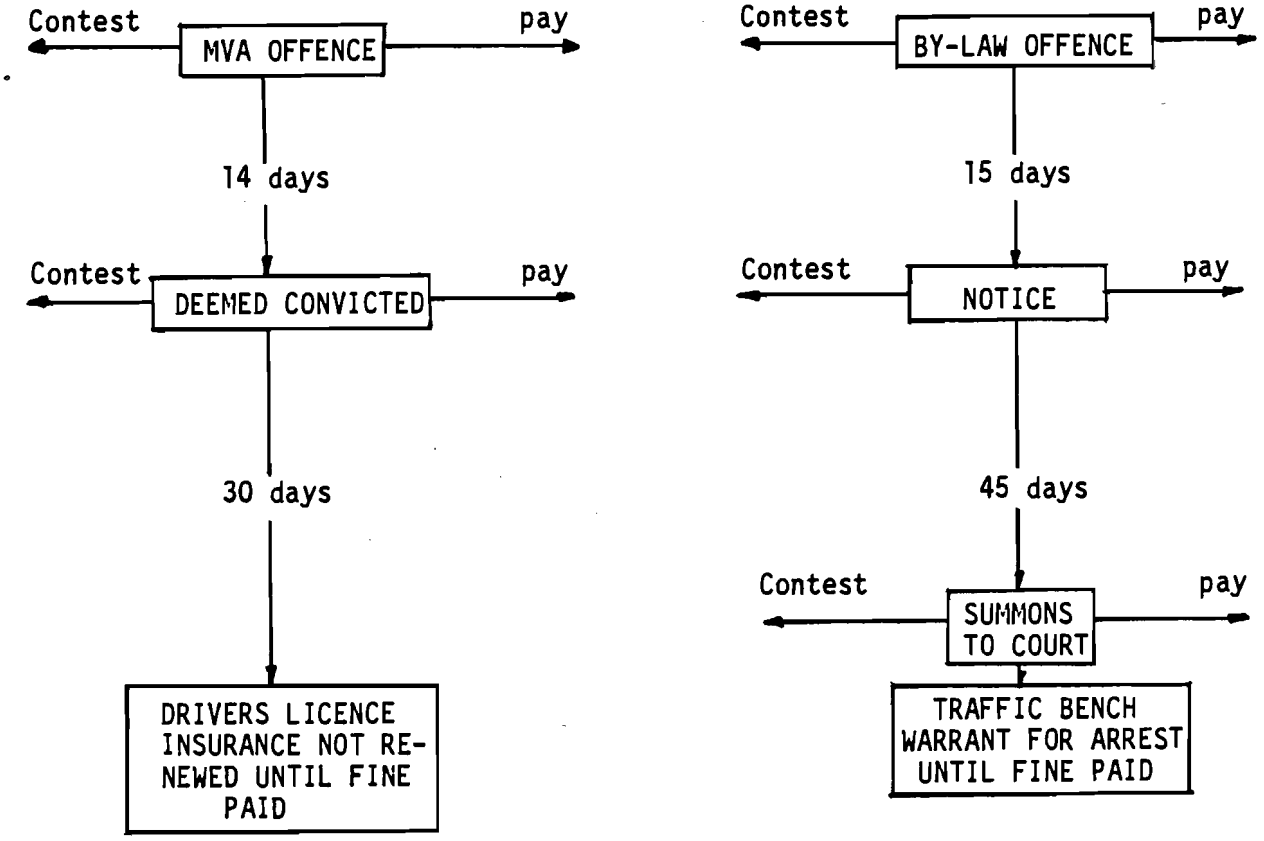


FIGURE 23 - FINE COLLECTION STRUCTURE FOR MVA AND BY-LAW VIOLATIONS

MVA violation (see Fig. 23). In the case of a By-law offence, should the offender not pay the fine and fail to appear in court, a traffic bench warrant will be issued for his/her arrest. This means the offender is arrested if he/she is ever stopped by a police officer (for any reason). In the case of a MVA offence non-payment and failure-to-appear results in the offender's name being flagged in the provincial computer database. In this case the offender is not allowed to renew his/her drivers license and/or insurance until the fine is paid or until six years has passed (ref. 13). Originally the Court Services Branch advised they would support a plan to proceed on a 'deemed convicted' system for bicyclists who held B.C. driver's licenses. We are now advised this sytem will not be available. Although there will be a deemed convicted no follow up occurs if the ticket is not paid. The assumption made in the above two collection procedures is that all cyclists have a drivers license. The fact is that all cyclists under the age of 16 and many people older than 16 do not have a drivers license. This raises the issue of whether the independent licensing of cyclists is feasible. From the above discussion we see that the licensing of cyclists may have some definite advantages, these are:

1. Improved regulation and tracking of cyclists.
2. Immediate photo identification of a cyclist (traffic offender/accident victim).
3. Ensured education and examination of all cyclists receiving a license.
4. Improved cyclist compliance to traffic laws and regulations due to awareness of enforcement.

To incorporate cyclists licensing into the existing licensing program would be both expensive and difficult to enforce. A licensing program would require a system equal to the motor vehicle licensing system. A method of renewal of licenses, age of licensee, etc. would have to be established. Such a program may also discourage cycling for those people who could not afford the high license fee that would be required to administer the program. For these reasons, it may not be in the best interest of the general public to license all cyclists. It may, however, be feasible to license cyclists who use their bicycles for commercial purposes.

BICYCLE COURIERS

Downtown bicycle couriers have been used by Courier companies in Vancouver since 1982 (ref. 14). From their initial introduction into the courier business, the majority of courier companies have hired bicycle couriers due to their fast delivery and inexpensive operation. Most of the downtown couriers are paid on a piece rate (or per delivery commission). Courier companies have found that a piece rate payment structure motivates the courier to deliver as quickly as possible. With commissions ranging from 65 to 75%, and an average of 40 to 50 trips per day, it is not uncommon for a courier to earn $100/day (ref. 15). As a result, the industry has grown to a point where bicycle couriers generate over $2.5 million worth of courier business per month (ref. 16).

Unfortunately, due to the commission structure with which the majority of couriers are paid, delivery times seem to take priority over traffic safety. Bicycle couriers are becoming well known for their general disregard and violation of traffic laws and regulations. The most serious offences commonly made by many couriers include:

- riding on sidewalks
- unsafe lane changes
- running red lights/stop signs
- riding on crosswalks
- riding without due care and attention
- failure to signal change of direction
- illegal passing procedures

Such violations are a threat to pedestrian safety and promote motor vehicle accidents. With no means of identification many of these violations go unreported. Vancouver Police have found that repeat offenders can accumulate up to 4 or 5 violations per day (ref. 15). As noted earlier, outstanding fines for By-law offences are not collected until couriers are arrested for outstanding Traffic Bench Warrants. And if a courier doesn't have a drivers

license, there is presently no means of ensuring payment of fines for violations of the Motor Vehicle Act (see Figure 23).

In order to effectively control the bicycle courier problem, the City of Vancouver in consultation with private industry, is in the process of implementing a Commercial Bicycle Operator Licencing Program. The licensing program will be structured to ensure minimum road knowledge of the cyclist, a means of cyclist identification, and strong punitive action for repeat offenders. In particular, the Commercial Bicycle Operator Licensing Program will include the following:

1. That all bicyle couriers be examined on traffic skills, and traffic laws and regulations.

2. That all bicycle couriers be required to carry photo identification listing the operator's identification number, name and address as well as that of his/her employer.

3. That bicycles used by licensed operators display a license plate with the operator's identification number, and that such plate be located on the bicycle so that it is visible from the rear.

4. That the licensed operator be fined and/or have his/her license revoked upon accumulation of traffic offences.

With the above program in place and increased enforcement, a marked decrease in traffic violations can be expected. The licensing program will be run through the Permits and Licenses Department.

RECOMMENDATION:

31) That a Commercial Bicycle Operator Licensing Program, as outlined in this report, be implemented in order to control the present downtown bicycle courier problem (COMPLETED).

ONE WEEK BICYCLE ENFORCEMENT CAMPAIGN

Prior to increased bicycle enforcement, a one week bicycle enforcement campaign can be very effective. Similar to that run in Victoria (from September 28 to October 4, 1987), such a campaign can obtain overwhelming public support through increased cyclist awareness of existing laws and regulations. The week prior to the one week campaign would consist primarily of a media blitz. Utilizing radio stations, newspapers and possibly television, the public can be made aware of the upcoming program and in turn be educated at the same time. The distribution of informational brochures through schools, community centres and bicycle shops would also be effective.

During the actual week of enforcement, the campaign would require 3 to 5 officers per day who would be specifically assigned to enforce all traffic laws and regulations governing cyclists. The enforcement officers could also be supplied with informational brochures outlining traffic laws, regulations and safety tips.

The program would be geared towards cyclists of all ages. Children would have to be dealt with according to their age. A reasonable outline to follow would be as follows:

Age	Action For Traffic Offence
1 - 11	Stop child and inform of offence and reasons why not to commit such an offence. Informational brochure provided. Take name and address to send form letter to parents.
12 - 15	Stop child and inform of offence. Legally entitled to a ticket under "Young Offenders Act", but would be better to contact parents and explain violation. Informational brochure provided.
16+	Warning of first offence or ticket and explain violation. Informational brochure provided.

During the week of enforcement, daily media updates are essential to the success of the campaign (ref. 17). As run in Olympia, Washington, an Enforcement Diversion Program can also be incorporated into the enforcement week where offenders could attend an education course in lieu of fines.

The one week bicycle enforcement campaign in Victoria was successful in that it greatly increased public awareness of the rights and duties of cyclists and that it obtained overwhelming public support (ref. 17). One hundred and six tickets were issued creating a gross revenue of approximately $7,000 (excluding staff time costs). The Victoria Police Department plans to expand its bicycle enforcement program to run one week out of every six weeks between April 1 and October 31 of each year.

RECOMMENDATION:

32) That the Vancouver Police Department in cooperation with the Bicycle Advisory Committee run a One Week Bicycle Enforcement Campaign, as outlined in this report.

BICYCLE REGISTRATION

The registration of bicycles in Vancouver began in 1959 and ran until 1978. During this period bicycle registration shifted between being compulsory and voluntary. in 1971 a new bicycle storage facility was built and the Bicycle Registration Unit was expanded to include two Police Officers, two Bicycle Inspectors and one Clerk. In 1977 a review of the comparative effectiveness of the Unit (as opposed to costs) was undertaken by the Planning, Research and Inspections section. As a result of this study, the two police officers were withdrawn from the Unit and the Unit itself was disbanded in 1978. In 1978, City Council withdrew By-law 4572 requiring the registration of bicycles. One of the main arguments in the police report was that bicycles should not be treated any differently than other valuable property. They reasoned that bicycles should be included in the newly instituted identification programs whereby owners were being asked to mark valuable property with their social insurance number. Unfortunately, considerable debate exists within the cycling community regarding the accuracy of these assumptions, due to the fact that the SIN cannot be easily traced to the owner as would a drivers license number and the program is not effective unless the majority of bicycles are

marked/registered. The bicycle should be treated differently from other valuables since it is a vehicle. As with motor vehicles, the bicycle must be easily identifiable when stopped by a police officer.

For these above reasons, it is recommended that staff time and funding be put into a Vancouver Bicycle Identification Program as opposed to a Province wide registration program in order to reduce the present theft rate and improve rider identification (see 'Bicycle Identification Program')

The Bicycle Association of British Columbia (BABC) has recently introduced a province-wide bicycle registration program for their members. BABC members mark their bicycles by means of a decal placed on the underside of the top tube. The Vancouver Police or RCMP notify the BABC of recovered bicycles with the BABC decal.

BICYCLE THEFT PREVENTION

Bicycle thefts in Canada have grown to a point where there is a real cause for concern, requiring action by the RCMP and local police departments. Over $110 million worth of bicycles were stolen in 1986 in Canada (ref. 18). In Vancouver, 15 to 20 bicycles are stolen per day totalling over 500 missing bicycles per month (ref. 18). Over 47% of Vancouver cyclists have at one time had their bicycle stolen (see 'Vancouver Bicycle Survey'). The reasons for this extremely high theft rate are simple:

1. There is no easy means of marking bicycles.
2. Bicycles are generally easy to steal.
3. One cannot recognize a stolen component unless it is marked.
4. Enforcement against bicycle theft is difficult.
5. Insurance companies readily pay for bicycle theft.

From Figure 24 we see the bicycle registration program run from 1959 to 1978 did not have a significant impact on the number of stolen bicycles in Vancouver. This can be mainly attributed to the fact that the one

registration decal did not discourage bicycle theft for components. Decals could also be easily removed from the frame leaving the stolen bicycle inidentifiable. Bicycle Identification Programs, on the other hand, have proven more successful.

