SURREY CITY CENTRE PLAN – TRANSPORTATION SERVICING

FINAL

October, 2009

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1. INTRODUCTION & OVERALL STUDY PROCESS

This Transportation Servicing Study of Surrey City Centre is one of several studies associated with the update of Surrey's City Centre Plan. Other studies focused on the market potential for development of higher density office, residential and institutional uses; the land use concepts and urban design guidelines for build-out of the area; social support requirements; and public amenities, including recreation facilities and parks. IBI Group was commissioned by the Engineering Department to carry out this study while Bing Thom Associates and Coriolis Consulting carried out the land use/urban design and market studies on behalf of the Planning Department.

In short, this study evaluates transportation network alternatives through to a 2031 horizon year, in support of more intensive and compact urban development within the City Centre study area.

1.1 Surrey City Centre Plan Update

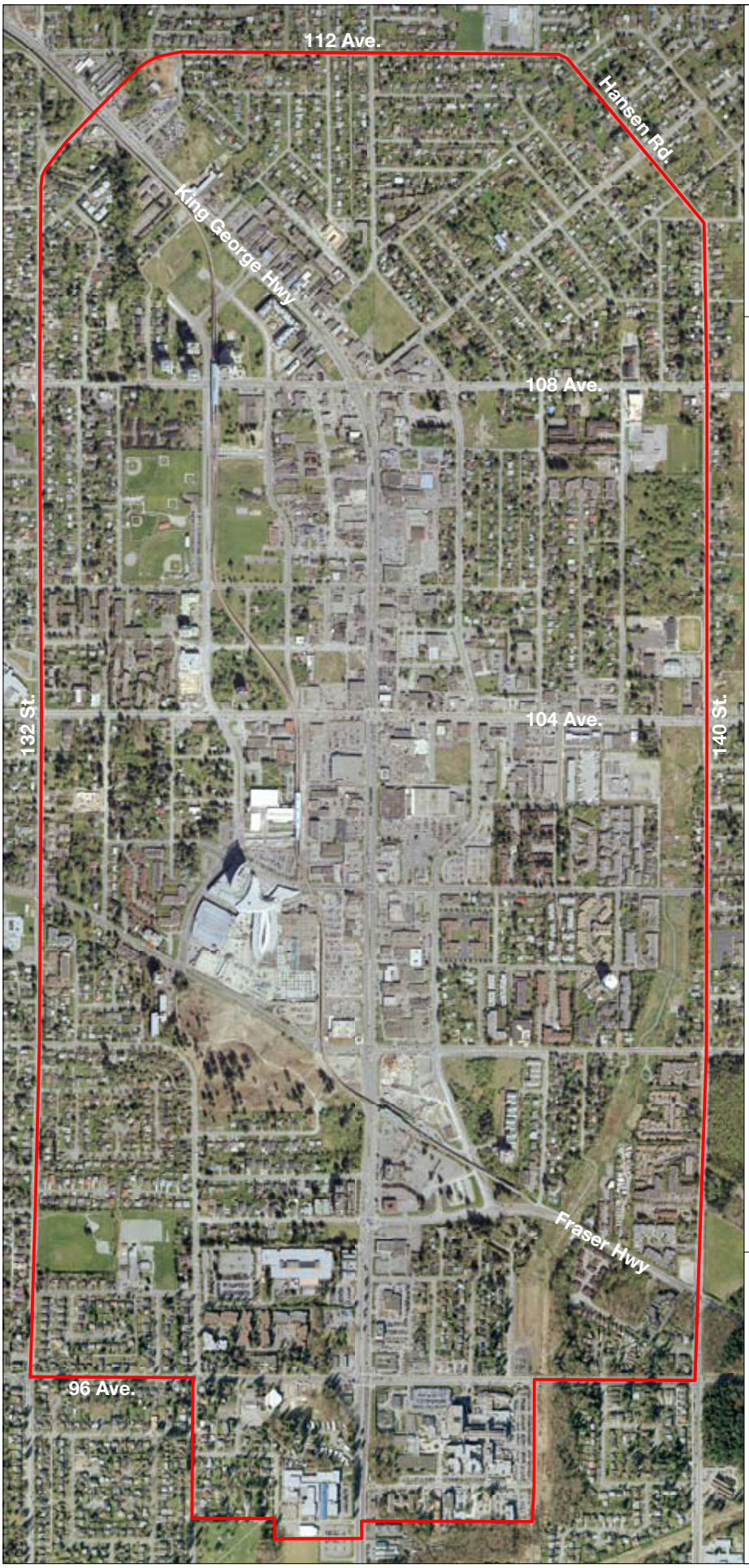
The current City Centre Plan was adopted in 1991 in light of the City Centre's position as one of eight Regional Town Centres[1] in Metro Vancouver (then referred to as the Greater Vancouver Regional District), and in response to plans for the three SkyTrain stations in Surrey Centre. The 1991 Plan included development concepts and land use plans, an open space concept, social and utility infrastructure, and a new transportation network. Over the intervening years, the City Centre has seen some success at achieving the goals of the existing plan, including the development of office space and increased local population. In terms of transportation infrastructure, elements that have been addressed include the development of much of the ring road network, increased transit service, and improvements to City Parkway. However, development has not kept pace with the City as a whole, and has not been as focused on the SkyTrain stations as originally intended.

Exhibit 1.1 shows the boundaries of the City Centre, including 132nd and 140th Streets on the west and east, and 112th, 96th and 94A Avenues on the north and south. Surrey City Centre is a fairly large urban centre, approximately 3.5 km long from north to south, and 1.6 km wide from east to west. As can be seen in the photo, the study area is currently dominated by road-oriented commercial development with its attendant large parking areas down the centre of the study area, with a ring of low to medium-density residential areas surrounding it.

Recently, one of six components of the Transportation Showcase Program[2] defined a Transit Village focused on the Surrey Central SkyTrain station. The preferred plan for the transit village includes high-density mixed use development on a tighter grid of streets, and with the suburban-style transit exchange replaced by on-street bus operations more typical to a 'downtown' area.

There is also growing developer interest in other areas of the City Centre, including projects under construction near the King George SkyTrain station, and further proposals for high density residential complexes and office space that would help achieve a vision for the Region's "Second Downtown." This is consistent with projections that the areas would roughly triple in both population and employment over the 2001 to 2021 time frame. Within the context of this potential growth and provincial government interest in expanding the rapid transit system (Provincial Transit Plan, 2008), the City undertook this update of the City Centre Plan, including several parallel studies.

[1] The Regional Town Centres are an element of the Liveable Region Strategic Plan (LRSP) developed by the then-GVRD.
[2] The Showcase program is a partnership of Transport Canada, TransLink and local municipalities and relates to public transportation and the built environment in which it operates.



Surrey City Centre Plan Update - Transportation Servicing Study

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LEGEND

Study Area Boundary

500 metres

Scale: 1 to 15 000

Exhibit 1.1

Study Area Aerial

The first phase of the update program was carried out in 2006 and included analysis of existing conditions and public consultation by way of an "Ideas Fair" in November 2006. This current study represents the second phase (Developing the Plan) for the transportation network. The ultimate purpose of this project was to ensure that Surrey City Centre's multi-modal transportation network functions as effectively and efficiently as possible regarding the movement of people, goods and services in the context of proposed future land use patterns. The process for carrying out the study, including inputs from other related studies, is explained in the next section.

1.2 Study Process

The transportation servicing study included two parallel streams of activity:

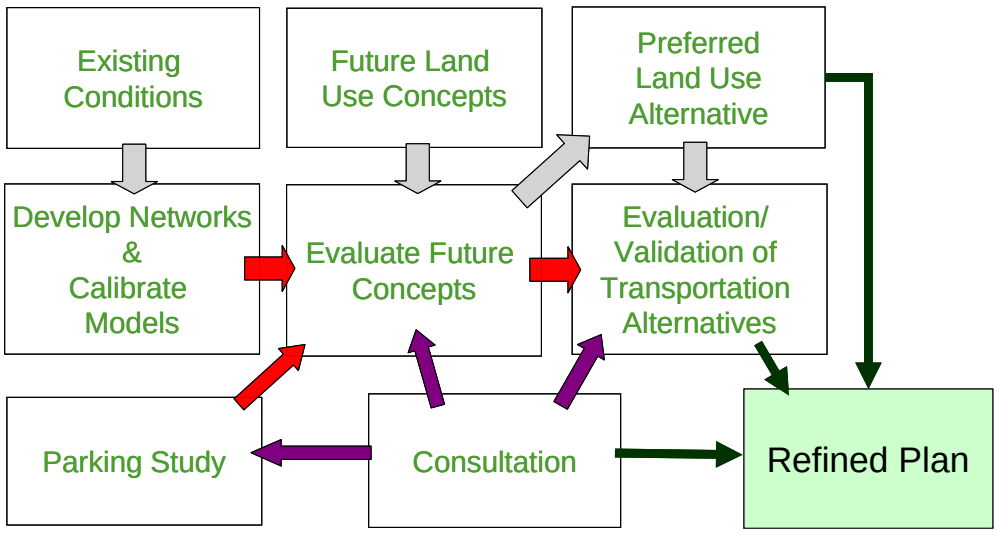
1) To define and evaluate transportation networks within the context of proposed land uses, and

2) Conduct a parking study of the City Centre.

Exhibit 1.2 illustrates the process to update the City Centre Plan, focusing on the transportation aspects. The first set of activities builds towards the evaluation and validation of transportation alternatives, resulting in a Refined City Centre Plan, one component of which is the Transportation Servicing Plan (TSP). This study included a review of existing conditions and issues, development and calibration of a Transportation Model and identification of transportation network alternatives. A review of trip generation and mode splits in transit-oriented developments was also carried out as input to the transportation model used in evaluation. An initial set of future land use concepts was defined by the City's concurrent marketing and land use planning studies, and through public consultation the best elements of these were combined, resulting in a preferred land use alternative. Conceptual transportation networks and street cross sections were also presented to the public for comment, and these were well received. The final evaluation and recommendations of this transportation study are related to the Preferred Land Use concept.

The City Centre Parking Study included developing an inventory of parking supply and regulation in the City Centre, and since this was not dependent on other input it was carried out early in the study. Likewise, a long list of parking strategies was defined, evaluated and presented during public consultation. Once the preferred land use was defined, more detailed parking recommendations were developed.

Exhibit 1.2: Study Process Schematic



The rest of this report presents the recommendations of the Transportation Servicing Plan and documents the analyses carried out during the study, including the following sections:

- Section 2 - A discussion of the transportation requirements, opportunities and constraints identified at the start of the study, considering the existing transportation networks, current gaps and issues, and future demands that would be placed on the system as growth occurs;
- Section 3 - Definition and evaluation of transportation network options for 2031, ranging from a walk/bike and transit focused scenario to a road capacity expansion scenario;
- Section 4 - Detailed assessments of several specific network element options, including the King George Highway cross section, truck routes, and application of urban roundabouts;
- Section 5 - Description of the City Centre Vision for Transportation and the recommended transportation network elements, including cost estimates and project timing;
- Section 6 - City Centre Street Network Refinements, including cross sections and streetscape and intersection treatments.
- Appendices include backup technical papers describing model development, Transit Oriented Development, a Parking Study, and City Centre street cross sections.

2. REQUIREMENTS, OPPORTUNITIES AND CONSTRAINTS

This chapter of the report presents an overview of the existing transportation network, current and proposed land use, and identifies the requirements, opportunities and constraints for developing a future transportation network in the City Centre.

2.1 Transportation Network

The existing transportation network within the City Centre was reviewed using a combination of mapping, staff reports, visits to the study area, and stakeholder input. This review of the current status (2007) breaks the transportation system into the following elements:

- Street network, including goods movement;
- Transit system;
- Cycling facilities; and
- Pedestrian realm.

These are discussed and illustrated in subsequent sections of this chapter.

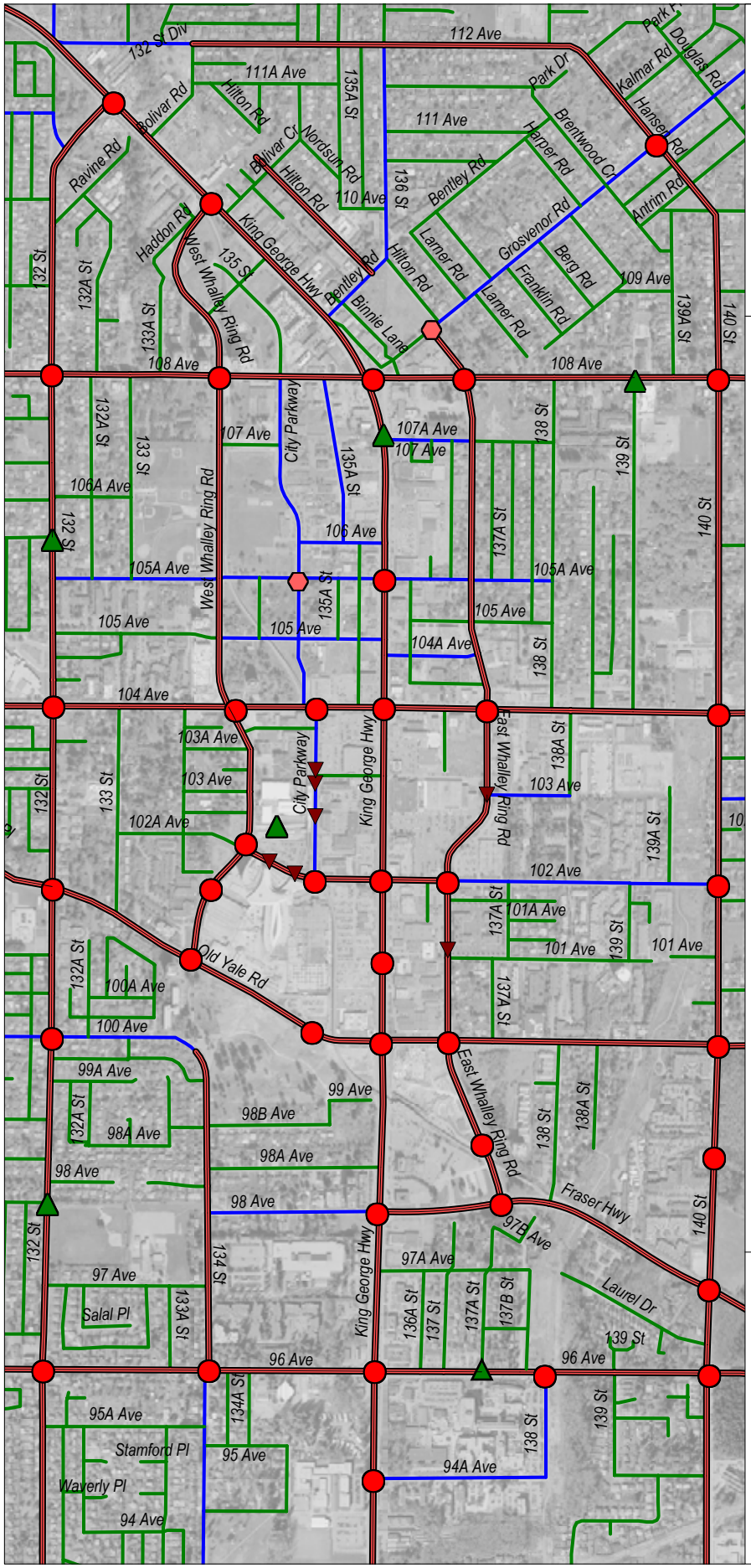
2.1.1 EXISTING STREETS

As indicated in **Table 2.1**, Surrey's City Centre has approximately 67 kilometres of streets and lanes, with a high proportion of these being arterials and collectors.

Table 2.1: Street Types in Surrey City Centre

Street Category	Length within City Centre
Arterials	**25.3 km**
Goods Movement Routes	10.9 km
Other Arterials	14.4 km
Collectors	**9.1 km**
Local and Lanes	**32.6 km**
Total	**67.0 km**

Exhibit 2.1 depicts the current classification of roads within the City Centre. The highest traffic volumes are currently carried on arterials such as King George Highway, 108 Avenue, 104 Avenue, Fraser Highway, and 96th Avenue. The exhibit also shows the current traffic controls: 39 signals, 6 pedestrian crosswalks, 7 overhead signs and 2 four-way stops.



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LEGEND

Traffic Control

- Traffic Signal
- 4 Way Stop
- Overhead Sign
- Pedestrian

Road Classification

- Arterial
- Major Collector
- Local and Lanes

500 metres

Scale: 1 to 15 000

Exhibit 2.1
Road Classification and Traffic Control

One particularly notable aspect of the City Centre is that the street spacing, particularly along King George Highway (KGH), is atypically long for an urban centre: up to 300 metres between streets and up to 500 metres between signalised intersections. (In downtown Vancouver, the streets are spaced 90 to 150 metres, not including the laneways). While this phenomenon is partly due to the highway-oriented land uses along KGH, it results in the major street through the study area acting as a barrier to travel. In order to improve connectivity for transit users, pedestrians and cyclists, one of the objectives of the City Centre Plan Update is to produce finer-grained block spacing at a more 'human' scale.

In addition to people movement functions (primarily automobiles but also transit vehicles, bicycles and some pedestrians), the arterial streets in the City Centre also fulfill a goods movement role. **Exhibit 2.2** illustrates the current truck routes through the City Centre; these include the busiest streets in the study area. King George Highway is a major regional route for north-south traffic (leading to the Pattullo Bridge), particularly for goods moving to and from port and industrial lands along the Fraser River, and because of this its perception as a barrier is enhanced. There is also traffic going to and from the east via the Trans Canada Highway, passing through Guildford and entering the City Centre on 104 and 108 Avenues. Fraser Highway was part of the original main highway through Surrey in past decades, and it continues to be a significant route for goods movement. (Goods movement routes are discussed in more detail in Section 4.2).

2.1.2 EXISTING AND PLANNED TRANSIT SERVICES

Transit service within the City Centre includes three main elements:

- Rail rapid transit (SkyTrain) serving the centre of the study area;
- A 'hub and spoke' bus service where all local and community bus routes converge on the Surrey Central Transit Exchange;
- Custom transit service (HandyDART) for residents with mobility challenges.

The SkyTrain stations and existing bus services are shown on **Exhibit 2.3.**

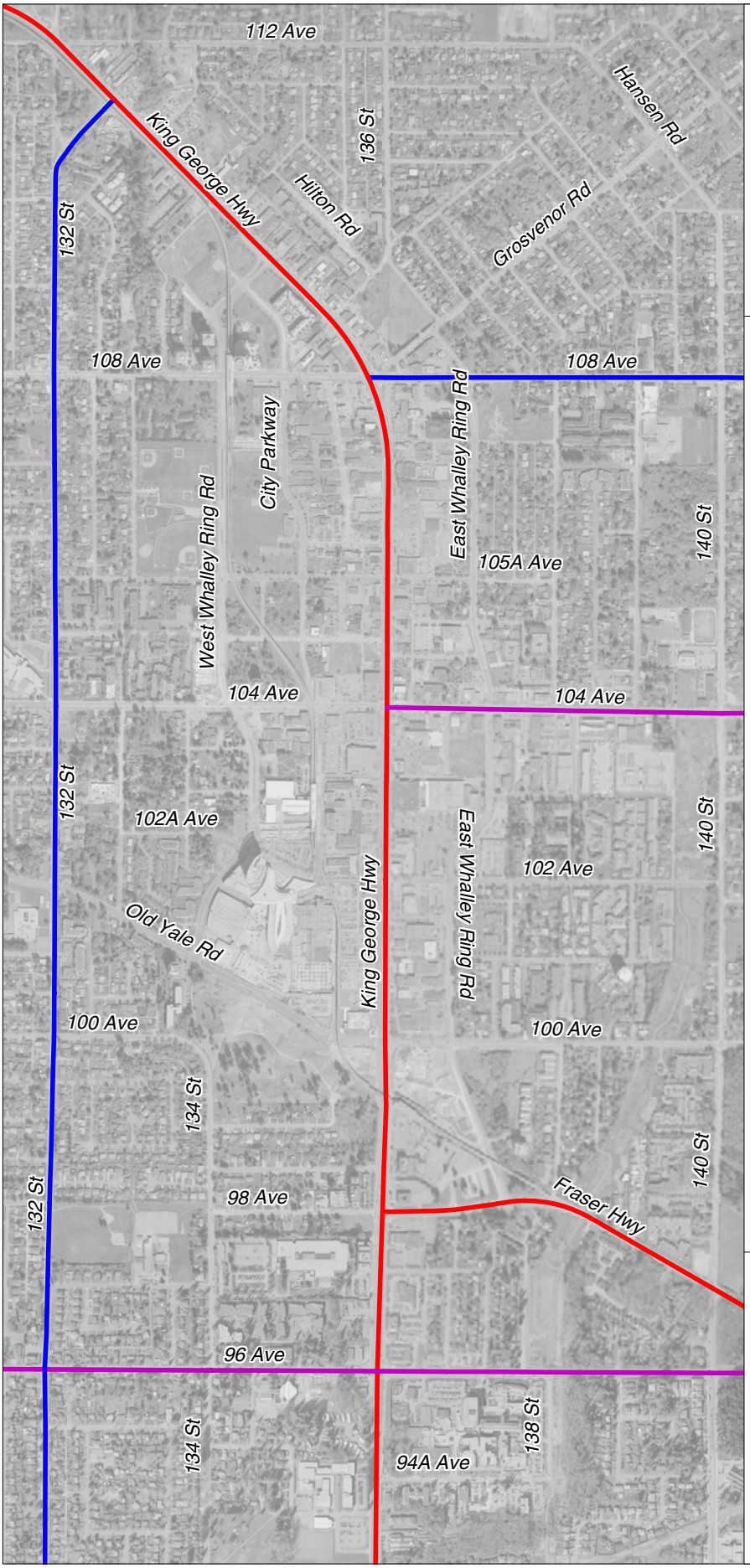
Table 2.2 lists the transit services that were being provided within the City Centre in 2007. This is expected to evolve over the period through to 2013 as new service and higher frequencies are provided through implementation of the South of Fraser Area (SOFA) Transit Plan.

In 2007, routes 320 and 321 met the threshold for the Frequent Transit Network (FTN), a subset of the public transit system that operates every 15 minutes or better during the peak, midday and evening time periods, 7 days per week. These two routes connect the City Centre and the SkyTrain system to Newton, South Surrey and White Rock (along King George Highway), and to Guildford, Fleetwood and Langley (via 104th Avenue and Fraser Highway).

Improvements expected to take place as part of SOFA include:

- significant increases in service;
- B-Line service on King George Highway by 2010-11;
- Possible bus or rail transit in its own right of way in future.

These and other initiatives are described further in Chapter 5.



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IBI GROUP

LEGEND

Truck Routes

- Truck Routes
- Truck Route with Restrictions
- Dangerous Goods

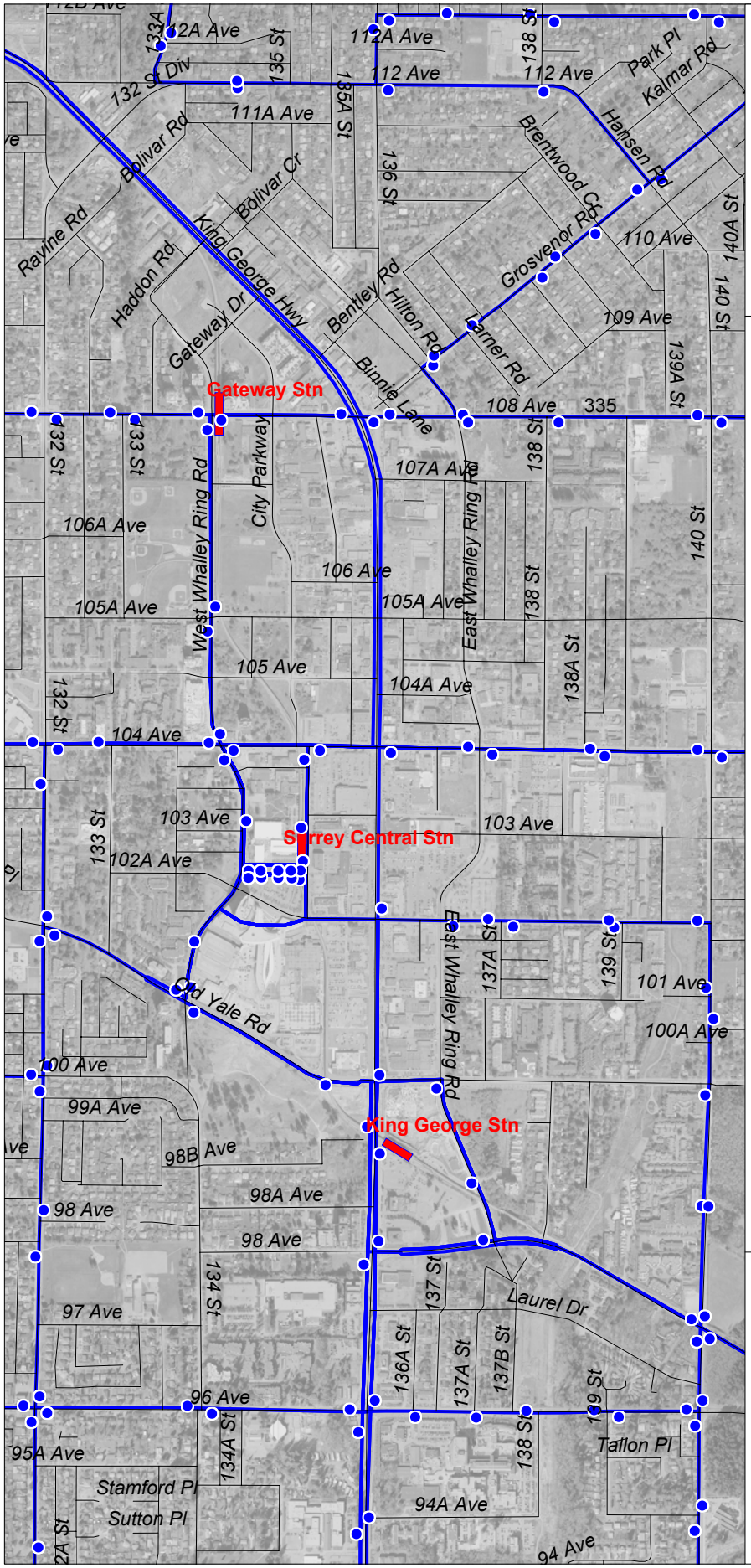
500 metres

Scale: 1 to 15 000

Exhibit 2.2

Goods Movement

Truck Routes



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LEGEND

SkyTrain Stations

Bus Routes

Bus Stops

500 metres

Scale: 1 to 15 000

Exhibit 2.3

Transit Service Coverage

Table 2.2: Public Transit Services in 2007 – City Centre

Route		Average Headway (minutes)								Skytrain Connection			
No	Name	AM peak	Midday	PM peak	Evening	Late Eve	Night	Saturday	Sunday	Gateway	Surrey Centre	King George	Notes
314	SURREY CENTRAL/SUNBURY/SCOTT RD STN	30	60	30	60	60		60	60		Yes	Yes	
316	SURREY CENTRAL/SCOTTSDALE (via 100 Av, 116 St)	30	30	30	60	--		30	60		Yes		
320	LANGLEY/FLEETWOOD/GUILDFORD/SURREY CTR	10 WB/ 15 EB	10	15 WB/ 10 EB	30	60		15	15		Yes		Service between Fleetwood and Langley is less frequent (~30 min, 60 in evening)
321	WHITE ROCK/NEWTON/SURREY CTR	10	10	10	30	30		15	15		Yes	Yes	Weekend service between Newton and White Rock is every 30 minutes
323	NEWTON EXCH/SURREY CTR	30	30	30	60	60		30	60		Yes		
324	NEWTON EXCH/SURREY CTR	30	30	30	60	--		30	60		Yes		
325	NEWTON EXCH/SURREY CTR	30	60	30	30	60		60	60		Yes		
326	GUILDFORD/SURREY CTR (via 88 Av, 156 St)	30	60	30	--	--		60	60		Yes	Yes	
329	SURREY CENTRAL STN/SCOTTSDALE	--	60	--	--	--		60	--		Yes	Yes	
332	GUILDFORD/SURREY CENTRAL STN (via 108 Av)	25	60	15	30	60		60	30	Yes	Yes		Individual buses in AM/PM peaks are 10-30 minutes apart; Saturday early AM and evening service is 30 minutes, otherwise 60
335	FLEETWOOD/SURREY CENTRAL STN	30	60	60	--	--		60	60	Yes	Yes		
345	KING GEORGE STN/WHITE ROCK CENTRE	30	--	30	--	--		--	--			Yes	
393	NEWTON EXCH/SURREY CENTRAL STN	--	--	--	30	--		--	--		Yes		
394	WHITE ROCK/KING GEORGE STN EXPRESS	30	--	30	--	--		--	--			Yes	
395	WILLOWBROOK/KING GEORGE STN	15	--	30	--	--		--	--		Yes	Yes	
501	LANGLEY CENTRE/SURREY CENTRAL STN	15 SB	30	15 NB/ 30SB	30	60		30	30		Yes		# 590 provides extended NB AM peak and SB PM peak service
502	LANGLEY CENTRE/SURREY STN	15	15	12	30	--		30	30		Yes	Yes	
509	WALNUT GROVE/SURREY CENTRAL STN	20	--	20	--	--		--	--		Yes		
590	LANGLEY SOUTH/SURREY CENTRAL STN	20 NB		30 SB				--	--		Yes		See also route 501
C71	SURREY CNTRL/SCOTT RD STN	35	60	30	60	--		60	60	Yes	Yes		
C73	GUILDFORD/ SURREY CENTRAL STN	30	60	30	60	--		60	60	Yes	Yes		
C74	FRASER HEIGHTS/GUILDFORD/SURREY CEN	15	60	20	60	--		60	60		Yes		PM peak service 30 mins until 4PM, 15 min 4-6
N19	SURREY CENTRAL/DOWNTOWN (via KGH, Kingsway)	--	--	--	--	--	30	--	--		N/A		Only night stop is Surrey Central Exchange

Transit Ridership Patterns and Related Issues

Ridership at the three SkyTrain stations was recently counted, but the most recent published data comes from 2003, with an update carried out at Surrey Central station in 2005. **Table 2.3** summarizes the results of the available counts.

Table 2.3: Average Daily Ridership at SkyTrain Stations in City Centre

Station	Weekday On	Weekday Off	Weekend On	Weekend Off
Gateway	3,300	3,300	1,700	1,800
Surrey Central	6,400	9,100	4,800	6,200
King George	6,100	3,800	5,000	4,400
2003 Total	**15,900**	**16,200**	**11,500**	**12,400**
System-Wide in 2003	205,000	212,000	133,000	134,000
Surrey Central in 2005	8,000	12,300	4,700	6,900

Sources: SkyTrain Station Passenger Counts, CTS for TransLink, January 2003 and February 2005

King George and Surrey Central contribute a similar number of passengers boarding the SkyTrain system, but southbound passengers leave the system at Surrey Central far more frequently than they do at King George. This suggests that passengers use King George station as an entry point and upon returning they get off one station further north. This is partly due to passengers wishing to choose SkyTrain seats heading north and bus seats heading south, but it also underlines an accessibility issue at King George station, where transfers to southbound buses are not very convenient. Since there is no direct access from the station to the bus stop, passengers are often seen dashing across the King George Highway instead of using the nearest pedestrian crosswalk, roughly 100 metres north of the station.

