Residential Wood Frame Innovation Comprehensive District

Urban Design Study

Submitted to:

City of Prince George

December 2010

by:

HB LANARC

PLANNING DESIGN SUSTAINABILITY

and

D'AMBROSIO

architecture + urbanism

with

OPUS International

Dayton & Knight Ltd.

CITY OF
PRINCE GEORGE

APPENDIX D

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EXECUTIVE SUMMARY

Study Purpose and Methodology

The purpose of this study was to explore the possibility of introducing mid-rise (5-6 storey) wood-frame buildings into the RWICD study area which currently provides policies and objectives for up to 4 storey buildings. The RWICD study area is bounded by Winnipeg Street to the west, Victoria Street to the east, 4th Avenue to the north, and 11th Avenue to the south. Two policy scenarios with two growth scenarios each were identified:

- Existing Policy
    - 15 – 25 year build out (roughly 700 additional units)
    - Complete build out (roughly 2000 units)
- Policy enabling 6 storey wood frame
    - 15 – 25 year build out (roughly 730 additional units)
    - Complete build out (roughly 3200 units)

These formed the basis for the urban design, civil and transportation engineering studies, including the public engagement component. Specifically, the RWICD study included:

- A review and summary of the existing physical and policy contexts for the study area;
- A technical review of servicing and transportation policy and infrastructure to establish a baseline for the study;
- A detailed urban design study;
- A community design workshop and public request for comment and survey;
- Technical (transportation, infrastructure and servicing) modeling and evaluation based on the policy and growth scenarios identified above.

In addition to the identification and assessment of opportunities and constraints associated with introducing mid-rise wood-frame buildings, this study also included a technical review and assessment of urban design, transportation, and servicing and infrastructure constraints and implications under existing policy.

Key Study Findings

Urban Design

The urban design study explored potential opportunities for introducing up to 6 storey wood-frame buildings in consideration of parking, building design (articulation), orientation, views, transition in scale, and improvements to streetscape amenities and the overall open space network. The study also identified the existing physical/built context to identify opportunities and constraints related to future growth and change in the study area more generally. Following are the key findings of the urban design study:

- The areas "City Beautiful" block structure and street layout, and its proximity to the downtown core and its diverse amenities, make this neighbourhood a desirable area for locating future residential and mixed use growth both from a neighbourhood livability and Citywide sustainability perspective.

- Options for at-grade off-street parking were identified as an alternative to underground parking which was deemed to be prohibitively expensive at the time of construction for this type of development in this location over the short to medium term.

- The 5 and 6 storey wood-framed multi-family buildings in the cost- range envisioned in this study may be more limited in form and dynamics than comparable concrete structures. Construction budgets necessitated by market- driven building and sales economics tend to result in simple rectilinear ('boxy') buildings. The precedents for these types of buildings bear out this observation.

- A "PG-Hybrid' building typology incorporating a 2-3 storey townhouse into a 6 storey building was developed as part of this study as a strategy for transitioning from new, taller buildings to existing, shorter buildings

- A number of public realm and streetscape enhancements including sidewalks, landscaped boulevards, greenways, pedestrian crossings, round-a-bouts in key locations, and traffic calming were identified as priorities to be considered as part of any future growth and change in the study area.

- The 5 to 6-storey wood-frame building typology may reduce the amount of wood that will be visible in future developments, in contrast to the objectives of this study which were to encourage the use and expression of wood in future development. This is because the structure is largely invisible once the building is complete, and under the new provisions of the building code for 5 to 6-storey wood structure buildings, the exterior is not permitted to be clad with wood unless it is fire-retardant-treated wood conforming to rigourous technical specifications with the inherent costs.

- Existing policy for the study area provides for a significant amount of capacity in a development form familiar to residents and builders/developers (i.e., 2-3 storey townhouses and 3-4 storey apartments buildings). If incentives are provided for wood cladding, the amount of wood used in buildings that meet the existing policy, could potentially use more wood than in the proposed 5 to 6-storey typology.

Transportation

Opus International Ltd. conducted a transportation study to assess potential transportation implications of introducing 6 storey wood-frame buildings into the study area. Key findings of the transportation study included:

- Under existing conditions, the current functional classifications for the study area road network are appropriate. Also, a number of intersections may be impacted within and outside the study area. Modifications to the network may be required to address delays related to left turn traffic, etc. This should be reviewed once the allocation of units in the neighbourhood are confirmed.

- While the RWICD condition constitutes a net increase of 60 percent more traffic compared to what is permitted under existing policy (assuming full build-out), the traffic impact analysis finds that there are no additional improvements that would be required under the RWICD condition as compared to the existing policy condition. Accommodating surface parking was identified as a challenge even assuming a potential 15 percent reduction in required off-street parking, assuming that a corresponding 15 percent reduction in automobile ownership and subsequently parking demand can result through Traffic Demand Management (TDM.)

- A TDM target vehicle mode shift of 15 percent would require transit and land use measures to form the bulk of the strategy with the goal of increasing walking and bicycle trips and reducing the need for residents to travel in single occupancy vehicles.

- A series of streetscape improvements and traffic calming measures are recommended within the neighbourhood. However, detailed analysis should be undertaken when more comprehensive plans are developed for the study area, including consultation with the Ministry of Transportation and Infrastructure (MoTI).

Servicing and Infrastructure

Dayton & Knight Ltd. evaluated the capacity of existing water, sanitary sewer, and storm infrastructure to service the proposed RWICD development area. The study evaluated infrastructure capacities under existing developed conditions, and for development that includes proposed multi-family mid-rise (four to six storey) buildings of wood construction.

The study identified servicing limitations for each of the water, sanitary sewer, and storm sewer systems. The study found that existing infrastructure cannot service build out levels of development for either four or six storey wood construction. Limited amounts of multi-family development can be supported in the proposed RWICD area, subject to limitations on development location, building size, density, type of construction and methods of storm water disposal.

Public Feedback

A Community Design Workshop with over 40 people in attendance was a key component of the RWICD study. The results of the community design workshop and public feedback showed that the majority of participants and respondents expressed that 5 and 6-storey wood frame buildings should not be permitted anywhere within the RWICD study area. Respondents that did express support for introducing up to 6 storey buildings identified the area between Victoria Street, Vancouver Street and 4th Avenue and 11th Avenue as the most appropriate location for this type of development. Within these areas, corners and along common greenspace were locations noted as being most suitable.

Participants and respondents also identified a number of desired public realm and streetscape improvements to accompany any new growth and development within the study area.

Recommendations

Based on the study findings, a number of recommendations were made. Key recommendations include:

- Upgrade the water distribution system , sanitary sewer, and storm water infrastructure to enable servicing of development currently permitted under existing policy and zoning. These upgrades would also enable servicing of 5 and 6 storey wood-frame developments.

- Adopt policy supporting the introduction of buildings up to 6 storeys in height in the area bounded by Victoria Street, Vancouver Street, 11th Avenue and 5th Avenue (see figure 31, pp 44). It is not recommended that this area be pre-zoned to allow such development. Rather, It is recommended that this area be re-designated through OCP policy to allow such development. As such, it is recommended that proposals for buildings between 4-6 storeys in height within this area be accessed through site specific re-zonings based on the considerations itemized within recommendation #9 below.

- The introduction of up to 6 storey buildings within the Crescents Neighbourhood Plan (CNP) area are not recommended. As such, changes to land use policy are not recommended for this area.

- Incentives and implementation tools to facilitate up to 4 storey residential development (as permitted under existing policy) and to encourage the use of wood cladding should be identified as a means of achieving the objectives of the RWICD initiative, namely, encouraging the use and expression of wood;

- City wide growth management policy should limit new growth on the periphery of the City, particularly low density green field development, so as to minimize auto-oriented sprawl development and significantly, to focus new growth within existing built areas that have been identified as priority growth areas, such as the RWICD study area.

Contents

1.0 Purpose & Overview

The Council of the City of Prince George has directed City staff to initiate a policy amendment discussion with the community regarding the creation of a "Residential Wood Innovation Comprehensive District" (RWICD). This is in response to recommendations from the November 2009 Mayor's Task Force for a Better Downtown Interim Report for immediate action aimed at improving the downtown marketplace climate and for fostering a culture of wood within the city of Prince George as a whole. This initiative also reflects two broad strategies identified in the Draft Integrated Community Sustainability Plan (ICSP) currently being undertaken by the City, namely, to focus growth in and around downtown neighbourhoods and to encourage wood construction as a key economic development strategy for the City.

The RWICD study area is bounded by Winnipeg Street, Victoria Street, 4th Avenue and 11th Avenue, and is intended to enable/encourage six story wood frame construction within this District. The area lies partially within the:

- Official Community Plan (OCP) higher density multi-family residential strategy area
- Crescents Neighbourhood Plan (CNP) multi-family conversion use area
- Smart Growth on the Ground Downtown Prince George Concept Plan (SGOG) transitional areas

Figure 1: Study Area Boundary

Extensive consultation to achieve the objectives and policies currently contained within these plans has been carried out. As such, further community consultation is being undertaken, together with a planning and design study and related technical (servicing and transportation) analysis, to explore opportunities, constraints and potential impacts related to the introduction of 6-storey wood frame buildings within the RWICD study area. This study is being conducted within the context of existing built form, servicing and infrastructure within this transitional area, and the stated concerns of residents within and adjacent to the RWICD study area regarding potential impacts of taller buildings.

The purpose of this report is to provide an overview of the existing physical and policy contexts for this study, and in particular, to identify some of the opportunities and challenges related to the introduction of 6 storey wood frame buildings in the study area and to inform community dialogue about the potential introduction of this building form. This is achieved through a policy review, site analysis, and precedent review, along with a preliminary urban design study focused on siting, massing, parking and potential public realm improvements. The urban design study is based on:

- existing policy which allows a building height of 3 -4 storeys within the study area; and
- the broad goals of the RWICD initiative, namely, the introduction of 6 storey wood frame buildings.

The above two policy directions are studied based on:

- a full build-out scenario, and
- an anticipated 15 - 25 year build-out scenario, based on growth scenarios identified as part of the My PG OCP update process, and a high level assessment of development opportunities in the study area.

It is important to note that a market demand study is not included as part of the scope of this study, and further, a residential demand study for the RWICD study area does not exist. As such, anticipated growth in the study area is based on extrapolating a range of units for the study area based on the Growth Scenarios identified in the Draft OCP, and included as **Appendix C.**

An overview of the existing transportation network and policy framework is provided in **Appendix A: RWICD Transportation Backgrounder**. An overview of existing infrastructure and servicing is included as **Appendix B: RWICD Servicing and Infrastructure Backgrounder.**

2.0 Policy Overview

The RWICD study area is addressed within the following policy documents:

- Official Community Plan (OCP)
- The myPG Sustainability Plan (Integrated Community Sustainability Plan (ICSP))
- Crescents Neighbourhood Plan
- Smart Growth on the Ground Downtown Prince George Concept Plan (SGOG)

Development of the objectives and policies currently contained within the above plans involved extensive consultation. Highlights from these policy documents relevant to the RWICD study area are provided on the following pages, and summarized by the diagram below.

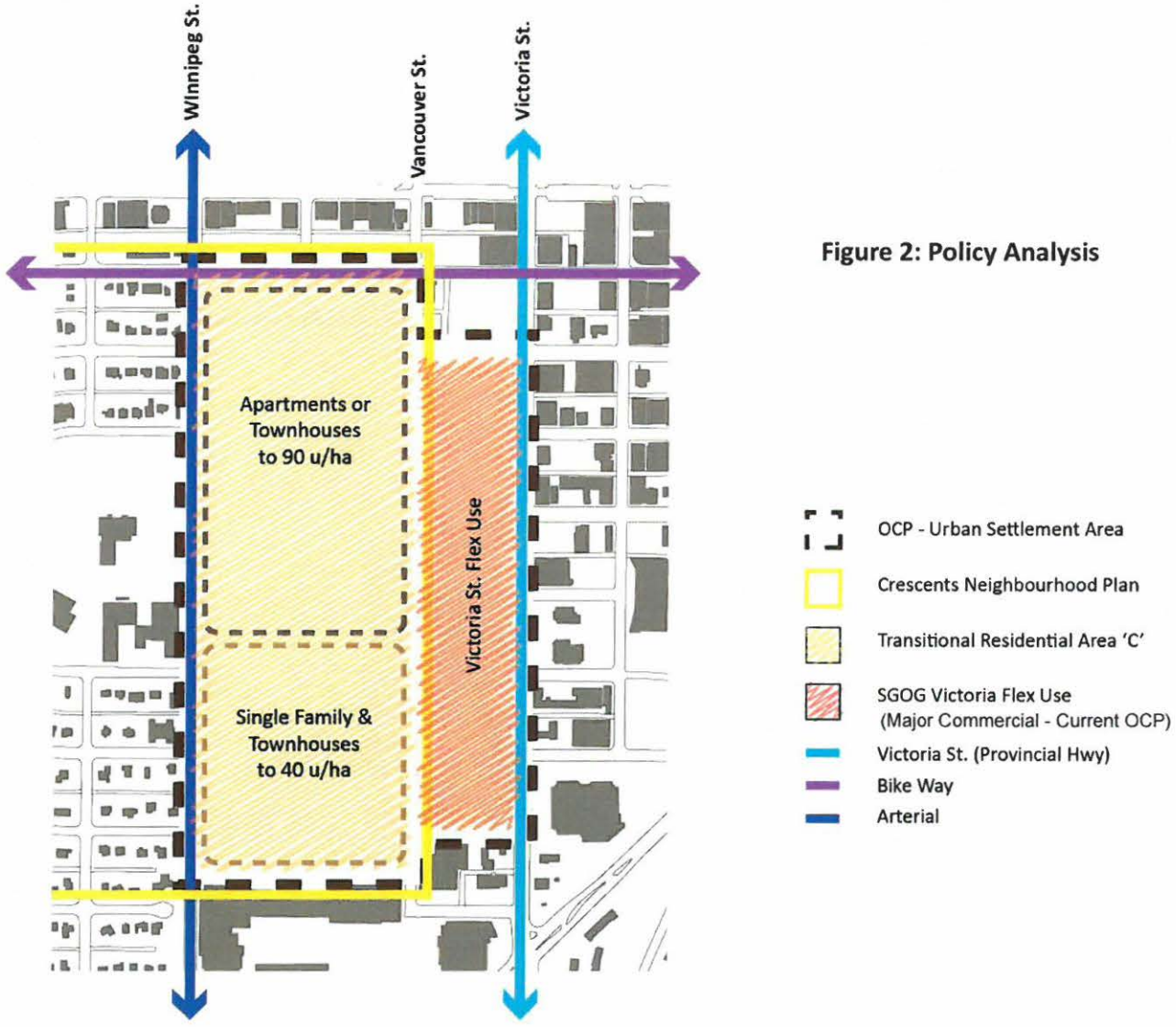


Figure 2: Policy Analysis

Integrated Community Sustainability Plan (ICSP)

The ICSP is a high level document that establishes a vision of the long term future for Prince George. The key goals and strategies outlined in the ICSP relevant to the RWICD study area (from a land use perspective) aim to promote increasing density in the downtown core, to ensure transit supportive densities and increase walkability to nearby services, reduce the overall carbon footprint and support a the use of local resources, in particular, wood.

Official Community Plan (OCP)

Overview: The OCP defines the RWICD study area as an "urban settlement area" and "transitional neighbourhood" that will accommodate future growth in the form of higher density, infill housing. The form of housing is defined as a mix of townhomes, rowhouses and four storey apartment buildings. Victoria St. is defined as a key area of transition to downtown and designated for commercial/office use.

- Schedule C : Long Range Land Use designates the RCIWD study area as 'Urban' and Victoria St. as "Downtown-Commercial"
- The OCP defines the RWICD study area as: "Urban Settlement Area" (OCP Map 1) and Victoria St. as a "Major Commercial Site':
    - The designated settlement area of the OCP is projected to accommodate a future growth of 80,000 new people. Guiding principles for redevelopment stress compact communities, infill neighbourhoods, a variety of innovative housing, preservation of the quality/character of neighbourhood, and the inclusion of social housing.
- The OCP further defines the RWICD study area as "Transitional Residential Area C' (OCP Map 4: Residential Strategy:

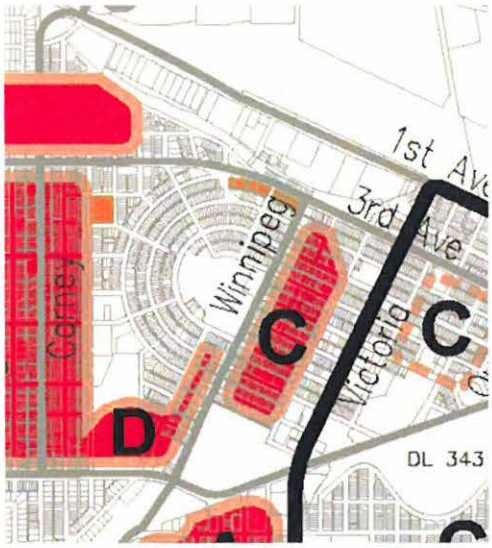


Figure 3: OCP Map 4: "Transitional Residential Area C'

- To this regard, Policy 6.3.9 of the OCP provides the following direction: "c. Redevelopment to higher density multi-family (apartments) – the neighbourhood between Vancouver and Winnipeg streets is recommended for apartments due to the age of the housing stock and its strategic location in the city centre. Future housing in this area may consist of a mix of ground-oriented townhomes and apartments; property assembly is required to create larger sites and improved site design. A small part of this area may be suitable for conversion to residential commercial..."

  a. Redevelopment densities are defined as; medium density townhomes (8-16units/acre)-ground oriented, low rise apartments (12-36units/acre)-four storey, high density apartments (36units/acre), four storeys or higher

  b. Clustered small lot single family housing is encouraged adjacent to community amenities

  c. Mixed use is encouraged along major roads, or established neighbourhood amenities (parks, community centers, etc.)

  d. Townhomes should be integrated with other forms of housing, creating a street oriented, 'urban village'

  e. Apartments should be integrated into commercial areas, adjacent to collector/arterial, or located at the periphery or entrance to the neighbourhood, with appropriate setbacks, landscaping, and/or terracing of the building form

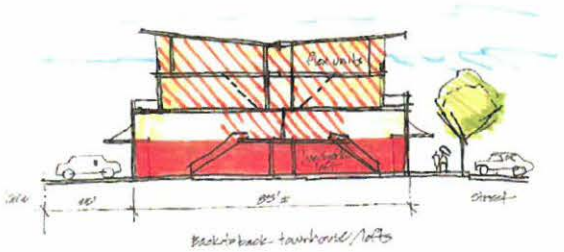
- Multi-family in the RWICD study area are guided by Section 6.4 which outlines Residential Development Permit Area Guidelines for multifamily housing. This includes:

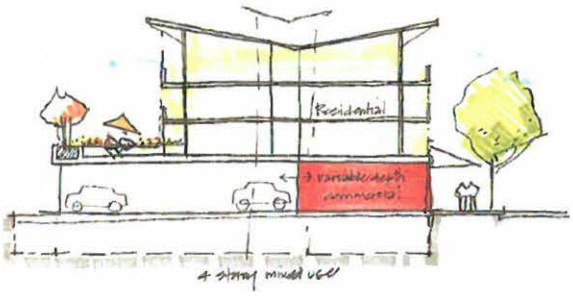
    - Must not exceed a built area of 1200m2, t/h and r/h maximum 16 units cluster, must be adjacent to park, amenities, maximize sun exposure.
    - Guidelines also incl. a description of standard good building design, landscape, play areas and parking and lighting

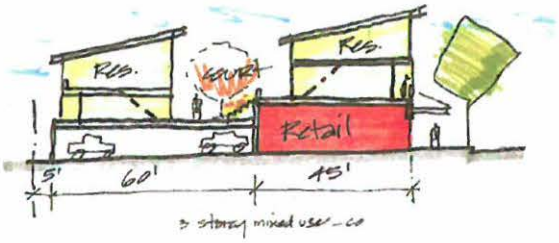
- Map 9 - Major Road Network defines Winnipeg St. and 4th Ave as "arterial roadways" and Victoria St. as a "Provincial Hwy"; 10th Ave and Winnipeg St. are designated as "on-street, existing bikeways". More detailed information related to the existing transportation network and City wide transportation policy can be found in **Appendix A: RWICD Transportation Backgrounder.**

Smart Growth On the Ground (SGOG) Concept Plan

The SGOG Downtown PG Concept Plan provides some direction for only a portion of the RWICD study area between Vancouver St. and Victoria St., and 4th to Parkwood Place. These blocks are envisioned as a 'transitional' area between higher densities in a compact mixed use downtown and the residential neighbourhoods to the west of downtown. Mixed use buildings with ground floor commercial uses are envisioned to front onto Victoria Street, with transitional housing envisioned as flex-use live/work townhouses forms in between Victoria and Vancouver Streets.







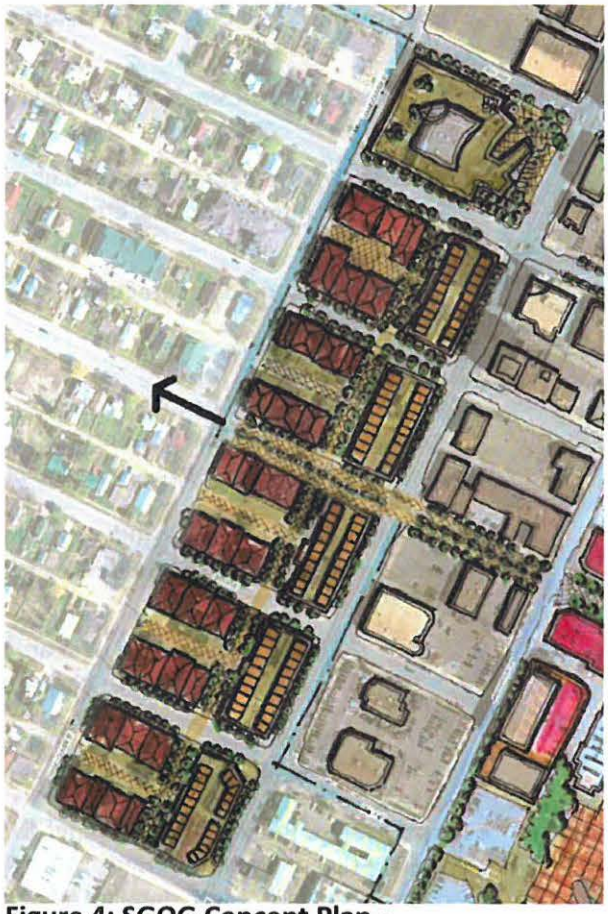


Figure 4: SGOG Concept Plan - Victoria Flex District

Crescents Neighbourhood Plan

The Crescents Neighbourhood Plan only covers a portion of the RWICD study area between Winnipeg St. and Vancouver St., and 4th to Parkwood Place. Consistent with the OCP, the neighbourhood plan defines the area as 'transitional' and appropriate for future growth and higher density housing, including a mix of duplex, townhomes and apartments (4-storey). While infill development is outlined, this plan proposes that some existing single family would be maintained (sensitive infill development) and the character of the area retained. Higher densities are encouraged to occur adjacent to community amenities (park spaces, schools, etc.), arterial roadways or commercial streets. The east side of Vancouver St. is allocated to expand some minor commercial uses as long as the west side of Vancouver St. has been redeveloped to higher densities.

