CITY OF VANCOUVER

CITY CLERK'S DEPARTMENT
Access to Information & Privacy

File No.: 04-1000-20-2018-362

August 8, 2018

s.22(1)

Dear s.22(1)

Re: **Request for Access to Records under the Freedom of Information and Protection of Privacy Act (the "Act")**

I am responding to your request of July 3, 2018 for:

The Transportation 2040 Report mentions "Transportation Plan 1997" and "Various Downtown Streetcar plans" under Relevant Existing Policy, Directions, and Programs on page 78. Request is for the copy of the said reports and documents.
https://vancouver.ca/files/cov/Transportation_2040_Plan_as_adopted_by_Council.pdf

The following requested reports are included in the records enclosed:

- Downtown Streetcar Benchmarking Report (2004)
- Downtown Transportation Plan (2002)
- Tourist and Recreational Usage of Proposed Downtown Streetcar (2004)
- PPP Review of Vancouver Streetcar Project (Macquarie North America, 2002)

The following requested reports are available through the links shown:

- Transportation Plan (1997)
  https://www.slideshare.net/Transportation2040/1997-transportation-plan
- Downtown Streetcar Council Report (1999)
  https://council.vancouver.ca/990323/tt1.htm
- Streetcar and Local Bus Comparative Review: A Technical Memorandum for the City of Vancouver's Downtown Streetcar Project Update (IBI, 2006) - Found in https://council.vancouver.ca/20061005/documents/pe5.pdf as Appendix G
- Council Report: Downtown Streetcar Project Update (2006)
  https://council.vancouver.ca/20061005/documents/pe5.pdf
- Downtown Streetcar Backgrounder (2007)
  http://openmov.museumofvancouver.ca/node/156671
- Council Report: Downtown Streetcar - Report Back on Phase Zero Preliminary Engineering (2008)
  http://www.samsullivan.ca/wp-content/uploads/2012/12/tt3.pdf

Under section 52 of the Act, and within 30 business days of receipt of this letter, you may ask the Information & Privacy Commissioner to review any matter related to the City's response to your FOI request by writing to: Office of the Information & Privacy Commissioner, info@oipc.bc.ca or by phoning 250-387-5629.

If you request a review, please provide the Commissioner's office with: 1) the request number (#04-1000-20-2018-362); 2) a copy of this letter; 3) a copy of your original request; and 4) detailed reasons why you are seeking the review.

Yours truly,

Barbara J. Van Fraassen, BA
Director, Access to Information & Privacy
Barbara.vanfraassen@vancouver.ca
453 W. 12th Avenue Vancouver BC V5Y 1V4

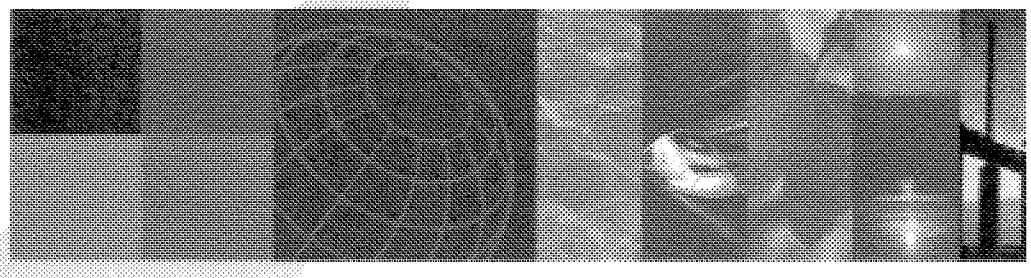
*If you have any questions, please email us at foi@vancouver.ca and we will respond to you as soon as possible. Or you can call the FOI Case Manager at 604.871.6584.

Encl.

:ma

City of Vancouver

Downtown Streetcar
Benchmarking Report
December 2004



Halcrow
TSi Consultants

Halcrow

City of Vancouver

Downtown Streetcar
Benchmarking Report
December 2004

Halcrow
TSi Consultants

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318 – 4190 Lougheed Highway, Burnaby, BC, Canada, V5C 6A8
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City of Vancouver

Downtown Streetcar
Benchmarking Report

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Signed
		FINAL VERSION	24/11/05	

Halcrow
318 – 4190 Lougheed Highway, Burnaby, BC, Canada, V5C 6A8
Tel: (604) 293 2882 Fax: (604) 293 2892
www.halcrow.com

1 Glossary

(a) **ADA:** *Americans with Disabilities Act.* Similar acts apply in Canada, the UK and Australia to disabled access to transit systems. Note many historic streetcar designs and stations do not meet ADA requirements and have been specially adapted to comply or sought special dispensation.

(b) **ATP**: *Automatic Train Protection:* A safety system which prevents trams from running through red-light signals.

(c) **DBOM:** *Design, Build, Operate and Maintain.* A style of procurement commonly used in conjunction with the PFI initiative in the UK but now adopted in other countries. Bids are solicited from private sector proponents for the design, build, operate and maintenance of an infrastructure asset. Financing is typically a mixture of public and private section funding.

(d) **'Drive-on-sight'**: For on-street running trams/streetcars are driven in the same way as cars and must obey all traffic signals, speed limits etc. This type of operation is called 'drive-on-sight'. For segregated rights-of-way signalling systems are used to control the movement of trams allowing higher speeds.

(e) **FTA:** *US Federal Transportation Authority*

(f) **LRT:** *Light Rapid Transit.* There are varying definitions but generally considered as modern tram cars/streetcars capable of on-street running on mix traffic alignments. LRT/Streetcar also have crash-worthiness standards suitable for street operation.

(g) **On-Street running:** An expression used to describe tram operation in a mixed traffic environment where no dedicated right-of-way exists. Trams/Streetcars are normally operated using drive-on-sight.

(h) **P&R:** *Park and Ride.* Tram/LRT stations with a large number of parking lots normally located on strategic highway.

(i) **PCC**: Presidents Conference Committee. A standard Art-Deco streetcar design widely adopted throughout North America. Other common designs include the Peter Witt.

(j) **RAV:** *Richmond – Airport – Vancouver Rapid Transit System.* Proposed transit system to connect Richmond/Vancouver Airport with downtown.

(k) **Segregated right-of-way (ROW):** A segregated ROW allows trams to run at higher speeds and is not shared with other traffic using dedicated signalling systems.

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2 Introduction

2.1 *Background*

2.1.1 The objective of this technical note is to provide the City of Vancouver with information on the characteristics of LRT/streetcar systems that might be comparable with that planned for downtown Vancouver. The systems presented in this report are a mixture of restored streetcar and modern LRT systems. Some have a very strong tourist appeal such as San Francisco's F-line whilst others are modern urban transit system such as Portland's streetcar line.

2.1.2 The systems reviewed in this benchmarking report are as follows:

- San Francisco F-Line
- New Orleans
- Portland (Streetcar)
- Sacramento
- Toronto
- Sydney
- Melbourne
- Nottingham
- Manchester
- Vancouver (for reference)

2.1.3 The first part of this technical note presents a detailed description of each system together with photographs and system maps where possible. A table summarising technical data is also given for each system. Note detailed ridership information is not readily available other than the number of daily boards.

2.1.4 The second part of the report provides combined summary tables for reference and a short discussion of the implications for Vancouver's proposed streetcar system.

3 San Francisco F-line

3.1 *Introduction*

3.1.1 San Francisco has an extensive public transit system including LRT, streetcar and metro systems. San Francisco has two historic tram operations: the cable car system and the F-line streetcar. This section concentrates on the F-line.

3.1.2 A unique feature of the F-line is that it is one of the only systems operated using historical, refurbished, streetcar vehicles. The historic streetcar vehicles give the F-line a very strong tourist appeal connecting important tourist areas within San Francisco.

3.1.3 The F-line was built in four separate stages eventually connecting the downtown area with Fisherman's Wharf. The line was finally completed in March 2000. It is uses 24 rehabilitated streetcars. 17 of the cars are Art-Deco Presidents Conference Committee (PCC) cars and the remaining 7 cars are imported Peter Witt-style streetcars from Milan. The F-line is just over 8-km long and runs from the Castro district downtown to the historic Fisherman's Wharf area (see figure 3.1). The route is not fully segregated and is shared with other road traffic in Market Street. There are 32 stops, approximately every one block and most are accessible by means of ramps or passenger lifts for wheelchair access. The system is operated using overhead contact wire.

3.1.4 All of the streetcar vehicles have refurbished after being purchased from a variety of different sources, although they were built to similar designs. The vehicles were then repainted in a variety of different colour schemes to reflect the various US cities that once owned and operated streetcars (see figures 3.2 and 3.3).

3.1.5 The system has been a success in terms of ridership which has steadily increased year on year. The F-line now carries on average 20,000 passengers per day with a much higher ridership in the summer months, underlining its tourist appeal. The system is now carrying twice the forecast ridership with overcrowding becoming a problem at certain times of the day. Muni (San Francisco Municipal Railway) has recently purchased a further 11 more PCC cars to increase capacity. These additional vehicles will be introduced in 2005.

Figure 3.1: F-Line system map

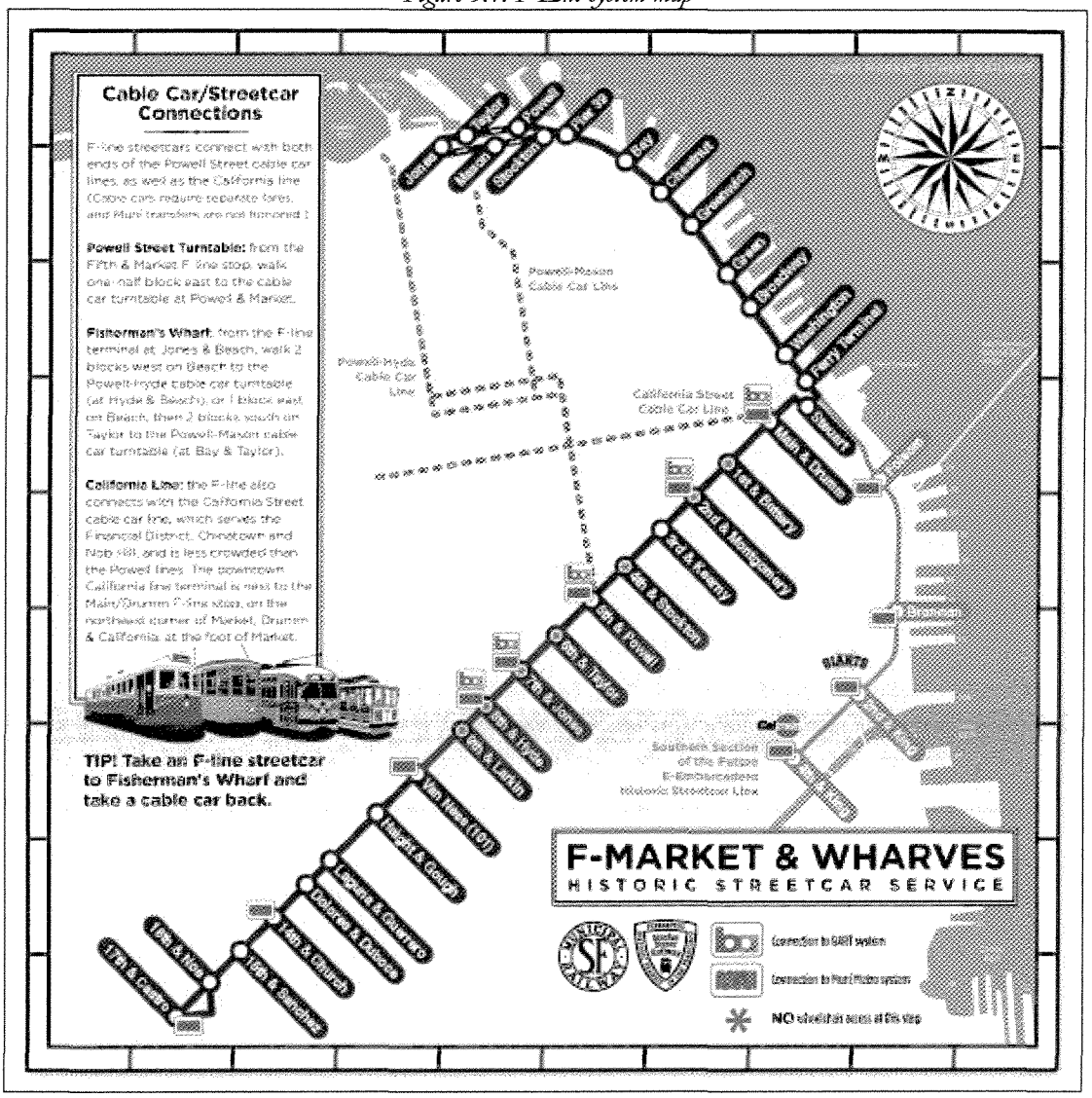


Figure 3.2: PCC 'Streamliner' design

Figure 3.3: Peter Witt Design

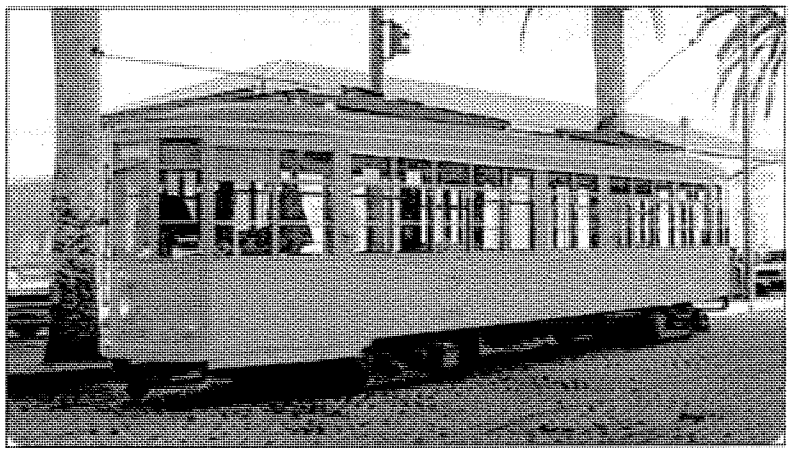


Table 3.4 San Francisco F-Line Characteristics	
System type e.g. LRT/transit/streetcar	Conventional tramway
Average age of vehicles (historic versus modern)	Restored streetcars PCC design and Peter Witt design
Number and type of cars e.g. low floor/articulated/historical	24 St Louis Car PCC ex-Philadelphia (1948); 3 St Louis Car PCC double-ended (1948, rebuilt 1994); 17 are in service painted in PCC colours of Muni. Further PCC cars have been purchased to increase capacity. Also 7 Peter Witt design cars in service
Vehicle dimensions (width, height, length)	Standard PCC design or Peter Witt Design
Capacity of cars (seated and standing)	Standard PCC design or Peter Witt Design
Accessibility (disabled accessibility) e.g. platforms and boarding	Stations are accessible by ramps or lifts. Note PCC fleet has been modified to achieve ADA compliance.
Length (segregated and at-grade)	5 miles/8km joint running in market street and segregate running from Market Street to Fisherman's Wharf.
Type of signalling/traffic management	Drive on sight.
Number of stations	32 stops
Type of platform at station – if any	Low level platforms
Frequency/headway	6-10 min
Hours of operation	05:00/00:30
Technical characteristics of maintenance facility (total area, floor size, # of bays)	Information not publicly available
Organisation and Institutional Setting	Public Ownership and Operation. San Francisco Municipal Railway (MUNI)
Integration with other Transit Systems	Basic fare allows travel on any MUNI vehicle (the "Metro" streetcars, historic streetcars and buses) except for MUNI's cable cars.

4 New Orleans

4.1 ***Introduction***

4.1.1 The transit system in New Orleans is operated by New Orleans Regional Transit Authority (NORTA). NORTA is a political sub-division of the state of Louisiana created in 1983 to take control of New Orleans' transit system previously in private ownership but losing money. The streetcar system is well used by commuters and tourists. NORTA markets one-day and three-day tourist passes called VisiTour which are sold through a wide variety of outlets including hotels. VisiTour passes allow unlimited use of the streetcars and buses.

4.1.2 New Orleans has three streetcar lines: Canal, Riverfront and St Charles. The St Charles line was the only one to survive when most of the original system was shut during the 1960s. Once the St Charles line was transferred to public ownership in 1983 NORTA began restoration including the original Perley Thomas vehicles dating back to 1923 and to 1924 (see figure 4.1). Refurbishment of the line included the Carrollton maintenance facility and 35 streetcars. The maintenance facility has recently been further expanded to accommodate an additional 23 vehicles for the Canal line. Despite the heritage attraction of the Charles Streetcar line it is well patronised by commuters as well as tourist carrying on average 20,000 riders per day. One problem with the heritage Perley Thomas streetcar design is that it is not ADA compliant and as a result no more historical vehicles can be added to the fleet (streetcars for the Riverfront and St Charles lines are ADA compliant). The Charles line has 52 stops extending over a 11.2km route, the majority of which is in the central median with the remainder, about 10 blocks, street running in shared alignment. Trams are driven 'on-sight' with no signalling system. One unusual feature of the system is the use of broad gauge rather than standard 1435mm gauge.

4.1.3 The Riverfront streetcar line was opened in 1988. The Riverfront line is operated with replica Perley Thomas streetcars but built with modern components. The line has 10 stations and uses part of an original railway right-of-way. The line has short, low level concrete platforms to facilitate easy boarding and is also ADA compliant.

Figure 4.1: New Orleans St Charles Line Streetcar

4.1.4 The Canal line, opened in 2004, runs over a new 8.85km line built in the central median with a 1.6km branch. The Canal line was forecast to carry 31,000 riders per day by 2015 serving both local residents and tourists, but recorded 30,000 riders in the first day of operation and 125,000 in the first week.

4.1.5 An innovative feature of the Canal streetcar line are 24 modern streetcar vehicles based on a historic streetcar design (see figure 4.2). The vehicles are designed to resemble the Perley Thomas model which originally ran on Canal Street in the 1920s. The vehicles resemble the Perley Thomas design still in use on the St Charles line but are built to modern standards including air conditioning, a modern low-noise braking system and ADA-compliant accessibility lifts.

4.1.6 Following the opening of the Canal Street project, New Orleans is planning another new line known as the Desire Corridor.

4.1.7 A summary of operating characteristics can be found in table 4.3.

Figure 4.2 New Orleans Canal Streetcar

Table 4.3 New Orleans Streetcar Characteristics	
System type e.g. LRT/transit/streetcar	3 lines historic streetcar design using trolley wire
Average age of vehicles (historic versus modern)	35 Perley Thomas cars dating back to 1923-1924 operate the St Charles line 24 new cars (2004) for the Canal St line plus a further 7 cars for the Riverside line based on the Perley Thomas design (1997)
Number and type of cars e.g. low floor/articulated/historical	35 historical (1923-1924) 7 cars Perley Thomas design 24 new cars also based on the Perley Thomas design
Vehicle dimensions (width, height, length)	Standard Perley Thomas design
Capacity of cars (seated and standing)	Standard Perley Thomas design
Accessibility (disabled accessibility) e.g. platforms and boarding	Only the Riverside and Canal lines are ADA compliant; the St Charles line has dispensation to operate. Some platforms have bus style shelters
Length (segregated and at-grade)	Canal streetcar line - 5½ miles/8.8km St Charles streetcar line – 10.6 miles/17km Riverfront streetcar line – 2 miles/3.2km Total of 18.1 miles / 29km Streetcars operate along a central median in downtown area. The Riverfront line follows a former rail route and is segregated.
Type of signalling/traffic management	Drive-on-sight
Number of stations	52 stops on the St Charles line 10 on the Canal Street line 10 stops on the Riverfront line
Type of platform at station – if any	Low, short platforms for the Riverside and Canal streetcar lines
Frequency/headway	Daytime 6 - 18 minutes, evenings 18 – 6 minutes
Hours of operation	First car 04:00-07:18 am, last car 22:36-04:04
Technical characteristics of maintenance facility (total area, floor size, # of bays)	1 general purpose facility for under 200 vehicles at Carrollton maintenance facility
Organisation and Institutional Setting	Public Ownership and Operation under the New Orleans Regional Transit Authority (NORTA)
Integration with other Transit Systems	$1.25 for a streetcar or bus fare in the NORTA system and $0.25 for a transfer.

5 Portland Streetcar

5.1 ***Introduction***

5.1.1 Portland has two LRT systems the MAX light rail and the Portland streetcar. The data presented in this chapter only refers to the Portland Streetcar. Note that a historic streetcar vehicle does runs as a tourist attraction on the MAX light rail system between Lloyd Centre and downtown Portland on weekends during the summer.

5.1.2 The Portland Streetcar system had been under discussion since 1988 when the first citizen's committee was formed to investigate building a downtown streetcar system. Construction began in 1999 with operations commencing in July 2001. The initial route is a 4.8km long continuous loop contained wholly within the downtown area. The loop connects Portland State University with the Good Samaritan Hospital (see figure 5.1). The system has a total of 32 stops located approximately every 3-4 blocks. Stops are made on-request by passengers. The system uses GPS satellite tracking to advise passengers of the next tram time thus avoiding the need to run to a published timetable.

5.1.3 The system has seven LRT vehicles manufactured by Skoda-Inekon in the Czech Republic (see figure 5.2). Five are in current use, supplemented by 2 historic tram cars formerly used on the MAX system. The two spare Skoda-Inekon vehicles will be used on the River Place Marina extension (see below). The seven Skoda-Inekon vehicles are narrower, shorter and lighter that those used on the MAX LRT system. The vehicles were designed deliberately small to reduce the cost of expensive construction work fitting them into existing street alignments. They are designed to run in mixed traffic within the downtown area, and can use conventional raised platforms and curbside loading/unloading. Ridership is performing above forecasts with projected boardings of 3,000 per day compared to 6,000 per day actual boardings.

5.1.4 Construction work is on-going to extend the system to River Place Marina. The 0.6 mile extension is extension connects the marina with the Portland State University using a single line section. The new extension is scheduled to open in mid 2005. There are also other plans to extend the system into the South Waterfront District beyond

River Place Marina. Construction on the Gibbs extension is expected to start in January 2005. Plans are also afoot for an eastside extension.

5.1.5 Characteristics of the Portland Streetcar system are given in Table 5.3.

Figure 5.1: Portland Streetcar Map

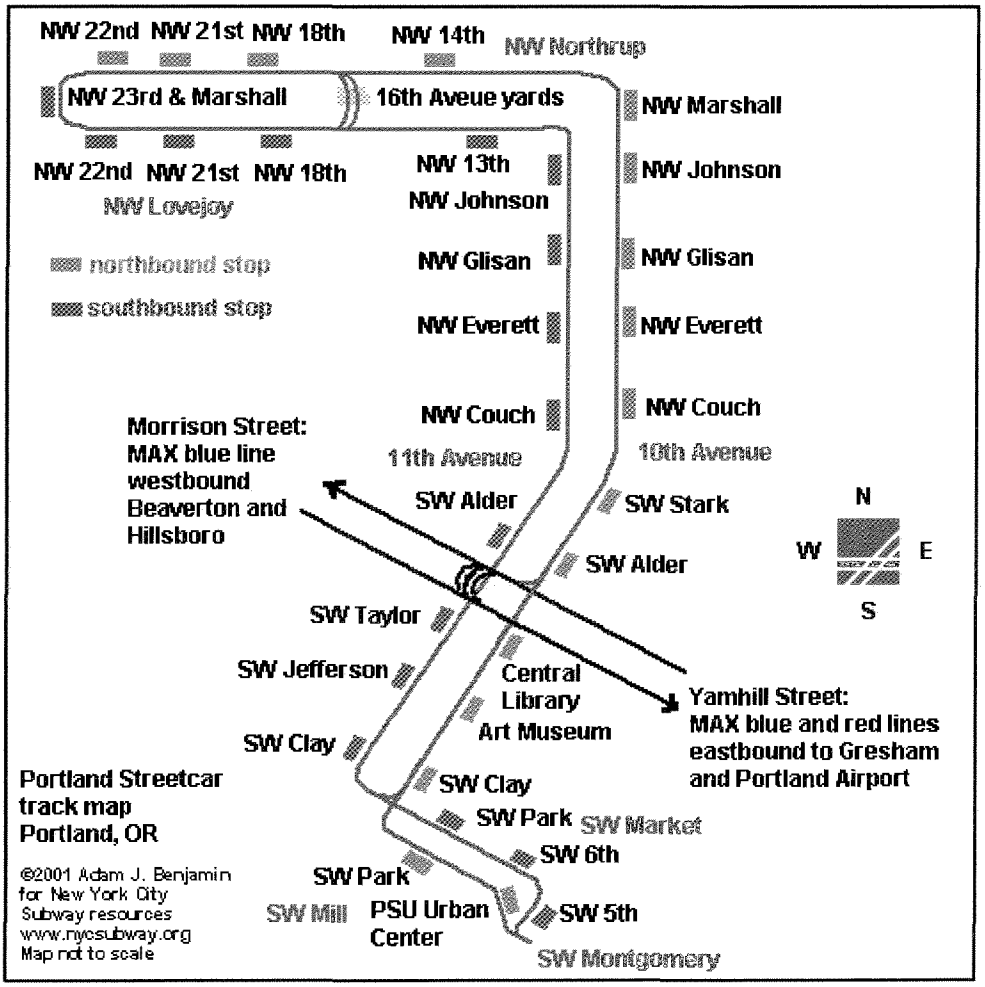


Figure 5.2: Portland Streetcar Vehicle built by Skoda-Inekon

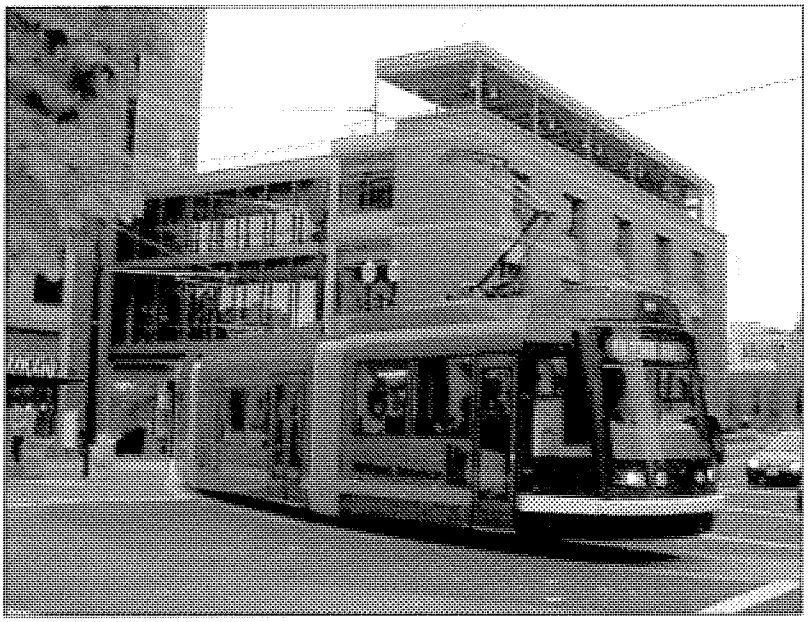


Figure 5.3: Portland Streetcar showing low-level platforms

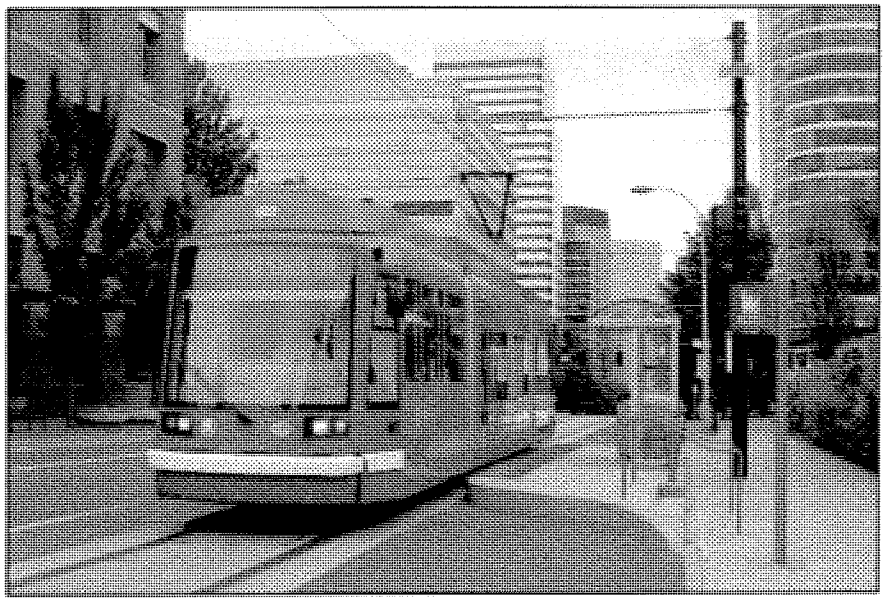


Table 5.3: Portland Streetcar Characteristics	
System type e.g. LRT/transit/streetcar	Streetcar system entirely within the downtown area. Fares are integrated with TriMet passes.
Average age of vehicles (historic versus modern)	3-years old for Skoda-Inekon vehicles and 12-years old for replica Brill heritage streetcar units.
Number and type of cars e.g. low floor/articulated/historical	7 Skoda-Inekon LRT vehicles delivered in 2001. 2 Gomaco Brill replica cars (1991/92) The two streetcars are for tourist purposes rather than transportation vehicles.
Vehicle dimensions (width, height, length)	2.46 meters wide and 20 meters long. They are narrower and lighter than those in use on the MAX system.
Capacity of cars (seated and standing)	Each vehicle can accommodate up to 140 passengers.
Accessibility (disabled accessibility) e.g. platforms and boarding	Curbside boarding and station ramps for wheelchair access.
Length (segregated and at-grade)	Length: 4.8km operated on a continuous loop in downtown area.
Type of signalling/traffic management	Streetcars must be driven in the same way as cars and obey all traffic signals laws. Average speed is 15 mph/24kph.
Number of stations	16 in both directions.
Type of platform at station – if any	Ramped access for wheelchairs.
Frequency/headway	No published timetable – operated on a "turn up and go" basis with GPS used to give waiting time at stations. But generally 14-minute headways on weekdays and Saturdays, and 20-minutes on Sundays.
Hours of operation	Weekdays 5.30am until 11.30pm (1.30 Fridays) and 7.50am – 1.30pm Saturdays, and 7.30am – 10.30pm Sundays.
Technical characteristics of maintenance facility (total area, floor size, # of bays)	Yard under I-405 (elevated portion) serves as a storage and maintenance area. For heavy maintenance there are connections with the MAX system and vehicles can be taken to Elmonica or Ruby Junction MAX yards.
Organisation and Institutional Setting	Public Ownership and Operation. Tri-County Metropolitan Transportation District of Oregon
Integration with other Transit Systems	Fares allow inter-modal transfer between Tri-Met buses and light rail, as well as on the Portland Streetcar (which is owned by the City of Portland).

6 Sacramento

6.1 *Introduction*

6.1.1 Sacramento is the state capital of California. The city's system is operated by the Sacramento Regional Transit District (RT). RT is also responsible for all bus operations. The Sacramento system was built in 1987 following the cancellation of a freeway project and used Interstate Transfer funds originally budgeted for the highway. The Sacramento system is a conventional LRT with a mixture of segregated and on-street running sections. Initial construction costs were kept low by use of a reserved freeway right-of-way together with a number of single-line sections and the use of former railway alignments/rights-of-way. Some sections of the system are now being double-tracked to provide more capacity. The segregated running sections are operated at higher speeds and with automatic signalling. The original system had a total length of 26.9 miles/43km and connected the eastern and north eastern suburbs with the downtown area (see figure 6.2). The system has a total of 42 stations.

6.1.2 Ridership has risen steadily since opening carrying 8.5 million passengers in 2002, or 39,000 average weekday trips. The LRT system is aimed at commuting, leisure and recreational trips into downtown Sacramento. The system does not have a high tourist usage despite the use of historic streetcars on downtown sections (see below).

6.1.3 There are plans to extend the system with a 10.2 mile extension to Folsom and a 0.55 mile extension to the downtown Sacramento Amtrak station. Work started on both extensions in 2001 with completion expected in December 2003. The entire Folsom extension is due to open in 2005 (2 years late) and is expected to add 6,000 daily passengers. The Folsom extension links the Rancho Cordova area with downtown Sacramento and is planned to open in a number of stages. As part of the extension plans additional 40 LRT vehicles are being purchased from Spanish manufacturers CAF to complement the existing fleet of 36 Siemens vehicles which have been in use since the system opened in 1987. Figure 6.1 shows a new CAF vehicle. There is also a southern extension to Meadowview. This is a 6.3 mile extension and was opened in September 2003. The ultimate objective is to extend the south line a further 4.9 miles/ 7.8kmto Elk. Another extension is also planned to the Airport, see figure 6.2.

6.1.4 The system uses a mixture of overhead catenary designed for higher speed running on the segregated sections and trolley wire in the downtown areas. The use of trolley contact wire for downtown sections allows historic streetcars to be operated. Historic streetcars cannot be used in on sections with overhead catenary. Maintenance is done at a 12-acre site which has capacity to service up to 85 LRT vehicles. A new maintenance facility is being added on the Folsom extension to provide more capacity.

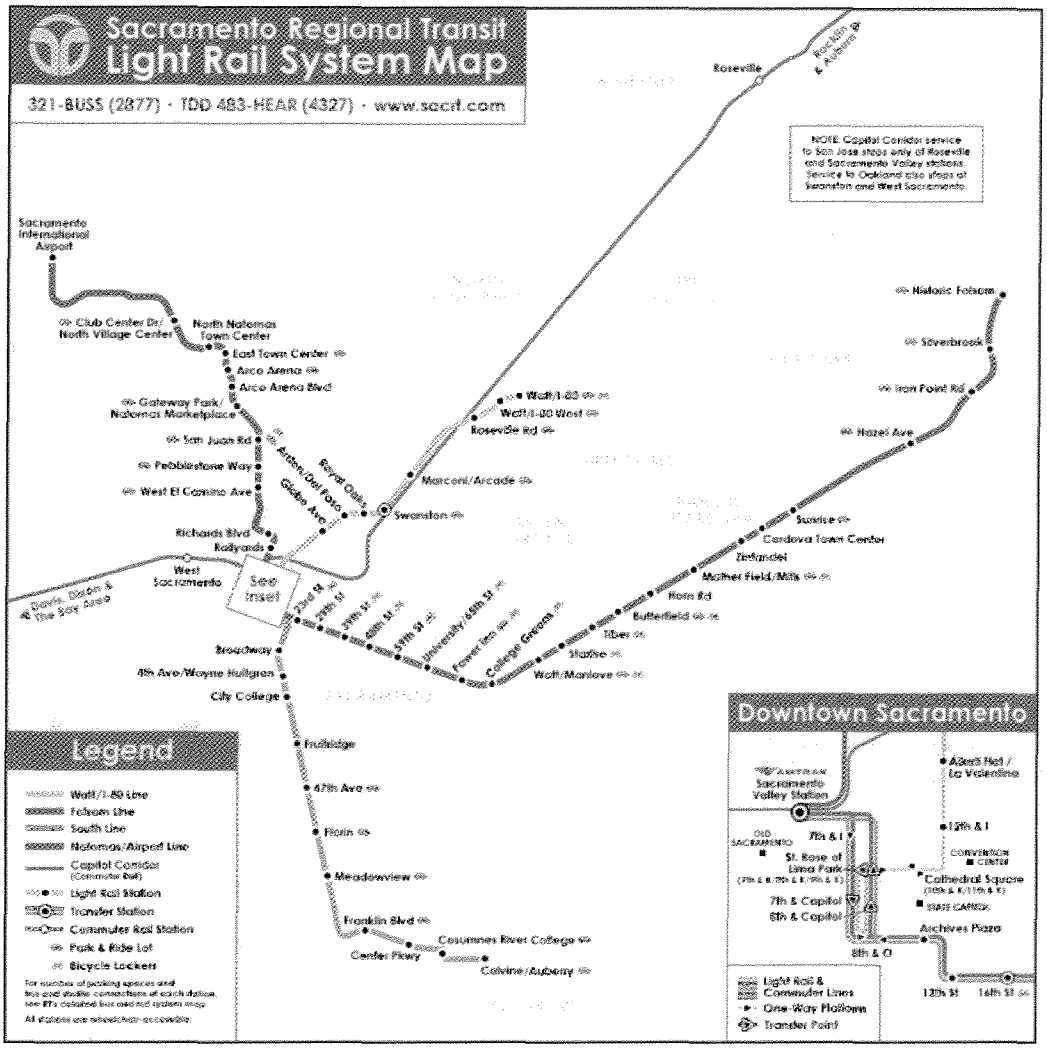
6.1.5 An interesting feature of the Sacramento system is the number of LRT stations with Park and Ride. 13 stations have a total of 6,042 parking lots, with a further 450 planned for Hazel Avenue on the Folsom extension. There is no charge for parking. Most stations have ramps or lifts for disabled/senior access.