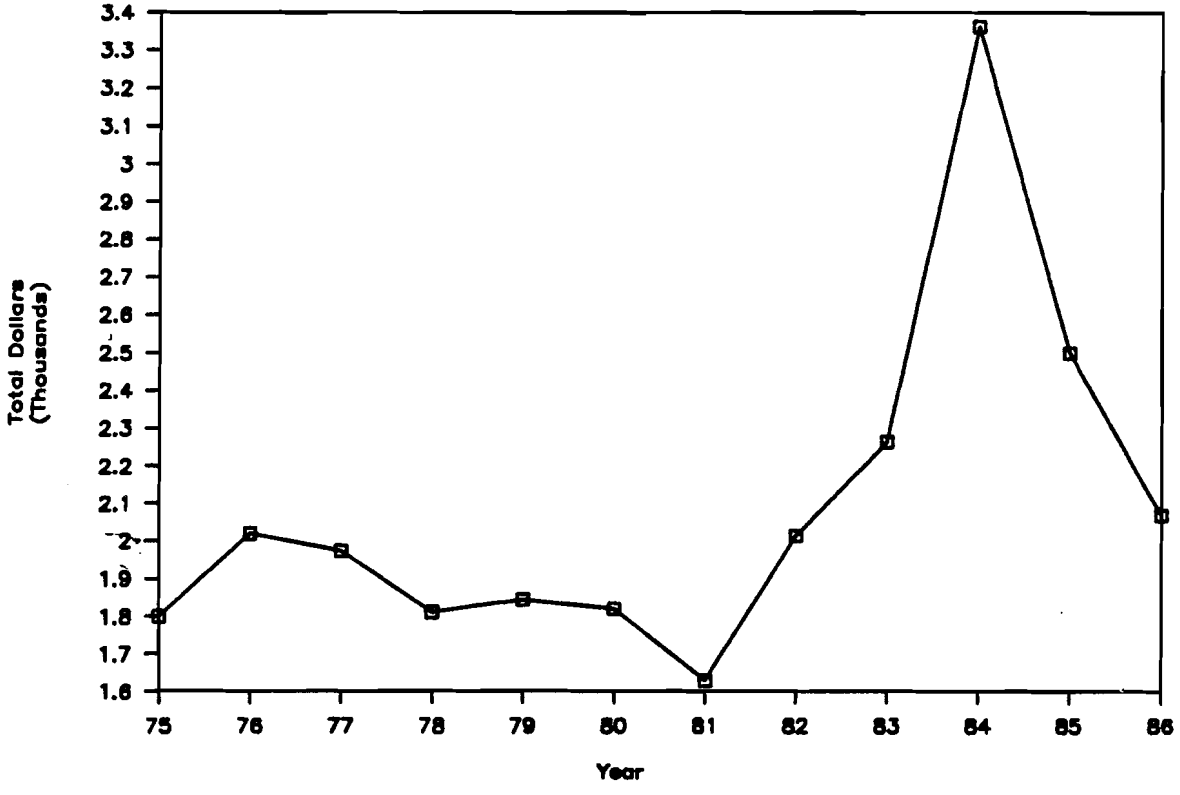


FIGURE 24 - REPORTED BICYCLE THEFTS, VANCOUVER 1975-1986 (Ref. 25)

BICYCLE IDENTIFICATION PROGRAM

The RCMP in co-operation with various municipalities have run a Bicycle Identification Program in an attempt to reduce bicycle thefts. In this program,the bicycle and all its major removable components are marked with the owner's/parent's driver's licence number. In cases where a drivers licence number is not available the social insurance number is used. The advantages of the program are as follows:

1. As the majority of stolen bicycles are stolen for parts, the program discourages this practice by making each part identifiable. Resale of these items also becomes difficult for the thief.

2. Use of a drivers licence number as identity marks enables police to determine the owner of the bicycle in minutes. It also provides a tool for the police to assist in identifying the rider of a bicycle or to corroberate the name given by a rider who does not produce I.D.

3. The program enables police to recognize a stolen bicyle by noting that only one part of the bicycle is marked or that two different marks appear on the same bicycle.

4. Prospective purchases of used bicycles can have the identification number checked to confirm that the bicycle is not stolen.

5. The recovery rate of stolen bicycles has increased, decreasing the number of fraudulent bike theft claims.

Police can look for irregularities on a bicycle to help spot stolen bicycles. The size of the bike, irregular components, odd color coordination and damaged areas from removed components signal that the bicycle may be stolen. The bicycle can then be checked for identification markings. A similar program run in Cranbrook, B.C. for 2 years reduced the theft rate by 40%. The above identification program coupled with trained observations made by police officers and secure bicycle parking facilities can greatly reduce bicycle thefts in our City.

RECOMMENDATION:

33) That the Vancouver Police Department consider working with local RCMP to initiate a Vancouver Bicycle Identification Program to reduce bicycle theft.

34) That the Vancouver Police Department prepare an informational memo to all on-street officers outlining methods of identifying a stolen bicycle.

BICYCLE INSURANCE

In addition to the Proposed Bicycle Identification Program bicycle owners should ensure that their bicycle is insured against theft. Bicycle insurance is generally not available as a single policy but the theft of ones bicycle is usually covered under household insurance. Most insurance policies, however, have recently put a "roof" on bicycle theft coverage due to the high theft rate. Cyclists should always confirm their bicycle theft coverage when negotiating household insurance.

The most effective insurance against theft is a good lock and a secure facility to which to secure one's bicycle. The bicycle plan is recommending substantial provision of secure bicycle parking facilities in the Vancouver Parking By-Law (see 'Bicycle Parking'). These provisions for new developments, in addition to improved parking facilities at recreation and community service centres, will greatly improve security against theft.

In addition to theft and damage in the course of theft, cyclists are exposed to damage and injury claims when involved in motor vehicle accidents. Presently, cyclists are not required to carry accident insurance. When involved in an accident in which the motorist is 100% at fault, damage and injury claims are covered under the motorists Third Party liability coverage (Public Liability Property Damage). All motorists are required to carry a minimum $200,000 in Third party liability coverage but can increase coverage to $15,000,000. Underinsured Motorist Protection does not apply here since

cyclists are not required to carry accident insurance. In the case where the cyclist is at fault, the motorist, pedestrian or other cyclist must puruse legal action to retrieve damages. The Bicycling Association of British Columbia (BABC) has provided all their members with Third Party Liability Coverage of $1,000,000 to cover injury and damage to a third party. In addition, the BABC plan covers all personal medical expenses in excess of BC Medical coverage, up to $10,000 per year. This program is an ideal opportunity for cyclists to obtain improved third party coverage. BABC general membership costs $25 per year and can be obtained at the BABC office at Sport B.C.

ENFORCEMENT ON RECREATIONAL ROUTES

Vancouver has a number of segregated recreational facilities on which enforcement is difficult. The most prominent areas in which enforcement is required are those where heavy pedestrian volumes share the same facility. These areas iclude the Burrard Street Bridge section of the Habitat Bicycle Route and the Stanley Park Seawall (see 'Existing Recreational Routes'). Enforcement on the Stanley Park Seawall is generally done on horseback and during peak-use periods.

A large number of cyclists riding on the Stanley Park Cycle Routes are tourists with rental bicycles. In general, most tourists are unfamiliar with local traffic laws and regulations governing cyclists. One method of educating bicycle renters would be to provide all Vancouver Bicycle Rental outlets with informational pamphlets as required reading before rental. The pamphlet would outline all traffic laws and regulations in addition to park rules and pedestrian crossings (see Appendix E).

Many communities have increased enforcement through the use of deputized officers on bicycles. Such "bike cop" programs have proven successful in areas outside of the City such as segregated recreational facilities and University campuses. Bike cops are an inexpensive method of enforcement due to the low labour and vehicle maintenance costs. The University of California

in Davis, California has successful used a deputized police officer to control bicycle traffic for several years now. The program at the university gives the bike cop the authority to ticket moving violations and has been effective in enforcing common cycling violations: stopping at stop signs, red lights, riding on the sidewalk, and riding at night without lights (see 'Cycling and Cyclists in Vancouver'). Seattle is using bike cops in the downtown area to enforce criminal and traffic offences. The bike cops have proven effective in response time and apprehension due to their manoeuverability in traffic. In Vancouver, bike cops have been used at the University of British Columbia by the RCMP. The two RCMP officers, supplied with mountain bikes, have been effective in controlling the UEL trails and traffic violations on campus streets. A similar program using Vancouver police officers on mountain bikes may be effective on the Stanley Park Seawall and English Bay area. Police officers involved in the program would be required to complete a CCA Can-Bike Skills 2 course before implementation of the program, in order to ensure such officers have the necessary cycling traffic skills required to safely negotiate city traffic and set a good example for other cyclists to follow.

RECOMMENDATIONS:

35) That an informational pamphlet, outlining cycling traffic laws and regulations, be supplied to all bicycle rental outlets for distribution to rental customers.

36) That the Vancouver Police Department consider the use of trained police officers on bicycles to enforce traffic laws and regulations governing cyclists on the Stanley Park Seawall and the English Bay area.

ENCOURAGEMENT

Up to this point the plan has discussed ways in which Engineering, Education and Enforcement programs are interdependent in achieving integration of the bicycle into the existing transportation network and in achieving widespread acceptance of the bicycle as a vehicle. Just as the proper use of improved engineering facilities is dependent on cyclist education and education is dependent on enforcement, so are all the proposed facilities and programs dependent on increased usage. The full benefits of a bicycle conscious city are attained through increased cycling. Cycling can be encouraged in three ways:

1) by improved end-of-trip facilities
2) by promotional/informational programs
3) by intermodal transit links/facilities

END-OF-TRIP FACILITIES

The most effective method of encouraging commuter cycling is to provide convenient end-of-trip facilities at the workplace. When a cyclist arrives at his/her place of work he/she requires a secure parking facility to which the bicycle can be locked, a location in which to change (and store one's clothing, helmet, etc.) and, ideally, shower facilities. Therefore, the three key end-of-trip facilities for a commuter cyclist are:

1) parking facilities
2) lockers
3) shower facilities

In general an addiional 1-2% of an employment centre's workforce can be expected to commute by bicycle through the installation of secure bicycle parking facilities and an additional 1-2% increase can be expected if showers and lockers are also supplied (ref. 23). In Vancouver, 23% of the cyclists

surveyed are discouraged from riding their bike due to the lack of end-of-trip facilities at their work place (see 'Vancouver Bicycle Survey'). Unlike motor vehicles, the bicycle has little protection against theft of its components and no protection against weather. As noted earlier (see 'Bicycle Parking') bicycle parking facilities must offer varying levels of protection against damage, theft and weather depending on the duration of use and location of facility. Bicycle Parking facilities which do not meet the required level of service are avoided by cyclists. Substandard facilities result in cyclists using nearby parking meters, traffic control signs, lamp standards, trees and fences. This practice is illegal and may be hazardous for pedestrian traffic (By-law 2849 - sect. 71(1)). It is therefore essential that the guidelines for proper parking facilities be followed in order to provide effective convenient bicycle parking that will be used. In addition to employment centres encouraging bicycle commuting through the provision of parking facilities, improved parking facilities at public service outlets would encourage city-wide cycling. Improved bicycle parking facilities at Vancouver schools, libraries, community centres, parks, museums, and other public buildings should be considered as a vital component in our City encouragement program. The provision of such facilities would set an example for the private sector to follow.

While parking facilities are required by all by cyclists, shower and locker facilities are generally only required by commuter cyclists. Employment centres should be encouraged to provide such facilities if bicycle commuting is to be encouraged. Additional benefits for noon hour exercisers and late workers can also be realised by such facilities. Recommendations at the development permit stage can be made to developers for such facilities. Such facilities can usually be accommodated in present developments by reallocation of existing washroom facilities or as part of other fitness amenities.

Some employment centres in California have found a marked increase in the number of commuting cyclists by providing end-of-trip facilities. Palo Alto has ordinances requiring bicycle parking, showers and lockers in all new employment centres. Accordingly, a 1980 census has shown that 11% of all work

trips in Palo Alto are made by bicycle. The Xerox Corporation headquarters have 18-20% of their workforce commuting to work by bicycle through the installation of parking, showers and lockers (ref. 23). Lawrence Livermore Labs have 10-15% of their work force commuting by bicycle as a result of the installation of similar end-of-trip facilities. Since the installation of improved bicycle parking and shower facilities at Vancouver City Hall, the number of employees commuting by bicycle has climbed to over 4%. Employment centres can further encourage their workforce to commute by bicycle by offering additional promotional and informational programs.

RECOMMENDATIONS:

37) That the City of Vancouver provide secure bicycle parking facilities at Vancouver schools, libraries, community centres, parks, museums, and other public buildings.

38) That private developers be encouraged to provide shower and locker facilities in the development permit application stage.

PROMOTIONAL AND INFORMATIONAL PROGRAMS

Cycling in Vancouver can be further encouraged through programs run by individual employment centres and by City wide promotional campaigns. Employees are usually hesitant about cycling to work for several reasons. The most common reasons are:

1) Time
2) Safety
3) Weather
4) Inconvenience

The argument that cycling takes more time than driving to work is situation dependent. Cycling is perceived to take more time than driving, but in urban areas during rush hours, the bicycle is as fast or faster than driving a motor vehicle. This is mainly due to the cyclist's ability to safely pass areas of heavy congestion and generally park closer to the employment centre.

Commuting by bicycle also saves exercise time as this is accomplished during the trip to and from work. Encouragement programs can include the provision

of a BABC Vancouver Bicycle Map with local commuting times added. A common deterrent for Vancouver commuters is fear of traffic. Over 35% of Vancouver cyclists are discouraged from riding due to their fear of traffic (see 'Vancouver Bicycle Survey'). Traffic skills and confidence can be increased through CCA approved Can-Bike education programs which can be offered through the employment centre to all interested employees. Riding in adverse weather, which is a deterrent for over 51% of Vancouver cyclists, is also covered through education of employees. The inconvenience of cycling is overcome through provision of proper end-of-trip facilities.

Some employers further encourage bicycle commuting by offering financial incentives. Varion Industries, in California, offers its employees a 50¢/day bike commuter subsidy. As a result, 5% of their work force commute by bicycle (ref. 23).

In Vancouver, Bike to Work Day or "Working Wheels" is an excellent opportunity for employers to create an initial interest in bicycle commuting. Organized and promoted by the CCA in 1987, Working Wheels is a one day encouragement campaign for commuter cycling. Employers across Canada are encouraged to take part in this drive to promote bicycle commuting by encouraging their employees to ride to work. Such a Bike to Work campaign can be enhanced by other activities such as a cyclists breakfast or noon hour BBQ and bicycle safety and maintenance clinics.

On a City-wide basis cycling can be encouraged through a number of high participation events. Bicycle Sundays, promoted as a family cycling event, began in 1969. Up until recent years the event has been held in Stanley Park on Park Drive. Even though the road closure has been popular with cyclists, low participation rates were evident as a result of the early hours (8 AM - 11 AM). Extension of the road closure into the afternoon was in conflict with the restaurant owners who depend on motorist clientelle. In 1987, in an attempt to find a new location, Bicycle Sunday was held in the False Creek Area. A bicycle clinic, information booths and a Police Operation

Identification Booth accompanied the successful event. Bicycle Sundays should be continued in Vancouver as part of Vancouver's encouragement campaign. Fund raising Wheelathons or cyclothons held in the city should be supported and encouraged whenever possible.