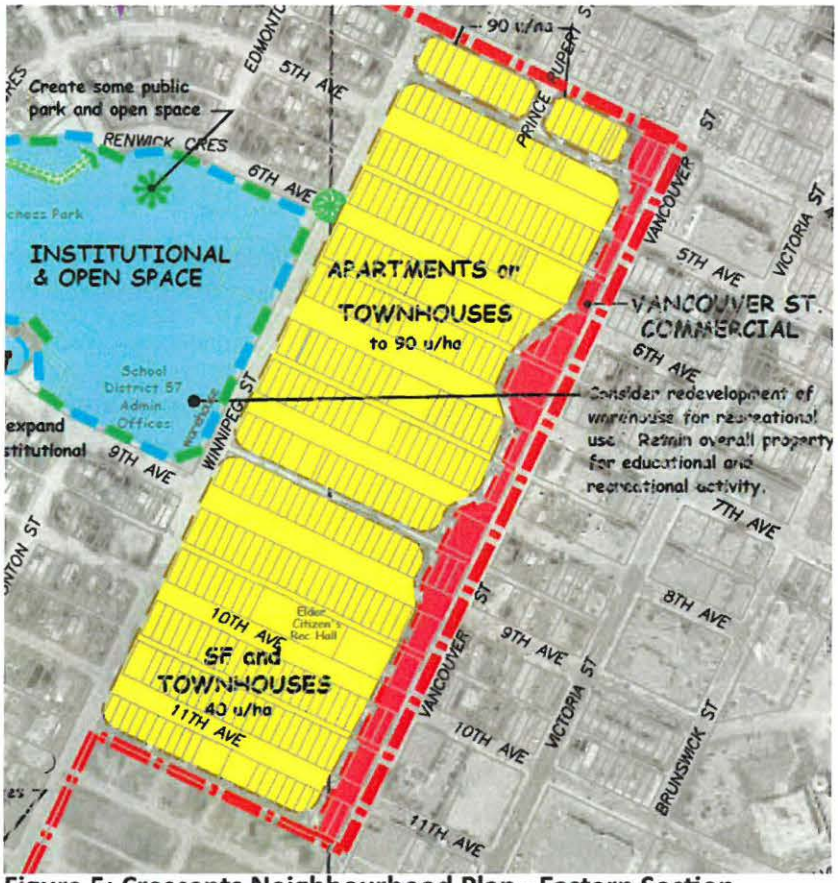


Figure 5: Crescents Neighbourhood Plan - Eastern Section

Relevant Policies from the Crescents Neighbourhood Plan include:

- Policy 5.1.1. of the CNP provides the following direction for the RWICD study area (with respect to residential):

    - "Provision is made for continued development and conversion of parcels situated between Vancouver and Winnipeg Streets for apartment or townhouse developments. Future rezoning applications in this area shall also be subject to consideration of the following:

a. The area between 11th Ave and 9th Ave shall be considered only for redevelopment to townhouse type projects, or continued use for single family or duplex dwellings. Townhouse development are encouraged where the site area is at least 1125m2 in area(normally requiring development of about 5 existing lots) with a density maximum of 40 units per hectare with the exception of the Elder Citizens Recreation Site where higher density may be appropriate. Smaller sites may be considered in special circumstances.

b. The area between 8th Ave and 4thAve is preferred for either townhouse or apartment type densities. Apartments are preferred where the site area is 1375m2 in area (normally about 6 lots) with a maximum density of 90 units per hectare.

c. Any redevelopment within the area between 8th Ave and 4th Ave is contingent on any lots that are left within the block not being 'locked in' thus prohibiting the opportunity for redevelopment.

d. Multi-family sites are to be consolidated to form one parcel of land per development, as a condition of rezoning.

e. Blocks immediately south of 4th Ave, between Winnipeg and Vancouver (extending to the lane) shall have no specific site minimum, but are subject to a density maximum of 90 units per hectare."

- Policy 5.3.1. of the CNP provides the following direction for the RWICD study area (with respect to commercial):

    - "Some minor expansion of commercial confined to service commercial and office use is encouraged on the west side of Vancouver Street, permitting redevelopment with consolidation of lots fronting on Vancouver St. No further expansion westward is recommended in this area, as most of the lots in this area are proposed for various housing densities."

- Section 5.6 of the CNP provides the following direction for the RWICD study area (with respect to transportation):

    - That 5th Ave will serve as an arterial route into downtown, 10th ave as a collector extending to the school and neighbourhood center; 9th Ave and Winnipeg St. as bike routes; and new signals are desired for pedestrian and bikes (specifically at 6th and Winnipeg St. for bikes and 8th and 9th Ave at Winnipeg St. for pedestrians).

- Section 6.0 of the CNP provides the following direction for the RWICD study area (with respect to Implementation):

    a. "...proposed potential implementation for traffic calming in the overall neighbourhood context..."

3.0 Site and Context Overview

The RWICD study area is bounded by Winnipeg Street, Victoria Street, and the lanes in behind 4th Avenue and 11th Avenue, and is located directly adjacent to the downtown core at the boundary of the Crescents Neighbourhood. Between Victoria Street and Winnipeg Street, the study area consists of residential buildings and uses, the majority of which are single family homes ranging from roughly 50 to 90 years old, some of which are located on double lots. This portion of the study area also includes four 3 and 4 storey apartment buildings, most of them built within the past 10-15 years. Between Victoria and Vancouver Streets, the area consists of primarily commercial buildings and uses, many of these ranging from 20-50 years old. There are a number of vacant parcels and surface parking lots located throughout the study area. Typical lot size within the study area is 9m wide by 34m deep. Many buildings straddle two or more property lines to accommodate larger buildings and off-street parking.

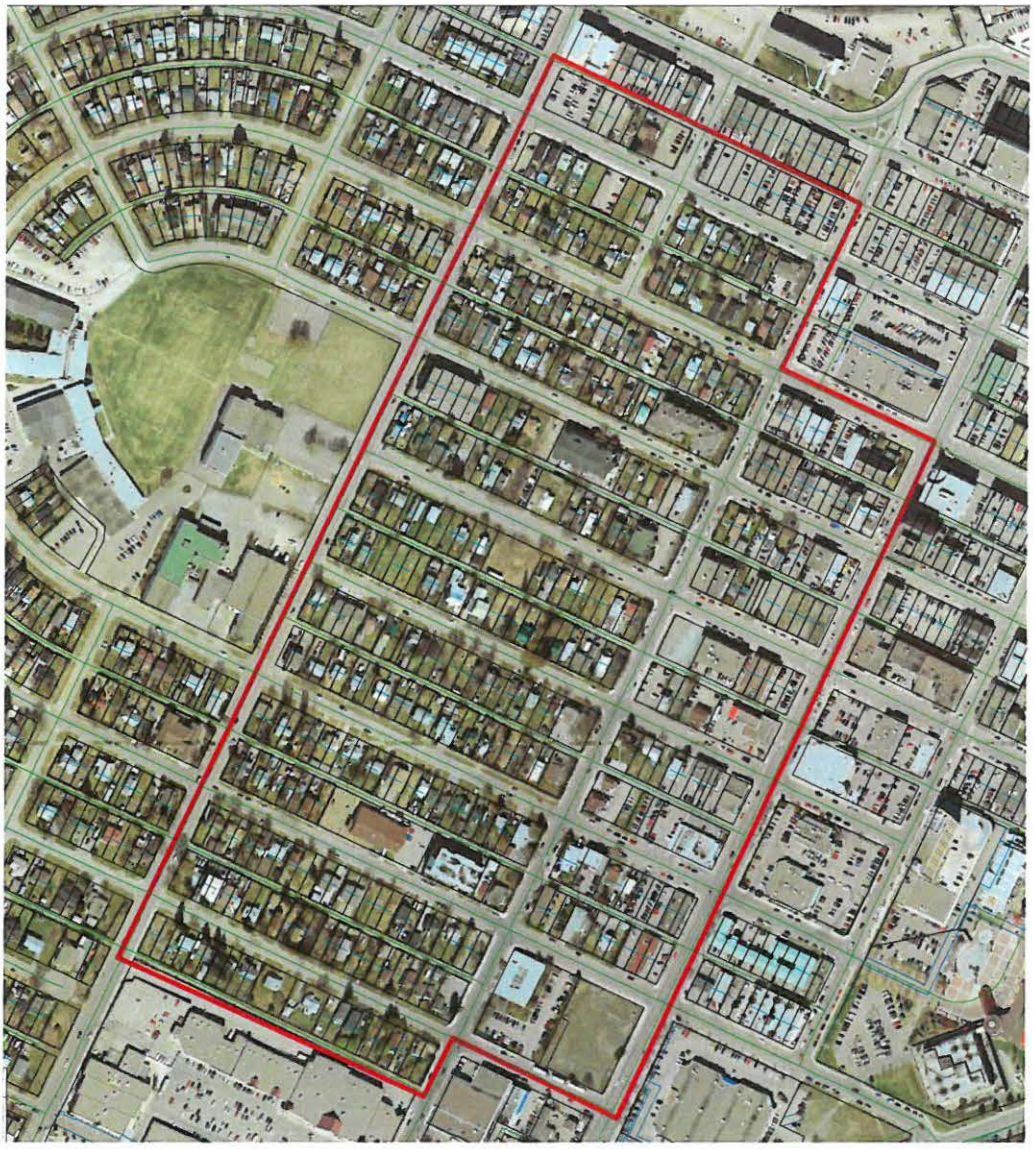


Figure 6: Aerial Photograph (2008) showing RWICD study area

Residential Buildings of the Neighbourhood

Figure 7: Majority of the neighbourhood are single family homes ranging from roughly 50 to 90 years old, some on double lots (shown above).

Note: Lines are not intended to accurately place pictures shown at the lot level.

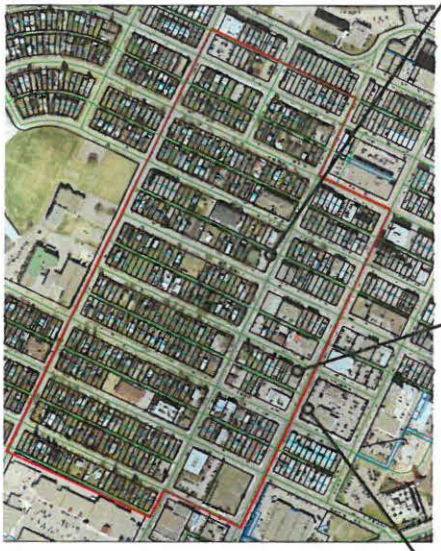
Figure 8: There are also duplexes in the neighbourhood.

Figure 9: There are also 3 and 4 storey apartment buildings, most of them built within the past 10-15 years

Figure 10: New buildings are consistent with the character style of the neighbourhood.

Commercial Uses of the Neighbourhood

Figure 11: Commercial conversion (of residential) along Vancouver St.



Note: Lines are not intended to accurately place pictures shown at the lot level.

Figure 12: Commercial use on Victoria St. (looking into study area).

Figure 13: Victoria St. commercial uses adjacent to study area on downtown side.

The study area is located within a five minute walking radius of several key amenity areas, including commercial-retail nodes, parks and civic spaces. The street layout of the area reflects the original 'City Beautiful' movement popular in the early 1900's. The study area is a key piece of this history, as reflected in the concentric street alignment. Two key streets are primary axis in and out of the neighbourhood. 7th Ave strongly connects through downtown terminating directly at the center of Duchess Park Secondary School and 9th Ave, extends from the neighbourhood directly into the heart of the City Centre (Prince George City Hall). The study area blocks are roughly east-west aligned. They are larger than average block size of approximately 240m in length. To the south of the study area is a large, auto-oriented retail center. To the west is residential (primarily single family residential), public amenities and a few major employment nodes (University Hospital of Northern British Columbia and CN Industrial Lands to the Northeast of downtown).

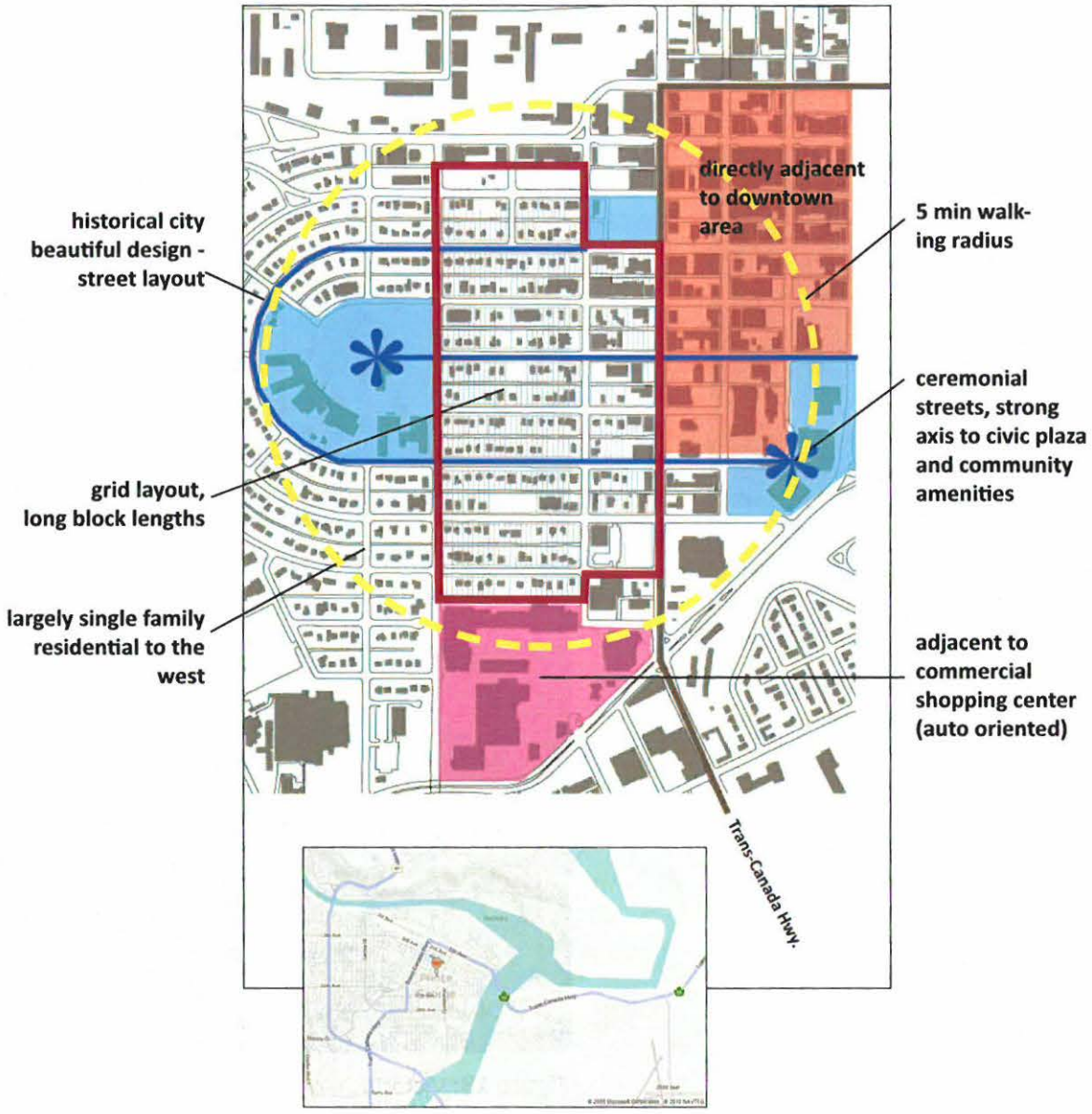


Figure 14: Site and Context Analysis Diagram

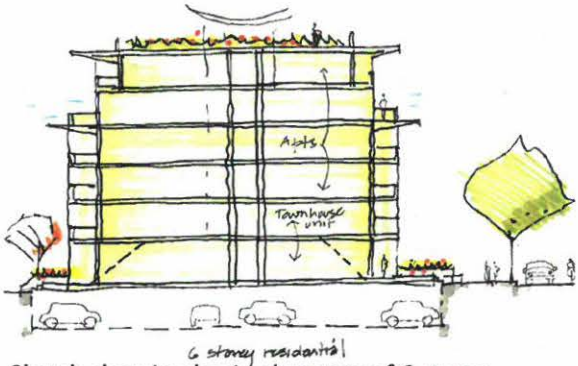
4.0 Mid-Rise Wood-Frame: Precedents, Opportunities and Challenges Overview

In April of 2009, BC Building Code changes permitting the use of wood-frame construction for buildings up to 6 storeys tall went into effect. The change, which raises the limit from 4 storeys, is intended to help reduce the carbon footprint of residential construction, decrease construction costs, increase housing affordability, land use efficiency and the viability of transit service, and make use of one of B.C.'s most abundant primary resources: wood. 5 and 6 storey wood-frame buildings can also be designed to maintain a low seismic risk (Government of B.C. - Accessed October 26 2010) http://www.housing.gov.bc.ca/building/wood_frame/index.htm).

Key constraints include wood shrinkage, poor acoustics (internally between units and between outdoor and indoor spaces), fire flow limitations, moisture penetration and building upkeep. Building design, in particular building articulation (vertical set backs and horizontal upper storey step backs, are a significant challenge for 5 and 6 storey wood frame buildings due to structural loading requirements. However, some articulation is achievable with wood stick frame construction, and engineered wood products, offer greater flexibility with regards to building articulation.

Currently, jurisdictions in the United States permit five-storey condos of wood, or six storeys if the first floor is concrete. Wood framing is permitted on eight-storey buildings and higher in much of Europe, some examples of which are shown on the following page. Since the new B.C. Building Code changes, there have only been a handful of applications for 5-6 storey wood frame projects, including the Remy, in Richmond, B.C, shown on the following page.

A seismic shake test for a 6 storey wood-frame structure built from B.C. forest products and based on the new B.C building code. The test confirmed that seismic risk can be kept at a safe level for wood-frame construction up to six storeys.



Sketch showing basic elements of 6 storey (above) and 5 storey mixed use courtyard building with atrium with concrete base (below).

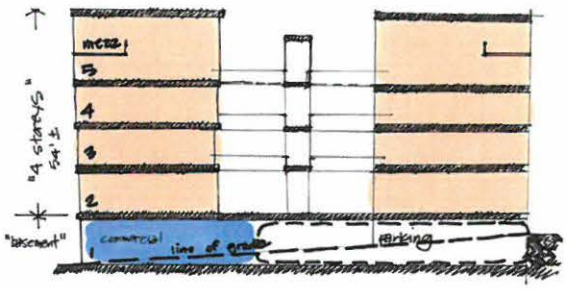
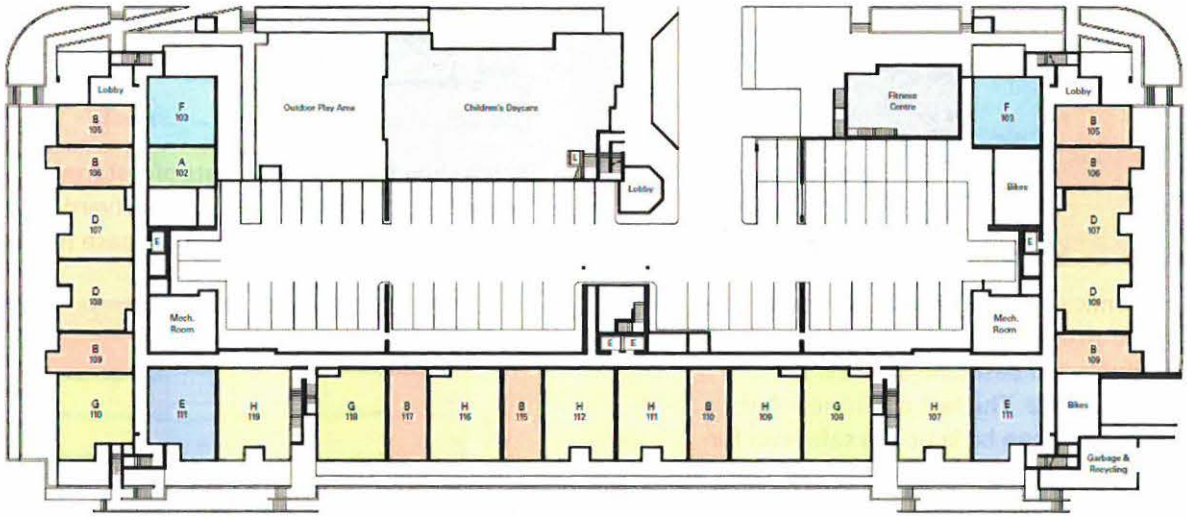


Figure 15: THE REMY

Elevation, Rendering and ground level floor plan of the Remy in Richmond, B.C., the first six-storey wood frame project to get a building permit in B.C.



LEVEL 1

Figure 16: THE MARSELLE - Seattle, WA.

The marselle building is an eight storey building: 6 storeys of wood frame construction on top of two storeys of conrete and steel construction.

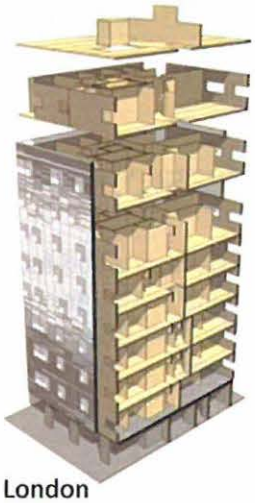
Figure 17: THE JEFFREY, Portland OR.

The Jeffrey is a new six story wood-frame rental apartment complex in Portland's West End district, three blocks north of Portland State University and across the street from Safeway. It has been built to LEED Silver standards and contains 50 studio units and 30 one-bedroom units. The building has bike storage, community rooms, secure outdoor courtyards, laundry facilities and secure access. Income restrictions apply.

TALLER MID-RISE WOOD -FRAME BUILDINGS FROM EUROPE

Limnologen. Vaxjo, Sweden

Esmarchstrasse 3. Berlin, Germany



The Stadthaus, Murray Grove, North London

Holzhausen, Switzerland

5.0 Urban Design Study

Siting (building location and orientation) and massing (building shape/form) studies were undertaken to explore and identify some of the opportunities, challenges, and implications of introducing 6 storey wood-frame buildings into the RWICD study area, and in particular, transition in scale from 5 and 6 storey buildings to existing lower scale building within and adjacent to the study area.

The RWICD study area's location adjacent to the downtown, its proximity to civic, cultural, and recreational amenities along with jobs and services, and it's fine grained block structure and "City Beautiful" layout, makes this neighbourhood a very desirable location for future growth both from a market demand, an urban design and policy perspective.

For the purposes of this urban design study, the consulting team assumed potential growth within the study area of roughly 600 - 800 additional units over a 15 - 25 year time period based on:

- the significant number of short, medium and long term development opportunity sites
- the emerging desirability of locating future growth in this neighbouhood; and
- assumptions about future growth as outlined in the draft OCP Review growth scenario options currently underway.

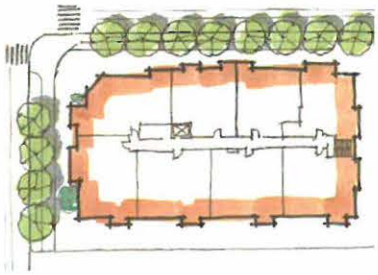
In addition to siting and massing, the urban design study also investigated:

- potential public realm and streetscape improvements that could accompany new taller forms of multi-family residential development;
- transportation network options including cycling and pedestrian routes; and
- a range of options to accommodate both on-street and off-street parking, including surface parking and underground structured parking.