6.2 ***Historic Streetcars***

6.2.1 As noted above the downtown area has been modified to allow historic streetcars to operate. However, there is only one restored vehicle which is mainly used for special occasions. There are four other streetcar vehicles awaiting restoration.

Figure 6.1: CAF LRT for Sacramento

Figure 6.2: Sacramento System Map Including Proposed Extensions



Note: not all of the lines in this map are actually in service.

6.2.2 Table 6.3 gives detailed operating characteristics of the Sacramento system.

Figure 6.3: Sacramento LRT Characteristics	
System type	Light rail standard gauge. Mixture of segregates and on-street running
Average age of vehicles (historic versus modern)	36 vehicles date from 1987 and 40 from 2004. Historic streetcar operated in city centre on special occasions only. Plans to refurbish four other heritage vehicles.
Number and type of cars e.g. low floor/articulated/historical	36 Siemens single-articulated, bidirectional cars 40 single-articulated, bidirectional cars built by CAF for system extension.
Vehicle dimensions (width, height, length)	CAF vehicles length 84', width 8'9" & height 12' 6" Siemens vehicles length 79'6", width 8'9" & height 12'6"
Capacity of cars (seated and standing)	CAF 64 seated, 177 standing Siemens 64 seated, 80 standing
Accessibility (disabled accessibility) e.g. platforms and boarding	All 41 stations are ADA accessible. 20 offer bus transfers and 13 stations have parking lots for park and ride.
Length (segregated and at-grade)	Length: 26.9 miles/43km mostly segregated Number of routes: 1 but 10.2 mile/16.3km extension planned
Type of signalling/traffic management	3 aspect colour light signalling on segregated track with drive on sight in city centre. At grade crossings are protected by standard railroad crossing gates.
Number of stations	41 stations, more planned with various extensions.
Type of platform at station – if any	At grade boarding platforms are not required.
Frequency/headway	15 minute intervals peak, 30 minute intervals off-peak
Ridership	8.5 million passengers 2002
System compatibility	Can operate both modern and historic streetcars in downtown areas only, subject to system capacity.
Technical characteristics of maintenance facility (total area, floor size, # of bays)	1 general purpose facility for under 200 vehicles occupying a 12-acre site
Organisation and Institutional Setting	Public Ownership and Operation. Sacramento Regional Transit District
Integration with other Transit Systems	Fare allows transfer between bus and light rail routes operated by Sacramento Regional Transit District

Contents

7 Toronto

7.1 *Introduction*

7.1.1 Toronto has a large transit system including rail, streetcars, subway and buses. Streetcar services are operated by the Toronto Transit Commission (TCC). There are 11 streetcar routes, 10 of which run on shared alignments in the downtown area. The total length of the system is 152.9km. In 2002 the streetcar system had approximately 40.6 million riders. Technical details of the Toronto Streetcar system are given in Table 7.3.

7.1.2 The TCC has a total fleet of 248 streetcars. The fleet comprises 196 Canadian Light Rail Vehicles (CLRV) built between 1977 and 1981 (see figure 7.1) and 52 Articulated Light Rail Vehicles (ALRV). ALRVs have a normal capacity of 155 passengers compared to 75 riders for a CLRV. The fleet of CLRV and ALRVs replaced aging PCC vehicles.

Figure 7.1: Canadian Light Rail Vehicle (CLRV)

Figure 7.2: ALRV

7.1.3 In 1997 TCC converted Spadina Avenue from bus to streetcar operation reporting a 15% increase in ridership as a result (Spadina Streetcar). The system was further expanded in 2000 with a 1km westward link from Spadina Avenue to Bathurst along the waterfront (Harbourfront Streetcar).

7.2 ***St Clair Avenue***

7.2.1 A key issue with the Toronto system is the use of alignments shared with other traffic in 2001. TCC produced a report examining measures to improve transit priority within Toronto to improve and sustain transit ridership, and improve competitiveness with private auto. One recommendation was to examine alignments where physically separated transit tracks could be implemented to give transit priority over private auto.

7.2.2 This resulted in a further report presented by TCC in December 2002. The initial recommendation of the December 2002 report was that further work should be done to examine a segregated right of way on St. Clair Avenue. St Clair Avenue was chosen

by TCC because it is one of the few routes in Toronto which is wide enough to accommodate both streetcar tracks and highway traffic (although the latter would be at reduced capacity). St Clair Avenue Streetcars also carry between 45% and 57% of people travelling in the corridor. In September 2004, after a lengthy debate (a 16-hour meeting!) final approval was given for the scheme to be implemented. The total cost of the scheme is $55 - $65 million of which $25 million would have been required to replace existing track on a like-for-like basis without changing traffic priorities.

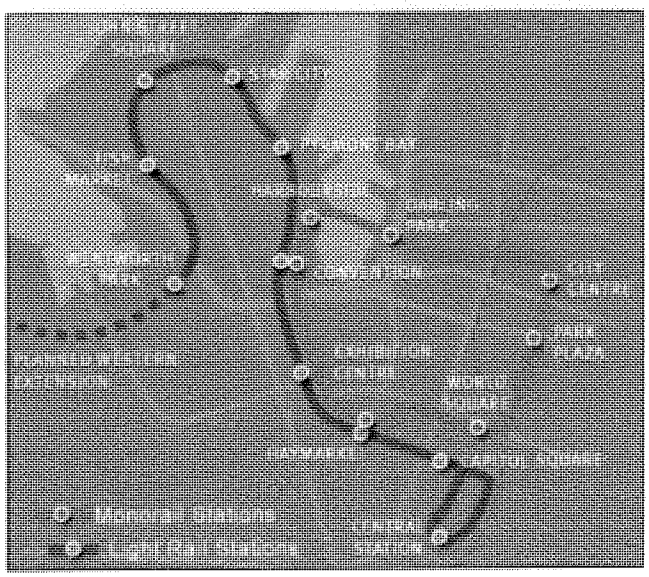
Table 7.3: Toronto Streetcar Characteristics	
System type e.g. LRT/transit/streetcar	Conventional street car operation on mainly shared alignments
Average age of vehicles (historic versus modern)	22 (All PCC phased out in late 1970s following introduction of ALRV & CLRV)
Number and type of cars e.g. low floor/articulated/historical	- 248 (2002) of which 196 are Canadian Light Rail Vehicles (CLRVs) and 52 are Articulated Light Rail Vehicles (ALRVs)
Vehicle dimensions (width, height, length)	CLRV are standard 50-foot streetcars ALRV 23.1m long articulated in the middle, 3.6m high and 2.5m wide.
Capacity of cars (seated and standing)	CLRV - 102 riders up to 132 crush loading ALRV - 155 riders up to 205 crush loading
Accessibility (disabled accessibility) e.g. platforms and boarding	Streetcars are not accessible. Plans are in hand to addresses this.
Length (segregated and at-grade)	Length: 152.9 km Number of lines: 11
Type of signalling/traffic management	Transit-priority traffic signals on all streetcar routes. Median right-of-way for streetcars on Queens Quay West and Spadina Avenue, with planning underway for King Street and St. Clair Avenue.
Number of stations	n.a.
Type of platform at station – if any	Streetcar platforms generally on near side of the signalized intersection. Some "far-side" platforms have been established to allow streetcars to take advantage of intersections where signal priority has been installed.
Frequency/headway	Peak 2.5-10 min, off-peak 5-20 min
Hours of operation	Variable operation hours with some lines running from 5:00 am to 3:00 am the next day.
Technical characteristics of maintenance facility (total area, floor size, # of bays)	Two facilities: Roncesvalles Carhouse and Russell Carhouse
Organisation and Institutional Setting	Public Ownership and Operation overseen by the Toronto Transit Commission (TCC)
Integration with other Transit Systems	Fares allow one-way continuous transfer between all TTC modes (bus, subway, streetcars and light metro transit) limited by time. "TTC Times Two" allows passengers who ride the TTC immediately before and after a GO Train/Bus trip can use the TTC transfer from their first TTC ride to board the second TTC vehicle. "Greater Toronto Area (GTA) Weekly Pass" is accepted on all TTC, Mississauga, Brampton and York Region Transit routes.

8 Sydney

8.1 ***Introduction***

8.1.1 A new 6.7km light rail line was opened in Sydney, Australia in 1997. There are 12 stops in total and the line is market as Metro Light Rail (MLR) and operated by Connex (see figure 8.1). The total capital cost of the line was AUS$ 65 million (approx CAN$68 million). The Sydney LRT is part of a long-term development scheme for the urban regeneration of Pyrmont which includes the Darling Harbour area. The system has strong tourist appeal as it serves a casino in Darling Harbour. The majority of the new line was built along the disused Darling Harbour goods line. The 5.7km section on the former goods line is a dedicated right-of-way with conventional colour light signalling. Speeds of up to 80km/h are permitted on the dedicated right-of-way. The remainder of the line is along a shared alignment requiring on-street running and uses line-of-sight signalling with a maximum speed of 20km/h. In 2000 the system was further extended from Wentworth Park to Lilyfield using the former Lilyfield goods line adding a further 3.1km of track. The cost of this extension was AUZ$16 Million

Figure 8.1: Sydney LRT and Monorail
(Note the western extension was completed in 2000)



8.1.2 The line is operated with a fleet of seven Adtranz (now Bombardier) modern air-conditioned trams which have low floors suitable for wheelchair access (see figure 8.2). The trams consist of five articulated modules and can be driven from either end. Each tram can carry 200 riders.

Figure 8.2: Sydney Trams at Central Station

8.1.3 The system currently has an annual ridership of 4 million passengers, or circa 13,000 riders per day. However, ridership is lower than originally forecast. One anecdotal reason for lower than forecast ridership is that the system does not reach the downtown area but instead terminates at Central Station (see below) which limits the commuting appeal of the line. It is also understood that the Casino in Darling Harbour has not generated as much ridership as expected.

8.2 ***Future Developments***

8.2.1 As stated above, one criticism of the current system is that it does not reach the downtown area. In May 2004, Metro Transport Sydney submitted a plan to extend the light rail system from Sydney Central station into the downtown shopping area. However, the scheme is controversial and bitterly opposed by retailers because of the anticipated disruption during construction. Two possible routes have been proposed.

8.2.2 Characteristics of the Sydney LRT system are summarised in Table 8.3.

Table 8.3: Sydney LRT Characteristics	
System type e.g. LRT/transit/streetcar	LRT
Initial line opening	1997 extended in 2000
Average age of vehicles (historic versus modern)	7 (in 2004)
Number and type of cars e.g. low floor/articulated/historical	7 (2004) full low floor trams - 7 Adtranz Variotram LRV (1997) maximum speed 80km/hour
Vehicle dimensions (width, height, length)	Length 28.28m Width 2.65m Height 3.388mm
Capacity of cars (seated and standing)	Seating Capacity 74 Standing Capacity 103 Total Passengers 223
Accessibility (disabled accessibility) e.g. platforms and boarding	All trams are low floor and all stations are accessible.
Length (segregated and at-grade)	7.2 km route length of which 5.7 km is a dedicated right-of-way and 1.5 is on a street running area Number of routes: 1
Type of signalling/traffic management	Signalling system in the right-of-way is a conventional relay based interlocking system and used audio frequency jointless track circuits. Route selection is made by tram drivers at wayside panels, with the route automatically resettling after use. On-street signal system is line-of-sight, with maximum speed set at 20km/h. An Automatic Train Protection system (ATP) enforces the wayside signalling and governs the speed of the train.
Number of stations	14
Type of platform at station – if any	Raised platform to allow easy boarding
Frequency/headway	10 to 15 min (06.00 to 24.00), 30 min (24.00 to 06.00)
Hours of operation	24 hour operation
Technical characteristics of maintenance facility (total area, floor size, # of bays)	Details not publicly available but a small maintenance depot is shown in various promotional material
Organisation and Institutional Setting	Private Operation through franchise operator Metro Transport Sydney, similar to Melbourne
Integration with other Transit Systems	Metro Transport Sydney operates both Metro Light Rail and Metro Monorail, though fares must be purchased separately. Other companies operate the bus and rail systems. However, purchase of a TramLink ticket allows transport on both Metro Light Rail and CityRail.

9 Melbourne

9.1 ***Introduction***

9.1.1 Unlike Sydney, Melbourne (Australia) retained its historic tram system and today this extends for 245km with 31 major routes and 1,770 stations. In 1999 the network was divided into two operating franchises: Yarra Trams and Swanston Trams. Franchise bids were then invited from the private sector. Yarra Trams are operated by Metrolink Victoria Pty a joint venture between Transfield and Transdev. In April 2004 Metrolink Victoria Pty also took over the running of the Swanston franchise and now runs the entire tram system. 141 million trips, or circa 450,000 riders per day were made during 2002/2003. As with other systems reviewed in this report, Melbourne's network is a mixture of dedicated rights-of-way and shared alignments. The city centre section is all shared.

9.1.2 Traffic congestion in Melbourne has gradually reduced the competitiveness of trams. As a result there are now plans to introduce a series of tram priority measures in the city centre to improve average speeds for transit.

9.1.3 New sections have recently been added to the network including a 2.2 km extension to Market Street, Box Hill (opened in 2003) and a connection to the Docklands precinct.

9.2 ***Types of trams***

9.2.1 Melbourne has a fleet of 474 trams with five different classes, designated W, Z, A, B and Low-floor. The oldest of these is the W-class which was first introduced into service in 1923 (see figure 9.1). This was the first standard tram design for Melbourne. Eight refurnished W-class trams are currently run on the City Circle tram route which is free and is a popular service for tourists. A total of 23 W-class trams have been refurbished and returned to service to retain the heritage feel of the system. However, the W-class trams are not wheelchair accessible

9.2.2 Recently a new generation of Siemens built low-floor trams were introduced. (Halcrow was responsible for successfully obtaining "vehicle acceptance" for these trams on behalf of Siemens from our Melbourne office). There will be a total fleet of 95 low-floor trams (late 2004). The low-floor trams are wheelchair accessible (see figure 9.2).

The new low-floor trams are gradually replacing the Z1 and Z2 class trams. Improvements have also been to tram stops with the construction of 17 "superstops" to provide better access.

Figure 9.1: W-Class "Christmas Tram"

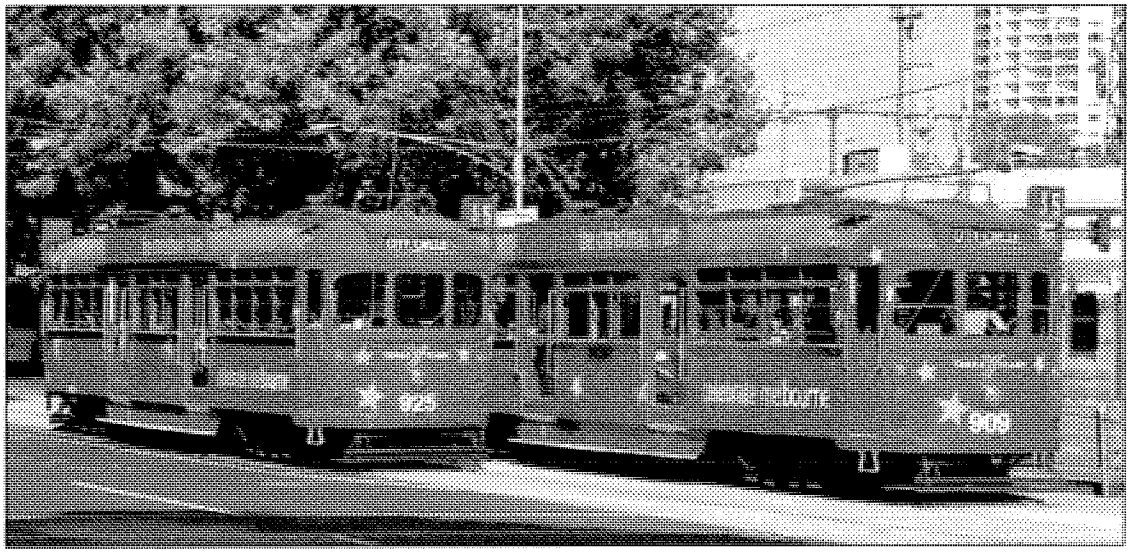


Figure 9.2: New Generation Siemens Low-floor Tram

9.2.3 A summary of Melbourne's tram system is given in table 9.3.

Table 9.3 Melbourne Tram System	
System type e.g. LRT/transit/streetcar	Tram (W-Class are similar to North American Streetcars)
Average age of vehicles (historic versus modern)	A large number of trams operating over 31 routes.
Number and type of cars e.g. low floor/articulated/historical	474 (2004) trams available for regular service/1 - 70 A-class vehicles - 132 B-class vehicles - 36 C-class low floor Citadis vehicles - 38 three section D-class low floor Combino vehicles - 21 five section D-class low floor Combino vehicles (one now in service, all to be delivered by 30.11.2004) - 53 W-class heritage trams (restricted operation on routes 30, 78, 79 and the free City Circle) - 124 Z-class trams
Vehicle dimensions (width, height, length)	n.a.
Capacity of cars (seated and standing)	n.a.
Accessibility (disabled accessibility) e.g. platforms and boarding	The first Yarra Trams Superstop, launched in 2001, a tram stop at the corner of Collins and Swanston Streets, offers easy access to mobility-impaired passengers. Initial investment has included the purchase of low-floor trams and the construction of Superstops to provide better access for the disabled and mobility impaired plus the refurbishment of vehicles to maximise passenger comfort and safety.
Length (segregated and at-grade)	Length: 245 km 31 major routes
Type of signalling/traffic management	Implementation of a two-year, AU$30 million Tram Priority Program began in 2004. Program will begin with 8 priority routes and includes hook turns, separation curbs, changes to parking arrangements, extension of curbs at tram stops. It will include a review of traffic management, tram operations, improved technology and road rules. Tram traffic lights ('T' lights) will be installed at intersections to help trams make up lost time at some intersections.
Number of stations	1770
Type of platform at station – if any	16 "superstops" otherwise curbside loading
Frequency/headway	10-12 minutes in peak , 5-30 minutes in off-peak
Hours of operation	Operate between 0500 and 0100 Mondays to Saturdays and between 0615 am and midnight Sundays.

Technical characteristics of maintenance facility (total area, floor size, # of bays)	There are 8 tram depots to service the 31 routes.
Organisation and Institutional Setting	Private Operation through franchise operator Yarra Trams. Concession model following broadly the same model as the UK. State still has ultimate ownership of the assets.
Integration with other Transit Systems	Melbourne transit services are provided by private franchise operations. The Victoria State Government's Office of the Director of Public Transport (ODPT) (in the Department of Infrastructure) co-ordinates all public transport services and ensures that private operators meet their contractual obligations. Under the franchise system, revenue for a transport company comes mainly from its allocation of MetCard revenue. A Two Hour Metcard allows unlimited train, tram and bus travel for at least two hours within selected zones on the day of first validation. Surveys are conducted on a quarterly basis to gather information on ticket usage, which is then used to determine the proportion of revenue that each operator receives on the basis of the number of equivalent passenger kilometres travelled on each MetCard. Franchisees are allowed to provide additional ticket types, with revenue going directly to the operator, however these are not very popular and generally do not provide the same value for money as a Metcard.

10 Nottingham NET LRT

10.1 ***Introduction***

10.1.1 This UK system was recently opened in March 2004. Halcrow were responsible for producing the ridership estimate for the winning proponents (Arrow Light Rail Ltd). Construction of the system started in 2001.

10.1.2 The project has been procured under a DBFO style contract with a 30-year concession period. The system is simi lar in design to the Manchester Metrolink system (see chapter 11) using a mixture of segregated and non-segregated track. The segregated sections of track have been created by sharing an existing heavy rail alignment to provide access into Nottingham city centre.

10.1.3 The 14km system connects Nottingham's main railway station with the suburbs of Hucknall and Cinderhill. The city's main railway station is located south of the city centre. The NET system improves accessibility from the north side of Nottingham to the station and provides access from the station to the city centre.

10.1.4 The system includes 4km of on-street running through the city centre before it joins a shared alignment with the Robin Hood heavy rail line (Nottingham to Mansfield/Worksop). There are a total of 23 stops with 5 stops have P&R spaces. The intention is that the P&R stops will attract car users as they enter the city and divert private cars away from the city centre. There are 15 trams which have low-floor access built by Adtranz (now Bombardier) see figure 10.1. Figure 10.2 shows the low-level platforms constructed to facilitate easy boarding. The Incentro trams use a 750c DV overhead power supply with a maximum speed between 70km/h – 80km/h.

10.1.5 Initial ridership has been very encouraging with NET announcing in August 2004 that they intend to increase the frequency of trams to provide more capacity. An estimated 750,000 riders were estimated for the first month of operation.

10.1.6 There are plans to build two other lines but they have been put on hold following the UK government's withdrawal of funding for LRT schemes.

Figure 10.2: NET LRT Vehicle

Figure 10.3: NET Low-level Platforms

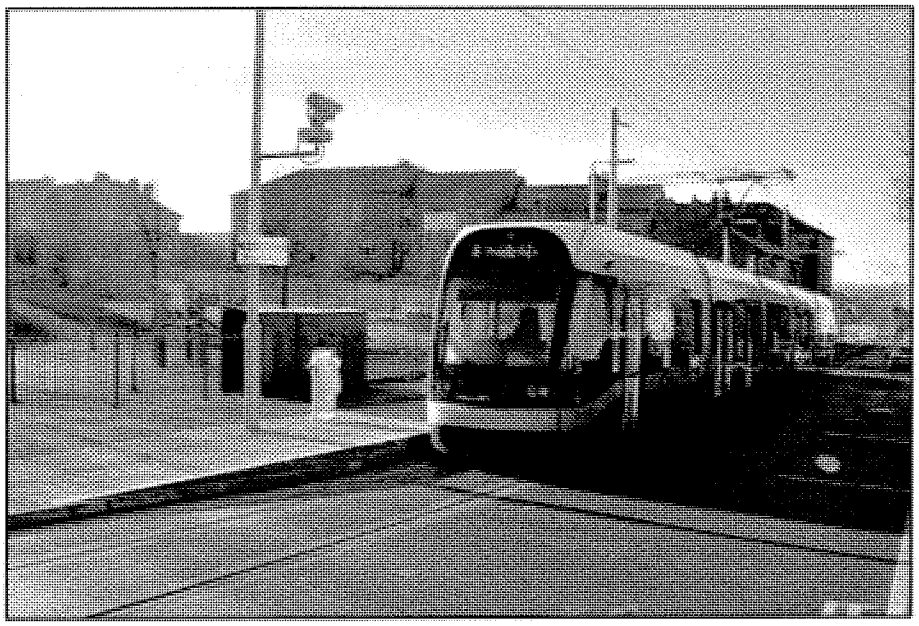


Figure 10.1 Nottingham NET Characteristics	
Characteristics	**Comments**
System type	LRT Tram vehicles built in Derby UK Phase 1 is a mixture of at-grade and segregated running 14km in total
Average age of vehicles (historic versus modern)	Opened in 2004
Number and type of cars e.g. low floor/articulated/historical	15 Bombardier Incentro five-section articulated tramcars (2004)
Vehicle dimensions (width, height, length)	Length: 33 m Width: 2.4 m Height from top of rail to top of vehicle: 3.35 m Floor to ceiling height: 2.1 m
Capacity of cars (seated and standing)	Seats: 62 Capacity: 191 per tram assuming 4 passenger per square metre
Accessibility (disabled accessibility) e.g. platforms and boarding	2 specified wheelchair locations with low level stop request and help points per tram. Trams are low-floor throughout.
Length (segregated and at-grade)	14 km route length of which 10 km are off-street and 4 km are on-street
Type of signalling/traffic management	Segregation from/priority over traffic. Ten of the 14km are away from roads, with some of the on-street running also segregated from traffic. Trams get priority over other road traffic at almost all the junctions on the route. Also note that bus services are integrated with tram to provide feeder services. On-street signalling: combined stop/proceed with road traffic, point position indicators, tram loop detection Off-street signalling: Track circuit block signalling integrated with railway level crossing signalling
Number of stations	23
Type of platform at station – if any	Platforms at flush level with tram to allow easy boarding
Frequency/headway	Peak/off peak: 6-8, 8-15
Hours of operation	06:00 to 24:00 Monday to Saturday; 8:00 to 23:00 Sundays and holidays.
Technical characteristics of maintenance facility (total area, floor size, # of bays)	One depot on Wilkinson Street that includes stabling for the full fleet of 15 tram; automatic tram wash; sanding facilities; control room with CCTV monitors, public address system, etc.; accommodation for drivers, inspectors and infrastructure maintenance staff.
Organisation and Institutional Setting	Private operator through a 30.5 year concession to design, build, operate and maintain (DBFO) system granted to proponents Arrow Consortium.
Integration with other Transit Systems	Separate fares for the tram system. However, there are a number of joint NCT bus and NET tram tickets available (CityRider, DayRider,

	GroupRider, EasyRider) which allow travel on both city buses and trams. Limited competition between bus operators and tram system.

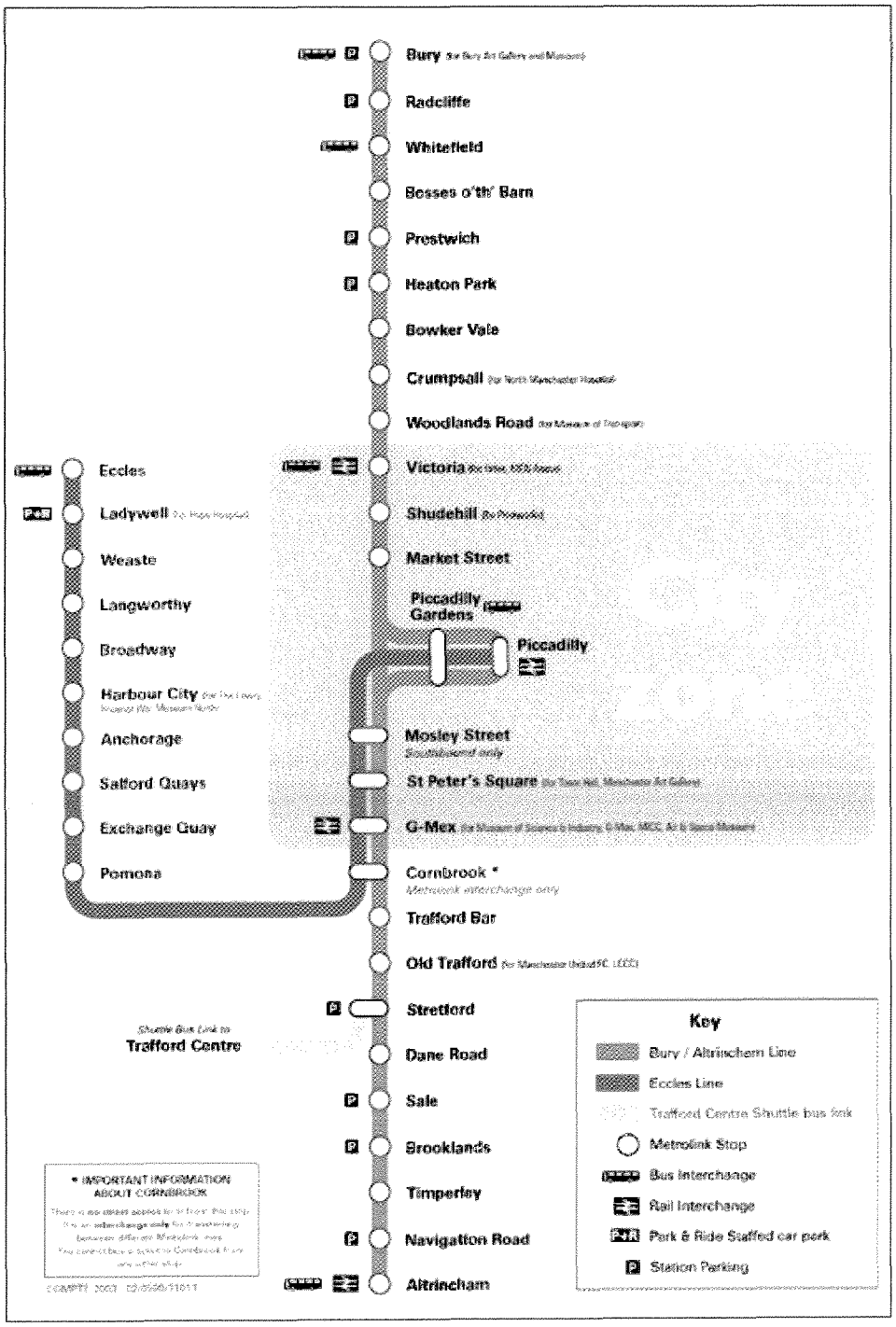
11 Manchester Metrolink

11.1 ***Introduction***

11.1.1 Manchester was the first UK city to implement a modern LRT system. Phase 1 consisted of the conversion of two former heavy rail lines and an on-street city centre connection. (Note: the decision to convert the two former heavy rail lines was driven by the need to replace existing life-expired rolling stock and electrification equipment, similar to decision regarding St Clair Avenue in Toronto). Figure 11.1 shows the Metrolink network Phases 1 & 2. Phase 1 was opened in 1992 and proved highly successful. The 31km route was built under a DBOM arrangement under the UK government's private finance initiate. The system was re-franchised in 1997 and new operator Serco was selected. Serco are also involved in the RAV project in Vancouver. Phase 2 extended the system to Eccles and was fully opened in July 2000. In 2001 Metrolink carried 17.2 million passengers compared to the 7.5 million who used the Bury and Altrincham heavy rail services prior to conversion to Metrolink. The heavier than expected use of Phase 1 led to considerable interest from other cities and a number of other schemes were proposed.

Figure 11.2 Metrolink Tram

Figure 11.3: Metrolink Platforms (Piccadilly Gardens)


Bury
Radcliffe
Whitefield
Bosses o'th' Barn
Prestwich
Heaton Park
Bowker Vale
Crumpsall
Woodlands Road
Victoria
Shudehill
Market Street
Piccadilly Gardens
Piccadilly
Mosley Street
St Peter's Square
G-Mex
Cornbrook *
Trafford Bar
Old Trafford
Stretford
Dane Road
Sale
Brooklands
Timperley
Navigation Road
Altrincham
Eccles
Ladywell
Weaste
Langworthy
Broadway
Harbour City
Anchorage
Salford Quays
Exchange Quay
Pomona
Shuttle Bus Link to
Trafford Centre
* IMPORTANT INFORMATION ABOUT CORNBROOK
Key
Bury / Altrincham Line
Eccles Line
Trafford Centre Shuttle bus link
Metrolink Stop
Bus Interchange
Rail Interchange
Park & Ride Staffed car park
Station Parking

11.1.2 Phase 1 consists of 31km of track with a fleet of 26 trams operating headways of 6 minutes. The trams are Italian-built T68 light rail vehicles built in 1991 supplemented with an additional 6 type T68a vehicles built in 1999 for the Eccles extension. The vehicles are articulated two-car units (see figure 11.2). As the system is a converted heavy rail line the LRT trams cars were built to allow boarding from high level platforms, rather than on-street boarding (see figure 11.3). For trams stops in Manchester city centre this meant constructing new platforms, installing electrification masts and special insulated track. Some critics of the system have argued that the city centre sections are a blight on the urban landscape with a mass of wires, platforms and track, with little attention given to the visual impact.

11.1.3 There are advanced plans for further expansion (Phase 3), including a line to the Manchester Airport, Ashton-under-Lyne and Rochdale. Halcrow have been involved in the project since the early stages and are currently working for one of the proponents for Phase 3. However, expansion plans suffered a set back in August 2004 following the UK government's decision to put funding on hold on the grounds of value for money following a report by the National Audit Office. Phase 3 plans envisage a "big bang" approach to expansion of the system i.e. building a number of new lines at once rather than a piece-meal approach to provide Metrolink services to all parts of Manchester.

11.1.4 The system remains heavily overloaded in the AM and PM peaks leading to plans to purchase more rolling stock. Ridership is predominately geared towards commuting into central Manchester, with services heavily overloaded in peak hours.

11.1.5 Table 11.3 provides technical data on Metrolink.

Figure 11.3: Manchester Metrolink Characteristics	
Characteristics	**Comments**
System type	Tram car built to UK British Rail loading gauge and platform heights Phase 1: Bury to Altrincham: Suburban heavy lines converted to light rail operation with on-street city-centre running. Phase 2: City centre to Eccles: Segregated track and on-street running.
Average age of vehicles (historic versus modern)	All modern Phase 1: approximately 11-years Phase 2: approximately 4-years
Number and type of cars e.g. low floor/articulated/historical	32 GEC ALSTOM-Firema vehicles articulated but can run in pairs. No historical vehicles in use.
Vehicle dimensions (width, height, length)	2.57m x 3.7m x 29m
Capacity of cars (seated and standing)	200 passengers with a crush load of 250
Accessibility (disabled accessibility) e.g. platforms and boarding	Trams are fully accessible to wheelchair users each platform and station. Includes ramps to raised platforms and special reserved places for wheelchairs.
Length (segregated and at-grade)	Length Phase 1 and 2: 39 km. Only city centre section is at-grade. Tender has been issued for contract to design, construct and operate extensions to Rochdale via Oldham (24 km), Manchester Airport (22 km) and Ashton-under-Lyne (10 km).
Type of signalling/traffic management	On-sight driving in city centre with track-circuit block on segregated lines to give higher line speeds controlled from a central signalling centre. Fitted with ATP.
Number of stations	36
Type of platform at station	Raised platform using former British Rail stations on Phase 1. Platforms required in city centre stations
Frequency/headway	Phase 1 - Bury to Altrincham every 6 min (peak), 12-15 min (off-peak) Phase 2 - Eccles every 12 min (peak), 12-15 min (off-peak)
Hours of operation	First/last car: 06.00/24.00 Monday-Saturday, 07.00/24.00 Sunday
Technical characteristics of maintenance facility	Maintenance Depot at Shude Hill. (A new Metrolink depot is also being built in Trafford to accommodate the expanded phase 3 system).
Organisation and Institutional Setting	Metrolink is privately operated by Serco Metrolink. Assets remain under public ownership though Greater Manchester Passenger Transport Executive (GMPTE)
Integration with other Transit Systems	A stand-alone fare system but multimodal tickets are available but not widely used

12 Vancouver Skytrain & Streetcar

12.1 ***Introduction***

12.1.1 Vancouver does not operate an LRT or streetcar system analogous to those reviewed in previous chapters. Vancouver has a mixture of transit systems including: Skytrain (a driverless transit system operating on a dedicated right-of-way), express B-line buses, trolley buses and normal buses. There are two Skytrain lines: Expo and Millennium. New Mark II rolling stock was built to operate on the Millennium line but is compatible with the Expo line. Both lines are fully segregated and operated on an elevated guideway. This is a unique configuration in the context of the systems reviewed in this report. Trains are operated at very high frequencies with a top speed of 90km/h. Skytrain has daily boardings of 205,000 with 32 stations. The system is operated by TransLink.