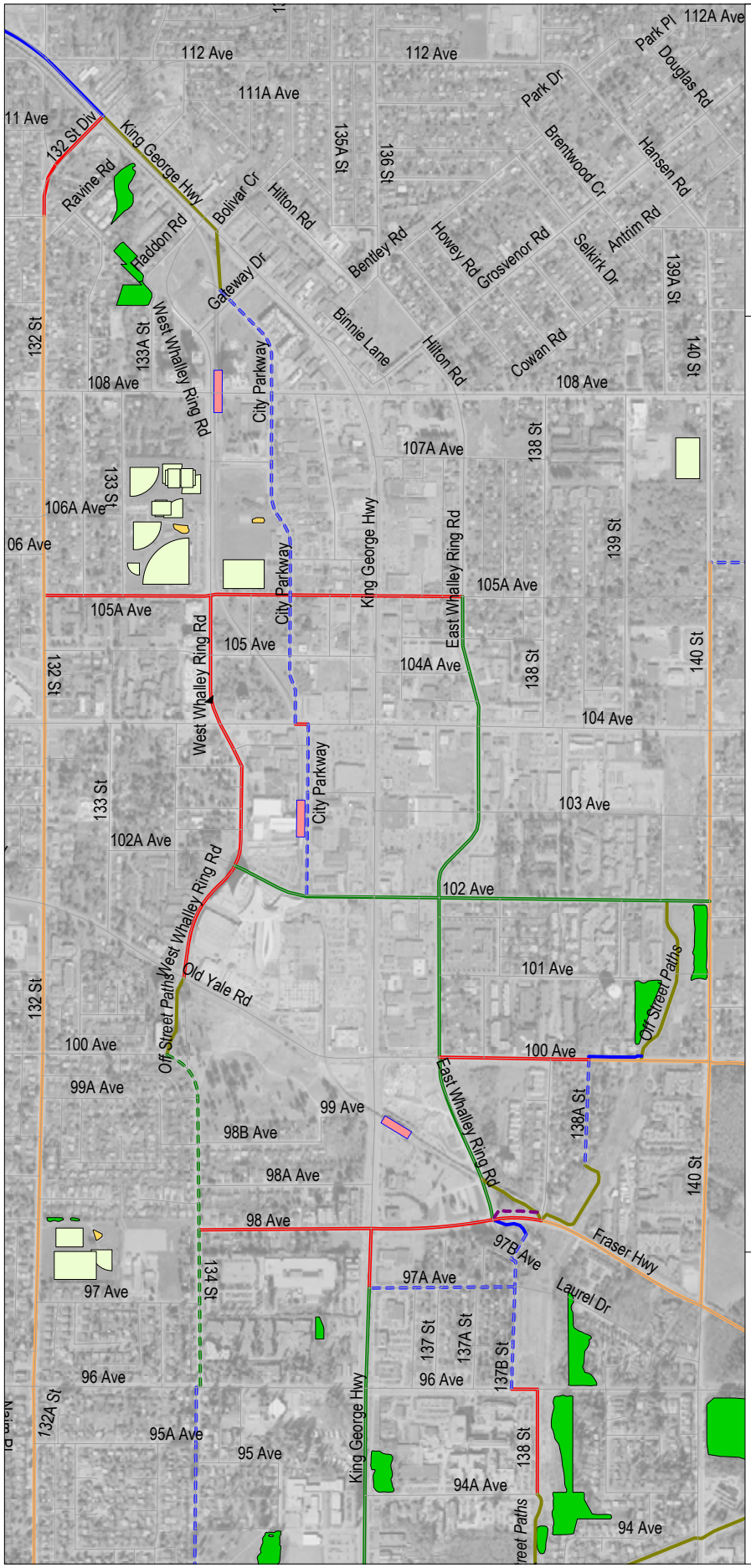
Looking ahead to the population, employment and student body increases forecast for the City Centre (Section 2.2.) plus the mode choice shift towards transit that increased density and Transit Oriented Development would foster, additional passenger carrying capacity will be required on the SkyTrain system -- once more cars are available, longer trains could serve the City Centre stations.

With regard to bus ridership, the number of transit passengers boarding at Surrey Central Transit Exchange was estimated at 10,800 per day in early 2007, based on data collected by TransLink on board the buses. This number is higher than the SkyTrain ridership figure, so the exchange is clearly serving a role as a bus-to-bus transfer point and a local stop for nearby activity centres.

2.1.3 CYCLING FACILITIES

Exhibit 2.4 shows the cycling facilities (18.2 km) that were available in the City Centre as of May 2007. These included 3.4 km of on-street bicycle lanes, 1.6 km of off-street paths, and 13 km of other designated routes (encompassing shoulder bike lanes, bike-friendly routes, local streets, and shared traffic routes).

The off-street path and local route on City Parkway represent an interim step towards the development of the Surrey Parkway (a section of the regional BC Parkway), an inter-jurisdictional cycling and pedestrian trail across Metro Vancouver.



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IBI GROUP

LEGEND

SportsFields

Park Playgrounds

Natural Areas

Bike Routes by Type

- Bike Lanes
- Bike-Friendly Lanes
- Boulevard Paths
- Local Roads
- Off Street Paths
- Shared Traffic
- Shoulder

500 metres

Scale: 1 to 15 000

Exhibit 2.4

Bicycle Routes (2007)

There are several issues related to the current cycling network, including:

- The north-south direction includes several partial routes, only one of which runs from end to end along the edge of the study area. The others are discontinuous and require riders to zigzag across the City Centre;
- The only continuous north-south route uses the shoulders of 132 Street, which is also a truck route;
- The east-west direction is not well-served north of 100 Avenue to the east, and no through routes truly exist to the west of the City Centre.
- There are no routes into Guildford, Invergarry Park, or Bolivar Heights;
- Only one of the SkyTrain stations is directly accessible from the bicycle network.

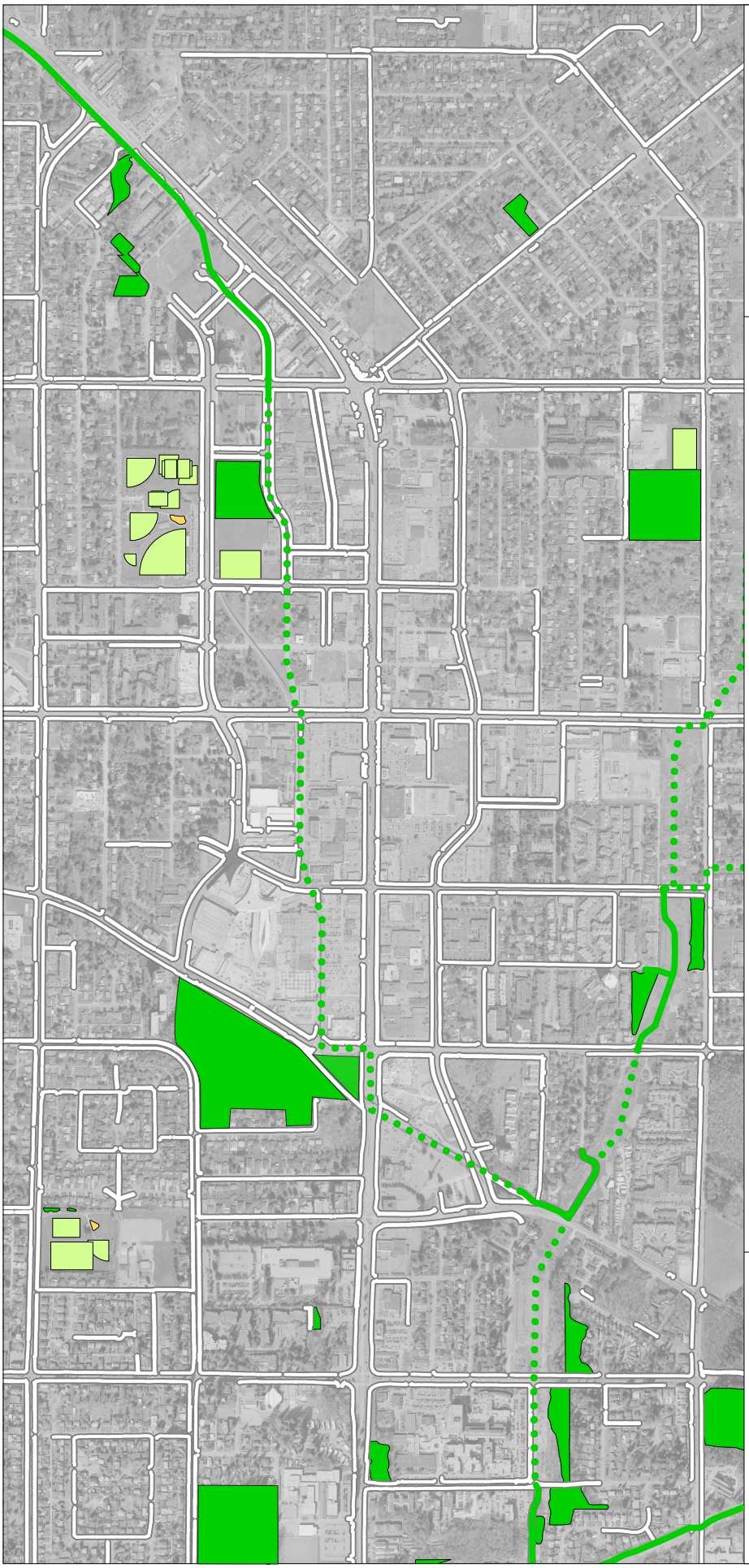
These issues were accounted for during discussions to propose a future cycling network through the City Centre.

2.1.4 PEDESTRIAN FACILITIES

The pedestrian realm is represented on **Exhibit 2.5**, which shows existing and proposed trails as well as available sidewalks in the study area. The BC Parkway, already noted in the discussion of bicycle routes, would also serve pedestrians. The proposed route parallels the SkyTrain route from the northwest boundary of the study area to a point southeast of King George station. There are two short sections of an additional greenway in the hydro corridor, in the south-eastern corner of the City Centre.

Some general observations related to the pedestrian realm include:

- The major arterials meet the minimum requirements for sidewalks on both sides of the street;
- Local roads do not always include a sidewalk on either side of the street. This is particularly true in the lower-density residential pockets;
- City Parkway, a proposed greenway route, does not have sidewalks south of 105 A Avenue;
- Opportunities for pedestrians to cross the arterials are dictated by intersection spacing – and as noted in Section 2.1.1, this spacing is fairly high and therefore prohibitive to pedestrians.



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LEGEND

SportsFields

Park Playgrounds

Natural Areas / Parks

Greenways

Built

Proposed

500 metres

Scale: 1 to 15 000

Exhibit 2.5

Sidewalks and Trails

(2007)

2.2 Land Use

This transportation study is being conducted in the context of updating proposed land uses in the City Centre, with the end result expected to be a higher concentration of residents, employees and students than there is currently. The transportation system and its supporting policies have been designed to accommodate this new demand.

2.2.1 CURRENT ZONING IN CITY CENTRE

Exhibit 2.6 is a map of the current (2007) zoning in the City Centre, by type of land use. Commercial development is concentrated along King George Highway (between the Ring Roads) and along 104 Avenue to the east. Much of the rest of the area is low density residential land, with the exception of several higher-density residential properties ringing the centre of the study area. The 'comprehensive' developments are a mix of residential, commercial, and institutional uses, including the Surrey Central office tower (with SFU campus), the Gateway development (office and residential towers). This category also includes Surrey Memorial Hospital, which is situated southeast of KGH and 96 Avenue.

Most of the older commercial sites along KGH and 104 Avenue are single-storey highway-oriented businesses and shopping plazas set back behind large surface parking lots. There has been growing interest among city stakeholders and private developers to take these under-utilised lands at the centre of the study area and re-shape them into an urban core, including higher density residential, commercial and mixed land uses.

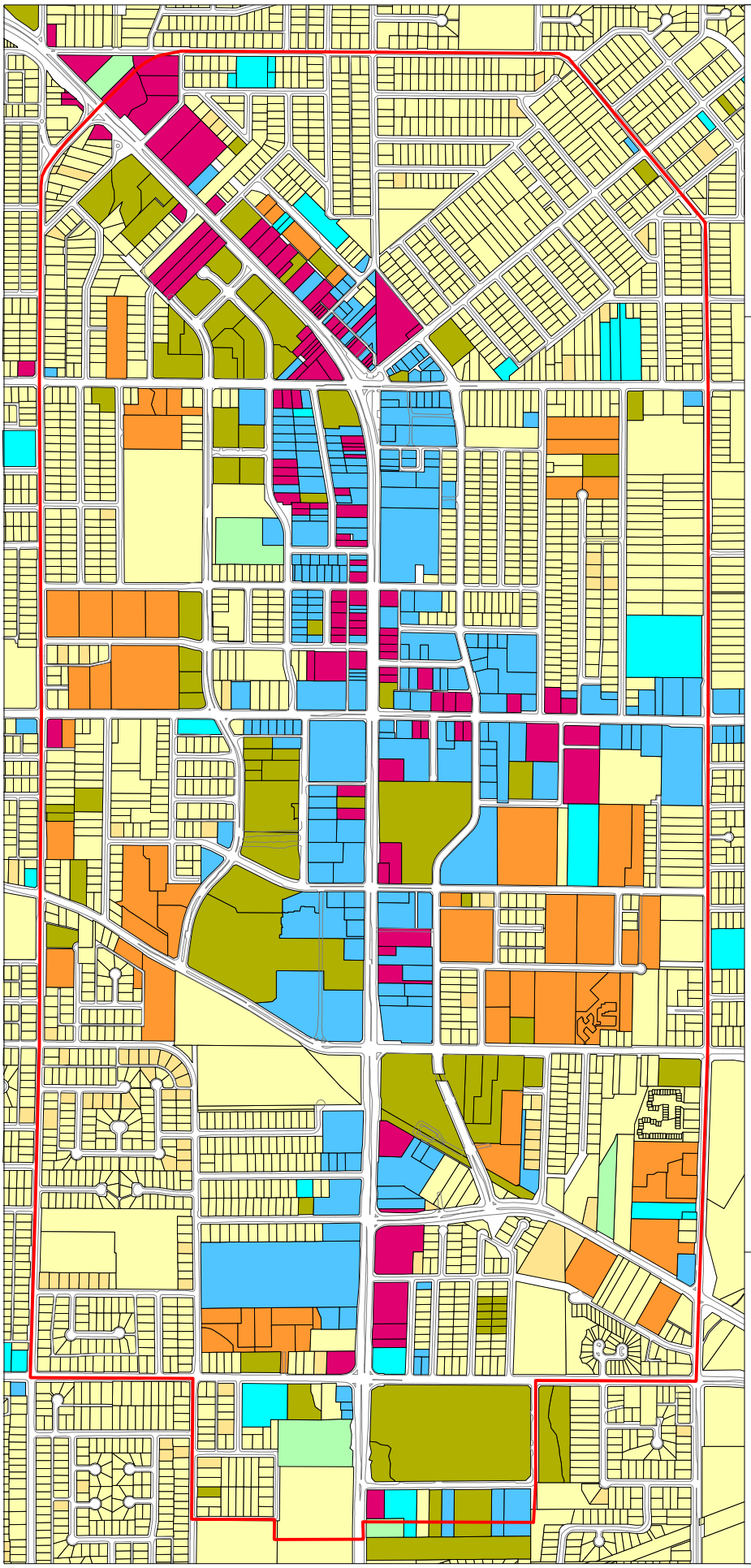
2.2.2 PROPOSED LAND USE - 2031

The City Planning Department and its marketing consultants prepared new population and employment forecasts for the City Centre, building on the existing figures from the 2006 Census and accounting for the growth potential for office, retail and residential space. Simon Fraser University was also contacted to confirm their expected increase in students attending the Surrey campus in the Central City tower. **Table 2.4** summarizes the growth projections for the study area.

Table 2.4: Planned Population and Employment Growth – Surrey City Centre

Category	2006 (Census)	2031 (Projection)
Population	**19,300**	**65,000**
Under 18	3,900	6,500
18-64	12,700	39,800
65 plus	2,700	18,700
Employment	**14,800**	**36,000**
Retail	2,800	8,000
Non-retail	12,000	28,000
University Enrolment	**2,000**	**10,000**

Exhibit 2.7 illustrates the proposed distribution of development, with the highest concentrations around the three SkyTrain stations and the next highest in the KGH and 104 Avenue corridors.



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LEGEND

Zoning Group

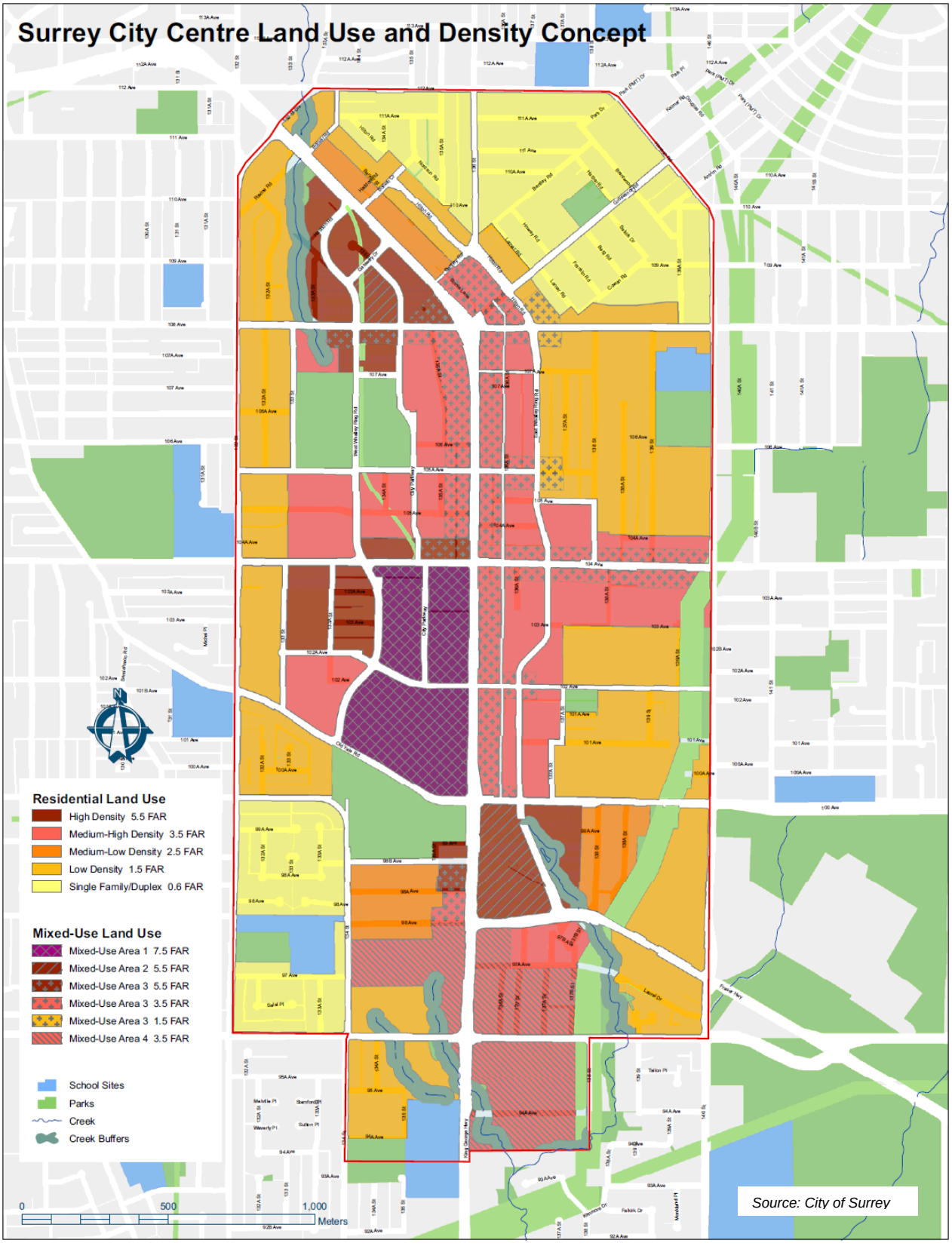
- Commercial
- Comprehensive
- Hwy Commercial
- Industrial
- Institutional
- Residential (high)
- Residential (low)
- Residential (medium)
- Tourist / Recreation
- all others

500 metres

Scale: 1 to 15 000

Exhibit 2.6
Current Zoning
by Aggregate
Zoning Groups

Exhibit 2.7: Proposed Land Use Concept (2031)



2.3 Opportunities and Constraints

To complement the overview of the transportation network and land use in the City Centre, this section presents descriptions of plans relevant to the City Centre, and wraps up this chapter with an overview of the key issues feeding into the definition of future transportation networks.

2.3.1 SURREY CENTRAL TRANSIT VILLAGE PLAN

The Surrey Central Transit Village plan was prepared for the City of Surrey and TransLink. It forms one element of the Transport Canada Urban Transportation Showcase Program, and culminated in a final report (January 2007) that was adopted as the guideline for development of the area around the SkyTrain station, bounded by 102 and 104 Avenues, King George Highway and West Whalley Ring Road. The principal elements of the recommended plan included the following:

- Transit Services & Infrastructure:
  - Create a 'Civic Square' as a major transit Hub, connecting SkyTrain to Bus Rapid Transit (BRT) and local bus services. This was intended to make better use of public streets and provide local and regional public transport connections in a safer environment.
  - Replace the existing bus loop with a *'transit couplet'*, wherein eastbound and westbound bus services would stop along two parallel roads on the north and south sides of the Civic Square.
  - Introduce B-Line or Bus Rapid Transit[3] to connect Surrey City Centre to Guilford Town Centre, Newton, South Surrey and White Rock, and operate this on City Parkway. This would complement the regional rail service offered by SkyTrain. This BRT route would be designed to facilitate conversion to Light Rail Transit in the future.
  - Construct a new off-street covered bus layover facility, providing drivers break room facilities.
  - New connection for passengers to the Surrey Central SkyTrain station from the proposed Civic Plaza to the east, and modification of the SkyTrain platform and accesses.
- New Roads:
  - Construct new east-west streets running between West Whalley Ring Rd and King George Highway.
  - Construct new north-south connectors; one from 104th Avenue to 102nd Avenue across the whole Surrey Central Transit Village, located to the east of City Parkway. A second new road would connect 104th Avenue to the northern most new east-west road.
- Pedestrian Infrastructure:
  - All new roads will provide improved access for pedestrians and cyclists; including wide sidewalks on both sides, good lighting cover, curb bulges where practical and well-marked crosswalks.
  - Enhanced two mid-block pedestrian corridors. One will link the Civic Plaza and Central City Tower entrance Plaza and a second will link the North Surrey Recreation centre to the Central City Town entry Plaza.
  - City Parkway will form part of an urban greenway (BC/Surrey Parkway).

[3] The BC Transit Surrey RapidBus Transit System Study (concluded May 1999) recommended using King George Highway, 102 Avenue, City Parkway and 104 Avenues to provide this service.

- Bicycle Infrastructure:
  - Provision of end of trip facilities including secure bicycle storage and showering facilities.
  - Cycling route running north-south on City Parkway, and connecting to the wider cycle network.
  - New roads to be designed with cyclists and other road users in mind.
  - These specific proposals are currently subject to refinement as the City is planning for the relocation of several major civic facilities (including City Hall) within this core area, requiring a review of the proposed street system.
- Parking Strategy:
  - Review of current Minimum parking bylaw; regarding further reduction in the City Centre.
  - Discourage off-street surface parking, through incentive zones; and favour on street and multi-storey parking.
  - Encourage shared parking area between daytime and evening/night users.

2.3.2 OTHER PLANNED STREET IMPROVEMENTS (AS OF 2007)

Exhibit 2.8 shows existing and projected streets at the initiation of this study. Most of these streets were part of the Engineering Department's Ten-Year Servicing Plan for 2006-2015, a capital program for street improvements. The core Transit Village area is also shown, where the street pattern will be more fine-grained but previous specific plans are currently subject to refinement. Over the course of the study, other street improvements were confirmed (see Chapter 5) and others will likely be proposed as development opportunities allow.

These planned street improvements shown on the map include:

- 132 Street Diversion – King George Highway to 112 Avenue;
- Completion of East Whalley Ring Road – including two segments north of 108 Avenue and extension south of Fraser Highway to 96 Avenue;
- Extension of West Whalley Ring Road from Old Yale Road to 100 Avenue, along the western edge of Holland Park;
- Widening of Fraser Highway east of East Whalley Ring Road;
- Intersection and signal improvements at 132 St/96 Avenue, and King George Highway at several future intersections;
- Extension of a 105/105A Avenue collector from East Whalley Ring Road to 152nd Avenue;
- Extension of 103 Avenue from King George Highway through to 140 Street. The eastern portion of this is constrained by a power substation and unlikely to proceed;
- Spot widening of portions of two collectors -- City Parkway and Bentley Road – to facilitate turns;
- Extension of 98B Avenue through King George Highway to East Whalley Ring Road, and a new segment of 137 Street connecting this to Fraser Highway. This proposal was identified in 2007 during the early stages of this study, and it provides better access to the King George SkyTrain station, as well as an additional location for crossing King George Highway.

Surrey City Centre Plan Update - Transportation Servicing Study

SURREY
CITY OF PARKS

IBI GROUP

LEGEND

Traffic Control

- Traffic Signal
- 4 Way Stop
- Overhead Sign
- Pedestrian
- Special Crosswalk
- Fire
- Future Signal

Road Classification

- Arterial
- Major Collector
- Local
- Future Streets
- SkyTrain
- Transit Village
  Streets to be determined

500 metres

Scale: 1 to 10 000 (approx.)

Exhibit 2.8

Existing and Planned* Road System

* NOTE: PLANNED ROADS INCLUDE THE 10 YEAR SERVICING PLAN

2.3.3 TRANSPORTATION CHALLENGES

Chapter 2 has described an inventory of existing conditions and existing short-term plans in the study area, as well as key opportunities and constraints. Moving forward from 2009 towards the planning horizon of 2031, these are some of the key challenges anticipated for the study area:

- The population, employment and student enrolment growth projected for the study area will generate more travel demand, and this will place a strain on existing streets and transit facilities.
- The City Centre acts both as a corridor for through travel and as a destination. It is reasonable to assume that through traffic would continue to be a fact of life given the proximity of both the Pattullo Bridge and to a lesser extent the Port Mann Bridge. Some through traffic may be diverted to new regional roads (such as South Fraser Perimeter Road), but additional traffic from other parts of the City will be attracted to these bridges when plans to replace or widen them are implemented.
- King George Highway and the other arterials are perceived as barriers between different parts of the City Centre, especially for the non-auto modes. The people-carrying and goods movement role of the network needs to be maintained while at the same time addressing the needs of pedestrians, cyclists and transit riders. There will be demand-related pressure to add capacity to the street system, but this should not come at the price of liveable streetscapes. Parallel routes for general traffic and goods movement would help offload King George Highway and allow it to carry a higher proportion of pedestrians, cyclists and transit riders.
- Providing enough parking through public and private approaches will be critical to supporting employment and population growth in the area, but the supply must be well-placed, well-managed, and not use up large portions of urban land that would be better applied to other land uses. Currently, a lot of the growth potential in the City Centre is taken up with surface parking.
- Connections with adjoining neighbourhoods are not easily achieved by walking or cycling, especially in the east-west direction. The pedestrian mode has a key role as it links residents, employees and visitors to the area between their actual destinations and the mode of transportation they used to arrive in the City Centre. The existing city blocks are too large in scale (with some 200 metres or more apart) and limit opportunities, especially for pedestrians, to cross King George Highway and other arterials. As the City Centre is redeveloped, opportunities to complete arterial and collector streets will need to be pursued, and new local streets and access lanes provided through the development process.
- There may be Right of Way challenges when accounting for boulevards for street trees, enhanced pedestrian and cycling elements, urban design features and public art, retaining on-street parking as a buffer, and maintain efficient street operations for transit and traffic.
- The bus transit system is a suburban-style network that will need to provide greater coverage and more frequent service, merely to maintain the same mode split it achieves today. Ideally, the service growth will outpace development of the City Centre so that public transit becomes a major player in helping to manage future traffic demands.
- The SkyTrain rail rapid transit system is expected to require greater passenger carrying capacity as a result of land use intensification, a more urban form of development around stations, and increased frequency of bus transit feeder services, including future B-Line service along King George Highway.

Assessments of these challenges, the related opportunities and options, and the resulting recommendations are documented in Chapters 3 (Network Alternatives), 4 (Detailed Assessments) and 5 (Implementation Plan).

3. TRANSPORTATION NETWORK ALTERNATIVES

This chapter of the report presents several conceptual transportation network alternatives that were evaluated against future land uses. This was done to estimate the travel demand associated with proposed land use plans for the City Centre, and to gauge the performance of the future street network in conjunction with different levels of investment in road improvements, transit services, parking policies, and the pedestrian and cycling environment.

3.1 Initial Network Alternatives

Based on the review of requirements, opportunities and constraints for the City Centre, the following initial network alternatives were defined for the purpose of this study:

- **Future Baseline**. This scenario includes only minimal changes to the transportation network, namely those that already have identified funding within the City Centre, and it is tested in conjunction with a 'trend' land use scenario. It is used as a benchmark to evaluate the benefits of the proposed land use patterns and transportation networks;
- **Walk, Bike and Transit Focus (WBT)**. This scenario focuses on people movement through and within the study area, focusing on non-auto modes, with strategic improvements to the streets in the City Centre;
- **Demand Oriented (DO).** This scenario focuses on building out the arterial and collector street network to full width in the City Centre, with accompanying improvements to other modes carried out in conjunction with the street improvements. ;
- **Balanced**. This scenario mixes elements of the walk/bike/transit and the demand oriented scenarios, based on the evaluation of the other alternatives and input from City staff. The concept assumes that most desirable transit improvements in WBT could be implemented in future, allowing some of the street improvements in the DO scenario to be deferred to later in the planning horizon as long as traffic operations remain serviceable.

Fuller descriptions of these alternatives follow.

3.1.1 FUTURE BASELINE CONDITIONS

Exhibit 3.1 illustrates the basic assumptions for the local street network in the City Centre within the baseline scenario. The only changes assumed for this scenario are the completion of the West Whalley and East Whalley Ring Roads as two-lane facilities.

For the purpose of evaluating each of the scenarios within the context of Metro Vancouver, several other changes outside the study area were assumed:

- Just east of 140th Street and north of Fraser Highway, part of the Green Timbers site is being developed, with a large RCMP office and a major health care facility proposed. These are highly likely to be in place in the next few years, well before the 2031 horizon.
- At the northern end of King George Highway, the Pattullo Bridge is assumed to have been widened to three lanes per direction by 2031.
- 92nd Avenue is assumed to be downgraded from arterial status between 144th and 148th Streets.
- Planned regional projects such as the Golden Ears Bridge, Port Mann/Highway 1 project and the South Fraser Perimeter Road are assumed to be implemented by 2013, well before the horizon year.

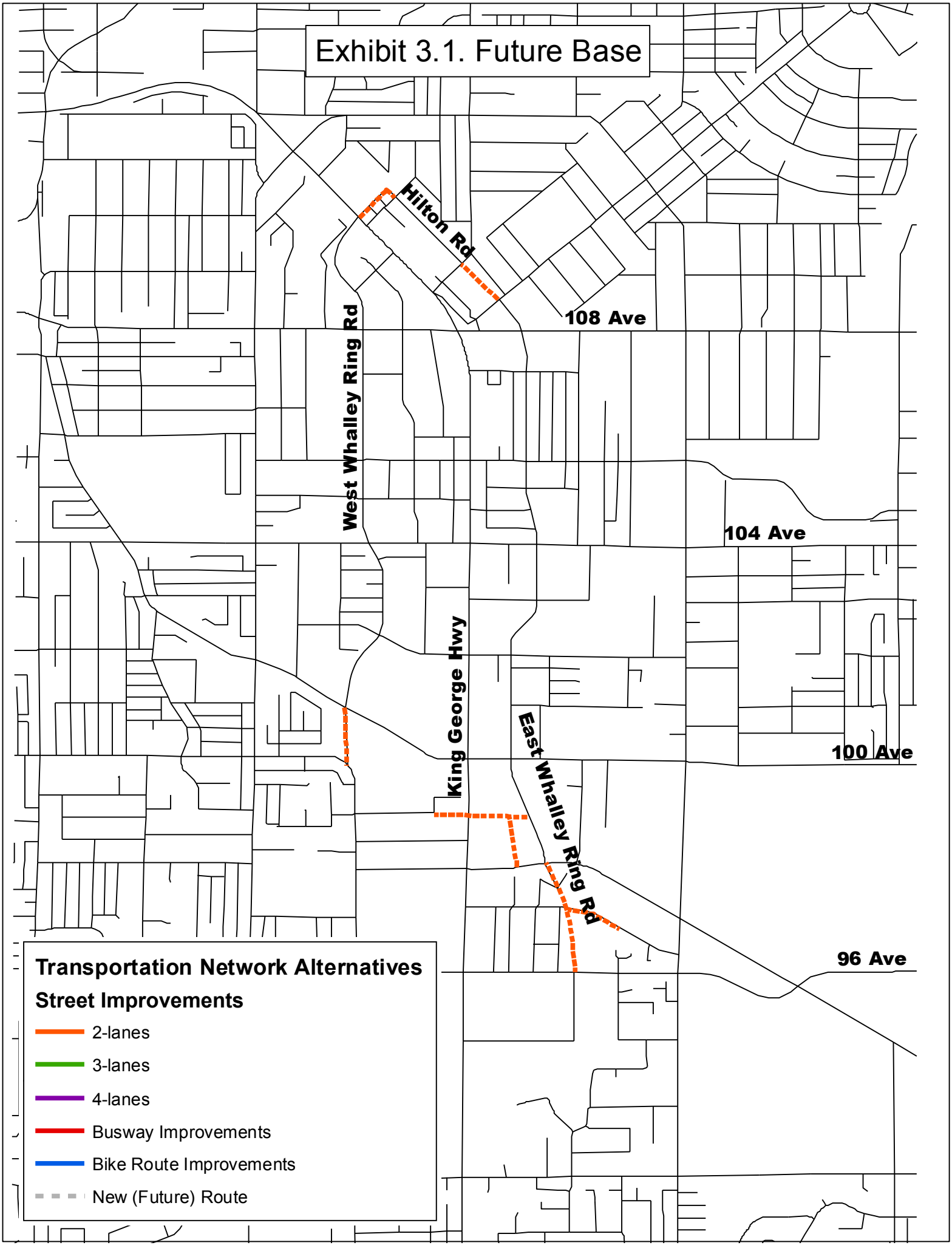


Exhibit 3.1. Future Base
Hilton Rd
108 Ave
West Whalley Ring Rd
104 Ave
King George Hwy
East Whalley Ring Rd
100 Ave
96 Ave
Transportation Network Alternatives
Street Improvements
2-lanes
3-lanes
4-lanes
Busway Improvements
Bike Route Improvements
New (Future) Route

3.1.2 CONCEPTUAL ALTERNATIVES

The development of future transportation concepts considered several aspects related to urban mobility: arterials, collectors and local streets, pedestrian elements, the cycling network, transit services, parking policies, and supporting measures.