Building Types

The following are some of the basic technical requirements as stipulated by the B.C Building Code for 5 and 6 storey wood-frame construction;

- Maximum building footprint for 5 storey building: 1440m2
- Maximum building footprint for 6 storey building: 1200m2
- exterior wall cladding must be non-combustible or constructed such that the interior surfaces of the wall assembly are protected by a thermal barrier or be of fire-retardant treated wood
- floor assemblies, mezzanines and load bearing elements shall have a fire-resistance rating not less than 1 hour.
- The building must be sprinklered



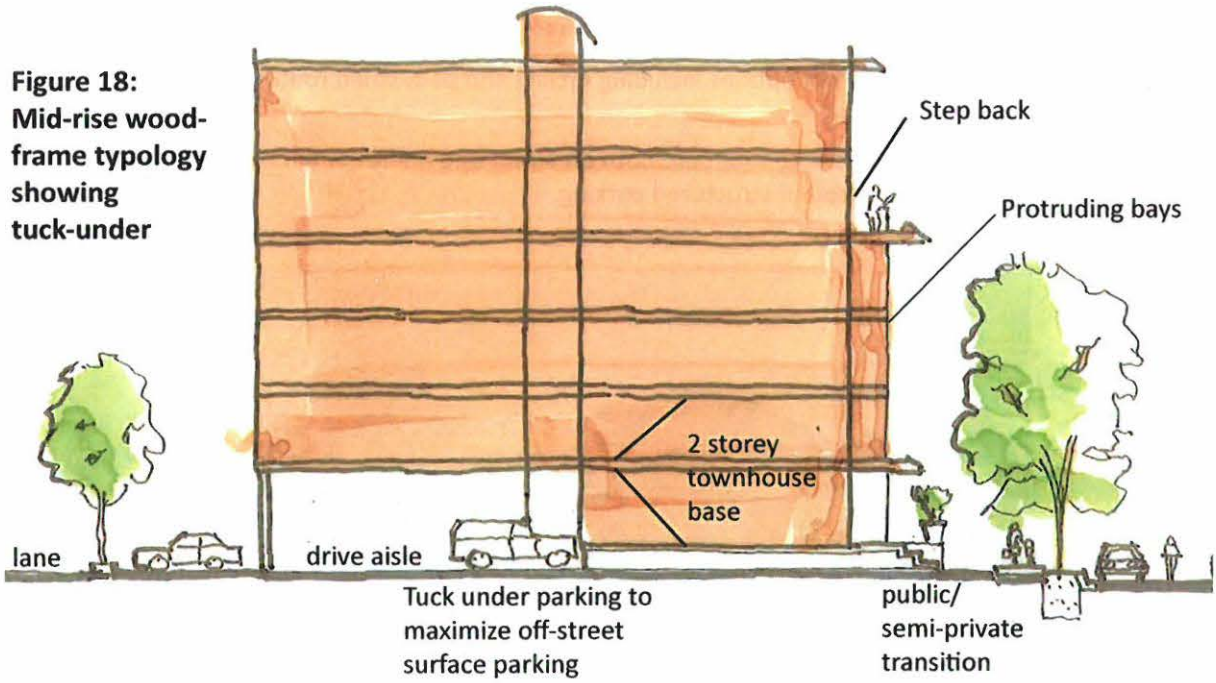
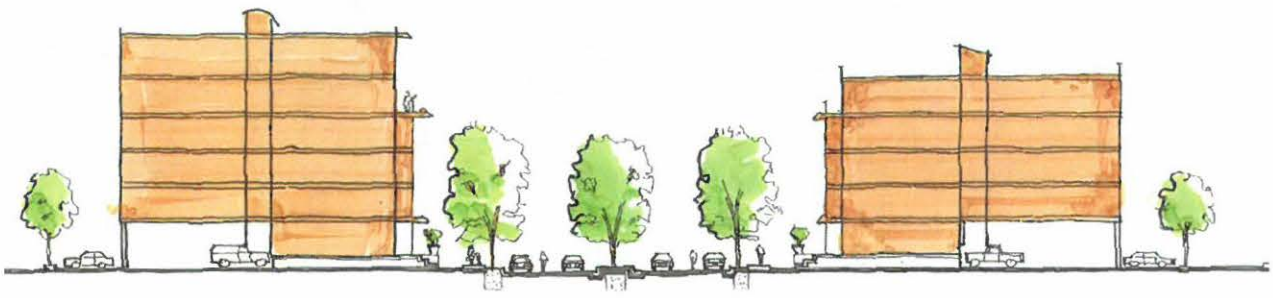


Figure 18: Mid-rise wood-frame typology showing tuck-under

MID-RISE/TOWNHOUSE HYBRID

6 storey building with townhouse 'podium' to transition in scale to existing single family homes as incremental growth and gradual densification occurs.

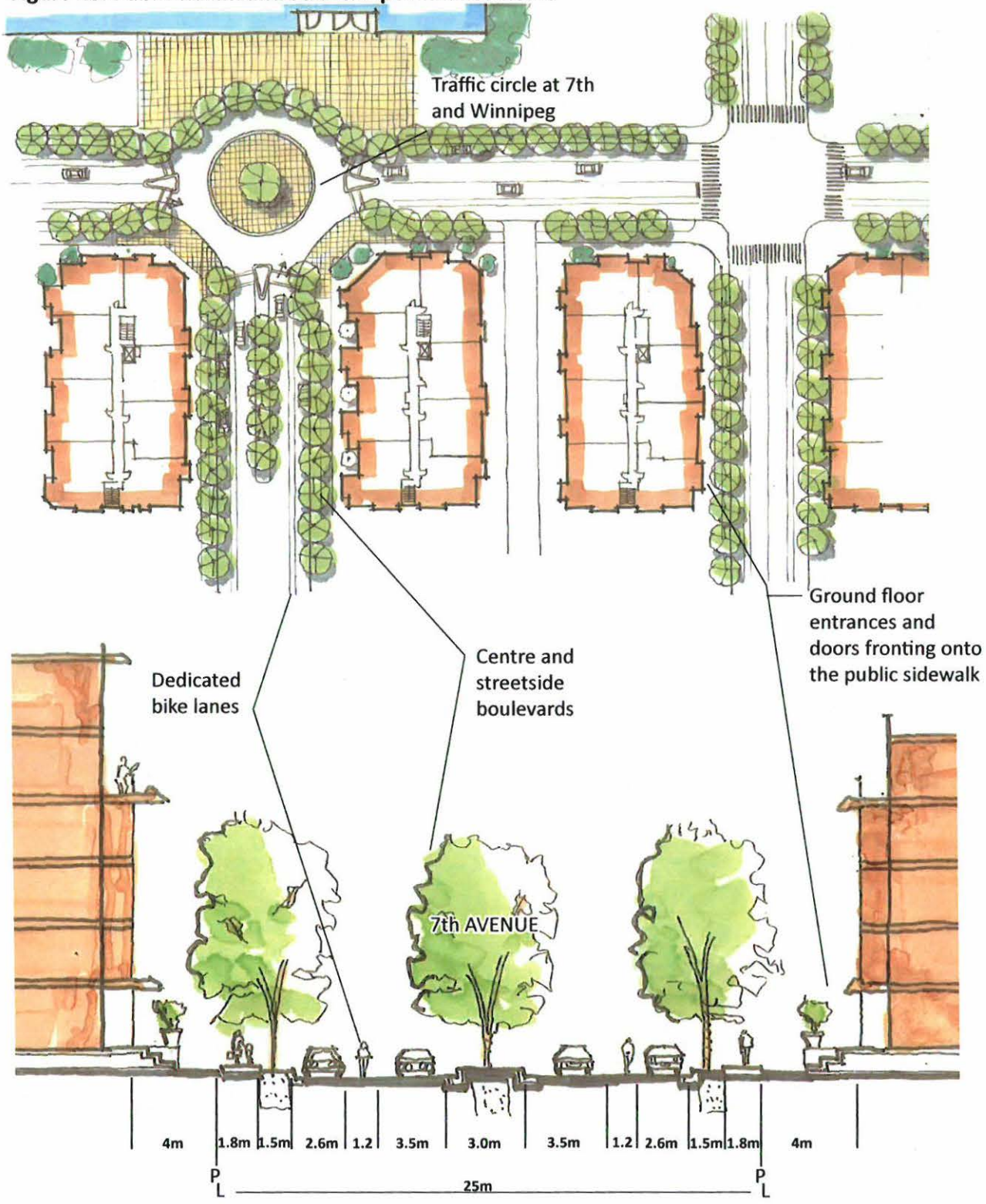
Figure 19: PG Hybrid (mid-rise + townhouse transition)



Section

Public Realm and Streetscape

Figure 20: Public Realm and Streetscape Enhancements



Parking

Required parking for a 5-6 storey residential building based on current City standards is roughly 90 - 100 stalls for a 6 storey building, and roughly 70 - 80 units for a 5 storey building. Underground structured parking is desirable from an urban design point of view. However, it can be prohibitively expensive at the stage of construction, undermining the financial viability of development.

As such, a range of surface parking options were explored to maximize the potential to introduce 5 and 6 storey wood-frame buildings from a market and financial perspective. These options included accommodating parking requirements through surface parking partially tucked under the building, and by accommodating some parking (such as visitor parking) on-street through both back-in angled parking and parallel parking. However, to accommodate the City's current parking requirements, additional surface parking would be required in addition to the tuck-under and on-street parking, which would accommodate roughly half of required parking. This could be partially addressed through reductions to existing parking requirements, which, in tandem with a range of surface parking approaches, could accommodate parking for 5 and 6 storey apartments without the need for underground structured parking.

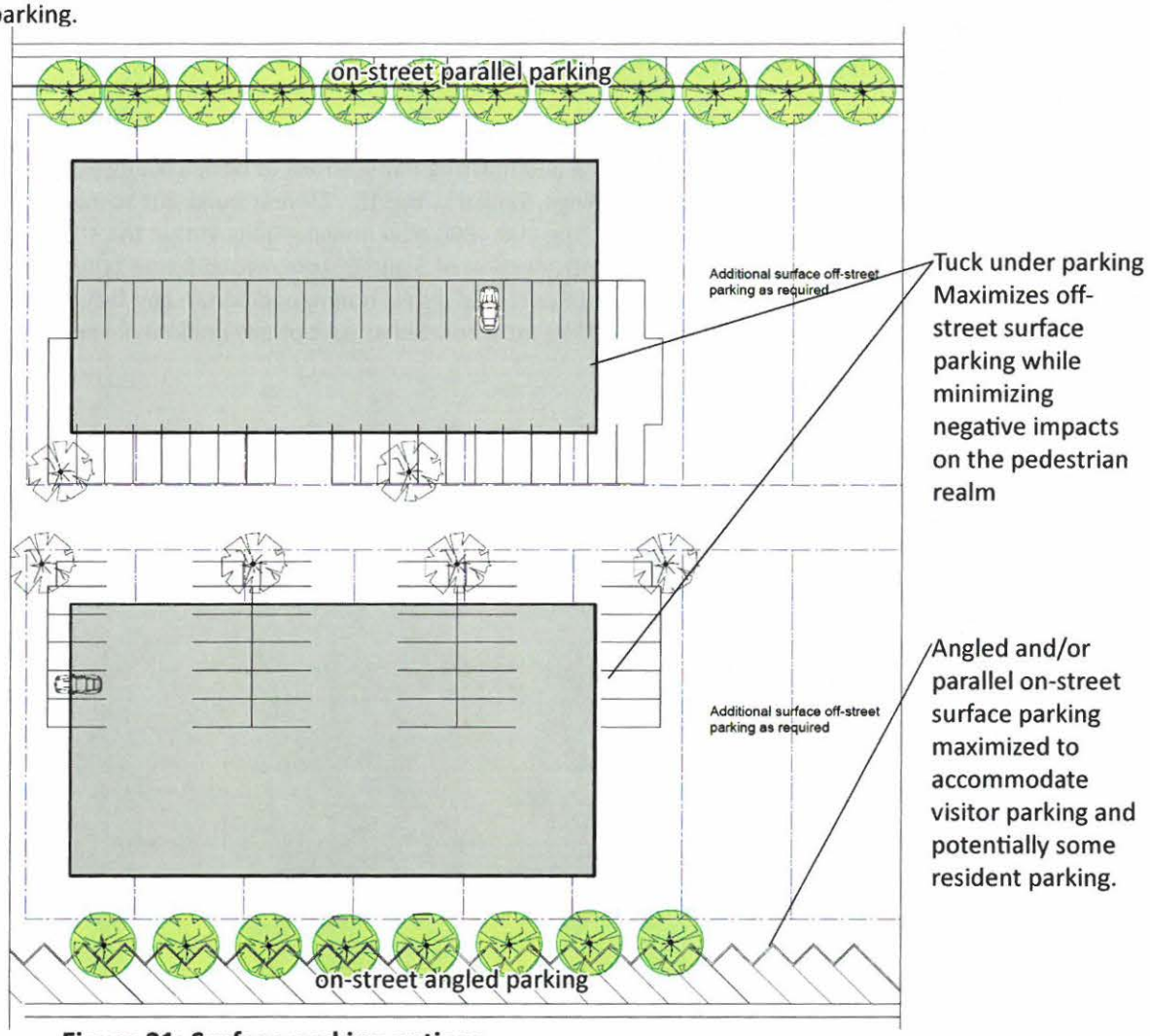


Figure 21: Surface parking options

Siting and Massing Study

The following pages contain siting plans (figure ground drawings) and massing models to illustrate siting and massing implications for the RWICD study area based on:

- existing policy which allows a building height of 3 -4 storeys within the study area; and
- the introduction of 6 storey wood frame buildings into the study area.

The above two policy directions are studied based on:

- a full build-out scenario that illustrates the neighbourhood if it were completely built out at the maximum allowable density, and
- a potential 15 - 25 year build-out scenario of roughly 600 - 800 new units, based on growth scenarios identified as part of the My PG OCP update process (included as Appendix D), and a high level assessment of development opportunities in the study area.

It is important to note that the full build-out scenarios (1B and 2B) are not proposals or plans. Rather, they are technical studies intended to test the siting and massing implications of both existing policy and the introduction of 6 storey wood-frame buildings. Similarly, the 15 - 25 year build-out scenarios are intended to show the implications for accommodating 600 - 800 new housing units within the study area both under existing policy (1A) and based on the introduction of 5 and 6 storey wood frame buildings (2A). The siting and massing studies also incorporate potential public realm, pedestrian and bicycle network, and streetscape improvements that could be incorporated as part of any gradual densification of the study area.

EXISTING POLICY - FULL Build-out (SITING PLAN): Roughly 2000 dwelling units

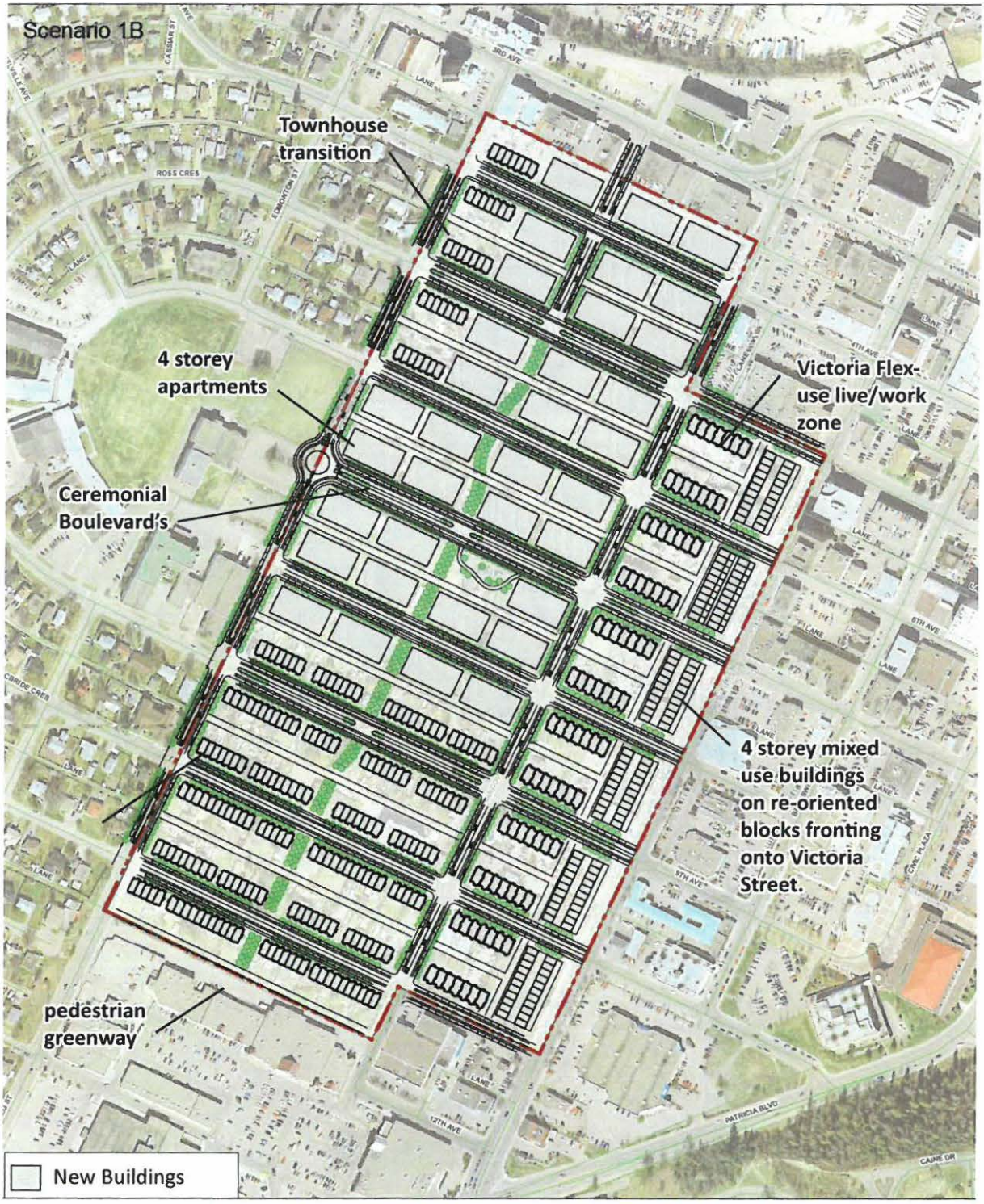


Figure 22: Existing Policy - Full Build Out Siting Concept

EXISTING POLICY - FULL Build-out (MASSING MODEL)

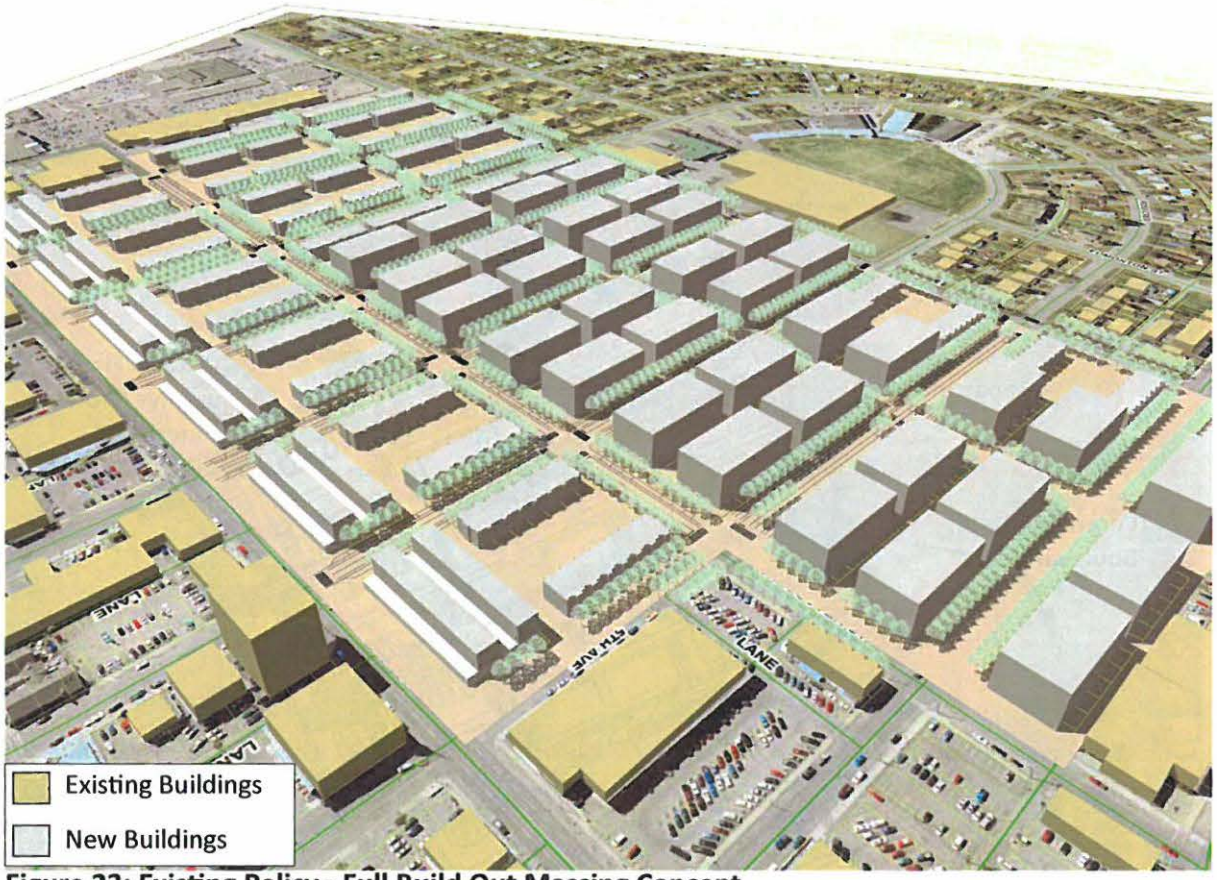


Figure 23: Existing Policy - Full Build Out Massing Concept

EXISTING POLICY - POTENTIAL 15 to 25 YEAR Build-out: Roughly 700 dwelling units

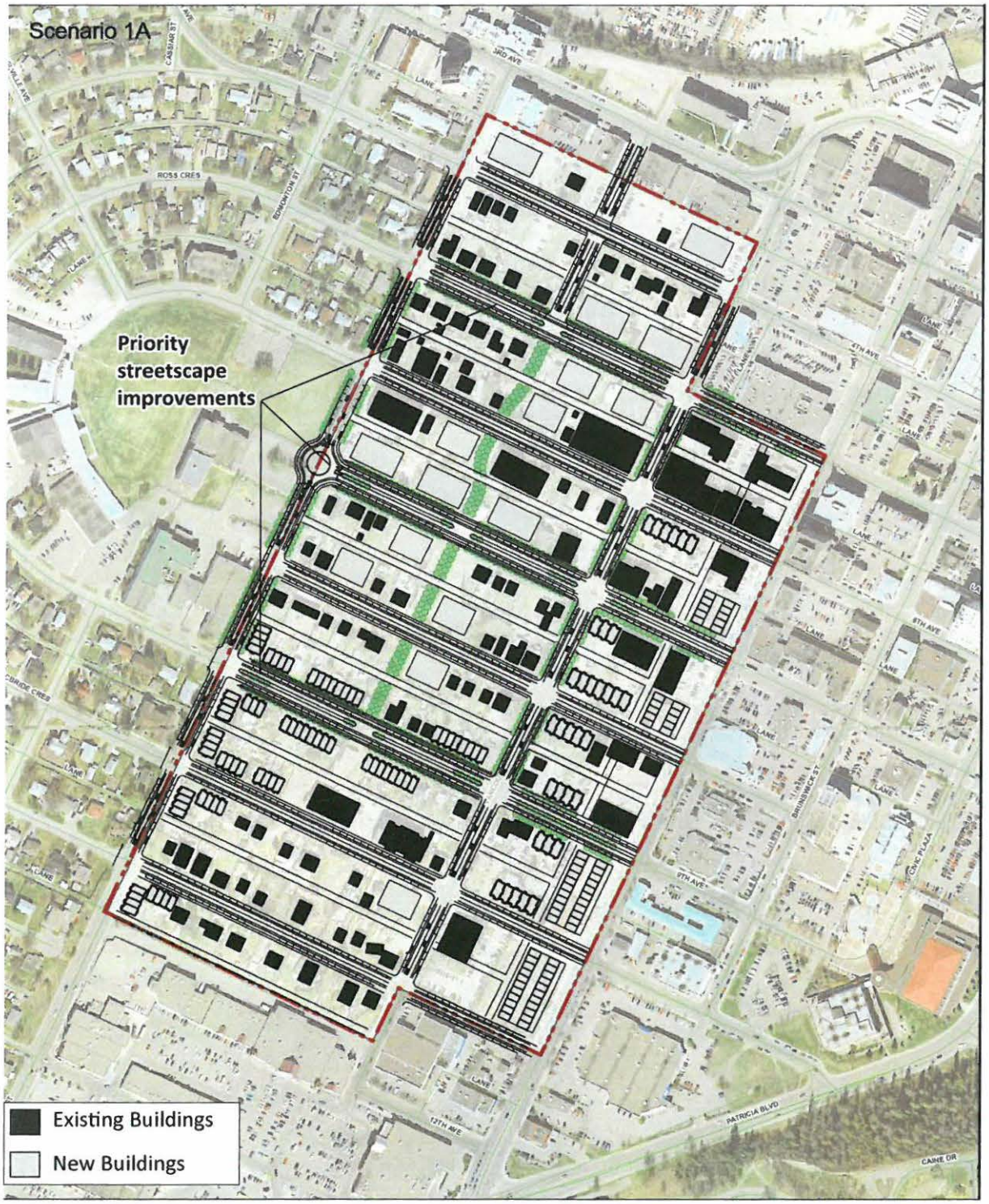


Figure 24: Existing Policy - Potential 15-25 year Build Out Siting Concept

EXISTING POLICY - POTENTIAL 15 to 25 YEAR Build-out (MASSING MODEL)