12.2 ***Vancouver Streetcar***

12.2.1 The City of Vancouver is planning an LRT/Streetcar system (see figure 12.1). Phase 1 will run from Granville Island to the Waterfront Transit Hub, a distance of approximately 5km. Phase 1 will follow the existing historic streetcar alignment between Granville Island and Science World. A proposed extension to Phase 1 sees the line further extended from the Waterfront Transit Hub to Stanley Park. A possible future Phase 2 extension adds another line from Science World to Granville Street, via Pacific Boulevard. The planned system could use a mixture of modern and historic streetcars.

12.2.2 Based on the systems reviewed in this report the following benchmarking principles can be applied to a possible Vancouver system:

- *Historic streetcars* have strong tourist appeal based on the evidence of New Orleans and San Francisco's F-Line. In a tourist-orientated system ridership can be increased without necessarily compromising the system's appeal to other users. The New Orleans system uses new streetcars based on historic shells but with modern components. The difficulty of using historic streetcars is that they are no longer made and second-hand vehicles would need to be refurbished, provided they could be located. The cost of refurbished vehicles

could exceed that of new modern tram cars. Modern cars have the advantage of meeting modern ADA standards (or Canadian equivalent) and have low-floors making them easy to board;

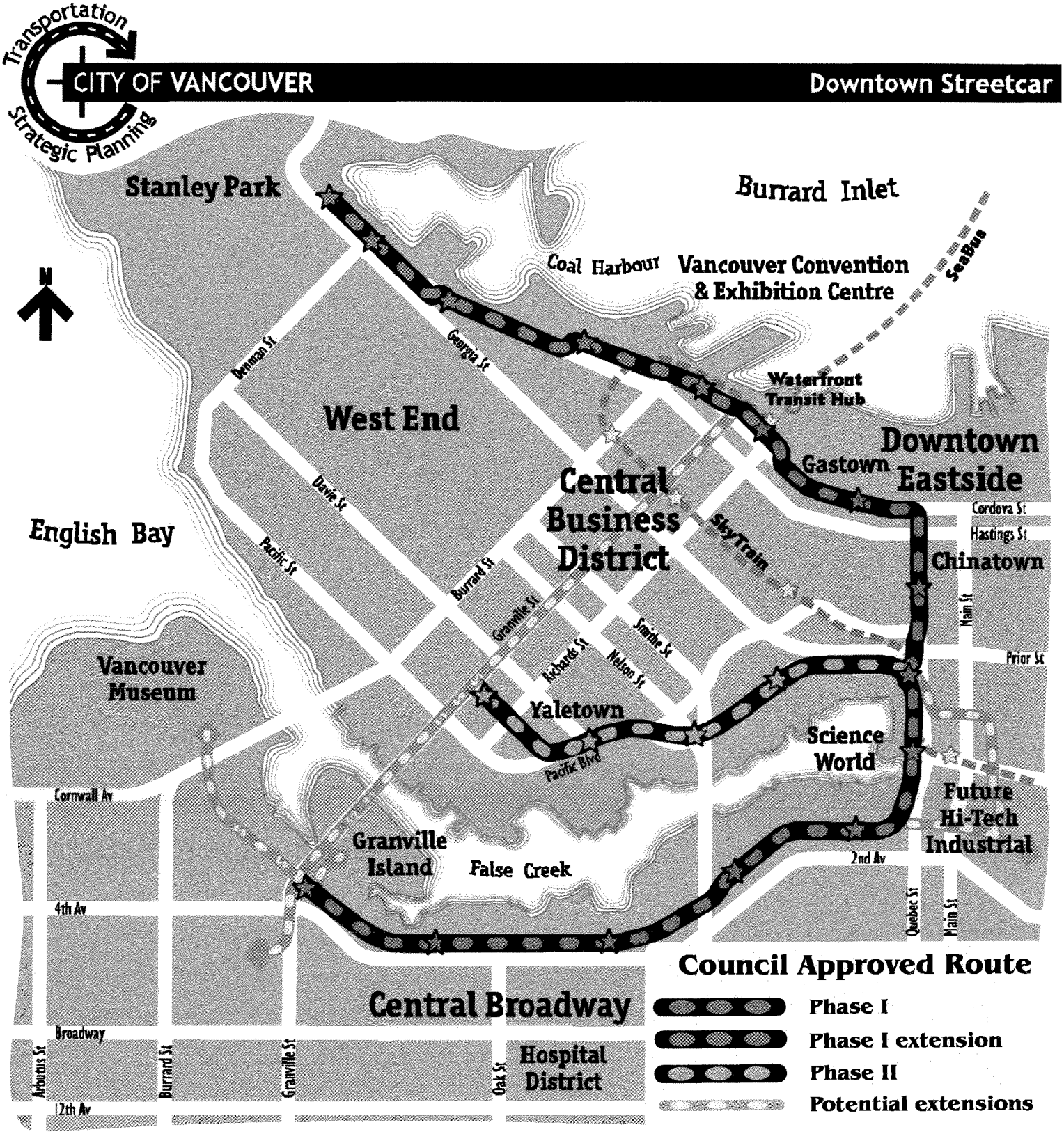
- *Dedicated rights of way.* Almost all systems reviewed have some segregated running sections to ensure that the streetcar is competitive compared with private cars. Where possible a wholly segregated system is likely to prove the most time-efficient but in an urban area, where road space is at a premium, this may not be possible. Improving priority for trams/streetcars has been an issue for a number of the systems reviewed in particular Melbourne. Toronto is also actively pursuing reallocation of highway space in the St Clair Avenue to provide better tram priority. Some systems have also benefited from the ability to reuse former railway lines reducing land acquisition costs and land take;

- *Stations/Stops.* New systems have been built with raised platforms and some have been retrofitted as is the case for Melbourne. Raised platforms allow easy wheelchair access into streetcars. Platforms are typically no more than a kilometre apart and in some cases at the end of every block;

- *Technical Aspects:* For segregated alignment sections modern colour light signalling is used and for shared sections line-of-sight driving is used. Signalling system may also be integrated with existing traffic signals to ensure streetcars are given priority. All systems (with the exception of Skytrain) use overhead electrification with 750V DC being the common standard (Note that TransLink's trolley buses use 650V DC). The majority of systems are also standard (1435mm) gauge. (New Orleans is broad gauge which is slightly wider). Some systems have been built as single track with passing places to reduce initial capital costs and measure market response. Others have been built in various stages as funding permits. For example, sections of the Sacramento system are currently being double tracked to improve capacity as ridership has increased;

- *Ridership:* The systems reviewed appear to have healthy ridership levels and in some cases demand has exceeded initial expectations. In the case of Nottingham additional services have been included to provide additional

capacity to meet demand. All publicly operated systems have integrated ticketing systems which makes them easy to use. In some cases they are free within the city centre area.


Transportation
Strategic Planning
CITY OF VANCOUVER
Downtown Streetcar
Stanley Park
Burrard Inlet
Coal Harbour
Vancouver Convention & Exhibition Centre
SeaBus
N
Denman St
Georgia St
West End
Waterfront Transit Hub
Downtown Eastside
Gastown
Central Business District
SkyTrain
Davie St
English Bay
Pacific St
Burrard St
Granville St
Cordova St
Hastings St
Chinatown
Main St
Smithe St
Richards St
Nelson St
Prior St
Vancouver Museum
Yaletown
Pacific Blvd
Science World
Future Hi-Tech Industrial
Cornwall Av
Granville Island
False Creek
2nd Av
4th Av
Quebec St
Main St
Central Broadway
Broadway
Arbutus St
Burrard St
Granville St
Oak St
Hospital District
12th Av
Council Approved Route
Phase I
Phase I extension
Phase II
Potential extensions

13 Summary Tables

13.1 ***Network Characteristics***

13.1.1 Table 13.1 shows network characteristics for each system. Melbourne has the longest tram system with 245km and 1770 stations many within the central downtown area. Most systems operate on a mixture of segregated and non-segregated alignments. Systems with track in downtown areas are normally shared with other traffic. Those systems which are able to provide direct access into the city centre/downtown area are preferred by riders at they do not need to change to reach their destination.

13.1.2 Rolling stock varies by system, with some operating historic streetcars to retain a strong tourist appeal and others using modern designed vehicles. Both modern and historic systems are equally well used. San Francisco and New Orleans appear to be the most successful examples using a historic design.

13.1.3 The extent to which systems have priority over other traffic is also important. For example in Melbourne shared alignments in the city centre are heavily congested leading to extended journey times for all users. Proposed schemes in the UK have failed at economic appraisal stage because they did not offer travel time savings over existing transit services. Travel time savings could be assured if the political difficulty of introducing dedicated rights-of-way in urban areas and the need to remove existing traffic were overcome, as is the case in Toronto.

13.1.4 Spacing of stations varies by system and is dependent on the physical layout of downtown areas. Most cities have a grid structure dictating the location of stops. On average stations are spaced between a few blocks and 1-2km apart. Typically systems have fewer stops on dedicated alignments to maximise speed and reduce run times, with more stops in downtown areas to maximise ridership and coverage.

13.1.5 All but three of the systems operate peak and off-peak headways with peak headways generally twice that in the off-peak. Only Vancouver, San Francisco and Sacramento operate the same frequencies throughout the day. On average peak, services operate between 6 minute and 10 minute headways. Off peak services operate between 15 minutes and 30 minutes.

Table 13.1: Network Characteristics

System	Rolling stock	Route Km	Number of Lines or Routes	Segregated (km)	Non-Segregated (km)	Number of Stations/stop	Av Km between stations	Freq Peak (min)	Freq Off Peak (min)
San Francisco F-line	Historic streetcar operation	8km	1 streetcar system	Section along waterfront is segregated	Shared section in market street	31	1 block	6-10	n.a.
New Orleans	Historic streetcars built to modern standards	12.9km	3 lines – 2 operating with new rolling stock based on historic design	Not know but dedicated central median	Some shared sections	60 plus	1 block	6-18	18-36
Portland Streetcar	Modern rolling stock	4.8km	1 line in downtown	Short dedicated section at Portland State University	Mostly non-segregated	16	1 block	14	20
Sacramento	Modern rolling stock	48.7km	1 linking eastern and northeastern suburbs with extension to Folsom planned (2004)	27.5km	21.2km	42	1.1km more in downtown area	15	30
Toronto	Modern rolling stock	152.9km	11 lines	Approx 16km but plans to segregated section e.g. St Clair Avenue	Almost all system is mixed traffic	Not stated	Not stated but high density in downtown area	2.5 -10	5-20
Sydney	Modern rolling stock	7.2km	1 line on edge of downtown tourist orientated	11.8km	3.0km on street operation	14	0.5km	10 -15	30
Melbourne	Mix of modern and historic W-Class trams	245km	31 routes	Outer sections are segregated	Significant sections in city centre	1770	0.13km but high density in downtown area	10 -12	5-30
Nottingham	Modern rolling stock	14.0km	1 commuting line plus P&R stations	10 km shared railway alignment	4 km in city center	23	0.6km	6-8	8-15
Manchester	Modern rolling stock	39.0km	2 commuting lines	33km	6km	36	1.1km high density in downtown area	6-12	12-15
Vancouver	Automated Rapid Transit	49.4Km	2 – Expo & Millennium	49.4Km all segregated		32	1.5km	2-6	n.a.

13.2 ***System Boardings***

13.2.1 Table 13.2 shows basic statistics on passenger boardings or "boards". Melbourne has the highest number of daily boards, followed by Toronto reflecting the size and coverage of these cities and their transit systems. Population statistics apply to city jurisdictions rather than catchment of individual systems or lines. Note Vancouver Skytrain has extremely high daily boardings given its city's size.

Table 13.2 Boards and Demographics

System	***Estimated Daily Boardings***	**Population**	**Density pop/ha**
San Francisco (F-line only)	20,000	3,228,605	20.5
New Orleans	40,000	480,000	24.7
Portland (Streetcar only)	6,000	1,222,000	12.8
Sacramento	39,000	1,393,498	14.6
Toronto	270,700	4,628,000	25.5
Sydney	12,903	4,201,493	18.9
Melbourne	454,839	3,559,654	13.7
Nottingham	19,608	620,000	31.0
Manchester	54,839	2,600,000	51.6
Vancouver (Skytrain)	205,000	2,126,806	21.6

13.2.2 The boardings reported in table 13.2 are consistent with reported daily ridership for transit systems in Vancouver. Boardings for a variety of transit routes in Vancouver are as follows:

- B-line, route 99 has daily boardings of 31,000
- Route 9 (Boundary/Broadway/Arbutus/UBC) has daily boardings of 25,000
- Route 20 had daily boardings of 22,000.

13.3 ***Revenue and Operating Costs***

13.3.1 Table 13.3 gives details of revenue and operating costs for the LRT/Streetcar systems. Note that disaggregate data is not available for all streetcar systems as some are reported within a larger transit system. Some systems also have a fare-free zone in the downtown/city centre areas which reduces revenue collected.

Table 13.3: Revenue and Operating Costs for Streetcar/LRT systems

LRT/Streetcar System	Number of dedicated employees	Annual Passenger Million CAN$	Annual Operating Costs Million CAN$	Rev/Cost Ratio (cost recovery)
Toronto CAN$ (1)	Not stated	62.0	106.0	58%
New Orleans US$	113	6.0	8.5	55%
Portland US$ (1)	545	22.5	56.3	31%
Sacramento US$	214	19.3	24.1	62%
San Francisco US$ (1)	1,010	23.4	114.8	16%
Vancouver Skytrain	493	60.0 (2)	67.1	89%

(1) Figures stated here apply to whole transit system streetcar.

(2) Skytrain numbers are estimated

CITY OF VANCOUVER

Downtown Transportation Plan

Approved by Vancouver City Council

July 9, 2002

The attached Downtown Transportation Plan was approved by Vancouver City Council on July 9, 2002.

The following motions were moved and carried unanimously:

A. **THAT** the Downtown Transportation Plan, attached as Appendix A to the Policy Report dated May 16, 2002, entitled "Downtown Transportation Plan", be adopted to improve downtown access and liveability by creating a balanced transportation system that includes adjusting the road network, enhancing public transit, promoting a walkable downtown, creating a network of bike lanes, maintaining efficient goods movement, managing parking supply and implementing intelligent transportation systems.

B. **THAT** the General Manager of Engineering Services and the Director of Current Planning be instructed to report back by January 2003 on an implementation program based on the recommendations scheduled for completion "within 3 years", as outlined in Section 7.0 of the Downtown Transportation Plan, attached as Appendix A to the Policy Report dated May 16, 2002, entitled "Downtown Transportation Plan", and that a schedule be developed for all other recommended items.

C. **THAT** General Manager of Engineering Services and the Director of Current Planning be instructed to regularly monitor the implementation of the Downtown Transportation Plan and report back with updates, as required, to address new issues or reflect new Council policies.

D. **THAT** TransLink be requested to include the recommendations of the Downtown Transportation Plan in developing an Area Transit Plan for Vancouver.

E. **THAT** "Water Transportation"be added as Section 4.9 to the draft Downtown Transportation Plan.

F. **THAT** Section 5 entitled "Implementation Ideas" in the draft Downtown Transportation Plan be replaced with the revised version containing illustrations.

G. **THAT** the specific action items in the Downtown Transportation Plan contingent to Council's resolutions for a design study for Granville Street/Mall, be deferred.

H. **THAT** Council receive the letter from TransLink dated June 27, 2002, and instruct staff to work with TransLink to address the comments and suggestions included in its written submission and consider the following statement in developing the Downtown Transportation Plan implementation program:

> *"Give effect to the City's stated priority to increase transit use and improve service by allocating road space and managing traffic systems and regulations to improve the reliability, speed, comfort and status of transit vehicles. Such priority will reflect transit's current and expected importance in moving people to and within the downtown and will include a range of measures including bus lanes, signal priority, bus bulges, queue jumpers, auto turning restrictions and improved pedestrian amenity."*

I. **THAT** Council receive the letter dated July 3, 2002, from the Vancouver Port Authority and instruct staff to consider its contents in developing the Downtown Transportation Plan implementation program.

J. **THAT** as part of the report back to Council in January 2003 noted in **B**, Council be offered options for:

1. *Population-based indicators of the level of pedestrian, transit, bicycle, and automobile use to be gathered every one to two years;*
2. *Five-and ten-year goals to be set for each of these indicators;*
3. *Costs of gathering these indicators.*

K. **THAT** as part of the report back to Council in January 2003 noted in **B**, Council be offered options for:

1. Transportation demand strategies that involve Vancouver employers and major destinations within Vancouver;
2. Contests and rewards for reducing use of the car that could be promoted citywide.

L. **THAT** as part of the report back to Council in January 2003, staff report back on the implications of the following items as requested by the Bicycle Advisory Committee:

- *Robson Street bicycle route between Beatty and Burrard;*
- *northbound bicycle connection along the Homer/Richards corridor;*
- *bicycle connections to the Georgia viaduct.*

CITY OF VANCOUVER

Downtown Transportation Plan

Approved by Vancouver City Council

July 9, 2002

1 Executive Summary

The Vision

The vision for Vancouver is to be the most liveable city in the world. This vision has been achieved in the recent past and can continue to be achieved in the future. One of the most important aspects of a liveable city is its transportation system, at the centre of the city.

For downtown Vancouver, the transportation vision is to be the most accessible place in the region. Achieving this vision will contribute to a thriving and prosperous business community and create a downtown where people want to work, live and play. For all trips, whether on foot, by bike, on a bus, or in a car, the experience of travelling around the downtown will be pleasant. Downtown is a place where the transportation network can offer choices that are extensive and exciting, such that getting to and around downtown is an attraction in itself.

The Transportation Challenge

The transportation challenge facing the downtown is to accommodate more people travelling in the future without adding traffic lanes to the existing bridges and roads leading to the downtown. At the same time, there is an expectation to minimize congestion. At first glance the challenge appears enormous. However, this plan presents a strategy that meets the challenge.

In 1997, the *Vancouver Transportation Plan* recognized that road capacity is finite and that even if more roads were to be built they would soon be congested with more cars. The solution is to decrease the demand for auto trips by providing additional transportation choices, particularly transit. Although the transportation solution may seem simple, the transportation issues are much more complex within the downtown peninsula.

Downtown's transportation system is closely tied to its economic health and liveability. Businesses downtown depend on the transportation system to allow employees and customers to travel easily to their place of business. As well, many of these businesses rely on the road network to deliver and receive goods and services. If roads become congested, the cost of business would increase and the downtown economy could suffer.

Congested roads also affect the liveability and the desirability of being downtown. This is especially important because of the residential growth in the downtown peninsula. Reducing traffic congestion and the resulting air and noise pollution, creating more pedestrian friendly streets, providing more sustainable choices like transit and bicycling will help keep downtown an attractive place for businesses and residents alike.

The downtown transportation system must also address its role as an entertainment and recreational destination. Downtown is home to the region's largest sport venues (BC Place stadium and GM Place arena). It is also the region's primary tourist destination with major convention centre facilities, a thriving cruise ship industry and the majority of the region's hotel rooms.

To the benefit of Vancouverites, downtown Vancouver is economically successful and already very liveable. Vancouver has been ranked as the most liveable city in the world. To maintain this status in the future, efforts must be taken now to avoid the transportation problems facing many other North American cities. The Downtown Transportation Plan is the means to this end. It builds upon the success of the past and helps to guide transportation decisions to 2021.

Foundations of the Plan

Transportation planning in the city and region is an ongoing activity. The need for the Downtown Transportation Plan did not occur overnight. It has evolved and developed over the last ten years from a continuum of city and regional plans. These plans include:

- Central Area Plan (City of Vancouver, 1991)
- Transport 2021 (GVRD, 1993)
- Livable Region Strategic Plan (GVRD, 1995)
- CityPlan (City of Vancouver, 1995)
- Vancouver Greenways Plan (City of Vancouver, 1995)
- Vancouver Transportation Plan (City of Vancouver, 1997)

The Downtown Transportation Plan moves the city forward by taking the city and regional goals and applying them. The terms of reference included:

- The increase in peak period trips to downtown should be accommodated by a major expansion in transit;
- Overall road capacity into the downtown will not be increased above the present level;
- Facilities for pedestrians will be improved within downtown;
- Bicycle access both to and within downtown will be improved by providing bike facilities on bridges, and providing a safe and effective network of routes throughout downtown;
- The downtown street circulation system will be reviewed to support downtown neighbourhoods;
- Short-term parking will be managed to ensure there is sufficient parking to meet normal demand; and
- Parking and unloading of trucks in downtown commercial lanes will be reviewed with the intention of improving essential access to businesses.

The fundamental principle of the plan is to create a sustainable transportation system that will meet the needs of the present without compromising the future. The land use component of this principle is already well entrenched, and the resulting travel trends are promising.

The Central Area Plan encouraged the development of downtown residential land uses. In the past 10 years, the number of residents living downtown has increased by about 54%. This is projected to increase another 31% by 2021. Downtown employment is also projected to increase about 30% by 2021. This increase in downtown population has helped to reduce the burden on the city's transportation network by allowing residents to live closer to work. The downtown is a complete community, placing most residents within walking distance of most destinations. This proximity provides commuters with more transportation choices, particularly walking and cycling. This is confirmed by the walking and cycling trends between 1994 and 1999. In 1994, walking and cycling trips made up 20 percent of all daily trips into the downtown and together made up the third highest mode used behind auto and transit trips. In 1999, walking and cycling trips made up 35 percent of all daily trips and are now the most frequently used mode, followed closely by car and transit trips. At the same time, car trips into downtown have remained relatively constant. In the future, transit is expected to handle most of the new trips.

Process

A multi-disciplinary and inter-departmental staff team was created to develop the Downtown Transportation Plan. An extensive public consultation process was established to seek input from a wide range of stakeholders, including business, community and resident groups. The public process included the following:

- 17 workshops, open houses and walkabouts were held to address transportation issues from both travel mode and neighbourhood perspectives. Approximately 500 people participated in these events.
- Three newsletters were created and widely distributed for public information. Each newsletter included a survey on key issues. Over 1,500 people responded to these surveys with the majority indicating that the plan was on the right track.
- A random sample telephone survey was conducted in early 2002 to gauge support for the plan. The responses indicated that the majority of the public supported both the direction of the plan and its specific proposals.
- Numerous additional meetings were held with stakeholder groups to deal with specific issues and interests. A regular presence was established at meetings of the major downtown business groups over the course of the plan's development.

Plan Components

The Downtown Transportation Plan is separated into 7 main components. Although they are presented separately, all the components were concurrently developed through an iterative process due to the interactions amongst them.

1) ***Road Network Plan***
2) ***Transit Plan***
3) ***Pedestrian Plan***
4) ***Bicycle Plan***
5) ***Goods Movement Plan***
6) ***Parking***
7) ***Intelligent Transportation Systems***

1) Road Network Plan

Four key principles guide the plan's approach to the road network.

- Minimize Traffic Congestion. Traffic congestion not only affects auto traffic, but it affects the operation of transit buses and commercial vehicles, and decreases comfort for pedestrians and cyclists. Ultimately it reduces the economic health of the area and the quality of life for its inhabitants.
- Provide access to key destinations and support new land uses in the downtown. The maturing residential neighbourhoods in the downtown are an example of changing land uses that may require supportive changes to the road network.
- Provide a balanced transportation system. A range of transportation options needs to be provided within the downtown to meet demand and allow choice.
- Enhance safety and user comfort for all modes.

Road Network Recommendations

Several downtown streets are designated as part of TransLink's Major Road Network (MRN). The purpose of the MRN is to help maintain regional mobility and provide continuity through municipalities for all types of traffic. A review of the existing designated streets (Hastings, Georgia, Smithe, Nelson, Howe, Seymour and Main Street (south of Prior)) confirms that they are appropriate. A review of other streets showed that Burrard Street and Granville Street are potential candidates for inclusion. Other streets like Dunsmuir and Main (north of Prior) could be reviewed in the future.

The plan also proposes a number of changes to the road network to better match street form and function. Particular effort has been made to propose changes to streets in areas that were formerly commercial or industrial and which have since developed residential uses. These changes are designed to increase downtown liveability, while accommodating transportation needs.

Proposed changes to the road network include:

- Convert Carrall, Abbott, Beatty, Cambie and Homer to two-way streets to provide better accessibility and to better serve transit and cycling needs without hindering traffic circulation in the area.
- Maintain Granville Street as a transit, pedestrian and service vehicle corridor, entertainment district and future greenway. Transit efficiency along Granville Street should not be diminished.
- Reconfigure Granville Street south of Smithe Street to improve traffic circulation, widen sidewalks and reduce conflicts.
- Maintain Water and Cordova Streets as one-way streets for a better overall functioning of those streets, including the pedestrian realm.
- Further evaluate Pender Street between Cambie and Howe for potential conversion to a one-way eastbound street to facilitate the creation of a bike lane and permanent parking and loading lane.
- Widen roadways at specified locations to facilitate vehicular circulation.
- Redesign intersections with unusual geometry or where conflicts are common to improve comfort and safety.
- Adjust the traffic signal system to encourage traffic to flow (with "green waves") at 40 km/h, rather than 50 km/h at present.

2) Transit Plan

Transit carries the largest share of commuters to downtown by all modes, with about 40% of commuters travelling by bus, SeaBus, West Coast Express, and SkyTrain. This share is expected to increase to 45% by 2021.

The transit goals of the plan are to improve transit service both for trips within the downtown and trips to and from the downtown. In recognition of areas such as Central Broadway and the False Creek Flats in the metropolitan core, the plan also works to improve connections to these areas. These improved connections will likely first be made by bus, but these will be supplanted in the longer term by rail connections.

Transit Plan Recommendations

One way of providing better service is to create a more equitable fare structure for the short trips that tend to be made in the metropolitan core. A review of the fare structure, with reference to free or reduced fare zones in other cities, is recommended.

A rapid transit line between Vancouver and Richmond has long been part of regional plans. Several potential route alignments for different rapid transit technologies have been preserved in downtown Vancouver. The Downtown Transportation Plan has reviewed the alignments and recommends that the line be underground downtown with stations located in Downtown South, the Central Business District, and at Waterfront Station.

Options to expand rail rapid transit to the North Shore and along the Hastings corridor should also be preserved for future consideration.

City Council approved a basic downtown streetcar route network in 1999, which has been incorporated into the Downtown Transportation Plan. The routes use a variety of available rights-of-way to connect new neighbourhoods, transit hubs and tourist attractions. The service would act to complement the existing transit system and should be integrated in terms of fares and service. Some modifications of the streetcar network approved in 1999 are recommended. In general these modifications will better integrate the network with existing facilities and expand service to the False Creek Flats area, which has recently emerged as a desirable destination.

With the growth in new residential neighbourhoods downtown comes new demand for transit to serve these areas. In addition, some connections between existing neighbourhoods (e.g. the West End and Central Broadway) are not convenient. The plan's local transit proposals seek to address these issues through the creation of several simple, convenient local bus routes. These routes will be designed to complement liveability through the use of quiet electric trolleybuses or low-noise Community Buses. These changes will be pursued through TransLink's Vancouver Area Transit Plan, scheduled to start in 2002.

Several downtown locations function as major interconnection points in the transit system. These include Waterfront Station, Granville Street, Burrard Station, and Main Street Station. The plan proposes that these facilities be improved to increase their convenience, comfort and effectiveness as major transit nodes.

3) Pedestrian Plan

Walking is an efficient, healthy and popular means of travel over short distances, such as those found in downtown Vancouver. Not only do downtown residents walk to downtown destinations, but people arriving in the downtown by other travel modes frequently walk some distance to get from the bus stop, SkyTrain station or parking garage to their destination. Thus improving the walking environment benefits the users of all travel modes. Furthermore, the growing downtown population is dramatically increasing the number of walking trips made, while car and transit trips have remained steady. The goal of the plan is to increase the comfort, interest, accessibility and convenience of the pedestrian environment.

Pedestrian Plan Recommendations

The plan proposes a broad range of improvements for pedestrians that can be summarized as follows:

- Create a legible system of pedestrian routes that connect key destinations and places of interest.
- Increase comfort and safety at crossings with pedestrian bulges, selective introduction of mid-block crossings, modified treatment of sidewalk/lane crossings, wider crosswalks at busy intersections, and removal of selected pedestrian hold (delayed walk) signals.
- Increase accessibility with better curb ramp design and barrier-free access where grade transitions now require the use of steps.
- Encourage walking by extending guidelines promoting weather protection, such as canopies and awnings to more streets.

Enhanced treatments are proposed for many streets with the greatest intervention on Greenway routes on Granville, Comox/Helmcken, and Carrall streets. Wider sidewalks are proposed for Davie Street and the portion of Granville Street south of Nelson.

4) Bicycle Plan

A comprehensive network of bicycle routes on local streets has been developed in Vancouver since the adoption of the 1992 Cycling Network Study. The missing link in this network is the downtown, where an absence of low-traffic streets makes it impossible to extend the same strategy taken in the rest of the City. Recognizing this difficulty, the City's 1997 Transportation Plan recommended the creation of a network of bike lanes downtown.

Although recent trends show that cycling is growing rapidly as a commuting mode. A lack of cycling facilities in the downtown may be discouraging some people form cycling. Travel surveys performed during the wet weather months indicate that the number of cycling trips to downtown doubled between 1994 and 1999. This occurred in the absence of any major improvements to downtown cycling facilities. The number of bike trips is expected to more than double again by 2021. Experience in other cities indicates that bicycle lanes offer the most benefit in attracting cycling traffic and improving safety for all users. For this reason the Downtown Transportation Plan focuses on creating a network of bike lanes.

Bicycle Plan Recommendations

A basic network of bike lanes connecting key entry points (bridges, existing bikeways) to the downtown with major activity centres is proposed. This 25 kilometre network has been designed to minimize its effects on other road users by preserving on-street parking and traffic lanes

wherever possible. In many cases travel lanes will be narrowed slightly in order to allow bike lanes to be introduced. In a few instances parking will be removed but this is often accompanied by benefits to traffic and transit. The cycling network would be introduced with a way-finding system to promote the use and presence of the network.

Local streets in the West End and new waterfront neighbourhoods are being designated as "bicycle-friendly" streets given their low traffic volumes and importance in providing local access. From a cycling perspective, these streets are analogous to the established bikeways outside of downtown. Changes are proposed to make some of the traffic diverters in the West End more permeable to cyclists.

End-of-trip facilities (bicycle storage, showers, change rooms) will continue to be pursued in new developments through the City's land use controls.

Use of the cycling facilities will be monitored over time to ensure they are appropriate to demand. The network as proposed should be reviewed periodically for its effectiveness in meeting demand.

5) Goods Movement Plan

The ability to move goods and services efficiently is important to the economic health of the central business district. Downtown includes a truck route network and extensive truck area for the purpose of accommodating goods movement activities. As the vast majority of this movement takes place on the road network, minimizing congestion is vital. Reducing congestion by encouraging the use of non-automotive means of commuting will help achieve this end. Additionally, goods movement needs to be compatible with the neighbourhoods it serves and traverses.

Downtown Vancouver is fortunately situated such that through movements of heavy trucks are not an issue. Defined truck routes and restriction of heavy trucks using the Lions Gate Bridge effectively eliminates heavy trucks using the downtown as a bypass to other destinations.

Goods Movement Plan Recommendations

The plan proposes that truck access be restricted in areas where industrial and commercial uses have been replaced by residential uses. Additional streets will be designated as truck routes in commercial areas to improve the connectivity of the network and reduce the need for circuitous routings.

Loading activities will continue to be encouraged to take place in off-street facilities where these exist. Rear lanes in commercial areas will continue to be dedicated primarily to goods movement since they reduce the burden on street frontages where competition with other users is greater. Only where alternatives have been exhausted should on-street loading spaces be provided. In such cases they would be considered a high-priority use.

Tour buses are regulated by the truck route system but also have special needs. The plan considered creating a parallel network of designated streets for tour buses. However, routings would be better managed on a case-by-case basis to balance the needs of tour bus operators and minimize negative impact on residential and other sensitive areas.

6) Parking Plan

Regulating the number of off-street parking spaces is one of the few means currently available to the City to control the number of vehicles coming into downtown. The City establishes minimum and maximum parking standards for developments in order to ensure that an adequate, but not excessive, parking supply is available.

Controlling the off-street parking supply indirectly controls the market price of parking, which in turn influences its use. Since parking is one of the few out-of-pocket expenses car-owning commuters typically consider, maintaining an appropriate number of spaces can influence travel behaviour through the price mechanism and simple availability.

Short-term parking is important in maintaining the competitiveness of shopping, entertainment and tourism uses in the downtown. Thus it is a separate issue from off-street commuter parking. Short-term parking should be provided wherever practical.

Parking Plan Recommendations

The plan recommends that a review of downtown parking standards be conducted as transit service increase, such as after the opening of the Millennium SkyTrain line. This is to ensure that the off-street parking requirements stipulated in the Parking By-law reflect actual demands and that excessive parking supplies are not provided that would work against the transportation goals of the downtown. As well, a review of parking deficient areas within the downtown is recommended to allow the development of free-standing parking facilities only where required.

A major challenge for the City is that parking is less tightly regulated elsewhere in the region. If downtown parking becomes overly scarce and expensive relative to the rest of the region, inequalities would be created that would be damaging to the economic health and competitiveness of downtown businesses. For this reason TransLink is encouraged to develop and implement a regional parking policy that supports regional liveability and transportation goals.

In recognition of the importance of on-street parking as a source of short-stay parking, the plan proposes to introduce an additional 570 parking spaces during the rush hours. In terms of full time parking spaces available, the plan proposes no net loss, although some spaces are reallocated in order to meet other plan objectives.

7) Intelligent Transportation Systems

Intelligent Transportation Systems (ITS), refers to the use of technology to make our transportation system safer and more efficient. Some ITS services are already being used in Vancouver, such as the centrally co-ordinated traffic signal management system, red light cameras, and automatic vehicle location and real-time travel information on the 98 B-Line bus service.