Table 3.1 outlines the philosophy behind the two extremes of the network definition exercise for this study. For the walk, bike and transit focus, the street elements generally undergo the least development and widening is avoided/deferred, whereas the demand-oriented approach fills in gaps in the street network and offers widening of certain elements that are not yet built out to full standard.

The pedestrian and cycling elements are more robust for the first scenario and are only developed when there is opportunity as part of the demand-oriented approach. Transit services are assumed to meet or exceed the assumptions in the long-term vision for the area recently developed by TransLink, and these are scaled back to more modest service increases for the demand-oriented scenario. Likewise, parking policies are structured to govern demand more emphatically in the WBT scenario, shifting the need for parking into use of other transportation modes instead of the private automobile.

Supporting measures would also be implemented over time. The more comprehensive end of the range would be compatible with the WBT scenario, and the policies implemented (or lobbied for by the City and its partners) could help promote vehicle trip reduction without sacrificing personal mobility.

Table 3.1: Conceptual Transportation Elements

Transportation Alternative	Walk, Bike & Transit Focus	Demand Oriented
Arterials	Fill gaps in Ring Road system Introduce transit services in gaps, pedestrian and cycling facilities	Fill gaps in Ring Road system Consider modest widening to mitigate congestion
Collectors and Minor Streets	More closely spaced complete grid network, eliminate cul-de-sacs where possible	As needed for new development, starting with 10-year plan elements
Pedestrian Elements	Improved sidewalks on all new streets, retrofits to existing arterials	Improved sidewalks on new collectors and if/when arterials are widened
Cycling Network	Develop comprehensive designated network and ensure all streets have accommodation for safe cycling	Include bicycle lanes on new collectors and selected arterials at time of new construction or widening
Transit Services	Multiple BRT services, expanded regional connections, frequent grid network of local service	Modest frequency service increases in line with population growth, including basic BRT service
Parking	Promote alternative modes Reduce intensity of supply, move parking price towards urban area typical Access should not conflict with transit or cycling routes and crossings of busier sidewalks should be avoided	Similar supply requirements to current standard Modest parking fees Encourage relocation of access to side streets to improve traffic flow
Supporting Measures	Promote local and regional Transportation Demand Management measures	Continue and promote existing measures

The specific elements that were defined for each alternative are outlined in the following sections.

3.1.3 DESCRIPTION OF STREET NETWORK ELEMENTS

Table 3.2 identifies the street network elements that are included for each of the transportation alternatives. To provide context, it also identifies the existing condition (2008), and indicates "not applicable" (N/A) on proposed future street segments that do not currently exist.

All of the arterials are listed for reference; some do not have any changes proposed to the number of traffic lanes (indicated here by the "existing" designation) but over time may see changes to their cross section as pedestrian, cycling and transit improvements are implemented. The listing for collector streets focuses on extensions and widening proposals; the listing for local streets indicates the overall structure of the network in each alternative.

Table 3.2: Street Network Elements - Network Alternatives

Potential Transportation Initiative	Existing (2008)	2031			
		Future Base	Walk, Bike & Transit Focus	Balanced	Demand Oriented
Street Network - Arterials					
King George Highway (KGH) – widen to maintain traffic lanes where BRT lanes are created – 102 Av to 96 Av	6 lanes, some centre turn lanes	Existing	(to fit BRT + daytime parking)	(to fit BRT)	(to fit BRT)
132 Street – KGH to 96 - Widen to 4 though lanes + centre turn lane	2 lanes + turns	Existing	Existing	Existing	(4 lanes)
132 St. Diversion/112 Av – KGH to Bolivar Rd	N/A	N/A	N/A	(4 lanes)	(4 lanes)
West Whalley Ring Road – KGH to Old Yale	4 lanes + turns	Existing	Existing	Existing	Existing
West Whalley Ring Road – extension - Old Yale to 100 Av.	Edge of park	(2 lanes)	(2 lanes)	(4 lanes)	(4 lanes - full arterial)
134 Street –100 Avenue to 96 Avenue	(2 lanes + parking)	(2 lanes + parking)	(2 lanes + parking)	(4 lanes)	(4 lanes - full arterial)
East Whalley Ring Road – extension – KGH to Hilton/Bolivar	N/A	(2 lanes)	(2 lanes)	(4 lanes)	(4 lanes)
East Whalley Ring Road – extension – Bentley to Grosvenor	N/A	(2 lanes)	(2 lanes)	(4 lanes)	(4 lanes)
East Whalley Ring road – KGH to 108 Av (including segments above)	2 lanes, no through street	(2 lanes)	(2 lanes)	(4 lanes)	(4 lanes - full arterial)
East Whalley Ring road – extension - Fraser Hwy to 96 Av.	N/A	(2 lanes)	(2 lanes)	(2 lanes)	(4 lanes - full arterial)

Potential Transportation Initiative	Existing (2008)	2031			
		Future Base	Walk, Bike & Transit Focus	Balanced	Demand Oriented
140 Street – 108 Av to 96 Av– Widen to 4 though lanes + centre turn lane	2 lanes + turns	Existing	Existing	Existing	(4 lanes)
108 Avenue	*4 lanes + turns*	*Existing*	*Existing*	*Existing*	*Existing*
104 Avenue – KGH to 152 Street – Widening	4 lanes + turns	Existing	Existing	Existing	(4 lanes + BRT lanes)
102 Avenue, WWRR to 140 Street	*4 lanes + turns*	*Existing*	*Existing*	*Existing*	*Existing*
Old Yale/100 Avenue – west of 138 St.	*4 lanes + turns*	*Existing*	*Existing*	*Existing*	*Existing*
100 Avenue – east of 138 Street	*2 lanes + turns*	*Existing*	*Existing*	*Existing*	*Existing*
Fraser Highway – KGH to EWRR	4+ lanes	Existing	Existing	Existing	(4 lanes + BRT lanes)
Fraser Highway – EWRR to 96 Av – widen to 4 through lanes *(segment east of 140 street is outside study area)*	2 lanes + wide shoulders	Existing	(4 lanes)	(4 lanes)	(4 lanes + BRT lanes)
96 Avenue – Scott Road to 132 Street *(west of study area)*	2 lanes + LT	2 lanes + LT	2 lanes + LT	(4 lanes)	(4 lanes)
Street Network - Collectors					
Bentley Road – Widen to 3 lanes – KGH to EWRR/Hilton	2 lanes	Existing	Existing	Existing	(3 lanes)
105A Avenue – Extension – EWRR to 140 St	N/A	N/A	(2 traffic + LT + bike)	(2 traffic + LT + bike)	(4 traffic + LT + bike)
105A Avenue – Extension – 140 St to 156 St *(extends east of study area)*	N/A	N/A	(2 traffic + LT + bike)	(2 traffic + LT + bike)	(4 traffic + LT + bike)
103 Avenue Extension – KGH to EWRR	N/A	N/A	(3 lanes)	(3 lanes)	(3 lanes)
103 Avenue Extension – 138A St to 140 St (Due to land use constraints, recommended for removal from network)	N/A	N/A	N/A	N/A	N/A (Removed from plan)
City Parkway – Minor Widening/ Realignment – 104 to 105A Av.				✔	✔
City Parkway – Widen to 2 traffic lanes + 2 dedicated transit lanes for BRT service – 102 Av to 104 Av	2 + parking	Existing	(BRT + bike lanes only)	(BRT lanes + 2 traffic)	(BRT lanes + 2 traffic)
Street Network – Local Streets					
New streets added to serve developments per current practice/recent trends		✔			✔

Potential Transportation Initiative	Existing (2008)	2031			
		Future Base	Walk, Bike & Transit Focus	Balanced	Demand Oriented
Closer spaced grid pattern starting in core area between Ring Roads, including Transit Village			✔	✔	
Develop complete local street grid in areas being developed, with few/no dead ends			✔		

Exhibits 3.2 and **3.3** illustrate the street networks assumed for the Walk, Bike & Transit and the Demand Oriented alternatives. The maps show all proposed arterial and collector improvements and a representative set of local streets, particularly around the core of the study area, to illustrate how the street system could appear. This does not include all elements of the basic street network nor the finer grid that would be provided during development; these elements are details that cannot be assessed by the transportation model.

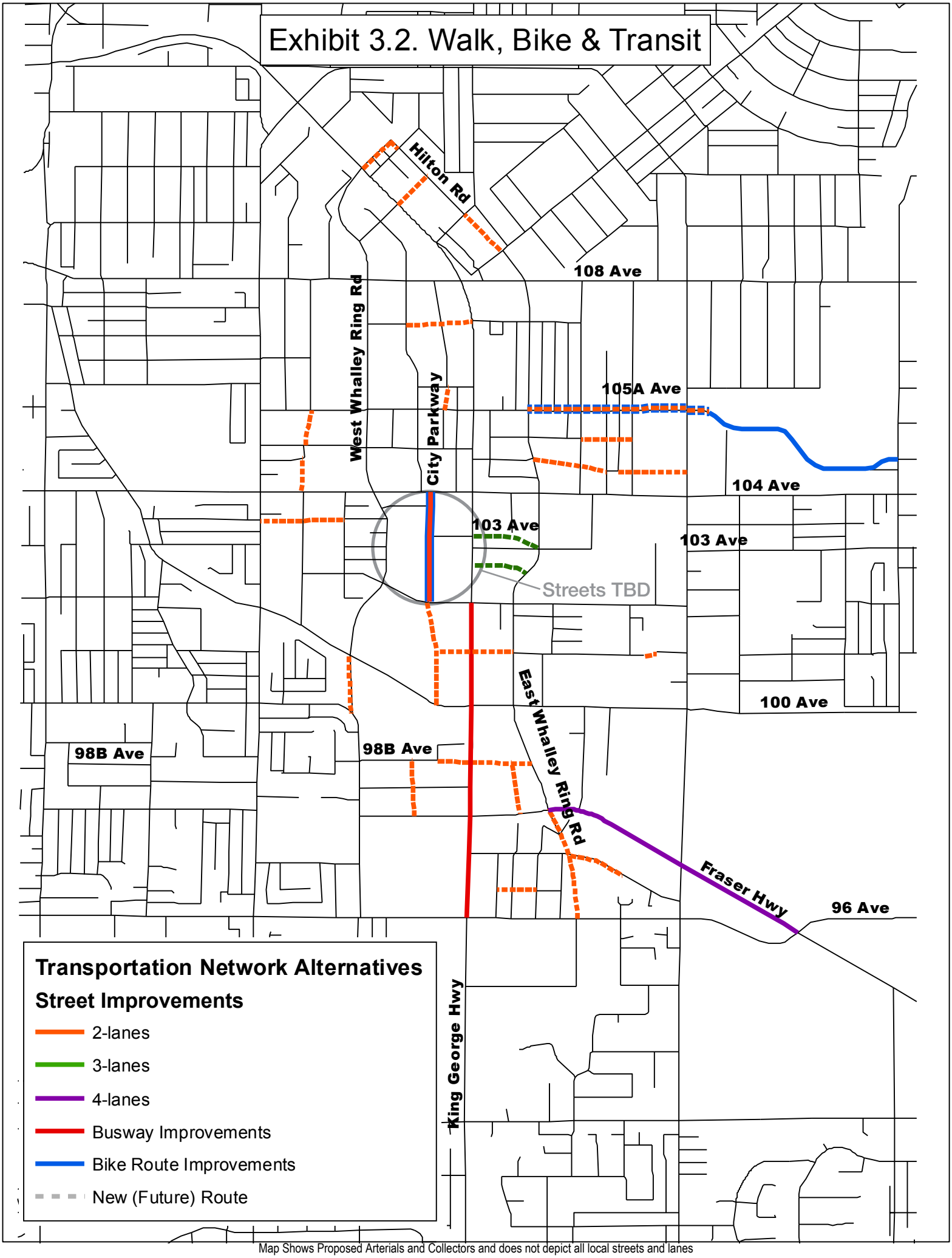
3.1.4 DESCRIPTION OF PARKING POLICY ELEMENTS

Table 3.3 is a synthesis of the basic parking supply and pricing assumptions built into these initial alternatives. The parking price is a highly effective way of influencing transportation mode choice -- the highest parking prices in Metro Vancouver are in downtown Vancouver, and there the mode share of walk, bike and transit is highest in the region for commuters.

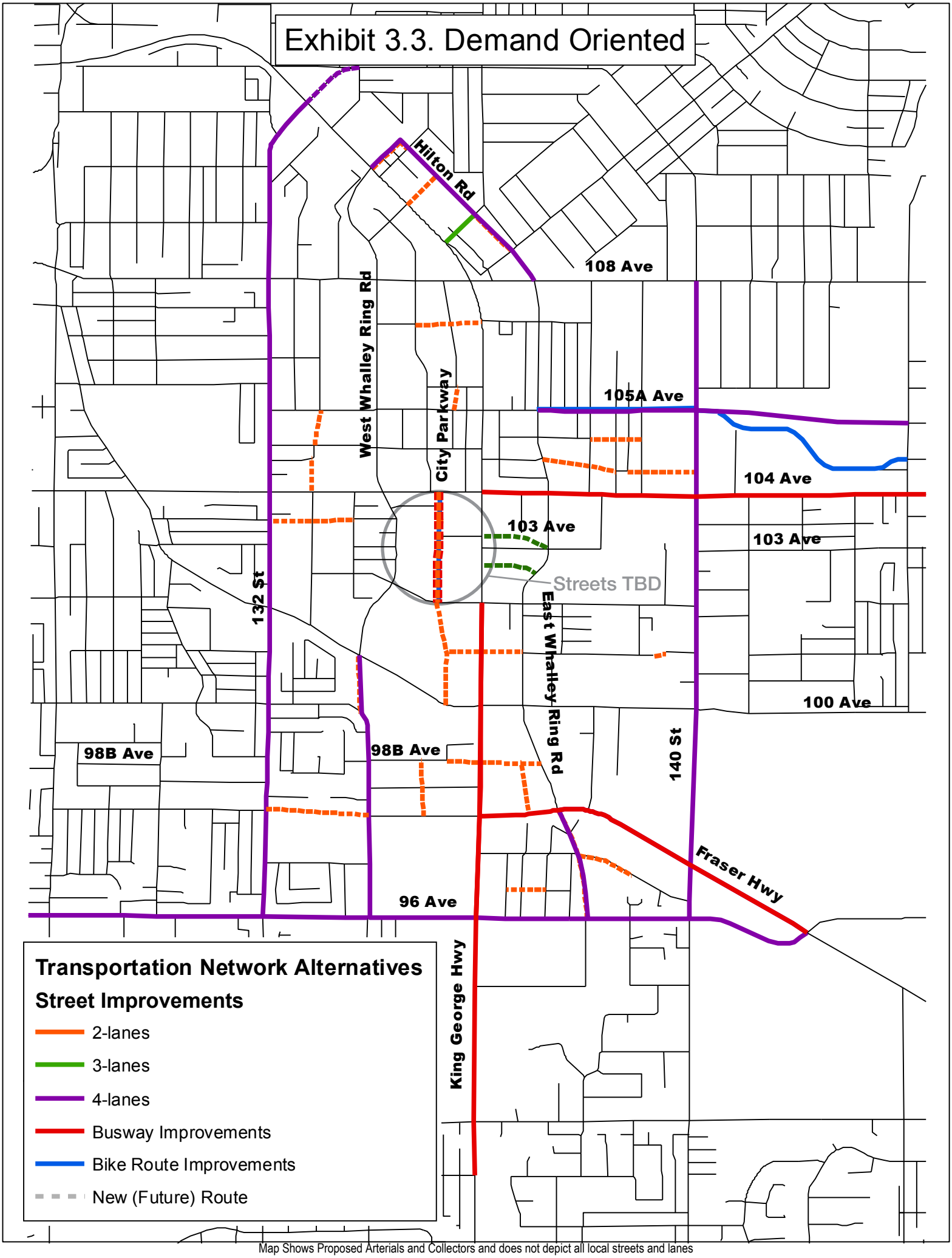
Table 3.3: Parking Policy Elements - Network Alternatives

Potential Transportation Initiative	Existing (2008)	2031			
		Future Base	Walk, Bike & Transit Focus	Balanced	Demand Oriented
Parking – General Assumptions					
Current requirements and low prices for parking	✔	✔			✔
Strategic changes to parking requirements, lower minimum spaces where TOD and TDM are in place			✔	✔	
Modest parking prices (Approx average of $6-10 per day[4] for Surrey CC zones)				✔	✔
Parking prices typical to urban centre (Approx average of $12-15 per day assumed for Surrey CC zones)			✔		
Relocation of new access points to side streets, improving flow of traffic, transit, pedestrians on arterials			✔	✔	✔

[4] Prices in the demand model's mode choice, for factors such as auto operating cost, parking fees, transit fares, and relative value of time, are set for a common timeframe. Modeling for 2031 can use current 2007 prices if all factors are assumed to increase at roughly the same rate over the long term.



Map Shows Proposed Arterials and Collectors and does not depict all local streets and lanes



Map Shows Proposed Arterials and Collectors and does not depict all local streets and lanes

3.1.5 DESCRIPTION OF TRANSIT ELEMENTS

Table 3.4 summarizes the transit service assumptions developed for these initial alternatives. The demand oriented alternative approximates the service levels developed in the South of Fraser Area (SOFA) Transit Plan through to at least 2013. The Walk, Bike and Transit alternative assumes a substantial increase in service hours including three BRT (Bus Rapid Transit) corridors, express services to destinations on both sides of the Fraser, and a denser grid of local and community services.

There is a longer-term question related to rail transit through the area, since there are three rapid transit corridors (104, Fraser Highway, King George), one or more of which may warrant future migration from BRT to LRT or even a SkyTrain extension.

In addition to the changes to transit service, there would also be modifications made to the transit support infrastructure in the City Centre, starting with the replacement of the current suburban-style exchange island to a street-based transit couplet operating on the planned 102 A and 103 Avenues. This is a key element of the Transit Village Plan.

Table 3.4: Transit Service Elements - Network Alternatives

Potential Transportation Initiative	Existing (2008)	2031			
		Future Base	Walk, Bike & Transit Focus	Balanced	Demand Oriented
Transit System – Rapid Transit/Rapid Bus					
King George Highway/104 Avenue BRT - Surrey Central to White Rock (3 Peak, 6 Off Peak) - at 10% higher speeds due to exclusive lanes			✔		
King George Highway/104 Avenue BRT via Surrey Central (5 Peak, 10 Off Peak)				✔	✔
Fraser Highway BRT from King George Station to Langley Centre (5 Peak, 10 Off Peak)			✔	✔	✔
Transit System – Regional Express Bus					
Surrey Central/Scottsdale/ Ladner/ Tsawwassen (express)			✔		
Surrey Central/Walnut Grove/Maple Ridge (express)			✔	✔	✔
Surrey Central/Richmond Centre (express)			✔		
Surrey Central/Guildford/Walnut Grove/Abbotsford (express)			✔		
Transit System – Local Bus & Shuttles					
South of Fraser Area Transit Plan, improvements through 2013		✔	Included	Included	Included

Potential Transportation Initiative	Existing (2008)	2031			
		Future Base	Walk, Bike & Transit Focus	Balanced	Demand Oriented
Frequent Transit Network:					
Local on KGH (in addition to BRT, and local bus will extend north of Surrey Central)			10 Pk/ 10 OP	10 Pk/ 15 OP	10 Pk/ 15 OP
108 Ave, to Guildford/Fraser Heights			5 Pk/ 10 OP	10 Pk/ 15 OP	10 Pk/ 15 OP
104 Ave, South Westminster - Guildford			5 Pk/ 10 OP	10 Pk/ 15 OP	10 Pk/ 15 OP
96 Ave, West of King George Station			5 Pk/ 10 OP	10 Pk/ 15 OP	10 Pk/ 15 OP
Identified and candidate FTN corridors (from SOFA Long Term Vision) outside City Centre			10 Pk/ 10 OP	15 Pk/ 20 OP	15 Pk/ 20 OP
Additional Grid Routes:					
132 St /Bridgeview			15 Pk/ 20 OP		
140 St /Hansen/112 Av/Bentley to Gateway			15 Pk/ 20 OP		
Community Services:					
WWRR, Surrey Memorial – Gateway			10 Pk/ 15 OP		
EWRR, Surrey Memorial – Gateway			10 Pk/ 15 OP		
Other Local Services in Surrey: 15 (or less) Peak/ 20 (or less) Off Peak			✔		
Transit System – Facilities					
Replacement of existing Surrey Centre Transit Exchange with future Transit Couplet (extended 102 A and 103 Avenues)			✔	✔	✔
SkyTrain station access improvements to bus stops (e.g. both sides of 108 Avenue at Gateway Station, King George access provided at 98 B Avenue)			✔		
Bus Layovers focused at non-City Centre ends of route, expanded exchanges elsewhere in Surrey			✔		

3.1.6 DESCRIPTION OF CYCLING AND PEDESTRIAN ELEMENTS

Table 3.5 summarizes the pedestrian and cycling environments assumed for the initial alternatives. The specific elements listed here define the general principles that would lead to improved facilities for walking and biking in the City Centre. Specific routes were proposed and refined through a collaborative process, and the end results are documented in Chapter 5. For the purpose of evaluating the alternatives, only a definition of the accessibility of various zones in the City Centre is required (the directness and convenience of these modes), as the demand model uses this information to estimate the mode choice of travel starting or ending in the City Centre.

Table 3.5: Cycling and Pedestrian Elements - Network Alternatives

Potential Transportation Initiative	Existing (2008)	2031			
		Future Base	Walk, Bike & Transit Focus	Balanced	Demand Oriented
Pedestrian Elements					
Closer-spaced grid network of through local streets			✔		
Widened sidewalks on arterials and local commercial streets			✔	✔	
Improved sidewalks on all new and reconstructed streets			✔	✔	✔
Cycling Elements					
Closer-spaced network of cycling through routes on collectors, certain segments of arterials, and off-street paths			✔	✔	
'Opportunity' approach: Bicycle lanes on arterials and collectors at time of new construction or widening				✔	✔

3.2 Assessment of Alternatives

This section describes the quantitative performance assessment of the transportation scenarios, carried out using a transportation demand model (EMME/2 platform). The scenarios modeled included the future base, walk-bike-transit, and demand oriented, and these were tested across a range of land use assumptions to determine how well the transportation system would support growth of Surrey City Centre.

3.2.1 METHODOLOGY

The demand model was developed by first combining the regional networks from the BC MoT Gateway Model (version 4) with a finer zone structure and street network from the Surrey subarea model. This was enhanced within the City Centre by further subdividing the study area into over 60 geographic zones (typically representing 1 to 6 square city blocks apiece) and adding in several collector roads and local streets where these formed the divisions between zones. The selection of the model and the resulting zone system are document in **Appendix A**.

A base year model with the existing streets and transit services was developed and validated for 2006-7 conditions. Population and employment estimates for each of the analysis zones were prepared by the City's Planning Department, based on 2006 Census information. Traffic data was compiled and new traffic counts undertaken at various locations around the City Centre to provide insight into current conditions and calibration targets for the AM and PM peak hour model results. Several rounds of model runs were carried out using the base year population and employment data to help adjust the assumptions in the model for the study area, until a reasonable calibration 'fit' to observed traffic volumes was achieved for the base year.

The focus of the modeling exercises was forecasting demand for the horizon year 2031. Population and employment projections were developed by the City and its marketing and land use consultants, as noted in Section 2.2.2. The transportation network for 2031 was taken from the existing source (Gateway v.4), since this already included most planned and proposed network improvements. After several initial model runs were carried out, recommendations regarding the Pattullo Bridge emerged that the capacity would be increased, and therefore this change was incorporated within the Surrey City Centre model for ongoing analyses.

The 2031 projected population, employment and university enrolment were assigned to the City Centre modeling zone system and the model was used to estimate the resulting travel demand, focusing on mode splits and traffic volumes. The breakdown of the population into age categories considered the recent census data for the base year and the Ministry of Health age cohort projections (on BC Stats) for the age profile in 2031. There is a general upward shift in the median age of residents in BC, from just under 40 years old currently to over 50 by 2031; this is significant because an older population tends to have lower per-person travel demands in the AM peak (a lower rate of commuting is assumed), with less difference across age groups in the PM peak (when all age groups tend to be either commuting or traveling for other purposes).

3.2.2 LAND USE ASSUMPTIONS

As noted in section 2.2.2 (above), the City prepared population and employment forecasts for the City Centre, based on figures from the 2006 Census. Simon Fraser University was also contacted to estimate the number of students expected to attend its Surrey campus in 2031. These numbers, along with their allocations to zones within the City Centre, were used to estimate travel demand in the City Centre for the future planning horizon of 2031.

At first, the land use scenarios included the 'trend' (growth in the City Centre following existing trends) and two more structured scenarios called 'Peaks and Valleys' and 'Nodes and Corridors.' What both of these latter scenarios did was concentrate future growth more strategically around the SkyTrain stations (acting as development hubs) or along the major arterials in the City Centre. Early tests of these scenarios using the demand model showed that both of the structured land uses resulted in more sustainable travel demand, with higher walk/bike and transit mode splits achieved than for the 'trend,' even though the population and employment were nearly identical when taken as a whole for the City Centre[5]. The Preferred Land Use scenario combines the strongest land use elements of these two earlier scenarios and is therefore the focus of the rest of this section.

3.2.3 FUTURE NETWORKS

Several possible future transportation networks were identified in Section 3.1, based on the opportunities and constraints the City Centre presents:

- Future Baseline, which includes only minimal changes to the current transportation network.
- Walk, Bike and Transit Focus (WBT), which is mainly focused on non-auto modes;

[5] Results for these earlier land uses are not being published in this report because the assumption for Pattullo Bridge was different at the time of the demand estimates, and the results are not truly comparable to those for the Preferred Land Use.

- Demand Oriented (DO), which focuses on building the major roads in the network along with some improvements to other modes.

The future baseline network was tested using the 'trend' land use scenario and the two other transportation networks were assessed in conjunction with the 'preferred' land use developed by the City.

3.2.4 2031 TRANSPORTATION MODE SPLIT

The trips that impact the Surrey City Centre (SCC) were segmented into five categories in order to allow a high level analysis of the transportation system. The five categories are:

- Trips that start and end in the SCC;
- Trips that start in the SCC and end somewhere else in Surrey;
- Trips from somewhere else in Surrey to the City Centre;
- Trips from the City Centre to other destinations; and
- Trips from other places to the City Centre.

Tables 3.6 and **3.7** provide information about the number of trips in each category by mode of travel for peak AM and PM respectively.

As can be seen in the table, the 'Base' network has the most trips overall, followed by the 'Demand Oriented' scenario, with the 'WBT' alternative resulting in the least number of trips through the SCC; however, the differences between alternatives with regard to the total number of trips are not large.

Generally, the way the trips are segmented between the trip categories is fairly similar, with trips in the City Centre accounting for about 11% of the total trips, trips from the SCC to elsewhere in Surrey for about 20%, from elsewhere in Surrey to the SCC 29%, from SCC to locations outside of surrey 18% and from other locations to the SCC 22%.

The aspect in which the alternatives significantly differ from each other is in the way trips are conducted in the system (the mode share). The 'Base' alternative has the highest automobile mode share at about 71% and the lowest transit and walk/bike usage (19% and 10% respectively). On the other hand, the 'WBT' alternative has the lowest car share at about 53% and the most transit and walk/bike trips (34% and 13% respectively). The 'Demand Oriented' alternative has results midway between the other two.

Considering the PM peak results in Table 3.7, the 'Base' alternative results in the largest number of trips and the 'WBT' in the lowest amount of trips. The spatial distribution of trips is somewhat different between AM and PM hours. In PM hours there is a marked increase in the percentage of trips within the SCC and between the SCC and the rest of Surrey (from 11% to 19% and from 20% to 28%, respectively). However the percentage of trips between SCC and other locations and vice verse is decreased from 18-13% and from 22-16% respectively). Overall, travel demand is higher in the PM peak.

Table 3.6: AM Peak Travel Demand by Scenario

Year	2031	2031	2031
Land Use	Trend	Preferred	Preferred
Network	Base	Walk-Bike-Transit, Minimal Road	Demand Oriented
Person Travel			
Within SCC	2,900	3,000	2,800
SCC - Rest of Surrey	5,400	5,100	5,200
Rest of Surrey - SCC	8,500	7,800	8,100
SCC - Other	4,800	4,500	4,700
Other - SCC	5,600	6,000	6,000
Total	27,300	26,500	26,800
Transit			
Within SCC	200	300	200
SCC - Rest of Surrey	400	400	400
Rest of Surrey - SCC	1,800	3,400	2,600
SCC - Other	1,100	900	1,000
Other - SCC	1,700	3,800	2,700
Total	5,300	9,000	7,000
% of Person Trips	*19%*	*34%*	*26%*
Auto			
Within SCC	1,400	900	1,100
SCC - Rest of Surrey	4,500	4,200	4,300
Rest of Surrey - SCC	5,900	3,400	4,700
SCC - Other	3,600	3,500	3,600
Other - SCC	3,900	2,200	3,200
Total	19,300	14,100	16,900
% of Person Trips	*71%*	*53%*	*63%*
Walk/Bike			
Within SCC	1,320	1,840	1,510
SCC - Rest of Surrey	510	480	490
Rest of Surrey - SCC	790	960	840
SCC - Other	40	40	40
Other - SCC	60	70	60
Total	2,700	3,400	2,900
% of Person Trips	*10%*	*13%*	*11%*

Table 3.7: PM Peak Travel Demand by Scenario

Year	2031	2031	2031
Land Use	Trend	Preferred	Preferred
Network	Base	Walk-Bike-Transit, Minimal Road	Demand Oriented
Person Travel			
Within SCC	6,900	6,800	6,000
SCC - Rest of Surrey	10,400	9,000	9,400
Rest of Surrey - SCC	8,700	7,700	8,000
SCC - Other	4,700	4,200	4,500
Other - SCC	6,000	4,800	5,300
Total	36,700	32,500	33,200
Transit			
Within SCC	500	600	500
SCC - Rest of Surrey	1,200	1,500	1,300
Rest of Surrey - SCC	1,600	2,900	2,200
SCC - Other	2,200	2,200	2,200
Other - SCC	800	1,500	1,100
Total	6,200	8,700	7,300
% of Person Trips	*17%*	*27%*	*22%*
Auto			
Within SCC	3,500	2,100	2,400
SCC - Rest of Surrey	8,400	6,600	7,300
Rest of Surrey - SCC	6,600	4,200	5,200
SCC - Other	2,500	2,000	2,300
Other - SCC	5,200	3,300	4,100
Total	26,100	18,200	21,300
% of Person Trips	*71%*	*56%*	*64%*
Walk/Bike			
Within SCC	2,960	4,040	3,130
SCC - Rest of Surrey	730	910	780
Rest of Surrey - SCC	590	590	560
SCC - Other	30	30	30
Other - SCC	50	40	40
Total	4,400	5,600	4,500
% of Person Trips	*12%*	*17%*	*14%*

3.2.5 TRANSPORTATION FORECASTS - SPECIFIC ROAD SECTIONS

This part of the analysis looks at specific links in the system and depicts the impacts of the different network scenarios on them. Tables 3.8 and 3.9 provide traffic volumes for six road segments in the network, for AM and PM peak hours, respectively. These segments include four locations to gauge demand within the City Centre and two on the nearby bridges crossing the Fraser River.