The Encouragement of cycling through a media campaign will be most successfully accomplished when combined with the proposed education campaign (see 'Education'). This would ensure that increased participation will not be accompanied by an increased accident rate, as was the case during the 1984 Transit strike in Vancouver (see 'Accidents').

RECOMMENDATIONS:

39) That the Park Board continue to hold Bicycle Sundays with the objective of encouraging safe cycling in Vancouver.

40) That fund raising cycling events be encouraged and supported by the City of Vancouver whenever possible.

INTERMODAL TRANSIT

Over one million people travel in and out of Vancouver each day from surrounding municipalities (see Table 4). Approximately 16% of these trips are made using Transit and over 84% are made by motor vehicle.

TABLE 4
Trips To/From Vancouver From Surrounding Municipalities
In a 24 Hour Period, 1985 (Ref. 19)

	TRANSIT	AUTO + PASSENGER	TOTAL
TO VANCOUVER	163,042	838,022	1,001,064
FROM VANCOUVER	165,219	834,136	999,355

If intermodal transit links and facilities for cyclists were provided, we could expect a significant portion of these trips to include cycling in combination with another mode. The encouragement of dual mode transport has many benefits. Most significantly, dual mode transport with bicycles as one mode would decrease the number of motor vehicles driven into the downtown core. The resulting benefits being decreased traffic congestion and lower demand for motor vehicle parking. Dual mode transport involving bicycles can take three forms:

- o car, park and bike
- o bike, park and ride
- o bike, carry and bike

Car, Park and Bike

The car, park and bike form of dual mode transport is most common with recreational cyclists, but also has benefits for the daily commuter. The driving portion of the trip overcomes the long distance barrier and the cycling component allows inexpensive, convenient parking at the employment centre. In general, no specific facilities are required for this form of transport besides proper end-of-trip facilities and some transit node parking facilities. The commuter can park his/her vehicle at any location where it can be safely and legally left during the working day. This combination does require the ability of the vehicle to transport a bicycle either inside, or by means of a bicycle rack.

Bike, Park and Ride

The most popular form of dual mode transport is the bike, park and ride combination. Commuters from surrounding municipalities need only to ride to the nearest transit exchange, park their bicycle, and ride to work. In the Netherlands, where dual mode transport is encouraged, 35% of all Dutch commuters arrive at a public transport station by bicycle (Ref. 24). And where regulations do not permit the bike to be carried on public transport, it is also popular to park a bicycle at the other end of their public transport journey in order to cycle to their final destination. Approximately 12% of all Dutch commuters store a second bicycle for the final leg of their trip to work (Ref. 24). The bike park and ride form is popular with public transport departments since vehicle carry-on conflicts are avoided, use of the transit system goes up, and bicycle park and ride parking facilities are much more cost effective than motor vehicle park and ride parking facilities. The provision of proper bicyle parking facilities also increases the station catchment area of commuters who would otherwise take their car. The greatest provision is in Japan, where over 3 million, bicycle parking spaces are provided at a total of 636 locations. It is estimated that 15% of Japanese rail commuters use a bicycle for the journey to the station, and the numbers

are increasing at 20 per cent per year (Ref. 1).

In Vancouver, the regional transit system includes buses, the Seabus, and the Skytrain (ALRT). With respect to the Seabus, bicycle parking is provided only at the north Lonsdale Quay station. Unfortunately, the facility is in the open and is of the 'toast rack' or 'wheelbender' design providing no protection against weather and little protection against damage or theft. The southern terminus Waterfront station has no bicycle parking facilities. Of the 15 Skytrain stations, 12 have bicycle parking facilities and only 6 of these are undercover. Again, all of these facilities are of the 'toast rack' design. To encourage 'bike, park and ride' dual mode transit, these facilities could be improved. Bicycle parking facilities should be provided at the Waterfront, Granville, and Broadway SkyTrain stations. In cases where off street space is not available the provision of bicycle parking could be a joint City/BC Transit effort. Where possible, parking facilities should be located in highly visible covered areas. Facility design and location should be as outlined in this report (see 'Bicycle Parking'). Further enhancements at Seabus and Skytrain stations could include the installation of lockers and the signing of parking facilities.

In Burnaby and Vancouver, the majority of Transit exchanges coincide with the above noted Skytrain stations. There are, however, a large number transit exchanges in the region with off-street facilities. BC Transit has the opportunity to promote bike, park and ride dual mode commuting on a region wide basis by providing bicycle parking facilities at all such locations. These exchanges include:

University of B.C.	University Loop Blanca Loop
Vancouver	Dunbar Loop Kootenay Marpole Loop
Burnaby	Lougheed Mall
Richmond	Sexsmith Steveston
Coquitlam	Coquitlam Centre

North Vancouver	Phibbs Exchange
Surrey	Newton Exchange Scottsdale Mall
Ladner	Ladner Exchange
Tsawwassen	South Delta Exchange

At locations where transit exchanges are located on-street, the municipality should be encouraged to provide bicycle parking facilities.

RECOMMENDATIONS:

41) That BC Transit be requested to upgrade bicycle parking facilities at all Skytrain and Seabus stations as outlined in this report.

42) That BC Transit consider providing bicycle parking facilities at all Park and Ride locations and off-street transit exchanges.

43) That individual municipalities be asked to consider providing bicycle parking facilities at transit exchanges where off-street space is not available.

Bike, Carry and Bike

The final form of dual mode transport is 'bike, carry and bike'. In this case, the cyclist is to carry his/her bicycle on board the transit system to be used on the final leg of the journey. The advantage of this form of dual mode transport is the fact that the commuter only needs one bicyle. As with the 'bike, park and ride' mode, this mode can overcome major cyclist barriers such as long distance, water, tunnels, bridges, etc.

Whether or not to allow bikes on trains or rapid transit has long since been a point of controversy between transit officials and cycling advocates across North America. Transit officials have a legitimate concern that the safety (hence liability) and convenience of regular commuter services may be compromised by allowing bicycles. Even though such concerns exist, several rail lines have met the demand through innovative designs and planning. The Austrian Federal Railway System has successfully introduced bicycle provisions in 30 of their 120 electric rail cars. Each car is marked with a bicycle pictograph on the outside and is provided with a bank of hooks above folding

benches, capable of securely carrying up to 10 bicycles. Bicycles are also allowed on the San Francisco Bay Area Regional Transit System (BART) at all times except rush hours. On BART, commuter cyclists are required to take out a 3 year bicycle commuter permit (with a release of liability) at a cost of $3.00. Bicycles are allowed on the last car with a maximum of seven bicycles per car. California Transit (CALTRAN) also allows bicycles on their Transit Shuttle from the MacArthur BART station over the bridge to downtown San Francisco. This system has been operating successfully since 1974. In Montreal, Quebec, cyclists are allowed to bring their bicycles on the first and last car of the Metro Subway System on weekdays after 7:00 p.m. and all day on weekends and statutory holidays.

If such a system were considered for Vancouver's Skytrain, various issues would have to be dealt with. Access to the train is a major obstacle. During peak usage, stations are generally packed full with commuters. Bicycles may not mix well during such periods especially during queuing, loading and unloading. As with other systems, the only safe usage of the system by cyclists would have to be during low use periods (non rush hour and weekends). As the use of stairs and escalators by cyclists would be both hazardous and inconvenient cyclists would be required to use the elevators in all multi-level stations.

Bicycle access would therefore be permitted only at ground level stations and multi-level stations with elevators. The final obstacle to be dealt with would be safely loading/unloading the bicycle. As most rail lines have found, the best method is to provide a convenient location for bicycles near the door in designated cars only.

The Seabus is a very important link to downtown from the North Shore for commuters. Bicycles have been permitted on the Seabus on Saturdays, Sundays and holidays since 1979. Cyclists are required to pay double fare and are asked to board last and disembark last. This system has proven very successful with no notable conflicts or inconveniences. For this operation to be acceptable an area in the back of the Seabus would have to be designated

which would not prohibit access to lifejackets. This would be achieved by the removal of 2 or 3 of the 400 seats to provide a bicycle storage area. Lost revenue from lost capacity would be covered by the present double fare charge. With this in mind, it is recommended that bicyles be permitted at all times on the Seabus.

As noted earlier Caltrans operates a shuttle bus to downtown San Francisco which carries bicycles. It runs all year round, 5 days a week and 7 times a day. San Diego Transit has successfully equipped buses on 3 major bus routes with external bicycle racks (see Appendix I). Cyclists are allowed to board/unload only at designated stops. The racks have a capacity of 5 bicycles and are secured by the cyclist. A similar system in Greater Vancouver could be used to transport cyclists from Surrey and Delta to Downtown Vancouver in order to bypass the George Massey Tunnel. The Ministry of Highways presently runs a bicycle shuttle through the tunnel during the summer months, 4 times a day. For winter commuters, however, it would be more feasible to equip express buses with an external rack. Scheduling problems could be avoided by allowing cyclists to board only at major transit exchanges and unload at one or two locations downtown. Loading several bicycles on a well designed external rack, similar to the San Diego racks would generally take less time than it does for all the passengers to board at these locations. The cyclists could secure the bicyles before boarding and remove them at the designated stop downtown. Such a system would be relatively inexpensive and would:

- o encourage transit use
- o discourage highway cycling
- o decrease demand for downtown motor vehicle parking

In Summer recreational cycling on the Gulf Islands and Vancouver Island has become very popular with cyclists in the Greater Vancouver area. As a result the number of cyclists using the BC Ferries system has increased significantly in the last year (see Table 5).

TABLE 5

ANNUAL NUMBER OF CYCLISTS USING BC FERRIES (Ref. 26)

Year	Total Number of Cyclists
1984	48,429
1985	49,110
1986	48,864
1987 to October	80,146

What makes dual mode transport different on a ferry is the fact that all vehicles are left on the car decks while operators spend the passage on the passenger decks. The essential provision required in this case is proper bicycle parking facilities. It is recommended that BC Ferries Corporation provide improved bicyle parking facilities on the ferry car decks in order to safely encourage the present increased trend towards recreational bicycle touring.

RECOMMENDATIONS:

44) That BC Transit consider:

i) allowing cyclists to use the Skytrain system during non-peak periods (similar to Montreal and San Francisco)

ii) permitting bicycles on the Seabus at all times to facilitate North Shore commuting.

iii) equipping express buses from Surrey and Delta with external bicycle racks to transport cyclists from major transit exchanges to designated unloading points in downtown Vancouver (similar to San Diego).

45) That BC Ferries Corporation consider providing improved bicycle parking facilities on ferry car decks in order to safely encourage the present increased trend towards recreational bicycle touring.

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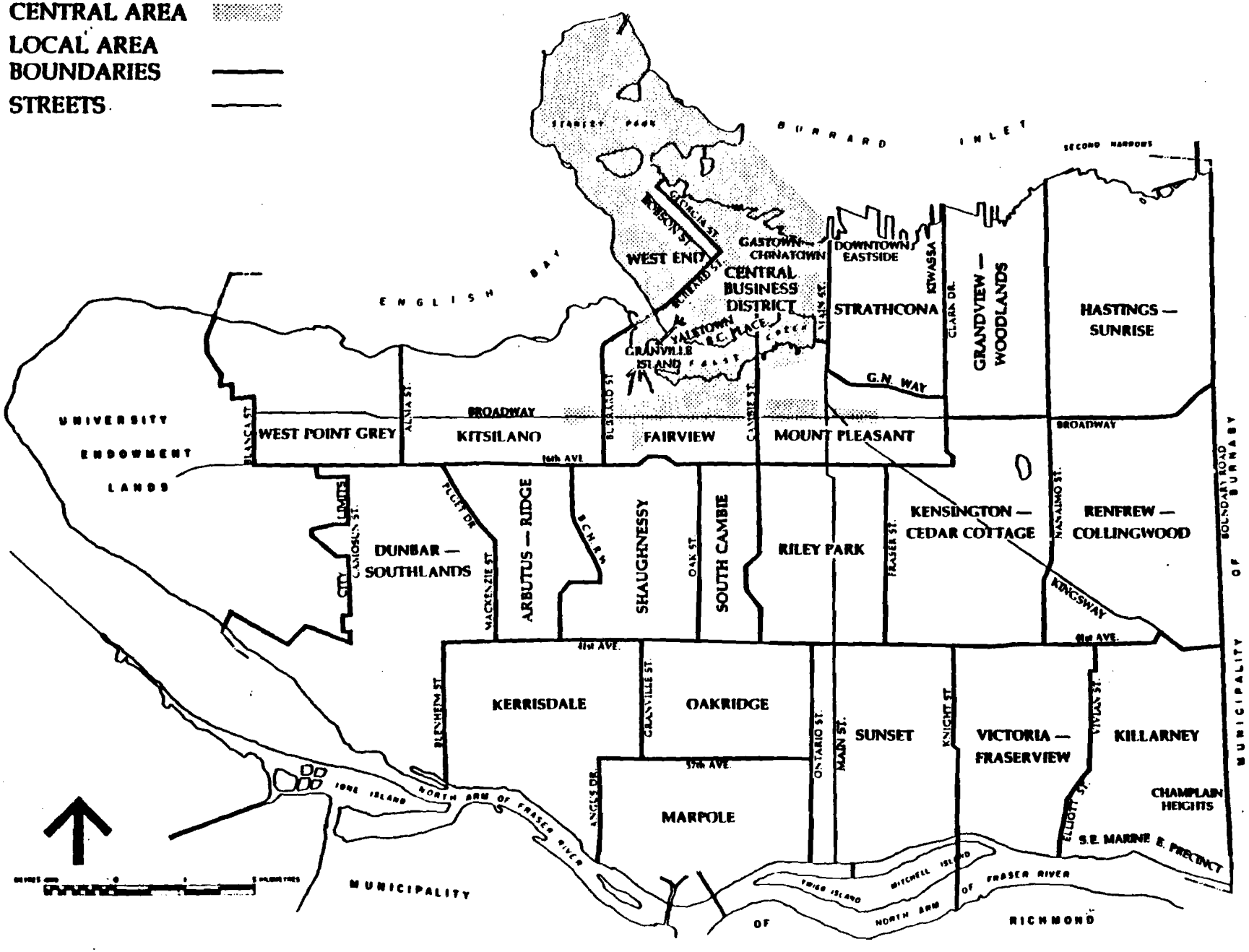
APPENDIX A