ITS Recommendations

The Downtown Transportation Plan proposes that ITS technologies be pursued to make downtown travel by pedestrians, cyclists and transit passengers more convenient and safe, and minimize overall road congestion. Some proposed applications include:

- Microwave detection to give priority to pedestrians, cyclists or transit buses at intersections;
- Use of the traffic signal control system to establish a 40 km/h progression speed;
- Real-time transit schedule information at all bus stops and through the internet;

- Use of ITS for road pricing and other transport demand management measures in co-ordination with TransLink;
- Provision of traveller information through wireless technology, roadside displays, the telephone or the internet; and
- Use of wireless technology or smart cards to manage and operate parking meters.

Plan Evaluation

An evaluation of the transportation network was completed using the downtown sub-area model of the regional EMME/2 transportation model. With the implementation of all recommended changes in the Downtown Transportation Plan, the model shows that the plan will help reduce overall traffic congestion by encouraging more transit ridership. Assuming regional transportation demand management measures are implemented, the model shows that average vehicle speeds in 2021, in comparison to 1996, would increase by 3 percent and average transit speeds would increase by 14 percent. This result is significant considering that, while the number of trips made into the downtown increases, there is no increase in road capacity and additional facilities are provided for pedestrians and cyclists. The analysis also indicates that the implementation of regional transportation demand management measures and a rapid transit line to Richmond contribute significantly to minimizing congestion in the downtown.

From an environmental perspective, the Downtown Transportation Plan should have a positive impact. Air quality and noise levels within the downtown should remain acceptable given the projection of no increase in automobile traffic, the continued use of trolley buses and future use of rapid transit. A model for assessing the streetscape environment in relation to land uses and traffic was developed. This model could be used during the implementation of various components of the plan to ensure compatibility between land uses and transportation, and that high-quality pedestrian environments are created.

The above shows that a highly accessible and liveable downtown can be achieved despite the constraints. Downtown can remain the most accessible town centre in the region and be economically competitive.

Implementation

Many of the recommendations in the Downtown Transportation Plan provide a specific course of action. However, the recommendations need to be reported back with additional analysis, public consultation, design details and budget allocations prior to implementation. Many, like painting lane lines on the roadway, adjusting the traffic signal control system, and constructing corner bulges are an application of existing traffic management tools and can be implemented relatively quickly from a reallocation of existing resources. Others, like the application of intelligent transportation system and constructing a rapid transit line, are more complex and require more time and resources. To begin the prioritization process, a number of proposals to be pursued in the short term (within three years) have been identified.

To capture many of the ideas generated and to illicit further discussions, over 50 conceptual designs and spot improvements are presented. These represent potential solutions to the many problem locations identified and could be a starting point for future changes.

Conclusion

In furthering the city's transportation goals and objectives as outlined in the 1997 Vancouver Transportation Plan, and consistent with other City and regional policies, an extensive public consultation process was undertaken to develop the Downtown Transportation Plan. From the public input received and analysis completed, proposals have been developed that move towards actual implementation. Most of the proposals build upon past work to ensure that the transportation network will serve the downtown well to 2021. In fact, past trends are promising, but there is a need to keep striving for the best transportation network possible. With the anticipated growth, this plan moves towards a more balanced transportation system. It will help to minimize congestion, increase accessibility, improve liveability, and achieve a sustainable transportation system. All these are key to the overall health and economy of the City's central business district and will contribute to Vancouver's status as one of the most liveable cities in the world.

2 The Transportation Challenge

The transportation challenge facing the downtown is to accommodate more people travelling into the downtown in the future without adding traffic lanes to the bridges and roads leading to the downtown. At the same time, there is an expectation to minimize congestion. At first glance the challenge appears enormous. This plan presents a strategy that meets the challenge.

The ***Vancouver Transportation Plan***, 1997, recognized that road capacity is finite and that even if more roads were to be built they would soon be congested with more cars. That solution is to reduce the demand for auto trips by providing further transportation choices, particularly transit.

Downtown's economic health is closely tied to its transportation network. Transportation is as much about economy and liveability as it is about travelling and commuting. Business downtown depend upon the transportation system to allow employees and customers to travel easily to their place of business. As well, many of these businesses rely on the road network to deliver and receive goods and services. If roads become congested, the cost of business would increase and the downtown economy could suffer. Businesses might then relocate to more accessible locations where they can be more competitive.

Congested roads also affect the liveability or the desirability of being downtown. This is especially important because of the residential neighbourhoods in the downtown peninsula. Reducing traffic congestion and resulting air and noise pollution, creating more pedestrian friendly streets, providing more sustainable choices like transit and bicycling will help keep downtown an attractive place for businesses and residents alike.

The downtown transportation system must also address it's role as an entertainment and recreation destination. Downtown is home to the region's largest sports venues (BC Place stadium and GM Place arena). It is also the region's primary tourist destination with major convention facilities and over 55 percent of the region's hotel rooms. The tourist industry is anticipated to grow 6 percent annually to 2021 (Colliers International). The cruise ship industry currently attracts over one million passengers annually.

The ***Vancouver Transportation Plan*** acknowledged the complexities of the downtown transportation system by recommending the preparation of the Downtown Transportation Plan. Specifically, it recommended the preparation of a "*...transportation and circulation plan for the Downtown, including a complete review of the Downtown transit system to improve service and choice, improve regional connections and airport links, evaluate alternative transit vehicles (such as mini-buses), establish priorities for 'Great Streets', improve route and destination signage, create pedestrian priority areas and implement bike lanes and street improvements.*"

To the benefit of Vancouverites, downtown Vancouver is economically successful and already very liveable. Vancouver has been ranked as the most liveable city in the world. To maintain this status in the future, efforts must be taken now to avoid the transportation problems facing many other major North American cities. The Downtown Transportation Plan is the means to this end and will help guide transportation decisions to 2021.

The importance of future transportation planning is demonstrated by the current success of the existing downtown transportation system. For more than half a century, Vancouver has nurtured an economically healthy and liveable downtown. In the 1940s and 1950s, the focus was on adjusting to increased auto use. It was apparent then that, while road access is important for commerce, attempting to satisfy all demands for road space would require unacceptable trade-offs with the objective of a liveable downtown. Plans for downtown expressways were formulated in the 1960s but were later suspended because of the disruption they would have created, both in terms of land occupied and neighbourhoods affected.

Building public transit links (particularly rapid transit) to the downtown peninsula then became paramount to maintaining suitable access. A passenger ferry from Lonsdale Quay in North Vancouver to Waterfront Station began operating in 1974. The region's first rapid transit line, SkyTrain, was opened from downtown to New Westminster in 1985, with an extension to Surrey a few years later. In 1992, the region's first commuter rail line was opened from Mission to Waterfront Station.

The result of the past efforts is a highly accessible downtown. This success is reflected by its large concentration of residents, employment and trips within the city. With 560 hectares, downtown comprises about five percent of the city's total land area. However, it is home to 13 percent of the city's residents, accommodates 39 percent of the city's jobs, and receives 21 percent of the city's trip destinations. In the future, more residents, more employment and more trips destined to the downtown are anticipated. The Downtown Transportation Plan builds upon the success of the past to meet the needs of the future.

This section provides the context for the development of the Downtown Transportation Plan. **Section 2.1** provides the city and regional context for downtown transportation planning. **Section 2.2** sets forth a vision for downtown and for a downtown transportation system.

2.1 The City and Regional Context

Plans for the City of Vancouver and for the Greater Vancouver region provide the context for the development of the Downtown Transportation Plan. Recommendations of the Downtown Transportation Plan support plans for the city and region.

2.1.1 City of Vancouver

In 1991 Council adopted the Central Area Plan Goals and Land Use Policy. The plan expressed the policies of the City of Vancouver related to office zoning, displacement of support activities from downtown, lively retail, central area housing, providing density bonuses, liveability and high density living. The main land use direction was to create more housing capacity by consolidating a compact downtown core central business district (CBD) and an uptown (Broadway corridor) office district. The reduction of zoned capacity for offices outside the CBD and uptown areas was another objective. This has since become widely known as Vancouver's "living-first strategy" for its Central Area. Other policies included protecting support service opportunities, creating complete neighbourhoods on the downtown peninsula with all necessary amenities, creating areas for "choice of use" (offices and housing), targeting retail to desired pedestrian shopping streets and adjusting land use policies to allow uses and scale that preserve heritage character.

Transportation objectives were an explicit aspect of the new land use policies. Orienting new office development to transit was one objective of office land use consolidations and deletions. They included consolidating zoned office capacity around rapid transit stations, bringing overall office and transportation capacity closer together and increasing housing on the downtown peninsula to reduce commuting times and congestion, and reducing the need for inner city neighbourhoods to accommodate through commuters to downtown. By calling for streets to be the "focal point of public life," the Central Area Plan calls for public realm improvements to foster movement on foot.

The Central Area Plan was followed in 1995 by CityPlan, the City of Vancouver's overall guide to future planning, development and civic decisions. It acknowledges that the public wanted to emphasize transit, walking and biking to slow traffic growth in neighbourhoods and improve the environment. CityPlan reinforced the vision for downtown. Finally, and perhaps most importantly for this report, it recommended the undertaking of a City of Vancouver Transportation Plan.

Also in 1995, a Vancouver Greenways Plan that identified conceptual multi-use and richly landscaped corridors providing greater priority to pedestrians and cyclists throughout the city, including downtown, was approved. The purpose of Greenways is to expand the opportunities for urban recreation and to enhance the experience of nature and city life.

The City of Vancouver Transportation Plan (1997) set forth transportation policies for both the City as a whole and downtown for the period to 2021. It specified that growth in trip demand would be met by the existing road network. It recommended greater transportation choice and a more balanced downtown transportation system. It nonetheless acknowledged that the car would continue to be the major form of transport for trips by people travelling outside neighbourhoods, especially for trips for which transit does not offer a good alternative. It stressed the importance of good truck access to the city and of improving delivery access to the Port of Vancouver and the International Airport. This Downtown Transportation Plan is viewed as fulfilling the overall policy guidelines set forth in the Transportation Plan for downtown trips and transportation facilities.

2.1.2 The Greater Vancouver Region

The GVRD's 1993 regional transportation plan, ***Transport 2021***, provides transportation policies and programs for the region. It identifies the need for regional land use policies that cluster population and jobs so that people can have an opportunity to live close to work. It recommends changing the look and feel of neighbourhoods and "streetscapes" such that walking and bicycling is given an opportunity to take hold. It proposes Transport Demand Management (TDM) as a tool to influence travel behaviour. This includes "carrots", such as encouraging telecommuting, encouraging employers to discourage car commuting, installing high-occupancy vehicle highway lanes and giving buses priority over cars. "Sticks" including higher and more generally applicable parking charges, higher fuel and other driving costs and bridge tolls, are also proposed. It also includes transit supply measures, including new rapid transit lines, bus priority measures and express buses. Transport 2021 also proposes using the "choke points" of the bridges and tunnels across the Fraser River and Burrard Inlet to limit access to geographical sub-areas within Greater Vancouver by single-occupant vehicles. The plan projected that the proportion of commuters using transit to travel downtown would increase from 37 to 48 percent from 1991 to 2021.

The 1995 ***Livable Region Strategic Plan*** (LRSP), which was formulated jointly with ***Transport 2021***, guides decision-making for the Greater Vancouver Regional District (GVRD). The LRSP supports complete communities focused around town centres, a better balance in the distribution of jobs and housing and more effective transportation services. It envisages a compact metropolitan region in which a larger share of population is accommodated in the municipalities on the Burrard Peninsula and northern areas of Delta and Surrey. The plan calls for greater transportation choice as a way of minimizing congestion and dependence on private automobiles. The GVRD is commencing a review of the LRSP in 2002.

2.2 The Downtown Vision

Downtown Vancouver is the region's pre-eminent economic generator, as well as its international face to the Pacific Rim. It is the principal locale for Greater Vancouver's head office, business services and tourist functions. Downtown Vancouver is also the region's most prominent entertainment centre, the locale of the region's largest sports venues and the region's largest retail hub. Downtown Vancouver is also a special place with unique character areas, livable residential neighbourhoods, heritage resources, a unique skyline and active public spaces.

The key to maintaining an alive downtown is that it is both a place of commerce and of residence. The integration of residential neighbourhoods with the commercial core assures the presence of people on downtown streets outside of normal business hours. Residential neighbourhoods also complement the commercial objectives for downtown by providing a reservoir of workers and shoppers and entertainment venue visitors.

The objective of this Downtown Transportation Plan is to support and facilitate these important downtown functions. The vision for Vancouver is to be the most liveable city in the world. One of the most important aspects of a liveable city is its transportation system, especially in its downtown.

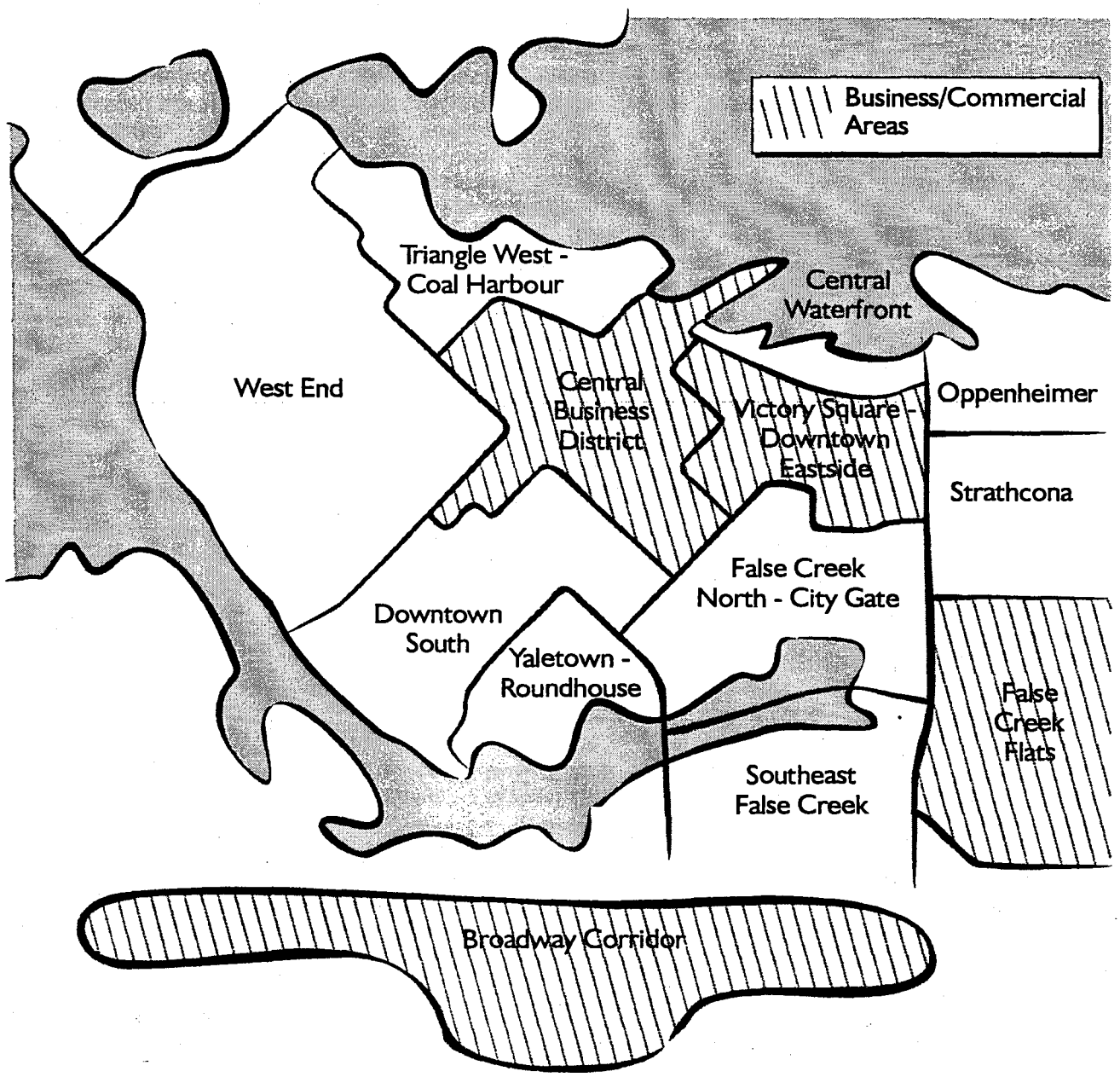
The Downtown Commercial Core in a Larger Central Area

While the most prominent component, downtown is one of three related nodes in a central area or 'metropolitan core' providing a wide range of employment and commercial services. Figure 2-A shows the three nodes. The three nodes function as an integrated metropolitan core accounting for more than one in five regional workers. A vision of the Downtown Transportation Plan is to reinforce the integrated nature of the metropolitan core, improving the economic functioning of the entire complex.

Downtown Transportation Vision

For downtown Vancouver, the transportation vision is to be the most accessible place in the region. Achieving this vision will contribute to a thriving and prosperous business community and create a downtown where people want to work, live and play. For all trip purposes by all modes, the experience of travelling around the downtown will be pleasant. Motorists will not be unduly delayed by congestion, transit users would be provided with a reliable and efficient transit system, pedestrians and cyclists of all ages and abilities will find downtown inviting and barrier-free. Downtown is a place where the transportation network offer choices that are extensive and exciting, such that getting to and around downtown is an attraction in itself.

Figure 2-A
Vancouver's Metropolitan Core



2.3 Sustainability and Transportation

Achieving sustainability is key to the health and economy of the city and region. Sustainable transportation will help Vancouver meet the needs of its present community without compromising the ability of future generations to meet their own needs. Recognising that transportation and land-use are fundamental components to achieving a sustainable city, the Downtown Transportation Plan seeks to address problems of pollution, noise, congestion, safety, energy consumption, and costs that are incurred in moving people and goods throughout the downtown. The challenge is how to increase access to goods, services, activities and destinations while reducing energy use, noise, pollution, congestion and, at the same time, increasing safety, security and liveability.

Vancouver has made significant progress toward sustainability and has been consistently rated as a leading city in terms of liveability. City Council has adopted plans that place high priority on creating a downtown where people have access to affordable transportation to move them between home, work, and places of leisure.

The Downtown Transportation Plan will make progress towards achieving sustainability by providing recommendations that:

- Help promote more efficient systems for moving goods and people;
- Encourage more sustainable transportation modes such as walking, transit, and cycling;
- Reduce vehicle kilometres travelled by providing jobs, entertainment venues and commercial and retails services in close proximity to where people live;
- Encourage alternative approaches to car travel including carpools, vanpools and car sharing networks;
- Increase safety by reducing the potential for conflicts between modes;
- Enhance access to information that increases the efficiency of goods and people movement through ITS; and
- Reduce average commuting times for downtown trips.

In short, the movement towards becoming a sustainable city requires policies and plans to provide guidance and incentives for people to modify their behaviour and pattern of travel. The Downtown Transportation Plan provides the mechanism for that change to happen.

"Sustainability is a direction rather than a destination. A sustainable city is one that protects and enhances the immediate and long-term well being of a city and its citizens, while providing the highest quality of life possible. Sustainability requires integrated decision-making that takes into account economic, ecological and social impacts as a whole". (From Creating a Sustainable City, Report to City Council, April 1,2002)

3 Foundations of the Plan

This section outlines the foundation of the plan and provides background for a better understanding of the goals and objectives and the process undertaken to develop the plan.

3.1 Terms of Reference

The terms of reference for the Downtown Transportation Plan were laid out by the ***Vancouver Transportation Plan***. The Downtown Transportation Plan is intended to review the downtown transportation network in light of land use changes, future growth in residents and employment and the resulting increase in trips into and within the downtown to the year 2021.

Around the Central Business District, areas previously used for industrial, warehousing and railway purposes have developed or are being developed into residential neighbourhoods. These include the Downtown South, False Creek North, Granville Slopes, Coal Harbour and Triangle West neighbourhoods. These new neighbourhoods have different accessibility needs that are different from previous land uses. The Downtown Transportation Plan examines these needs and tries to resolve them while maintaining the accessibility requirements of the central business district.

3.1.1 Vancouver Transportation Plan Policies

The following policies, as approved by Council, were intended to provide the basis for the Downtown Transportation Plan:

a) The increase in peak period trips to downtown should be accommodated by a major expansion in transit. Regular bus services to and within downtown should also be substantially expanded, especially in peak periods.

b) Overall road capacity into downtown will not be increased above the present level.

c) To provide for the increase in transit within the downtown, bus only lanes may be appropriate. Other measures to facilitate buses, including bus bulges and queue jumpers, will be pursued where practical.

d) Transit services within the downtown should be improved with the addition of a downtown transit loop, new routes to under-served areas, a free or low fare zone, expanded ferry services and improved boarding facilities.

e) Facilities for pedestrians will be improved within downtown.

f) Bicycle access both to and within downtown will be improved by providing bike facilities on bridges and providing a safe and effective network of routes throughout downtown.

g) Other measures that encourage the use of alternatives to the car and encourage downtown residents to rely less on cars will be supported where possible.

h) The downtown street circulation system will be reviewed to support downtown neighbourhoods and to encourage a more pedestrian and resident friendly environment.

i) Within the downtown, existing maximum standards on commuter parking are proposed to be maintained, consistent with about one in four people driving a car to work.

j) Short-term parking will be managed to ensure there is sufficient parking to meet normal demand.

k) Residential parking standards will be reviewed as necessary to ensure they reflect the lower levels of car ownership of downtown residents and the objective of promoting transit, cycling and walking as alternatives to cars.

l) Parking and unloading of trucks in downtown commercial lanes will be reviewed with the intention of improving essential access to businesses for commercial vehicles.

3.1.2 Specific Issues

Council provided further direction and tasks to the Downtown Transportation Plan in a number of areas:

a) **Third Crossing:** The issue of a Third Crossing across or beneath the Burrard Inlet was excluded from the terms of reference. It was noted that a Third Crossing raises issues outside of downtown and outside of the city that cannot be adequately addressed without a broader analysis. If a third crossing was to include general traffic, it would also be contradictory to the Vancouver Transportation Plan of no new road capacity into the downtown above present levels.

This was reconfirmed by City Council in March 2001. At that time it was noted that a new auto-oriented crossing of the Burrard Inlet would not become relevant until after the implementation time (2021) of the Downtown Transportation Plan and that consideration of such a crossing be deferred until, at the earliest, the next review of the long term regional strategic plan. In March 2002, City Council again reconfirmed its position by resolving that the City of Vancouver does not support a Fourth Crossing initiative for the Olympics, or prior to a full impact study on North Shore municipalities and the east-side neighbourhoods of Vancouver. Council changed the reference of a Third Crossing to a Fourth Crossing in recognition that a third crossing already exists as the SeaBus.

b) **Granville Mall:** The potential reintroduction of general traffic along Granville Mall as desired by some downtown businesses and property owners was to be reviewed as part of the Downtown Transportation Plan. Although a recommendation is made in this plan, the details of the review was completed and reported to Council under a separate report. On May 14, 2002, Vancouver City Council directed staff to report back on a terms of reference, budget and funding source to complete a redesign of Granville Street. (Report Tracking System - RTS #2530)

c) **Downtown Streetcar:** The downtown streetcar was included in the Downtown Transportation Plan's terms of reference for follow-up. This includes a review of the role of the streetcar within the downtown transportation system, potential downtown extensions and additional links to the Roundhouse Community Centre and Stanley Park.

d) **Rapid Transit:** Previous studies have looked at various alignments for a north-south rapid transit line within downtown. Potential routes within downtown were to be re-examined to the extent possible.

e) **Richmond Rapid Bus:** The Richmond Rapid Bus (98-B Line) began operation in August 2001. Confirmation of optional routes within downtown was to be considered in the broader context of the Downtown Transportation Plan. However, due to delays in opening the new express bus route and ongoing delays in fully implementing the service, the review has been deferred until after the completion of the Downtown Plan.

f) **Pacific Boulevard:** An urban design study for Pacific Boulevard was to be undertaken in consideration of the broader downtown transportation planning program and the future role and function of Pacific Boulevard. This study was completed in conjunction with the

Downtown Transportation Plan team and was reported to council seperately. Council also approved further study of Pacific Boulevard west of Cambie bridgehead and that Expo Boulevard and Pacific Boulevard be tudied further as part of a revised ODP for Northeast False Creek.

g) **Major Roads:** Several downtown streets have already been designated as part of the region's Major Road Network. The Downtown Transportation Plan was to identify additional roads that may be suitable for nomination, and hence funding.

3.2 Methods

A number of tools were used to help develop and assess the Downtown Transportation Plan. One of these was the Greater Vancouver's regional transportation model (EMME/2). Others relating to the streetscape and environment were also developed and used. These are briefly described below.

3.2.1 EMME/2 Transportation Sub-area Model

EMME/2 is a computer program that is used to help plan transportation infrastructure. This particular computer model is used in 58 countries by over 580 organisations, including cities, metropolitan areas, transit agencies, consulting firms, and universities.

The main function of the EMME/2 model is to assign trips to a multi-modal transportation network (vehicle, transit, walk, etc.) based on the fastest (least expensive) mode and route for an individual trip. This emulates actual behaviour whereby, for example, people, through trial and error, are able to select the quickest route to work or school. This method of trip assignment onto a transportation system generally works well for vehicle trips and trips made on transit. However, the model is less accurate at predicting walk and bike trips. For walk and bike trips it is helpful to look at trends and demographics.

The model is most accurate as a comparative tool and should be used primarily in that role. This means the model can look at different transportation network options and different land-use and compare statistics such as the total travel time and transit ridership. These statistics then contribute to the over-all evaluation of the various network options.

The EMME/2 model created for the Downtown Transportation Plan by Ward Consulting is called an 'sub-area model'. This is because while it is based on the regional transportation computer model used by the Province, TransLink and the GVRD, it has greater detail in the downtown sub area. For example, the downtown sub area model divides the downtown peninsula into 190 traffic zones. This compares with 34 traffic zones in the regional model. Indeed, practically all downtown streets are represented in the model.

3.2.2 Environmental and Social Impact Assessment

The transportation network has an impact on the physical and social environments. These impacts need to be minimized to achieve the liveability goals of the Downtown Transportation Plan. Measurements of noise, air pollution, traffic safety, streetscape impacts, and guidelines for social assessments were used to assess these impacts. These measurements could be used in conjunction with the EMME/2 transportation model in a multiple accounts framework to obtain the overall impact of the plan.

a) **Noise:** Measurement of street noise levels was completed by the Vancouver-Richmond Regional Health Board at selected locations throughout the downtown peninsula. Standards used to evaluate the acceptability of noise levels are those recommended by the World Health Organization (WHO)

b) **Air Pollution:** Air quality within the downtown is currently monitored by the GVRD's Air Quality Branch. Data from their monitoring station at Robson Square is used to assess air quality within the downtown and compared with other monitoring stations. It is noted that output of the Transportation Demand Sub-area Model enables the assessment of such variables as carbon dioxide (CO_2) generation.

c) **Safety:** The City of Vancouver and the Insurance Corporation of British Columbia (ICBC) retained Hamilton Associates to undertake a study of traffic collision incidence throughout downtown Vancouver (study area focuses on the commercial core). Both intersection and mid-block crash data were analyzed between 1992-1996 inclusive. Crash data were adjusted for traffic volumes to obtain locations with highest frequency of collisions and over-representations of various crash types.

   Hamilton Associates obtained more current collision data (1998-2000) from the Police Department to supplement the safety study. As well, Police data on assaults and thefts within the data were referenced as an indication of relative pedestrian safety.

d) **Streetscape Impact:** Baker, McGarva, Hart Architecture (BMH) was retained to develop a framework for assessing the impact of transportation links on land uses and on the streetscape. The output consists of a data base displaying the current quality of the street environments and the quality of the relationship between street environments and land uses.

e) **Guidelines for Social Impacts and Assessment** of the Downtown Transportation Plan were obtained from the City of Vancouver's Social Planning Department. Topics recommended to be referenced in the Downtown Transportation Plan include universality of accessibility, public benefits enhancement and community involvement in facility design.

3.3 Goals and Objectives

The following are goals and objectives of the plan:

- **Maximize Access** - The provision of additional transportation choices will help to increase accessibility and promote an economically competitive downtown.
- **Minimize Congestion** - Maintaining the capacity on the major arterial road network in the downtown will help to minimize congestion. This is particularly important for goods movement.
- **Enhance Public Transit** - Improved transit services will improve the overall downtown accessibility. This includes new bus and rapid transit routes, transit priority measures and enhanced transit hubs.
- **Maintain Efficient Goods Movement** - Access by trucks and commercial vehicles are essential to an economically vibrant and healthy downtown.
- **Serve Adjacent Land Uses** - The road network should serve the needs of adjacent land uses. Residential land uses are becoming more dominant in many parts of the downtown and this needs to be reflected in the transportation network.
- **Promote Walking and Bicycling** - The promotion of walking and biking supports the objective of minimizing congestion and recognizes that walking and bicycling are very popular modes within the downtown.
- **Increase Pedestrian Comfort** - In addition to promoting walking routes, the whole of the downtown should be a pedestrian-friendly zone. The creation of streetscapes conducive to pedestrian activity and enhancing liveability is pursued.
- **Manage Parking** - On and off-street parking supplies need to be managed to help achieve the downtown transportation goals.
- **Promote Sustainability** - A sustainable transportation system will meet current needs without compromising the ability of future generations to meet their own needs.

Overall, by introducing greater transportation choices, a balanced transportation system will be achieved. Ideally, this balance would be achieved by providing more transportation facilities without compromising existing transportation facilities.

3.4 Land Use Planning

Transportation planning requires the interaction of land use planning and the engineering of transportation facilities. Land use planning in the transportation context is about arranging land uses in such a way that the need for transportation facilities is minimized. Changes in the relationship of land uses (places of employment and residence) can often accomplish with little or no expenditure of public transportation dollars more than billions of dollars in infrastructure expenditure. And the results – labelled 'complete communities' in the *LRSP* – are often perceived to be better and more interesting places in which to live and work.

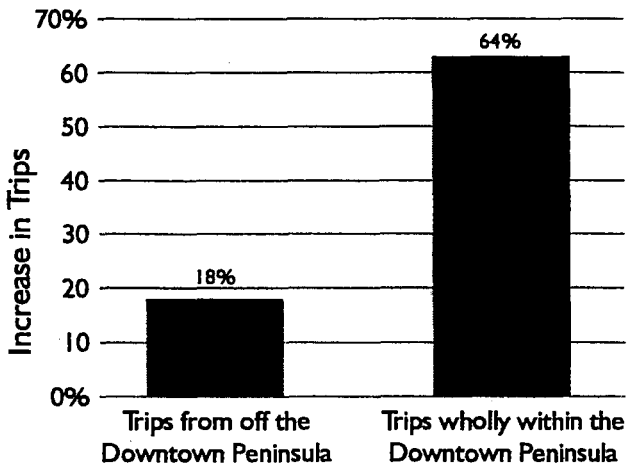
Planning in the City of Vancouver has helped to rearrange land use development in such a way that the need for transportation facilities and links – roads, bridges and tunnels – is reduced. One of the primary objectives of Vancouver's 1991 *Central Area Plan* was to increase downtown population as a way of offsetting the demand for trips to the downtown peninsula from off the peninsula. Underlying the plan was the assumption that increases in road capacity from Vancouver's suburbs to downtown could not be substantially increased. The solution to the problem is to improve both public transit services and land use relationships so that downtown access is improved and neighbourhood disruption minimized.

New residents and new neighbourhoods on the downtown peninsula contribute to a lively, around-the-clock downtown, provide a valuable labour force pool and permit greater employment capacity on the peninsula. The effect of carrying out this policy is demonstrated in *Figure 3-A*. From 1996-2021, the number of trips from external sources to the peninsula is projected to increase by only 18 percent. The generation of AM peak hour trips entirely within the peninsula is projected to increase by 64 percent from 1996-2021. The proportion of total trips to downtown destinations in the AM peak comprised of trips from within the peninsula (trips with both origin and destination on the peninsula) is projected to increase from 23 percent in 1996 to 29 percent in 2021.

Figure 3-A

Projected Increase in Trips to Downtown Vancouver Destinations 1996 – 2021

Source: EMME/2 Transportation Demand Model



3.5 Transportation Trends

Downtown Vancouver generally offers a balance of transportation choice and is a place where people walk, bike and use transit in greater numbers than any other location in the region. The latest information from the 1999 TransLink Trip Diary Survey shows that, at the regional level, walking and cycling trips were the fastest growing trip types *Figure 3-B*. A similar but more pronounced trend is occurring for trips to Vancouver destinations where walk trips increased from 14 percent to 19 percent of all trips *Figure 3-C*. In downtown Vancouver the trend is particularly pronounced with walk trips increasing from 21 percent of all trips to 30 percent over the five-year period *Figure 3-D*.

Overall, the trends for transportation in the City of Vancouver show that the City is moving towards more sustainable modes. In general, the number of;

- trips in private automobiles are not changing (or are slightly declining),
- trips on transit are increasing,
- bicycle trips are increasing significantly, and
- walk trips are increasing significantly.

It should be noted that the transit trips are expected to increase significantly for peak period travel.

The downtown transportation plan responds to these trends by recommending significant improvements for pedestrians, cyclists, and transit riders while maintaining sufficient road space for general traffic circulation.

Figure 3-B

Trips to all GVRD destinations over a 24 hour period.

Source: 1999 TransLink Trip Diary Survey

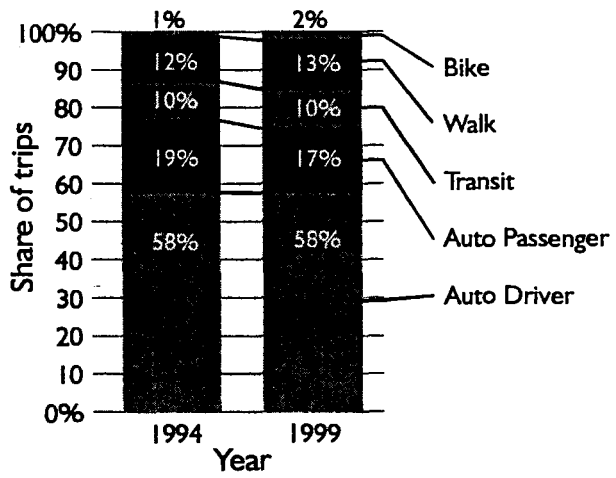


Figure 3-C

Trips to Vancouver destinations over a 24 hour period.