At certain locations such as the bridge crossings, the directionality of traffic often changes between the morning and the afternoon hours. Generally, PM traffic volumes are usually higher than AM volumes for the entire system.

Table 3.8: Estimated AM Peak Traffic Volumes on Selected Links

Time Period/Year	2031 AM	2031 AM	2031 AM
Land Use	Trend	Preferred	Preferred
Location/Network	Base	Walk-Bike-Transit, Minimal Road	Demand Oriented
140 Street (Between 106 Ave. - 108 Ave.)			
Northbound	510	480	630
Southbound	540	450	580
128 Street (south of 104 Ave.)			
Northbound	1,200	1,050	1,060
Southbound	810	700	720
King George Hwy (Between 92 Ave. - 94A Ave.)			
Northbound	1,770	1,240	1,630
Southbound	1,390	1,420	1,370
King George Hwy (Between Bridgeview Dr. - 132 St.)			
Eastbound	1,580	1,150	1,370
Westbound	2,040	2,030	2,040
Pattullo Bridge			
Eastbound	4,090	3,610	3,840
Westbound	4,100	4,160	4,150
Port Mann Bridge			
Northbound	10,100	10,210	10,170
Southbound	7,950	7,770	7,950

Table 3.9: Estimated PM Traffic Volumes on Selected Links

Time Period/Year	2031 PM	2031 PM	2031 PM
Land Use	Trend	Preferred	Preferred
Location/Network	Base	Walk-Bike-Transit, Minimal Road	Demand Oriented
140 Street (Between 106 Ave. - 108 Ave.)			
Northbound	300	330	230
Southbound	540	670	510
128 Street (south of 104 Ave.)			
Northbound	850	840	850
Southbound	1,510	1,410	1,390
King George Hwy (Between 92 Ave. - 94A Ave.)			
Northbound	1,680	1,530	1,540
Southbound	1,740	1,650	1,580
King George Hwy (Between Bridgeview Dr. - 132 St.)			
Eastbound	2,200	1,980	1,920
Westbound	1,470	1,270	1,220
Pattullo Bridge			
Eastbound	4,930	4,840	4,750
Westbound	3,410	3,290	3,240
Port-Mann Bridge			
Northbound	7,100	7,190	7,080
Southbound	9,290	9,210	9,130

With regard to the level of service the networks provides: 96.8% of the links in the 'Demand Oriented' alternative are forecasted to provide good level of service (V/C of up to 0.7) in AM peak period, 3% borderline level of service and 0.2% of the links are forecasted to have low level of service (V/C of 0.85 and higher). In the PM period the level of service is generally lower than in the morning, the model forecasts that in the 'Demand Oriented' network 93% of the links will have good service, 4.9% will have borderline level of service and as many as 2.1% of the links will have a low level of service.

3.2.6 LAND USE SENSITIVITY CASES

In addition to the three alternative network scenarios, a sensitivity test was carried out on the ability of the transportation networks to handle much greater development than assumed. Specifically, it was decided to investigate the transportation implications of doubled population and employment growth by 2031, in comparison with the Preferred Land Use. The analysis doubled the number of trips within, in and out of the Surrey City Centre using the same basic origin-destination patterns. The mode splits were recalculated for the sensitivity case based on the resulting transit and auto times – both networks would be busier with more travelers.

In general, it was observed that with travel based in the City Centre doubled, the overall volume-to-capacity ratios of the arterials and collectors in the model increased. In addition, traffic in the model was observed to use alternative parallel connections (e.g. 128 Street, 132 Street, 148 Street, South Fraser Perimeter Road, 105 Avenue, 100 Avenue), either existing or proposed as part of the 2031 street network. Even with double the auto trips based in the City Centre, traffic on its major arterials would not double and the road network would remain functional. Instead, there is a 'ripple effect' where some projected pass-through trips would instead bypass the City Center and use less congested alternatives. Within the City Centre, a higher proportion of trips would use routes such as the West and East Whalley Ring Roads instead of King George Highway.

Tables 3.10 through 3.12 present a summary of results from the land use sensitivity analysis for the AM and PM peak periods. The impact of doubling the population and employment of the City Centre had only a marginal impact on the mode choice results, with a slight shift away from private automobile to walking and cycling in the PM peak. This modest change is reflected by Tables 3.10 and 3.11.

Table 3.10: AM Trip Volumes with Land Use Sensitivities

Year	2031	2031	2031	2031	2031
Land Use	Trend	Preferred	Preferred	Double Growth	Double Growth
Network	Base	Walk-Bike-Transit, Minimal Road	Demand Oriented	Walk-Bike-Transit, Minimal Road	Demand Oriented
Transit	5,300 19%	9,000 34%	7,000 26%	18,200 34%	14,200 27%
Auto	19,300 71%	14,100 53%	16,900 63%	28,000 53%	33,400 62%
Walk/Bike	2,700 10%	3,400 13%	2,900 11%	6,900 13%	5,900 11%
Total	27,300	26,500	26,800	53,000	53,600

Table 3.11: PM Trip Volumes with Land Use Sensitivities

Year	2031	2031	2031	2031
Land Use	Trend	Preferred	Double Growth	
Network	Base	Walk-Bike-Transit, Minimal Road	Walk-Bike-Transit, Minimal Road	Increase
Transit	6,200 17%	8,700 27%	17,800 27%	105%
Auto	26,100 71%	18,200 56%	35,700 55%	96%
Walk/Bike	4,400 12%	5,600 17%	11,400 18%	104%
Total	36,700	32,500	64,900	100%

Table 3.12 provides a comparison of traffic volumes on representative highway, arterial and transit links within and approaching the City Center, to demonstrate the theoretical impact of higher demand using the same road network assumed for 2031.

Table 3.12: Sensitivity of Road and Transit Volumes to Land Use (Double Growth Scenario)

Time Period/Year	2031 AM	AM Test		2031 PM	PM Test	
Land Use	Preferred	Double	%	Preferred	Double	%
Location/Network	Demand Oriented	Demand Oriented	Change	Demand Oriented	Demand Oriented	Change
East Whalley Road (Between 106 Ave. - 108 Ave.)						
Northbound	340	500	47%	350	510	46%
Southbound	580	800	38%	650	790	22%
West Whalley Road (Between 102 Ave. - 104 Ave.)						
Northbound	710	790	11%	850	900	6%
Southbound	810	950	17%	790	840	6%
King George Hwy (Between 92 Ave. - 94A Ave.)						
Northbound	1,630	2,030	25%	1,540	1,760	14%
Southbound	1,370	1,600	17%	1,580	1,940	23%
King George Hwy (Between Bridgeview Dr. - 132 St.)						
Eastbound	1,370	1,770	29%	1,920	2,370	23%
Westbound	2,040	2,420	19%	1,220	1,620	33%
Pattullo Bridge						
Eastbound	3,840	4,760	24%	4,750	5,130	8%
Westbound	4,150	4,860	17%	3,240	3,700	14%
Port Mann Bridge						
Northbound	10,170	10,810	6%	7,080	7,690	9%
Southbound	7,950	8,500	7%	9,130	9,600	5%
SkyTrain (between Scott Rd and Gateway Stations)						
Northbound	5,430	8,560	58%	1,090	1,960	80%
Southbound	2,750	4,590	67%	4,720	6,680	42%

4. DETAILED ASSESSMENTS

This chapter of the report documents several detailed studies that were carried out on special topics that arose, including:

- Design of King George Highway;
- Truck Route Alternatives to King George Highway; and
- Feasibility Assessment of Roundabouts.

4.1 King George Highway

This section presents an initial analysis of several proposals for a King George Highway (KGH) cross section in the City Centre with a focus here on short-term alternatives. Longer-term recommendations for King George Highway are presented in Chapters 5 and 6.

Currently King George Highway acts as the major north-south arterial route through the City Centre and is the only continuous route other than 132 Street. Because it leads to the Pattullo Bridge (which is planned for widening), it serves as part of an alternative route across the Fraser River, on its own or in conjunction with 108th and 104th Avenues and Fraser Highway. In addition to commuter traffic to, from and through the city Centre, it also acts as a truck route. Currently, transit buses only use KGH south of 102 Avenue during daytime hours but in future this is likely to change as the area along KGH redevelops. Similarly, there are bicycle lanes on KGH south of Fraser Highway that would ideally be extended farther north. The challenge for KGH is accommodating all the existing and future users, focusing more on the people moving functions, without requiring substantial widening of the highway, since this would undermine its presence within a 'downtown' area.

4.1.1 REVIEW OF URBAN DESIGN PROPOSALS FOR KGH CROSS SECTION

Exhibit 4.1 illustrates two urban design proposals from the Planning/Urban Design consultant, Bing Thom Associates (BTA), from its September 2007 preliminary report. The exhibit shows two concepts for King George Highway and an example of a street that inspired the proposal put forward by BTA.

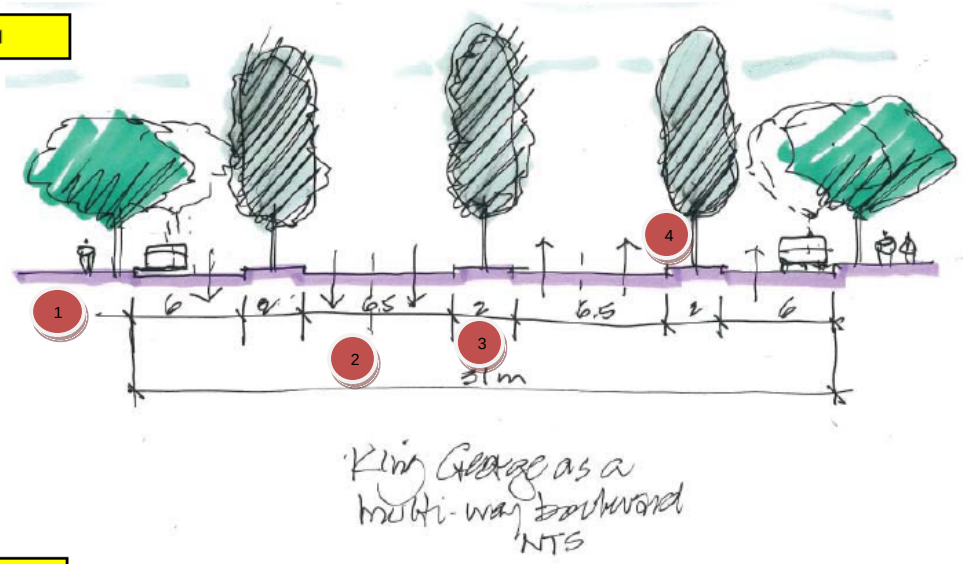
The first concept is a multi-way boulevard where one each of the NB and SB traffic lanes is converted into a parking access roadway behind a landscaped buffer boulevard. Most traffic would be carried on two remaining "through lanes" in each direction. The following comments are specific to the note numbers (in red circles) on the sketch and photos of the multi-way boulevard:

Road Right-of-Way

1. The cross section being proposed shows a width of 31 metres, but in fact the full requirement would be in the order of 38 to 40 metres assuming the existing widths of the east and west side boulevards and sidewalks were maintained in the future. This exceeds the existing Right of Way (ROW) dedication of 32.6 to 32.7 metres typical to KGH from north of the Surrey Central Mall entrance through to 107A Avenue.

Exhibit 4.1: Initial Urban Design Proposal for King George Highway

BTA Section 1



BTA Section 2

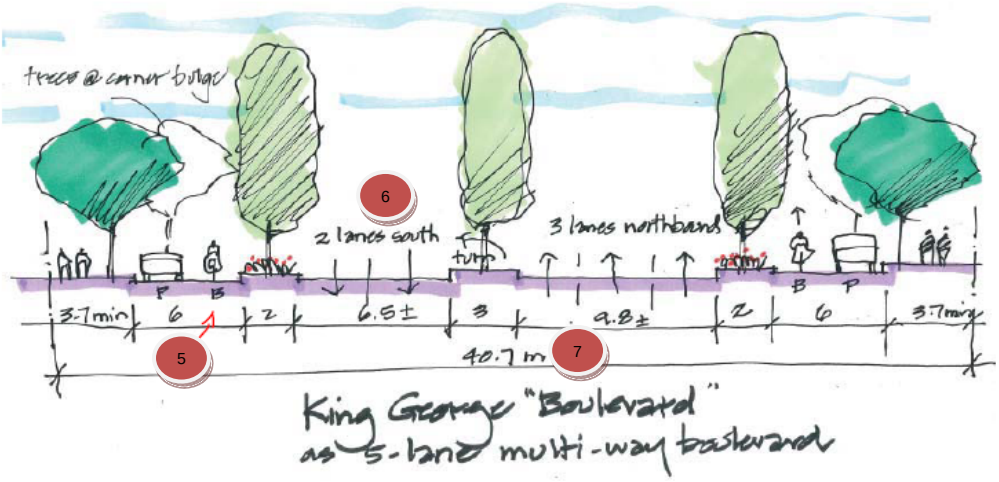
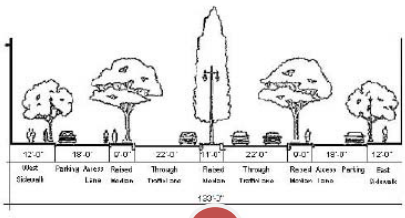


Illustration 2

In San Francisco, a number of elevated freeway structures were sufficiently damaged by the Loma Prieta earthquake and required demolition. The decision was made by the city's supervisors (Council) to restore a grade-level boulevard (Octavia Boulevard), and to add new developed on the excess right of way. (Design by Jacobs & Macdonald / CityWorks.)



Lanes, Capacity and Function

2. The cross section provides only two through lanes of traffic in each direction, and narrows these to 3.25 metres apiece. Given that traffic levels are expected to increase over the next 25 years, this width reduction could cause peak period congestion in excess of what is currently experienced[6]. The current lanes on KGH vary from 3.5 to 3.8 metres, and these are recommended due to the street's role as a major goods movement corridor and its role as a public transit route. Initial review of other truck route alternatives suggests that King George Highway would remain part of the regional strategic truck route network, and while there may be some diversion of trucks when other future road links open, the development of the City Centre will generate local truck traffic as well.

Agreement with City Centre Planning Principles

3. A fundamental principle of the City Centre Plan Update is the development of a finer street grid. This will introduce new intersections along KGH and shorten city blocks. The proposed 2 metre median would work between certain existing intersections with longer distances between crossing streets. However, since in the future KGH would intersect with additional east-west cross streets (resulting in shorter city blocks), the median will nearly always need to be wide enough to accommodate back-to-back left turn lanes at signal locations. A minimum median of 4.5 metres would be recommended so that it can transition to a 3.3m left turn lane plus a 1.2-m raised median.

Transit

4. To promote and support higher transit mode shares in the City Centre, a basic principle of the City Centre Plan would be full accommodation of transit services on all major streets. The proposed 2 metre boulevard between the through traffic lanes and parking access lane would be insufficient for transit stops. New TransLink guidelines for accessible transit stops would require enough room for a shelter plus circulation space between that shelter and the curb for wheelchairs and carriages; this width is at least 3 metres. The location of the boulevard also raises questions as to how a bus stop located there would be accessed safely by passengers; presumably this would have to happen right at intersections and passengers would have to backtrack to the stop.

Pedestrian Environment

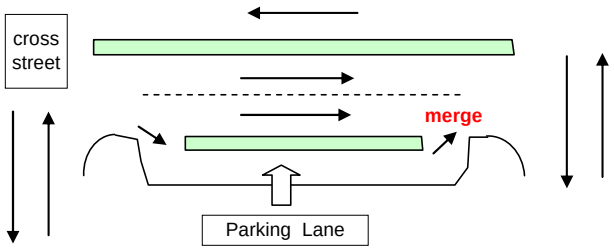
The overall width of the cross section will raise issues for pedestrian crossing times for KGH. Increasing the distance between the outside curbs will require that pedestrian minimum times be increased when setting the traffic signals, which in some locations could have the effect of giving more green time to the cross street than would be warranted by critical traffic volumes (and this is turn would add to signal-related delays along KGH).

Parking/Service Lane

5. Vehicle and bicycles in the access/cycling lane may experience difficulties at the entrances to the through traffic lanes since merging back into traffic will be focused at one location near traffic lights. This could also prompt conflicts with right turning traffic on the main street. The following sketch shows in plan view how the access lane would have to terminate at intersections, with the merge location before the signal being the critical location for conflicts.

[6] The traffic model is currently being calibrated now that base year (2006) Census data has been issued, and running the model with 2031 land use scenarios and transportation networks will provide quantitative input into this discussion.

Exhibit 4.2: Potential Parking/Service Lane Conflicts



The second concept in Exhibit 4.1 is also a multi-way boulevard where one of the SB traffic lanes is converted into a parking access roadway behind a landscaped buffer boulevard, and on the NB the parking access roadway is simply added to three existing through traffic lanes. In addition to the issues discussed above, the following issues are also relevant:

6. There isn't a clear reason why there would be only 2 SB lanes but 3 NB. As noted above, the 3.25 m lane widths are minimal and could result in 'side friction' slowing the street or creating problems with larger trucks.

7. The overall width shown for this concept, including the curb to curb distance and the sidewalks and boulevards, is in fact 42.7 metres. This is wider than nearly all existing sections of KGH except on the approaches to 100 Avenue/Old Yale, and south of 98A Avenue.

The urban design/land use consultant also provided illustrations in support of the multi-way concept, engendering these comments:

8. The illustration of Octavia Boulevard (San Francisco) is an interesting choice. This road carries less traffic than in the past due to removal of the defunct freeway access ramps damaged in the 1989 earthquake, and Van Ness Boulevard, a very wide arterial highway, runs parallel to Octavia only a few streets east. This section of Octavia Boulevard does not have any bus stops, so the design of the median separating the traffic lanes from the local access lane does not have to accommodate bus stop activity. In Surrey, King George Highway south of 102 Avenue does include several transit routes, and in future this could also be a consideration on the northern half of the KGH in the City Centre.

9. The cross section for Octavia Boulevard exceeds available ROW along KGH, except in the southern part of the KGH corridor (see also note 7).

4.1.2 OTHER CROSS SECTION ALTERNATIVES – INITIAL CONCEPTS

This section identifies initial options for dealing with several potential roles for KGH in the City Centre. At this time, these are based on using the existing ROW with limited modifications to the street, thereby focusing on more easily implemented options and maintaining greater flexibility for additional improvement.

Through the planning process, a number of objectives have been identified that need to be accounted for when contemplating the KGH corridor. These relate to its role in moving people and goods, and include:

1) An improved walking environment;

2) A better cycling environment;

3) Safe goods movement;

4) Reliable and efficient operation of transit vehicles;

5) Improved availability of on-street parking supply in support of particular land uses within the City Centre.

Concept Discussion

These objectives and some potential approaches to address them are defined in **Table 4.1**.

Table 4.1: Objectives for Improvement of King George Highway

Objective	Potential Approaches	Comments
Improved Walking Environment	W1. Widen sidewalks to 2.0 m minimum (some are only 1.5)	Sidewalk widening would require either ROW or width taken from the existing boulevards. Widening would be fairly minor partial takes at the edge or property and might be achievable through adoption of City Centre sidewalk standards. Obtaining more public ROW might be advisable as development occurs.
	W2. Introduce on-street off-peak parking as a buffer between moving traffic and the boulevard/sidewalk	Feasibility of off-peak parking depends on traffic operations and volumes (plus the need for transit stops along the curb). Where feasible, this can be introduced in phases in conjunction with development.
	W3. Widen the boulevard to 2.0 metre minimum, creating a buffer from traffic and sufficient space for street trees and/or plantings.	The typical section for the boulevard indicates a standard of 2.0-2.5 metres, but in practice the width is less in several locations. A wider boulevard would be most beneficial in locations near transit stops, since the boulevard becomes the location for the transit stop (and shelter). Meeting a minimum standard for sidewalk width would be based on expected pedestrian volumes (higher in commercial precincts and lower elsewhere); any future ROW widening should consider both sidewalk and boulevard needs.
	W4. Use the median as a pedestrian refuge and for planting of street trees and/or	As a gateway to Surrey, King George Highway could be an appropriate place for special treatments[7] where there is room in the median. The median can also be used to provide

[7] Refer to City of Surrey Arterial Medians Master Plan, 2004.

Objective	Potential Approaches	Comments
	urban design features.	pedestrian crossing points between City blocks until the spacing of signalized cross-streets is 100-120 metres or less.
Cycling Environment	C1. Create cycling lanes in the curb traffic lane, either dedicated 1.5-1.8 metres or shared with traffic 4.3 metres.	Introducing a full cycling lane would require reduction of the central or side boulevards if existing ROW is assumed. Introducing a shared lane would either take away from boulevards or require narrowing of other lanes. Narrower lanes could be created but these would be substandard and not recommended given presence of large trucks.
	C2. Focus cycling activities on parallel streets (such as the Ring Roads and City Parkway) with fewer conflicts from other users.	There are existing bicycle lanes on East Whalley Ring Road (EWRR) that would benefit from repainting and more prominent signage. This facility is part of the proposed cycling network for the City Centre. (These lanes would have to be relocated onto King George Highway if EWRR were made into a major truck route.)
Safe Goods Movement	GM1. Maintain existing routes on King George Highway GM2. Consider diversion of trucks onto other routes.	Through lanes and turn lanes need to be wide enough for design vehicles, e.g. existing standards. *This subject is addressed at length in a separate memorandum.*
Reliable and Efficient Transit Operations	T1. Mostly curb side bus stops and operation in mixed traffic.	For local bus operations, curb side operation is a safe assumption. This reduces locations for curb side parking and has potential conflicts with cyclists.
	T2. Transit priority at [certain] traffic signals.	Signal priority will be under consideration along parts of King George Highway within the City Centre. Depending on how the signal operation is set up, it could also have delay reduction benefits for parallel traffic flows.
	T3. BRT operation with curb side stops, consider bus/HOV lane in peak	Creation of a transit priority lane would likely shift traffic volumes to the other lanes and would preclude curb parking when the transit priority lane is in effect. BRT operation along the curb has conflicts with right turns, and these can be delayed at locations with high pedestrian activity.
	T4. BRT operation in median lanes with median stops	Median lane operation and median stops (platforms) could potential require widening of the street up to 39-40 metres. Width can be optimised by placing platforms in ‘shadow’ of left turn lanes.

Objective	Potential Approaches	Comments
Increased On-Street Parking Supply	P1. Implement curb parking away from transit stops and busy right turn locations, when and where traffic conditions permit and land use warrants. P2. As above, with parking meters (also pay/display or pay-by-phone alternatives).	Curb parking can be feasible during periods of lower traffic, but enforcement is often required to limit the potential for parking outside permitted times and locations. There is some risk of disrupting peak period transit operations (some transit priority schemes involve parking prohibition, at least during peak periods) and other traffic. 'Making parking pay for itself' is one of the objectives identified in the *parking management study*.

Short-Term Recommendation

The existing standard cross section for King George Highway in the City Centre (drawing reference SSD-R.6.2) includes a 33.4-metre right of way. The section includes six travel lanes, the median/left turn lane, and the boulevards and sidewalks. There are small localised variations to this section for KGH between 100 Avenue and 108 Avenue, but these are mostly related to the outside boulevard and sidewalk dimensions.

A near-term solution for King George Highway may be to retain the existing cross section until such time that the ultimate cross sections (see Chapter 6) become feasible. When transit service is increased and additional stops introduced, then these would be accommodated in the outside lanes next to expanded sidewalks. Where bus stops are introduced, the boulevard treatment could be interrupted to install bus shelters and create a paved waiting area for transit passengers. Depending on the future traffic volumes and the level of future transit service on KGH, it may also be feasible to permit off-peak parking in the curb lanes, and possibly regulate this through time limits and pay parking meters.

Longer-Term Considerations

The following issues will be considered as more information becomes available during the course of the study:

- **Growth**. This study will produce estimates of future traffic demand on King George Highway based on several land use scenarios being generated by the City's Planning Department for 2031. Given that KGH is already perceived as a barrier by many community stakeholders, it is highly unlikely that a fourth travel lane would be recommended to accommodate growth in travel demand. Instead, additional demand will be directed towards other travel modes (by providing improvements to walking, cycling and transit – thereby increasing the people moving capacity of the corridor) and some of the residual growth in automobile traffic could use parallel streets to a greater extent since there appears to be spare capacity at this time. One benefit of creating a more complete grid system of streets is that local traffic need not contribute to congestion on the major streets since alternate travel paths would be available.

- **Bus Rapid Transit**. Previous studies have already considered the potential routing of a BRT service through the City Centre along King George Highway, City Parkway and 104 Avenue. The 1999 design (for BC Transit) focused on a median operation on King George Highway. TransLink's 2008 Transportation Plan indicated that a new study of the KGH route would be carried out in partnership with the City, and a second BRT route was proposed for Fraser Highway that would overlap part of the KGH route. The ultimate design for BRT will have to

consider whether to use exclusive bus lanes, where to place those lanes, location and access to platforms, traffic signal priority, and impacts to other road users.

While this outside study has not been initiated, it would still be worthwhile to obtain input from TransLink (and feedback from City of Surrey staff) as to the range of cross section and operational alternatives that might be under consideration so that we can represent at least one likely outcome in our modeling work, and not preclude any reasonable options from future consideration.

4.2 Truck Route Alternatives

This section presents an initial analysis of existing and potential future trucking patterns in the City Centre, and includes descriptions and evaluation of several truck route alternatives to King George Highway. The 1991 Surrey City Centre Plan noted that the future vision for truck traffic was a diversion of trucks away from King George Highway onto the inner and outer ring road systems and the South Fraser Perimeter Road.

4.2.1 TRUCK VOLUMES AND TRAVEL PATTERNS

Existing Volumes

Table 4.2 presents estimates of the truck traffic at critical intersections along King George Highway (KGH) in 2007. Seven-hour counts from July and August 2007 were used to derive the percentages of trucks approaching the major intersections and this was applied to estimates of Average Daily Traffic as provided by the Engineering Department.

Table 4.2: Estimated Truck Volumes on KGH (2008)

Location	KGH @ 108					
	Approach – all Vehicles (7 hours)	Trucks (7 hours)	% Truck	2-Way (7 Hours)	24-Hour	**Truck 24 Hr (Approaching)**
N	7,355	597	8.1%	14,100	39,700	1,700
E	4,760	307	6.4%	9,300	25,000	800
S	6,208	476	7.7%	12,500	31,400	1,200
W	3,209	75	2.3%	6,400	14,300	200

Location	KGH @ 104					
	All Veh_7	Truck_7	% Truck	2-Way	24-Hour	**Truck 24 Hr**
N	7,235	573	7.9%	13,900	31,400	1,300
E	4,847	450	9.3%	10,000	28,600	1,300
S	7,506	317	4.2%	14,000	38,900	900
W	4,854	146	3.0%	8,800	18,500	300

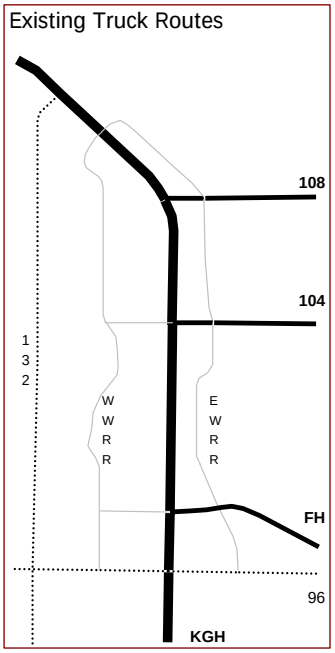
Location	KGH @ Fraser Hwy					
	All Veh_7	Truck_7	% Truck	2-Way	24-Hour	**Truck 24 Hr**
N	8,918	446	5.0%	19,300	44,600	1,000
E	3,002	208	6.9%	5,500	11,800	400
S	9,824	451	4.6%	19,000	44,600	1,100
W	1,642	158	9.6%	2,900	4,700	300

Existing Patterns

The primary movement of trucks along King George Highway is straight through in the north-south direction. A significant percentage of southbound trucks turn east onto each of 108 Avenue, 104 Avenue and Fraser Highway (and westbound trucks on those streets primarily turn north onto KGH), since each of these is a truck route. This pattern is illustrated by the figure, on which the dark lines indicate the major movements of trucks.

Trucks currently using King George Highway include a mix of locally-destined deliveries and through traffic heading toward other parts of Surrey, or through to Highway 99 and the US Border. The traffic turning onto the east-west truck routes would be headed for Guildford or connecting to the Trans Canada Highway. None of these trucks would be using the Pattullo Bridge and KGH to bypass the weigh scales[8]; it is much more likely that travel time or local destinations are the key considerations.

In the future, there may be some diversion of traffic off King George Highway due to the Port Mann Bridge Project (which will replace or twin the current bridge) and the construction of the South Fraser Perimeter Road (SFPR), as those projects would offer some travel time advantages to pass-through trucks crossing the Fraser River. Overall traffic forecasts suggests that vehicle volumes going east-west on 104 and 96 Avenues would undergo modest increases due to vehicle accessing the SFPR west of Surrey Centre and the Port Mann Bridge by driving through Guildford.

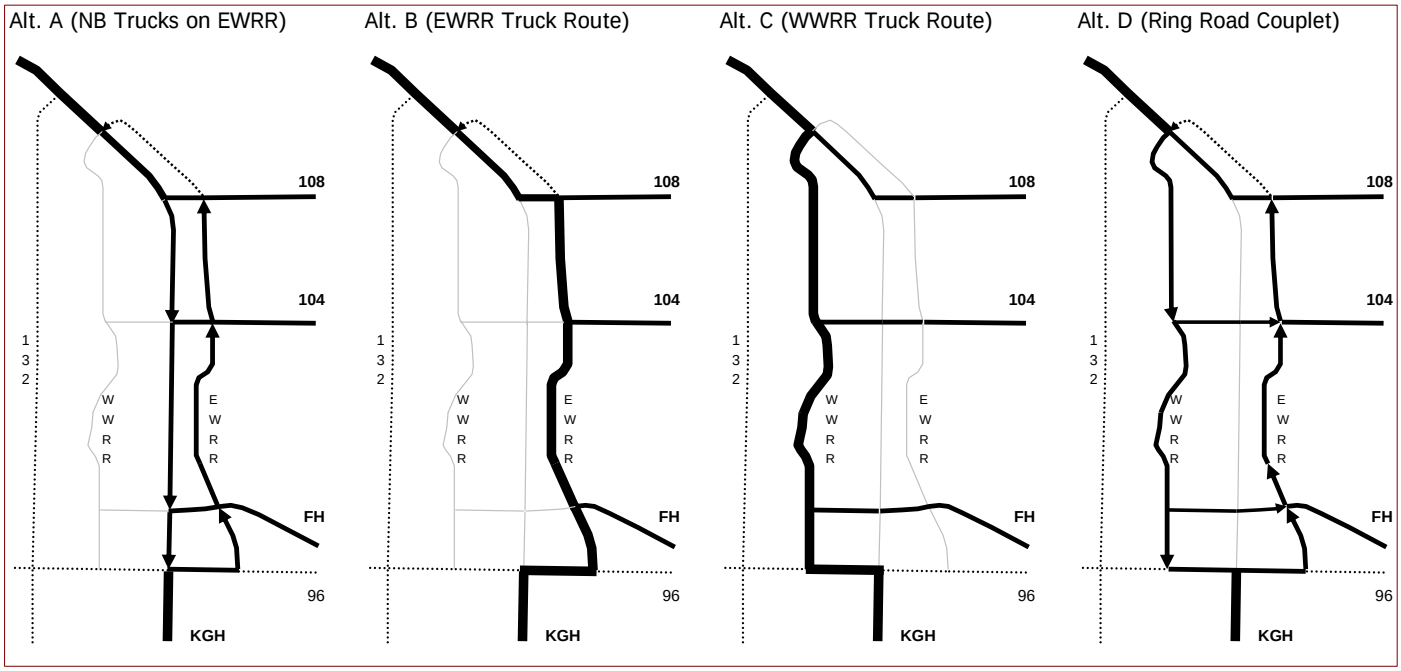


4.2.2 TRUCK ROUTE DIVERSION ALTERNATIVES

Truck route diversions are being investigated to help decide the roles of King George Highway, the Ring Roads, and other streets in the City Centre. The four alternatives shown on these schematics **(Exhibit 4.2)** represent a range of potential routes, and each makes use of one or both Ring Roads to divert some (or most) truck traffic from King George Highway between 108 and 96 Avenues.

[8] The current eastbound weigh scale is east of the Highway 1/104 Avenue interchange and would not be bypassed by using that route, and the westbound weigh scale is just west of Highway 15 in eastern Surrey.