CITY OF VANCOUVER LOCAL AREAS

CENTRAL AREA
LOCAL AREA BOUNDARIES
STREETS



APPENDIX B

ACCIDENT STATS (1985-86)
VANCOUVER - HOSPITAL STATS ADMITTED

Age	Male	Female	Total
0- 4	2	0	2
5- 9	10	8	18
10-14	18	6	24
15-19	14	5	19
20-24	8	6	14
25-29	11	3	14
30-34	7	2	9
35-39	4	1	5
40-44	1	1	2
45-49	2	1	3
50-54	3	2	5
60-69	0	2	2
85+	2	0	2
			119

APPENDIX B

VANCOUVER CITY 1985-86
CYCLIST ACCIDENTS BY INJURY TYPE (Ref. 27)

	Male	Female	Total
*Fractured Skull	12	3	15
Fractured Upper Limb	24	14	38
Fractured Lower Limb	12	4	16
Dislocation	7	2	9
*Intracranial Injury (within the skull)	18	8	26
Internal Injury Chest	3	3	6
Fractured Spine	3	1	4
*Open Head Wound	1	1	2
Open Wound Upper Limb	1		1
Superficial Injury	1		1
TOTAL	82(70%)	36(30%)	118

* plotted as head injury

APPENDIX C

BICYCLE DECELERATION DATA

BICYCLE LENGTH (HUB TO HUB) = 0.97m

Cyclist travels at a constant velocity between points A and B. Brakes are applied at point B and cyclist comes to a complete stop at point C. Six sets of data were collected from one experienced cyclist. The cyclist simulated braking from an unexperienced cyclist to a highly experienced cyclist in order to obtain a full range of deceleration rates. This exercise was performed on asphalt in dry conditions at zero grade using narrow racing tires. The results of the test do by no means represent deceleration rates for all cyclists. Rates will vary with varying tire widths, road-surface, weather conditions, braking mechanism and braking method.

TEST NO.	X_1	Dt.	V_1	X_2	Dt_2	$a=V_1/Dt_2$
1	34.15m	7.00s	4.9	6.00	2.40	- 2.0 min.
2	34.15	3.50	9.8	11.50	2.46	- 4.0
3.	34.15	7.17	4.8	2.00	0.93	- 5.2 max.
4	34.15	2.10	16.3	9.50	3.73	- 4.4
5.	34.15	1.50	22.8	5.50	4.46	- 5.1
6	34.15	2.14	16.0	11.85	3.30	- 4.8

$a = 4.3 m/s^2$

∴ for the purpose of our calculations we can assume the bicycle has the same deceleration rate as that of a vehicle ($4m/s^2$).

APPENDIX D

CALCULATED INTERSECTION CLEARANCE TIMES

$$y = t + \frac{V}{2a} + \left(\frac{w+l}{V}\right) = \text{required time interval}$$

	Motor Vehicle	Bicycle
where V=approach velocity (m/s).....	V_m	V_b
a=deceleration rate (m/s^2).....	$4m/s^2$	$4m/s^2$
l=vehicle length(m).....	6m	1m
t=perception-reaction rate(s).....	1 sec.	1 sec.
w=intersection width (m).....	W	W

From field tests performed on a light-framed bicycle in dry weather conditions (see Appendix C) we conclude that the bicycle has a deceleration rate of $4m/s^2$ (similar to that of a motor vehicle). If we assume that a bicycle vehicle length averages 1 meter (wheelbase) and that the perception-reaction rate of a cyclist to be the same as that of a motorist, we can vary the approach velocity and intersection width to compare required clearance time intervals (see Table below).

CALCULATED INTERSECTION CLEARANCE TIMES

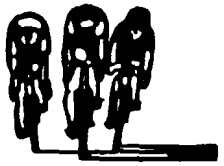
INTERSECTION WIDTH	20 km/h Bicycle[t]	30 km/h Bicycle[tt]	40 km/h Bicycle	50/km/h MV	50/km/h Bicycle
8m	3.31	3.12	3.20	3.74	3.38
10	3.67	3.36	3.38	3.88	3.53
12	4.03	3.60	3.56	4.03	3.67
14	* 4.39	3.84	3.74	4.18	3.82
16	4.75	4.08	3.92	4.32	3.96
18	5.11	4.32	4.10	4.46	4.10
20	5.47	4.56	4.28	4.61	4.25
22	5.83	* 4.80	4.46	4.75	4.39
24	6.19	5.04	4.64	4.90	4.54
26	6.55	5.28	4.82	5.04	4.68
28	6.91	5.52	5.00	5.18	4.82
30	7.27	5.76	5.18	5.33	4.97

* exceed required clearance interval of a motor vehicle.
t minimum bicycle design speed for non-arterial streets
tt minimum bicycle design speed for arterial streets

DON'T USE A TRAIL UNDER THE INFLUENCE OF ALCOHOL OR DRUGS. You may need all of your reflexes quickly, do not use trails under the unfluence of alcohol or drugs.

CLEAN UP LITTER. Do not leave glass, paper, cans, or any other debris on or near a trail. If you drop something please remove it immediately.

HAVE YOU OUTGROWN TRAILS? Trails have engineering and design limits. If your speed or style endangers other users check for alternative routes better suited to your needs. Selecting the right location is safer and more enjoyable for all concerned.



Share the Trail!

ALWAYS EXERCISE DUE CARE AND CAUTION.

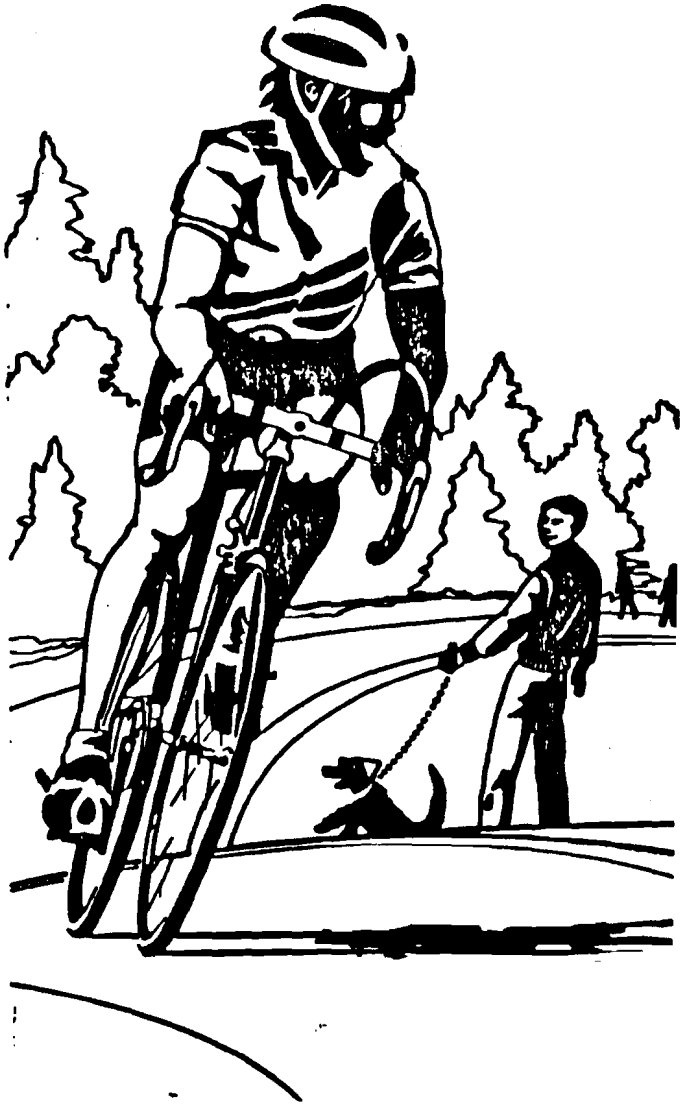
This brochure is adapted from the model Path Users Ordinance developed by the International Bicycle Fund, 4247 135th Place S.E., Bellevue, WA 98006

Local Distribution of the pamphlet made possible by:

CASCADE BICYCLE CLUB
P.O. Box 31299
Seattle, Washington 98103
(206) 522-BIKE

APPENDIX E

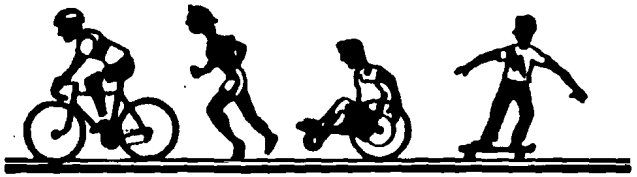
Share the Trail!



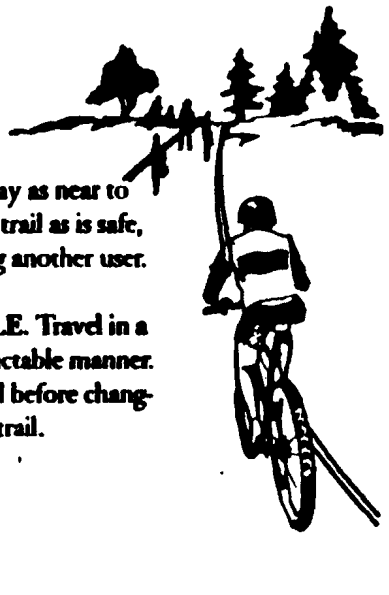
Share the Trail!

USER GUIDELINES FOR MULTI-USE TRAILS

Trails (or paths) for non-motorized use have become very popular. A consequence of their success is congestion. With this, a major issue has become safety. Regardless of whether you are bicycling, walking, jogging, or skating, if you follow the same set of rules as everyone else your trip will be safer and more enjoyable.

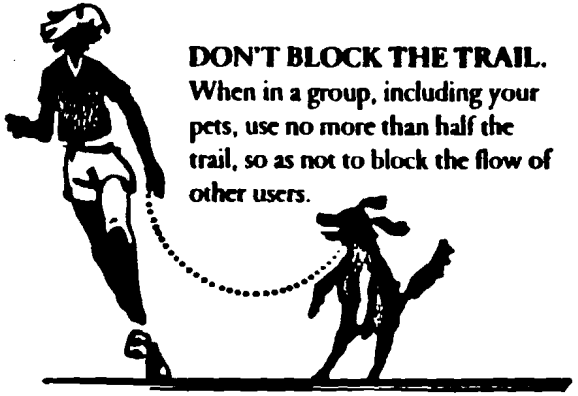


BE COURTEOUS. All trail users, including: bicyclists, joggers, walkers, wheelchairs, skateboarders and skaters, should be respectful of other users regardless of their mode, speed or level of skill.



KEEP RIGHT. Stay as near to the right side of the trail as is safe, except when passing another user.

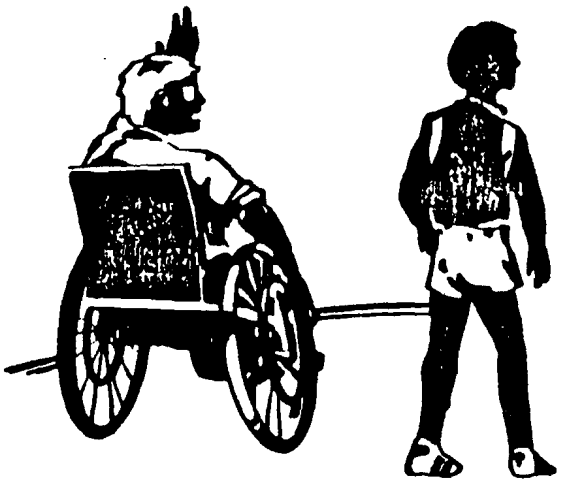
BE PREDICTABLE. Travel in a consistent and predictable manner. Always look behind before changing position on the trail.

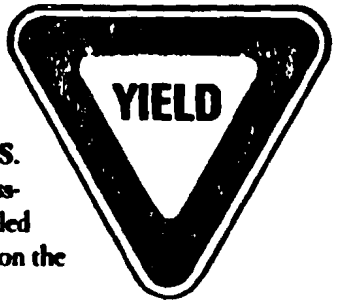


DON'T BLOCK THE TRAIL. When in a group, including your pets, use no more than half the trail, so as not to block the flow of other users.

PASS ON THE LEFT. Pass others, going in your direction, on their left. Look ahead and back to make sure the lane is clear before you pull out. Pass with ample separation. Do not move back to the right until safely past. (Faster traffic is responsible for yielding to slower and on-coming traffic.)

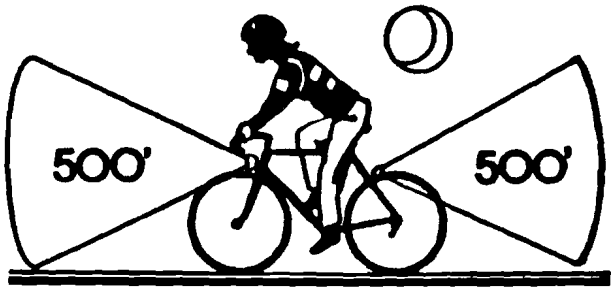
GIVE AUDIBLE SIGNAL WHEN PASSING. Give a clear warning signal *before* passing. Signal may be produced by voice, bell, or horn.