Source: 1999 TransLink Trip Diary Survey

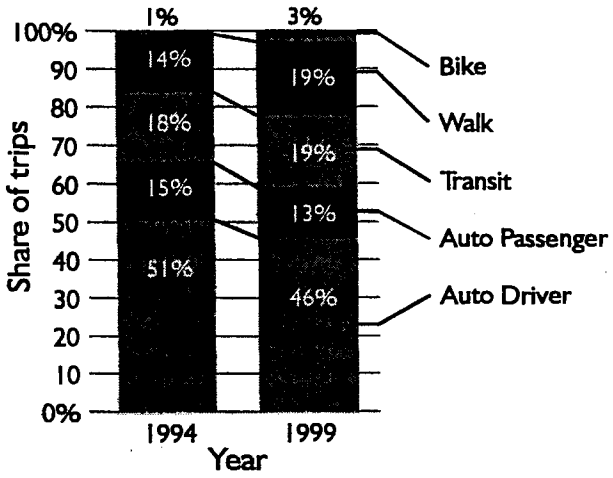
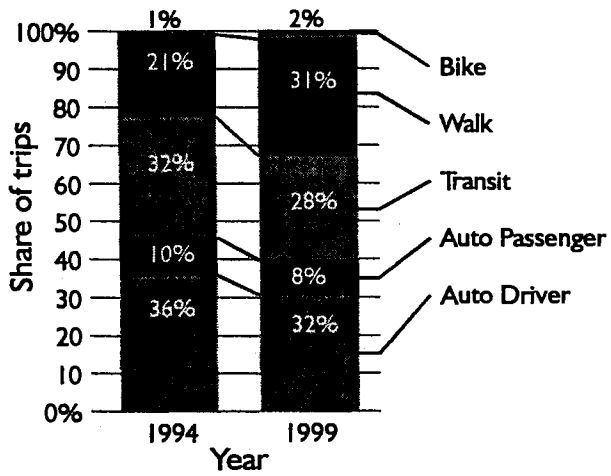


Figure 3-D

Trips to Downtown Vancouver destinations over a 24 hour period.

Source: 1999 TransLink Trip Diary Survey



3.6 Population and Employment Targets

Population and employment targets for the downtown peninsula provide the basis for projecting the demand for trips to, from and within downtown. The number and kind (transit, auto, walk, etc.) of trips by each transportation mode define the size and shape of the transportation system required to serve downtown.

Targets for future downtown population and employment are established on the basis of historical trends, city and regional targets, development opportunities and public policy. Regional population and employment targets for the Greater Vancouver Regional District (GVRD) and their distribution among area municipalities may be found in the 1993 GVRD report, *Managing Greater Vancouver's Growth* (pages 7-26), and in the 1996 *Livable Region Strategic Plan* (*LRSP*). Based on then current official development plans and land use zoning in the municipalities, the *LRSP* reflects the commitment of both the GVRD and its municipalities to the allocation of growth targets within the region. The target population for 2021 for the region was 2,676,000 (3,000,000 including population in institutions and in unincorporated areas), while the employment target was 1,317,000. The 2021 population target for the City of Vancouver is 635,000, while the employment target is 435,000.

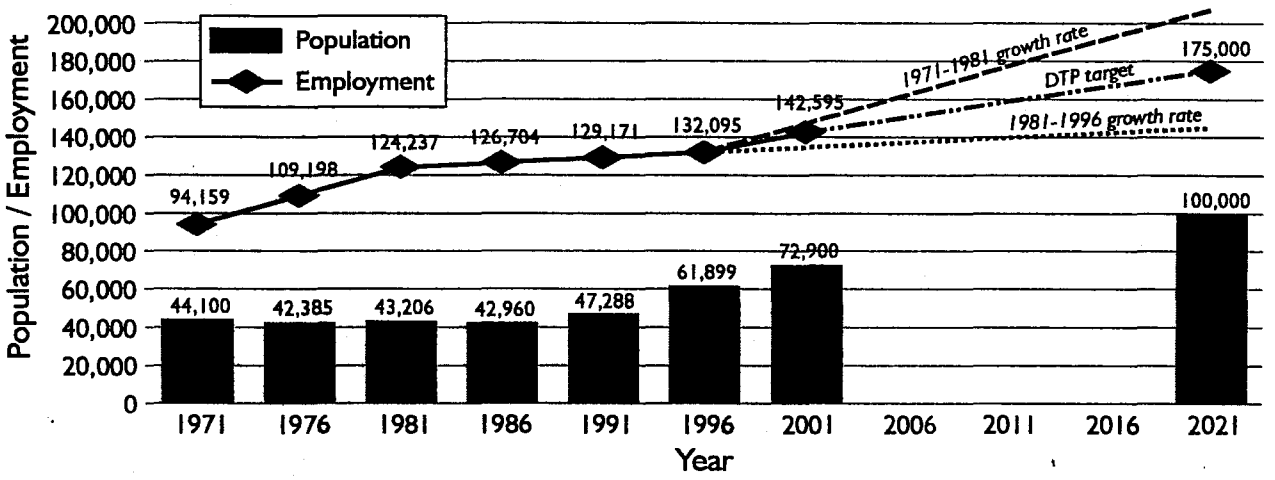
Note that the *LRSP* is subject to review every five years. The first review since approval by the GVRD board in 1996 is currently underway.

3.6.1 Downtown Population Targets

The 2021 population targets for the downtown peninsula are established largely on the basis of existing planning policies and land use zoning and anticipated future developments. *Figure 3-E* shows population and employment trends and future targets for the years 1971-2021. The population target for 2021 is 100,000.

Figure 3-E

Population and Employment in Downtown Vancouver



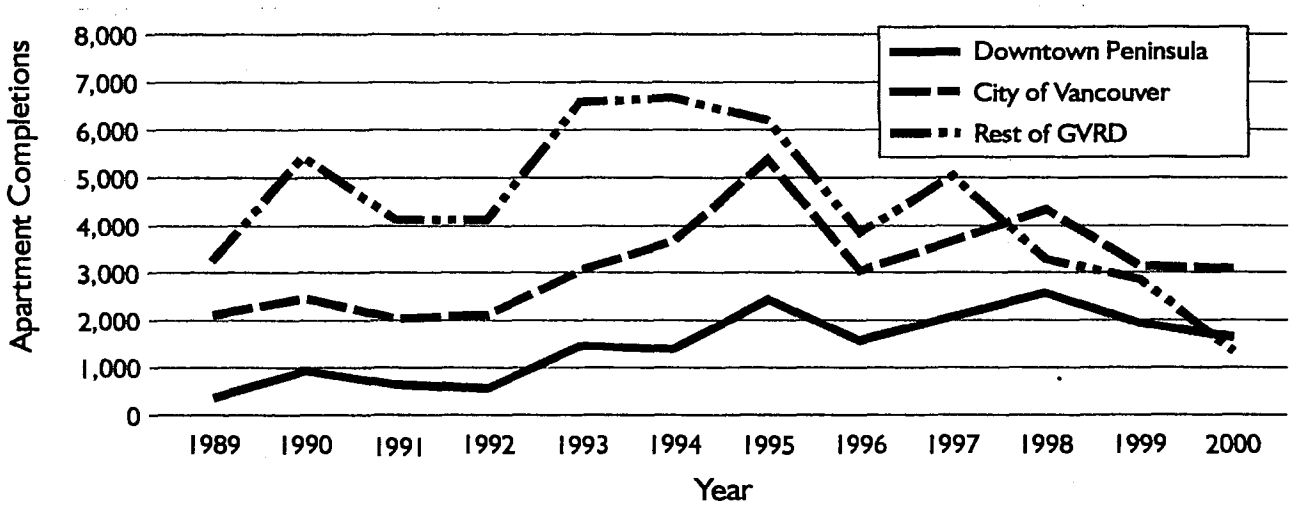
While this population target is about four percent above previous population targets for the downtown peninsula, it is considered to be a conservative one. Recent development has been occurring at a far greater rate than previously estimated. Population growth between 1991 when the *Central Area Plan* was approved and 2001 was 54 percent (*Census Canada*). The 2021 target represents a 37 percent increase in population over 2001. Complete build-out under existing land use policies and zoning is currently estimated to accommodate a population of more than 115,000.

This capacity increases with development approvals for live/work studios, heritage bonus zoning and the like. A population in the 110,000 range by 2021 may be quite likely.

Living in downtown Vancouver has become extremely popular. The population of central Vancouver is approximately 30 percent greater than for central Toronto and nearly three times that of central Montreal (Transportation Association of Canada, *Urban Transportation Indicators*, 1999). Residential population growth from 1991-2001 was more than 1.5 times growth in the downtown populations of such cities as New York and Chicago. *Figure 3-F* portrays recent apartment completions in downtown Vancouver and the GVRD. Completions in 2000 in downtown were greater than in the remainder of the GVRD outside Vancouver. They were over 50 percent of the total for the City of Vancouver as a whole. While downtown apartment completions in 2000 were 35 percent off their 1998 peak, this performance is nonetheless far superior to that experienced in the GVRD outside the City, where apartment starts were 75 percent less in 2000 than their 1996 peak.

Figure 3-F

Apartment Completions (all tenure types)



Downtown's residential population is complementary to the commercial purposes of the downtown core in providing a nearby labour force and a large pool of nearby consumers. Some companies, especially in the high-tech sector, have reportedly located near or in downtown Vancouver to take advantage of the readily available labour pool. The downtown population is also complementary to the transportation objectives in that it reduces trip length, making alternative modes of transportation more attractive, and displaces the origins of many trips to downtown destinations to origins also on the peninsula, reducing trip volumes into downtown from outside.

3.6.2 Downtown Employment Targets

A similar process to that used for targeting future population growth has been applied to employment. Choosing a realistic target for employment is more complex than for population. Employment is much more susceptible to economic cycles and other short-term events than is population. As well, commercial and office real estate development, which provides the majority of employment accommodation, is extremely cyclical and occurs sporadically. For instance, from 1990-1995, 3.1 million ft^2 of office space was absorbed, while construction of only 1.6 million ft^2 was initiated (Royal LePage for the GVRD; City of Vancouver construction data). While only 270,000 ft^2 in new office construction was initiated downtown in the 1996-2000 period, 1.6 million ft^2 was absorbed in the period. Also in the latter period, construction of 1.26 million ft^2 in hotel

space with almost 2350 rooms was initiated. These new hotels, ranging in size from boutique hotels of just over 60 rooms to two hotels of over 450 rooms, illustrate another variable in estimating employment generation in downtown Vancouver: most downtown sites are eligible for hotel, as well as office developments, and the two land uses differ substantially in trip generation characteristics. Approvals for almost 1.6 million ft^2 of offices occurred in 2001. The significant increase in new downtown office development applications in 2001 was the result of the decrease in office vacancies from 16 percent in 1992 to three percent in 2001.

Downtown employment in 1996 was 132,000, approximately 39 percent of the City's total. *Figure 3-E* above shows that the past history of downtown employment from 1971 to 1996. Growth in the two 1970s' five year periods was 14 and 16 percent. It hovered just above two percent for each of the five year periods from 1981 to 1996. Based on office absorption and hotel construction in the late 1990s, downtown employment estimates for 2001 were in the 138,000 to139,000 range, more than a five percent increase from 1996.

The employment target for 2021 is 175,000, or about 40 percent of the City's total and 13 percent of targeted employment of 1,317,000 in the GVRD. This represents approximately a straight line projection of trends from 1971 to 2001 for a further 20 years. While the target is robust relative to short-term trends, both population and employment targets will be reviewed as part of the *LRSP* review. Under-estimating employment could be worse than over-estimating for providing adequate future access to downtown. In addition, other factors that influenced the target employment level include:

- Changes in industry structure;
- Office space absorption in the 1990s;
- Targets used for other transportation projects by the City of Vancouver and region;
- Potential for planned transportation projects to shape land use; and
- Private sector projections.

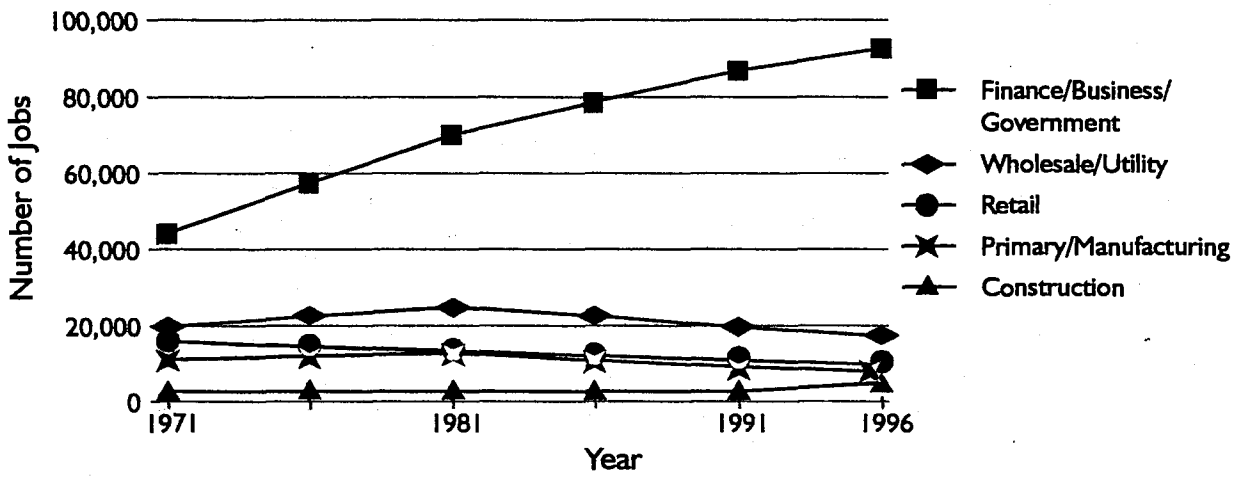
a) Industry Structure

The overall employment trend is the outcome of several related and parallel phenomena reflecting the performance of various industrial sectors on the downtown peninsula. On the one hand, some sectors have languished. *Figure 3-G* shows employment by industry from 1971 to 1996. Nearly 13,000 jobs were lost in the manufacturing, transportation, storage and communication and wholesale sectors from 1981 to 1996. These losses reflect in part the changing land uses in the downtown peninsula, especially the removal of manufacturing and transportation uses, as well as events in downtown office employment connected to British Columbia's economy. No further losses are anticipated in these sectors from major land use decisions. Another 3,500 jobs were lost in retail trade. Although major department stores seem to be having problems, mostly unrelated to their downtown stores, the number of recent retail development applications and expressions of interest by major retailers suggests that the period of retail decline may be over. Downtown residents and workers generate their own retail sales demand. On the positive side of the ledger, over 22,500 jobs, or an average of 7,500 in each five-year period, were gained from 1981 to 1996 in what are frequently identified as tertiary sectors. Nearly 85 percent of these were in services serving other businesses (business services), one of the industries that tend to occupy downtown office space. These employees occupied approximately 5 M ft^2 of office space. Similar growth in the 1996-2021 period without offsetting decreases in other sectors would result in employment totals slightly exceeding the suggested target. As well, some comfort can be taken in the knowledge that the downturn in the computer and telecommunications sector in 2000-2001 affected Vancouver considerably less than it did other metropolitan centres (Ottawa-Gatineau and Toronto) (Statistics Canada, *Perspectives*, April 2002).

Figure 3-G

Downtown Jobs 1971-1996 (by Industry)

Source: Census Canada



b) Office Space Absorption in the 1990s

The GVRD's study by Royal-LePage of office space absorption throughout the region from 1990-2000 concluded that approximately 6 M ft^2 of office space was absorbed in the 1990s in the 'metropolitan core,' including downtown and central Broadway. This was 43 percent of the total absorbed in the GVRD and reflects a healthy downtown office sector.

c) Targets Used in Other City of Vancouver Transportation Projects

Downtown employment targets in the 167,000 to 174,000 range have been used in a number of other downtown transportation projects: Millenium SkyTrain line; Richmond/Airport-Vancouver rapid transit study; downtown streetcar; and 1997 City of Vancouver *Transportation Plan*.

d) Transportation Shaping Land Use

The *LRSP* has been based on the notion that transportation policies and projects influence land use development and vice-versa. In the case of downtown Vancouver, the completion of the Millennium SkyTrain line, as well as the construction of a north-south rapid transit line from downtown Vancouver to Richmond and the International Airport will make downtown Vancouver easily the most accessible employment centre in Greater Vancouver.

e) Private Sector Projections

Private sector real estate companies, notably Colliers International Realty Advisors, Inc., have recently projected demand for new office and hotel space in the context of downtown rezoning applications. A demand for 7.8 million ft^2, including projects currently under construction, from 2001 to 2021 is foreseen. Translated to anticipated employment, such a demand for space would likely see total downtown employment in the 170,000 range.

The 2001 employment estimate of 138-139,000, based on office space absorption and hotel construction throughout the 1990s lies approximately on this projection line. The employment target represents construction of some further 6.4 million ft^2 in office and retail development from 2002-2021 in addition to the 1.5 million ft^2 of office space under construction in 2002. A further 1.0 million ft^2 in hotel space with 1,500 rooms is also anticipated.

3.6.3 Downtown Employment and Population and Targets by Sub-Area

Population and employment targets for the future for each sub-area within downtown were obtained based on existing land use policies and regulations. *Figures 3-H and 3-I* illustrate population and employment by sub-area within the downtown peninsula. Downtown South and False Creek North are expected to absorb half of downtown's population growth to 2021. The Triangle West - Coal Harbour area is targeted to absorb nearly 20 percent of total growth. The remaining downtown neighbourhoods are targeted to absorb about 30 percent of total growth.

The traditional Central Business District, or downtown commercial core, is expected to account for nearly half (49%) of total employment growth from 1996-2021. False Creek North is projected to account for 13 percent of employment growth, while the Central Waterfront District is anticipated to account for 12 percent of total targeted employment changes. The remaining sub-areas are anticipated to collectively accommodate about 25 percent of total employment growth.

Figure 3-H

Share of Downtown Population Growth by Neighbourhood, 1996 – 2021

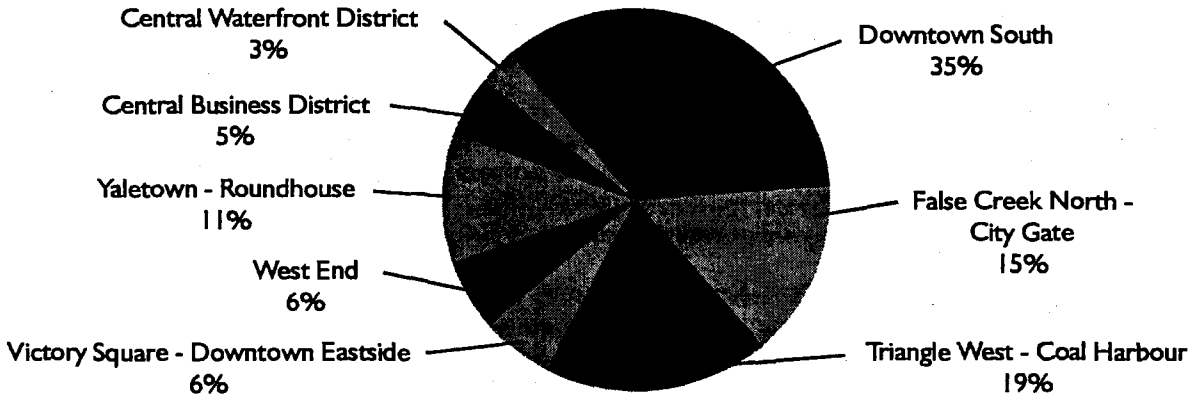
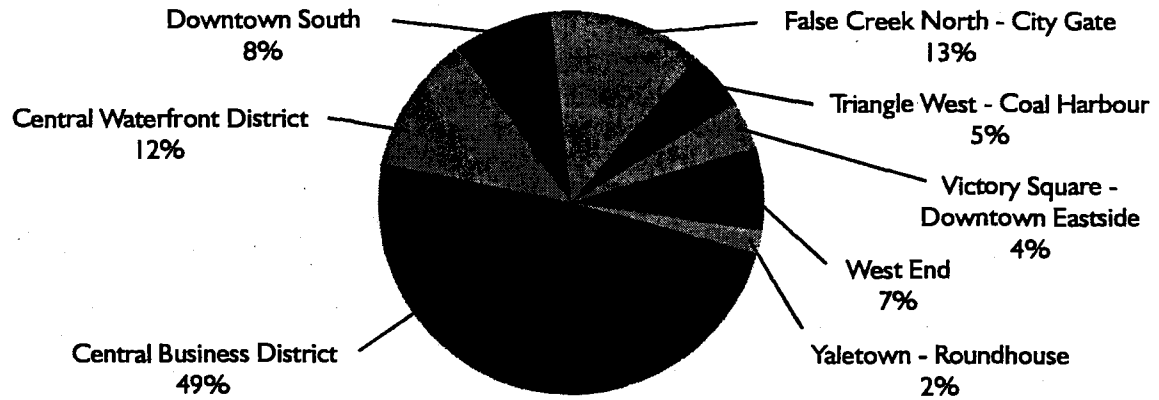


Figure 3-I

Share of Downtown Employment Growth by Neighbourhood, 1996 – 2021



3.6.4 Downtown and Vancouver's Metropolitan Core

Vancouver's downtown is one of three related commercial nodes that together comprise the 'Metropolitan Core' (*See Figure 2-A above*). The Central Broadway area, bounded by 12th Avenue and False Creek between Burrard and Main Streets, is designated to accommodate overflow office development from the downtown core. The Broadway corridor contained over 10.5 M ft^2 of office space in 2001, and another 3.5 M ft^2 is anticipated by 2021. The area had nearly 57,600 employees and 32,000 residents in 1996. Target employment for 2021 is 73,500, while target population is 38,500. The latter excludes an additional 4,000 people expected to live in Southeast False Creek.

The area east of Main Street and bounded by Prior Street on the north and Great Northern Way on the south, called False Creek Flats, has been partially rezoned to accommodate the high-tech industry. A further 75 hectares of industrial land is also available in the False Creek Flats area for downtown-serving industries. The 'Flats' had employment of nearly 5,000 in 1996, and is expected to account for up to 25,000 employees and development of approximately 5 M ft^2 further of office-type space by 2021. *See Figure 3-J.*

This metropolitan core had 194,600 employees in 1996, almost one in five of the GVRD total, and the target for 2021 is 273,500 employees. This core had a residential population of just over 93,900 in 1996, and the target population for 2021 is 160,200. Total resident population was 48 percent of total employment in 1996 and the target for 2021 represents 52 percent of target employment. Overall, this core may account for about 21 percent of total employment in the GVRD in 2021 and slightly less than five percent of the GVRD's target population. It will likely account for 63 percent of the City of Vancouver's employment and 22 percent of its population.

The overall economic performance of the Metropolitan Core should be improved if it functions as a single interconnected entity and improved access from the remainder of the GVRD is provided.

Figure 3-J

Population & Employment by Sub-Area, Metropolitan Core, 1996 & 2021

	1996		2021	
	Population	Employment	Population	Employment
Downtown Peninsula	61,900	132,000	100,000	175,000
Central Broadway	32,000	57,600	42,500	73,500
False Creek Flats	0	5,000	200	25,000
Metro Core =	93,900	194,600	142,700	273,500

3.6.5 Employment and Population Targets and the Downtown Transportation Plan

This concluding note is intended to elaborate on the relationship between population and employment projections and the Downtown Transportation Plan. Failure to achieve the population target will result in both fewer home-to-work trips originating on the downtown peninsula, and likely fewer reverse commuting trips from the peninsula to areas external to the peninsula. Exceeding the population target might mean both fewer trips into the peninsula from external points, as well as a greater number of reverse commuting trips from the peninsula to jobs off the peninsula.

Over-shooting the population target would, all else being equal, increase the ratio of residents to jobs, generally a positive result, easing pressures on the performance of the transportation network. A major part of the favourable result in easing congestion on trips to and from the downtown peninsula from the late 1970s to the present and again between 1996 and 2021 is the result of a decreasing ratio of jobs to residents on the downtown peninsula. The ratio was approximately 2.94 in 1986 and will be approximately 1.75 in 2021 should both population and employment targets be met.

Failure to achieve the employment target would result in fewer trips to the peninsula from off the peninsula, as well as less walking and biking for all trips to downtown destinations. Over achievement of the target would likely result in increased numbers of commuters to downtown from off the peninsula.

Regardless of the result, it is also important to note that any implications of over or under achievement of targets are greater for transit than other modes. The number of vehicles travelling to the downtown peninsula in the AM peak hour was about the same in the late 1990s when employment approximated 135-140,000 as in the mid-1970s when employment was under 110,000. And the EMME/2 transportation demand sub-model indicates that number of vehicles projected to be travelling to the downtown peninsula in 2021 will be similar to the current level. The major change in both instances is in the number of people using transit. The reason transit trips increased is easily explained. Transit services have been improved since the 1970s. SkyTrain and the West Coast Express are the most significant additions. On the other hand, there have been few improvements in road access to the City of Vancouver and the downtown peninsula. Aside from the Port Road, access to which is limited to users of the port, no major increases in road capacity are anticipated in the future in the City of Vancouver. Future transit improvements contemplated include extension of the Millennium SkyTrain line both east and west, the construction of a rapid transit line to Richmond and the development of a downtown streetcar system.

Another and simpler way of saying the above is that future population and employment targets have little to do with future road congestion. Downtown road congestion will remain similar regardless of population and employment targets or achievements. On the other hand, the implications of the targets for transit ridership are significant.

3.6.6 Conclusion

Both population and employment targets are robust. However, no recent trends bring question to these targets, and the numbers will be reviewed as part of the larger review of the *Liveable Region Strategic Plan*. It is nonetheless important that development continues to be monitored closely as a part of plan implementation.

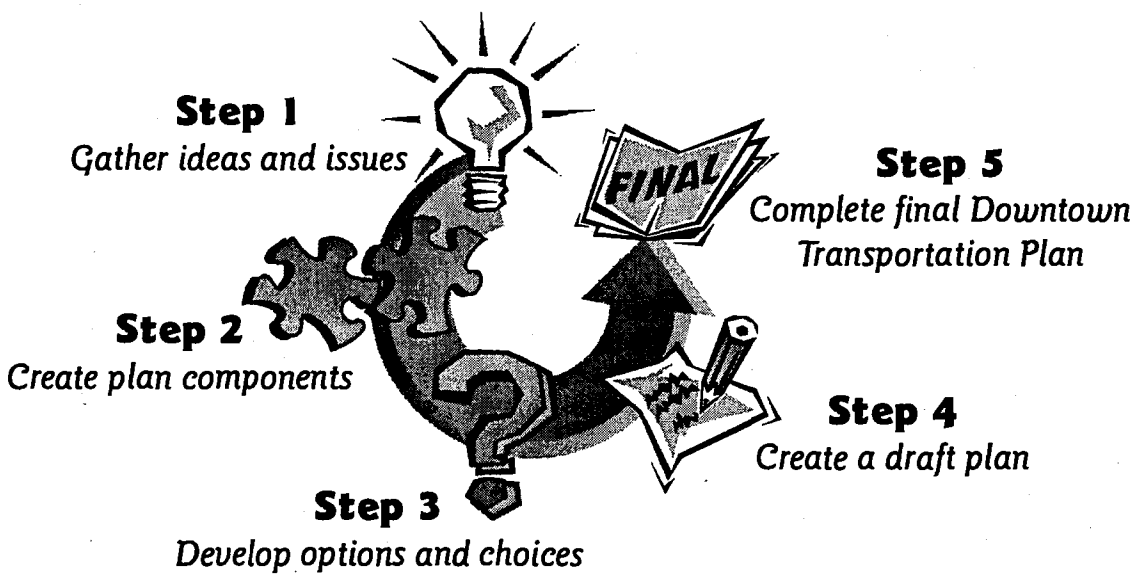
Recommendation PE 1: *Undertake follow-up studies of the demand for and supply of residential and commercial space on the Downtown Peninsula and report back to Council in 2003.*

3.7 Public Consultation Process and Results

The Downtown Transportation Plan team created a public consultation process that engaged a variety of community representatives, business interests, transportation advocates, stakeholder groups, advisory bodies and individuals throughout the process. A variety of mediums were used to communicate and involve the public in developing the plan. Local television, radio, newspapers, newsletters, posters, roving displays, brochures, web-site and e-mail were used to convey information, build awareness and seek participation.

In June of 2000, the public consultation process was initiated with the first of three newsletters and an open house. Approximately 75 people attended the 'kick-off' open house that highlighted the major components being studied as part of the plan, the terms of reference and the key dates and events for public involvement throughout the planning process. Over the course of the planning program over 2,000 participants took part in varying capacities in helping to identify issues and concerns, generate ideas, and reviewing the proposals. The general 5-step public consultation process and timeline are illustrated in Figure 3-K.

Figure 3-K
Public Consultation Process



3.7.1 Newsletters and Informational Brochures

Staff produced three newsletters that were distributed city-wide through local newspapers and were made available at all neighbourhood community centres, libraries, fire halls as well as Vancouver City Hall *(See Figure 3-L)*. Each newsletter provided the public an opportunity to respond to specific and general issues relating to the plan through an attached questionnaire. Over 1500 people responded to the questionnaires.

Figure 3-L

Newsletters with Questionnaire - distributed City-wide

The first newsletter was released in May of 2000 and introduced the transportation components to be studied, as well as an overview of policies that provided the guiding principles to be followed through the development of ideas and options. The newsletter also focused on some of the major transportation issues, problems and the challenges that the downtown faces in the years to come. Over 125,000 copies of the newsletter were distributed via the local papers to homes and businesses across the City.

Responses from the first questionnaire provided the following results:

- 29 percent suggested that improved transit service would encourage them to leave their car at home. 20 percent said they would leave their car at home if there were convenient alternatives to using the car;
- The most popular alternative transportation modes to driving vehicles were transit and cycling; and
- 66 percent of the respondents preferred bike lanes versus 21 percent who preferred shared wide curb lanes.

In April of 2001, the second newsletter was released which introduced the plan components and invited the public to participate in a series of workshops and "walk-abouts" to identify issues and generate ideas. This newsletter was distributed city-wide to homes and businesses. Over 500 people responded to the questionnaire that was included as part of the newsletter with some of the results highlighted below:

- The majority of respondents strongly agreed that Granville Mall should be maintained as a transit/pedestrian mall;
- Burrard, Granville, Pender, Pacific and Georgia Streets were indicated as the five key streets on which to create bike network; and
- The majority of respondents strongly agreed that commuter parking should be constrained to reduce congestion and encourage people to walk, bike, carpool or take transit.

The third newsletter was released in November of 2001 and illustrated the proposed bicycle and pedestrian networks, transit improvements, parking changes, future streetcar routes, and other changes to the downtown road network. These newsletters were distributed city-wide as an insert in a local paper. Canada Post delivered the newsletters directly to homes and businesses throughout the downtown peninsula. A questionnaire was also included as part of the newsletter asking people to respond to specific proposals contained in the newsletter. Some of the general responses are highlighted below:

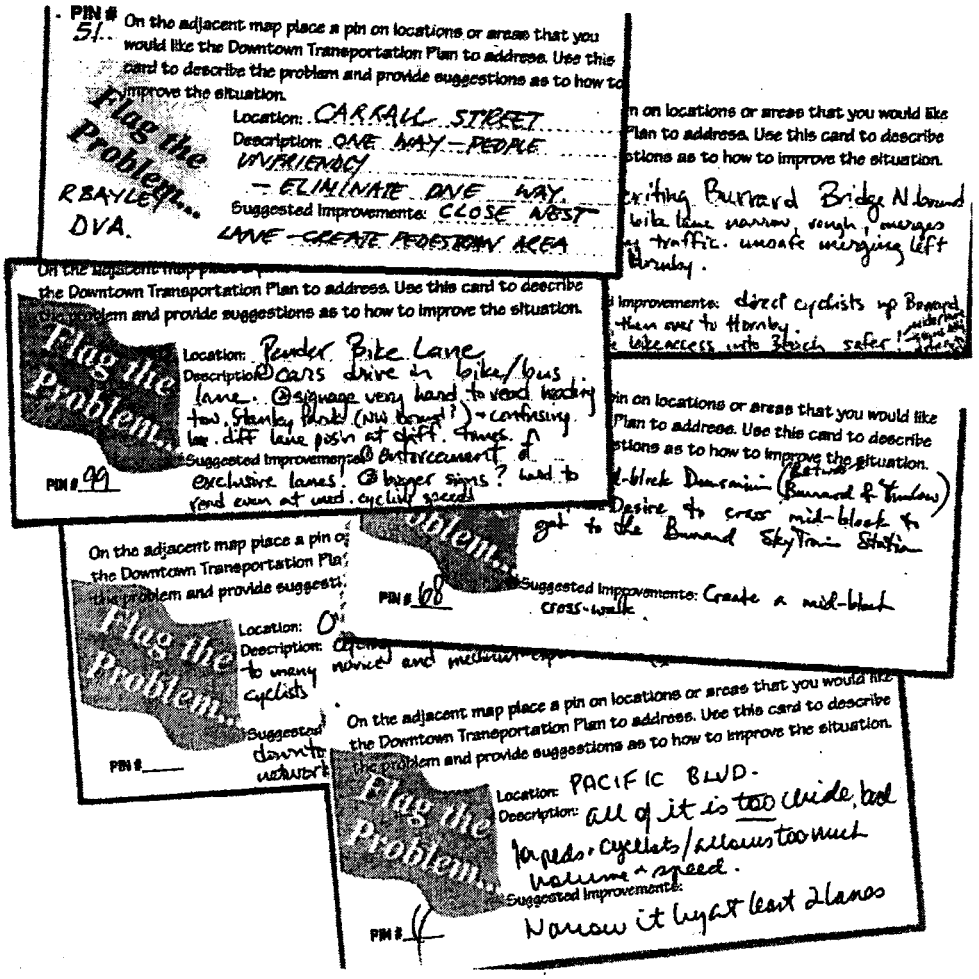
- Majority of respondents strongly agreed that a network of bike lanes should be developed downtown;
- A vast majority of respondents agreed that the use of sidewalks on Granville Mall should be used for outdoor seating and kiosks should be encouraged.
- The majority of respondents disagreed with introducing general traffic to Granville Mall; and
- A majority of respondents strongly agreed with redesigning Helmcken Street as part of the Greenway network to give pedestrians and cyclist more priority.

3.7.2 Public Workshops and 'Walk-abouts'

A series of 16 area and issue-specific workshops and *'walk-abouts'* were held throughout the downtown. *'Walk-abouts'* were conducted throughout downtown neighbourhoods to gain a first hand assessment of area specific issues and concerns. All of the observations and comments were documented on detailed maps and cards as illustrated in *Figure 3-M*. Workshop participants were also asked to "Flag the Problem" for additional issues that they wanted to be addressed. Many of these issues have been analysed and addressed through the *Spot Improvements* section of this plan. A summary of key messages from those workshops and *'walk abouts'* is outlined below. In addition, roving displays were set up at a series of venues and public institutions around the downtown to inform the public about the plan and upcoming events.

Figure 3-M

Public Input at Workshops - "Flag the Problem"



3.7.3 Key Messages from Public Consultation Process

Overall, there has been a high level of general support for the plan and its directions. There have been some specific concerns highlighted by various stakeholder groups. In general, the majority of the responses received were favourable to all components of the plan. This was confirmed both in our newsletter questionnaires and in a follow-up telephone random sample survey by Ipsos-Reid. There were, however, concerns such as the need for, and impact of bike lanes, the perceived bias against the car, the economic impacts, the underlying assumptions and overall vision of the plan. In response, the plan has been adjusted to provide additional details in these areas to allow a better appreciation of the issues and understanding of the recommendations. Staff have continued to consult with all concerned parties to address specific issues, provide additional information, and explain the comprehensive impact assessment used in analysing the proposed recommendations. Many of the original issues and concerns have been addressed through this process. A summary of the key messages is summarised for each of the major components below.

Pedestrians

- Create a network of clearly defined pedestrian routes that will provide safe, secure, interesting links to major destinations and transportation modes.
- Provide pedestrians greater priority through pedestrian activated traffic signals, wider sidewalks, elimination of "delayed walk" at intersections, mid-block crossings and landscaped medians.
- Improve the pedestrian environment by providing better lighting, street furniture including benches, as well as other amenities including drinking fountains, public art and improved landscaping.