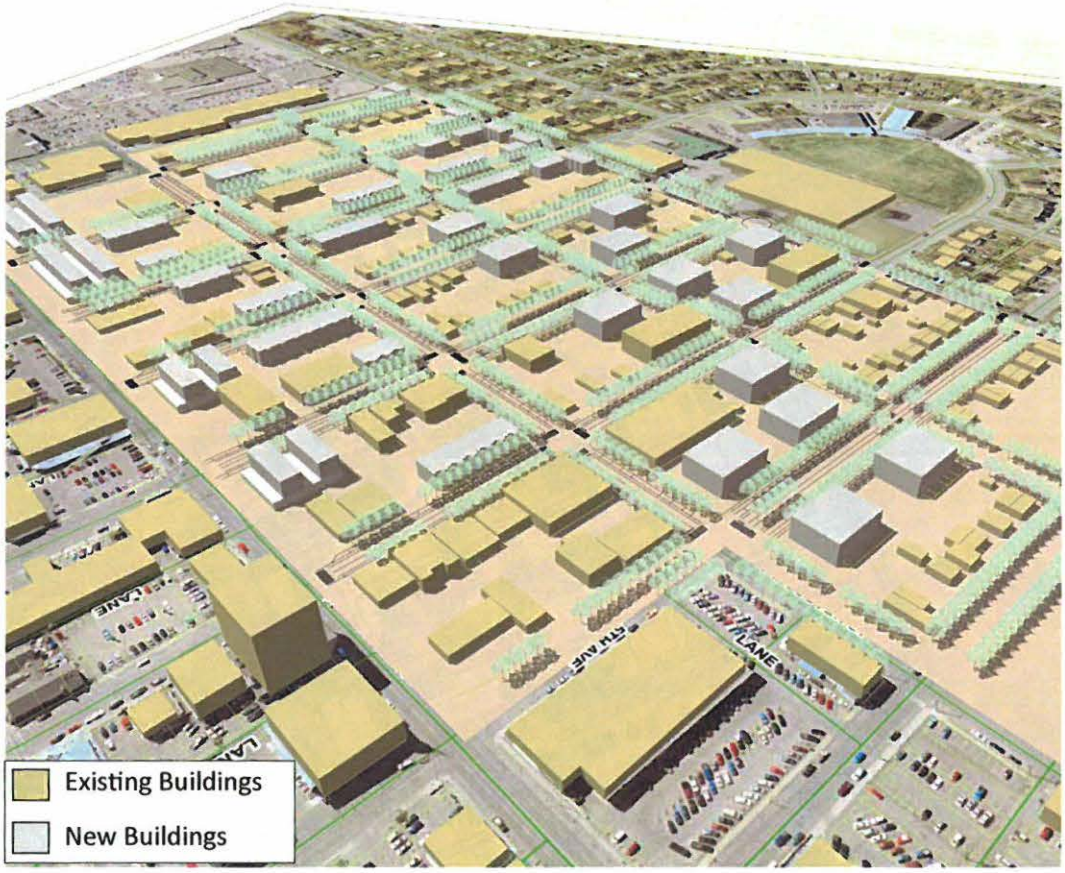


Figure 25: Existing Policy - Potential 15-25 Year Massing Concept

INTRODUCTION OF 6 STOREY MID-RISE - FULL BUILD-OUT (SITING PLAN): Roughly 3200 dwelling units

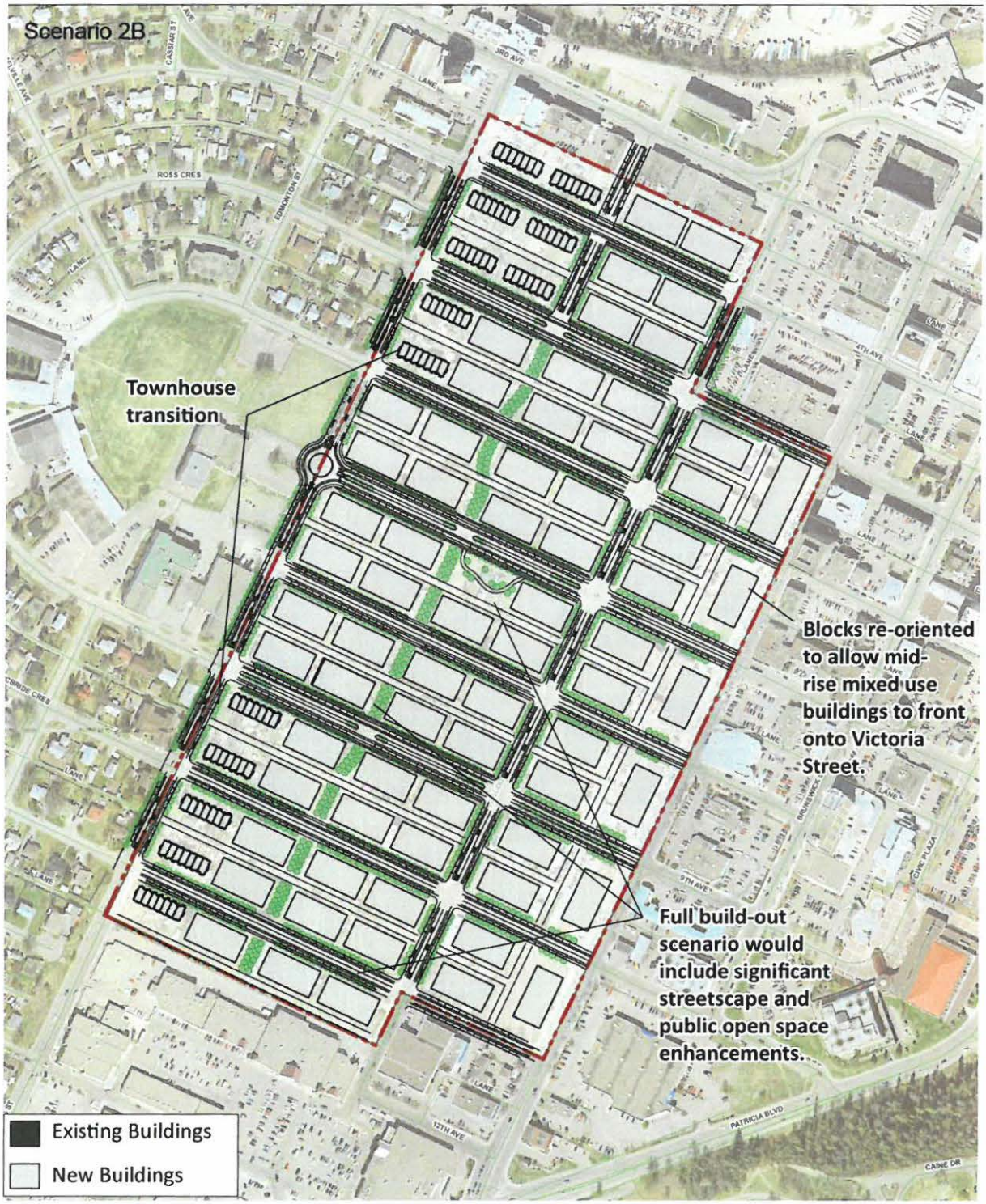


Figure 26: Mid-Rise Full Build Out Siting Concept

INTRODUCTION OF 6 STOREY MID-RISE - FULL Build-out (MASSING MODEL)

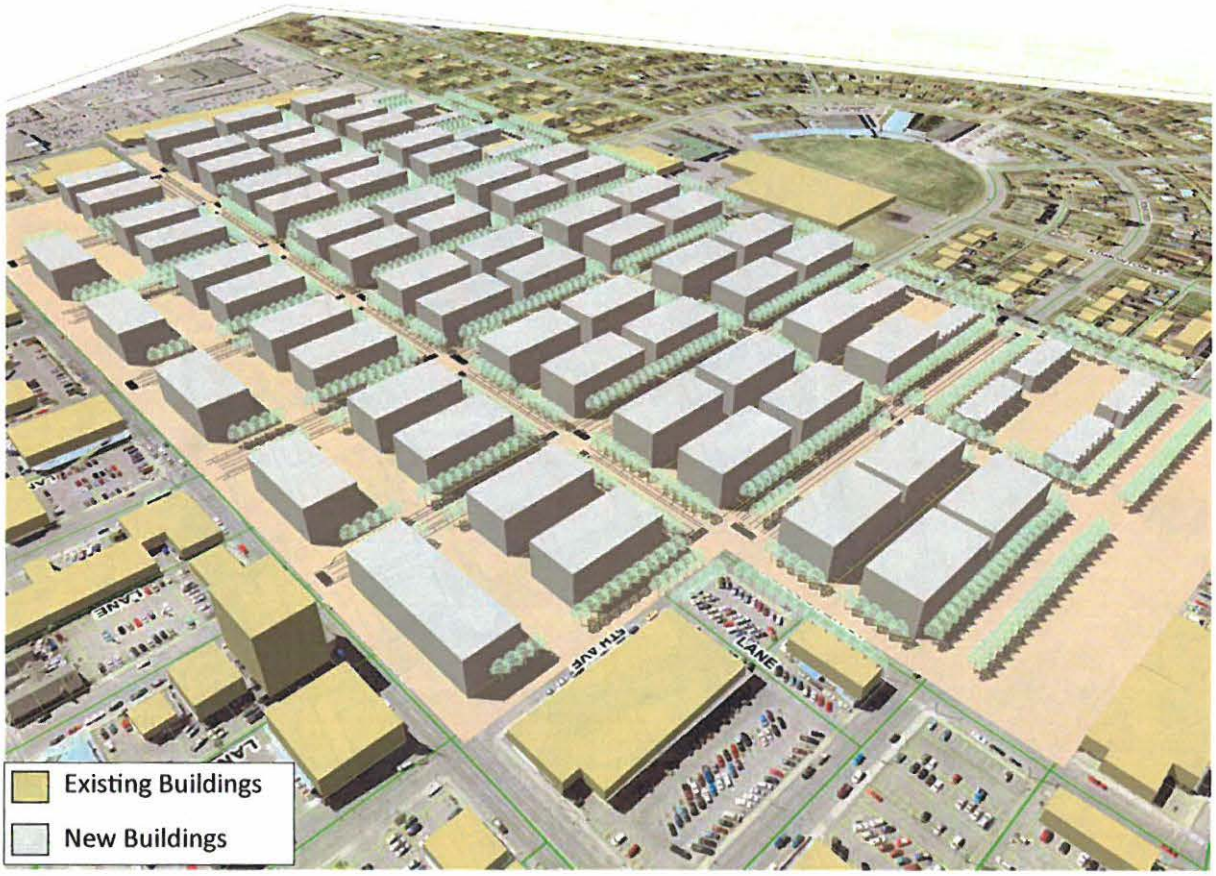


Figure 27: Mid-Rise Full Build Out Massing Concept

INTRODUCTION OF 6 STOREY MID-RISE - POTENTIAL 15 to 25 YEAR Build-out: Roughly 730 units

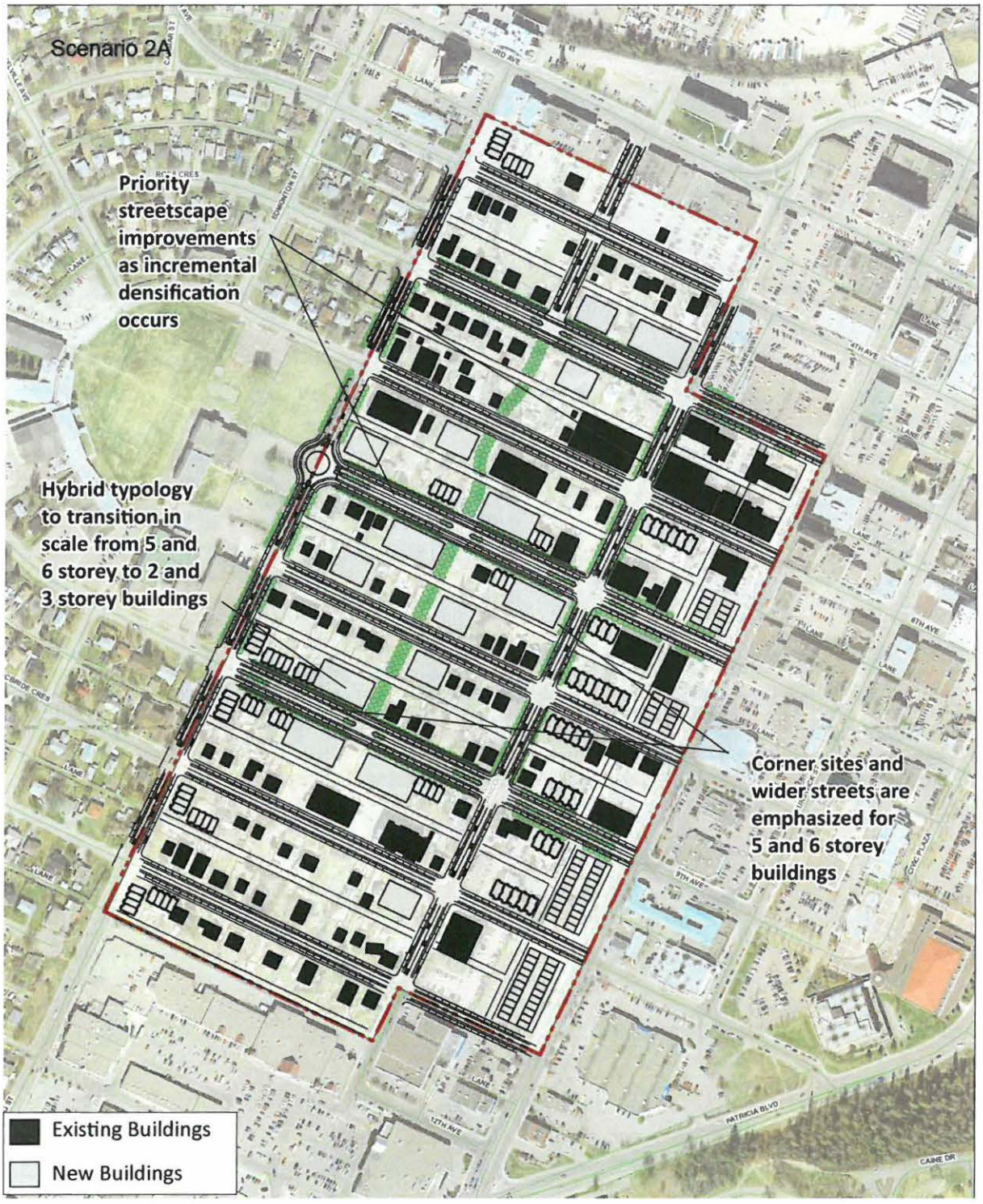


Figure 28: Mid-Rise Potential 15-25 Year Build Out Siting Concept

INTRODUCTION OF 6 STOREY MID-RISE - POTENTIAL 15 to 25 YEAR Build-out (MASSING MODEL)

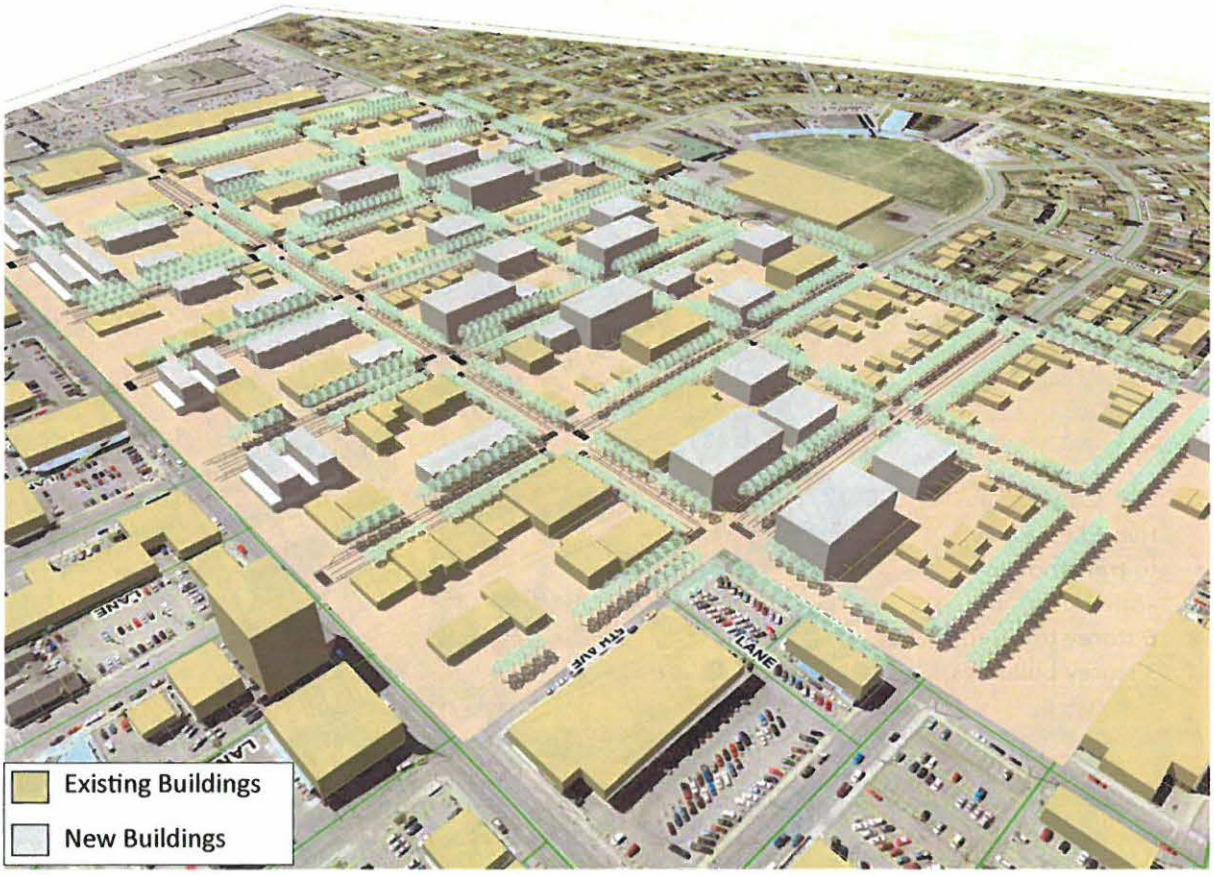


Figure 29: Mid-Rise Potential 15-25 Year Build Out Massing Concept

6.0 Key Study Findings

6.1 Urban Design

Overview

The urban design study explored potential opportunities for introducing up to 6 storey wood-frame buildings in consideration of parking, building design (articulation), orientation, views, transition in scale, and improvements to streetscape amenities and the overall open space network. The study also identified the existing physical/built context to identify opportunities and constraints related to future growth and change in the study area more generally.

The original 'City Beautiful' plan for the study area including the 'crescents' concept around Duchess park with the axial relationship of 7th Avenue are strong and positive attributes to this important neighbourhood. Its proximity to the downtown core and its diverse amenities, and the traditional fine grained block structure and street network, emphasizes this area as a desirable residential neighbourhood. Further, the urban design study found that this area presents a significant opportunity for implementing a number of the City's sustainability policies and priorities; in particular, concentrating new growth in and around the downtown through mixed use infill and intensification. As a close-to-downtown neighbourhood, the RWICD study area exhibits symptoms common of many North American cities suffering from the effects of increasing peripheral suburban sprawl development that draws residential and corresponding commercial activity away from downtown including disinvestment, neglect, property damage, personal safety etc. There exists some fine examples of heritage architecture amongst the many nondescript commercial, single-family and multi-family residential buildings. Unfortunately the 'City Beautiful' plan has been eroded somewhat from its inception with elimination of 8th Avenue around the crescent and shortening of Prince Rupert Street.

Parking

A mid-rise wood-frame building type was developed that maximizes off-street surface parking (see figures 18 and 21). This is accomplished by accommodating less expensive at grade parking (compared to construction costs of underground parking) located behind a narrow floor plate of at-grade space (commercial or residential as appropriate) with access from the rear lane. This strategy allows for the ground floor residential or commercial activities to front onto, engage and animate the street, something parking lots and/or parking structures do not do when located fronting onto the street or sidewalk. The rear oriented parking areas are partially covered by the residential floors above providing shelter from inclement weather and reducing snow removal costs in winter. However, this increases the costs of insulating the part of the building suspened over the parking and therefore exposed to the outdoors. On-street parking should also be incorporated on fronting streets along with landscaping and public amenities adjacent to the sidewalks, however, should be considered in context with City snow removal operations.

Building Form and Design

Four-storey buildings require thoughtful articulation (variations of massing), material and detailing choices human-scaled elements, to make a streetscape attractive to pedestrians. This encourages

walking and can contribute positively to a sense of community and neighbourhood. This is accomplished by techniques such as: setting back the top floor (from the sidewalk the building appears as only 3 storeys), and composing the architectural elements such as bay windows and balconies. In the case of concrete construction, exploiting the qualities of the material to make interesting and dynamic elements such as cantilevers is fairly typical. However, it is important to consider here that while wood structures have many good qualities and can have many dynamic capabilities, the 5 and 6 storey wood-framed multi-family buildings in the cost- range envisioned in this study, may be more limited in form and dynamics than comparable concrete structures. Construction budgets necessitated by market- driven building and sales economics tend to result simple rectilinear or 'boxy' buildings. The precedents for these types of buildings bear out this observation (see figures 15, 16 and 17). It is important that along with incentives to build these mid-rise, denser forms of housing, one should take into consideration the costs of high-quality and dynamic building forms.

Scale, Siting and Orientation

The study area has a diverse range of types and sizes of buildings; from one-storey single family homes to 9-storey commercial buildings along Victoria Street. Consequently, infill development should be designed to make a thoughtful transition to the scale of existing adjacent buildings. One approach is to include a 2 to 3-storey 'townhouse' type as a transitional form between existing single family and duplexes and 5 to 6-storey apartments. The "PG-Hybrid', illustrated in this study was developed for this application (see pp 19). In general, it is recommended that 5 to 6-storey buildings be located along and at corners of streets with wider rights-of-way.