Exhibit 4.2: Initial Set of Truck Route Alternatives to KGH



Analysis

Table 4.3 presents an analysis of these alternative routes and the highlights are depicted on six conceptual maps (Exhibits 4.3.1 through 4.3.6). These present the existing condition and volumes of trucks in the City Centre, and then compare the benefits and impacts of keeping the existing routes versus the four diversion alternatives. The analysis considers truck movements, street requirements, traffic operations, on-street parking, property access, cyclists, pedestrians, BRT and bus transit, surrounding land uses, environmental concerns, and special issues. The movements of trucks and main issues related to the existing truck routes and diversion alternatives are indicated on the maps.

Initial Summary

Based on the initial analysis, the most promising options appeared to be:

- No Change from Existing;
- Alternative A – Diversion of northbound trucks onto East Whalley Ring Road; and
- Alternative B – Diversion of NB and SB trucks onto East Whalley Ring Road.

The two alternatives (A and B) here both reallocate some of the current impacts on King George Highway onto the East Whalley Ring Road instead, which may or may not be acceptable or practical. Making no change from the existing routes keeps trucks on the largest streets in the area, but it also maintains some existing conflicts that are likely to become more frequent as the area develops.

The other two alternatives (C and D) have a greater number of potential conflicts with existing and planned developments without offering any substantial benefits, other than making some use of capacity on West Whalley Ring Road.

4.2.3 TRUCK ROUTES - FUTURE DIRECTIONS

Given that the diversion of trucks onto East Whalley Ring Road did not seem to offer a net improvement, and since it was not particularly compatible with the land use vision for that corridor, that original set of alternative routes was dropped from further consideration.

Instead, King George Highway (KGH) was recommended for retention as the primary route, with the other existing truck routes also kept on the truck network. In particular, 132nd Street is planned over the long term to be widened by two lanes, which would make it more attractive as a route for north-south bypass traffic, including trucks. As the City Centre land on either side of KGH is redeveloped, there will be additional local traffic, and the creation of a finer-grained local street network will result in several new traffic signals. Alternative north-south routes such as 132 St will become more attractive to goods movement as travel time becomes more competitive, given that intensity of development and density of traffic signals would be lower than along KGH.

Similarly, on the east side of the study area, 140th Street is planned to be widened south of 108th Avenue. Particularly during off-peak periods, this will offer some spare road capacity and provide an alternative to trucks travelling through the City Centre where they can avoid the central part of King George Highway. 140th street may become particularly attractive to trucks that currently use KGH and 104th Avenue or Fraser Highway.

Therefore, 140th Street between 96th Avenue and 108th Avenue has been recommended for promotion as a truck route. Extension of this route to ultimately connect back to King George highway, via Grosvenor, 112 Avenue and the future 132 Street diversion, is also under consideration. (This will depend on how attractive the route might become in future compared to continuing use of 108th Avenue and KGH, and on compatibility with neighbouring land uses as these evolve over time.)

These conclusions are incorporated within the goods movement recommendations in Chapter 5.

Table 4.3: Evaluation of Truck Route Alternatives to KGH

Category	No Change (Existing Routes)	Alternative A	Alternative B	Alternative C	Alternative D
DESCRIPTION (See also the attached set of maps)	Northbound and southbound trucks focused on King George Highway (KGH)	Southbound trucks remain on KGH Northbound trucks diverted onto East Whalley Ring Road (EWRR)	Northbound and southbound trucks diverted onto East Whalley Ring Road (EWRR) between 108 and 96 Avenues	Northbound and southbound trucks diverted onto West Whalley Ring Road (WWRR) between 108 and 96 Avenues	Northbound trucks diverted onto East Whalley Ring Road (EWRR); southbound onto West Whalley Ring Road
TRUCK MOVEMENTS (Also affects fuel consumption) ***Scoring System:*** 1 = Most Improved 3 = Neutral 5 = Most Impacts/ Costs	Mostly north-south with significant SBL and WBR truck flows at 108 Avenue, 104 Avenue and Fraser Highway	Southbound plus SBL turns at 108, 104 and Fraser remain on KGH Northbound on EWRR – requires a NBR at 96 Ave and a EBL turn onto EWRR (NB becomes a longer trip than currently with 3-4 extra turns)	SBL and possibly WBR turns at KGH/108 NB, WBR, SB and SBL movements on EWRR SBR and WBL from EWRR back onto KGH; NBR and EBL from KGH onto EWRR (NB and SB become longer trips with 4 extra turns)	SBL and possibly WBR turns at KGH/108 NB, WBR, SB and SBL movements on WWRR SBL and EBR from WWRR back onto KGH; NBL and WBR from KGH onto 134/WWRR E/W on 104 and Fraser across KGH (NB and SB become slightly longer and 3 extra turns; longest path for KGH to/from E-W trucks)	Southbound on WWRR – requires a SBL and EBR from WWRR/134 onto 96 and then KGH Northbound on EWRR – requires a NBR at 96 Ave and a EBL turn onto EWRR EB on 104 and Fraser across KGH (NB and SB become slightly longer and 3-4 extra turns)
	3	4	4	5	4
STREET REQUIREMENTS	No change from existing street network	Extension of EWRR south of Fraser Highway Completion of EWRR N of 108 via Hilton Rd	Extension of EWRR south of Fraser Highway Completion of EWRR N of 108 via Hilton Rd *(Same as A)*	Construction of WWRR through west side of Holland Park	Extension of EWRR south of Fraser Highway Completion of EWRR N of 108 via Hilton Rd Construction of WWRR through west side of Holland Park *(Same as A/B + C)*
	3	4	4	4	5

Table 4.3: Evaluation of Truck Route Alternatives to KGH

Category	No Change (Existing Routes)	Alternative A	Alternative B	Alternative C	Alternative D
TRAFFIC OPERATIONS	Introduction of BRT (potentially dedicated lanes) on KGH south of 102 Avenue	Impact of NB truck traffic displaced from KGH onto EWRR EBL from 96 Avenue onto EWRR – may need more signal time Some NB non-truck traffic may shift to KGH	Impact of NB & SB truck traffic displaced from KGH onto EWRR EBL from 96 Avenue onto EWRR & WBL from 96 onto KGH – may need more signal time Some NB&SB non-truck traffic may shift to KGH	Traffic volumes on WWRR are lightest of three streets, and capacity is greater than EWRR (but 134 St S of Holland Park is quite narrow) More LT time may be needed at KGH/96 and WWRR/KGH	Impact of truck traffic displaced from KGH onto Ring Roads, except at 104 and Fraser where it crosses (less impact than currently) EBL from 96 Avenue onto EWRR – may need more signal time
	3	4	5	4	4
ON-STREET PARKING	No change. Limited on-street parking may be introduced in curb lane	Some NB on-street parking on EWRR may be displaced	Some NB & SB on-street parking on EWRR may be displaced	Could be some displacement of on-street spaces from WWRR and NB 134 St	Some NB on-street parking on EWRR may be displaced
	2	3	4	5	4
PROPERTY ACCESS	Preference will be for access off minor streets and lanes	Increased traffic due to trucks may make left turns into driveways unsafe, and access could be restricted to signal locations	Increased NB/SB traffic due to trucks may make left turns into driveways unsafe, and access could be restricted to signal locations	Most property access along WWRR is from side streets, except along existing 134 St.	Increased traffic due to trucks may make left turns into driveways unsafe, and access could be restricted to signal locations
	2	4	4	3	4
CYCLISTS	Bike lanes on KGH south of Fraser Hwy, not v. compatible with truck traffic	Bike lanes currently on EWRR – at minimum, NB lane would be incompatible with trucks and should be moved; only existing parallel through street is KGH.	Bike lanes currently on EWRR – both lanes would be incompatible with trucks and should be moved; only existing parallel through street is KGH.	E/W truck traffic on 104 across City Parkway introduces new conflict Shared lane bike route on WWRR not compatible with truck traffic	EB truck traffic on 104 across City Parkway introduces new conflict NB bike lane on EWRR and SB bike shared lane on WWRR displaced by truck activity
	3	4	4	5	5

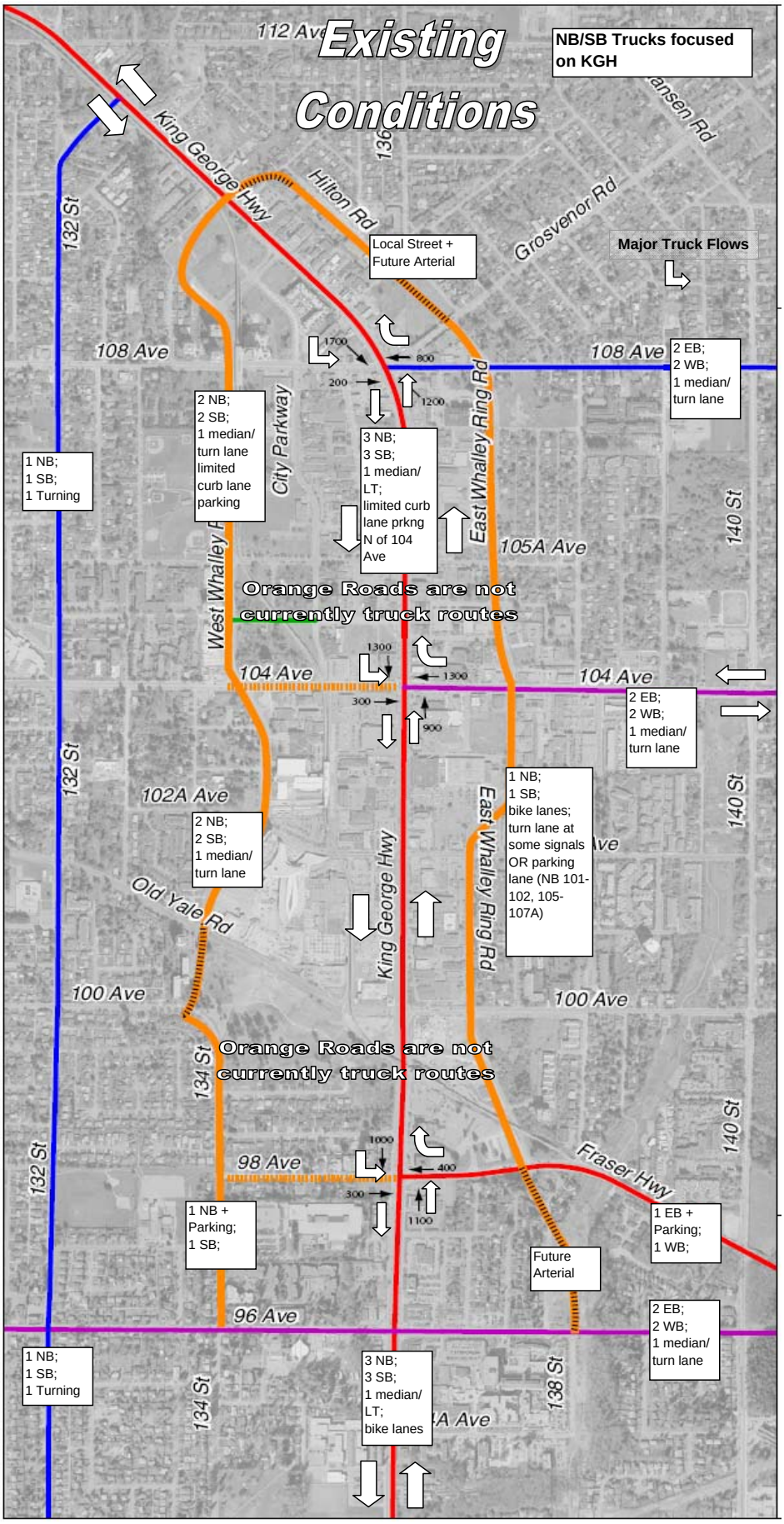
Table 4.3: Evaluation of Truck Route Alternatives to KGH

Category	No Change (Existing Routes)	Alternative A	Alternative B	Alternative C	Alternative D
PEDESTRIANS	Right turn conflicts with crossing pedestrians at 104/KGH, 108/KGH	Crossings of KGH may be slightly safer/more comfortable with removal of WBR turn conflicts and no NB truck traffic	Crossings of KGH would be safer/more comfortable with removal of trucks	Crossings of KGH would be safer/more comfortable with removal of trucks – but this benefit would be less on 104 Ave and Fraser Highway due to E/W truck flows East/west trucks on 104 introduce conflicts north of Transit Village	Crossings of KGH would be safer/more comfortable with removal of trucks – but this benefit would be less on 104 Ave and Fraser Highway due to EB truck flows EB trucks on 104 introduce conflicts north of Transit Village
	3	2	1	4	3
BUS TRANSIT (Including Future BRT)	Local service on KGH south of 102 Avenue, crossing service on 104, 108 Avenue Future BRT south of 102	Reduction in conflicts with trucks in NB direction (but SB and SBL conflicts remain)	Reduction in conflicts with trucks in both directions S of 108 Avenue	Reduction in conflicts with trucks in both directions S of 108 Avenue – except at major street crossings (104 Avenue, Fraser Hwy)	Reduction in conflicts with trucks in both directions S of 108 Avenue – except at major street crossings (104 Avenue, Fraser Hwy)
	4	2	1	3	3
SURROUNDING LAND USE	Currently highway and community commercial, with limited office, some residential N of 108 Avenue	EWRR – currently auto-oriented commercial S of 108 Future extension N of 108 enters residential/park district	EWRR – currently auto-oriented commercial S of 108 Future extension N of 108 enters residential/park district	WWRR – residential, commercial and office along corridor; park/recreation uses	WWRR – residential, commercial and office along corridor; park/recreation uses EWRR – currently auto-oriented commercial S of 108 Future extension N of 108 enters residential/park district
	3	3	3	4	4

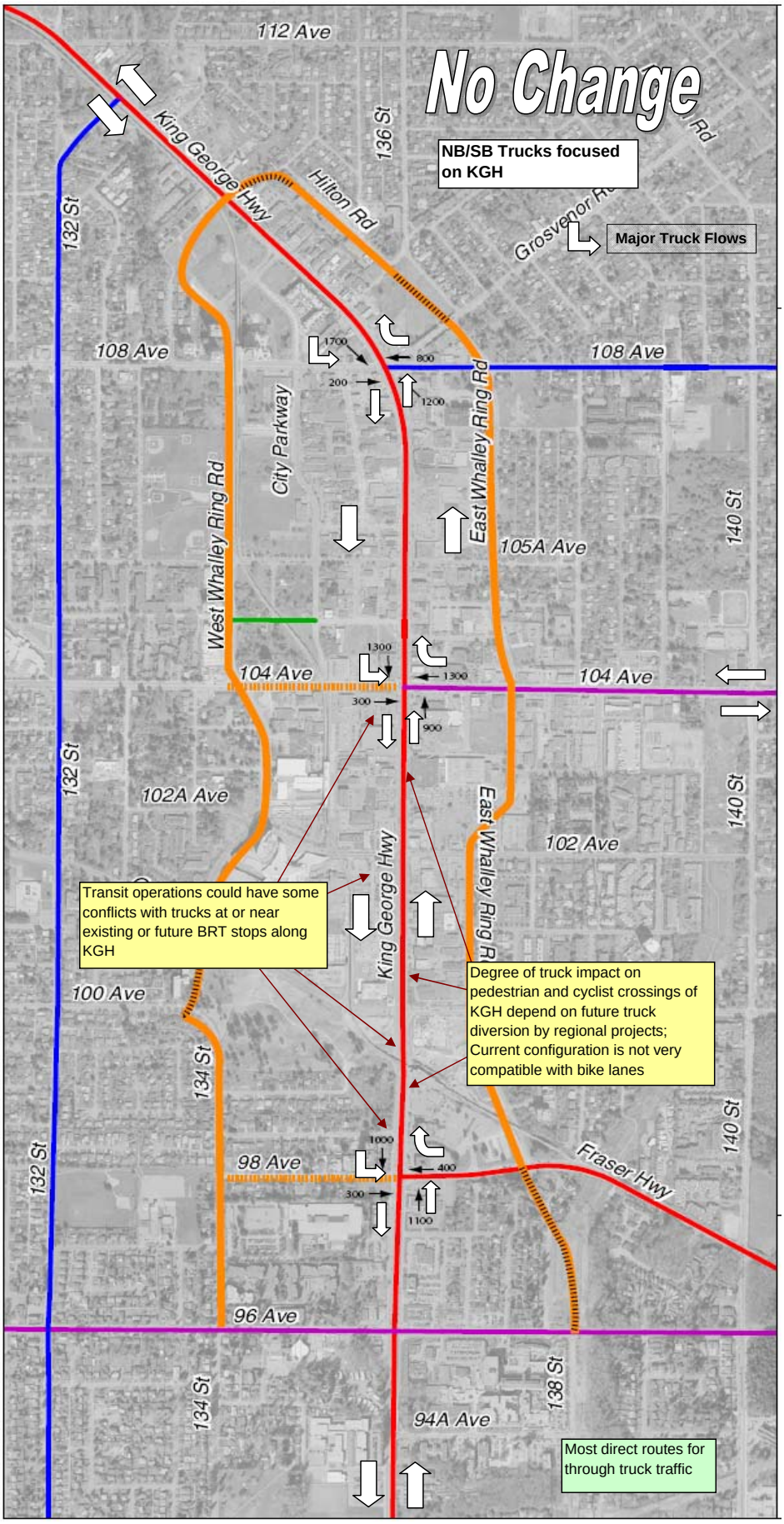
Table 4.3: Evaluation of Truck Route Alternatives to KGH

Category	No Change (Existing Routes)	Alternative A	Alternative B	Alternative C	Alternative D
ENVIRONMENTAL IMPACTS (Air Pollution)	No change from existing	Local Air Impacts: Left turning trucks at 96/EWRR; Trucks in residential area on EWRR N of 108	Local Air Impacts: Additional left turning trucks at 96/EWRR, 96/KGH, 108/KGH; Trucks in residential area on EWRR N of 108	Local Air Impacts: Left turning trucks at WWRR/KGH NB, 96/134 and 96/KGH; Trucks near residential areas on WWRR and 134	Local Air Impacts: *Combination of Alt. A and Alt. C, dispersed but affecting double the locations*
	3	4	5	5	5
CRITICAL LOCATIONS	N/A	Left turning trucks at 96/EWRR and right turning trucks at KGH/96 in conflict with pedestrians accessing Surrey Memorial Hospital	Left/right turning trucks at 96/EWRR and at KGH/96 in conflict with pedestrians accessing Surrey Memorial Hospital	Pedestrian, cyclist and other recreation user conflicts at Holland Park and Tom Binnie (trucks in both directions)	Left turning trucks at 96/EWRR and right turning trucks at KGH/96 in conflict with pedestrians accessing Surrey Memorial Hospital Pedestrian, cyclist and other recreation user conflicts at Holland Park and Tom Binnie (trucks in one direction)
	3	4	4	4	5
OVERALL ASSESSMENT (& Total Scores)	No change in truck routes; impacts and benefits would be related to other area improvements	Modest improvements to KGH offset by potential impacts along EWRR, near hospital, and some increased travel times	Most improvement to KGH but travel time and local impacts would also be somewhat greater than Alt. A	Would increase all truck travel times and move some conflicts with other users from KGH onto another street	Would increase many truck travel times and move some conflicts to Ring Roads
	32 LOWEST = LIKELY BEST	**38**	**39**	**46** NOT RECOMMENDED	**46** NOT RECOMMENDED

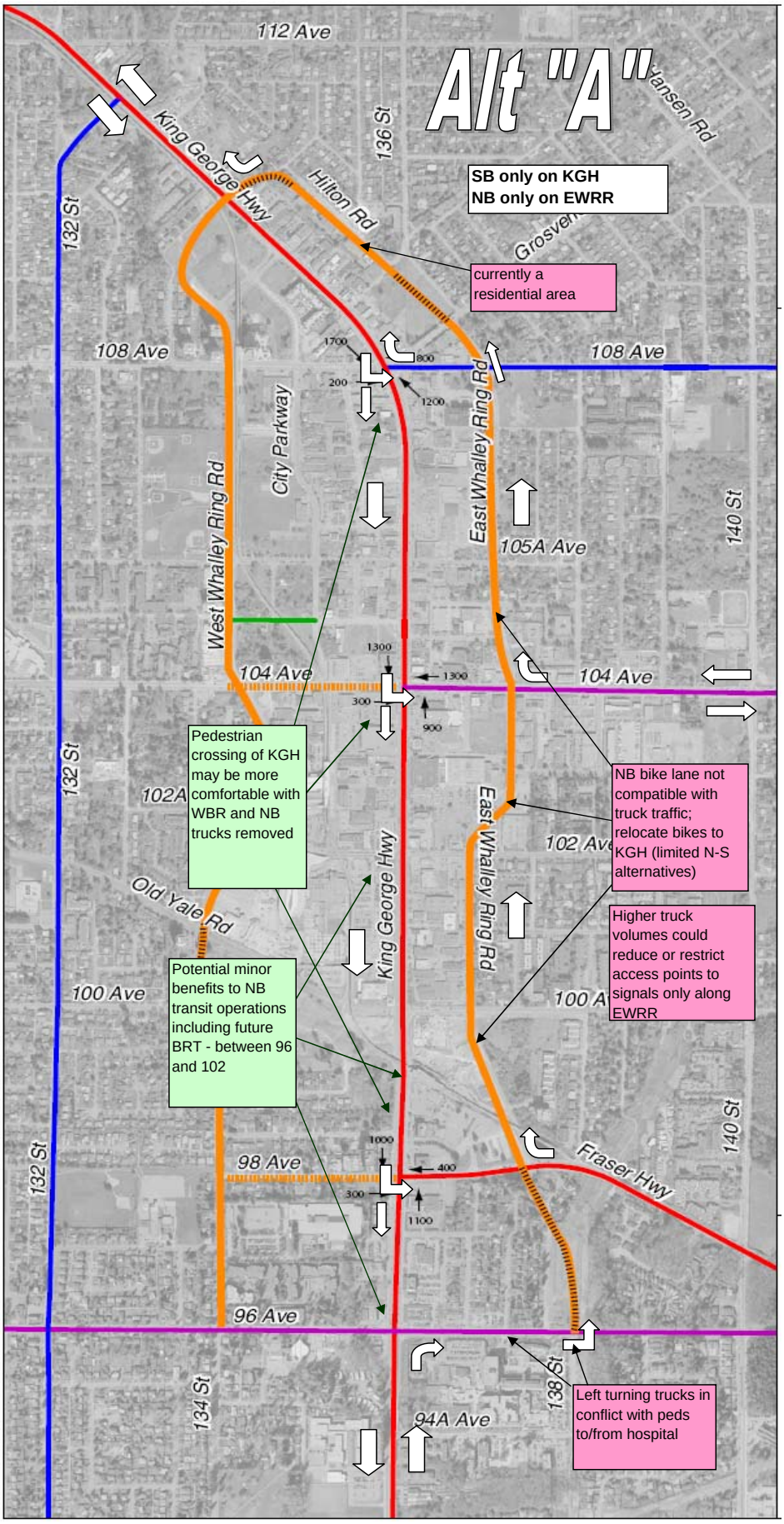
Truck Routes and Proposed Diversions



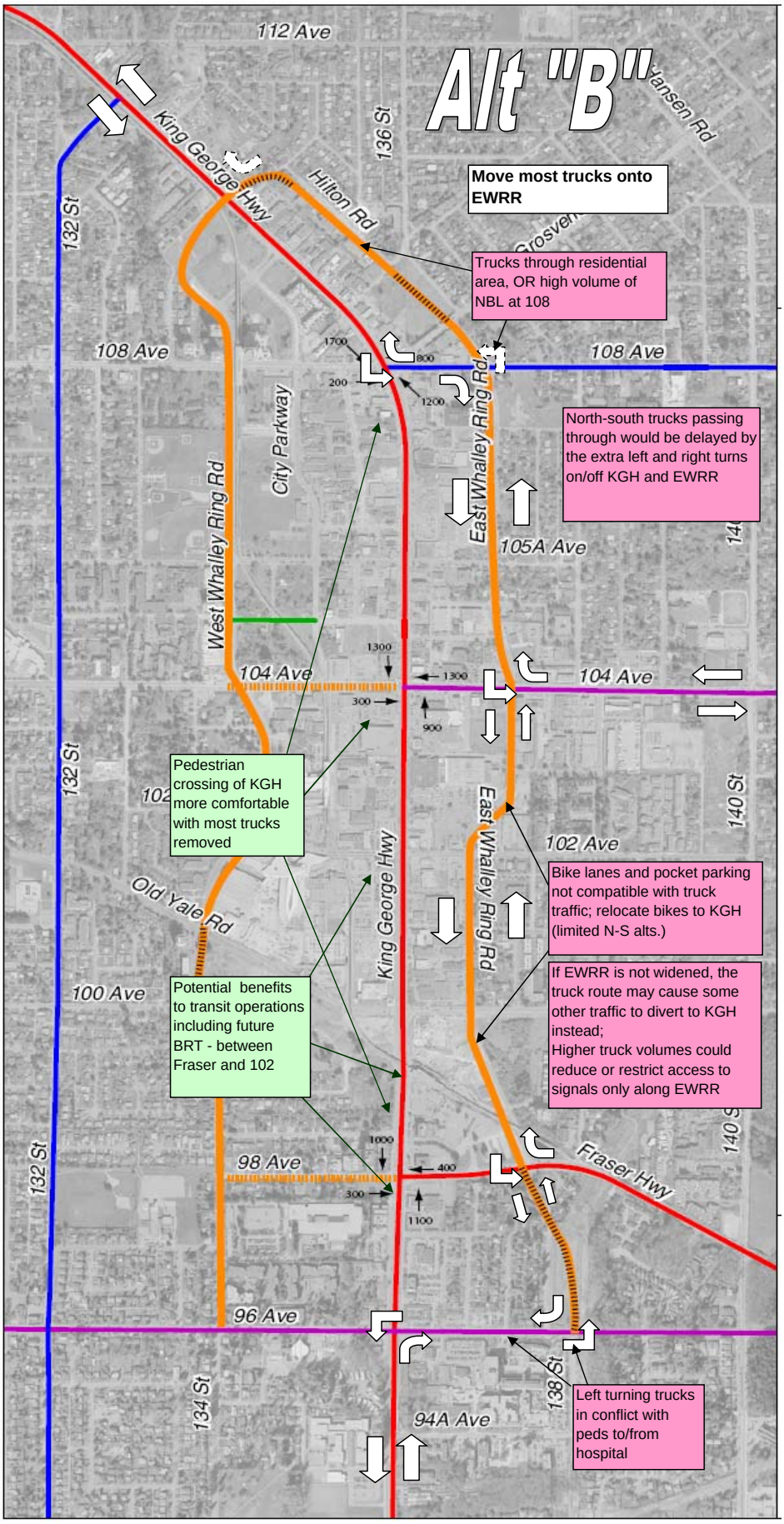
Truck Routes and Proposed Diversions



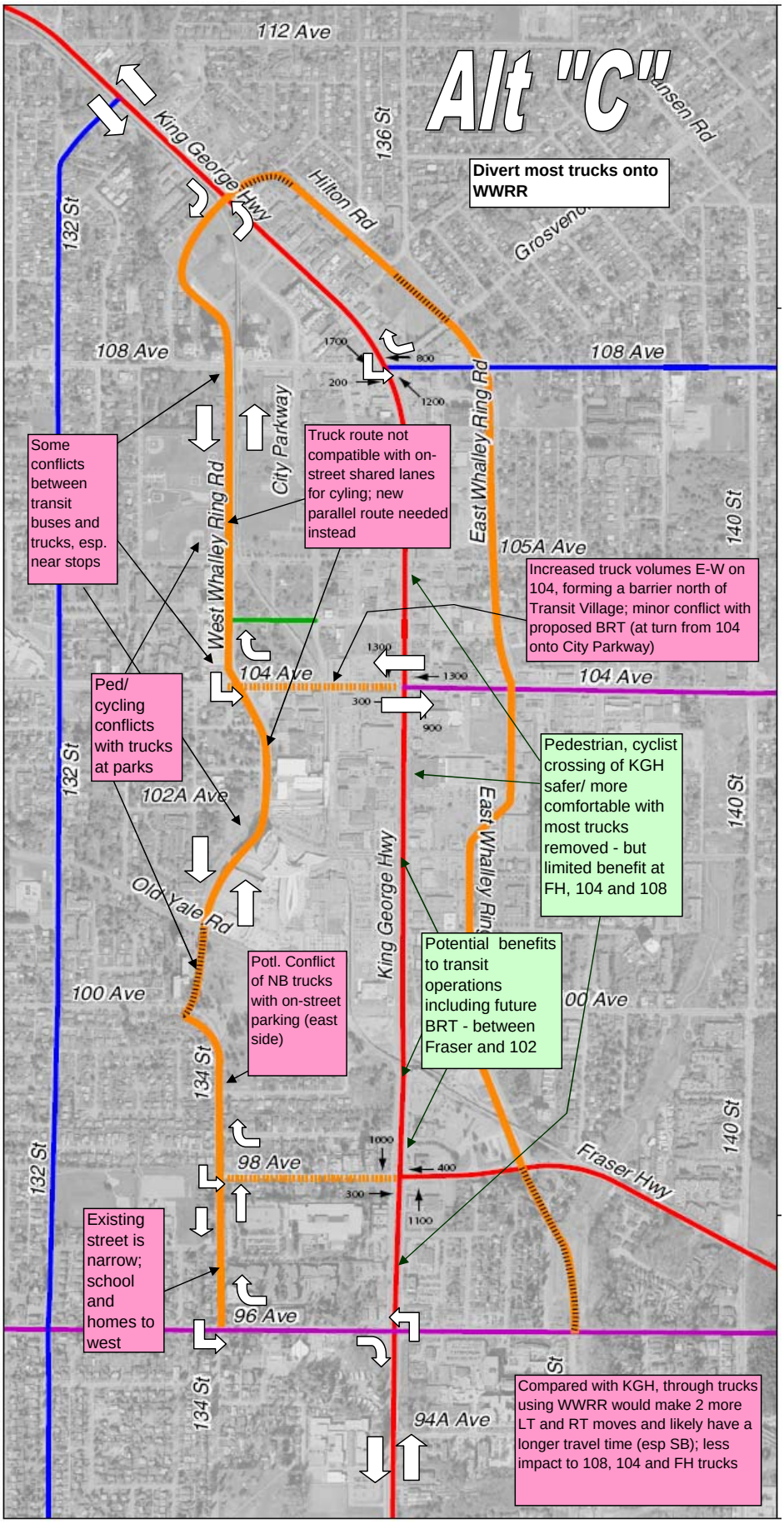
Truck Routes and Proposed Diversions



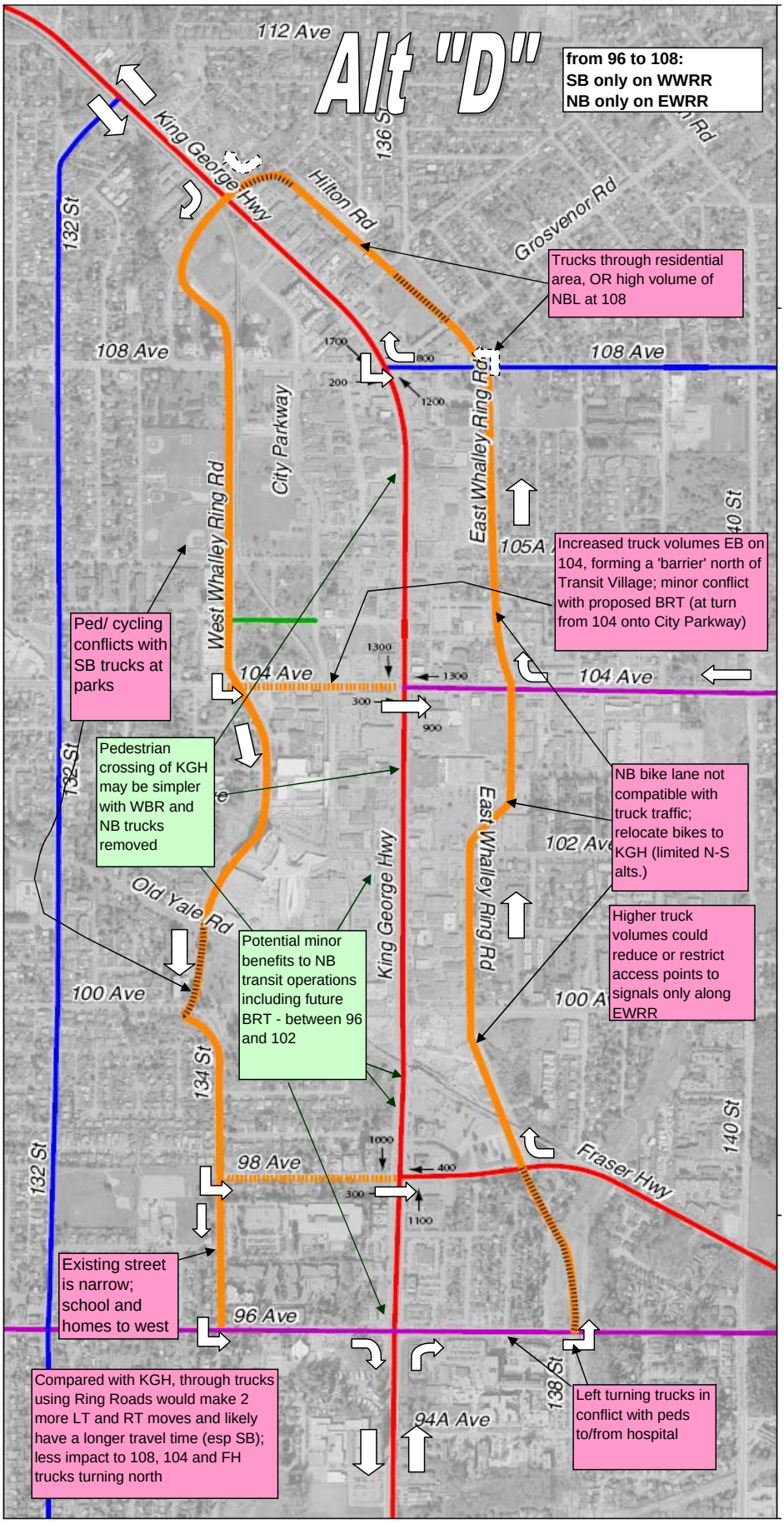
Truck Routes and Proposed Diversions



Truck Routes and Proposed Diversions



Truck Routes and Proposed Diversions



4.3 Roundabouts

This section presents a high-level analysis of the pros and cons of introducing an urban roundabout along King George Highway (KGH) within Surrey City Centre. This idea was presented as an urban design concept by the land use consultant (September 2007), including a proposal to convert the intersection of KGH and 108 Avenue to a large roundabout with a gateway monument contained within the central circle. This memo considers this location as a starting point for a conceptual design and then addresses the general qualitative issues related to roundabouts for this type of application.