Bicycling

- Develop a network of bicycling routes that connect existing and future transit nodes, neighbourhoods and major destinations.
- Provide cycling infrastructure, including painted bike lanes, bike racks, bike lockers, maps and destination/distance signage and change/shower facilities.
- Allow for bicycles on all forms of public transportation.

Road Network

- Create a better balance for all transportation modes based on Council's approved priorities.
- Discourage single occupant vehicles with measures including tolls, gasoline tax, parking tax, as well as encouraging more efficient use of vehicles through car sharing, van and car pools.
- Co-ordinate signal progression speeds that move traffic safely and efficiently.
- Create two-way streets to better serve residential neighbourhoods, hotels, and businesses.
- Provide transit priority along appropriate arterial streets.
- Provide incentives for developments that promote sustainable transportation alternatives, such as carpooling, rideshare programs, and car sharing.
- Remove truck routes in residential areas.

Public Transit

- Create a seamless network of transit routes to serve existing and emerging neighbourhoods and major destinations.
- Use parking pay-in-lieu to pay for transit improvements.
- Provide new, low-floor trolley buses to be used on all routes.
- Provide a 'loonie loop' or 'free zone' that would be paid for by the downtown BIA's to help promote shopping and visiting downtown.
- Make transit fares reflect distance/time travelled.
- Create new routes in emerging neighbourhood areas.
- Provide a request stop service on all routes for non-peak hours.
- Create transport hubs that are well designed with amenities, such as weather protection, security phones, change facilities, vending kiosks and washrooms.
- Encourage the development of Richmond-Vancouver Rapid Transit that would help to take some of the buses off of downtown streets.
- Create two-way bus routes on the same street to make it easier for users to understand.
- Provide real time display of when transit is coming.
- Create a downtown circulator to connect major retail streets.

3.7.4 Results from Random Sample Survey

In January of 2002, Ipsos-Reid conducted 900 telephone interviews with a randomly selected sample of downtown businesses and residents and commuters (300 businesses; 300 residents; and 300 commuters). In general, residents and business people are very supportive of the Downtown Transportation Plan. People generally support the plan because they believe it will improve traffic flow and reduce congestion. They also feel the plan will improve conditions for both cyclists and pedestrians. Those in opposition to the plan felt it did not focus enough on drivers/commuters and focused too much attention on pedestrians and cyclists.

4 Components of the Plan

The over all goal of the Downtown Transportation Plan is to improve access to downtown homes and businesses while enhancing the unique attraction of downtown Vancouver.

Given the population and employment targets, the total number of trips to downtown will increase by 30 percent. However, the change in the number of trips is different for each of the modes. The more sustainable modes like walking and biking will increase the most. Outlined below is a short summary of how people will reach downtown destinations if all of the plan components are implemented within the next twenty years.

- Walk trips are expected to more than double.
- Bike trips are expected to more than double.
- Transit trips made during rush hour are expected to increase by 50 to 60 percent.
- Vehicles entering downtown are expected to decrease slightly or remain about the same.

In short, the plan accommodates significant increases in walk, bike and transit trips by recommending major improvements for these modes. At the same time, these improvements also achieve an overall reduction in vehicle congestion that will benefit motorists and goods movement and ultimately the economic vitality of the downtown.

The following sections describe each component of the Downtown Transportation Plan.

4.1 Road Network Plan

Traffic congestion is one of the biggest concerns in an urban core. It not only affects the accessibility of the urban core, but its economic health. Therefore, one of the main goals of the downtown transportation plan is to minimize traffic congestion. This is accomplished by maintaining an efficient network of streets for traffic circulation.

The current street system within the downtown has evolved over the years to accommodate the flow of traffic. Measures such as turn restrictions, traffic signals, rush hour parking restrictions and one-way streets all contribute to the effective flow of traffic in and around downtown. Currently, the traffic signal management system is being upgraded to better co-ordinate the city's 650 signals and optimize traffic circulation. The good news is that congestion within the downtown is not an overwhelming problem. In comparison to other parts of the region, downtown Vancouver has surprisingly manageable congestion despite its concentration of jobs and residents.

If congestion is not the primary problem in the downtown, why do anything at all?

Things may look good now, but with the increasing population and employment downtown, the number of trips into downtown is expected to increase significantly. Without any intervention, this could mean a lot more cars driving around the downtown. This would not only increase congestion, but the general desirability of the downtown as a place to work, live or play diminishes. As well, building more roads to accommodate more traffic is not only difficult and expensive in a densely developed environment, but it is not sustainable. Many North American cities with extensive freeway systems are a testament to the fact that building more roads induces more people to drive and does not solve congestion problems.

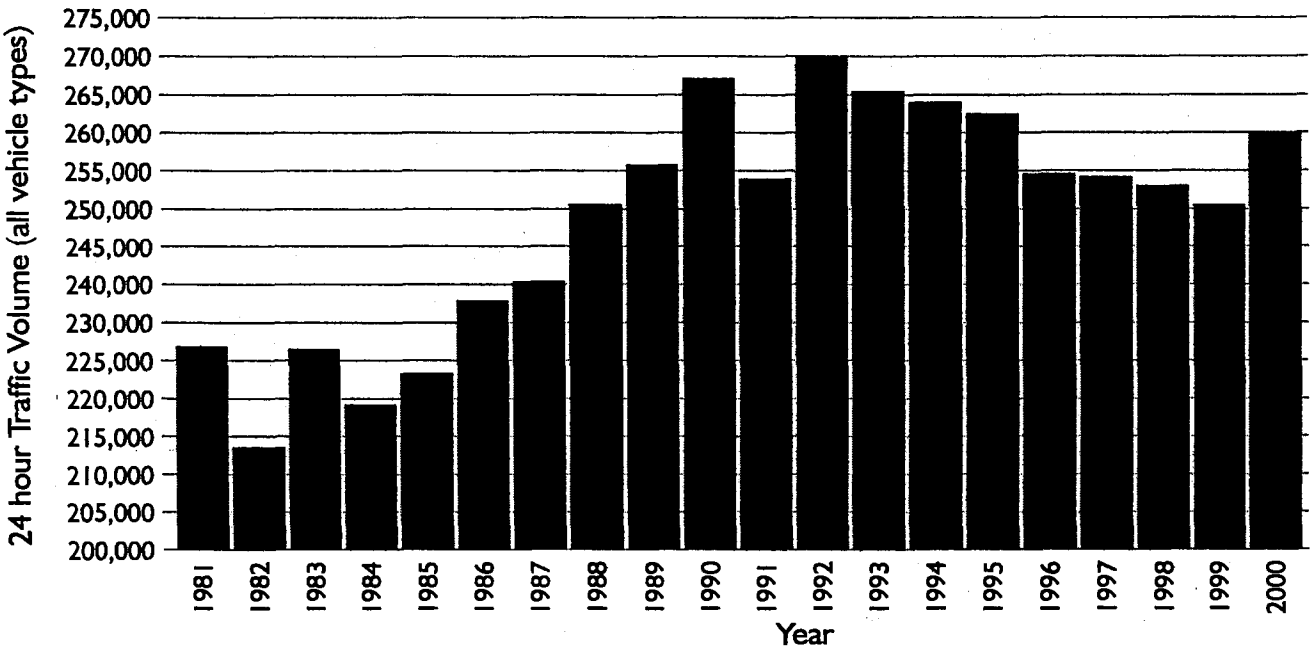
4.1.1 Future Trends

Auto trips will remain a significant proportion of the total number of daily trips into downtown in the AM rush hour (approximately 33% in 2021). Therefore, the accessibility of the downtown by auto needs to be well accommodated. It is an appropriate choice for many circumstances and should be recognized as a component of a balanced transportation system. The strategy is to provide a balanced transportation system that provides people with several mode choices that includes the car.

The 1997 Transportation Plan set a goal of no increased road capacity into the downtown and that traffic volumes into the downtown should be maintained at current (1996) levels. This may seem unrealistic given the growth in traffic and resulting increase in congestion in many parts of the region. But it is an achievable goal for the downtown. *Figure 4.1-A* shows that the 24-hour traffic volumes into the downtown over the last 10 years have levelled off and are gradually declining. With the projected employment growth in the downtown, this downward trend may be difficult to maintain. But, with the provision of transportation choices, appropriate land use policies and other incentives, the number of cars entering the downtown in 2021 is projected to remain about the same as today. Given this volume of traffic, the challenge is to maintain a manageable level of congestion in the future with the current road network, the expected growth in trips, and the provision of transportation choices that are often competing for the same road space.

Figure 4.1-A

24 Hour Traffic Volume Entering Downtown Vancouver



4.1.2 Principles

The following key principles guide the evaluation of the downtown road network:

a) Minimize Traffic Congestion. This is one of the most important factors for the Downtown Transportation Plan and is an expectation of the general public. Traffic congestion not only affects auto traffic, but it affects the operation of transit buses and commercial vehicles and impacts the environment in which pedestrians and cyclists travel.

b) Provide access to key destinations and support new land uses in the downtown. The emerging residential neighbourhoods in the downtown are an example of the changing land uses that may require changes to the road network system.

c) Provide a balanced transportation system. A number of transportation choices need to be provided within the downtown to meet demands and influence future travel choices.

d) Enhance safety and user comfort for all modes.

4.1.3 Methodology

The following key tasks were completed in analysing potential changes to the road network:

- Inventory the existing street system;
- Analyse existing operating conditions;
- Identify areas of concern and potential solutions;
- Determine future land uses and travel demand forecasts;
- Develop alternate scenarios for the road network;
- Determine traffic operating conditions plus other performance measures for the existing and alternate road network scenarios; and
- Evaluate and recommend the preferred road network.

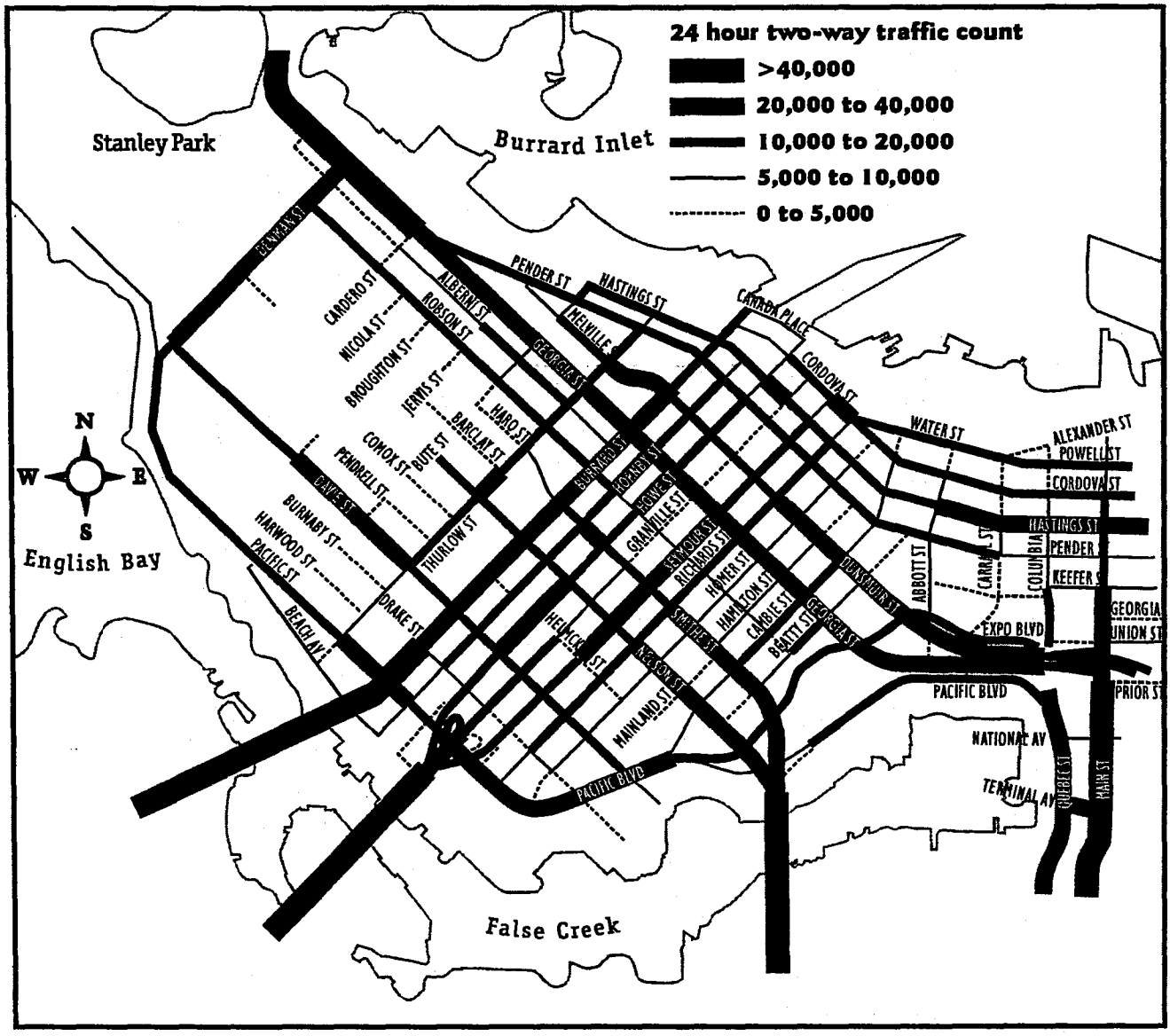
In developing scenarios for the overall road network, each change along a specific street was first evaluated individually in terms of benefits and impacts to all road users and property owners. If the results were positive, it was then co-ordinated with all other specific changes that were positive to create a new road network. The new road network was then evaluated using the regional traffic model (EMME/2) to determine its impact on congestion and accessibility by comparing it to the existing road network for today and for 2021. At this stage, other performance measures, such as environmental considerations, are also used to evaluate the new road network. As can be expected, there were a number of iterations made to ensure that the proposed changes to the road network achieved the best results.

Before considering any road network changes, one must first understand the contribution of all the streets for moving traffic. *Figure 4.1-B* shows the 24-hour traffic counts for most streets within the downtown peninsula except the West End residential neighbourhood. Most streets in the downtown core are busy streets. As expected, the bridges leading into the downtown carry the highest volume of traffic with over 60,000 vehicles per day on each. Traffic from the east across the "neck" of the peninsula is more distributed over a number of streets, with higher concentrations along Hastings Street, and the Dunsmuir and Georgia viaducts.

Figure 4.1-B

24 Hour Traffic Volume

(Based on available count data from 1990-2000 with some interpolation)



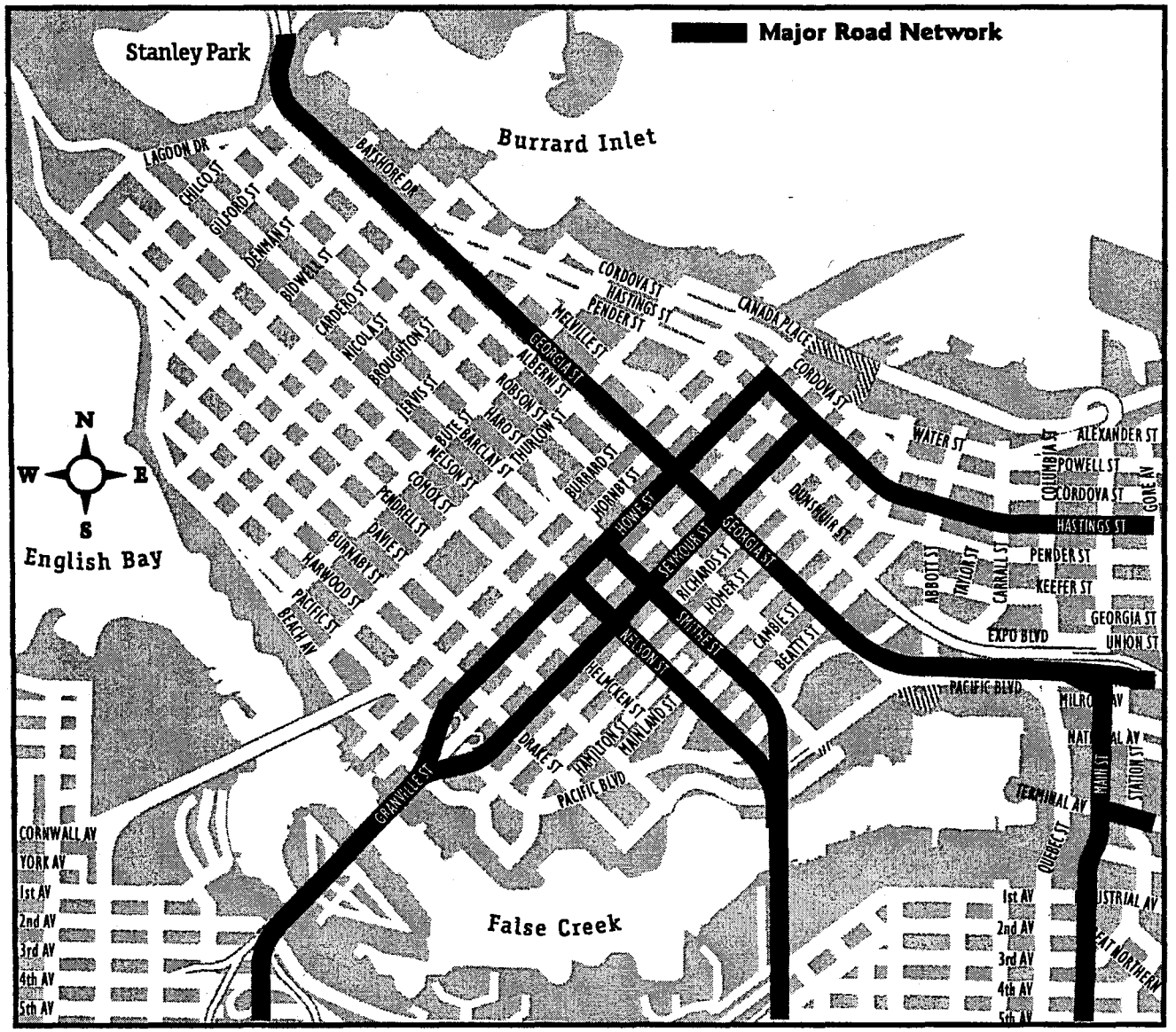
Just as important as identifying the busiest streets in the downtown, Figure 4.1-B also reveal the streets with the lowest traffic volumes. These streets, such as Carrall Street, Helmcken Street, Beatty Street, Drake Street and Homer Street were examined closely because they offer opportunities for more significant changes without reducing the function and efficiency of the downtown street network as a whole. Many of these streets were used to provide better local access or more transportation choices.

4.1.4 Major Road Network

In 1999, several streets within the downtown were designated as part of the Regional Major Road Network *Figure 4.1-C*. The purpose of the Major Road Network (MRN) is to maintain regional mobility by providing continuity through municipalities for all types of traffic. Municipalities receive capital and operating funds from TransLink to maintain and upgrade the Major Road Network. Although Vancouver retains ownership and control of designated MRN streets, the streets would be co-managed with TransLink and issues regarding maintenance standards, people carrying capacity and truck routes need to be mutually agreed upon.

4.1-C

Downtown Major Road Network



The designation of some downtown streets as part of the MRN was done in advance of a completed Downtown Transportation Plan. Because of this, it was recognized that revisions might be necessary.

A review of the existing MRN streets downtown confirms they are all appropriate. They all carry high volumes of regional traffic and buses to, from and across the downtown, which is recognized as a major regional activity centre. The streets create a continuous network by connecting to the MRN streets outside the downtown, such as Hastings Street, Main Street, Terminal Avenue, Cambie Street and Granville Street. Therefore, it is recommended that the existing MRN streets in the downtown be confirmed.

A review of other downtown streets for potential inclusion in the MRN resulted in the following observations:

- Burrard Street, from Burrard Street Bridge to Hastings, is one of the busiest streets in the downtown with traffic volumes similar to Georgia Street. Burrard could qualify as an MRN street based on its support of major regional transit services, its designation as a truck route, its role in providing network continuity, its accommodation of regional traffic to and across the downtown, particularly between the north shore municipalities and UBC. Consideration of Burrard Street as an MRN street should also include the Burrard Street Bridge and its connections to the rest of the MRN (i.e. Burrard Street to Broadway, Nelson, Smithe and Hastings streets).
- Granville Street from the Granville Bridge to Hastings Street is a major transit corridor. Granville Mall carries more people by all modes than any other downtown street, including the Lions Gate Bridge. Its role in providing efficient transit service in Vancouver is critical in reducing congestion along other MRN streets in Vancouver.

A more detailed review of each of the above streets is required prior to making any recommendations regarding its potential role as part of the MRN. In order to be included, they must meet the existing set of criteria established by TransLink and member municipalities. Many of these criteria have been referred to in the observations above. As more of the criteria are met, the more regionally important the street becomes. The reviews must also consider potential changes in streetscape, street usage and land use as the downtown area evolves.

Moreover, ongoing review of the adequacy of the MRN is essential. In future, more streets may need to be considered. For example, Dunsmuir Street and viaduct complement Georgia Street and viaduct. Main Street is both a truck route to the Port and has high transit and traffic volumes. When evaluating such streets for MRN, land use implications and streetscape needs for adjacent development will have to be fully understood and considered. Such streets will be brought forward to Council as need be.

One advantage of designating streets as part of the MRN is the funding contributions received from TransLink for maintenance and capital improvements. This source of funding is substantial and could help pay for changes along those streets (e.g. upgrades to the Burrard Street Bridge or streetscape enhancements along Granville Street).

One disadvantage is the sharing of control in making future street modifications, particularly with respect to people carrying capacity. This uncertainty suggests that the role of the street (in terms of transportation, adjacent land uses, and streetscape context) should first be confirmed prior to its inclusion as part of the MRN. Given that the future role of Burrard Street is becoming more apparent with the Burrard Bridge Sidewalk Study and the Transit Priority Study, it is recommended that Burrard Street be further evaluated and pursued for potential inclusion as part of the MRN. Similarly, Granville Street and Mall should also be further evaluated and pursued for inclusion as part of the MRN after establishing its transportation role and context.

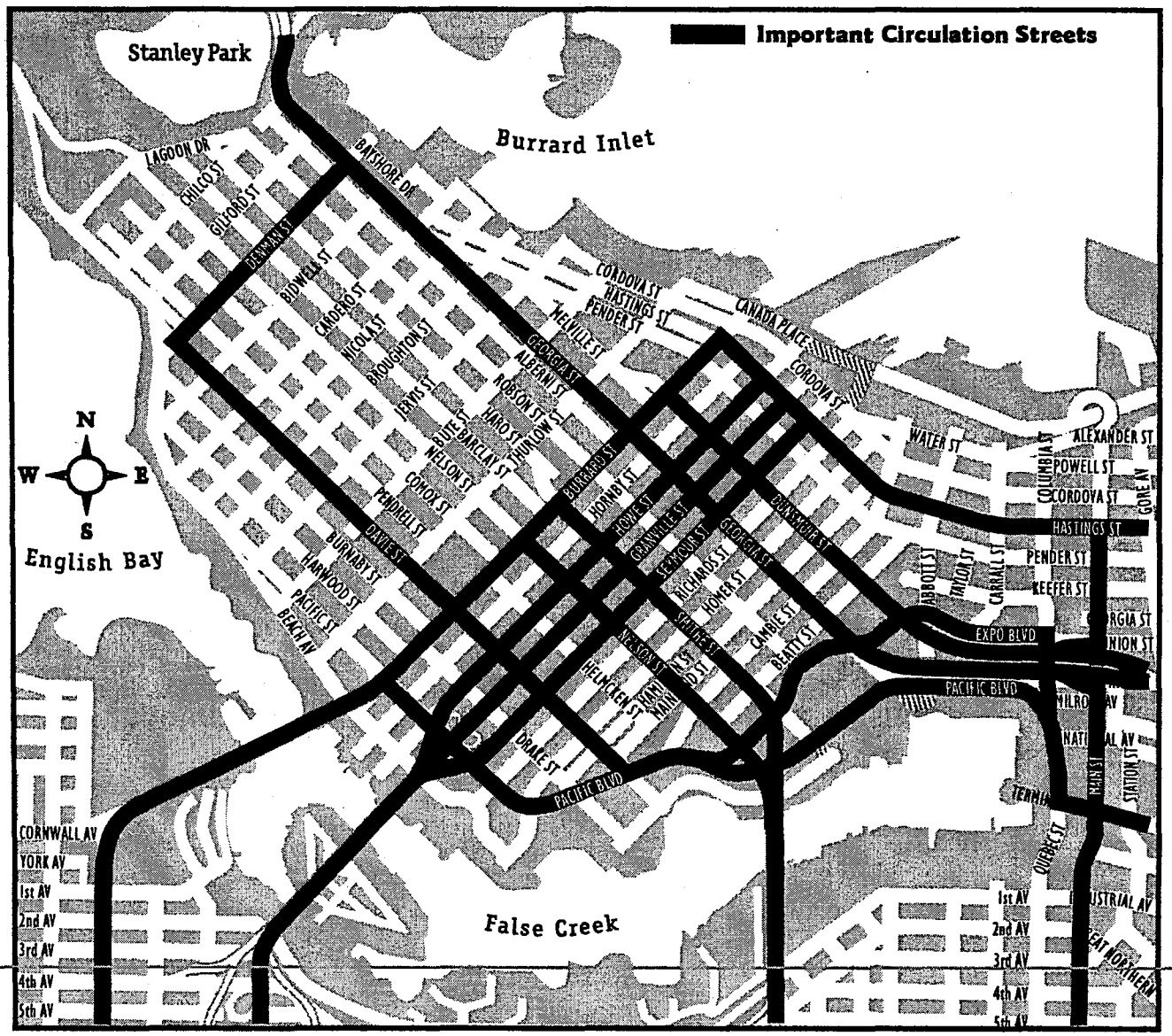
The urban and streetscape context of Main Street through Chinatown, and Dunsmuir Street and Viaduct are less certain as these streets evolve. Therefore, it is recommended that they be reviewed in further detail in the future.

4.1.5 Circulation Streets

Many streets within the downtown serve an important function in terms of providing circulation routes for traffic destined to various areas. *Figure 4.1-B* helps to demonstrate this by showing that a number of downtown streets carry traffic volumes in excess of 10,000 vehicles per day in both directions. *Figure 4.1-D* highlights some of the more significant circulation streets, including all the streets designated as part of the Major Road Network. These streets complete the connections between major downtown access points. Preserving adequate vehicular capacity along these corridors would help protect adjacent streets from overflow traffic and minimize congestion. It should be noted that both Water and Cordova streets are important circulation streets that provide an important link to east side of Vancouver, but have not been included because Hastings is identified as the primary east-west connection across the neck of the peninsula.

4.1-D

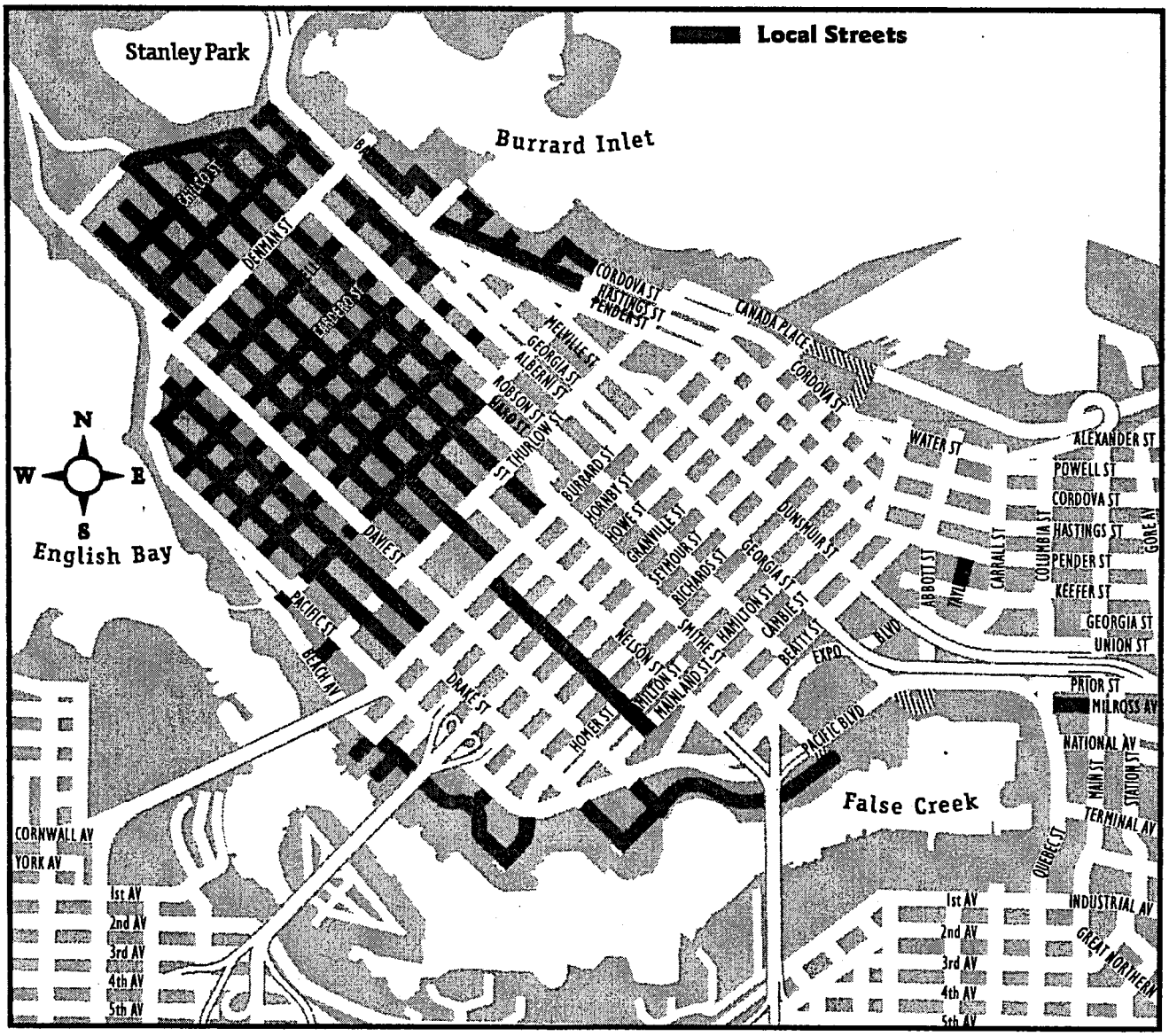
Important Downtown Circulation Streets



Some examples of important circulation streets that are not designated as part of the Major Road Network are Denman and Davie streets. Both these streets provide the necessary access routes to the West End neighbourhood and are also bus routes. Although changes to these streets may be recommended to provide greater transportation choices or more pleasant street environments, it will be necessary to carefully consider the impacts to traffic circulation. Changes that may be too restrictive on traffic circulation could lead to congestion and diversion of traffic to other more sensitive neighbourhood streets or lanes. Therefore any changes to circulation streets with high traffic volumes, such as those shown on *Figure 4.1-D*, need to consider the consequences of traffic congestion and its impacts on neighbouring streets.

To provide further clarity of the role of the various streets in the downtown, it is simpler to identify local streets or streets that primarily provide access to the adjacent land uses and are not required to accommodate any through traffic. This is shown on *Figure 4.1-E* and covers most local streets in the West End, Coal Harbour and False Creek North neighbourhoods. All other streets that have not been identified as either an important circulation street or a local street serve a role that ranges between the two (local collector street to secondary arterial street). A precise definition of these streets is avoided because the role of some streets varies along the length of the street making it difficult to classify. Alberni, between Denman and Burrard, Thurlow Street between Cordova and Beach, and Nelson, between Denman and Cambie Bridge, are a few examples. In avoiding a specific definition, more latitude is provided to ensuring that the street is evaluated and potentially changed based on its role in serving the transportation needs of the adjacent land uses and of the downtown as whole. As well, as the downtown evolves, it enables the street to change without being constrained by its definition. Therefore, it is recommended that all local streets and major arterial streets in downtown be identified, and that all other streets be recognized as providing some contribution to the overall circulation needs of the downtown without a specific classification.

Figure 4.1-E
Local Streets



4.1.6 Road Network Changes

Several changes to the road network are proposed to achieve the goals of the Downtown Transportation Plan. Many of the changes centre around the question of whether a street should be a one-way street or a two-way street given the existing traffic volumes, the land uses and the ability of the street to meet other transportation objectives (pedestrian, bicycle and transit needs).

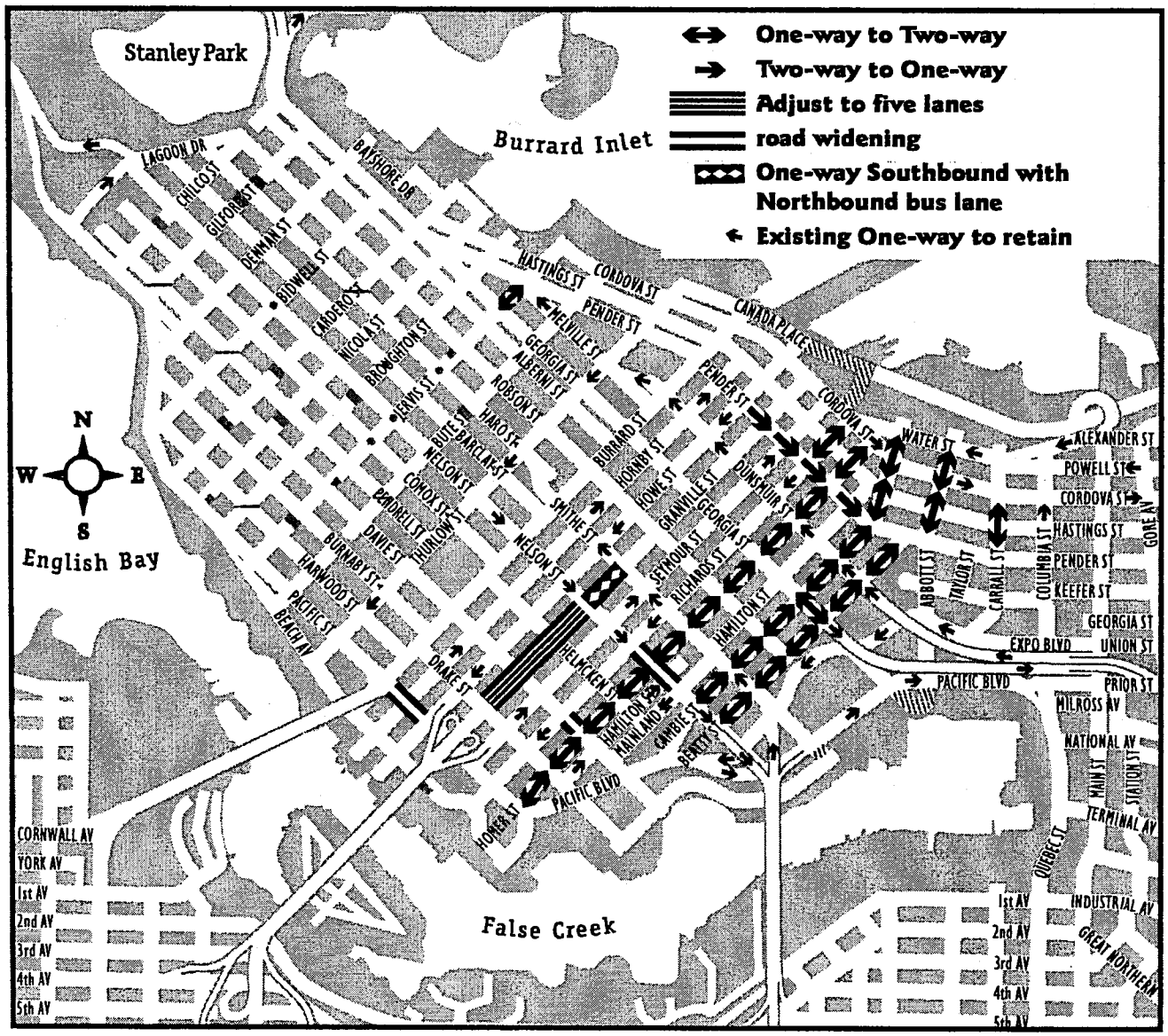
Many streets within the downtown core are one-way streets. These one-way streets provide safe and efficient traffic operations, and work best in pairs or couplets. In particular, one-way streets reduce conflicts at intersections, provide more orderly traffic flow, and provide better crossing gaps for pedestrians and side street vehicles. On the other hand, two-way streets generally have lower operating speeds because of the friction from opposing traffic, provide better accessibility

to land uses by reducing trip lengths, and provide more convenient and safer loading operations (e.g. tour buses) on both sides of the street. Both street operations have merits, but depending upon the overall objectives, one may be more advantageous.