The incorporation of more multi-family and mixed use buildings (such as commercial on main floor with residential above) into the study area provides the opportunity to site and orient new development positively towards the public realm (streets and open spaces) to make it more attractive, active and safe (see pp 20). Many of the existing buildings are setback from the street more than required by zoning, or in some cases have surface and/or structured parking fronting onto the public street or sidewalk. Establishing and requiring adherence to a 'build-to' line within the study area, and ensuring active ground floor uses with direct access fronting onto the adjacent street, with parking, servicing and vehicle access from the rear lane, is strongly recommended to enhance the overall quality of new developments.

Public Realm/Streetscape Improvements

The quality of streetscape will be an important contribution to the success of future developments as well as that of the entire neighbourhood. The following priority enhancements were identified for consideration as part of the urban design study (see page 20):

- The rights-of-way (ROW) which is the area between properties including roads, sidewalks and landscaping, require sidewalks on both side of ample widths, 2.5m to 3.5m, dependant on the ROW width.

- Landscaped boulevards along streets with residential frontage, and the incorporation of street trees parallel to and set back 700mm from the curb in areas with commercial frontage, significantly improves pedestrian comfort, amenity and safety and enhances street definition and enclosure. Street trees in parking bulges are ideal buffers between the sidewalk and

the roadway. In addition to providing shade and visual interest, trees have the added traffic-calming effect of visually compressing the street width and thereby causing drivers to reduce their speed.

- In addition to a continuous planting of street trees, on-street parking lanes, either parallel on the 20m rights-of-way or angled on the 25m rights-of way, serve as a buffer between the sidewalk and travel lanes.

- Bicycle lanes, 1.2m wide should be sited between the parking lanes and the drive aisles.

- Given the length of the blocks between Winnipeg Street and Vancouver Street, (260m), parking bulges and mid-block crossings should be introduced to break up this length. (Note that pedestrian friendly blocks in Portland are 79m, in Houston 100m and Sacremento 120m). Ideally these crossings should be elevated, at the same height as the sidewalk to emphasize the pedestrian crossing and as a form of traffic calming in appropriate locations, however, may not be appropriate for snow clearing practices within a northern climate. Another option could include alternate materials and/or patterns visible in the other seasons.

- At the street intersection corners, the sidewalks should be widened to the edge of the bicycle lanes and past the parking lane, to reduce the crossing distance for pedestrians and enhance the traffic calming effect on drivers.

- The laneway-to-sidewalk intersections should be designed like the pedestrian crossings, with the sidewalk elevation maintained across the laneway width to emphasize the pedestrian crossing and as a means of traffic calming.

- Street-side rain gardens at the bulges may be another appropriate strategy to improve both the aesthetic and the stormwater management aspects of streets.

- The technical requirements of snow removal and snow piling will have to be considered in advance as part of the landscape design of all urban streets.

- Street trees on each of the down-block sides of the crosswalks are recommended. On the 25m rights-of-way (5th, 7th and 9th Avenue) a 3m centre treed boulevard is recommended and would strength the 'City Beautiful' plan (the 'horseshoe' or 'crescents' concept).

- To emphasize the axial importance of 7th Avenue round-abouts at 7th Avenue and Winnipeg Street, and at 7th Avenue and Vancouver Street, should be considered.

- Relative to good standard practice in urban design, the amount of Park and Greenways in the study area are inadequate. Further study and greenspace development is recommended to coordinate future redevelopment of private sites with the comprehensive planning for improved public open space networks in the study area and adjacent neighbourhoods. This area is located in the East Bowl District, which is the most established area of the City with a population of over 17,000 and is characterized by high density and urban residential,

commercial and industrial development. The Parks and Open Space Master Plan outlines a District Park provision of 1ha/1,000 residents within a District area, for which the East Bowl District has an identified District Park deficiency of 9.22 ha. The acquisition of the 3.26 ha Duchess Community Park site alleviates some of this deficiency; however, a further 5.96 ha of District Park land would still be required to fulfill the District Park deficiency in the East Bowl District. If residential densities in the East Bowl District were to increase, additional District Parkland would be required. If the East Bowl District increased in population by 500 for instance, the District Park deficiency would increase from 9.22 ha to 9.71 ha.

- Consider re-acquiring property that was formerly Prince Rupert Street to create a greenway that cuts through the long blocks between Vancouver & Winnipeg. With the rear lanes as access, this would not have to be linear pathway, thus taking on a meandering shape. Ideally a community park would be developed along this corridor fronting on to 7th Avenue. There appears to be a vacant parcel mid block that should be considered for public use. Beyond providing needed green space, this park could serve as a valuable community asset, such as an informal gathering place.

- Transit service through the area consists of the #1 Heritage/10 Ave which runs down Vancouver Street. Further study will be required if augmentation of the transit service is to be improved to meet the anticipated increased population.

Use/Expression of Wood

It is interesting to note while the impetus for the RWICD study is understood to be the encouragement of the use of wood, the 5 to 6-storey building typology may reduce the amount of wood visible in future developments as the structure is largely invisible once the building is complete. Currently 4-storey wood structure buildings are permitted by the building code to be clad in wood. Under the new provisions of the building code for 5 to 6-storey wood structure buildings, the exterior is not permitted to be clad with wood unless it is fire-retardant-treated wood conforming to rigourous technical specifications with the inherent costs.

Existing policy for the study area provides for a significant amount of capacity in a development form familiar to residents and builders/developers. If incentives are provided for wood cladding, the amount of wood used in buildings that meet the existing policy, could potential use more wood than in the proposed 5 to 6-storey typology. The existing policy of up to 4 storeys provides more opportunity for sensitive, human scale developments.

6.2 Transportation

Overview

Opus International Ltd. conducted a transportation study to assess potential transportation implications of land use policy changes within the RWICD study area.[1] Specifically, council has endorsed an initiative to explore within this study area an increase in density and height from 3-4 storey buildings currently

1 Note that the Opus International Technical Study included as Appendix A refers to existing policy for the RWICD study area as 'OCP policy'

permitted under existing policy to potential 5-6 storey buildings as proposed by the RWICD initiative.

The proposed RWICD study area currently contains roughly 300 dwelling units. Roughly 150 of these are apartment dwellings and roughly 150 are single family homes. A full build-out under the RWICD initiative of 6 storey buildings throughout the study area would result in a total of approximately 3,200 residential units upon its build-out horizon, anticipated to occur no sooner than 20 – 25 years. For context, the original build-out of the study area based on existing policy is approximately 2,000 residential units. Based on the EMME/2 macroscopic transportation model,the study area currently has a population of almost 500 residents (300 units). While it will take significant time for the entire development to build-out, it was determined that Opus would assess transportation conditions for two horizon years (please see section 1.0, pp 2 of the report for a description of study assumptions and methodology):

- An interim build-out determined to be in approximately 10 years (2020); and,
- An ultimate build-out horizon determined to be no earlier than 20 years (2030).

While the actual horizon year when interim build-out and full build-out would occur may differ, it was necessary to determine these two base horizon years for the purpose of traffic analysis. The horizon years are set to establish a reasonable growth for background traffic. A comparison between the conditions based on the current policy and potential RWICD is made in the report. Additional transportation conditions assessed include:

- Existing and future road classification and function;
- Existing transit routes and service;
- Existing cycling routes and service;
- Existing major pedestiran routes and service;
- Future road improvement requirements under interim and build-out conditions, compared between the existing policy condition and potential RWICD;
- Identified intersections of concern for the future due to additional development pressures;
- Future road cross-sectional requirements; and,
- Future parking conditions.

General Findings and Implications

- Under existing conditions, the current functional classifications for the study area road network are met. No roads operate over or under the suggested Average Annual Daily Traffic

(AADT) range for their respective functional class.

- Under existing conditions, all intersections in the study area operate at acceptable levels of service.

- Winnipeg Street carries modest volumes and there is no need to accommodate these volumes over two travel lanes in each direction. The desire for the road diet should be based on improving safety and creating additional infrastructure for cycling. There is likely a case for a road diet, by providing one general purpose lane in each direction and a centre two-way left-turn-lane (TWLTL).

- The OCP condition proposes to add 2,000 residential units by build-out and the RWICD condition proposes to add 3,200 residential units by buildout. For reference, the EMME/2 macroscopic transportation model indicates that only 500 residents currently reside in the study area. From a traffic generation perspective, the OCP condition generates up to 867 and 1,054 total two-way trips in the AM and PM peak hours respectively and the RWICD condition generates 1,387 and 1,686 total two-way trips in the AM and PM peak hours respectively. Increasing the density of uses from the current OCP condition of 3 - 4 storey buildings to the RWICD condition of 4 – 6 storey buildings constitutes a net increase in traffic by 520 and 632 two-way trips in the AM and PM peak hours respectively, or an increase in traffic levels by 60 percent.

- While the RWICD constitutes a net increase of 60 percent compared to the OCP condition, the traffic impact analysis finds that there are no additional improvements that would be required under the RWICD condition as compared to the OCP condition.

- The City's EMME/2 macroscopic transportation model was used to determine the existing assignment and distribution. For this task, Opus contracted NovaTrans Engineering. In general, the model found the following distribution for the primarily residential study area:

    - The distribution is predominantly to the west (towards Highway 97). The model predicts that approximately 80 percent of traffic will come to/from that direction. It reflects that the employment areas are predominantly in that direction. The model predicts that most of the traffic will utilize Winnipeg Street, and this should be treated as a conservative estimate as the route is likely faster than Victoria street due to a lack of traffic signals. The inbound distribution from the south is split between Victoria Street and Winnipeg Street (35 percent and 44 percent respectively).

    - The distribution to the north is generally the remaining 20 percent. In terms of inbound and outbound traffic assignment, the model predicts the assignment being split roughly equally between Winnipeg Street and Victoria Street.

- The following intersections will likely experience the most traffic impact outside the immediate study area and were identified by the City of Prince George's EMME/2 macroscopic transportation modeling software:

- Yellowhead Highway (Victoria Street)/17th Avenue – southbound left turn in the AM peak;
- Carney Street/10th Avenue – may warrant a traffic signal with additional traffic;
- Massey Street/Carney Street– southbound left turn in the AM peak;
- Carney Street / 15th Avenue – southbound left turn in the AM peak;
- Edmonton Street between 13th Avenue and 15th Avenue - this is generally a collector route with the major desire line being travel between 13th Avenue and 15th Avenue via Edmonton Street – traffic calming may be required to reduce attractiveness of the route for cut through traffic or for speed reductions;
- Winnipeg Street / 13th Avenue – the approach to the signalized intersection may need widening; and,
- Winnipeg Street / 15th Avenue Ramps

These intersections should be examined in greater detail for intersection specific improvements when it comes time to develop the study area.

- The study area road network continues to operate under acceptable levels of service to build-out. This considers that Winnipeg Street and 7th Avenue can undergo road diets. A road diet for Winnipeg Street considers that sight lines should be protected and will be improved.
- However, upon the build-out horizon, several intersections will experience higher delays and should be monitored for improvement. These include:
    - 9th Avenue and Winnipeg Street – the left turn movement from 9th Avenue to Winnipeg experiences long delays. The pedestrian signal at this location could be upgraded to a full signal or a turn lane could be provided by removing some parking.
    - For Victoria Street – demand for the northbound and southbound left turns from Victoria Street will likely be high enough to consider improvements upon the build-out horizon. Potential requirements for turn lanes were previously identified in the Downtown Transportation and Parking Study, which analyzed Victoria Street conditions using a medium to conservative (1.5 - 3.0 percent) growth rate. While the current study assumes 0.5 percent per annum growth on Victoria Street, which is in line with the historic growth patterns of Downtown, RWICD traffic accounts for addition traffic on Victoria Street to bring the analysis volumes for future build-out to be more in line with the rates assumed for the Downtown Transportation and Parking Study. Having said that, the modifications would not be triggered for a 25-year period, which would almost coincide with the build-out of the OCP or RWICD conditions.
    - For 7th Avenue, dedicated left turn lanes to Winnipeg Street and Vancovuer Street can be considered upon the implementation of the suggested road diet.
- While the EMME/2 model has predicted that the impact will occur at the aforementioned

intersections, once detailed plans for the OCP condition or RWICD condition are available, the detailed operational analysis for the intersections should be conducted to determine turn lane storage lengths, deceleration lengths, tapers, etc. It should be understood that this report only identifies the potential problems the network will face and suggest mitigation without doing detailed analysis to identify construction or design parameters. Detailed modelling can be undertaken using standard traffic capacity analysis software.

- Regarding parking, it is understood that creating a supply of structured parking under each building may be prohibitively expensive. The parking analysis utilized a projected modal split target of a 15 percent shift from vehicle mode. Assuming that the Bylaw rates reflect the actual parking demand (i.e. minimum Bylaw rate is the minimum parking demand) and the understanding that the visitor Bylaw parking requirements are to be met on street, the road network on-street parking can likely accommodate the visitor demand and any residual residential parking demand, allowing a reduction on the minimum Bylaw requirements to be achieved under the OCP condition.

- While a 15 percent parking reduction should be targeted, demand should be monitored to gauge whether this can be achieved. It should be noted, however, that while a 15 percent modal split shift should be targeted, ultimately parking demand is a function of vehicle ownership. While the resident may be using transit or walking to work, as long as a vehicle is owned, there will be a contribution towards parking demand. Thus, it is pertinent that demands are continually monitored during the process in which vehicle ownership reduction in the area should be observed for any correlation to mode shift.

- However, under the RWICD scenario, a significant amount of parking would be required according to the current Bylaw, and as such, only a small portion of the overall parking requirement could actually be accommodated on-street. Thus, a large proportion of the parking requirement under the RWICD scenario would still be required off-street.

- Due to the fact that a significant amount of off-street residential parking would still be required for the RWICD scenario, creating surface parking lots adjacent to the buildings is a likely scenario. However, this may be an issue from an urban form/design perspective, as the relatively short blocks between north-south streets would not allow for a more continuous block of residential developments. Furthermore, the "tuck under" parking and heavy parking demand for parking expected by the RWICD scenario suggests the need to revisit underground parking options for some of the proposed buildings.

6.3 Servicing and Infrastructure

Overview

Dayton & Knight Ltd. evaluated the capacity of existing water, sanitary sewer, and storm infrastructure to service the proposed RWICD development area. The study evaluated infrastructure capacities under existing developed conditions, and for development that includes proposed multi-family mid-rise (four to six storey) buildings of wood construction.

The study identified servicing limitations for each of the water, sanitary sewer, and storm sewer systems. The study found that existing water and storm water infrastructure cannot service full build out levels of development for either four (existing policy) or six storey wood construction. Limited amounts of multi-family development can be supported in the proposed RWICD area, subject to limitations on development location, building size, density, type of construction, fire protection, and methods of storm water disposal.

Water Distribution System

The responsibility for controlling the maximum size of a building permitted in a municipality in relation to the locally available firefighting capability rests with the municipality. Evaluation of a variety of forms and size of building construction has identified that buildings constructed entirely of wood, in four to six storeys, may exceed the available water supply for fire protection and therefore needs to be evaluated at the time of site specific re-zonings in consideration of the fire risk factors noted below.

In order to consider buildings constructed entirely of wood in four to six storeys, the City of Prince George should consider policy to limit development to that which the City can adequately provide water for fire protection. This could include requirements for specific fire protection engineering analysis to consider factors that affect fire risk such as:

- Building size
- Type of construction (ie. wood vs. fire retardant treated wood)
- Occupancy
- Building location, spacing greater than 30 meters in order to limit exposure to other buildings
- Sprinklers
- Enhancement of the reliability and /or fire rating of fire separations

Notwithstanding analysis of specific development proposals, the City of Prince George should update its Fire Underwriters Survey (FUS) Public Fire Protection Classification survey in order to better understand the capacities of its community fire defences including water supply, fire department, fire prevention, emergency communications, building construction controls, and hazard levels.

It should be noted that existing B.C. Building Code regulations are under review with the City's Policy Advisory Committee (PAC) of which the Current Planning and Development Department had provided information to the PAC to consider. At this time the committee has determined the B.C. Building Code regulatory framework is not yet mature enough to address 6-storey wood frame construction to assert any position to advance on at this time.

Assuming development controls will be in place to limit required fire flows to those typical of multi-family development (150 – 200 L/s), required water system improvements include:

- Installation of 200mm diameter watermain looping along Winnipeg Street from 5th Avenue to 11th Avenue.

- Replacement of the existing 100 mm diameter watermain with 200mm diameter pipe along 8th Avenue from Winnipeg Street to Brunswick Street.

- Installation of 200 mm diameter watermain looping on Brunswick Street, from 7th Avenue to 8th Avenue.

- Installation of additional fire hydrants in order to provide the required hydrant spacing and access from fire trucks to buildings.

Storm Water, Source Controls and Impervious Surfaces

The RWICD development area has the potential to increase impervious areas such as roads, building roof tops, and parking lots, with possible negative storm water related impacts. Existing storm drainage pipes within and downstream of the RWICD area do not have sufficient capacity to convey stormwater resulting from the 5 or 10 year return period storm event under existing conditions. The existing storm water system cannot accommodate the increase in storm water flows that would result from build out levels of development (four or six storey) in the RWICD area. It is also not expected to be economically feasible to upgrade critical downstream storm drainage pipes (Patricia Boulevard & Winnipeg Street trunk mains) to the capacity required to suit RWICD development.

In order to avoid significant capital improvements to the downstream storm sewers, development in the RWICD area both under existing policy and under a potential RWICD condition will need to either:

- Limit the net increase in impervious area or;

- Consider the feasibility of Low Impact Development (LID) practices that would utilize native permeable sand and gravel soils to infiltrate a portion of the storm run-off.

Sanitary Sewer

Under existing conditions almost all sanitary sewer pipes within and downstream of the RWICD area have been estimated to be flowing at less than capacity. Development to levels estimated in a 15 – 25 year horizon of RWICD development, however, may require downstream sewermain upgrades, depending on where development proceeds. In particular, the amount of development that can be serviced in catchment area 2, from 5th Avenue to 8th Avenue, is limited to approximately 50 % of what has been proposed in 15-25 year RWICD build out scenarios. Sanitary sewer upgrades are required based on a full build out under existing policy.

6.4 Public Feedback

Overview

As a key component of the RWICD study, a Community Design Workshop was held on November 2, 2010 in the evening with over 40 people in attendance. The overall purpose of the workshop was to explore opportunities, constraints and preferences regarding increasing the permitted height within the study area from 3-4 storeys to 6 storeys in height. In addition to recording attendees comments on flip charts and their results of the block modeling exercise, participants were asked to complete a questionnaire. The workshop and request for comment were advertised 2 weeks prior to workshop, with the workshop informational materials and the questionnaire made available on the City's website for one week after the workshop.

The results of the community design workshop and public feedback showed that the majority of participants and respondents (51 out of a total of 62) expressed that 6-storey wood frame should not be permitted anywhere within the RWICD study area. Respondents that did express support for introducing up to 6 storey buildings identified the area between Victoria and Vancouver Streets or at the backside of Parkwood mall along 11th Avenue as the most appropriate area to. Within these areas, corners and along common greenspace were locations that noted as being most suitable.

Beyond the introduction of taller buildings within the RWICD study area, respondents were asked about the types and locations of desired/required public realm and streetscape improvements to accompany future growth and new development within the study area. Responses in order of frequency were:

- Sidewalks (including sidewalks on both sides of the street) - 12
- Greenways (including extending Prince Rupert Street) - 10
- Parks - 9
- Street trees - 5
- Bike Lanes - 4
- Crosswalks - 4
- Elementary School - 4
- Traffic-calming - 3
- Street lights - 3
- Lighting - 3
- Roundabouts - 2
- Improved safety - 2
- Improved signage - 2
- Improved Transit - 2
- Widen Streets - 2
- Add stores - 1
- Paved lanes - 1
- Reduced development costs -1
- Daycare - 1
- Community Garden - 1

7.0 Conclusions and Recommendations

1. The introduction of up to 6 storey buildings within the Crescents Neighbourhood Plan (CNP) area are not recommended. As such, changes to land use policy are not recommended for this area.

2. The City of Prince George is recommended to adopt policy supporting the introduction of buildings up to 6 storeys in height in the area bounded by Victoria Street, Vancouver Street, 11th Avenue and 5th Avenue (see figure 31). It is not recommended that this area be pre-zoned to allow such development. Rather, It is recommended that this area be redesignated through OCP policy to allow such development. As such, it is recommended that proposals for buildings between 4-6 storeys in height within this area be assessed through site specific re-zonings based on the considerations itemized within recommendation #9 below.

3. The area recommended for 6 storey wood-frame is within the recently studied Smart Growth Concept Plan Area (SGOG). An amendment to the SGOG Concept Plan is recommended for the area identified within that plan as the Victoria Flex Use District. This would allow consideration of wood-framed buildings up to 6 storeys in this area through site specific re-zonings as indicated in recommendation #2 above. The amended plan should include the concepts and recommendations with supporting photographic examples, and diagrams from this report. Similarly, the current MyPG OCP update currently underway should include policy that reflects the updated SGOG Concept Plan (received by Council in 2009) based on the recommendations included in this report.

4. It is recommended that consideration be made to amend the CNP to include the concepts and recommendations applicable to the CNP area with supporting photographic examples, and diagrams from this report.

Figure 30: Character sketch illustrating introduction of mid-rise wood-frame buildings into the recommended Policy Amendment Area (see figure 31 below).

5. It is recommended that incentives and implementation tools be identified to facilitate up to 4 storey residential development (as permitted under existing policy) and to encourage the use of wood cladding (where appropriate fire flows can be provided) as a means of achieving the key objectives of the RWICD initiative, namely, encouraging the use and expression of wood.

6. City wide growth management policy should limit new growth on the periphery of the City, particularly low density green field development, so as to minimize auto-oriented sprawl development and significantly, to focus new growth within existing built areas that have been identified as priority growth areas, such as the RWICD study area.

7. It should be noted that existing B.C. Building Code regulations are under review with the City's Policy Advisory Committee (PAC) of which the Current Planning and Development Department had provided information to the PAC to consider. At this time the committee has determined the B.C. Building Code regulatory framework is not yet mature enough to address 6-storey wood frame construction to assert any position to advance on at this time.

8. Existing available fire flows vary significantly in the RWICD area and range from as low as 60 L/s to as high as 460 L/s. Assuming that development controls will be in place to limit required fire flows to 150 – 200 L/s, the following improvements to the water distribution system are recommended to enable servicing of development currently permitted under existing policy and zoning:

    - Installation of 200mm diameter watermain looping along Winnipeg Street from 5th Avenue to 11th Avenue.

    - Replacement of the existing 100 mm diameter watermain with 200 mm diameter pipe along 8th Avenue from Winnipeg Street to Brunswick Street.

    - Installation of 200 mm diameter watermain looping on Brunswick Street, from 7th Avenue to 8th Avenue.

    - Installation of additional fire hydrants at mid block locations in order to provide the required hydrant spacing and access from fire trucks to buildings.

    These upgrades would be required prior to considering adoption of any policy allowing increased building height or density within the study area.

9. It is recommended that proposals for buildings up to 6 storeys in height within the recommended area (see figure 31) be assessed through site specific re-zonings and based on adequatley addressing the following considerations:

    - **Fire Protection** – Developments should require specific fire protection engineering in order to limit required fire flows to levels that can be provided by City of Prince George infrastructure.