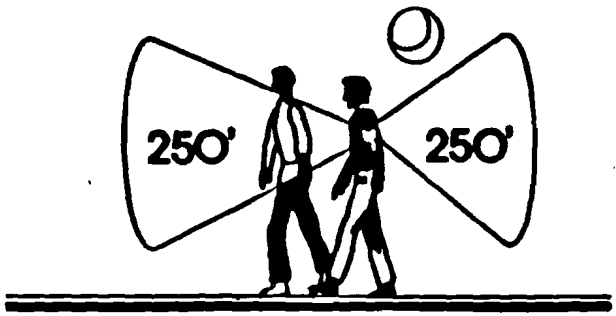


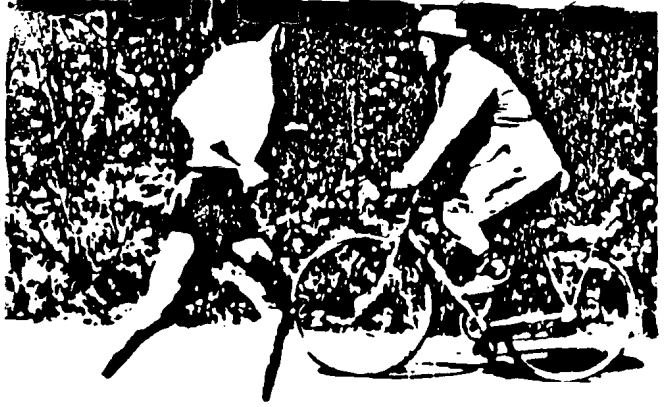


YIELD WHEN ENTERING & CROSSING TRAILS. When entering or crossing a trail at uncontrolled points, yield to traffic on the trail.

USE LIGHTS AT NIGHT. When using a trail any time from dusk to dawn be equipped with lights. Bicyclists should have a white light visible from five-hundred feet to the front, and a red or amber light visible from five-hundred feet to the rear. Other trail users should use white light visible from two-hundred fifty feet to the front, and a red or amber light visible from two-hundred fifty feet to the rear.







safety code

Horses and motorized vehicles are not allowed on the Burke-Gilman Trail

All Users

- Obey all trail and traffic signs and regulations.
- Show courtesy for other trail users at all times.
- Respect the rights of property owners.
- Keep dogs on leash (maximum length 8 feet) and remove pet feces from trail.

Bicyclists

Municipal Code 11.44.120, County Code & State code.

You are responsible for the safe operation of your vehicle under City, County and RCW Code.

- Yield to pedestrians.
- Give audible warning when passing pedestrians or other bicyclists.
- Ride at a safe speed. Slow down and form a single file for congested conditions, reduced visibility and other hazardous conditions.

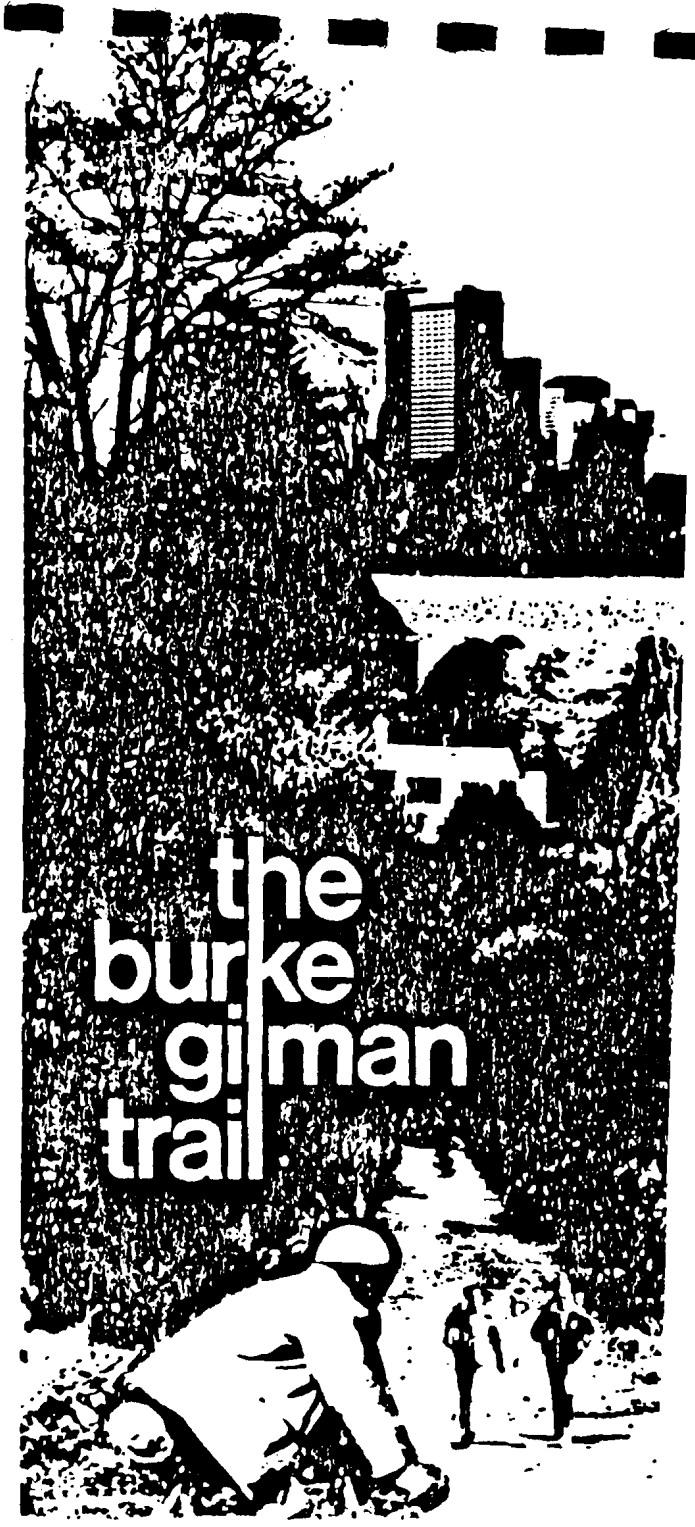
Pedestrians

- Watch for other trail users.
- Be especially alert when running.
- Listen for audible signals and help faster trail users (runners and bicyclists) pass safely.
- Form single or double file for congested conditions.

Seattle / King County
Burke-Gilman Trail

Printed courtesy SAFECO Insurance Company

the burke gilman trail



historical background

The Burke-Gilman Trail owes its historical significance to the saga of the Iron Horse and the struggle of a young city to win a place among major transportation centers and reap the economic benefits of international and domestic trade.

Judge Thomas Burke and his friend Daniel Gilman headed a group of 12 investors who in 1885 set out to establish a Seattle-based railroad. Theirs was not the first such attempt nor would it be the last. Their plan was to build northward across the mountains to Spokane and connect with the Canadian Transcontinental Line at Sumas.

While their Seattle, Lake Shore and Eastern Railroad never got past Arlington, it did become a major spur line serving Puget Sound logging areas, and helped to keep Seattle's hopes alive in the race to become a major Northwest rail terminus. In 1893, the first of James Hill's Great Northern trains puffed into Seattle, and the transcontinental link was established.

The S, LS and E (Sumas) spur was acquired by the Northern Pacific in 1913 and continued in fairly heavy use until 1963 when through-train operations were stopped. The Great Northern, Northern Pacific, and Burlington lines were merged in 1970 to become Burlington Northern.

Burlington Northern's application in 1971 for abandonment of the Sumas spur was part of a pattern by then familiar to all across the United States. By the 1970's, the general decline in railroading had resulted in the disuse and abandonment of over 50,000 miles of track.

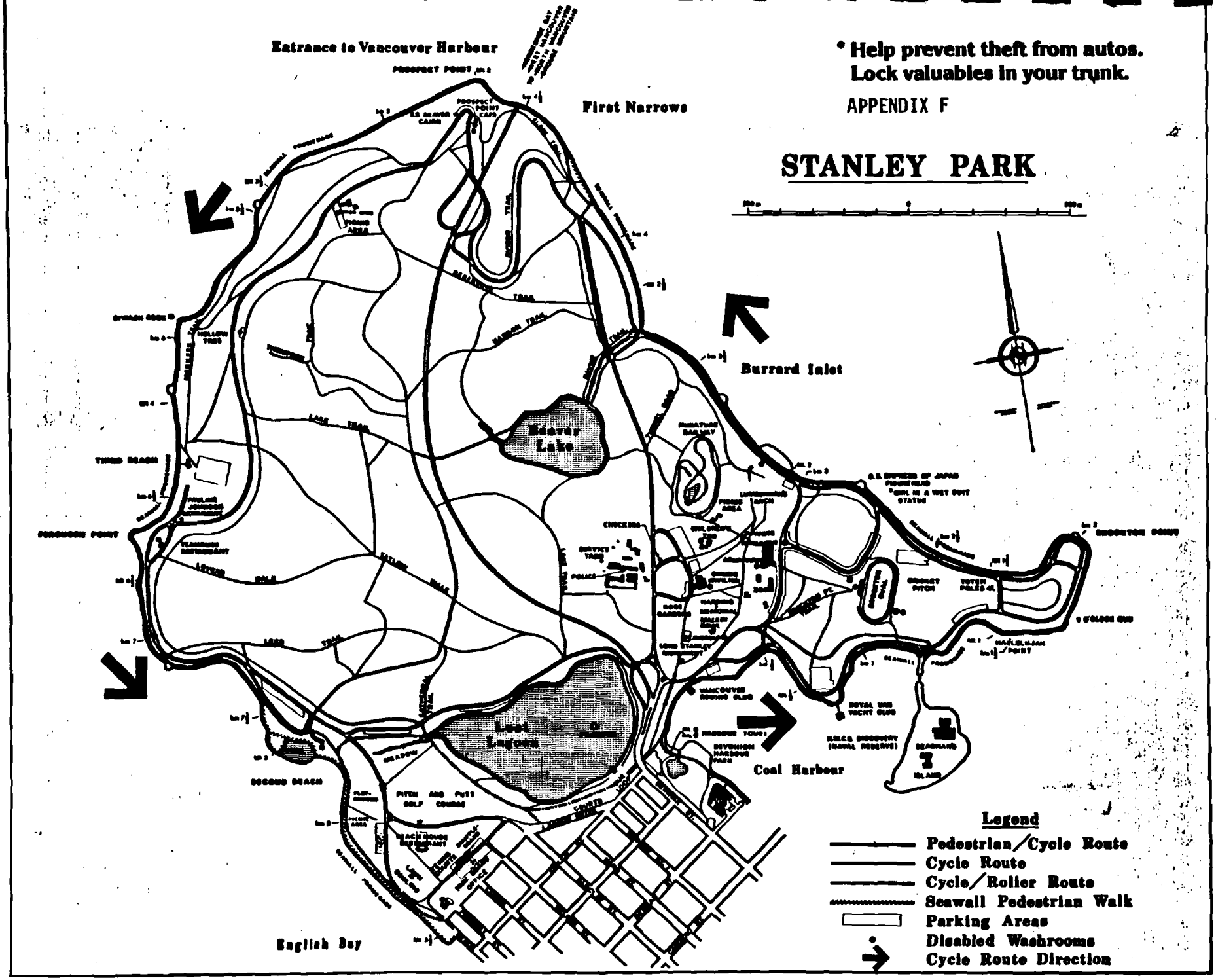
Alert citizens quickly recognized the recreational potential in this unexpected resource and launched a movement to acquire the right-of-way for a public hiking and biking trail. Other communities across the nation have come to recognize the immense opportunity afforded by the long, narrow-often scenic-strips of land in abandoned railroad rights-of-way and other "rails to trails" projects are being undertaken.

Through funding support primarily from the 1968 Forward Thrust bond issue, Community Development Block Grants, and Federal Gas Tax (FAUS) funds, the city, county and University of Washington have created a 12.5 mile recreational hiking and biking trail which extends from Gas Works Park to Kenmore Logboom Park.

King County's 2.25 miles of trails were designed by Mary Booth. Edward MacLeod and Associates designed the City of Seattle's 7.2-mile section. The Burke-Gilman Trail was dedicated August 19, 1978.

Seattle / King County Burke-Gilman Trail

This trail is for ALL users. Bicyclists YIELD to pedestrians and go slow enough to be safe. Let's all watch out for each other and have fun-safely!


Entrance to Vancouver Harbour
First Narrows
* Help prevent theft from autos.
Lock valuables in your trunk.
APPENDIX F
STANLEY PARK
Burrard Inlet
Beaver Lake
Lost Lagoon
Coal Harbour
English Bay
Legend
Pedestrian/Cycle Route
Cycle Route
Cycle/Roller Route
Seawall Pedestrian Walk
Parking Areas
Disabled Washrooms
Cycle Route Direction

SEAWALL WALK / CYCLE PATH

Courtesy Code:

- Stay on your side of the path.
- Exercise caution in congested areas.
- Yield to pedestrians.
- Maintain a safe speed.
- Warn others when passing. (use your bell)

ROAD RULES

- Ride with motor traffic not facing or against it.
- Signal before turning.
- Do not ride on a sidewalk unless posted by a sign. (City by-law 2849 sec. 60)
- Every bicycle shall be equipped with a warning bell. (City by-law 2849 sec. 55)

SAFETY HINTS FOR BICYCLISTS

- If you plan to ride at night, equip your bicycle with a white front light and a red rear reflector or tail light. (Provincial Motor Vehicle Act. Sec. 185.5)
- Use your bell for warning your approach. (City by-law 2849 Sec. 55)
- Always look behind you before changing direction.

The Vancouver Board of Parks and Recreation encourages park users to be aware of these regulations to make your visit a safe one.

Other Horticultural Highlights in Vancouver

VANDUSEN GARDENS

37th Avenue & Oak Street
"A 55-acre garden of native and exotic plants.
Gift shop, tool
summer hours: 10:00 a.m. - 9:00 p.m.
winter hours: 10:00 a.m. - 4:00 p.m.

BLOEDEL CONSERVATORY

Queen Elizabeth Park
33rd Avenue & Cambie Street
"An indoor tropical paradise of exotic birds and plants."
summer hours: 10:00 a.m. - 9:00 p.m.
winter hours: 10:00 a.m. - 5:00 p.m.