Figure 4.1-F summarizes the proposed changes to the road network. For each street, a brief description of the change and the rationale for the change are provided below. Several streets where no changes are recommended are included in the list below to document the discussion and resulting conclusions.

4.1-F

Road Network Changes



Carrall Street (between Cordova and Pender) - is recommended for conversion from a one-way southbound to a two-way street. The current traffic volumes along this section of street can be accommodated with a two-way street. Carrall Street south of Pender Street is currently a two-way street and this proposal would extend it north to Cordova. It is not extended further to Powell Street and Water Street because it would make the already complex intersection at Maple Tree Square more complicated and less safe by introducing additional conflicts. In addition to providing better accessibility to the area, making Carrall Street two-way facilitates the creation of bike lanes in both directions.

Abbott Street (between Water and Pender) - is recommended for conversion from a one-way northbound to a two-way street. The current traffic volumes along this street can be accommodated with a two-way street. Abbott Street south of Pender is currently a two-way street and this proposal would extend it north to Cordova. It would provide better accessibility to the area.

Beatty Street - is recommended for conversion from a one-way northbound to a two-way street. The current traffic volumes along this street can be accommodated with a two-way street with minor re-distributions, and new southbound capacity is provided to offset proposed changes to Cambie Street. The conversion would provide better accessibility to the area, particularly to the hotels located on the west side of the street where bus passengers currently load and unload onto the street. It also facilitates the creation of bike lanes in both directions. However, the implications of the proposed changes on traffic management during stadium events require further resolution.

Cambie Street (between Water and Nelson) - is recommended for conversion from a one-way southbound to a two-way street. Current traffic volumes on Cambie Street are relatively high because it is a route used by many motorists to gain access the Cambie Street Bridge. Conversion of this street will reduce the southbound capacity and result in some diversion of southbound traffic to other streets. This diversion is mitigated by the proposed conversion of both Beatty and Homer to two-way streets, which overall, would provide additional southbound capacity. Overall, it is expected that the traffic volumes among the north-south streets in the area (Homer, Hamilton, Cambie, Mainland) will be more balanced because they will all be two-way streets. In addition to providing better accessibility to the area, the conversion would facilitate the introduction of an efficient two-way transit service in the area where other alternatives are more circuitous. Because of the narrower street width between Nelson and Smithe, and because of the complications at the intersection of Cambie and Nelson, northbound general traffic cannot be introduced. However, a northbound counter-flow bus lane and the full time removal of some parking are proposed to maintain two-way transit service along this block. See Spot Improvement #5 in Section 4.8 for more details. In the longer term, when the site on the west side of Cambie Street between Nelson and Smithe redevelops, this block should be considered for widening and introducing two-way mixed traffic.

Homer Street (between Cordova and Pacific) - is recommended for conversion from a one-way northbound to a two-way street. The current traffic volumes along this street can be accommodated with a two-way street with some traffic redistributions, and new southbound capacity is provided to offset proposed changes to Cambie Street. The conversion would provide better accessibility to the area, particularly with the reopening of the Ford Centre, the new residential developments, and the restrictive but necessary one-way street system in Yaletown on Mainland and Hamilton streets.

Richards Street (between Cordova and Pender) - is recommended to remain one-way southbound, but that a northbound counter-flow bus lane be added. Full two-way operation of the street would offer few potential benefits for general traffic. The counter-flow bus lane would improve bus access to Cordova Street at Waterfront Station and could offset bus looping problems if Pender Street were to be made one-way eastbound. It would also facilitate a two-way bike connection between downtown and the waterfront.

Granville Mall (between Hastings and Smithe) - is recommended for further review. It's role as a transit, pedestrian and service vehicle corridor, entertainment district and future greenway should be maintained. Currently the mall is the busiest street in the downtown, carrying more people than any other street by all modes. It is also the busiest transit corridor in the downtown. Therefore, transit efficiency along the street should not be diminished. However, Granville Street/Mall does require an upgraded streetscape and some form of mall management to help revitalize the area.

Granville Street (between Smithe and Nelson) - is recommended for conversion from a two-way street to a one-way southbound street with a northbound counter-flow lane for buses, taxis and other authorized vehicles. The street changes are to address the congestion and conflicts created at the intersection of Granville and Smithe largely by northbound vehicles turning left. Due to the high volume of pedestrians crossing Smithe at the western crosswalk and the high volume of southbound buses, the capacity for northbound vehicles to turn left is limited. This back up of left turning traffic creates congestion and has resulted in the intersection experiencing the highest number of bus-related collisions and the second highest number of rear-end collisions within the central business district (*Safety Review for the Downtown Transportation Plan*, Hamilton Associates, 2001). This change will require all general traffic to turn right at Nelson, resulting in reduced congestion and improved safety at the intersection of Granville and Smithe. This change will also provide more parking/loading opportunities for taxis and commercial vehicles.

Granville Street (between Nelson and Drake) - is recommended for conversion from a six-lane street to a five-lane street with a centre lane that features left-turn bays and could include a planted median. The changes would address the fact that the current width of travel lanes is less than desirable and often results in transit buses straddling two traffic lanes. Current traffic volumes along this street would be manageable because the existing number of lanes approaching the intersections would be maintained and the current number of lanes does not operate efficiently due to the narrow widths. The change would also address Granville Street, between Davie and Drake, which experiences the third highest number of collisions with parked vehicles within the central business district (*Safety Review for the Downtown Transportation Plan*, Hamilton Associates, 2001). An added benefit is the opportunity to widen the sidewalks on both sides of the street by about one metre in total. This would be consistent with the objective to enhance the pedestrian environment.

Thurlow Street (between Nelson and Pacific) - is recommended to remain as a one-way street with traffic calming measures implemented. Conversion to a two-way street was considered to improve accessibility to the area and reduce speeds. However, offsetting the benefits were the increased traffic congestion in the southbound direction, an increase in traffic noise with the introduction of vehicles travelling uphill between Pacific Street and Davie Street, and an increase in northbound traffic that offsets the decrease in the southbound traffic. Therefore the existing one-way street should be traffic calmed with corner bulges to narrow the roadway and facilitate pedestrian crossings, and speed reduction measures implemented where appropriate. In addition, up to 0.5 metres could be added to each sidewalk for the creation of a boulevard with street trees. A major redevelopment of St. Paul's Hospital may necessitate another review of the traffic circulation in the vicinity.

Pender Street (between Cambie and Howe) - is to be considered for conversion from a two-way street to a one-way street. This section of street currently accommodates four narrow lanes of traffic where transit buses, delivery trucks, general traffic, taxis and cyclists all compete for road space. There is a desire to provide bike lanes as part of the downtown bicycle network and parking/loading spaces on the north side of the street. However, this does not appear to be achievable with a two-way street given the existing right-of-way. Because the conversion of this street from a two-way to one-way street will impact other streets and may have significant implications on traffic and transit operations, further detailed analysis with a micro-simulation model is recommended. See spot improvement #47 in Section 4.8 for more details.

Pacific Street (between Burrard and Howe) - is recommended for widening to facilitate the introduction of bike lanes and accommodate the flow of traffic. This could be done in conjunction with the redesign of the Burrard/Pacific and Burrard/Hornby intersections to address general safety issues and improve conditions for all modes. The findings of the Pacific Boulevard Streetscape Design Study also support this widening and needs to be considered along with the False Creek Pedestrian and Bike Crossing Study.

Water and Cordova Streets (between Richards and Main) - are recommended to remain as one-way streets. Water Street should remain a one-way street to preserve the existing sidewalk widths and the ability for buses and other service vehicles to load and unload on the curb lane where this is permitted. Cordova Street should remain as a one-way street to allow the introduction of a streetcar. A two-way Cordova Street with a streetcar running in traffic would reduce sidewalk space significantly, reduce the operational efficiency of the streetcar, and restrict left turns into Gastown. The idea of changing the one-way direction for both streets was also considered, but this would complicate traffic movements, decrease safety and likely increase congestion.

Other One-Way Streets - have also been reviewed and are recommended to be maintained. One-way streets such as Seymour, Howe, Smithe, Nelson, Georgia and Dunsmuir viaducts carry high volumes of traffic and play a significant role in making the downtown highly accessible. They cannot be easily converted to two-way streets without a significant redistribution of traffic and potential reduction of traffic capacity into the downtown, and a significant re-design of the bridge access points.

Extend Downtown Street Grid into Northeast False Creek - Extending the street grid pattern around BC Place stadium into Northeast False Creek will help to integrate this area into the rest of downtown. This includes creating a pedestrian connection along the Georgia Street axis to False Creek, extending Smithe Street east to False Creek, and extending Griffiths Way to False Creek and aligning it with Georgia Street.

Minor Road Widenings (approx. 0.5 metres) - are recommended along Davie (between Richards and Homer) and Nelson (between Richards and Mainland). The widening along Davie would make it consistent with the rest of Davie Street, facilitate the introduction of a bus route on Davie and Homer, and remove a block long narrowing that may be contributing to the over-represented head-on collisions at the intersection of Davie and Homer. The widening of Nelson would facilitate the introduction of bike lanes and improve the flow of traffic. It may also address the over-represented side swipe collisions on Nelson at Homer and at Mainland *(Safety Review for the Downtown Transportation Plan*, Hamilton Associates, 2001).

Spot Improvements - There are several potential road network changes identified at specific locations that could achieve a number of goals. Many of the recommended road network changes and spot improvements are described in greater detail in Section 5.0. Some potential ideas include the re-design of the Granville Bridge loops and the re-design of the intersection of Georgia Street and Pender Street.

4.1.7 Traffic Management with Traffic Signals

Traffic signals play a major role in controlling the flow of downtown traffic as nearly every downtown intersection is equipped with a traffic signal. In order to maintain efficient traffic flow, the City co-ordinates many of the signals downtown to provide motorists with sequential green lights (a "green wave") on most one-way streets, as well as two-way streets where one direction of travel predominates. In most cases, signals are set to allow traffic moving at 50 km/h to receive sequential green lights. In some cases this speed may be excessive as it means that motorists must maintain the speed limit as a minimum speed in order to keep moving - even minor delays may cause drivers to either speed to catch the next green light or stop at a red light. Speeds of 50 km/h and up are also uncomfortable for cyclists and nearby pedestrians, and require that motorists maintain a relatively narrow field of vision. In order to improve comfort and safety for all road users, it is recommended that the progression speed be reduced from 50 km/h to 40 km/h on some downtown streets

Road Network Plan Recommendations

Recommendation RN1: *Confirm the existing designated MRN streets (Hastings, Georgia, Smithe, Nelson, Howe, Seymour and Main (south of Prior)).*

Recommendation RN2: *Pursue Burrard Street and Granville Street for potential inclusion as part of the Major Road Network.*

Recommendation RN3: *Conduct a future review of other potential MRN streets (such as Main and Dunsmuir) after considering potential land use and streetscape development.*

Recommendation RN4: *Distinguish and recognize the role of important circulation streets and local streets in future street modifications.*

Recommendation RN5: *Convert Carrall, Abbott, Beatty, Cambie and Homer to two-way streets.*

Recommendation RN6: *Maintain Granville Street's role as a transit, pedestrian and service vehicle corridor, entertainment district and future greenway. Transit efficieny along Granville Street should not be diminished.*

Recommendation RN7: *Reconfigure Granville Street south of Smithe Street to improve traffic circulation, widen sidewalks and reduce conflicts.*

Recommendation RN8: *Maintain Water and Cordova Streets as one-way streets.*

Recommendation RN9: *Further Evaluate Pender Street between Cambie and Howe for potential conversion from a two-way to one-way eastbound street.*

Recommendation RN10: *Widen roadways at specified locations to facilitate vehicular circulation, bus movements and bike lanes.*

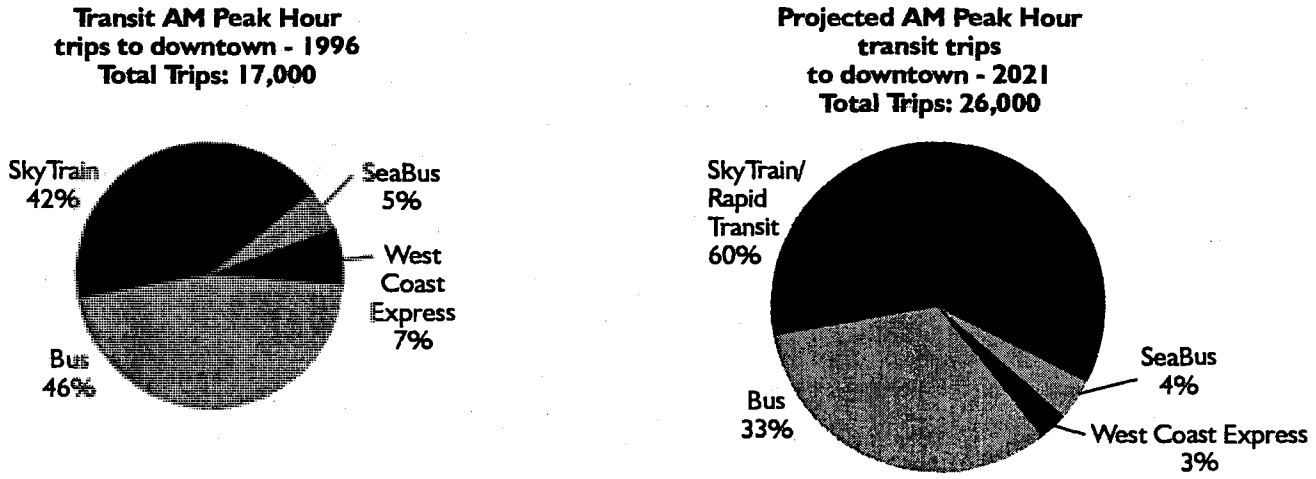
4.2 *Transit Plan*

Transit is the most popular way to commute to downtown. Currently about 40% of all morning rush hour commuters to downtown arrive by bus, SkyTrain, SeaBus or West Coast Express. Downtown Vancouver is more reliant on transit for access than any other destination in the region. The importance of transit access to downtown will increase significantly by 2021. Over the next twenty years the total number of transit trips to downtown is expect to increase by 45%. The Downtown Transportation Plan assumes that transit supply will increase to match this new demand for transit services as outlined in this section. *Figure 4.2-A*

Figure 4.2-A

Transit AM Peak Hour Trips

Source: Downtown Transportation Plan Sub-Area Model



However, TransLink, the regional transportation authority, is responsible for planning, financing and operating the regional transit system. The City of Vancouver has representation on TransLink and Coast Mountain Bus Company boards. The Downtown Transportation Plan was developed in consultation with TransLink.

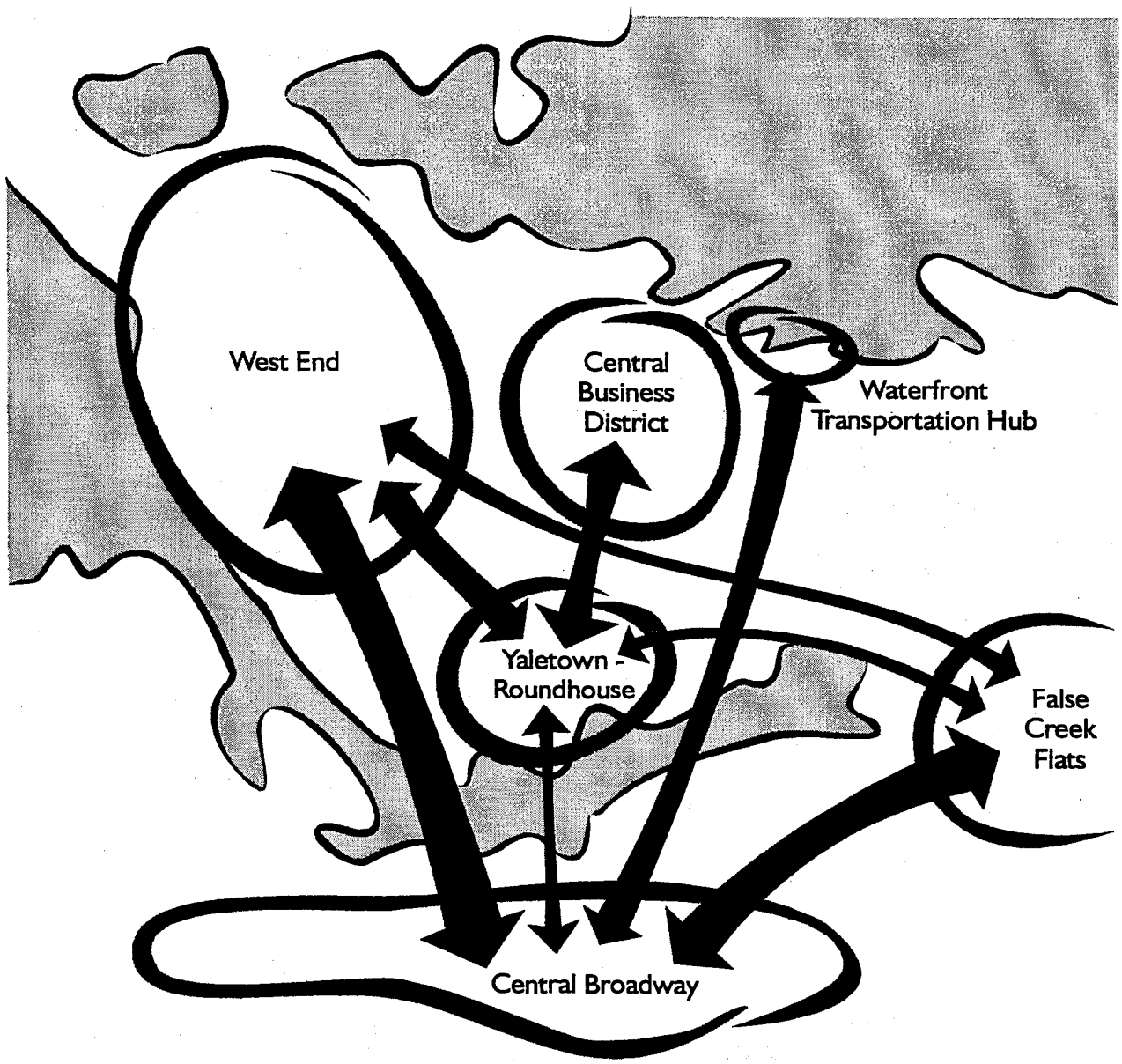
Goals

The transit goals of the Downtown Transportation Plan are to support the seamless integration of the various regional transit services, such as SkyTrain, West Coast Express, and SeaBus, and to develop an easy-to-use network of downtown transit routes that serve the existing and emerging neighbourhoods and job centres.

Connecting Neighbourhoods and Job Centres

The Downtown, Central Broadway, and the False Creek Flats are together referred to as the *Metropolitan Core* of Greater Vancouver. The Downtown Transportation Plan proposes better transit connections between the three key existing and emerging job centres in, Downtown, Central Broadway, and the False Creek Flats. These job centres require good transit connections to support a healthy metropolitan core. There is also a need to better connect the densely populated residential areas in Downtown South and the West End to the Central Broadway area. *Figure 4.2-B* identifies trips desires lines that are poorly served by transit.

Figure 4.2-B
Poorly served transit connections



The connection between Downtown and False Creek Flats is currently partially served by the Expo SkyTrain line. Connections to Central Broadway from downtown and from the False Creek Flats are targeted for improved service. Bus routes can provide the needed service in the short term. In the longer term these routes could be converted to or complemented by rail transit services. Ultimately, rapid transit lines should link the three job centres.

False Creek Flats

Portions of the False Creek Flats have been rezoned to change the land use from industrial to high-tech, education, and other higher intensity land uses. By 2021 the Flats could have many other "downtown-like" land uses that could include hotels and retail. Transportation studies have been completed by many of the major land owners, such as Finning and CN, but the City has yet to develop an overall transportation plan that will integrate this area with the rest of the City. There has also been a concern that developments in the Flats could compromise the efficiency of rail service in the City. Further work is needed to assess the needs of rail services (passenger and freight) in the metropolitan core. The City should pursue the development of a detailed transportation plan for False Creek Flats in co-ordination with a rail study.

4.2.1 Rail Rapid Transit

When the Expo SkyTrain line opened in 1985 it was an immediate success. Today, during the morning rush hour the Expo SkyTrain line and the West Coast Express carry half of all transit trips into downtown and require additional trains to meet the demand. With the anticipated expansion of rail rapid transit, the total number of rapid transit trips is expected to double the number of morning rush hour trips to 16,000. In fact, nearly all of the new motorized trips into downtown are expected to be on rapid transit.

One of the attractive features of rapid transit is that all of these new trips are accommodated in a way that has less impact on the immediate livability than any arterial street.

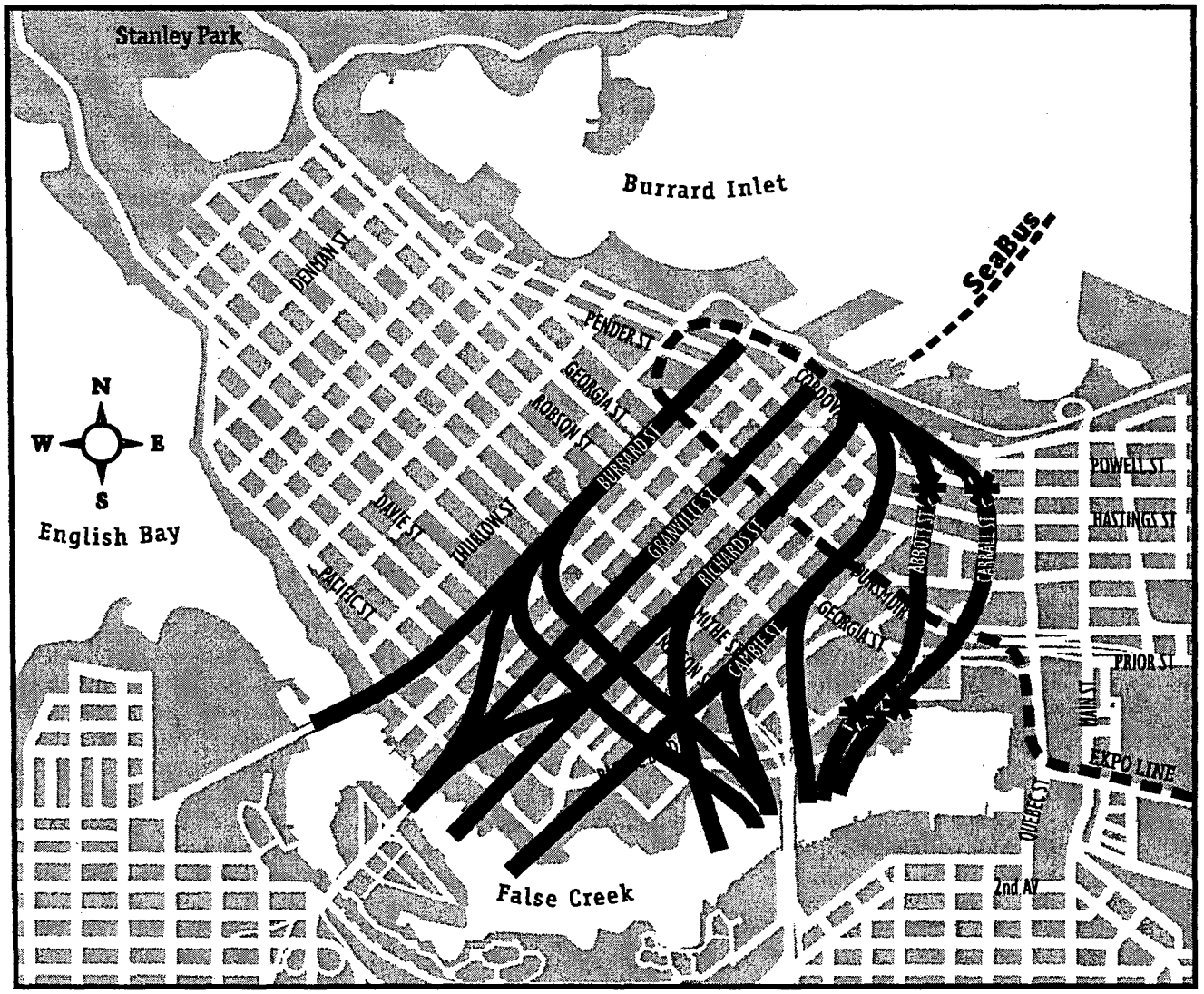
a) **Expo and Millennium SkyTrain Rapid Transit Lines**
Rapid transit is expected to carry 90 percent of new motorized trips into downtown generated between 1996 and 2021. About half of these new trips would be carried on the existing Expo SkyTrain line and the other half would be on the new Richmond rapid transit line. While the Millennium SkyTrain Line does not directly serve downtown, many riders will use the Millennium line to reach downtown by transferring to the Expo SkyTrain line at Commercial Drive or at a point further west when the Millennium line is extended to Central Broadway. When the first phase of the Millennium line opens in September 2002, an increase in the number of trips to downtown on the Expo line is expected. The Millennium line extensions to Central Broadway-Granville and ultimately to Coquitlam will further increase ridership on SkyTrain into the Metropolitan Core.

b) **Richmond/Airport Rapid Transit Line**
The Downtown Transportation Plan anticipates the construction of a north-south rapid transit line to Richmond and the airport. The Richmond/Airport rapid transit line will represent the biggest single improvement to access into the downtown and it will be the single most important addition to transit service to the downtown peninsula. Council has adopted a policy that supports a Richmond rapid transit line in a tunnel (subway) along the Cambie corridor.

A 1990 study for a Richmond rapid transit line identified the potential downtown alignments shown in *Figure 4.2-C*. These alignments have been reviewed for their ability to serve downtown employment centres.

Figure 4.2-C

Potential alignments for a rapid transit line to Richmond



1990 N.D. Lea Study

Alignments on the following downtown streets were compared; Burrard, Granville, Richards, Cambie, Abbott, and Carrall.

Council removed Carrall and Abbott from consideration.

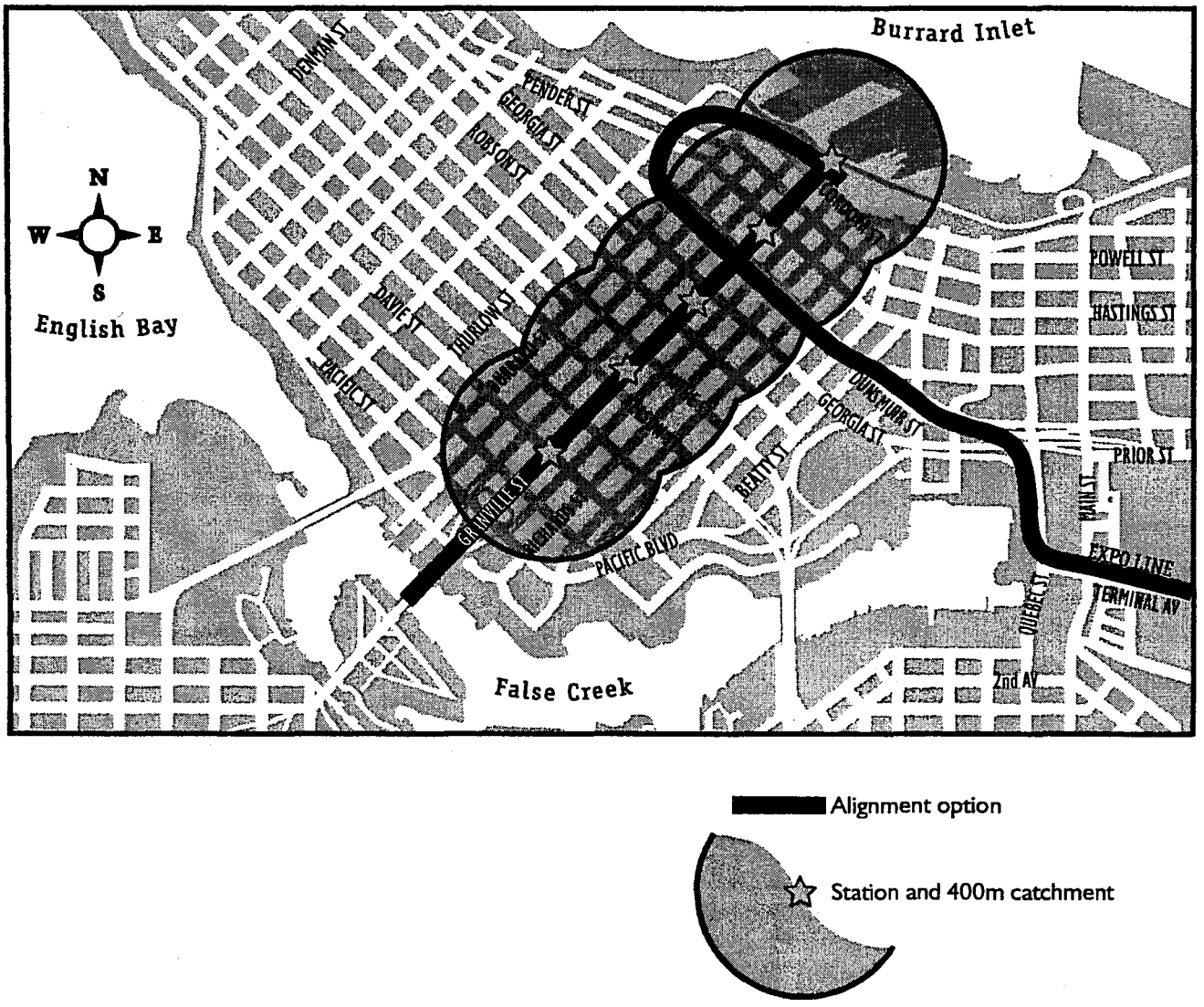
Alignment options

The potential alignments fall into three broad categories defined by the rapid transit technology:

Surface Light Rail: A surface light rail line would require two dedicated traffic lanes for trains running in both directions. An additional lane is required for station platforms. A good street for surface light rail should have few or no vehicle driveways and low traffic volumes to minimize any increase in congestion. The best alignment option for this technology is Granville Street. Surface light rail on other streets, such as Burrard, Hornby, or Howe, would compromise access to properties and result in significant increases to traffic congestion. Note that a surface alignment is not compatible with the City policy that supports rapid transit to Richmond in a tunnel along the Cambie corridor. *Figure 4.2-D.*

Figure 4.2-D

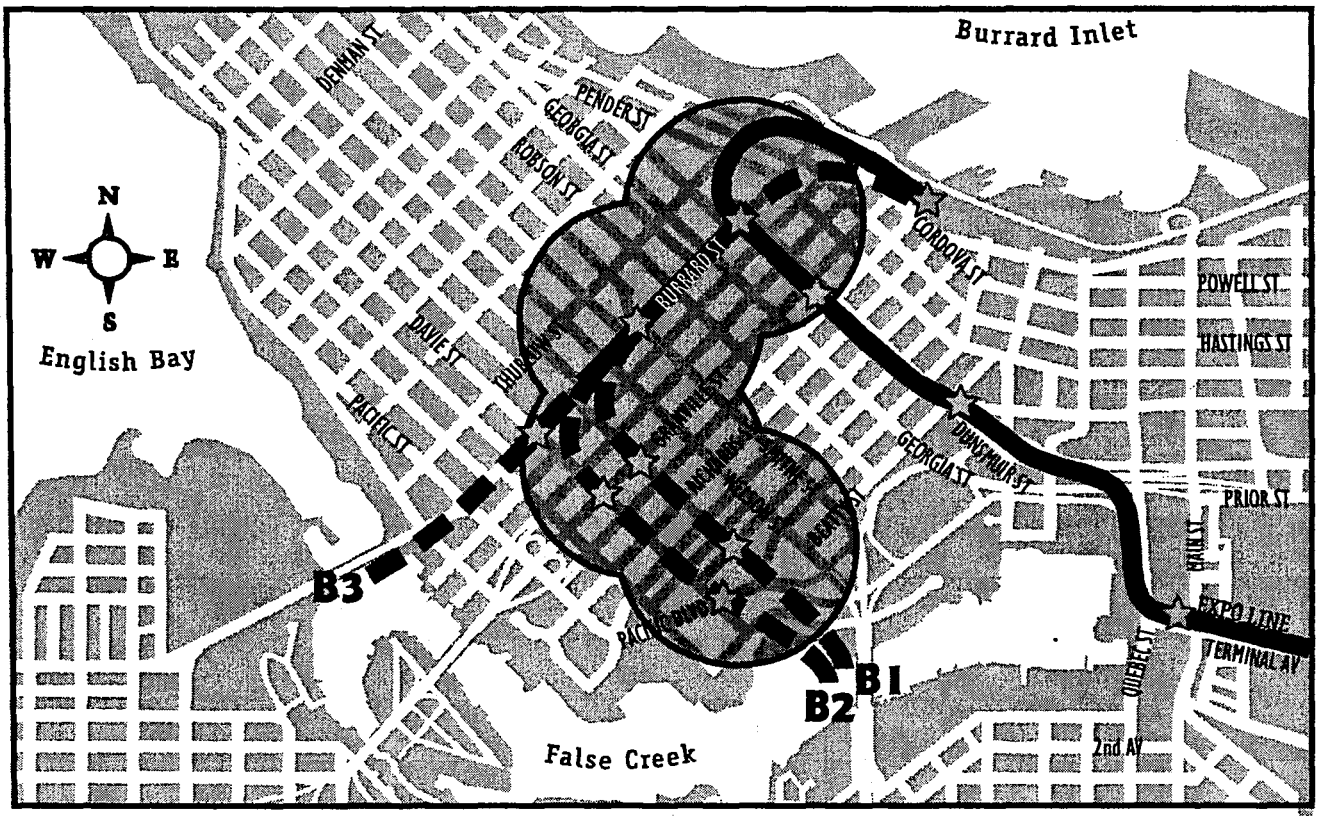
Potential alignment and station catchment for the Richmond/Airport rapid transit line as surface LRT