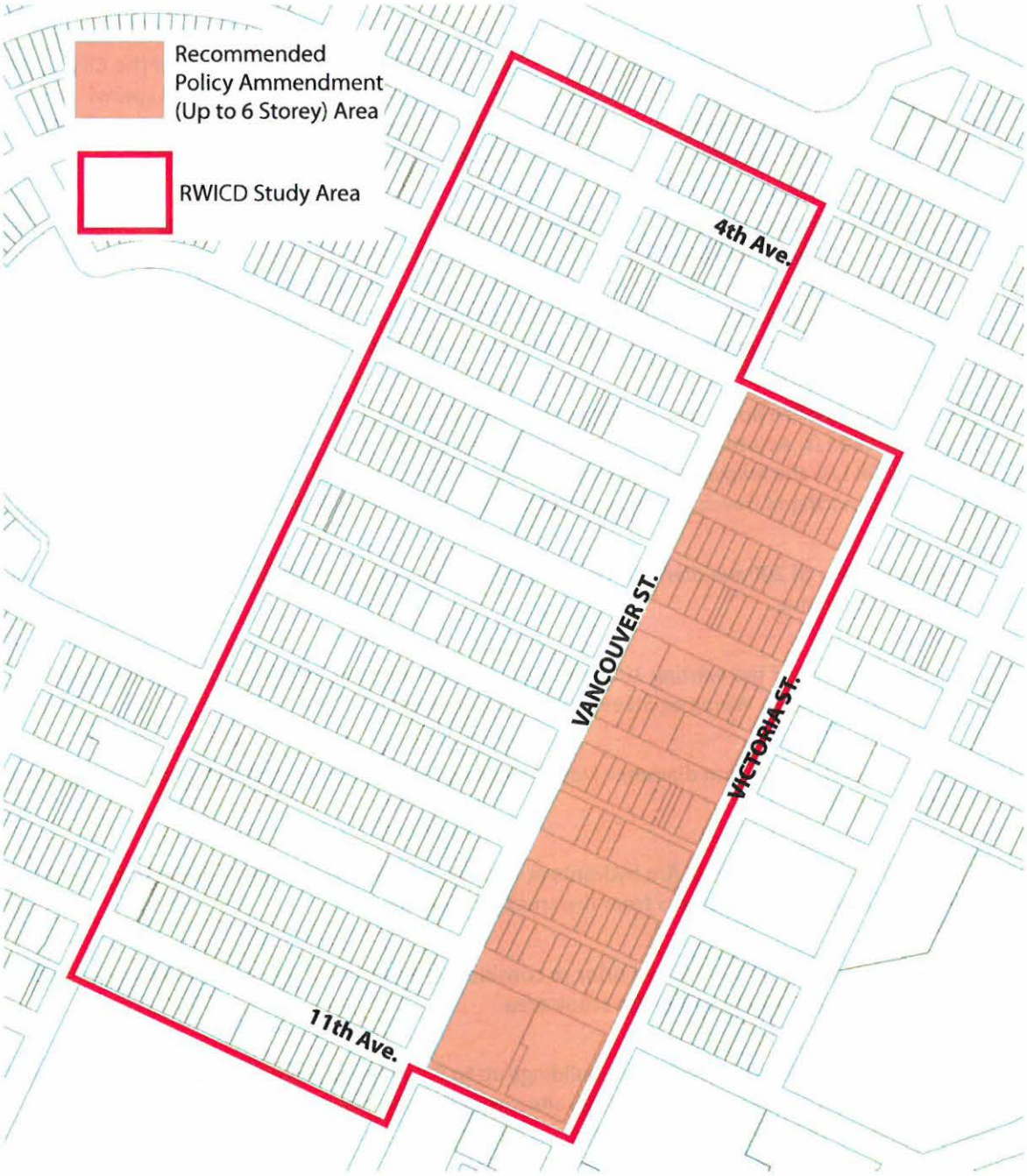


Figure 31: Recommended Policy Amendment Area allowing up to 6 storey buildings through site specific re-zonings.

- **Sanitary Sewer Servicing** – Remaining capacity of downstream sewermains varies for each street in the RWICD area. While capacity is expected to be available to service mid-rise development in the blocks between Vancouver and Victoria, this should be re-confirmed as development proposals are considered.

- **Storm Sewer** – In order to avoid significant capital improvements to downstream storm sewers, development in the RWICD area should be required to implement Low Impact Development practices that utilize native sand and gravel soils to infiltrate a portion of the storm water run-off into the underlying soils.

- **Transition in scale, views and shadowing:** With the diversity of existing building sizes, the scale of adjacencies, views and shadowing by new developments should be carefully considered, by, for example, stepping new development down to be similar in height to adjacent existing development, and siting new development so as to minimize view and shadowing impacts.

- **Parking:** Underground parking is preferred in new developments. However given the upfront construction costs of this option, parking at grade could be permitted based on the following considerations:

    - Should all required off-street parking be provided at grade (as surface parking), as much parking as possible should be provided behind the building through incorporation of 'tuck-under' parking so as to minimize the amount of surface parking located beside the building with frontage on the fronting street.
    - Any parking located beside the building with frontage along a street should be screened using (hard and/or soft) landscaping while still allowing views into the parking area to enable casual surveillance.
    - Off –street surface parking should never be located between the front of the building and the fronting public street.
    - Tuck-under parking or structured parking should never be located to front onto the adjacent public street.
    - Parking Access should be from the service lanes.
    - Streets should be developed to incorporate parallel on-street parking to accommodate required visitor parking for individual developments, so as to minimize impact of off-street surface parking requirements. To break up the extent of this parking and provide traffic calming, parking bulges should be located between every 4 parallel stalls and 8 angled stalls.
    - Where possible, off-street surface parking areas and access should be shared by adjacent developments.
    - Off-street parking requirements should be reduced within the study area given its proximity to transit service, downtown amenities and jobs, and existing surface and structured parking facilities.

- **Positive orientation to the street:** All new development should front positively onto the adjacent public street or sidewalk. New development should have 75% of their principal building facade placed at the minimum setback line. Building entrances should be clearly identifiable and accessible from the fronting public street. Residential units at the street level should be vertically separated from the sidewalk by at least 600mm. For commercial, to contribute to a pedestrian-friendly streetscape, a generous use of windows is recommended at ground level. This 'transparency' makes the streetscape more visually interesting, allowing merchandising and reducing the need for signage. A minimum of 75% of ground floor frontages should be windows and/or entryways.

- **Provision of basic streetscape amenities:** New developments within the study area should provide attractive landscaping and should be accompanied by the following streetscape amenities:

    - Sidewalks and street trees:

        - Residential frontage: a minimum 1.5 metre wide sidewalk with 1.5 metre boulevard/landscape area with street continuous planting (5-8 metre spacing) of street trees.

        - Commercial frontage: a Minimum 3 metre sidewalk including landscape strip with continuous planting (5-8 metre spacing) of street trees.

    - Provide a gracious transit shelter along Vancouver Street that provides all season protection to dignify the process of public transportation. A structure utilizing wood should be considered.

Figure 32: Existing policy 2: Attractive transit shelters should be provided to enhance the character and identity of the neighbourhood and emphasize wood in its design and expression.

- **Parks & Greenways:** Consider re-acquiring property that was formerly Prince Rupert Street to create a greenway that cuts through the long blocks between Vancouver & Winnipeg. With the rear lanes as access this corridor would not have to be linear. Ideally a community park could be developed along this corridor fronting on to 7th Avenue. There appears to be a vacant parcel mid block that should be considered. Besides greenspace this park could serve as a valuable community (formal or informal) gathering place.

- **Emphasizing wood in architectural expression:** The expression of wood should be emphasized in building character through the use of visible wood structure and the use and/ or expression wood cladding. With the cladding restrictions in the building code for 5 to 6-storey wood frame buildings, fire retardant treated lumber with a natural wood look should be used.

10. It is recommended that any new development that includes seniors oriented housing, and 15% of all housing, be made to be accecssible according to CSA Accessibility Guidelines (CSA # CAN – CSA – B651 – 04 "Accessible Design for the Built Environment").

11. In order to limit required fire flows in the RWICD area to levels that can reasonably be provided by the City of Prince George (water distribution and fire protection/emergency response) site specific design and fire protection engineering may be required. This may result in requirements that are more restrictive than Part 3 of the Building Code such as:

    - Limiting building footprint or fire area to less than allowed by the Building Code or incorporation of additional fire walls into building design;

    - Restrictions on wood construction on exterior walls or requirements for fire retardant treated wood framing; and

    - Limits to building location, spacing in order to limit exposure to other buildings to less than 30 metres where warranted.

12. The City of Prince George is recommended to update its FUS Public Fire Protection Classification survey in order to better understand the capacities of its community fire defenses including water supply, fire department, fire prevention, emergency communications, building construction controls, and hazard levels.

13. Re-design Winnipeg Street to one general purpose lane in each direction with a two-way-left-turn lane.

14. 7th Avenue is recommended to be designed and emphasized as a Ceremonial Boulevard with one general purpose lane in each direction, a centre median, dedicated bike lanes and parallel parking on both sides of the street. A roundabout / traffic circle is recommended to replace the 4-way stop at 7th and Vancouver, although the intersection could still operate as a 4-way stop to build-out based on the projected volumes. While the intersection treatment for Winnipeg Street and 7th Avenue is also suggested as a roundabout / traffic circle and given the volumes could operate

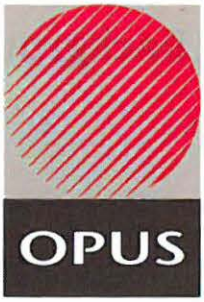
as part of the traffic modeling exercise and transportation analysis, as it was understood that the City would like to implement a road diet with a two-way-left-turn lane (TWLTL). Given the TWLTL configuration, Winnipeg Street could still operate under free flow conditions, with the 7th Avenue approach to Winnipeg Street be under stop-control. If it is desired to implement a roundabout / traffic circle, a more detailed operations and design study should take place.

15. 9th Avenue and Vancouver Street are recommended to be designated as Commuter Cycling collectors.

16. The City is recommended to conduct parking survey for similar multi-family residential and mixed use residential/commercial buildings to determine if the Bylaw requirements reflect actual parking demand for these types of uses specific to their locations to determine whether the requirements could be further reduced to reflect actual parking demand.

17. Application of on-site Low Impact Development (LID) Best Management Practices to new development proposals are recommended to reduce or eliminate flow impacts on the storm system and to minimize upgrades to the storm sewer associated with accommodating in-fill development re-development within the study area. However, as large scale implementation of LID is not well documented in the City of Prince George, it may not be practical to set specific long term policy with regards to LID in the RWICD area. Prior to setting policy allowing or requiring LID, the City should consider implementing LID as a pilot project within the RWICD study area where the results can be monitored for success over a period of time.

Appendix A: RWICD Transportation Backgrounder



HB LANARC
CITY OF PRINCE GEORGE

RESIDENTIAL WOOD FRAME INNOVATION COMPREHENSIVE DISTRICT

TRANSPORTATION STUDY

PRINCE GEORGE, BC

DRAFT FINAL REPORT

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RESIDENTIAL WOOD FRAME INNOVATION COMPREHENSIVE DISTRICT

TRANSPORTATION STUDY

DRAFT FINAL REPORT

Opus International Consultants (Canada) Limited

Prepared by:

Sarah Rocchi, P.Eng., PTOE
Vice President

Marcus Siu, MCIP, PTP
Transportation Planner

Susan Chu, B.A.Sc., EIT
Transportation Engineer

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EXECUTIVE SUMMARY

HB Lanarc in the capacity of urban design and planning consultants to the City of Prince George has retained Opus International Consultants (Opus) to conduct a transportation study to assess potential transportation implications of going from an existing Official Community Plan (OCP) policy for an area in Prince George generally bounded by Winnipeg Street to the west, Victoria Street to the east, 4th Avenue to the north, and 11th Avenue to the south. Council has requested review of an initiative that would see this study area increase in density from the currently allowed 3-4 storey buildings to 4-6 storey wood frame apartments. This District would be effectively known as the Residential Wood Frame Innovation Comprehensive District, herein referred to as RWICD.

The proposed RWICD initiative would add approximately 3,200 residential units upon its build-out horizon, anticipated to occur no sooner than 20 – 25 years. For context, the original build-out of the study area based on the existing OCP is 2,000 residential units. Based on the EMME/2 macroscopic transportation model, the study area currently has a population of almost 500 residents (300 units). While it may take some time for the entire development to build-out, it was determined that Opus would assess transportation conditions for two horizon years:

- An interim build-out determined to be in approximately 10 years (2020); and,
- An ultimate build-out horizon determined to be no earlier than 20 years (2030).

While the actual horizon year when interim build-out and build-out would occur may differ, it was necessary to determine two horizon years for the purpose of traffic analysis. The horizon years are set to establish a reasonable growth for background traffic and should be considered as guides, and not absolute years by which improvements may be expected. A comparison between the expected transportation conditions based on the current OCP and RWICD is made in the report.

Additional transportation conditions assessed include:

- Existing and future road classification and function;
- Existing transit routes and service;
- Existing cycling routes and service;

- Existing major pedestrian routes and service;
- Future road improvement requirements under interim and build-out conditions, compared between the OCP condition and RWICD;
- Identified intersections of concern for the future due to additional development pressures;
- Future road cross-sectional requirements; and,
- Future parking conditions.

The general findings of this study are:

- Under existing conditions, the current functional classifications for the study area road network are appropriate. No roads operate over or under the suggested Average Annual Daily Traffic (AADT) range for their respective functional class.

- Under existing conditions, all intersections in the study area operate at acceptable levels of service.

- Winnipeg Street carries modest volumes and there is no need to accommodate these volumes over two travel lanes in each direction. The desire for the road diet should be based on improving safety (e.g. sight distances) and creating additional infrastructure for cycling. There is likely a case for a road diet, by providing one general purpose lane in each direction and a centre two-way-left-turn-lane (TWLTL).

- The OCP condition proposes to add 2,000 residential units by build-out and the RWICD condition proposes to add 3,200 residential units by build-out. For reference, the EMME/2 macroscopic transportation model indicates that only 500 residents currently reside in the study area. From a traffic generation perspective, the OCP condition generates up to 867 and 1,054 total two-way trips in the AM and PM peak hours respectively and the RWICD condition generates 1,387 and 1,686 total two-way trips in the AM and PM peak hours respectively. Increasing the density of uses from the current OCP condition of 3 - 4 storey buildings to the RWICD condition of 4 – 6 storey buildings constitutes a net increase in traffic by 520 and 632 two-way trips in the AM and PM peak hours respectively, or an increase in traffic levels by 60 percent.

- While the RWICD constitutes a net increase of 60 percent compared to the OCP condition, the traffic impact analysis finds that there are no additional improvements that would be required under the RWICD condition as compared to the OCP condition.

- The City's EMME/2 macroscopic transportation model was used to determine the existing assignment and distribution. For this task, Opus contracted NovaTrans Engineering. In general, the model found the following distribution for the primarily residential study area:

    - The distribution is predominantly to the west (towards Highway 97). The model predicts that approximately 80 percent of traffic will come to/from that direction. It reflects that the employment areas are predominantly in that direction. The model predicts that most of the traffic will utilize Winnipeg Street, and this should be treated as a conservative estimate as the route is likely faster than Victoria Street due to a lack of traffic signals. The inbound distribution from the south is split between Victoria Street and Winnipeg Street (35 percent and 44 percent respectively).

    - The distribution to the north/east is generally the remaining 20 percent. In terms of inbound and outbound traffic assignment, the model predicts the assignment being split roughly equally between Winnipeg Street and Victoria Street.

- The following intersections will likely experience the most traffic impact outside the immediate study area and were identified by the City of Prince George's EMME/2 macroscopic transportation modeling software:

    - Yellowhead Highway (Victoria Street)/17th Avenue – southbound left turn in the AM peak;
    - Carney Street/10th Avenue – may warrant a traffic signal with additional traffic;
    - Massey Street / Carney Street – southbound left turn in the AM peak;
    - Carney Street / 15th Avenue – southbound left turn in the AM peak;
    - Edmonton Street between 13th Avenue and 15th Avenue - this is generally a collector route with the major desire line being travel between 13th Avenue and 15th Avenue via Edmonton Street – traffic

calming may be required to reduce attractiveness of the route for cut through traffic or for speed reductions;
- Winnipeg Street / 13th Avenue – the approach to the signalized intersection may need widening; and,
- Winnipeg Street / 15th Avenue Ramps – additional traffic due to the desire to travel east at 15th Avenue.

These intersections should be examined in greater detail for intersection-specific improvements when it comes time to develop the study area.

- The study area road network continues to operate with generally acceptable levels of service to build-out. This considers that Winnipeg Street and 7th Avenue can undergo road diets. A road diet for Winnipeg Street considers that sight lines should be protected and will be improved. However, upon the build-out horizon, several intersections will experience higher delays and should be monitored for improvement. These include:
  - 9th Avenue and Winnipeg Street – the left turn movement from 9th Avenue to Winnipeg experiences long delays. The pedestrian signal at this location could be upgraded to a full signal or a turn lane could be provided by removing some parking.
  - For Victoria Street – demand for the northbound and southbound left turns from Victoria Street will likely be high enough to consider improvements upon the build-out horizon. Potential requirements for turn lanes were previously identified in the *Downtown Transportation and Parking Study*, which analyzed Victoria Street conditions using a medium to conservative (1.5 – 3.0 percent) growth rate. While the current study assumes 0.5 percent per annum growth on Victoria Street, which is in line with the historic growth patterns of Downtown, RWICD traffic accounts for addition traffic on Victoria Street to bring the analysis volumes for future build-out to be more in line with the rates assumed for the *Downtown Transportation and Parking Study*. Having said that, the modifications would not be triggered for a 25-year period, which would almost coincide with the build-out of the OCP or RWICD conditions.
  - For 7th Avenue, dedicated left turn lanes to Winnipeg Street and Vancouver Street can be considered upon the implementation of the suggested road diet.

- It should be noted that the additional development intensity has been analyzed with, and would require full use of the traffic lanes in all seasons. For this reason, it is pertinent to avoid prolonged storage of snow in the roadway.

- While the EMME/2 model has predicted that the impact will occur at the aforementioned intersections, once detailed plans for the OCP condition or RWICD condition are available, the detailed operational analysis for the intersections should be conducted to determine turn lane storage lengths, deceleration lengths, tapers, etc. It should be understood that this report only identifies the potential problems the network will face and suggest mitigation without doing detailed analysis to identify construction or design parameters. Detailed modelling can be undertaken using standard traffic capacity analysis software.

- Regarding parking, it is understood that creating a supply of structured parking under each building may be prohibitively expensive. The parking analysis utilized a projected modal split target of a 15 percent shift from vehicle mode. Assuming that the Bylaw rates reflect the actual parking demand (i.e. minimum Bylaw rate is the minimum parking demand), the road network on-street parking can likely accommodate the visitor demand and any residual residential parking demand, allowing a reduction on the minimum Bylaw requirements of approximately 15 percent to be achieved under the OCP condition. However, under the RWICD scenario, a significant amount of parking would be required according to the current Bylaw, and as such, only a small portion of the overall parking requirement could actually be accommodated on-street. Thus, a large proportion of the parking requirement under the RWICD scenario would still be required off-street.

- While a 15 percent parking reduction should be targeted, demand should be monitored to gauge whether this can be achieved. It should be noted, however, that while a 15 percent modal split shift should be targeted, ultimately parking demand is a function of vehicle ownership. While the resident may be using transit or walking to work, as long as a vehicle is owned, there will be a contribution towards parking demand. Thus, it is pertinent that demands are continually monitored during the process in which vehicle ownership reduction in the area should be observed for any correlation to mode shift.

- Due to the fact that a significant amount of off-street residential parking would still be required for the RWICD scenario, creating surface parking lots adjacent to the buildings is a likely scenario. However, this may be an issue from an urban form/design perspective, as the relatively short blocks between north-south streets would not allow for a more continuous block of residential developments. Furthermore, the "tuck under" parking and heavy parking demand for parking expected by the RWICD scenario suggests the need to revisit underground parking options for some of the proposed buildings.

The general recommendations of this study are:

Recommended Road Improvements

- Road diet Winnipeg Street to one general purpose lane in each direction with a two-way-left-turn-lane to calm traffic and provide space for bike lanes. The road diet would also improve safety, as the proposed lane modifications should address any existing sight distance issues.
- 7th Avenue as a Ceremonial Boulevard with one general purpose lane in each direction, a centre median with left turn lanes at major intersections, dedicated bike lanes and parking on both sides of the street.
- 9th Avenue, 6th Avenue, and Vancouver Street to be designated as Commuter Cycling collectors.
- Potential roundabout / traffic circle to replace the 4-way stop at 7th and Vancouver, although the intersection could still operate as a 4-way stop to build-out based on the projected volumes. While the 4-way stop is likely the lowest cost option, the roundabout could be considered only as a gateway feature; however, it would not actually improve operations otherwise experienced under a 4-way stop condition.
- While the intersection treatment for Winnipeg Street and 7th Avenue is suggested as a roundabout / traffic circle as a gateway feature and given the volumes could operate with this intersection configuration upon build-out, this scenario was not specifically addressed as it was understood that the City would like to implement a road diet with a two-way-left turn lane (TWLTL). Given the TWLTL configuration, Winnipeg Street could still operate under free flow conditions, with the 7th Avenue approach to Winnipeg Street be under stop-control. If it is desired to implement a

roundabout / traffic circle, a more detailed operations and design study should take place.

Parking

- Should a reduction in the amount of off-street parking be desired, areas where a pool of structured parking may be available for all study area residents should be examined.
- Visitor parking minimum Bylaw requirements can likely be met on-street under both the OCP and RWICD condition. Should either condition be pursued, the City could exempt all residential development in the study area from requiring to provide on-site visitor parking with the understanding that parking could be provided on-street. However, current City policy restricts on-street parking at night in some parts of this neighbourhood for the purposes of snow removal. This would have to be rationalized in the future if this policy is carried through.
- A 15 percent reduction in parking demand should be a target based on suggested the modal split shift target of 15 percent. While a 15 percent parking reduction should be targeted, demand should be monitored to gauge whether this can be achieved. The RWICD scenario will still require a significant amount of parking to be provided off-street and strategies for accomodating this parking require examination.
- Alternative strategies for demand reduction should be evaluated for the RWICD with the understanding that a rather mid-range modal split shift target of 15 percent would not allow for a correspondingly significant reduction in the on-site provision of parking. Further measures may be required to achieve a larger decrease in vehicle ownership levels compared to current levels. Mode split targets can only be met with further investment in pedestrian facilities and cycle facilities in the study area.
- Prior to deciding on a formal parking strategy/solution, the City should conduct parking surveys for similar buildings to determine if the Bylaw requirements actually reflect the true parking demand for the type of use or whether the requirements could be further reduced. Should actual demand be less than the Bylaw requirement, it is possible that both OCP and RWICD conditions would not need to provide the amount of parking as currently calculated that this assessment is based upon.

- Access and servicing should be provided via a laneway to eliminate the need to have driveways directly accessing a City street. If surface parking be considered, consolidating parking for several buildings at a time should be pursued.
- Angled parking is not recommended as the number of stalls achieved through angled parking will not be significantly greater than the number of parallel parking spaces given the short blocks between north-south streets. Furthermore, angled parking would take up more City right-of-way.

Transportation Demand Management

- A modal split shift target of 15 percent from vehicle modes at the minimum should be the objective for this area, noting its proximity to the Downtown.
- Transit and land use measures should form the bulk of the TDM strategy, with the goal of increasing walking and bicycle trips and reduce the need for residents to travel in single occupancy vehicles.
- Bicycle racks, storage facilities, and end of trip facilities should be provided in all commercial developments (if pursued) in the study area.
- A car co-op or charge up ports for electric vehicles would be recommended for the residential developments in the study area.