Overall, installing an urban roundabout on King George Highway was **not recommended** by this study.

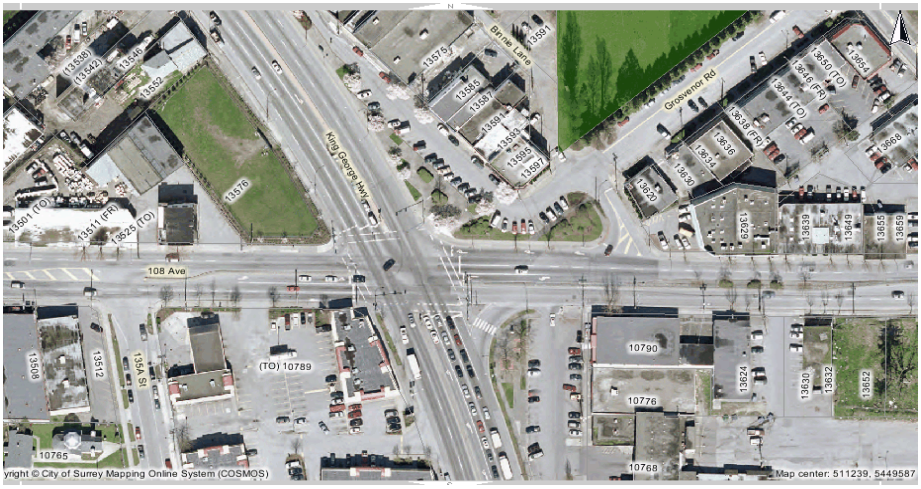
4.3.1 CONCEPTUAL DESIGN FOR KGH/108 ROUNDABOUT OPTION

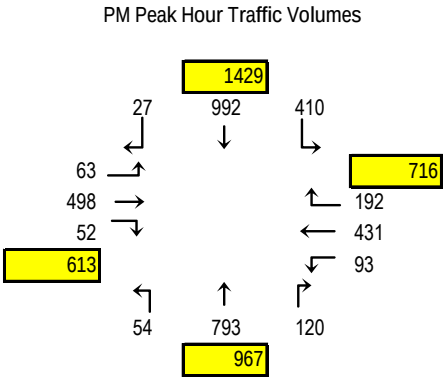
Background – Existing Conditions

The existing intersection at King George Highway and 108 Avenue is depicted in **Exhibit 4.4**, along with traffic volumes during the critical PM peak hour.

King George Highway has three northbound and southbound traffic lanes through this section, plus dedicated left turn lanes and a right turn channel in the northbound direction. 108 Avenue features two through lanes in each direction, left turn lanes, and a westbound right turn pocket. King George Highway carries approximately 64% of the daily (and peak hour) traffic through this location. Daily traffic through the intersection is approximately 55,000 vehicles, and growing. Approximately 7% of this traffic is trucks, not surprising given than both streets are designated truck routes.

Exhibit 4.4: King George Highway at 108 Avenue

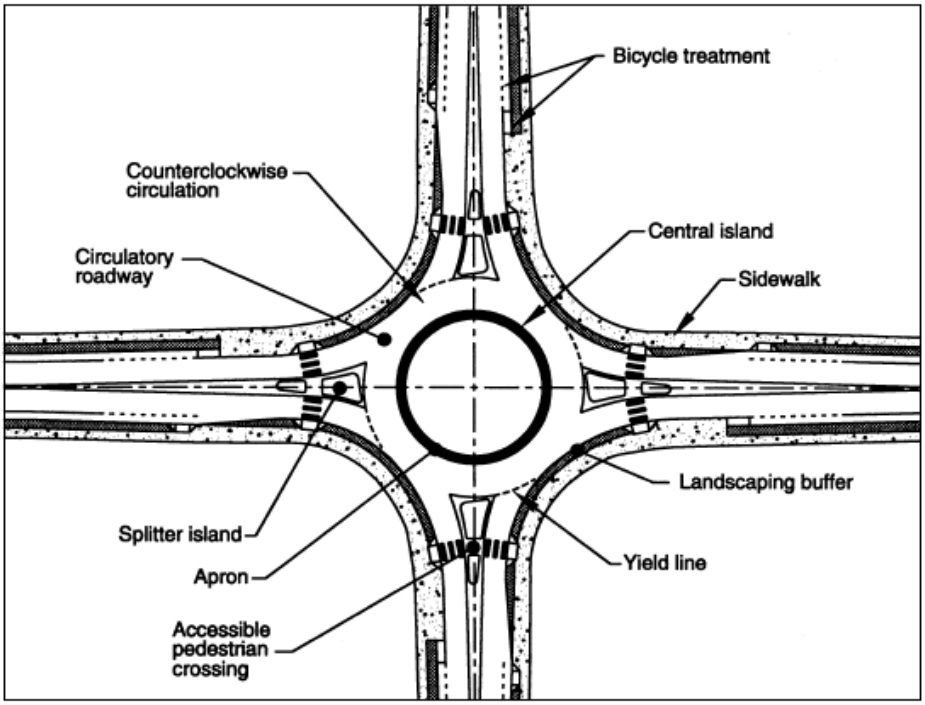




Roundabout Characteristics and Design Guidelines

Before developing a functional roundabout concept for this location, it is useful to introduce a few basic characteristics of roundabouts to the reader. **Exhibit 4.5**[9] shows key elements of a typical urban installation.

Exhibit 4.5: Typical Elements of an Urban Roundabout



Within a North American street system, this roundabout would function as follows:

- Automobile traffic would approach the roundabout and pass to the right of the splitter island. The island is configured to deflect the entering traffic into the appropriate lanes in the circulatory roadway. To make right turns, through movements, or left turns, the automobile proceeds counter-clockwise along the roadway through to the first, second or third possible exit point. The diagram shows a yield line for entering traffic; at higher volume roundabouts signals and stop bars could be necessary.

- Heavy commercial vehicles and buses would do the same, but their presence requires that the central island be sufficiently large to provide a safe turning radius all the way around the island. The apron is provided due to the overhang between the wheel bases of large vehicles as they circulate around the island.

- Pedestrians would cross the street at the designated crosswalk locations, which are set back from the circulatory roadway and cut through the splitter island.

- At higher volume intersections, bicycle lanes (or curb lane space for bicycles) would terminate before the roundabout and merge with a wider sidewalk. Cyclists would have to use the same

[9]Figure excerpted from ***Roundabouts – An Informational Guide.*** Federal Highway Administration, June 2000.

crossings as pedestrians, and the openings in the splitter islands would have to be sized accordingly.

Within British Columbia, there are very few large roundabouts in place, but one notable example is found within the City of Surrey at the 8th Avenue interchange with Highway 99. (This is consistent with the Ministry of Transportation's policy to consider roundabout design options for interchanges.) However, within urban areas in BC most roundabouts are small traffic circles, a form of traffic calming used at a local and collector street intersections. Given the lack of urban arterial applications in BC, a literature review of roundabout design documents and public presentations from North America, the United Kingdom, and elsewhere was carried out to develop an understanding of guidelines and issues related to high-volume arterial roundabouts.

These include the following:

- Much of the literature focuses on single-lane and double-lane roundabouts. The typical daily volume handled by double lane roundabouts is 40,000 to 50,000 vehicles per day, somewhat less than the current traffic on KGH, which is expected to increase over the next 25 years. This suggests that a two or three lane roundabout would be required to handle the traffic volume at this location.

- The roundabout needs to have as many circulatory lanes as the widest entrance from the approaching roads, which in this case is a three-lane approach.

- Double-lane roundabouts that can accommodate large commercial vehicles (design vehicle WB-20) are up to 60 metres in diameter with lanes of 4.4 to 5.0 metres (each lane) in the roadway.

- Multilane roundabouts tend to operate up to 40 km/h.

- If unsignalized, the traffic at each approach would yield to vehicles already in the circulatory roadway. This tends to favour approaches with lower traffic volumes and could increase delays to higher volume streets.

Functional Design

Given these guidelines and the traffic conditions, a roundabout at KGH/108 would have the following functional requirements:

- Due to the imbalance between traffic flows on King George Highway and 108 Avenue, the roundabout entrances would have to be signalized to give greater priority to traffic on KGH. Otherwise, delays would increase for a majority if traffic and the overall level of service would decline from the current (conventional intersection) design.

- The circulatory roadway for the traffic circle would retain three lanes, in order to be consistent with the cross section of King George Highway.

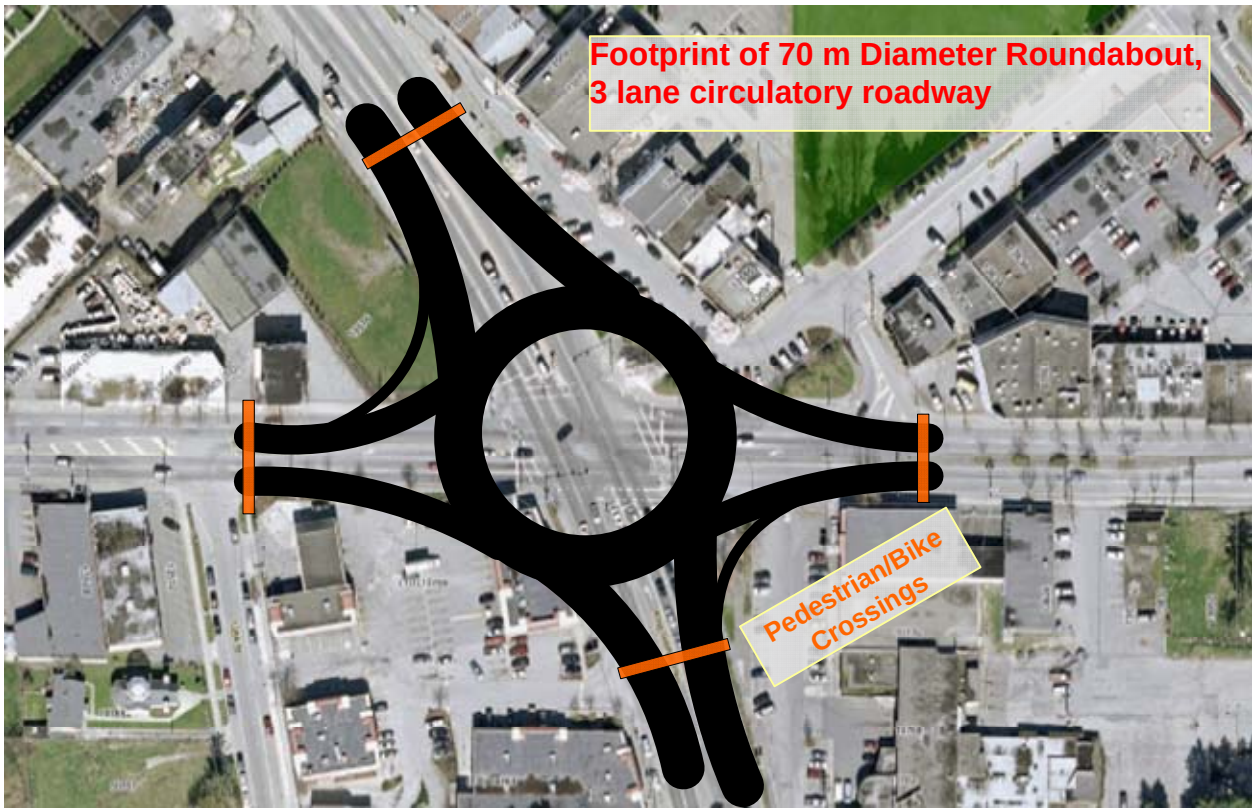
- Given the presence of heavy trucks, the size of the roundabout should meet requirements for WB-20 design vehicles. The inscribed diameter of a two-lane roundabout is recommended at 60 metres in the literature, with lane widths of 4.5 to 5.0 to allow for turning. Allowing 70 metres diameter for a three-lane roundabout should be sufficient for conceptual design purposes.

- Since KGH and 108 do not meet at a 90-degree angle, right turn bypass channels for southbound and northbound right movements would be used to avoid forcing vehicles into close back-to-back curves at the adjacent entrances and exits (NB entrance/EB exit; SB entrance/WB exit).

- Right of way would be required on all four corners of the KGH/108 intersection to accommodate this roundabout.

Exhibit 4.6 presents a roundabout design sketch illustrating the approximate footprint for this roundabout. This is a rough design to show the relationship between the circulatory roadway, approaches, and pedestrian/bike crossings. It also shows the potential for right of way impacts.

Exhibit 4.6: Roundabout Example for KGH/108 Intersection



4.3.2 ADVANTAGES/DISADVANTAGES OF ROUNDABOUTS – OTHER MOBILITY CONSIDERATIONS

This section outlines some of the pros and cons of roundabouts (in addition to the potential costs and right of way needs), focusing on the benefits and impacts of a multi-lane signalised installation.

Walking Environment

- (+) The splitter island acts as a pedestrian refuge and it allows people crossing to focus on one stream of traffic at a time, enhancing safety. Conflicting traffic can only come from a single direction – the entering or exiting lane. (This is similar and likely safer than the effect of median islands on higher traffic volume crossings)

- (+) If the roundabout has the effect of slowing through traffic, this could decrease the average severity and frequency of pedestrian accidents. (On higher volume streets, this would have to be supplemented by traffic signals to maintain level of service and safety for pedestrians).

- (-) If the exit traffic is fairly steady, a pedestrian could be discouraged or delayed from crossing the road.

- (-) The layout of the roundabout pushes the crossing locations away from the centre of the intersection, resulting in a more circuitous path and longer travel time. This degradation of accessibility at these locations would be contrary to improving the pedestrian environment to accommodate shorter trips within the City Centre.

- (-) There is usually no access to the centre island for pedestrians, so any "gateway feature" placed there would be inaccessible unless alternative access (e.g. pedestrian tunnel) is constructed, likely at substantial cost.

Cycling Environment

- (-) On multilane roundabouts, cyclists are generally not recommended to use the roadway due to potential conflicts with faster vehicles, especially lane changes near entrances and exits. Instead, cyclists are encouraged to use the same circuitous path around the intersection as pedestrians. This is disruptive to bicycle travel and increases travel time.

- (+) The safety benefits associated with the crossing locations for pedestrians would also apply to cyclists.

Goods Movement

- (-) The ability to manoeuvre large commercial vehicles could be limited by the design of the roundabout due to the requirement for continuous turning. Accommodating this requires wider lanes and a larger diameter roundabout. (The disadvantage of wider lanes is that other drivers may be tempted to speed.)

- Left turns can become quite challenging, as the movement requires a wide sweep around three quarters of the roundabout, starting with a right turn, a gradual left to circle the island, and a right turn again to exit. Great care is needed in design to limit awkward vehicle manoeuvres.

Traffic Operations and Safety

- Travel time savings are often achieved for single lane roundabouts where removal of the signal is possible due to modest volumes. However, In the case of multilane roundabouts with higher traffic volumes, traffic signals are needed, so the main impact of the roundabout on operations is that through movements and left turns are now accommodated within the same signal cycle and there is greater intermingling of these vehicles. The total time at the intersection may increase or decrease, depending on the amount of conflicting traffic. (Estimating this would require a more detailed design and analysis of traffic flows using a roundabout software package.)

- (+/-) The number of conflict points between movements decreases with roundabouts, thereby contributing to increased safety. However, much of this benefit is offset with multilane roundabouts because sideswipe accidents tend to increase due to turning path conflicts and lane changes by left and right turning vehicles.

Transit Operations

- Buses would circulate through a roundabout the same way trucks do, and be subject to the same operating challenges.

- (-) Bus stops would have to be set back from the intersection, since they cannot be placed at the roundabout or near the pedestrian/bike crossing location. Accounting for the approaches to the roundabout, this pushes possible bus stop locations up to one short city block away.

- (-) It is possible to accommodate transit priority at a signalised roundabout (for example to help Bus Rapid Transit work), but this requires clearing the roundabout of [most] conflicting traffic before the transit phase, reducing its effectiveness relative to a conventional signalised intersection.

On-Street Parking

- (-) Parking would have to be set back beyond the pedestrian/bicycle crossing and any bike lane transition area (where it joins the sidewalk). This setback from the roundabout reduces the length of the street that can be considered for off-peak curb parking.

5. IMPLEMENTATION PLAN

This chapter outlines the critical elements of the Surrey City Centre transportation network and defines the timing and implementation cost for the elements falling under the City's funding responsibility. The recommended long-term transportation network for the City Centre was defined through the collaborative efforts of the City's Engineering Department and Planning and Development Department and their transportation (IBI Group), land use (BTA) and market study (Coriolis) consultants. The recommendations are based on the technical assessments of the existing and potential future transportation networks presented in earlier chapters, as well as input from local stakeholders. This chapter includes the following sections:

- Description of Transportation Network Recommendations;
- Proposed Phasing Plan for Street Network Improvements; and
- Capital Cost Estimates for Implementation.

These recommendations provide for a transportation system to serve the forecast population and employment through to 2031, and they do so by including improvements across the full range of transportation modes.

5.1 Transportation Network Recommendations

The following recommendations and conclusions emerge from synthesis of the results of our previous technical analyses, including the evaluation of needs and opportunities related to each mode of transportation, and building on input from the City's Planning Department on the population, employment, and proposed development concentrations in the City Centre.

These were presented to Surrey City Council by staff in August 2008 and presented to the general public during Open Houses[10] in September 2008. There was fairly broad support from local residents and businesses for the Land Use recommendations (see Section 2.2.2) and for the Transportation Network. The City Centre Plan Update, including the land use concepts and a summary of the transportation elements (Road Network Concept and Road Widths), was presented to City Council on January 19 and endorsed on February 9, 2009[11].

This section starts with an outline of the City Centre Vision, which frames a set of goals for the movement of people and goods in the City Centre. This leads into the specific recommendations for the City Centre network, including the pedestrian environment, cycling facilities, transit services, goods movement, the street network and parking supply and management.

[10] A summary of the main components of the City Centre Plan Update and the proposed Open House materials was included in Corporate Report No: 2008 - R159.
[11] Corporate Report No. 2009 – C001 to City Council, February 9, 2009.

5.1.1 TRANSPORTATION VISION AND GOALS

The **City Centre Plan Update** includes the following vision statement:

> *To create an identifiable, energetic downtown for Surrey, comprised of distinct neighbourhoods, focused on a dense urban core and enhanced civic centre, linked by a green public network*[12]*.*

Several planning principles were identified in support of this vision, and from a transportation perspective these either set the stage for the urban environment the network will support (a focused downtown core surrounded by distinct and higher density neighbourhoods, with recreation, shopping and entertainment amenities) or they specifically provided direction to the definition of transportation network elements. Of particular interest, the creation of a finer grained road network and multimodal 'great streets' apply to this study.

In support of the overall vision for the plan update, a set of transportation goals can be set for the City Centre, with the following principal elements:

- Substantial increases in population, employment and students within the City Centre are accommodated through strategic improvements to the transportation system.
- Residents having a full range of transportation choices within City Centre and to other regional destinations;
- Employees and visitors to local businesses able to travel into the City Centre without being dependent on the automobile;
- A more complete grid of green arterials, collectors and local streets, where shorter block lengths and uninterrupted routes across the City Centre give increased accessibility to pedestrians, cyclists, and transit riders.
- Needs of automobile users are addressed by added capacity parallel to the existing major arterials (KGH, 104 Ave. and 108 Ave.), focusing on completion of the inner and outer Ring Roads.
- Less of the City Centre's valuable urban land dedicated to surface parking lots, with more demand being met in structures and on-street parking spaces regulated by the City.

These goals will be achieved through implementation of the transportation network elements defined in the remainder of this section, plus dedication of local streets and lanes through private Right of Way during redevelopment, in order to achieve the finer grained multimodal street network.

5.1.2 THE PEDESTRIAN ENVIRONMENT

The current pedestrian environment in the City Centre is of mixed quality. While major arterials meet the minimum requirements for sidewalks, these are often interrupted by driveways and adjacent to large parking lots. Opportunities to cross are limited to locations with traffic signals and long block spacing deters pedestrian activity. There are several short sections of off-street paths but the network is discontinuous. However, there are plans to address this, and the pedestrian environment between the Surrey Central SkyTrain station and Central City tower has recently undergone some improvement.

Since all travel involves a pedestrian element at the very beginning or end of the trip, it is essential to ensure that pedestrian improvements are incorporated within plans for the transportation

[12] Ibid.

network. Indeed, a key objective is developing and maintaining a safe, comfortable, convenient and aesthetically pleasing pedestrian system. Implementation of a pedestrian system in the City Centre shall emphasize the following priorities:

- Constructing smaller street blocks by infilling missing collector streets from the 1991 City Centre Plan and additional local commercial and local residential streets. This will bring the block sizes down to a pedestrian scale in line with other business districts and higher-density residential communities. Included within this would be the creation of additional lanes in some locations with pedestrian amenities provided within a reduced cross section.

- Constructing additional safe and comfortable pedestrian crossing locations, including new signalized crossings through shorter block lengths along arterials and collectors.

- Enhancing the current street design elements, including street furniture along busier pedestrian routes. These elements could include pedestrian-scaled lighting, landscaping and street trees, water fountains, recycling bins and garbage receptacles.

- Reducing the number of driveway crossings of the sidewalk, by promoting alternative or joint access points. (See also the parking recommendations in Section 5.1.7).

- Using and expanding on-street parking to create a "buffer" between moving traffic and pedestrians. This will be employed on local and collector streets in the City Centre, but will also be considered on a case-by-case basis on arterial routes during off-peak midday and evening hours where the curb lanes are not needed for traffic capacity or transit operations.

- Creating attractive new Greenway routes: wider off-street multi-use paths with enhanced landscaping, planting, public art, heritage features, way-finding and lighting. East-west routes include 102 and 105A Avenues and a proposed north-south route would follow West Whalley Ring Road and 98B Avenue to King George Station.

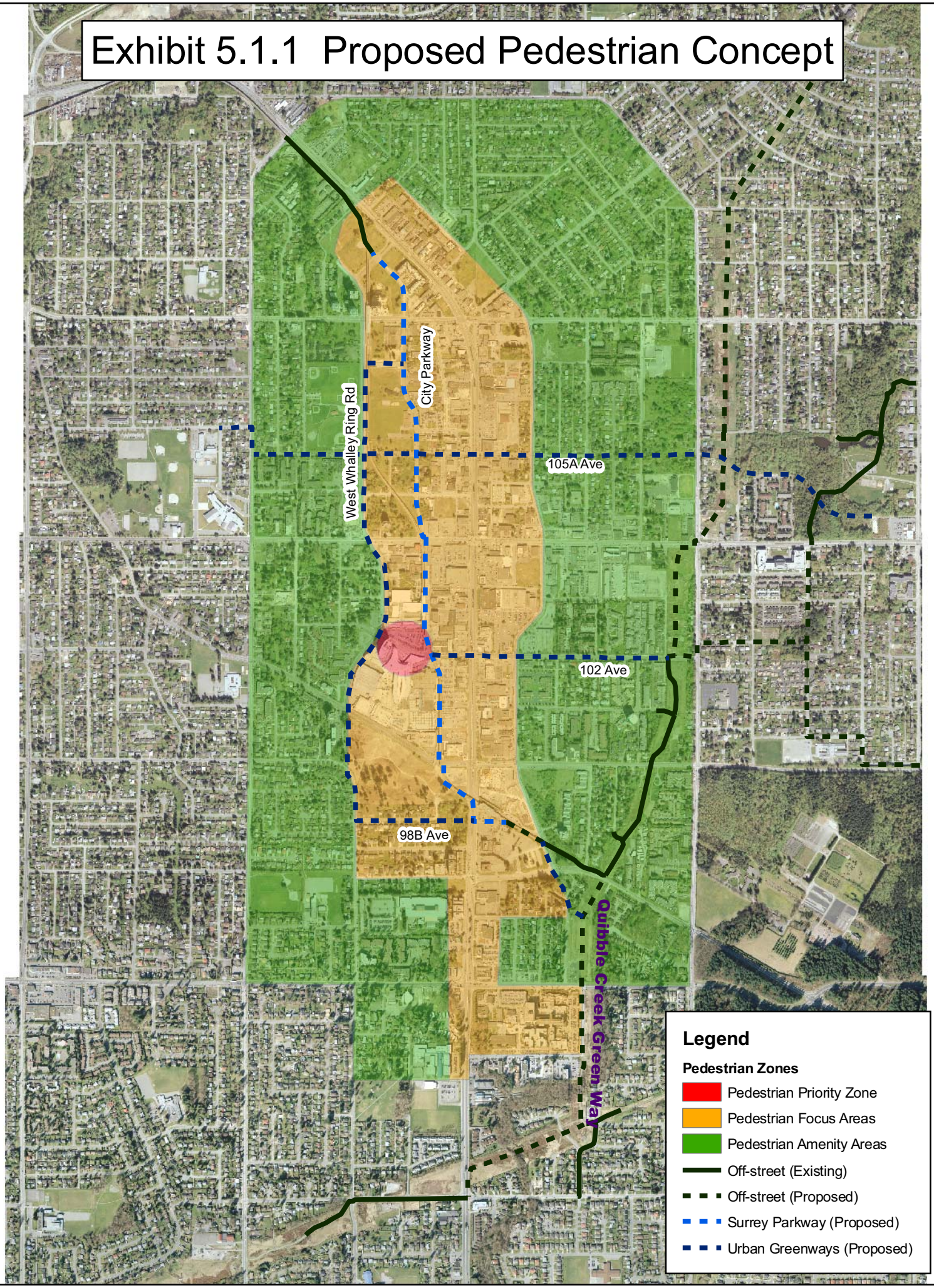
- Accelerating the development of existing and planned Greenway routes to a high standard. These routes include the Surrey (BC) Parkway and the Quibble Creek Greenway, which could be extended along the hydro right-of-way along the eastern edge of the City Centre. These form part of a Green Streets Network being developed in later phases of the City Centre planning process.

- Identifying maximum permitted widths for arterial streets. The intent of this concept is to limit the number of traffic lanes that any individual facility would be allowed to have, since wider arterials are a deterrent to pedestrians and act as dividing lines between two sides of a street. This plan recommends that arterials be limited to four through lanes, with the exception of King George Highway, which already has six.

Exhibit 5.1.1 illustrates a proposed concept for pedestrian facilities in the City Centre, including three zones (Priority, Focus and Amenity) with different levels of pedestrian accommodation, and a planned network of off-street urban greenways and pedestrian trails. The three zones are defined as follows:

- The Pedestrian Priority Area is to the south of Surrey Central Station and would continue and possibly expand upon the existing treatments where pedestrians and cyclists are given greater opportunity to cross 102 Avenue through use of traffic calming measures, wide crossing zones, and surface treatments to emphasize the special character of the area: a high volume pedestrian zone where there is a regular critical mass of people walking between the Central City complex (including SFU), the SkyTrain station, and in future, the Civic Complex.

Exhibit 5.1.1 Proposed Pedestrian Concept



- Pedestrian Focus Areas are located within the inner ring roads and would provide frequent, high quality pedestrian crossing opportunities and wider sidewalks with a higher degree of pedestrian amenities, such as benches and lighting; and

- Pedestrian Amenity Areas are between the inner and outer ring roads. In these areas, sidewalks, curb ramps and enhanced pedestrian facilities will be provided, with special attention near important pedestrian generation locations, such as schools and park facilities.

The features of these areas are reflected in the street refinements (including higher standard sidewalks and streetscaping) described for arterials and collectors in Chapter 6 of this report.

5.1.3 THE CYCLING ENVIRONMENT

The cycling environment in Surrey City Centre will undergo several significant improvements as it develops, starting with the continued implementation of planned cycling facilities. Currently, there are cycling route discontinuities in the east-west direction, with no single route crossing the City Centre, and north-south the only continuous route is on the shoulders of 132 Street at the edge of the study area. This contributes to a lack of connectivity between neighbouring Surrey communities and the existing activity centres and transit facilities (such as SkyTrain stations) in the City Centre.

Since supporting and encouraging travel using alternative non-motorized modes is consistent with the vision and goals for the City Centre, the recommendations focus on the creation of a 'friendlier' cycling environment for residents. They include the following initiatives:

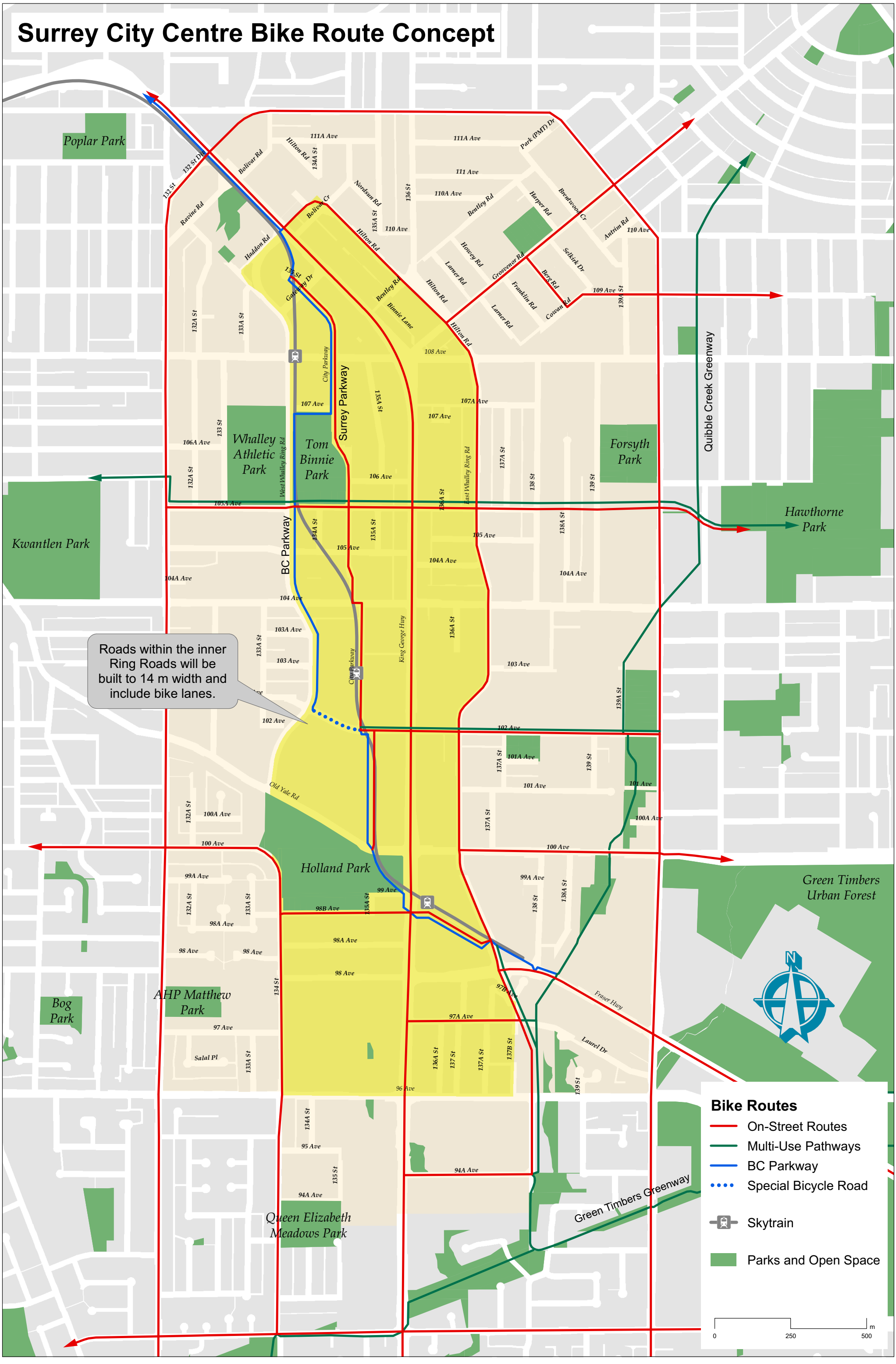
- Most streets in the City Centre will be designed to accommodate cycling by including wider curb lanes for shared use or dedicated bike lanes indicated by pavement markings and roadside signs. This will also apply to renewal initiatives along existing streets, including arterials and collectors, by including shared or dedicated bicycle lanes in the prototypical cross sections for City Centre streets. When existing streets are under construction due to new developments or widening, improved bicycle facilities could be implemented.