MAP

STANLEY PARK

VANCOUVER, CANADA

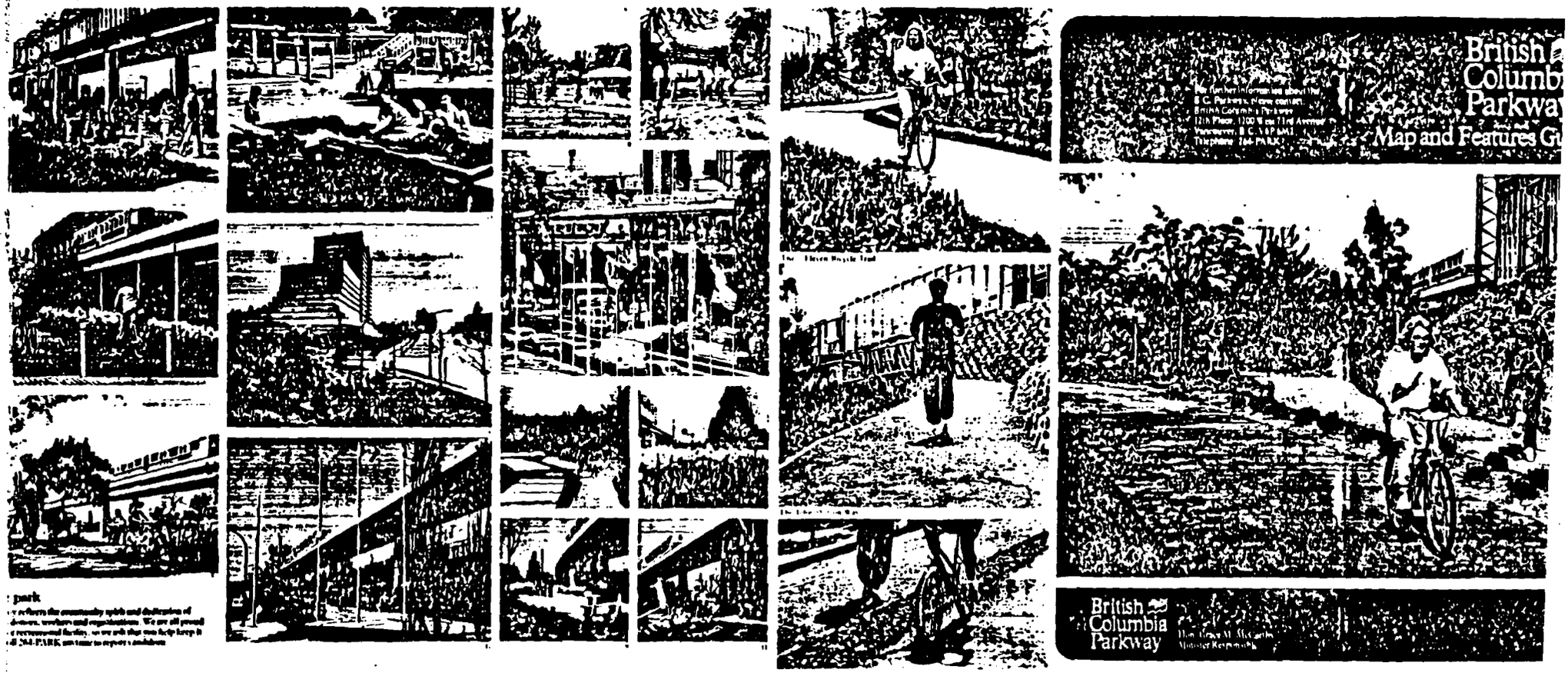
Lord Stanley, Governor-General of Canada, dedicated Stanley Park in 1889.

"...to the use and enjoyment of people of all colours, creeds and customs for all time..."

VANCOUVER BOARD OF PARKS & RECREATION
2099 BEACH AVENUE,
VANCOUVER, B.C., CANADA
V6G 1Z4

1987

APPENDIX G


British
Columbia
Parkway
Map and Features Gu
British
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Parkway

Welcome to the British Columbia Parkway

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The 7-Eleven Bicycle Trail

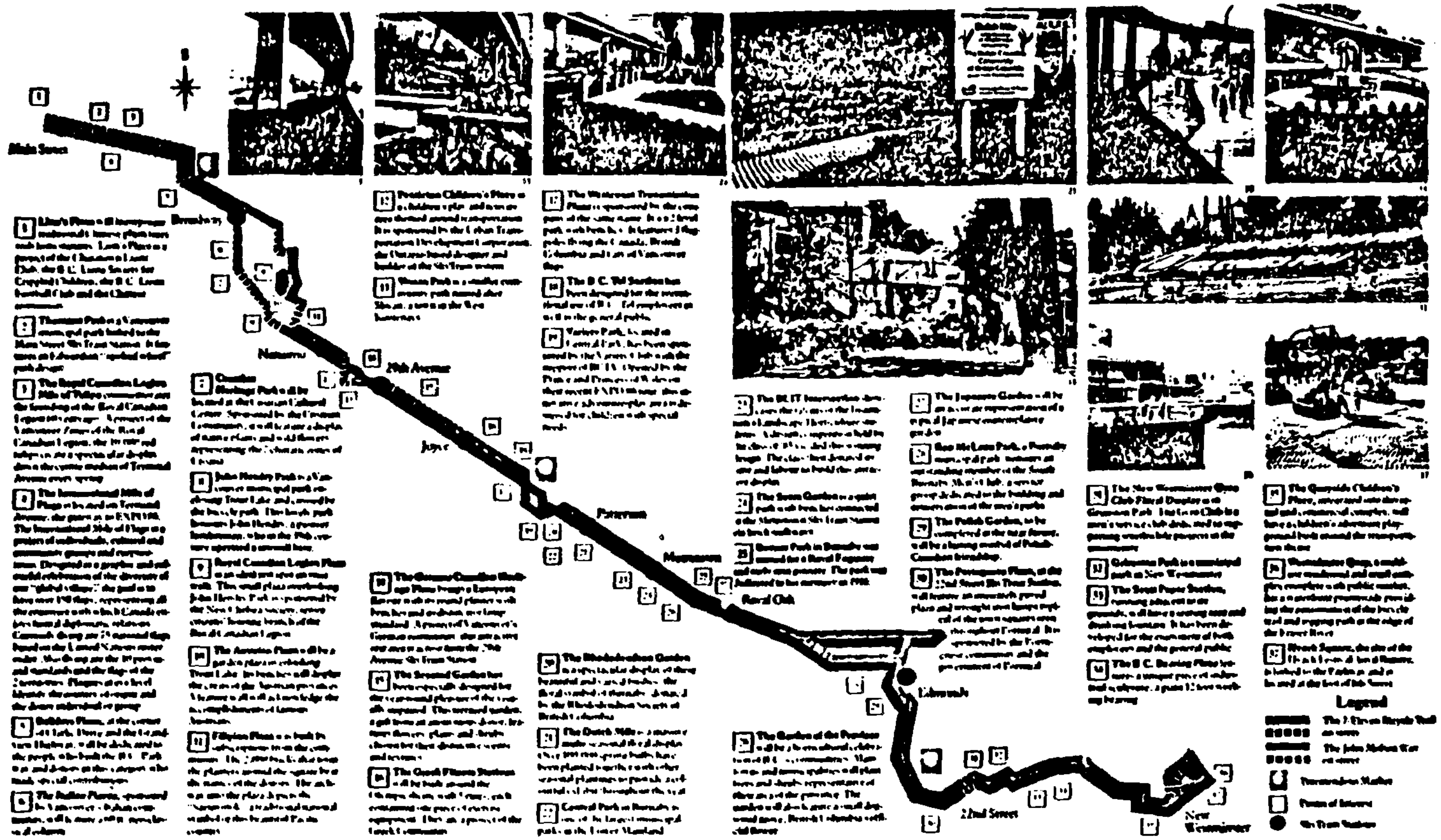
[illegible]

The John Molson Way

[illegible]

Treemendous

[illegible]



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Legend

- The 7-Eleven Bicycle Trail
- The John Molson Way
- Treemendous Marker
- Points of Interest
- SkyTrain Stations

British Columbia Parkway gr... acknowledges contributions r... between October 1984 and M... from the following sponsors:

[illegible]

APPENDIX H

B.C. MOTOR VEHICLE ACT (RSBC 1979, Chapter 288)

Rights and Duties of Operator of Cycle
185

(1) In addition to the duties imposed by this section, a person operating a cycle on a highway has the same rights and duties as a driver of a vehicle.

(2) A person operating a cycle

a) shall not ride on a sidewalk unless otherwise directed by a sign;
b) shall, subject to paragraph (a), ride as near as practicable to the right side of the roadway;
c) shall not ride abreast of another person operating a cycle on the roadway;
d) shall keep at least one hand on the handlebars;1
e) shall not ride other than on or astride a regular seat of the cycle;
f) shall not use the cycle to carry more persons at one time than the number for which it is designed and equipped; and
g) shall not ride a cycle on a highway where signs prohibit their use.

(3) A person operating a cycle shall not ride it on a roadway if there is a usable path intended for the use of cycles adjacent to the roadway.

(4) A person shall not ride a cycle, coaster, roller skates, sled or play vehicle when it is attached by the arm and hand of the rider or otherwise to a vehicle on a highway.

(5) A cycle operated on a highway between 1/2 hour after sunset and 1/2 hour before sunrise shall have a lighted lamp mounted on the front, capable of displaying a white light visible under normal atmospheric conditions at least 150 m in the direction in which the cycle is pointed, and a red reflector of a make or design approved by the superintendent for the purpose of reflecting or displaying a red light toward the rear. In addition, every cycle operated on a highway shall have the most conspicious portion of its rear mud guard, for a length of not less than 22.5 cm and the full width of the mud guard, painted white.

(6) (a) If an incident occurs by which a person or property is injured, directly or indirectly, owing to the presence or operation of a cycle on a highway, the person in charge of the cycle shall

(i) remain at or immediately return to the scene of the incident;
(ii) render all possible assistance; and
(iii) give to anyone sustaining loss or injury, and to any peace officer who is present, his name and address and the name and address of the owner of the cycle, and if the cycle has been licensed and registered, the license or registration number of the cycle.

(b) Where an incident on a highway, either directly or indirectly causes death or injury to a person or damage to property causing aggregate damage apparently exceeding $25, the person in charge of the cycle shall immediately report the matter to a police officer or a person designated by the superintendent to receive those reports, and shall furnish information, including that referred to in section 61 (4), respecting the incident as may be required by the police officer or person designated.

(c) Every report made under this section is without prejudice and is for the information of the Provincial or municipal police, and shall not be open to public inspection. The fact the report has been made is admissible in evidence solely to prove compliance with this section, and the report is admissible in evidence on the prosecution of any person for the offence of making a false statement in it.

(d) Notwithstanding paragraph (c), a peace officer may, where giving evidence in a proceeding, refer to a report prepared by him under this subsection to refresh his memory.

(7) A person shall not ride or operate a cycle on a highway without due care and attention, or without reasonable consideration for other persons using the highway.

(8) (a) Where a person is convicted of an offence under this Act in respect of his riding or operating a cycle, the court may, in addition to or in lieu of any penalty otherwise prescribed, order the cycle seized, and on the expiry of that period the person entitled to it may again have possession of the cycle.

(b) For the purpose of seizing and impounding a cycle pursuant to an order made under paragraph (a), a peace officer may enter by force any place or building in which the cycle is situated.

19.07

(1) Except as authorized by a permit issued by the Minister of Transportation and Highways, and except for crossing a highway at an intersection, use of any highway named in Schedule 1 by the following is prohibited at all times:

(a) vehicles drawn by animals;
(b) livestock, as defined in the Livestock Act;
(c) farm imolements and farm machinery, whether self-propelled or towed;
(d) pedestrians, unless attending a disabled vehicle;
(e) vehicles incapable of maintaining a minimum speed of 60km/h on level road, except construction or maintenance equipment owned or hired by the Ministry of Transportation and Highways while working on or travelling to or from a worksite located on a highway named in Schedule 1.

(2) Subsection (1) does not apply to pedestrians and to operators of pedal cycles and mopeds using footpaths constructed adjacent to the travel portion of the highway or the shoulder on the travel portion of the highway where the minister causes signs to be erected designating the footpath or shoulder for such permitted use.

Schedule 1 - Highways

(1) Trans-Canada Highway #1 - from the ferry terminal at Horseshoe Bay to the north approach to the Second Narrows bridge; from its intersection with Rupert Street to its junction with Route #3 in Hope; from its junction with the Coquihalla Highway (Aberdeen Interchange) to its intersection with Valleyview Drive at Kamloops.

(2) Hope-Princeton Highway #3 - from its junction with the Trans-Canada Highway in Hope to its junction with the Coquihalla Highway, 7.7 km east.

*(3) Coquihalla Highway #5 - from its junction with the Hope-Princeton Highway, 7.7 km east of Hope to the north interchange with Route #5A in Merritt.

(4) Annacis Highway #91 - from its interchange withthe Vancouver-Blaine Highway to the south approach to the Annacis Bridge; from the north approach to the Annacis Bridge to the south approach to the East Channel Bridge; from the north approach to the East Channel Bridge to the Richmond Connector.

(5) Annacis Highway #91A - from the Richmond Connector to the south approach to the Queensborough Bridge.

(6) Vancouver-Blaine Highway #99 - from 1st Avenue in Surrey to the south approach of the Oak Street Bridge.

*The Ministry of Transportation and Highways is in the process of seeking a cabinet amendment for this schedule which may include overturning this item.

Vancouver Street and Traffic By-Law No. 2849, (up to July 23, 1985)

55. Bell Required on Bicycle.
Every bicycle shall be equipped with a bell to be used as a warning of danger.

59. The driver of every slow moving vehicle shall drive such vehicle as close as possible to the right hand edge or curb of any street unless it is impracticable to travel on such side. For the purpose of this section a bicycle shall be regarded at all times as a slow moving vehicle.