It should be noted that once the actual scope, nature, and pattern of the RWICD development is established, more detailed traffic analysis should be undertaken to confirm location-specific requirements. It is recommended that the Ministry of Transportation and Infrastructure (MoTI) be consulted as a key stakeholder and included in the scope development of any future transportation studies on the RWICD. The next step in the RWICD planning is unknown as it is dependent on Council's direction which could be a number of likely possibilities, which could include amending the existing Neighbourhood Plan, or amending the OCP through its review.

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1 INTRODUCTION

1.1 Background

Opus International Consultants (Canada) Limited (Opus) has been retained by HB Lanarc to conduct a transportation study assessing the potential impacts of implementing a Residential Wood Frame Innovation Comprehensive District (RWICD) in the City of Prince George. The District would allow for increased densities from the current Official Community Plan (OCP) designation of the same area in the form of 4 – 6 storey wood frame apartment buildings. While the OCP build-out would see up to 2,000 residential units constructed, the RWICD build-out would increase the unit count to 3,200 units, representing a net increase of 1,200 units. The macroscopic transportation model indicates that only about 500 residents currently live in the study area.

Since the planning and design consultant, HB Lanarc, is currently undertaking this planning exercise to determine its feasibility, Opus' role is to determine the implications of increasing the build-out potential of the lands by going from the current OCP to the RWICD initiative from a transportation perspective.

A context map describing the location of the Residential Wood Frame Innovation Comprehensive District in Prince George is provided in FIGURE 1.1.

FIGURE 1.1 CONTEXT MAP

1.2 Overview of Transportation Issues

As a precursor the more detailed transportation operations assessment which is the main focus of this report, Opus previously identified transportation issues for HB Lanarc's Backgrounder and Urban Design Study.

The principal transportation issues can be summarized as follows:

- Likely growth in Prince George in the near future – It is recognized that there has been limited growth in the past 5 – 10 years in the City of Prince George. However, with the proposed development of the RWICD and build-out of several other Neighbourhood Plan Areas, a realistic growth scenario needs to be determined to coincide with the build-out of the RWICD. It was agreed with the Ministry of Transportation and Infrastructure (MoTI) that the study would assume a growth rate of 1.5 percent per annum for traffic. RWICD will likely account for 1 percent of this growth, based on the macroscopic transportation model findings.

- Left turns from Victoria Street (Highway 16) – It is recognized that the Ministry of Transportation and Infrastructure (MoTI) has stated that through movements on Victoria Street through the study area generally have priority, and as such, proposed road improvements must respect through traffic mobility on Victoria Street and options to avoid having to provide left turn slots from Victoria Street must be evaluated.

- Function and Form of Road Network and Consistency with Prince George engineering standards –The *Smart Growth on the Ground Downtown Prince George Concept Plan* is a detailed vision for the year 2035 of a sustainable and vibrant downtown Prince George. The document provides its vision for some of the affected streets in the RWICD, including 7th Avenue, which is slated to become a ceremonial boulevard. The City's *Active Transportation Plan* also outlines potential investments in pedestrian and cycling infrastructure that would have implications to the urban form of RWICD.

- Providing alternative transportation options – Prince George is predominately car-oriented and one of the major goals of the RWICD is to plan for a more inclusive transportation network that encourages greater share of alternative transportation. Green streets was a concept identified, which would call for the creation of tree lined boulevards and sidewalks. There was also a proposal for traffic calming measures. The concepts presented in the Smart Growth charette will be evaluated for consistency with the proposed street functions and form in RWICD.

- Parking – The RWICD plans to provide the minimum amount of parking necessary on-site and for the residential street network to accommodate visitor and some residential traffic. The on-street parking inventory needs to be determined and sufficiency of parking needs to be addressed. Finally, on-street parking must be managed in consideration of road maintenance operations, such as snow clearance and sweeping.

1.3 Report Outline

This report is structured so that the broad aspects of traffic impacts of the plans for the Residential Wood Innovation Comprehensive District (RWICD) are addressed.

- Existing Conditions – Road Network, Bike Routes, Transit Routes, Road Classifications, Current Network issues, Future Opportunities
- Future Policy Conditions – Goals and Objectives of RWICD
- Future Traffic Conditions – Interim Build-Out and Future Build-Out Conditions, Mitigation Measures
- Future Proposed Route Concepts
- Future Parking Conditions – expected parking demand, supply, and strategies
- Transportation Demand Management

2 EXISTING CONDITIONS

2.1 Base Network Laning and Traffic Control

The City of Prince George has identified the potential for a high intensity multi-family residential district, called the Residential Wood Frame Innovation Comprehensive District (RWICD) near Downtown Prince George, from 4th Avenue to 11th Avenue, between Victoria Street and Winnipeg Street. The area network conditions are displayed in FIGURE 2.1 below.

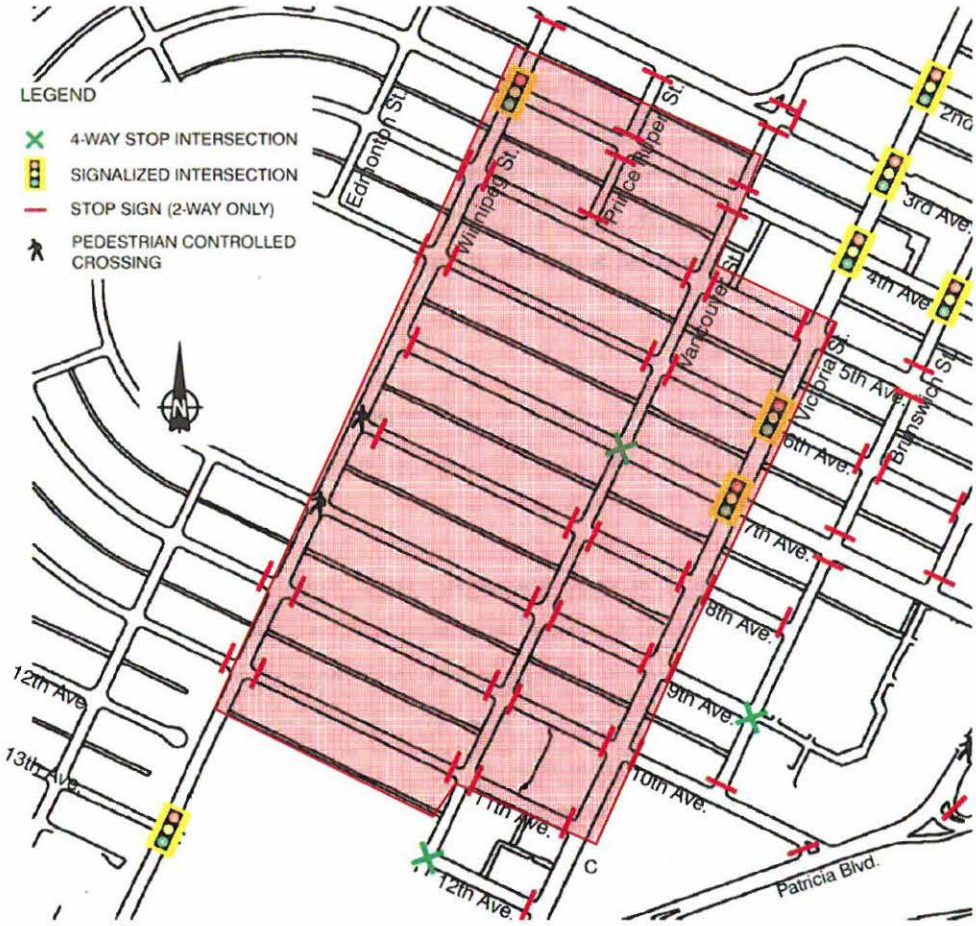


FIGURE 2.1 CONTEXT MAP

FIGURE 2.1 shows that all streets within the study area accommodate two-way traffic flows, with the exception of 4th Avenue, which is one way in the southeast direction. Victoria Street, Winnipeg Street, and 7th Avenue are the only roads

which currently accommodate two travel lanes in each direction. 3rd Avenue within the study area carries two lanes of traffic in the northeast direction and one lane in the southwest direction. All other streets in the study area accommodate one travel lane in each direction. Parking is generally available on both sides of each street, except for Winnipeg Street. The traffic signals along Victoria Street are located at 4th Avenue, 6th Avenue, and 7th Avenue. There is also a traffic signal at Winnipeg Street and 4th Avenue, a pedestrian crosswalk with overhead signs on Victoria Street at 9th Avenue, and a pedestrian signal at 9th Avenue and Winnipeg Street.

2.2 Existing Transit Routes

At the time of the 2001 Census it was found that less than 2 percent of the City's population used transit as a primary mode of travel to and from work. Compared to other medium-sized systems in the province, the City's investment in transit services was also one of the lowest. However, in 2004, system upgrades were implemented, and since then, ridership has almost doubled due to a system overhaul in 2004.

Currently, the following six transit routes, which all stop at the intersection of 7th Avenue and Dominion Street (referred to as the Downtown Transit Exchange) service the study area:

- ROUTE 1 – Heritage / 10th;
- ROUTE 5 – Victoria / 5th;
- ROUTE 11- Heritage / 10th;
- ROUTE 15 – UNBC / 15th;
- ROUTE 55 – 5th / Victoria; and,
- ROUTE 48 – Queensway.

A route diagram summarizing the above routes is provided in FIGURE 2.2. However, from a review of the document titled *Transit Service Review* (Entra Consultants, 2003), indicated that the previous downtown routing has been perceived to be circuitous and inefficient. However, it is understood that the current level of service for transit meets the needs of the City.

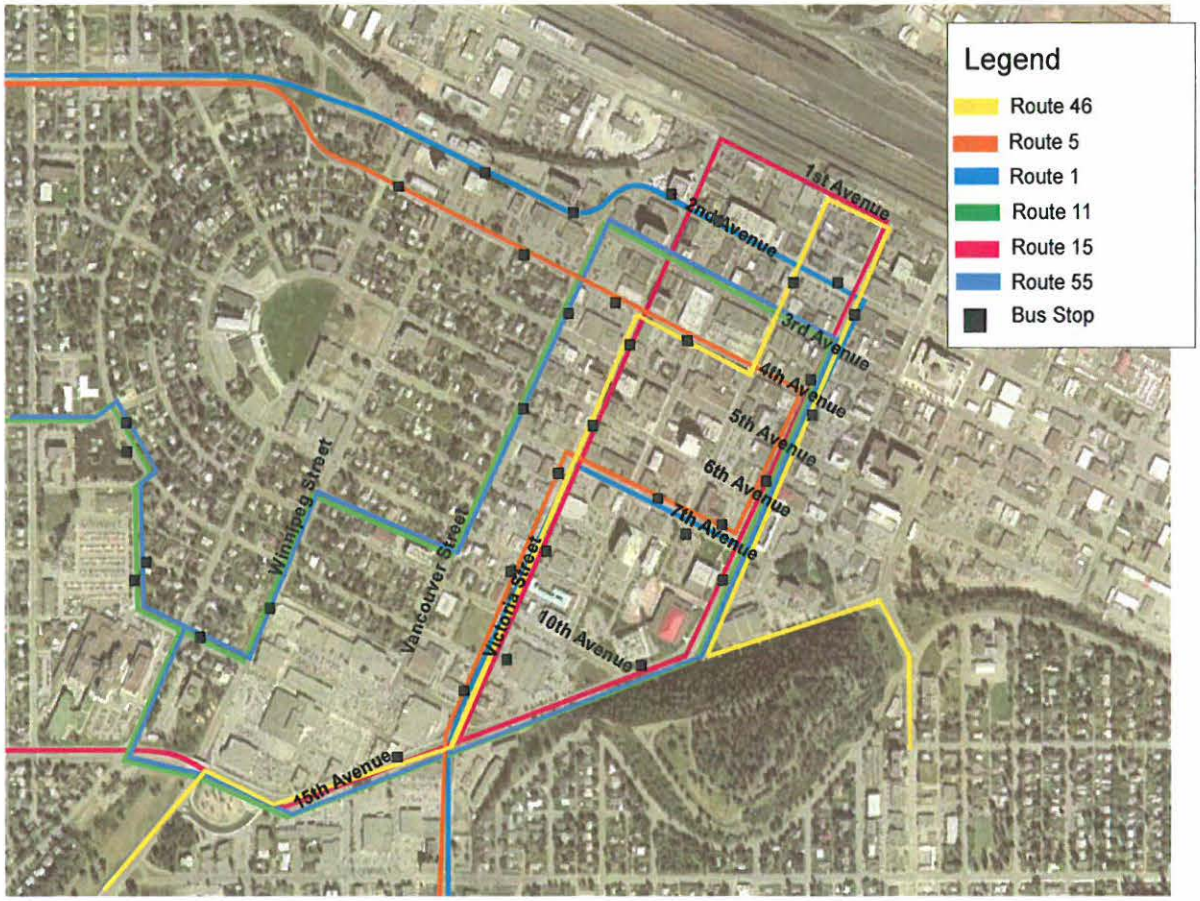


FIGURE 2.2 EXISTING DOWNTOWN TRANSIT ROUTES

With the exception of the routes that provide service to the University of Northern British Columbia (UNBC), which operates at 30-minute intervals, all routes operate once per hour. It is acknowledged that the population density in the City is too low to be supportive of more frequent transit service. To further discourage transit ridership, on-street transit facilities, such as shelters and benches, are unattractive due to frequent vandalization, trash accumulation, and inadequate lighting.

Currently, there are no requirements guiding the placement of transit stops. However, the City has a transit policy which requires that a transit stop is available within 400 metres of walking distance to/from residential homes. Generally, transit stops are located on the far-side, and to avoid jaywalking, mid-block stops should be avoided. While the City does not have set standards for transit stops, Opus

recommended the following to be considered in the *Downtown Transportation and Parking Study* (Opus, 2007):

- Lighting;
- Sidewalk;
- Accessibility for wheelchair users;
- Trash bins; and,
- Shelter from northern winter climates.

The City has a transit policy which explains how transit stops are to be located. These policies should be referenced if any improvement is suggested. To increase transit ridership, Opus also recommended that the City encourage the development of student housing in the downtown area. Schedule changes will likely be required to ensure that RWICD has excellent transit service.

2.3 Existing Bicycle Routes

The City developed the *Cycle Network Plan* in 2001. The *Cycle Network Plan* proposed guidelines and standards for the development of a cycle network, and identified existing and recommended links in the cycle network. The City's *Downtown Transportation and Parking Study* (Opus, 2007) as well as the *Prince George Active Transportation Plan* (Opus, 2007) also covered many aspects of cycling within the City.

Since the adoption of the Cycle Network Plan, over 100 km over bicycle lanes were installed. In addition, the government also funded for the development of a number of cycle facilities. The existing bicycle routes within the study area are shown in FIGURE 2.3. The existing bicycle network in the downtown has several east-west routes that terminate at Victoria Street. However, there are no east-west routes that cross the area.

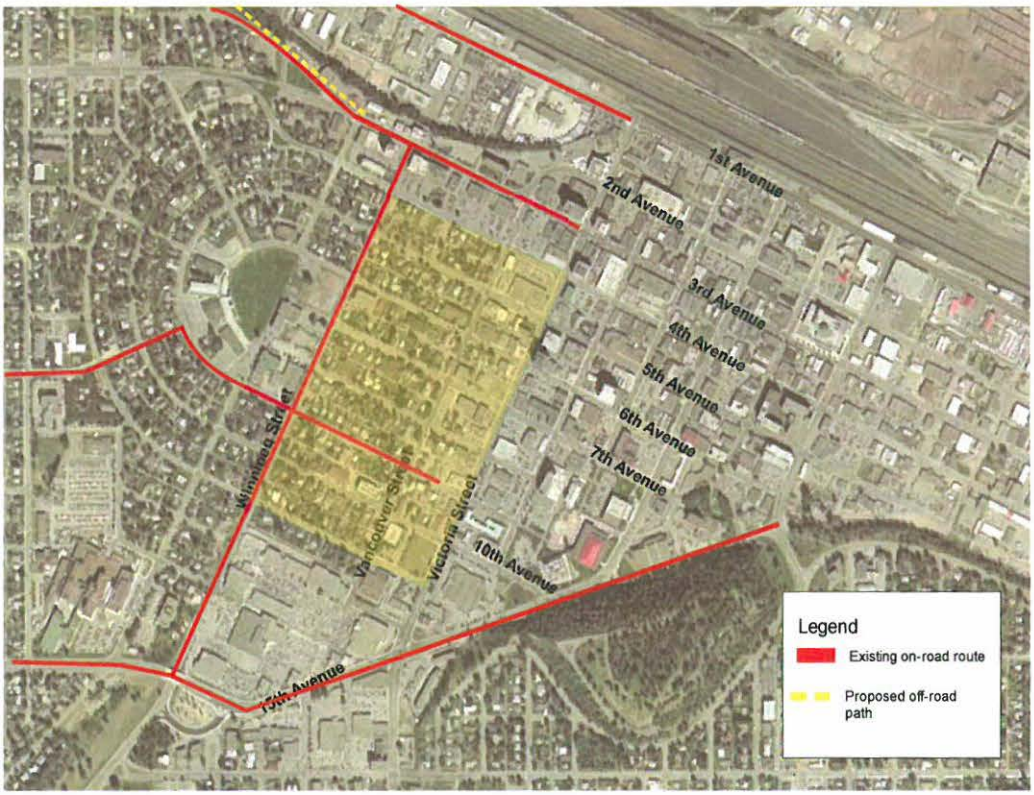


FIGURE 2.3 EXISTING DOWNTOWN CYCLING NETWORK

The Cycling Network Plan states that all roads are potential cycling routes and that facilities should be designed to allow cyclists to ride with traffic while providing identical facilities on both sides of the road. Standards were developed for the *Prince George Active Transportation Plan* (Opus, 2007). It should be noted that winter maintenance standards for bicycle lanes were not stated in the Cycle Network Plan.

2.4 Existing Pedestrian Network

The pedestrian network consists of sidewalks and walkways through the community. Since the adoption of the Pedestrian Network Study (Opus, 2004), $1 million dollars have been spent on new sidewalks links and sidewalk rehabilitation.

A review of the Pedestrian Network Study (Hamilton Associates, 2004) shows that sidewalk requirements for the City are as follows:

- Both sides of arterial roads;
- One side of urban collector roads;
- One side of urban local roads; and
- No sidewalks for rural roads.

In the downtown area, a review of the pedestrian network conducted for the *Downtown Transportation and Parking Study* (Opus, 2007) shows that sidewalks are located on both sides of the street.

Typically, sidewalks in the downtown are between 1.8 metres to 3.0 metres wide and offer bulb-outs at certain intersections. Wider sidewalks between 2.0 metres and 3.0 metres are considered to enhance the pedestrian experience. Standard drawings for crosswalks are provided in the City's *Subdivision and Development Servicing Bylaw 7652*.

2.5 Existing Road Network Conditions

A number of arterials and collectors provide access into the study area. Victoria Street is also Highway 16, a provincial highway. As such, Victoria Street is under the jurisdiction of the Ministry of Transportation and Infrastructure (MoTI). TABLE 2.1 summarizes the major roads in the study area.

TABLE 2.1. MAJOR CORRIDORS IN THE STUDY AREA

TYPE	CORRIDOR	ILLUSTRATION
Major Arterial	*Victoria Street* Victoria Street through Downtown Prince George also acts as provincial Highway 16. Victoria Street can also be labeled as a provincial arterial.	
Arterial	*3rd Avenue* 3rdAvenue is a major east-west arterial, extending to 5th Avenue.	
	4th Avenue 4th Avenue is a major east-west arterial, extending to 5th Avenue.	
	Winnipeg Street Winnipeg Street is a major north-south arterial. It is the alternate north-south route to Highway 16 through the study area. There is no parking on either side of Winnipeg	

TYPE	CORRIDOR	ILLUSTRATION
	Street.	
Collector	*7th Avenue* 7th Avenue is an east-west collector road in the study area.	
	9th Avenue 9th Avenue is an east-west collector road in the study area, extending to 10th Avenue.	
	Vancouver Street Vancouver Street is generally a collector street with a north-south orientation.	

NOTE: Images courtesy of Google Maps.

2.6 Existing Roadway Classification

A map providing information on the existing roadway classification within the study area road network is provided in FIGURE 2.4.

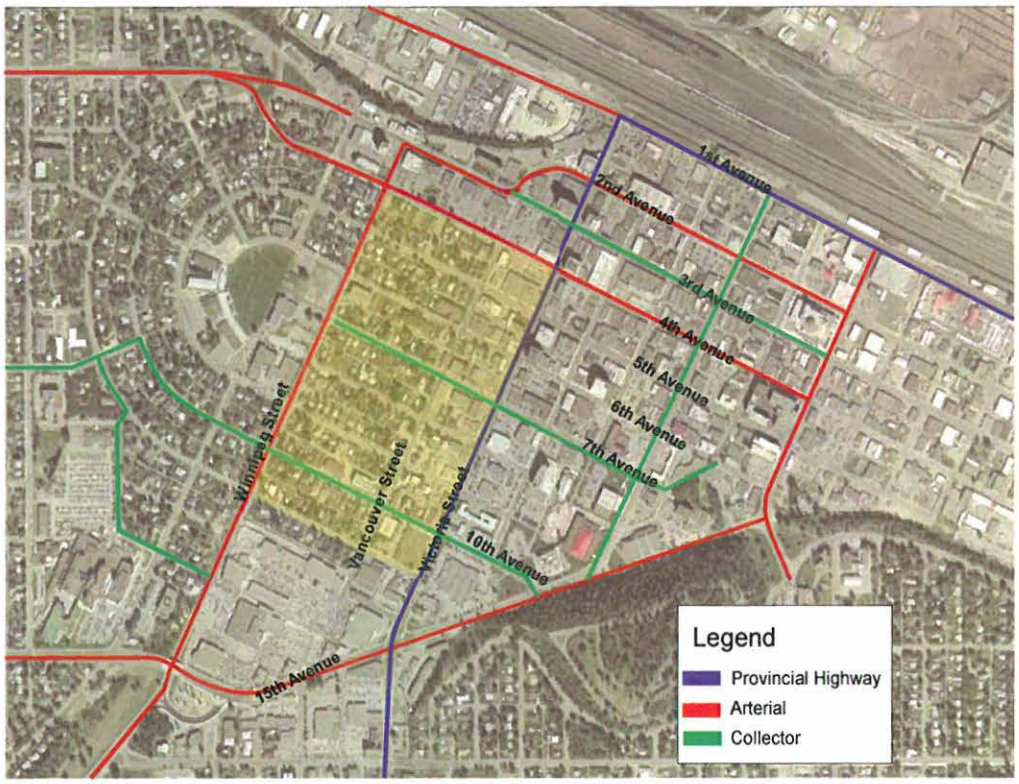


FIGURE 2.4 STUDY AREA ROADWAY CLASSIFICATION

2.7 Functional Classification Review for Existing Streets

The *Geometric Design Guide for Canadian Roads* (Transportation Association of Canada, 1998) specifies typical volumes observed for each roadway classification. The typical volumes for local, collector, and arterial roads are presented in TABLE 2.2. Based on a review of the *Downtown Transportation and Parking Study* (Opus, 2007), it appears that the downtown roadways are within the ranges defined for each classification.

TABLE 2.2 TYPICAL ROADWAY VOLUMES

	ROADWAY CLASSIFICATION			
	LOCAL	COLLECTOR	MINOR ARTERIAL	MAJOR ARTERIAL
TRAFFIC VOLUMES PER DAY	AADT between 1,000 – 3,000	AADT between 8,000 – 12,000	AADT between 5,000 – 20,000	AADT between 10,000 – 30,000

TABLE 2.3 summarizes the current volumes on the roads and in general they are within the limits of each functional classification.