- Provision of end of trip facilities will be encouraged, such as secure on and off-street bicycle parking and lockers. This would be included in City of Surrey facilities and could also be programmed into the parking requirements for new developments (see section 5.1. 7). In addition to lockers, facilities such as showers at larger places of employment would encourage commuting by bicycle, which is significant in central Vancouver and could become important to Surrey City Centre.

- The official Bicycle Route Network will be enhanced to provide either advanced facilities or more direct routes for cyclists through and within the study area. The building blocks for this network include:
    - Continued implementation of the Surrey (BC) Parkway along the missing link from City Parkway to King George Station;
    - Upgrading of the route along 105A Avenue to a parallel off-street path along a proposed urban greenway;
    - Expansion of bicycle lanes on King George Highway and future 98 B Avenue in the centre of the study area; and
    - Introduction of new bicycle routes in the northeast corner of the City Centre.

Exhibit 5.1.2 illustrates the proposed bicycle network in the City Centre.

Exhibit 5.1.2



Source: City of Surrey

5.1.4 THE TRANSIT ENVIRONMENT

The current transit system in the City Centre is dominated by the Expo Line SkyTrain service and the three stations within the study area. Most of the supporting bus services terminate or pass through an off-street transit exchange at Surrey Central, a structure suitable to suburban centres. As the City Centre evolves into a true downtown area, bus service will need to evolve from depending on a single transfer point, which will become feasible and attractive to customers as service frequency increases over time. Effective expansion of transit service across Surrey will rely on its evolution through and within the City Centre. In particular, the current bus exchange is near capacity, and the additional service identified through the SOFA Transit Plan will make the need to increase its functional capacity acute.

Key elements of the transit strategy for the City Centre include the following:

- Encourage and support significant improvements to bus services building on the Area Transit Plan (through to 2013) and then working with TransLink to begin operating new bus routes and introducing new Community Shuttle services. As the grid network of streets is completed through and around the City Centre, start to add services using the arterial street grid and connect buses to the most direct SkyTrain station, rather than routing most services to Surrey Central as is done now.

- Support the introduction of rapid bus services to Guildford, Fleetwood and Newton on 104th Avenue, Fraser Highway and King George Highway. On some routes, these will start out as mixed-flow bus services (like the current 97, 98 and 99 B-Line routes) and be upgraded to Bus Rapid Transit (BRT) using exclusive lanes. It is generally found that median lanes provide for better bus lane operations, and these are included in the recommended transit network. B-Line service on KGH and 104 Avenue is planned for implementation in 2010.

- Introduce transit priority measures to support more efficient bus transit operations.

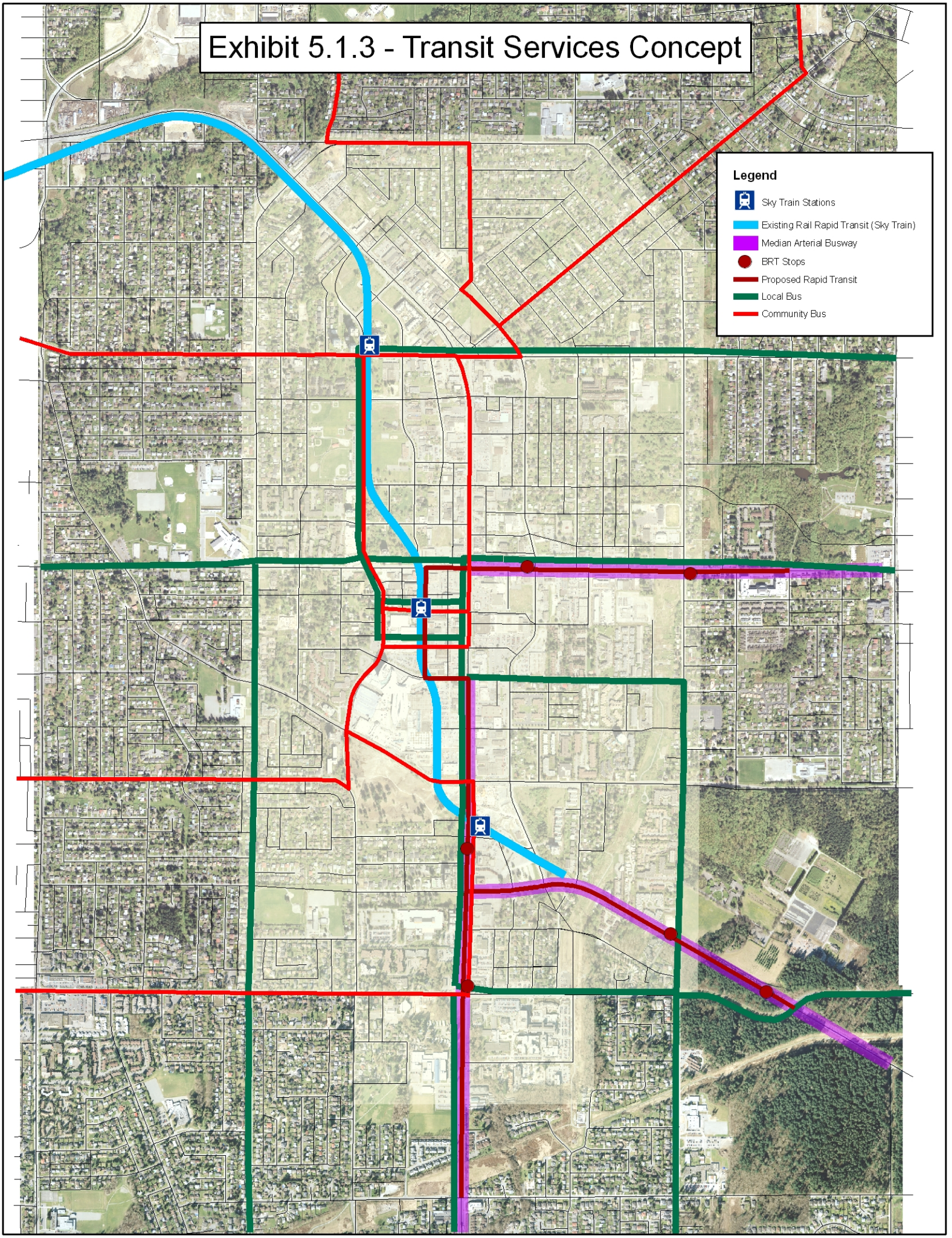
- Integrate land uses with future rail rapid transit services and stations. Alignments and technologies are being studied by TransLink with recommendations expected by late 2010.

- Support the promotion of U-Pass, a low cost transit pass provided to university and college students. This started out at UBC and then SFU and has been expanding to consider the seven major colleges in the Greater Vancouver area, including Langara College, Capilano College, and Kwantlen College. Similarly, the City may wish to support TransLink's Community Transit Pass for the general public, currently subsidized for residents of certain participating development such as the UniverCity at SFU in Burnaby.

- Implement high quality bus shelters that meet the Universally Accessible Bus Stop guidelines adopted by TransLink. Provision of bus shelters in Surrey is being reviewed as part of a comprehensive street furniture contract. In conjunction with improved stops, promote a high quality walking environment to provide pleasant access to transit stops, and bicycle friendly infrastructure to promote combined bus-bike trips.

Exhibit 5.1.3 depicts a transit service concept for the City Centre, focusing on proposed rapid transit corridors, the existing SkyTrain line and stations, and the highest priority areas for local bus service. The service pattern shown includes an example of a transit couplet identified through the Surrey Central Transit Village Plan; however, the street network through this area is not yet final as noted in Section 2.3.1.

Exhibit 5.1.3 - Transit Services Concept



The nature of public transportation service in the City Centre will evolve beyond what is shown on the map, with potential extensions of rail rapid transit, either Light Rail or SkyTrain, under consideration by TransLink and the Province of British Columbia.

5.1.5 GOODS MOVEMENT

Goods movement in the City Centre takes place primarily along King George Highway (KGH), with significant traffic also headed east along 108th Avenue, 104th Avenue and Fraser Highway. Much of this truck traffic is bound for either the industrial lands along the Fraser River in Surrey or the Pattullo Bridge. There is a secondary truck route along 132 Street that diverts some north-south truck traffic away from the commercial activity centres along KGH.

An evaluation was carried out on potential alternative truck routes (see Section 4.2) through Surrey City Centre, and it was concluded that shifting trucks onto the inner ring roads would likely undermine some of the development objectives in the City Centre and have limited transportation benefit. Instead, the outer ring roads generally offer greater potential for addressing continuing future trucking demands and taking some of the north-south truck movements off of King George Highway. Capacity improvements to both 132 Street and 140 Street are proposed as enhancements within the conceptual street network.

Exhibit 5.1.4 illustrates current truck routes within the City Centre and the alternative routes for trucks around the City Centre:

- Current truck routes. Heavy trucks must stay on designated truck routes while travelling within city limits and may only use roads that are not designated as truck routes to access their destination using the shortest path to and from these truck routes.

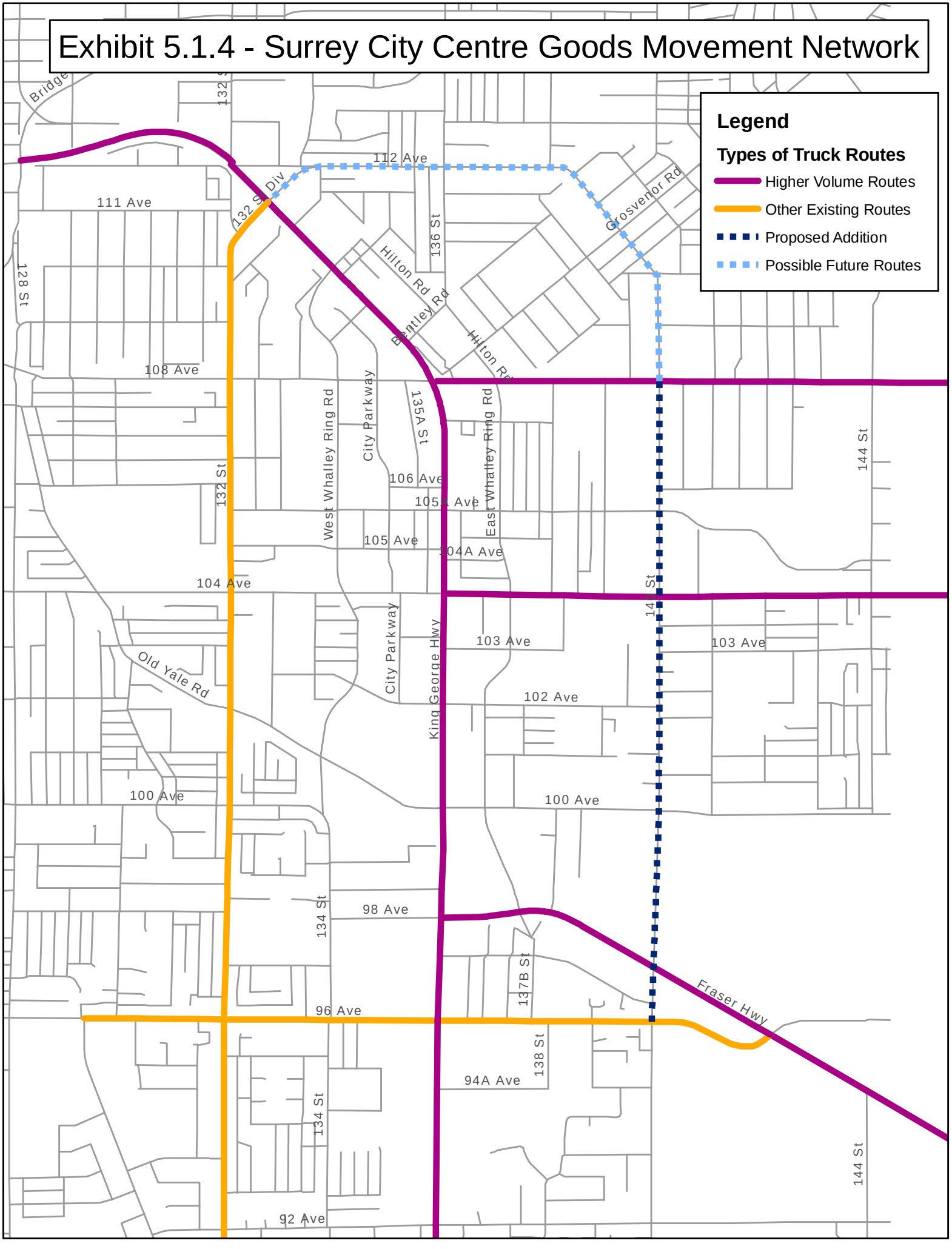
- Outside the study area, the South Fraser Perimeter Road is expected to reduce use of the access route from east to north through the City Centre on 108th and 104th Avenues and King George Highway.

- Alternative truck routes within the City Centre. It is proposed that 140th Street be added as a local truck route within the City of Surrey arterial network. At first this designation would be limited to points south of 108th Avenue. Depending on future traffic patterns and local development, there may be a future need to evaluate extending this route via Hansen Road, 112 Avenue and the 132 Street Diversion to connect back to KGH.

5.1.6 STREET NETWORK CONCEPT

As noted earlier in this report, the City Centre street network acts as both a corridor for travel and provides access to destinations within the study area. Given the proximity of two major crossings of the Fraser River, the Pattullo and Port Mann Bridges, it is reasonable to assume that travel demand and therefore automobile traffic would continue to be a fact of life. The development-driven growth projected for the study area will generate more travel demand, and this drives a requirement to enhance the network without over-burdening existing facilities and creating the perception of barriers to non-auto users between parts of the City Centre.

Exhibit 5.1.4 - Surrey City Centre Goods Movement Network



Chapter 3 of this final report described a series of future transportation scenarios (for modeling purposes) that included improvements to transit, walking and cycling accessibility, parking policies, and road network structure and capacity. The results of the assessment, based on land use projections to 2031, indicated the following:

- Provided that recommended transit, cycling and walking improvements are implemented – as described throughout Section 5.1 – then there will be significant shifts in mode choice away from the private automobile. This will not completely offset future increases in traffic, but traffic growth would occur at a slower pace than development in the City Centre.

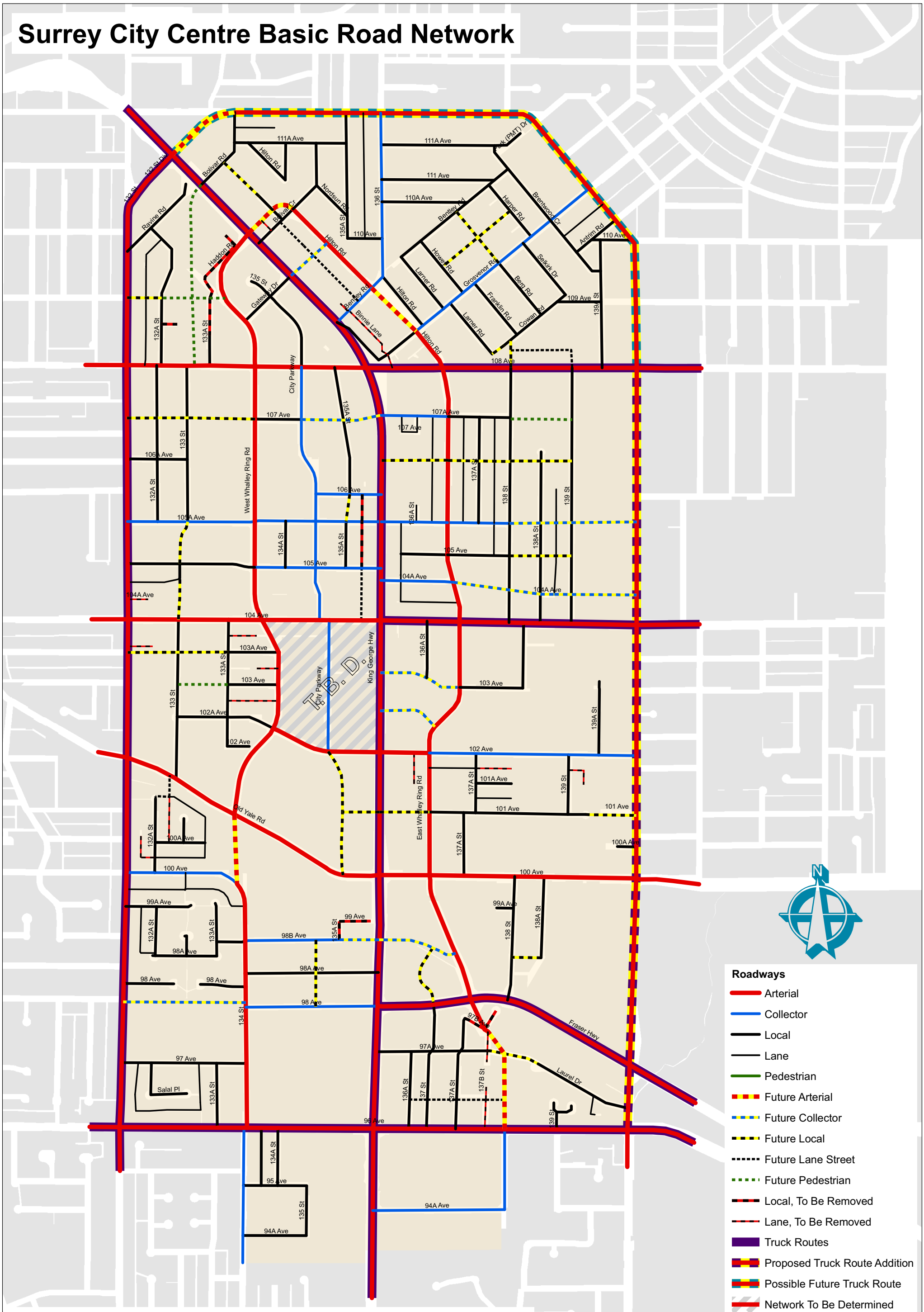
- The proposed street system will be generally adequate to meet the travel needs of the City Centre, provided that the inner and outer ring roads are completed and several east-west collectors are constructed. These projects build a complete grid of arterial and collector streets which helps to spread future traffic demands more evenly in the east-west and north-south orientation, instead of concentrating traffic solely on King George Highway, 108 Avenue, 104 Avenue and Fraser Highway.
- Congestion levels are expected to increase somewhat, but the increase appears to be consistent with the expected performance of a street network with ‘’downtown” characteristics.

To address the needs of the City Centre, this study recommends the conceptual street network as depicted in **Exhibit 5.1.5,** which shows the hierarchy of existing and planned arterials, collectors, local streets and lanes. Several specific steps would support the development of this network:

- Completion of those streets that have missing links (including East & West Whalley Ring Roads). These streets in particular help to relieve some pressure on King George Highway, and both are currently much more lightly used than KGH. This is expected to change once they are both complete through to 96th Avenue;
- Development of several new local and collector streets to serve development, creating a finer-grained road system (with spacing of 80 to 100 metres). This is in keeping with the promotion of a more human-scaled City Centre with better pedestrian and cycling accessibility. The addition of new traffic signals at significant local streets and collectors, in between the arterials, would provide better access to local streets and introduce safe new crossing locations for users of other transportation modes;
- Retaining existing and possibly constructing new local streets and lanes where the Right of Way is already public, in order to create site accesses between the existing streets and proposed additional arterials and collectors;
- Providing improved property access and a pedestrian friendly street network (including sidewalks, trails and pedestrian mews), particularly in the core area. An important goal would be to reduce property access driveways from arterial streets and relocate these to local streets and access lanes;
- The widening of arterial streets to their ultimate standards using a phased, strategic approach starting with the inner ring roads and then the new east-west collector streets. This would add network capacity on arterial streets other than KGH, 104 and 108, which are already built to near their standard, and would create opportunities to enhance cycling and pedestrian facilities, as well as creating space for on-street parking where it is determined to be feasible;

Exhibit 5.1.5

Surrey City Centre Basic Road Network



The proposed BASIC Road Network Concept is the BASIC road network for City Centre and does not show the finer-grained road network required to create these urban-sized blocks of 80-100 metres. As a result, it is expected that developments, where required, will dedicate additional road and lanes in addition to the roads and lanes shown on the Basic Road Network Concept.

Source: City of Surrey

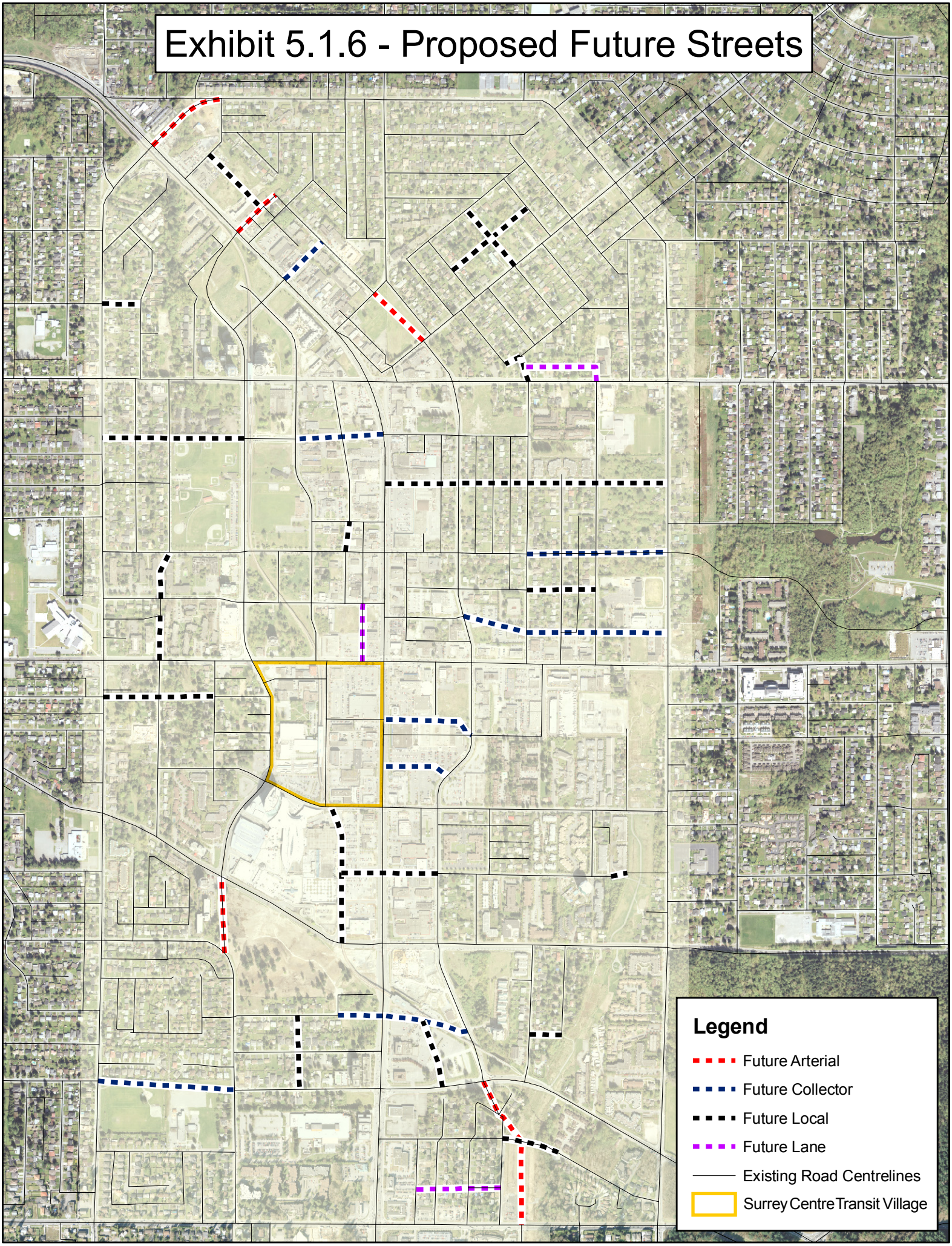
- A 'context sensitive' review of the base road network has been undertaken to identify cross section needs based on: traffic role; future transit role; pedestrian facilities and demand; and cycling and urban greenway routes. Revisiting the street network elements has resulted in updated right of way dedications for several classes of roadways. (These are described in Chapter 6 in conjunction with the cross section components and street roles.)
- Where warranted, implement cross section and signal improvements on major arterials that support high-capacity transit service, expected to include King George Highway and 104 Avenue.
- No widening of King George Highway beyond its current capacity *except* to provide a transit median and/or cycling and pedestrian enhancements not currently possible within the available public right of way.

Exhibit 5.1.6 focuses on the many new streets and street segments that would be added to the existing network (but does not show all of the potential local streets and lanes that would be created by development in the City Centre). The *basic network* includes the following additions:

- completion of the Outer Ring Road (132 St Diversion);
- completion of East Whalley Ring Road, both north of 108 Avenue and south of Fraser Highway;
- completion of the West Whalley Ring Road south of Old Yale Road;
- completion of the collectors 105A Avenue and 98 Avenue;
- extension of 98B Avenue across King George Highway;
- closure of gaps in local streets such as 107 Avenue;
- Infill of the street network (structure to be revisited following planning of civic amenities) in the Surrey Central Transit Village area;
- Infill of gaps in the local streets and lanes, where this would create a finer-grained street system and provide access to new residential and commercial developments as the Vision's land use elements are implemented.

Improvements to specific existing streets (such as King George Highway) are identified in Sections 5.2 and 5.3, along with the new and extended arterial and collector streets that form part of these recommendations.

Exhibit 5.1.6 - Proposed Future Streets



5.1.7 PARKING SUPPLY AND MANAGEMENT

The Surrey City Centre Transportation Servicing Study included a study of current parking supply and regulation, and an evaluation of best practices from other locales as they might be applied to this area. Full details of the parking study are included as **Appendix C** to this report. The overall objectives require a balance to be struck between reducing the proportion of land dedicated to providing a parking supply, and continuing to support the mobility of local residents, employees and visitors to the City Centre. Currently, a fair proportion of the parking supply in the City Centre is free and available on-site, manifested by the series of large parking areas along the length of King George Highway. The strategy for the future includes encouraging a mode shift away from auto-dependency and consolidating and making better use of the parking supply.

The high-level recommendations for City Centre parking include the following measures:

- Managed on-street parking supply wherever possible. This includes time limits to promote turnover of spaces in commercial districts and in passenger pick-up zones near transit stations. It also includes using as much of the potential on-street space for parking as feasible, including allowing off-peak parking on collectors and possibly less busy segments of arterials where traffic operations would not be unduly impacted.

- Cash-in-lieu of the provision of on-site parking to fund building of common structured parking. Instead of each development and tenant being responsible for providing its individual parking requirement, there will be locations where pooling the cost of parking spaces from several properties and constructing a common shared supply would reduce the parking footprint and make better use of developable land.

- Parking management and application of ITS. Where supply is concentrated into a set of public or public-private parking lots and structures, visitors and residents are better assured of finding spaces where directory maps and signs are provided. This can be enhanced through the use of dynamic message signs that provide a count of available spaces at key parking areas using a real-time detection system.

- Supporting Transportation Demand Management (TDM) programs. These programs include work-based programs to encourage commuting using alternative modes, and telecommuting. They also include residentially-based programs such as developers providing transit passes and shared community cars. This can be encouraged locally by building incentives into the parking bylaw to reward developers and employers that meet success thresholds.

- Requiring bicycle parking facilities and change rooms in new developments. As with TDM, this can be applied at both residential and employment sites, as a basis requirement for approval and/or with incentives to encourage compliance.

- Formalizing a requirement for only one (1) stall per residential unit in transit supportive locations. This strategy would reduce excess parking that is often provided at residential developments, where a second space is often provided for each unit. If the market for the development suggests a higher number of spaces, the developer could place these outside the basic price for a unit and sell them as add-ons to tenants wishing for extra spaces.

- Considering further relaxations of parking minimums where there is reduced demand. Over time, it is forecast that the concentration of new residents and jobs in the City Centre will result in a higher proportion of locals living within walking, biking or transit-convenient distance of their employment. This will fuel a shift away from the automobile, so the rate of

parking spaces needed to accommodate each resident or employee will decrease from what it is today.

- Examining the potential for shared parking facilities between uses with different peak demands. Especially in the case of mixed-use development at one site or a group of sites contributing through pool funds to an area parking facility, the number of parking spaces required in the bylaw can be reduced to a maximum reflecting only the most intensive group of simultaneous uses, rather than by adding the maximum requirement associated with all parking needs over a 24-hour day. A prime example is using restaurant and entertainment facility parking as the same supply for daytime office workers.

- Considering a more proactive role for the City in managing and pricing public parking supply. The City is in a prime position to take the lead in managing parking in the City Centre, both as a holder of land where public parking facilities might be created, and as the manager of all on-street parking spaces, including those with and without parking meters.

The parking report expands upon this list and includes strategies that can be implemented in the near term and as development continues and expands in the City Centre.

5.2 Priorities and Phasing

This section of the report focuses on the elements of the recommended transportation network over which the City has most direct control: the street network improvements. These improvements include missing links in the arterial and collector street system, and widening of certain existing streets to provide exclusive transit lanes, bicycle lanes and improved pedestrian amenities.