60. No person shall ride any bicycle upon any sidewalk except where posted by signs. (By-law 4994, Aug. 10, 1976).

60 A. No person shall ride a bicycle upon a street while wearing headphones, or any other manufactured device capable of transmitting sound, over or in close proximity to both ears, except that this prohibition shall not apply to the wearing of a device designed and worn for the purpose of improving the wearer's ability to hear sounds emanating from outside of the device. (5923 July 23/85) (#5712-83.09.20)

60 B. A police officer may arrest without warrant any bicyclist whom he finds committing a breach of any provision of this by-law if such person fails to stop and state his proper name and address when so requested by the police officer. (By-law No. 5870, Feb. 5, 1985).

By-Law No. 4792, Amendment 5120: allows cyclists to use the Granville Mall.

Vancouver Parks By-Law

14(h) No person shall, without permission of the Superintendent first had and obtained, ride any bicycle upon any sidewalk, footpath or promenade in any park unless such a sidewalk, footpath or promenade has been so designated as a cycle path and specifically provided therefore, and in this respect the provisions of the Street and Traffic By-law No. 2849 and amendment thereto shall reply motates motandis.

Criminal Code of Canada

118 Everyone who, a) resists or willfully obstructs a Public Officer or Peace Officer in the execution of his duty or any person lawfully acting in aid of such an officer.

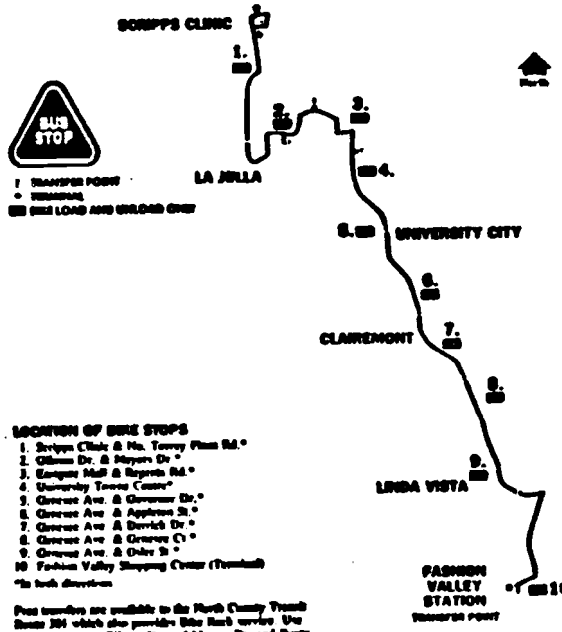
b) omits without reasonable excuse to assist a Public Officer or Police Officer in the execution of his duty in arresting a person or in preserving the peace, after having reasonable notice that he is required to do so.

c) resists a willfully obstructs any person in the lawful execution of a process against lands a goods or in making a lawful distress or seizure.

is guilty of an enditable offence.

ROUTE 41

Fashion Valley to Scripps Clinic
VIA UCSD



LOCATION OF BIKE STOPS

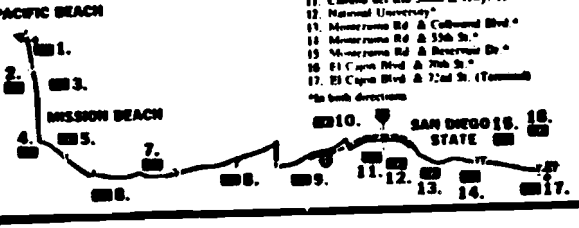
1. Scripps Clinic & No. Torrey Pines Rd.*
2. Gilman Dr. & Meyers Dr.*
3. Eastgate Mall & Regents Rd.*
4. University Towne Centre*
5. Genesee Ave. & Genesee Dr.*
6. Genesee Ave. & Appleton St.*
7. Genesee Ave. & Derrick Dr.*
8. Genesee Ave. & Genesee Ct.*
9. Genesee Ave. & Osler St.*
10. Fashion Valley Shopping Center (Terminal)

*In both directions

Free transfers are available to the North County Transit Route 304 which also provides Bike Rack service. Use Route 41 stop at Gilman Dr. and Meyers Dr. and Route 101 stop at V.A. Hospital

ROUTE 80

Pacific Beach to 72nd and El Cajon Blvd.
VIA FASHION VALLEY AND SDSU



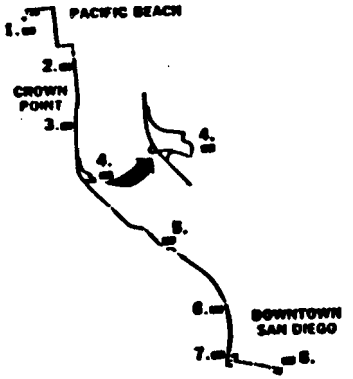
LOCATION OF BIKE STOPS

1. Mission Blvd. & Sapphire St. (Terminal)
2. Mission Blvd. & Pacific Beach Dr. (Eastbound ONLY)
3. Mission Blvd. & Santa Rita Pl. (Westbound ONLY)
4. W. Mission Bay Dr. & Mission Blvd. (Eastbound ONLY)
5. W. Mission Bay Dr. & Bahia Hotel (Westbound ONLY)
6. Sea World Dr. & Sea World Way*
7. Friars Rd. & Hotel Circle North (Westbound ONLY)
8. Fashion Valley Shopping Center*
9. Camino de la Reina & Camino del Este*
10. Camino del Rio North & Mission Center Rd.*
11. Camino del Rio South & Hotel Circle South*
12. National University*
13. Mission Gorge Rd. & Fairmount Ave.*
14. Mission Gorge Rd. & 55th St.*
15. Mission Gorge Rd. & Briarcrest Dr.*
16. El Cajon Blvd. & 70th St.*
17. El Cajon Blvd. & 72nd St. (Terminal)

*In both directions

ROUTE 9

Downtown San Diego to Pacific Beach
VIA CROWN POINT



LOCATION OF BIKE STOPS

1. Sapphire St. & Mission Blvd. (Terminal)
2. Ingraham St. & Bird Ave.*
3. Ingraham St. & Vacation Village Rd.*
4. Sea World Way & Sea World Dr.*
5. Midway Dr. at Main Post Office*
6. Pacific Highway & Palm St.*
7. Broadway & Kettner Blvd.*
8. 11th St. & Broadway (Terminal)

*In both directions

Whenever you see this symbol on a route map or bus stop sign, it means that on related buses you can take your bike along for free. For some time now, all regularly scheduled buses on Routes 9, 41, and 80 (see timetable) have been equipped with special bike racks that enable you to take your bike along for no extra charge. Although the racks may look a bit complicated from a distance, they are both secure and easy to operate.

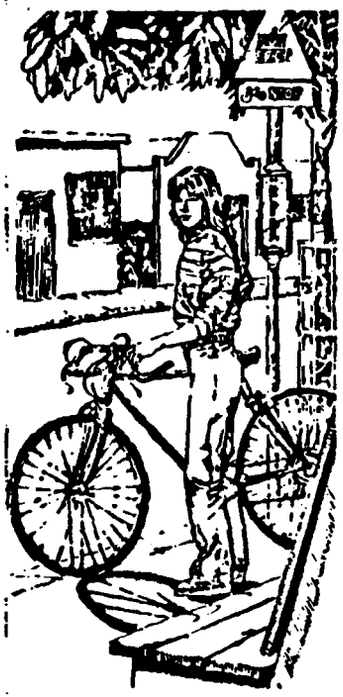
There are probably many places in and around San Diego that you would like to ride your bike — places like Mission Bay, Fashion/Mission Valley or University Towne Centre — but these places are too far to ride to. Now you can combine two forms of transportation. Take the bus and bring your bike along for the ride. We hope this pamphlet will make using the bike racks easier and more convenient.

Try it this week!

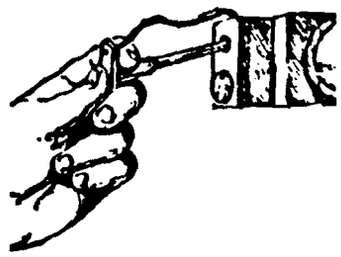
How to take your bike for a bus ride.

San Diego Transit

1. With the bus at any of the stops that have the bike route sign attached to the regular bus stop sign. When the bus arrives inform the driver of your intention to use the bike rack.

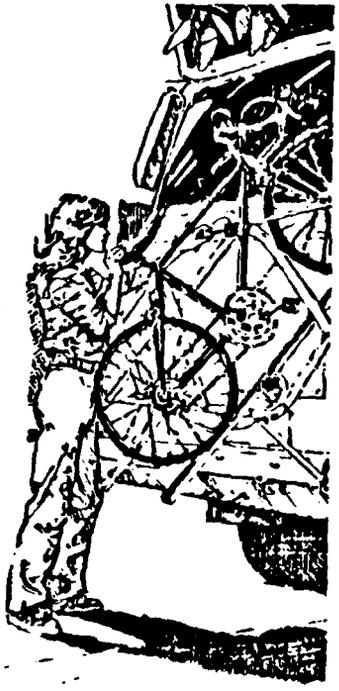


2. Remove the securing mechanism pin from the bike rack by pushing the red button and pulling the pin toward you.

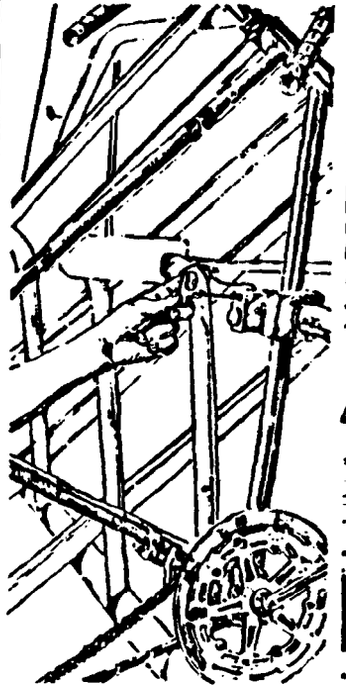


3. Place the front wheel of your bike into the track as shown below. For safety reasons, bicycles must fit in the rack with the wheels secure in the track. If the bike does not fit, it cannot be carried on the bike rack.

4. Roll your bike up the rack far enough so that the front support of the bike frame fits into the securing mechanism.



5. Replace the securing mechanism pin once again, remember to push the red button.



6. Now, board the bus, pay the regular fare, and you and your bike are on your way. When you reach your destination, be sure to exit through the front door and tell the driver that you need to take your bike off of the bus.

APPENDIX J

RECOMMENDED BICYCLE PARKING REQUIREMENTS

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCLE PARKING
4.2.1	Dwelling			
4.2.1.1	One-Family Dwelling, Two-Family Dwelling, Infill One-Family Dwelling, or Infill Two-Family Dwelling in the following districts:		NONE	
	R, C, WED, DEOD	A minimum of one space for every dwelling unit, except that the maximum number of spaces for a site having a one-family or two-family dwelling as the only use other than an accessory use shall be:		
		Site width at rear property line.		
		Spaces less than 10.0 m	2	
		at least 10.0 but less than 12.2 m	3	
		at least 12.2 but less than 14.5 m	4	
		14.5 m or more	5	
	FSD	A minimum of two spaces for every dwelling unit		
4.2.1.2	Multiple Conversion Dwelling in the following districts:		NONE	
	RS-1A	A minimum of one space.		
	RT-1A, RT-3, FM-1	A minimum of one space for every residential unit.		
	RT-2A	A minimum of one additional space for every dwelling unit newly created.		
	RS-2, RT-1, RT-2, RT-4, RM except FM-1, C, M, I, DEOD:			
	Two residential units	A minimum of two spaces.		

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCLE PARKING
	Three or more residential units	A minimum of one space for each 70 square metres of gross floor area.		
	WED			
	Two residential units	A minimum of two spaces.		
	Three or more residential units	A minimum of one space for each 80 square metres of gross floor area.		
	FSD	A minimum of two spaces for every dwelling unit.		
4.2.1.3	Multiple Dwelling or Infill Multiple Dwelling in the following districts, except as provided for in sections 4.2.1.7 and 4.2.1.8:			
	RS-2, RT-2, RT-4, C, DEOD, RM except FM-1 and except sites less than 500 square metres in RM-3A1 and RM-3B	A minimum of one space for each 70 square metres of gross floor area.	25% of units	1
	RT-1A, RT-2A, RT-3, FM-1, sites less than 500 square metres in RM-3A1 and RM-3B	A minimum of one space for every dwelling unit.	25% of units	1
	WED	A minimum of one space for each 80 square metres of gross floor area.	25% of units	1
4.2.1.4	Rooming House.	A minimum of one space for each 37 square metres of floor area used for sleeping units, exclusive of bathrooms.	NONE	
4.2.1.5	Dwelling Units up to a maximum of two in conjunction with a Neighbourhood Store.	A minimum of one space for every dwelling unit.	NONE	

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCLE PARKING
4.2.1.6	Dwelling Units in conjunction with another use except as provided for in sections 4.2.1.5, 4.2.1.7, 4.2.1.8.	A minimum of one space for each 67.5 square metres of gross floor area.	NONE	
4.2.1.7	Three or more dwelling units designed solely for senior citizens' housing under the provisions of the National Housing Act or the Housing Construction (Elderly Citizens) Act, or other similar use.	A minimum of one space for every six dwelling units.	NONE	
4.2.1.8	Three or more dwelling units designed solely for families of low income under the provisions of the National Housing Act.	A minimum of one space for every two dwelling units.	25% of units	1
4.2.1.9	Residential Unit associated with an forming an integral part of an artist studio.	No requirements.		
4.2.2	Temporary Accommodation			
4.2.2.1	Hotel or Motel.	A minimum of one space for every dwelling unit and one space for every two sleeping or housekeeping units.	5% of auto	2-covered
4.2.3	Institutional, Public and Semi-Public and Health			
4.2.3.1	Special Needs Residential Facility.	A minimum of one space for each 37square metres of floor area used for sleeping units, exclusive of bathrooms	5% of auto	1
4.2.3.2	Clinic or Office for medical, dental, veterinary, or similar use.	A minimum of one space for each 28 square metres of gross floor area.	5% of auto	1