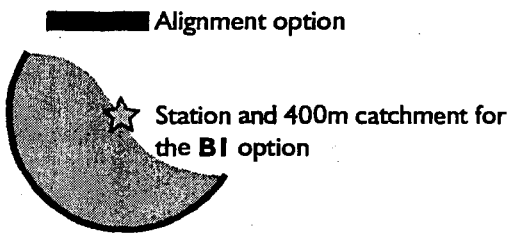


Tunnel Rapid Transit: Tunnel alignments require adequate right-of-way (street width) and few underground developments. Malls, parking, and other major utilities exist under streets like Granville and Howe. This limits the ability to implement rapid transit under these streets. Rapid transit lines in tunnels can use SkyTrain or other rail technology. *Figure 4.2-E.*

Figure 4.2-E

Potential alignments and catchment for the Richmond/Airport rapid transit line in a tunnel under Burrard Street

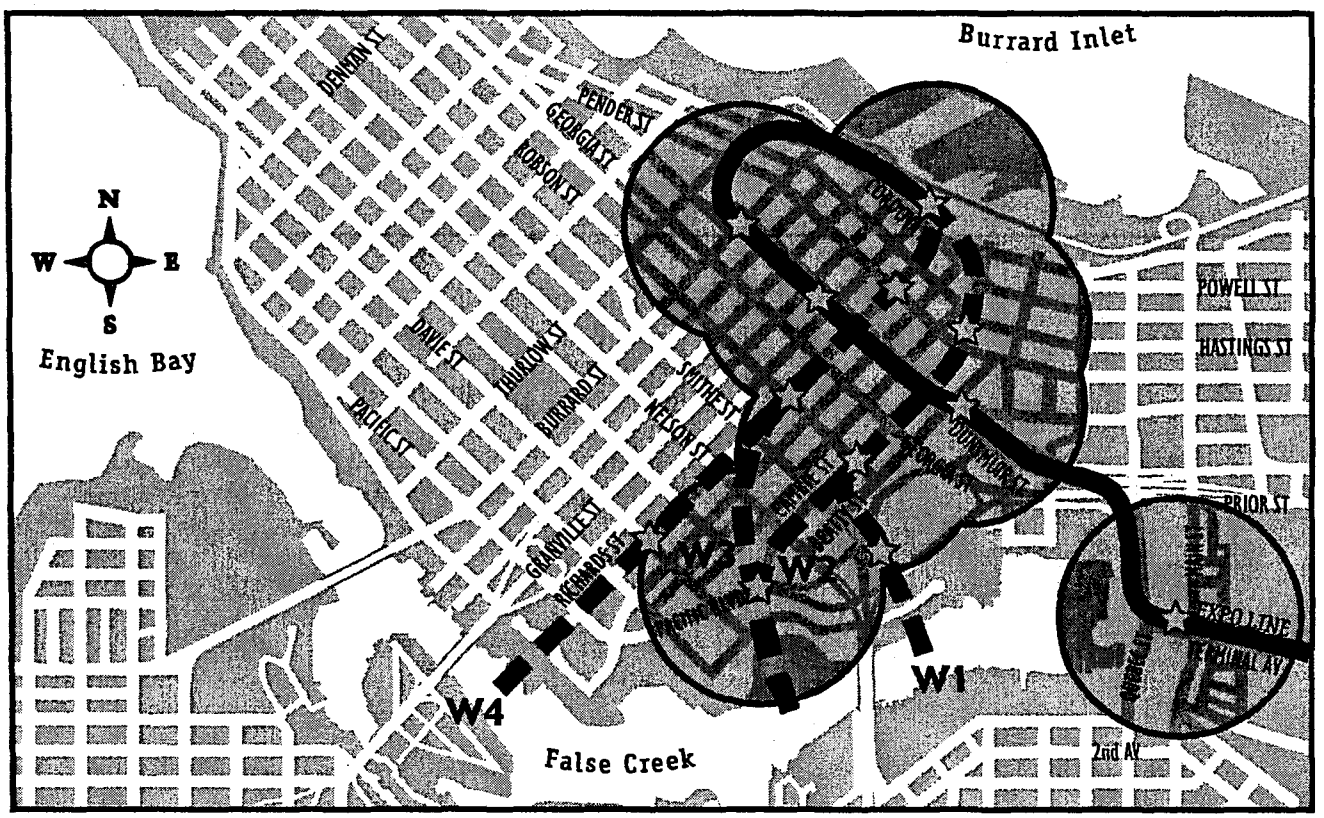


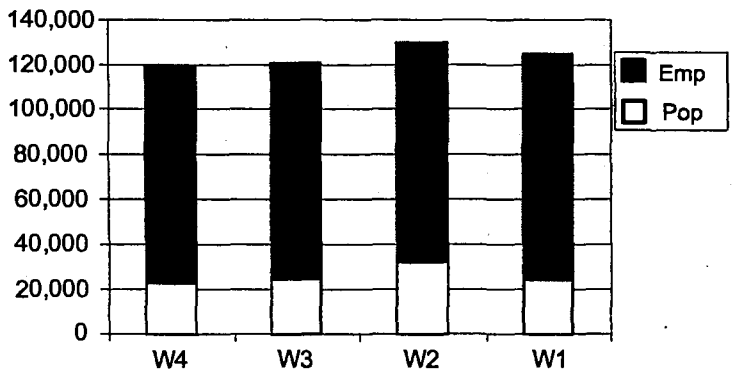


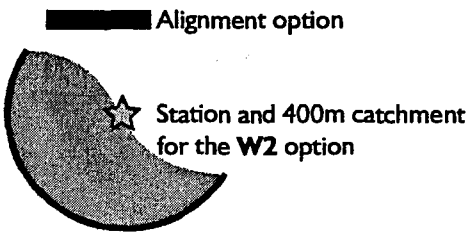
Tunnel SkyTrain as an extension of the Expo line: The Richmond rapid transit line could be built as an extension of the existing Expo line. If this technology option were chosen, potential alignments would see the Expo line extended from Waterfront Station east and south. Due the constraints of right-of-way and turn radius, the potential alignments are limited to Richards and Cambie Streets. *Figure 4.2-F.*

Figure 4.2-F

Potential alignments and catchment for the Richmond/Airport rapid transit line as an extension of the Expo SkyTrain line







Given the fact that a number of land use changes have occurred since 1990, the Downtown Transportation Plan examined potential downtown alignments in terms of the station catchment area. The number of jobs and residents within a five minute walk (400m) from a station were studied for eight alignments. The study showed that all alignments provided good catchment but that alignments that operate as an extension of the existing Expo line serve the most downtown jobs and residents - *Figure 4.2-G.*

Figure 4.2-G

Downtown catchment for the Richmond/Airport-Vancouver Rapid Transit Line

		1990 N.D. Lea Study	2001 Ward Study
Technology	**Favoured Alignment**	**Jobs 400m (2006)****	**Res + Jobs 400m (2021)**
***Surface rail**	Granville Street	90,000	12,000 + 61,000 = 73,000*
Tunnel rail	Burrard Street	114,000	20,000 + 60,000 = 80,000
SkyTrain	Cambie Street	137,000	22,000 + 107,000 = 130,000

* Note that the surface LRT is not directly comparable to the tunnel alignments due the difference in time required to access the station platform and that surface LRT has been removed from consideration.

** The N.D. Lea Study used a downtown employment projection of 190,000 by 2006. The Ward Study used a downtown employment projection of 175,000 by 2021.

The City of Vancouver supports an underground alignment along the Cambie corridor from the Fraser River to downtown. This alignment has the potential to achieve the highest overall catchment for downtown and the City at large and achieves the most ridership. In the downtown the Richmond rapid transit line should have a station in Downtown South, the central business district (centred at Burrard and Dunsmuir) and at the transportation hub at Waterfront Station, using tunnel rail technology.

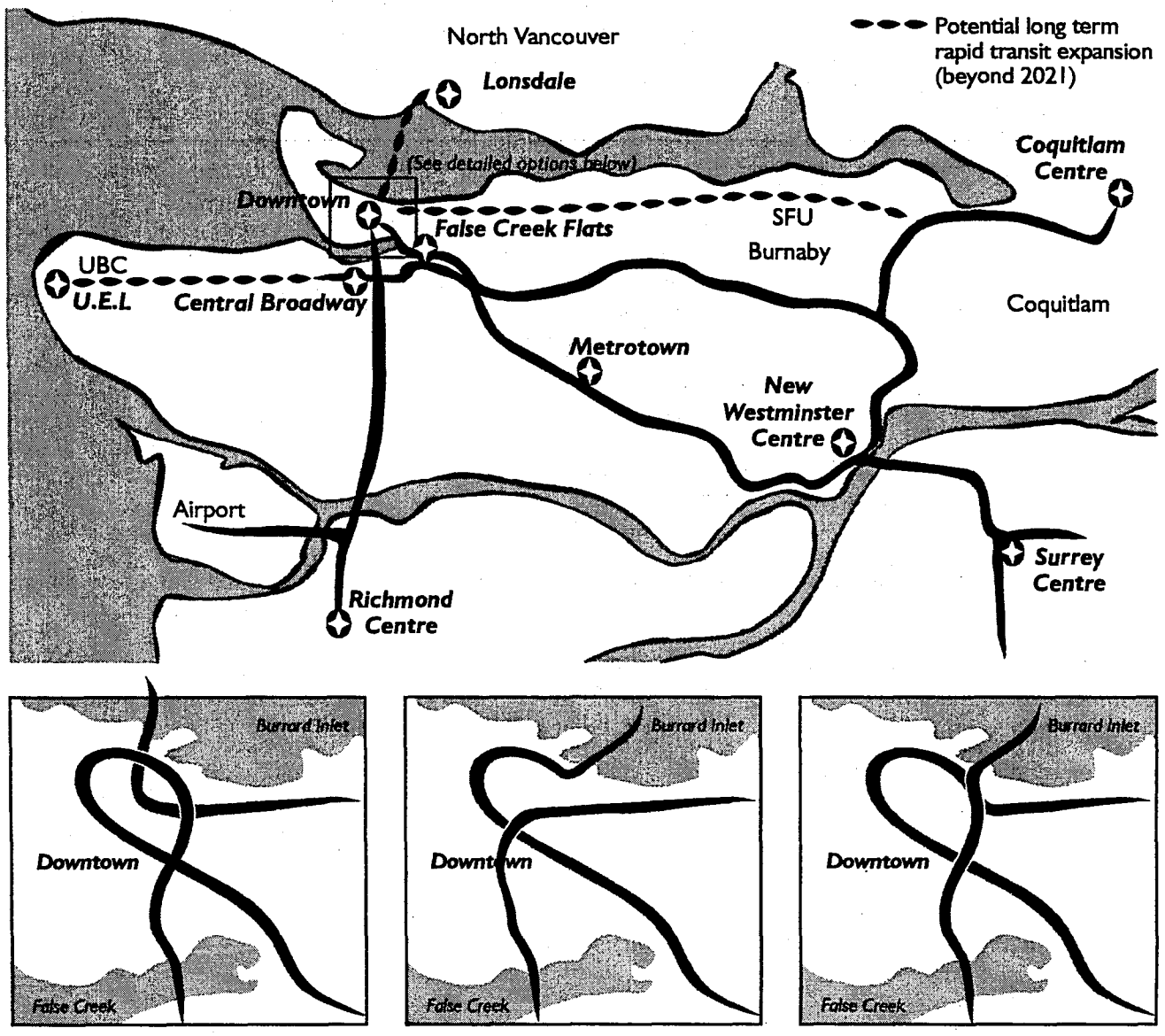
Richmond rapid transit line will replace most, if not all, of the suburban express buses that currently use Seymour and Howe Streets. With most of the buses removed the role these two streets should be reviewed by the City. For example, the bus lanes may no longer be required and could be used for other modes. As part of the implementation of the Richmond/Airport rapid transit line the City should review the opportunities for using the existing bus lanes on Seymour and Howe Streets for other sustainable modes or for additional parking or landscaping.

c) Beyond 2021

In the longer term, (beyond the 2021 planning horizon) future rapid transit lines into downtown could include a line on the Hastings corridor and a line to the North Shore. If the Richmond line is not developed as an extension of the existing Expo line, the downtown section of the alignment should consider possible extensions of this new line to the North Shore and/or along the Hastings corridor - *Figure 4.2-H*.

Figure 4.2-H

Downtown Rapid Transit Terminus and Future Expansion



4.2.2 Downtown Streetcar

Modern cities require a wide range of transit services reflecting complex land use. Experiences in other cities have shown that streetcars provide a high level of service and can be extremely popular with residents, commuters and tourists alike. Streetcar systems in some European cities are the dominant transit service. Modern examples in North America include streetcars in cities such as New Orleans, Portland, San Francisco and Toronto. San Francisco has also focussed on "rider appeal" by refurbishing streetcars from all over the world, resulting in the system becoming an attraction.

Background

As downtown develops to the edges of False Creek and Burrard Inlet, the resulting high-density areas need to be served with transit. The downtown streetcar would provide a quick and efficient alternative to the automobile and provide links to other transit services, such as SeaBus, SkyTrain, West Coast Express, and regular bus and trolley bus services. A right-of-way along the south shore of False Creek from Granville Island to Main Street was purchased by the City from the Canadian Pacific Railway (CPR) in 1995. The City has developed this right-of-way into a demonstration streetcar line.

Council approved a concept plan for a streetcar system in 1999 following a consultant study and an extensive public consultation process. The system is intended as an expansion of the demonstration line in False Creek South, but using the latest technology with a variety of vehicle types, including restored heritage cars, heritage replicas and modern low floor cars. Its purpose is to link a number of activity centres in the downtown that are beyond comfortable walking distance for many.

A preliminary financial study has recently been completed (MacQuarie Bank, 2002). It concluded there is a strong potential to enter into a private public partnership to offset the costs of this system. It also concluded that more detailed ridership and system analysis was necessary before final decisions on the planning should be made.

The city has been preserving corridors to facilitate the implementation of the downtown streetcar. Wherever possible, a separate right-of-way should be used to free this system from road congestion. This would significantly enhance the efficiency and attractiveness of the service.

Corridors have been reserved through Southeast False Creek and the Concord Pacific, Coal Harbour, and Bayshore developments. Possible extensions into the False Creek Flats have been anticipated and rights- of-way will be reserved. Extending the line into False Creek Flats would access a projected 20,000 employees, provide a potential connection to the Millennium SkyTrain line, and would provide a good location for a maintenance facility.

Segregated vs Integrated

One of the major issues is whether the streetcar is segregated within its own right-of-way or runs in traffic. The need for segregation is a function of congestion, ridership levels, trip time requirements, and the need to integrate the proposed streetcar system into the urban fabric through which it runs.

Cities such as Toronto have experienced the need to segregate streetcar lines, such as the Spadina and Harbourfront lines, when some or all of these components begin to impact too greatly on service efficiency. Both San Francisco and New Orleans have segregated portions of their systems.

Portland's light rapid transit line is primarily segregated, but its new downtown streetcar line has been designed to operate primarily in traffic. However, routes for Portland's downtown streetcar line were chosen that were not highly congested, and several streetcar priority measures were incorporated, and more are being discussed in order to further improve efficiency.

Proposed Streetcar Routing

The concept of the streetcar system approved by Council would link major tourist destinations, major residential developments, and significant employment centres on the periphery of downtown and the south shore of False Creek. The Expo SkyTrain line would be linked using the former C.P.R. right-of-way to False Creek South, Granville Island, and eventually Vanier Park - *Figure 4.2-1*. Phase I would connect Granville Island to Science World, Chinatown, Gastown, Waterfront Station and the Convention and Exhibition Centre. The Phase II line downtown would follow Pacific Boulevard connecting BC Place Stadium, GM Place, the various False Creek/Yaletown neighbourhoods, to Granville Street via Drake Street. A future extension from Waterfront Station would connect through the Coal Harbour neighbourhoods and provide a link to the Bayshore development and Stanley Park.

This concept would provide transit service in areas that are growing and in need of transit service, as well as link to transit nodes such as Waterfront Station, Main Street SkyTrain Station, and the Granville corridor. In addition, several employment nodes would be serviced including Burrard Landing, the Convention and Exhibition Centre, the West Hastings corridor, the Plaza of Nations/GM Place/BC Place, and Granville Island. A future extension through the False Creek Flats to the VCC Station would not only link up with the new Millennium Line but service the planned high-tech employment/education area in the False Creek Flats.

System and Fare Integration

Ridership modelling undertaken by the City of Vancouver, has demonstrated that a significant portion of the streetcar ridership will be originating or terminating their journey on another part of the transit system. It is therefore ideal to have a seamless, easy to use system, where one can transfer from one type of service to another. A financial plan needs to be investigated with TransLink, the City, and the system operator, in order to provide this integration. Above all, the streetcar system should appear to be part of the overall transit system from the rider's perspective. To the extent possible, it should not displace or compete with local bus services; rather it should be complementary to them. Where the overall transit system can be upgraded and/or simplified, some local bus services may need to be reconsidered or their routes reconfigured.

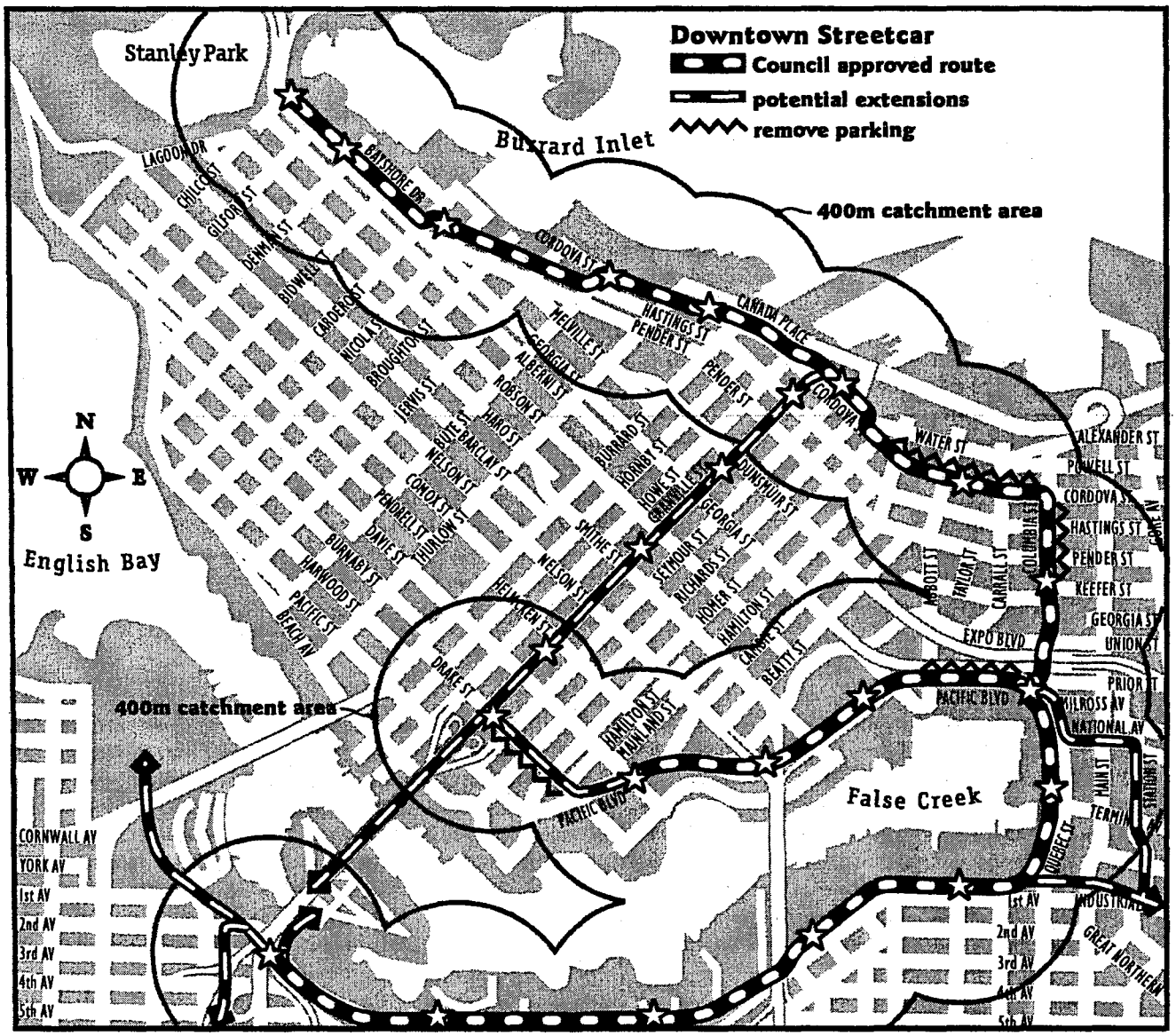
Ridership

Initial streetcar ridership projections were undertaken in the previous 1999 City study using the GVRD's Emme/2 transportation demand model showing both opening day and proposed 2021 ridership. Generally, the more a streetcar operates like a bus operating in general traffic, the less competitive advantage it will have over a bus. Therefore, segregation, and good linkages become important in ridership estimates.

Further ridership analysis is warranted to determine what ridership would be expected in PM peak hour travel, the number of transfers that could be expected between other components of the transit system, rider origin and destination details, and further preference analysis of specialized riders such as tourists.

Figure 4.2-I

Approved and Potential Streetcar Routes



Potential Extensions

Extensions beyond previously described routes should also be investigated further. The possibility of an extension along the Arbutus Corridor involves a privately owned right-of- way, but has been identified in Vancouver's *Transit Strategy* (April 2002) and should be examined in greater depth. Extensions to Vanier Park also require right-of-way provisions, but should be pursued to increase access to the Kits Point area. Internal CBD connections could also be explored with the Granville/Seymour/Howe and the Robson/Alberni corridors being the prime candidates. Connections from downtown to the north and east could also be investigated. However, some or all of these potential connections may be beyond the 2021 time frame of the Downtown Transportation Plan. *Figure 4.2-I* identifies proposed streetcar routes and potential extensions.

Recommended Adjustments to 1999 Proposals

The recommended route and station locations from the Downtown Streetcar study of 1999 should be adjusted to integrate the recommended changes in the Downtown Transportation Plan. The following minor adjustments to the 1999 proposals are recommended for investigation.

The Pacific Boulevard Line was originally recommended to terminate at the foot of Davie Street. However, due to the complexity of terminating the line in a relatively narrow right-of-way, it is recommended that the line be extended further east on Pacific Boulevard with a station on Pacific at Davie. The original study also proposed continuing down Pacific Boulevard to terminate under the Granville Bridge and provide vertical connections up to the bridge deck. A better routing would be to continue down Pacific Boulevard and turn on Drake Street to terminate at Granville Street, to avoid making the vertical connection. It is also easier to provide a terminus station in this location. Alternative detailed alignments along Pacific Boulevard from Cambie bridgehead to Drake Street are also shown in a proposed Pacific Boulevard redesign approved by Council in May 2002.

It is recommended that the north side alignment along Pacific Boulevard be pursued first, due to the more direct connections to public facilities and the relatively simpler alignment. The south side alignment on Pacific Boulevard could still be pursued as an alternative. Double tracking should also be considered.

In terms of station locations on the Pacific Boulevard Line, a station is recommended for the Quebec/ Pacific Boulevard intersection that could serve both the Waterfront Line and the Pacific Boulevard line. The station location on the north side of Pacific Boulevard at BC Place is recommended to be moved further to the east between BC Place Stadium and GM Place, for better access to the latter and to allow a redesign of the lower level entry to BC Place. The previously proposed station at Abbott Street would not be necessary. In addition, the station proposed for Expo and Pacific Boulevard is recommended to be moved further east under the Cambie Bridge where better bus and pedestrian connections to the bridge exist. There is also more room to build a station at this location.

Changes are recommended for termination of the Waterfront line in front of Waterfront Station, where a transit hub on Cordova Street is proposed. See spot improvement #50 in Section 5.1 for a detailed description.

The station on Cordova Street is recommended to be moved slightly further east from Abbott Street, where a connection through to Blood Alley exists and the building arcade would provide more room for pedestrian movements.

The potential extension through the False Creek Flats to the VCC Skytrain Station is illustrated on Industrial Avenue to the termination point near Clark Drive. An additional route could be considered for Station Street from Industrial Avenue turning west on National Avenue and connecting into the system at Quebec and Pacific Boulevard. The potential benefit of this line would be a direct connection to the Main Street SkyTrain station stairs, a direct connection to the train station and bus depot, and a direct connection to the proposed high tech industrial park north of the train station. In addition, by routing the False Creek Flats Line on this alignment, it would take pressure off the Quebec alignment which already has two services (Pacific Boulevard Line and Waterfront Station Line) planned for this one section.

If double tracking is required on the Waterfront line and if a track on Water Street is not desirable due to heritage impacts, an additional segregated alignment could be considered south on Abbott Street and either east on Keefer to Columbia or continuing south and connecting up with Pacific Boulevard. This would have the potential benefit of double tracking the line but maintaining segregated right-of-way, as opposed to running in traffic for a significant distance on Cordova Street and Columbia Street.

4.2.3 Local Bus Routes

New neighbourhoods are rapidly emerging in Coal Harbour, Downtown South, and False Creek North. In the next 20 years, transit ridership wholly within downtown is expected to increase by 85 per cent in the morning rush hour, mostly on local bus routes. A major goal of the Downtown Transportation Plan is to improve local transit service to and from these neighbourhoods and to improve connections and circulation within the entire Metropolitan Core, including the Medical/Civic precinct on Central Broadway and the emerging high-tech precinct in False Creek Flats.

Objectives

- Improve legibility: use direct routes, minimize turns, and operate in both directions on the same street wherever possible. Avoid one-way loops except where required by one-way streets and for terminal loops.
- Provide direct transit service to major activity centres such as SkyTrain stations and the central business district.
- Serve desire lines that are currently poorly served (e.g. West End to Central Broadway, CBD to Central Broadway, Yaletown-Roundhouse to downtown.) with a single, no-transfer, transit connection. See *Figure 4.2-B*.
- Replace poorly performing services in the Yaletown-Roundhouse Downtown South area with a more legible, useful service.
- Maintain service to topographically isolated communities such as Beach Avenue.
- Keep West End transit service on arterial streets.
- Use electric trolley buses where possible, and smaller, low-noise community buses where not. Use streets with existing trolley overhead where possible.

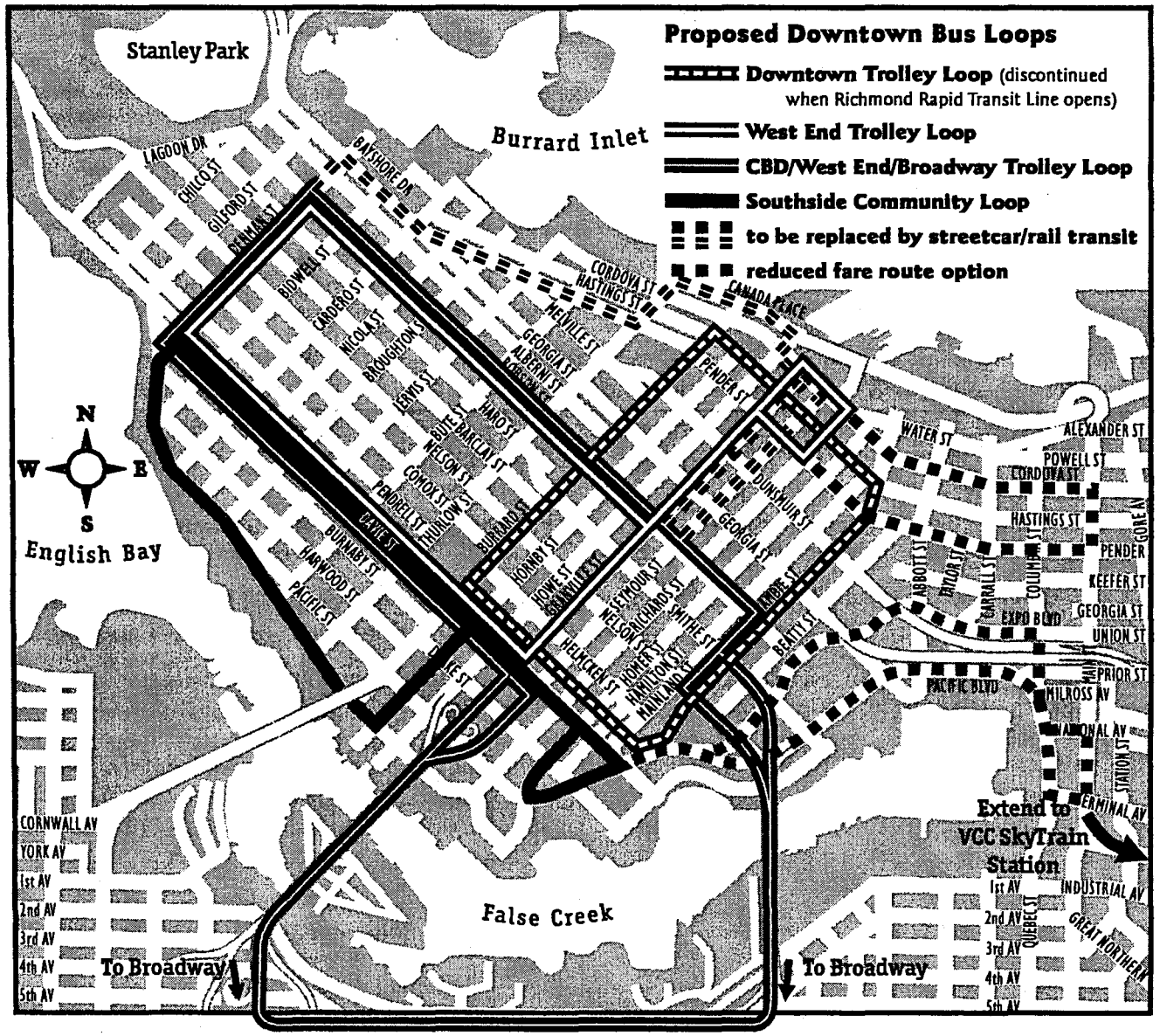
Proposed downtown circulator bus routes

The plan proposes four bus routes that loop within the metropolitan core. These downtown bus routes are illustrated conceptually in *Figure 4.2-J*. Two of the routes are modifications to existing downtown bus routes and the other two are entirely new routes. They provide the following connections:

Connection	
West End to Downtown	modify existing route
Beach/Denman to Yaletown	modify exisitng route
West End to Central Broadway	new route
Downtown South to the CBD	new route

Figure 4.2-J

Conceptual bus routes to serve the Metropolitan Core

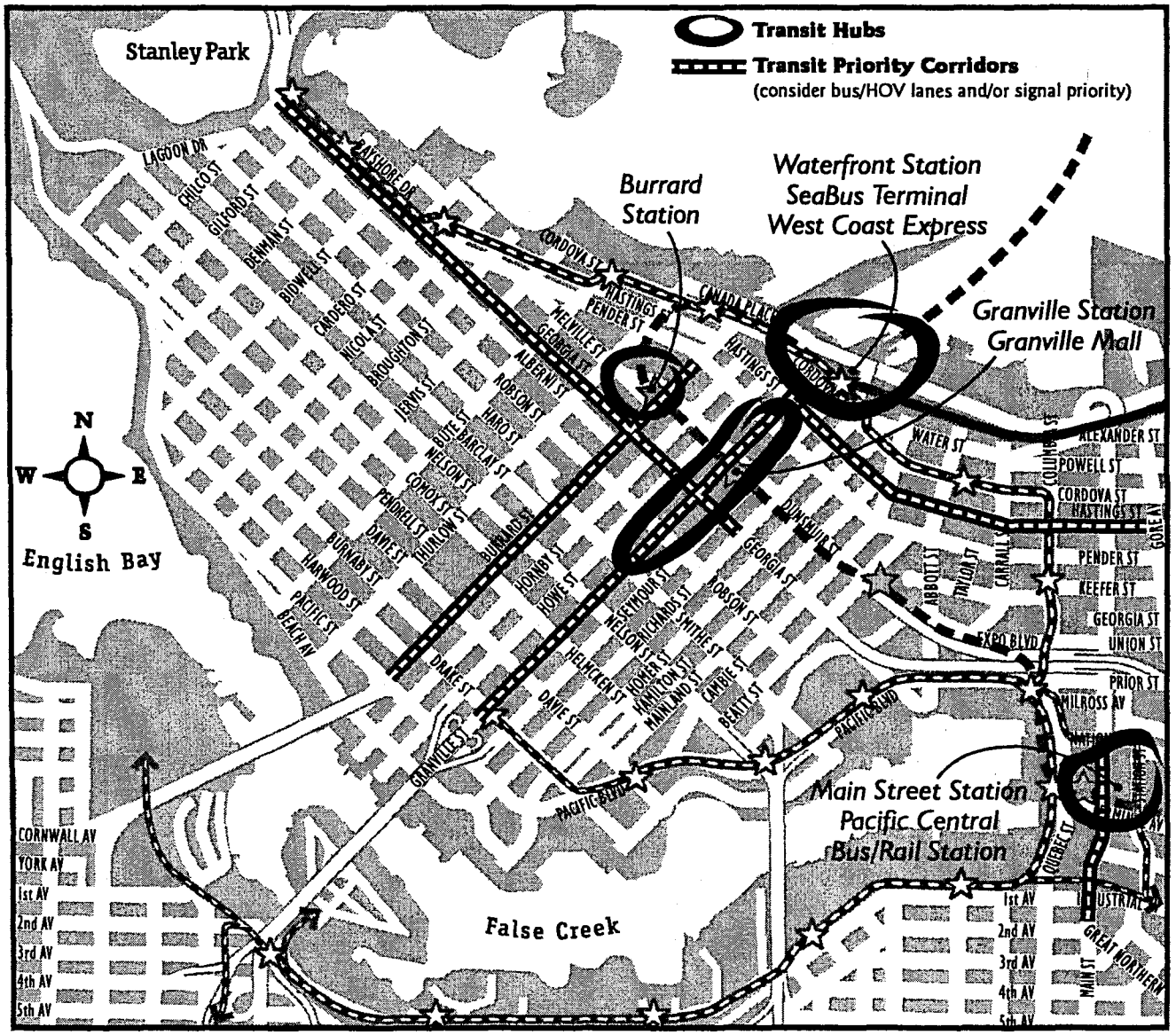


These potential routes illustrated in Figure 4.2-J and described in more detail in Section 5.2, would satisfy the DTP goals and principles. Note that these are conceptual routes only. TransLink would do the detailed route planning with additional consultation and analysis. Note also that some of these connections can be implemented initially with bus service and later replaced with streetcar or rapid transit service.

4.2.4 Transit Priority

Transit will be given priority at improved "transit hubs" and along corridors. See *Figure 4.2-K* for recommended transit priority locations downtown.

Figure 4.2-K
Transit Priority Locations Downtown



Transit hubs

Good integration and connections between the various bus routes and transit modes are critical for an accessible downtown and will increase the attractiveness of transit. Waterfront Station and the Granville Mall are identified as the two primary transit hubs in the downtown. In addition, Burrard Station and Main Street Station are also important hubs. The Downtown Transportation Plan makes recommendations to enhance these transit hubs.