The arterial and collector streets requiring the most significant improvements are indicated on **Exhibit 5.1.6**. The exhibit indicates the phasing and the resulting number of lanes from the proposed improvement. The proposed phasing plan for the street improvements is based largely on a set of priorities starting in the core of the study area and radiating outward:

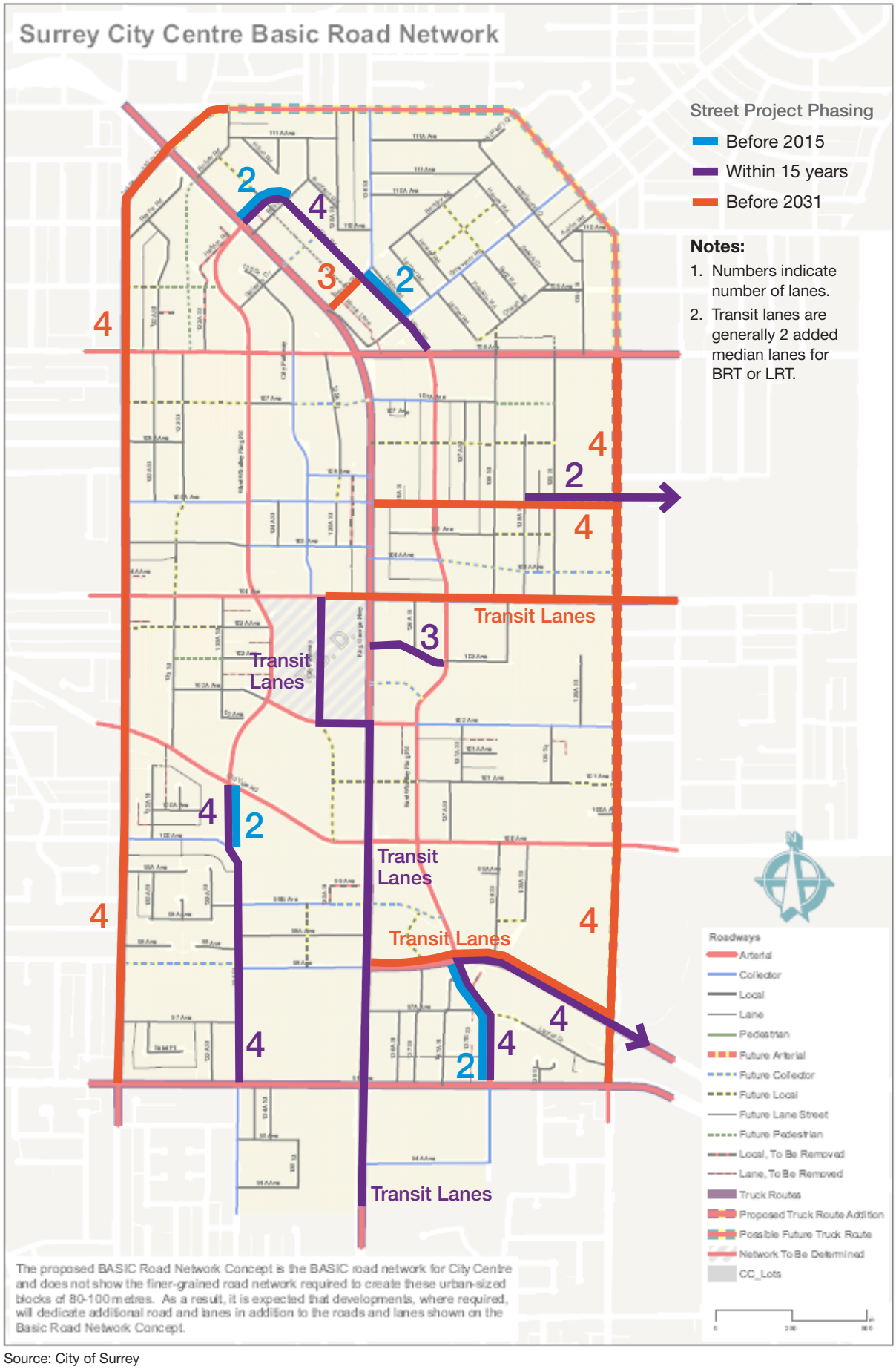
- Some improvements had already been listed as potential projects in the 2006-2015 Servicing Plan, and now fall within the Short to Medium time frame. The improvements likely to be completed by 2015 are related to completion of the inner ring roads to a minimum two-lane standard. Projects include extension of West Whalley Ring Road from Old Yale to 100 Avenue, extension of East Whalley from Fraser Highway to 96th, and completion of two links between 108th and King George Highway.

- Longer term improvements (completion within 7-15 years) include the upgrading of the inner ring roads to four traffic lanes to offset potential increases in traffic from focusing on King George Highway, widening Fraser Highway to four lanes, introducing two new collector segments, and perhaps most notably, upgrading King George Highway south of 102 Avenue to include median transit lanes, most likely for BRT service.

- Other future improvements during the planning horizon (likely completion before 2031) include the widening of most of the outer ring roads to four lanes, in conjunction with expected increases in general purpose and truck traffic, and introduction of dedicated transit lanes on 104 Avenue and Fraser Highway.

The timing of local street improvements will be driven by development of the City Centre, and as such specific street timings could be highly speculative. Nevertheless, it is highly likely that all other new streets shown previously on Exhibit 5.1.5 would be implemented before the planning horizon (before 2031).

Exhibit 5.1.7 - Proposed Phasing of Street Network



Source: City of Surrey

5.3 Cost Estimates

Capital cost estimates for the major elements of the street network are based on the most recent unit rates used to update the City's 10-year servicing plan. These estimates are order of magnitude, based on the type of project being contemplated, and include:

- new arterial $8.5M per km;
- arterial widening $7.5M per km;
- new collector $5.1M per km; and
- collector widening $2.6M per km.

These include design, implementation and construction costs but do not include dedication of new right of way.

Table 5-1 summarizes the construction cost estimates by phase and type of street in the City Centre network. Overall, the entire program of street network capital improvements is estimated to cost $105 Million (in current 2009 dollars). The short-term improvements related to East and West Whalley Ring Roads, adding to some $ 9.4 Million, had already appeared in the 2006-2015 servicing plan and therefore represent updates to previous cost estimates and not new projects.

Table 5-1: Surrey City Centre Street Improvement Costs by Phase

Construction Costs (Millions, 2009)	Street Category		
Time Frame	Arterial	Collector	Total
Short-Medium Term (before 2015)	$ 9.4		$ 9.4
Longer Term (within 15 years)	$ 35.3	$ 8.4	$ 43.7
Planning Horizon (before 2031)	$ 46.8	$ 5.6	$ 52.4
Grand Total	**$ 91.4**	**$ 14.1**	**$ 105.4**

Local streets and lanes are generally constructed in support of individual developments and it is expected that this is how those elements would be delivered within the City Centre. Therefore, construction costs applicable to the City focus on the arterial and collector streets. None of these estimates explicitly include new rights of way, which may require City expenditure even down to the local street level where certain parcels may be required to complete gaps in existing streets.

Table 5-2 (next page) lists the individual projects, and includes the street classification, timing (short-term, medium and long-term), limits of the improvement project, length of street segment, key features of the improved street (number of traffic lanes, et cetera) and the order of magnitude capital cost estimate for the street improvement project.

Table 5-2: Surrey City Centre Street Improvements - Itemized

Street Category	Street Name	Limit 1	Limit 2	Time Frame	Length (km)	*Existing Street Condition - Typical*	Future Lanes (Total)	Added Lanes	Transit Improvement	Bicycle Lanes	Greenway	Unit Rate - Construction (Millions/km)	Total Construction (Million)	Construction - Short/Medium (Millions)	Construction - Within 15 Yrs (Millions)	Construction - Before 2031 (Millions)
Arterial	King George Highway *	96 Av.	102 Av.	Within 15 yrs	1.2	6 lanes, some centre turn lanes	6		BRT Lanes			$ 7.50	$ 9.00		$ 9.00	
Arterial	132 Street	King George Highway	96 Av.	Before 2031	3.2	2 lanes + turns	4	2				$ 7.50	$ 24.00			$ 24.00
Arterial	132 St. Diversion	Bolivar Rd	King George Highway	Before 2031	0.25	N/A	4	4				$ 8.50	$ 2.13			$ 2.13
Arterial	West Whalley Ring Road	107 Av.	Old Yale	Short-Medium		Off street greenway					yes			$ -		
Arterial	West Whalley Ring Road	Old Yale	100 Av.	Short-Medium	0.25	Edge of park	2	2				$ 8.50	$ 2.13	$ 2.13		
Arterial	West Whalley Ring Road	Old Yale	100 Av.	Within 15 yrs	0.25	Edge of park	4	2				$ 7.50	$ 1.88		$ 1.88	
Arterial	134 Street	96 Av.	100 Ave.	Within 15 yrs	0.85	2 lanes + parking	4	2				$ 7.50	$ 6.38		$ 6.38	
Arterial	East Whalley Ring Road	Hilton/Bolivar	King George Highway	Short-Medium	0.2	N/A	2	2				$ 8.50	$ 1.70	$ 1.70		
Arterial	East Whalley Ring Road	Hilton/Bolivar	King George Highway	Within 15 yrs	0.2	N/A	4	2				$ 7.50	$ 1.50		$ 1.50	
Arterial	East Whalley Ring Road	Bentley	Grosvenor	Short-Medium	0.2	N/A	2	2				$ 8.50	$ 1.70	$ 1.70		
Arterial	East Whalley Ring Road	Bentley	Grosvenor	Within 15 yrs	0.2	N/A	4	2				$ 7.50	$ 1.50		$ 1.50	
Arterial	East Whalley Ring Road	Grosvenor	108 Av.	Within 15 yrs	0.15	2 lanes, discontinuous	4	2				$ 7.50	$ 1.13		$ 1.13	
Arterial	East Whalley Ring Road	Bentley	Hilton/Bolivar	Within 15 yrs	0.35	2 lanes, discontinuous	4	2				$ 7.50	$ 2.63		$ 2.63	
Arterial	East Whalley Ring Road	Fraser Hwy	96 Av.	Short-Medium	0.45	N/A	2	2				$ 8.50	$ 3.83	$ 3.83		
Arterial	East Whalley Ring Road	Fraser Hwy	96 Av.	Within 15 yrs	0.45	N/A	4	2				$ 7.50	$ 3.38		$ 3.38	
Arterial	140 Street	96 Av.	108 Av.	Before 2031	2.45	2 lanes + turns	4	2				$ 7.50	$ 18.38			$ 18.38
Collector	104 Av.*	King George Highway	140 Street	Before 2031	0.81	4 lanes + turns	4		BRT Lanes			$ 2.60	$ 2.11			$ 2.11
Arterial	Fraser Highway	East Whalley Ring Road	King George Highway	Before 2031	0.3	4+ lanes	4		BRT lanes			$ 7.50	$ 2.25			$ 2.25
Arterial	Fraser Highway	East Whalley Ring Road	96 Av.	Within 15 yrs	1.05	2 lanes + wide shoulders	4	2	BRT lanes			$ 7.50	$ 7.88		$ 7.88	
Collector	Bentley Road	King George Highway	East Whalley Ring Road/Hilton	Before 2031	0.15	2 lanes	3	1				$ 2.60	$ 0.39			$ 0.39
Collector	105A Avenue*	East Whalley Ring Road	140 St	Within 15 yrs	1.2	N/A	2	2		yes		$ 5.10	$ 6.12		$ 6.12	
Collector	105A Avenue*	East Whalley Ring Road	140 St	Before 2031	1.2	N/A	4	2		yes		$ 2.60	$ 3.12			$ 3.12
Collector	103 Avenue Extension	East Whalley Ring Road	King George Highway	Within 15 yrs	0.25	N/A	3	3				$ 5.10	$ 1.28		$ 1.28	
Collector	102 Av.	City Parkway	140 Street	Short-Medium		Off street greenway					yes			$ -		
Collector	City Parkway	102 Av.	104 Av.	Within 15 yrs	0.4	2 + parking	2 (BRT Only)		BRT lanes	yes		$ 2.60	$ 1.04		$ 1.04	
Totals ($ Millions, 2009)										**Short-Medium**				**$ 9.4**		
										Within 15 yrs					**$ 43.7**	
										Before 2031						**$ 52.4**
* Projects continue beyond City Centre; costs here are only within limits indicated											**Total**			**$105.40**		

6. STREET REFINEMENTS

This chapter takes the network-level recommendations of the Implementation Plan and defines conceptual features of various street prototypes, including key street elements, typical cross sections, and street and intersection treatment examples that could be applied within Surrey City Centre. Stage 2 of the City Centre Plan Update includes streetscape designs that would build on this initial discussion, depending on the needs and constraints of specific locations. Further developments related to urban design and the Green Streets Network would be part of Stage 2.

6.1 Key Elements

The function and character of individual streets will vary according to their hierarchy in the street network, and the features of the individual streets will reflect their intended roles. Building on the street network recommendations in Chapter 5, this section identifies the intended roles of the streets and the resulting cross section prototypes. These prototypes would apply to new streets and also represent ideal standards at such time that existing streets are upgraded.

6.1.1 STREET NETWORK FUNCTIONS AND FEATURES

Functional classifications of Surrey City Centre street network are (1) arterial streets, (2) collector streets, (3) local streets and (4) lanes. For each of these street types, there are variations in the set of elements that apply to each street due to the specific designation of urban greenways, bicycle routes, and transit services.

Arterial Streets

- Typically, this is intended to be an urban arterial accommodating longer-distance vehicle trips, including transit and goods movement, with 50 to 60 km per hour speed designations.
- Each of the major thoroughfares is proposed to have a high quality pedestrian environment on both sides of the street, including enhanced sidewalks, boulevards, and new bus stops and street furniture.
- Some sections of arterial streets are designated bicycle routes, and these would ultimately feature exclusive cycling lanes. On existing streets and on new streets that are not designated bicycle routes, shared curb lanes would be included.
- Arterial streets include:

King George Hwy;	132 St;	West Whalley Ring Rd/ 134 St;
108 Ave;	Old Yale Rd/ 100 Ave;	East Whalley Ring Rd;
104 Ave;	96 Ave;	102 Ave;
Fraser Hwy; and	140 St/ Hanson Rd/ 112 Ave.	

Collectors

- Typically, this is intended to be an urban collector (50 km/hour) linking various parts of the City Centre and carrying some local transit and goods movement traffic.
- Each of the collector streets is proposed to have a high quality pedestrian environment on both sides of the street, similar to the arterials. Certain collectors are proposed to include urban greenways (see Section 5.1).
- Several collectors form part of designated bicycle routes, and these would ideally feature exclusive lanes. On existing streets and on routes that are not designated bicycle routes, shared curb lanes would be a desirable feature.
- Collector streets include:

94 A Ave;	138 St;	98 Ave;
98 B Ave;	100 Ave;	105 A Ave;
134 St (south of 96 Ave);	102 Ave (east of E. Whalley Ring Rd);	
136 St;	City Parkway;	106 Ave;
107 A Ave;	Grosvenor Rd.; and	Bentley Rd.

Local Streets

- Local streets are intended to be urban streets operating at 50 km/hour or less, serving fronting businesses and residences. These streets would include (at a minimum) two traffic lanes and accommodate modest levels of traffic and parking.
- Local streets in commercial and higher density residential areas are proposed to have three or four lanes so that traffic (including some transit service) and curb parking can easily be accommodated in these busier areas. Minor streets in low and medium density residential areas would have at least two travel lanes.
- Each of the local streets is proposed to have a high quality pedestrian environment on both sides of the street. Minor streets would also accommodate bicycles in shared curb lanes and mixed traffic.

Access Lanes and Mews

- Access lanes and mews will be part of the development frontage improvements within the City Centre, providing access into properties.
- Lanes are intended for lower-speed vehicle access to parking and loading, requiring up to 12 m width. Vehicle access lanes may also include sidewalks to provide safe passage to pedestrians.
- Mews are a form of lane with a focus on pedestrian and cycling modes, and some lower speed (20 km/h or less) traffic may be permitted.

6.1.2 FUNCTIONAL REQUIREMENTS AND PROPOSED STREET DEDICATIONS

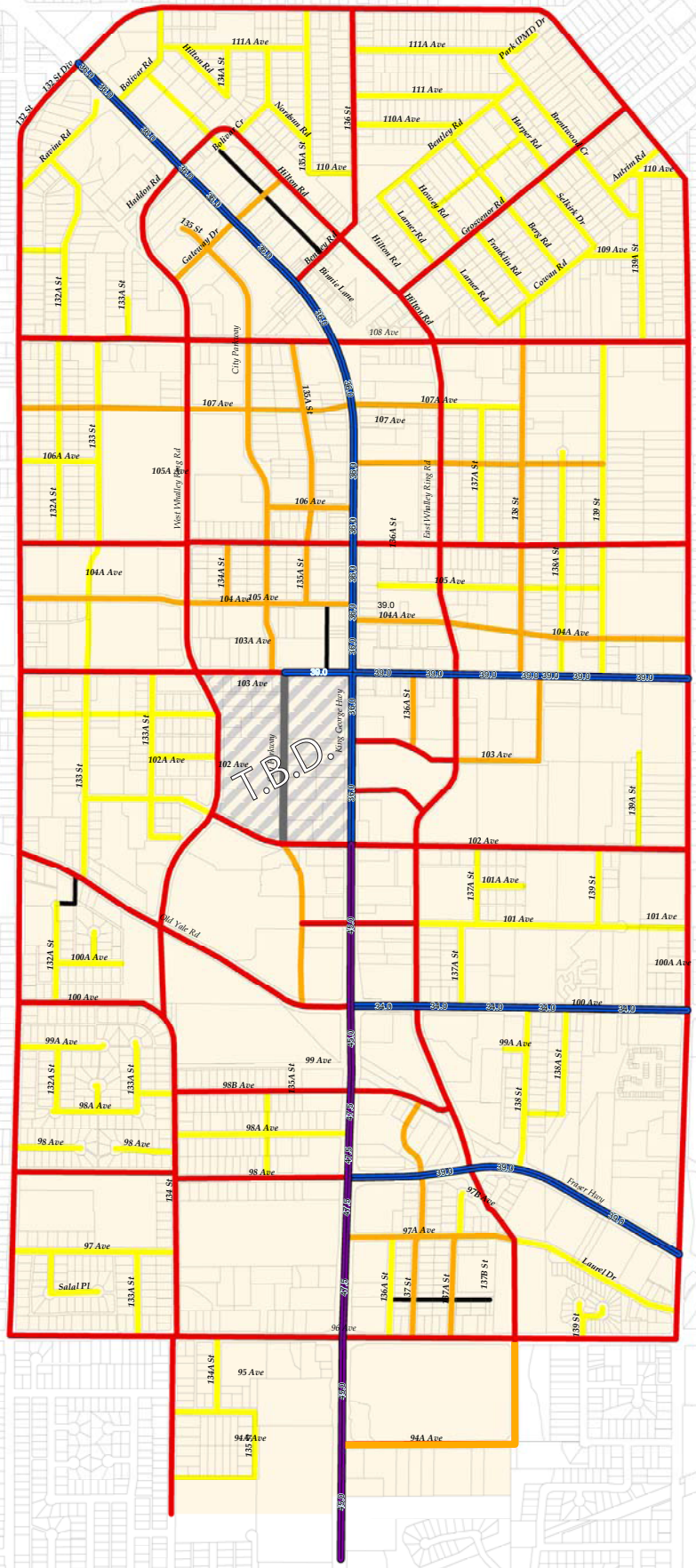
Table 6-1 summarizes the basic functional requirements for each type of street in the City Centre network. These requirements are the foundation for the prototypical cross sections shown on the following pages.

Table 6-1: Main Features of Surrey City Centre Streets

Category	Arterial	Collector	Local Street	Access Lanes or Mews
TRAFFIC LANES	4-8 Travel Lanes Landscaped Median and Left Turn Bays	4 Travel Lanes Left Turn Bays at Intersections	2-4 Travel Lanes	2 Low Speed Lanes No Traffic in some mews
PARKING	Limited Lay-By Locations and Off-Peak where feasible	Curb Lane at Certain Times and Locations	Curb Lane at Certain Times and Locations	Short-Term & Deliveries
TRANSIT	Curb side bus stops using boulevard Median transit lanes on King George Highway s. of 102	Curb side bus stops using boulevard zone	Not usually applicable Some curb side bus stops using boulevard zone	Not applicable
BICYCLES	Shared curb lane (minimum) On designated routes – exclusive lanes	Shared curb lane (minimum) On designated routes – exclusive lanes	Shared curb lane/mixed traffic	Accommodated in mews
SIDEWALK/ BOULEVARD	Minimum 2.0m sidewalks, Outside buffer could extend sidewalk towards adjacent buildings	Minimum 2.0m sidewalks Outside buffer could extend sidewalk towards adjacent buildings	1.5m sidewalks with landscaped or treed boulevard outside 2.0M sidewalks on busier commercial streets	In mews: range from exclusive to priority for pedestrian
OTHER FEATURES	Trees in boulevard Public Art Street Furnishings Urban Greenway on certain streets	Trees in boulevard Public Art Street Furnishings Urban Greenway on certain streets	Street Furnishings	Lanes may provide access to off-street parking
RIGHT OF WAY	Minimum 27 m (Wider on streets accommodating transit lanes)	24 – 27 m	20 - 24 m	Up to 12 m

Since the City of Surrey is directly responsible for the development of arterials and collector streets, these are discussed in further detail in the following sections. **Exhibit 6.1** shows proposed street right of way dedications for the conceptual street network.

Exhibit 6.1 - Proposed Street Right of Way (ROW) Widths



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1:5,000

Source: City of Surrey

6.2 Cross Sections

A street in the Surrey City Centre is made up of traveled way and the roadside that comprise its cross section. The traveled way incorporates through lanes and turning lanes plus bicycle lanes, parking lanes, transit stops, curb and gutter, median and barrier. The roadside includes the sidewalks, boulevards, street trees and landscaping and sometimes a buffer zone to the edge of the City's right of way. The **Table 6-2** summarizes proposed future dimensions for urban street cross section elements:

Table 6-2: Future Cross Section Elements of Surrey City Centre Streets

Cross Section Elements	KGH south of 102 Ave with BRT	KGH north of 102 Ave without BRT	Arterial (e.g. 108 Ave)	Collectors	Local (Parking + 2 Bike Lanes)
Total Right of Way (M)	37.4 (min)- 45.0 (at BRT stops)	34.8	27.0	27.0	24.0
Total Curb to Curb (M)/Travelled Way	29.4 - 37.0	27.6	19.0	14.5 (where curb bulge is present) to 17.0	11.5 (at curb bulges) to14.0
Total Vehicle Lanes*	8	6	4	4	4
Functions of Vehicle Lanes	2 bus lanes 6 travel lanes	6 travel lanes	4 travel lanes	2 travel 2 parking	2 travel 2 parking
Travel Lane Widths (M)	3.3 – 4.5	3.5 – 4.5	3.3 – 4.3	3.6 – 4.0	3.0 – 3.6
Left Turn Treatment	Median becomes LT lane	Median becomes LT lane	Median becomes LT lane	For higher volumes, 1 parking lane is dropped to create space	For higher volumes, 1 parking lane is dropped to create space
Bicycle Lane	Shared	Shared	Shared	Designated	Designated
Bicycle Lane Width** (M)	4.5	4.5	4.3	1.5 - 2.0	1.5
Parking Lane	Not Included	Depends on Traffic	Depends on Traffic	Both sides between intersections	Both sides between intersections
Parking Lane Width (M)	-	-	-	2.5	2.5
Median	Two, with bus lanes in between	Included	Included	Not Included	Not Included
Median Width (M) ***	1.6 (minimum) – 7.6 (areas with bus stops)	4.6	3.8	-	-
Sidewalk/ Boulevard Width (M)	4.0	3.6	3.6	5.0 (typical) – 7.5 (at curb bulge)	5.0 (typical) – 7.5 (at curb bulge)

Notes:

* Number does not include turn pockets at intersections.

** Whole lane width included if shared.

*** Wider medians on arterials become the left turn lanes at intersections.

Drawings for each of these cross section types are provided in **Appendix D**.

6.3 Street Treatments

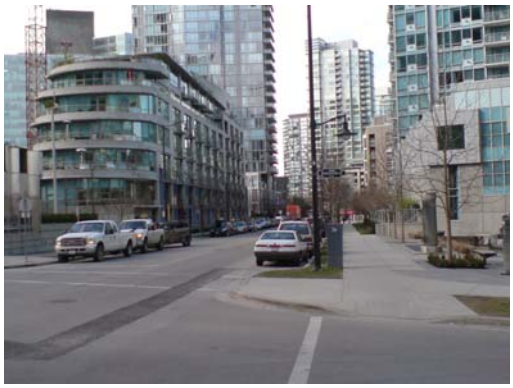
This section outlines a set of typical street features that could be applied to Surrey City Centre, including illustrations from other jurisdictions. The application of these to the recommended street network is demonstrated in a set of three-dimensional drawings of future City Centre streets, including King George Highway.

6.3.1 CITY CENTRE STREETSCAPE ELEMENTS

Treatments for urban streets in the City of Surrey Centre could include:

- **Bicycle Lanes**: Many streets in the City Centre would benefit from enhanced bicycle facilities including shared vehicle-bicycle lanes, as provided by the roadway cross sections included in the City Centre Plan. An emerging concept is the marking of bicycle routes across intersections, as in the second illustration. This marking is in more common use in Northern Europe and has recently been implemented in Richmond, BC. In future, a recommended Canadian standard for bicycle lane markings may be adopted.

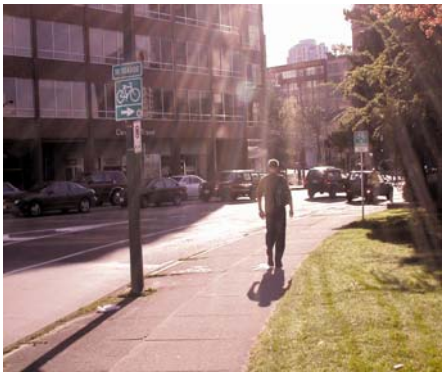
- **On-street parking and curb bulges**. The recommendations for the street network and parking both emphasize use of on-street space, especially during off-peak periods. These illustrations show how a curb lane has been set aside for parking with the curb extended at the intersection and near a crosswalk, to narrow the crossing distance for pedestrians. These are already being applied on some local and collector roads in the City Centre.



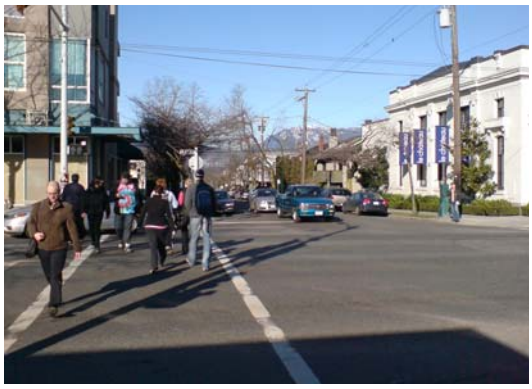
- **Bus Lanes and Bus Shelters**. Over time, it is expected that median transit lanes would be implemented on King George Highway and then expanded to 104 Avenue and Fraser Highway. The first photo below shows how this was achieved on No. 3 Road in Richmond when the 98 B-Line ran in its own lanes. Transit would typically operate in the curb lanes of other arterial streets, with accessible bus stops featuring shelters at busy locations and substantial waiting area for passengers – this allows the bus to extend its ramp for passengers using mobility aids and pushing strollers to board the bus.

- **Landscaped Boulevards**: These will be provided for aesthetic and erosion-control purposes. A combination of trees, shrubs, and grasses could be considered. Street trees can often be lined up with street lighting, as shown in the second illustration.

- **Sidewalks**: These illustrations show that a range of sidewalk designs can be suitable, depending on the nature of the street. The first example includes streetscaping and a wide sidewalk, which extends under the awnings of the commercial property. The second is in a mixed residential/commercial area.



- **Crosswalk**: All intersections with pedestrian movements should have marked crosswalks. Two styles of markings are shown here, a 'textured brick' marking (this helps deter drivers from proceeding too quickly in high pedestrian volume areas), and a more traditional crossing.

- **Traffic Calming**: There are various types of traffic calming that would apply in the City Centre, depending on the type of street. On arterials, collectors, and busier local streets, it is more appropriate to use traffic signals, lane markings, the median, and curb bulges to delineate the street and manage the general flow and speed of traffic. Features such as speed humps, speed tables and mini-circles will not be suitable on busier streets in the City Centre and should only be considered for outlying lower-density residential streets, for access lanes or for mews (to control speeds).


6.3.2 SURREY CITY CENTRE STREETSCAPE RENDERINGS

Several examples of the proposed Surrey City Centre street cross sections were prepared and presented to the public at the September 2008 Open Houses. These provide useful illustrations of the relationship of the traffic lanes and street treatments for a variety of street types.

Exhibit 6.2 is an illustration of King George Highway (KGH) with the proposed median transit lanes included. This section of KGH would include wide sidewalks, a landscaped boulevard with street trees, marked crosswalks, street lighting for both the traffic lanes and the sidewalks, and a far-side bus stop. The bus stop includes a shelter, trash/recycling bin and newspaper box. The area beyond the sidewalk is shown here with paving stone; this area may be a setback between the sidewalk and the front of the building and act as an unofficial extension of the public space next to the street. Note that each of the curb lanes includes a marking for wider, shared bicycle lanes.

Exhibit 6.2: Street Treatments – King George Highway with Bus Lanes

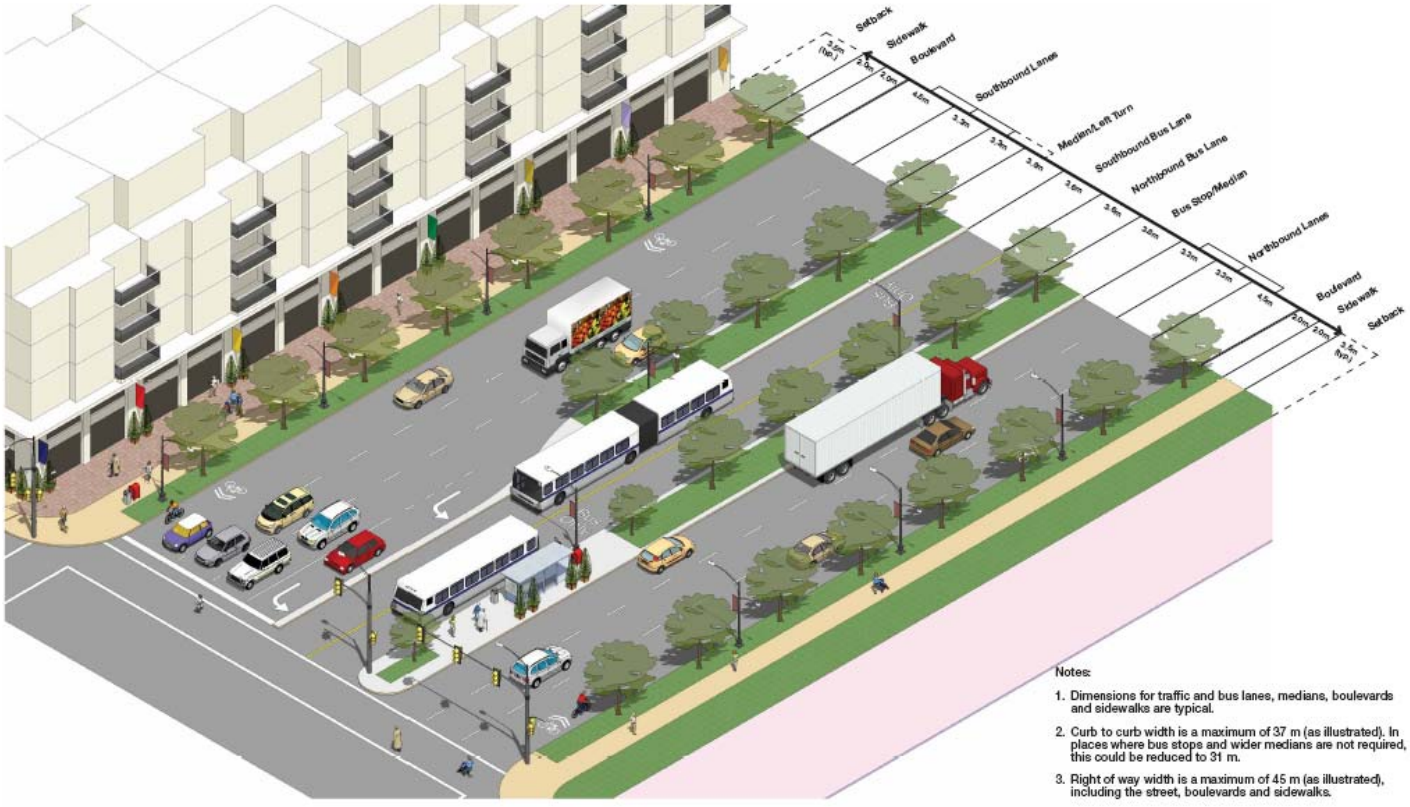


Exhibit 6.3 is an illustration of a four-lane arterial street with a left –turn lane at the intersection. This street section would include wide sidewalks, a landscaped boulevard with street trees, marked crosswalks, street lighting for both the traffic lanes and the sidewalks, and a far-side bus stop. The bus stop includes a shelter, trash/recycling bin and newspaper box; it acts as an extension of the sidewalk just beyond the corner of the two streets. The setback area (with paving stone) and the shared-lane bicycle facilities are similar to what was shown for KGH.

Exhibit 6.3: Street Treatments – Arterial Street with Median

Exhibit 6.4 is an illustration of a three-lane collector street with a left –turn lane at the intersection and parking along the curb elsewhere. This street would include medium-wide sidewalks, a landscaped boulevard with street trees, marked crosswalks, street lighting for both the traffic lanes and the sidewalks, and access to the parking spaces (and parking meters) from the sidewalk. Note that each of the curb lanes has exclusive bicycle lanes marked by continuous lines.

Exhibit 6.4: Street Treatments – Collector with Curb Lane Parking

APPENDICES