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCLE PARKING
4.2.3.3	Hospital or other similar use; Institution of a religious, philanthropic, or charitable character, or other similar use.	A minimum of one space for each 93 square metres of gross floor area.	5% of auto	1
4.2.3.4	Church, chapel, funeral home, place of worship, or similar place of assembly.	A minimum of one space for each 9.3 square metres of floor area used for assembly purposes, except that where two or more separate areas of assembly exist within a site and are not used concurrently, the Director of Planning may require parking for only the largest of these areas.	NONE	
4.2.3.5	School (public or private).	A minimum of two spaces for every three employees in <u>elementary</u> schools and one and one-quarter spaces for each employee in <u>secondary</u> schools, except that where spaces required as the result of an extension to an existing school would diminish the existing school playground area, the Director of Planning may require a lesser number of additional spaces.	1 space/ 3 stud. 1 space 2 stud.	2 2
4.2.3.6	College.	As determined by the Director of Planning in consultation with the City Engineer.	20% of auto	2
4.2.4	<u>Cultural and Recreational</u>			
4.2.4.1	Community centre, activity centre or similar place of assembly; Library, gallery, museum, or aquarium.	A minimum of one space for each 18.6 square metres of floor area used for assembly purposes.	15% of auto	1 1
4.2.4.2	Theatre, auditorium, dance hall, club, or lodge.	A minimum of one space for each 9.3 square metres of floor area used for assembly purposes.	15% of auto	1

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCLE PARKING
4.2.4.3	Stadium, arena, exhibition hall, rink, ring, pool, or similar place with spectator facilities.	A minimum of one space for every 5 seats, or one space for each 9.3 square metres of pool or surface area used for assembly purposes, whichever is the greater.	10% of auto	1
4.2.4.4	Gymnasium, Health Club or Spa; School or Academy for the teaching of drama, music, art, dance, meditation, self-defence, self-improvement, or similar arts.	A minimum of one space for each 18.6 square metres of gross floor area.	15% of auto	1
4.2.4.5	Billiard Hall or Amusement Arcade.	A minimum of one space for every table or game.	15% of auto	1
4.2.4.6	Bowling Alley or Curling Rink.	A minimum of three spaces for every alley or ice sheet.	15% of auto	1
4.2.4.7	Racket or Ball Court.	A minimum of two spaces for every court.	15% of auto	1
4.2.4.8	Archery, Golf Driving, or Miniature Rifle Range.	A minimum of one space for every range or target corridor	15% of auto	1
4.2.4.9	Marine, Sailing School, or Boat Facilities.	A minimum of one space for every two mooring berths, with ddditional spaces for launching facilities and sailing schools as determined by the Director of Planning having regard to design and use.	10% of auto	2
4.2.5	<u>Commercial</u>			
4.2.5.1	Office, Business School, or Retail, except as noted below.	A minimum of one space for each 93 square metres of gross floor area up to 279 square metres, and one additionalspace for each additional 46.5 square metres of gross floor area.	5% of auto	2 covered

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCLE PARKING
4.2.5.2	Office in the following districts: FC-1	A minimum of one space for each 70 square metres of gross floor area and a maximum of one space for each 46.5 square metres of gross floor area.	5% of auto	2-covered
4.2.5.3	Restaurant or Drive-in Restaurant.	A minimum of one space for the first 111 square metres, or portion thereof, of gross floor area, and one additional for each additional 37 square metres of gross floor area.	5% of auto	2 covered
4.2.5.4	Premises, or portions thereof, licensed pursuant to Provincial legislation for the regular sale of liquor, except for a Cabaret, Neighbourhood Public House, or Liquor Store.	A minimum of one space for each 5.6 square metres of floor area open to the public.	NONE	
4.2.5.5	Cabaret, licensed for the sale of liquor.	A minimum of one space for each 9.3 square metres of floor area open to the public.	NONE	
4.2.5.6	Neighbourhood Public House, licensed for the sale of liquor.	A minimum of one space for each 18.6 square metres of floor area open to the public.	NONE	
4.2.5.7	Production Studio.	A minimum of one space for each 93 square metres of gross floor area.	NONE	
4.2.5.8	Neighbourhood Grocery Store.	No requirements.	NONE	
4.2.5.9	Artist Studio.	A minimum of one space for every studio.		
4.2.6	<u>Industrial</u>			
4.2.6.1	Manufacturing Uses; Repair, service, processing, or laboratory facilities; Wholesale Uses.	A minimum of one space for each 93 square metres of gross floor area in the building, or one space for every five employees on a maximum work shift,whichever is the greater.	NONE	

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCL PARKING
4.2.6.2	Transportation and Storage Uses, except as provided for in section 4.2.6.3; Utility and Communication Uses.	As determined by the Director of Planning in consultation with the City Engineer.		NONE
4.2.6.3	Storage Warehouse.	A minimum of one space for each 185 square metres of gross floor area.		NONE

4.3 Table of Number of Required Accessory Parking Spaces in DD and CWD Districts (except for Designated Heritage Sites), and in HA Districts

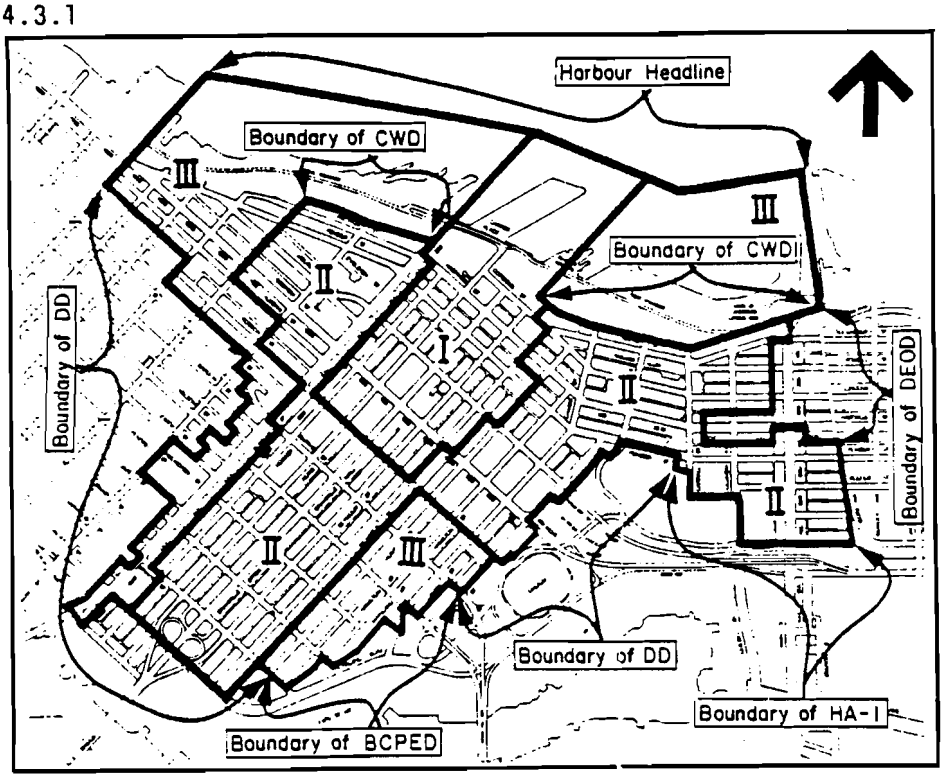
[Additional regulations for developments located in Central Waterfront District sub-area 3 are contained in the Central Waterfront District Official Development Plan.]

4.3.1 Non-residential Uses - DD and CWD Districts

Except as provided in section 4.3.2, all non-residential uses in the DD and CWD Districts shall provide parking in accordance with the following:

Area as outlined on Map 4.3.1	Required Parking Spaces		
Area I	A minimum of one space for each 115 square metres of gross floor area and a maximum of one space for each 100 square metres of gross floor area.	5% of auto	2-covered
Area II	A minimum of one space for each 100 square metres of gross floor area and a maximum of one space for each 93 square metres of gross floor area.	5% of auto	2-covered
Area III	A minimum of one space for each 93 square metres of gross floor area and a maximum of one space for each 80 square metres of gross floor area.	5% of auto	2-covered

Map 4.3.1



COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCL PARKING
4.3.2 Hotels - DD and CWD Districts			
	Hotels in the DD and CWD Districts shall provide a minimum of one parking space for every two sleeping, housekeeping or dwelling units.	5% of auto	2-covered
4.3.3 Non-Dwelling Uses - HA Districts - New Floor Space			
	Except as specified in section 4.3.5, all non-dwelling uses in floor space created after November 4, 1986 in HA Districts shall provide parking in accordance with the standard specified in section 4.3.1.	5% of auto	2-covered

COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCL PARKING

4.3.4 Non-Dwelling Uses - HA Districts - Existing Floor Space

For the purpose of this section Passive Uses (P) include vacant space, storage space and warehouse space; and Active Uses (A) include all other uses. Except as specified in section 4.3.5, all non-dwelling uses in floor space existent on November 4, 1986 in HA Districts shall provide parking as follows:

Change of Use	Required Parking Spaces		
P to P	no requirement	NONE	
P to A	0.4 times the standard specified in section 4.3.1	15% of auto	2-covered
A to P	no requirement	NONE	
A to A	no requirement	NONE	

4.3.5 Non-Dwelling Uses - HA Districts - New and Existing Floor Space on Small Sites

All non-dwelling uses on sites in HA Districts less than 325 square metres in size shall provide one parking space for the first 750 square metres of gross floor area plus one parking space for each additional amount of floor space equal to 0.7 times the standard specified in section 4.3.1.		15% of auto	2-covered

4.3.6 Residential Uses - DD and CWD Districts

Except as provided in section 4.3.8, residential uses in the DD and CWD Districts shall provide a minimum of:

(a)	1 space per dwelling unit for units 100 square metres or less in size;	25% of units	1
(b)	2 spaces per dwelling unit for units greater than 100 square metres in size.	25% of units	1

4.3.7 Dwelling Uses - HA Districts

Except as provided in section 4.3.8, dwelling uses in HA Districts shall provide a minimum amount of parking equal to 0.75 times the standard specified in section 4.3.6.		25% of units	1

4.3.8 Dwelling Units for Senior Citizens or Low Income Families - DD, CWD and HA Districts

Dwelling units in the DD, CWD and HA Districts for senior citizens or low income families as provided for in sections 4.2.1.7 and 4.2.1.8 shall provide parking in accordance with sections 4.2.1.7 and 4.2.1.8 respectively.		NONE	

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCL PARKING
4.4	Table of Number of Required Accessory Parking Spaces for Provincial and Municipal Heritage Sites Outside HA Districts			
4.4.1	Non-Dwelling Uses - New Floor Space			
	Except as specified in section 4.4.3, all non-dwelling uses in floor space created after November 4, 1986 shall provide parking* in accordance with the standard for the District in which the site is located.			*and bicycle parking
4.4.2	Non-Dwelling Uses - Existing Floor Space			
	For the purpose of this section Passive Uses (P) include vacant space, storage space and warehouse space; and Active Uses (A) include all other uses. Except as specified in section 4.4.3, all non-dwelling uses in floor space existent on November 4, 1986 in Provincial or municipal heritage sites outside HA Districts shall provide parking as follows:			
	Change of Use	Required Parking Spaces		
	P to P	no requirement	NONE	
	P to A	0.4 times the standard for the District in which the site is located	15% of auto	2-coverec
	A to P	no requirement	NONE	
	A to A	no requirement	NONE	
4.4.3	Non-Dwelling Uses - New and Existing Floor Space on Small Sites			
	All non-dwelling uses on sites in Provincial or municipal heritage sites outside HA Districts less than 325 square metres in size shall provide one parking space for the first 750 square metres of gross floor area plus one parking space for each additional amount of floor space equal to 0.7 times the standard for the District in which the site is located.		15% of auto	2-coverec
4.4.4	Dwelling Uses			
	Except as provided in section 5.4.5, dwelling uses in Provincial or municipal heritage sites outside HA Districts shall provide a minimum amount of parking equal to 0.75 times the standard for the District in which the site is located.		25% of units	1

	COLUMN 1 BUILDING CLASSIFICATION	COLUMN 2 REQUIRED MOTOR VEHICLE PARKING SPACES	MINIMUM BICYCLE PARKING SPACES	REQUIRED CLASS OF BICYCLE PARKING
4.4.5	Dwelling Units for Senior Citizens or Low Income Families			
	Dwelling units in Provincial or municipal heritage sites outside HA Districts for senior citizens or low income families as provided for in sections 4.2.1.7 and 4.2.1.8 shall provide parking in accordance with sections 4.2.1.7 and 4.2.1.8 respectively.		NONE	

APPENDIX K

RECOMMENDED LANE PAINTING PROCEDURES

A.

For 4-Lane Roadways 1/2 Street Width	Lane Width Curb Lane	2nd Lane
6.0	+3.1	2.9
6.2	+3.2	3.0
6.4	+3.4	3.0
6.6	3.6	3.0
6.8	3.7	3.1
7.0	3.7	3.3
7.2	3.8	3.4
7.4	4.0	3.4
7.6	4.0	3.6
7.8	4.2	3.6
8.0	4.2	3.8

+ curb lane widths of less than 3.6m are not recommended for use on any street designated as a priority 1 or 2 bicycle commuter route (see Street Priority System).

B.

For 6-Lane Roadways 1/2 Street Width	Lane Width Curb Lane	2nd Lane	Third Lane
8.2	*+2.8	2.7	2.7
8.4	*+2.9	2.7	2.8
8.6	*+3.0	2.8	2.8
8.8	+3.0	2.9	2.9
9.0	+3.1	2.9	3.0
9.2	+3.2	3.0	3.0
9.4	+3.4	3.0	3.0
9.6	3.6	3.0	3.0
9.8	3.6	3.1	3.1
10.0	3.6	3.1	3.3
10.2	3.6	3.2	3.4

* Lane widths of 2.7 and 2.8m are only to be used when no alternate solution is available.

+ Curb lane widths of less than 3.6m are not recommended for use on any street designated as a priority 1 or 2 bicycle commuter route (see 'Street Priority System').