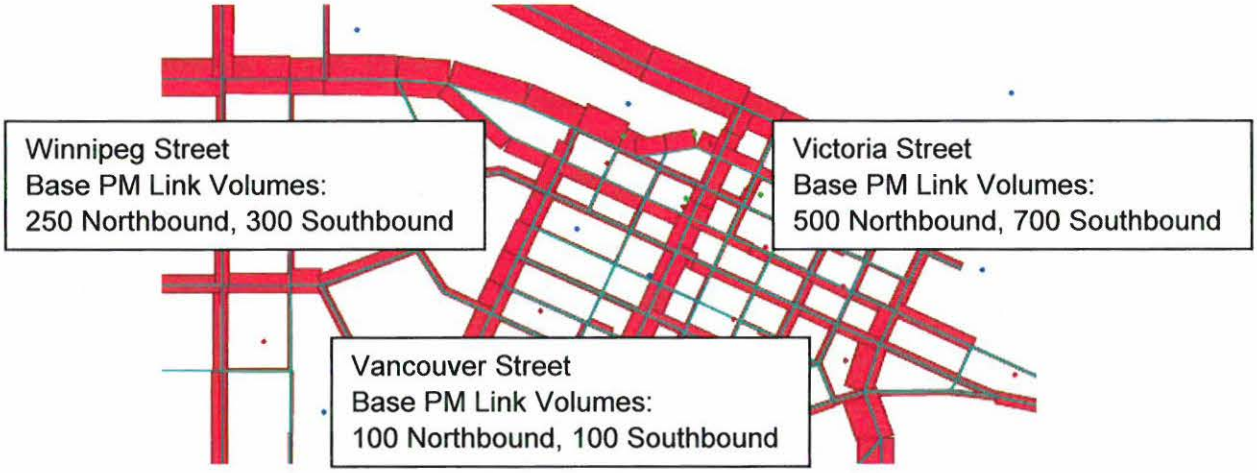
TABLE 2.3 AVERAGE ANNUAL DAILY TRAFFIC (AADT) – EXISTING TRAFFIC

CORRIDOR	AADT	DESIGNATION	CRITERIA (vehicles per day)	MEETS CRITERIA?
Victoria Street	13,000	Major Arterial	10,000 – 30,000	YES
Winnipeg Street	9,000	Minor Arterial	5,000 – 20,000	YES
3rd Avenue	7,000	Minor Arterial	5,000 – 20,000	YES
4th Avenue	7,000	Minor Arterial	5,000 – 20,000	YES
7th Avenue	3,000	Collector	8,000 – 12,000	YES
9th Avenue	3,000	Collector	8,000 – 12,000	YES

Ideally, an evaluation of the appropriateness of the functional classification should also include consideration of network spacing, continuity, and road function/purpose.

2.8 Existing Base Network Volumes

The most recent traffic counts were obtained from three general sources – the City of Prince George's GIS (PG Map), the MoTI, and base information from the City's EMME/2 databank. FIGURE 2.5 displays the screen capture from the City's EMME/2 model. The existing traffic volumes of the study area road network for the morning and afternoon peak periods are shown in FIGURE 2.6 and FIGURE 2.7 respectively.



*Victoria Street, Winnipeg Street, and Vancouver Street are considered N-S streets in this figure.

FIGURE 2.5 EMME/2 BASE NETWORK VOLUMES– PM PEAK

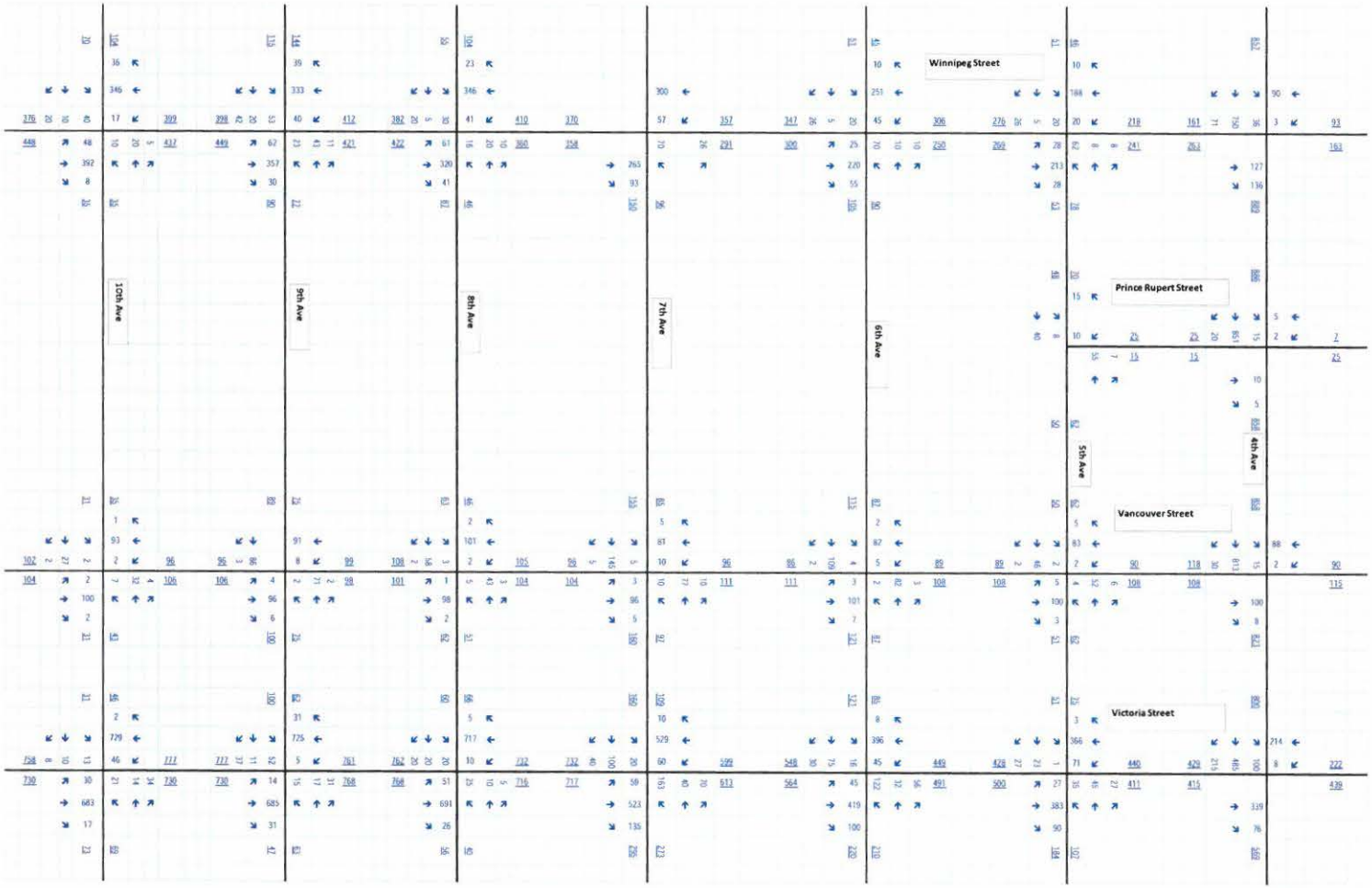


FIGURE 2.6 EXISTING TRAFFIC VOLUMES – AM PEAK

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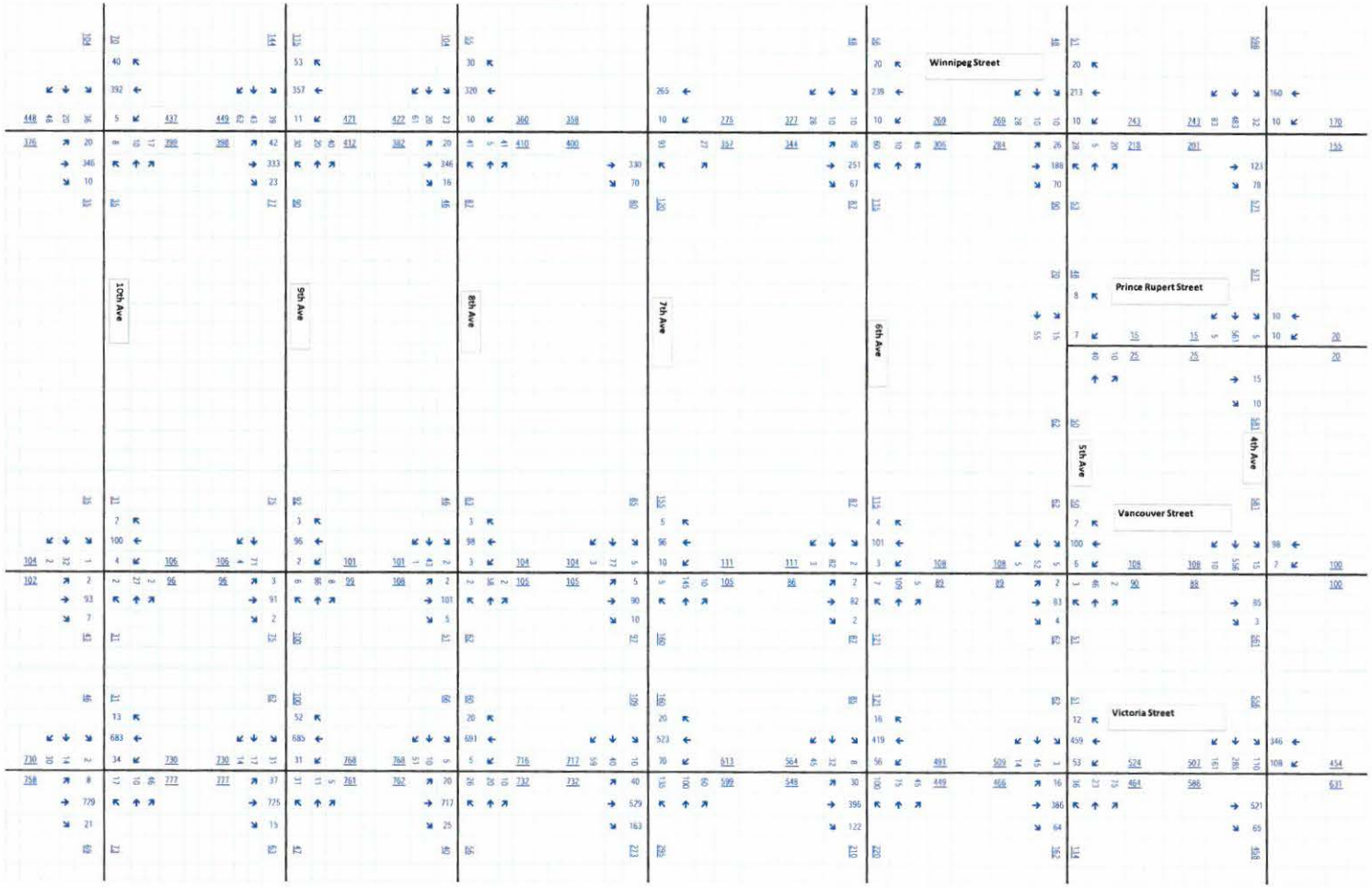

FIGURE 2.7 EXISTING TRAFFIC VOLUMES – PM PEAK

OPUS

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The base network traffic volumes can be considered modest at best, noting its proximity to the Downtown. Victoria Street is the only major arterial in the corridor, and has ample capacity considering that it operates with two through lanes in each direction with a two-way PM peak hour flow of 1,200 vehicles. It is within the range of volumes expected for a road of this functional classification, albeit at the lower range. The other major north-south streets of Winnipeg Street and Vancouver Street also carry modest volumes and are also expected to have ample capacity. The opening of the Duchess Park Secondary School does not seem to have contributed significantly greater volume to Winnipeg Street in the peak hours, as the traffic counts have indicated. In terms of the east-west connections, the model indicates that 4th Avenue is the only east-west route that carries a relatively substantial volume that can be attributed to more regional movements. 4th Avenue is one-way in the eastbound direction (into Downtown). The peak hour volume on 4th Avenue is between 500 – 600 vehicles.

While the City's transportation model is a PM peak hour model, additional count data from the AM reveals that while the two-way volumes carried by the same streets are in the same range, the directional splits are almost perfectly reversed.

With the base traffic information obtained from EMME/2 and the existing count data, capacity analysis for intersections with traffic control other than an unsignalized configuration between local roads was completed to confirm that capacity was not a big issue under existing conditions as the EMME/2 base data is suggesting. Capacity performance of the study intersections was assessed using Synchro Version 7.0 software, developed by Trafficware. The software conforms to the methodologies outlined in the *Highway Capacity Manual,* which evaluates the study intersections by calculating the intersection and approach vehicular delays, as indicated by levels of service (LOS).

The definition of LOS criteria for signalized and unsignalized intersections is given in TABLES 2.4 and 2.5. LOS A and B indicate little delay, while LOS E and F indicate long delays and potentially significant queuing. In general, LOS D or better represents adequate operating conditions with acceptable delays.

TABLE 2.1 SIGNALIZED INTERSECTION LEVEL OF SERVICE CRITERIA

LOS	CONTROL DELAY PER VEHICLE (s)
A	<10
B	>10 and <20
C	>20 and <35
D	>35 and <55
E	>55 and <80
F	>80

TABLE 2.2 UNSIGNALIZED INTERSECTION LEVEL OF SERVICE CRITERIA

LOS	CONTROL DELAY PER VEHICLE (s)
A	<10
B	>10 and <15
C	>15 and <25
D	>25 and <35
E	>35 and <50
F	>50

The capacity results for the study intersections were summarized and are presented in TABLE 2.6 to TABLE 2.7 for the signalized and unsignalized intersections respectively..

TABLE 2.3 EXISTING INTERSECTION CAPACITY ANALYSIS

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.39	B	0.29	B	Signal
9th Avenue and Winnipeg Street	0.28	A	0.24	A	Pedestrian Signal
4th Avenue and Victoria Street	0.43	B	0.41	A	Signal
6th Avenue and Victoria Street	0.40	A	0.38	A	Signal
7th Avenue and Victoria Street	0.41	A	0.41	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

The main findings of the existing traffic assessment are as follows:

- Under existing conditions, all intersections in the study area operate at excellent levels of service.

- Winnipeg Street carries modest volumes and there is no need to accommodate these volumes over two travel lanes in each direction. There is likely a case for a road diet, by providing one general purpose lane in each direction and a centre two-way-left-turn lane (TWLTL). Winnipeg Street can be considered for a road diet for purposes of accommodating bicycle lanes and improved safety.

3 FUTURE POLICY SCENARIOS

3.1 Current Policy

The OCP defines the RWICD study area as an "urban settlement area" and "transitional neighbourhood" that will accommodate future growth in the form of higher density, infill housing. The form of housing is defined as a mix of townhomes, rowhouses and four storey apartment buildings. Victoria St. is defined as a key area of transition to downtown and designated for commercial/office use.

The *Smart Growth on the Ground Downtown Prince George Concept Plan* also provides some direction for only a portion of the RWICD study area between Vancouver St. and Victoria St., and 4th to Parkwood Place. These blocks are envisioned as a 'transitional' area between higher densities in a compact mixed use downtown and the residential neighbourhoods to the west of downtown. Mixed use buildings with ground floor commercial uses are envisioned to front onto Victoria Street, with transitional housing envisioned as flex-use live/work townhouses forms in between Victoria and Vancouver Streets.

3.2 Residential Wood Frame Innovation Comprehensive District

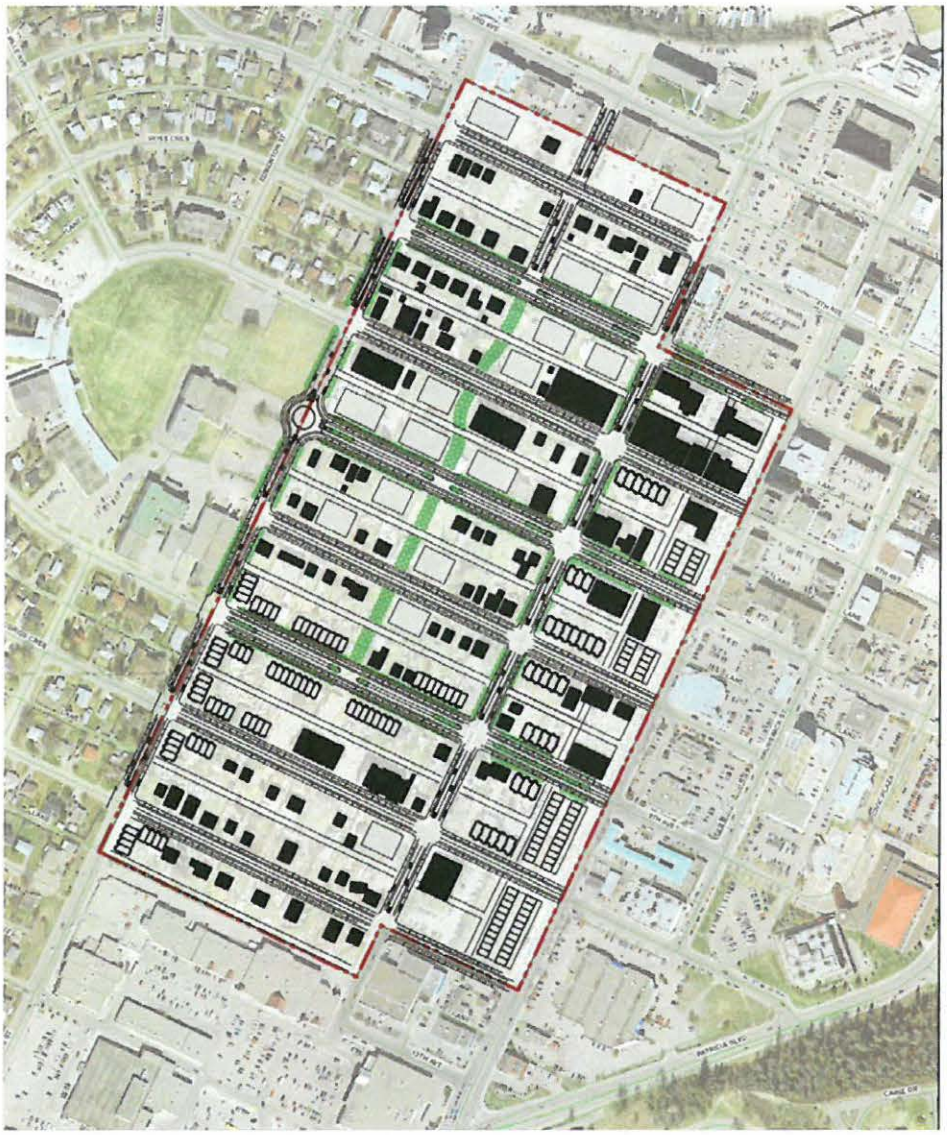
The City of Prince George has identified the potential for a high intensity multi-family residential district, called the Residential Wood Frame Innovation Comprehensive District (RWICD) near Downtown Prince George, from 4th Avenue to 11th Avenue, between Victoria Street and Winnipeg Street. The District would replace the existing 300 residential units (approximate population of 500) with 2,200 – 2,800 dwelling units over a number of 4-6 storey wood-framed apartment blocks (approximate population of 3,750 – 5,000).

3.3 Differences between the OCP Scenario and the RWICD

The existing policy allows for the construction of low-rise buildings of 3-4 storeys while the RWICD is proposing 4-6 storeys. While the difference in 2 or so storeys per building may seem minimal, the build-out condition projects that the RWICD initiative would add 1,200 units to the current OCP scenario.

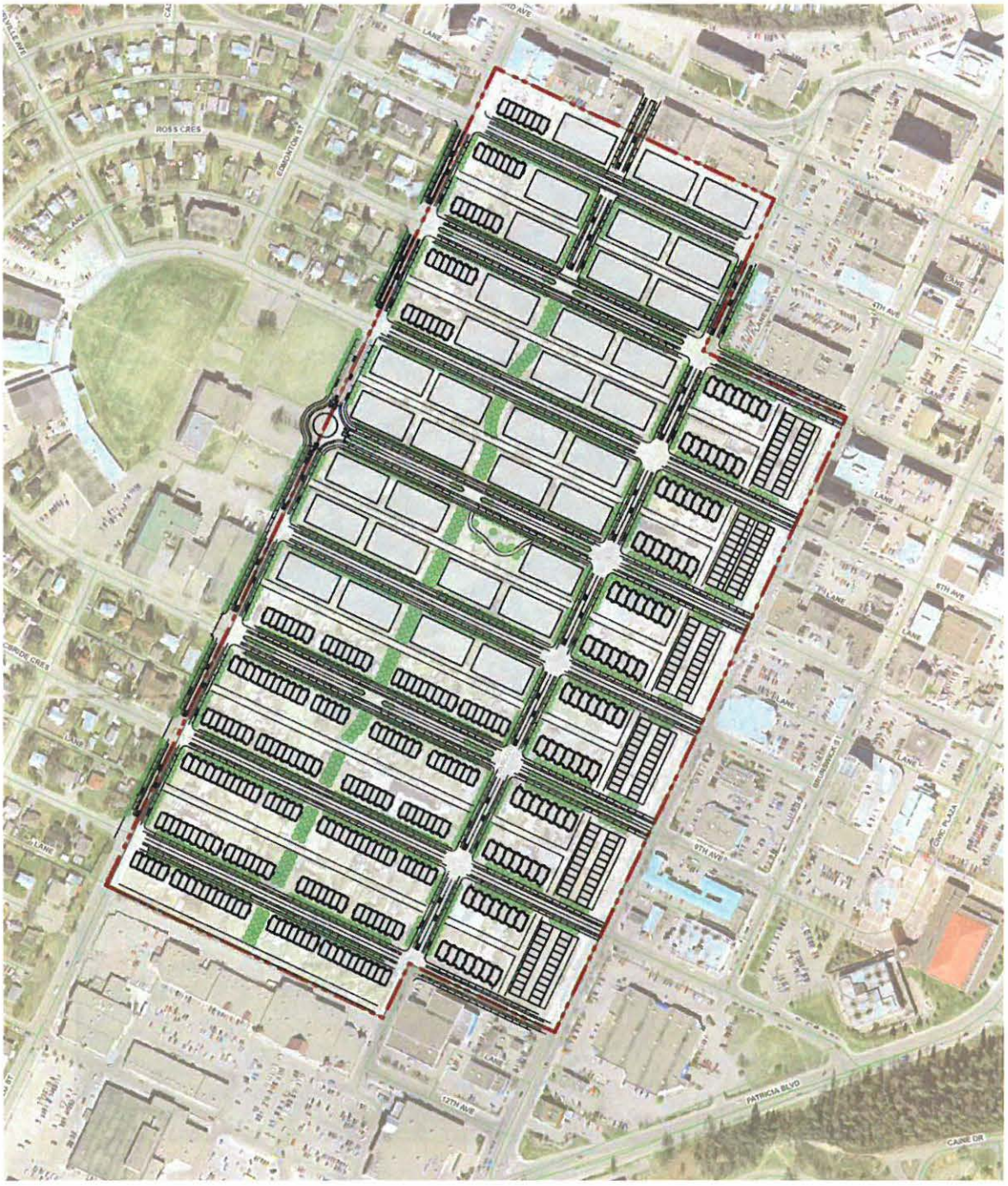
Current OCP

The full OCP build-out is approximately 2,000 residential units and the interim build-out (15 – 20 years) is proposed to be 700 residential units. FIGURE 3.1 and 3.2 display the OCP condition for the interim and build-out conditions respectively.



SOURCE: HB LANARC

FIGURE 3.1 INTERIM OCP CONDITION – 700 UNITS

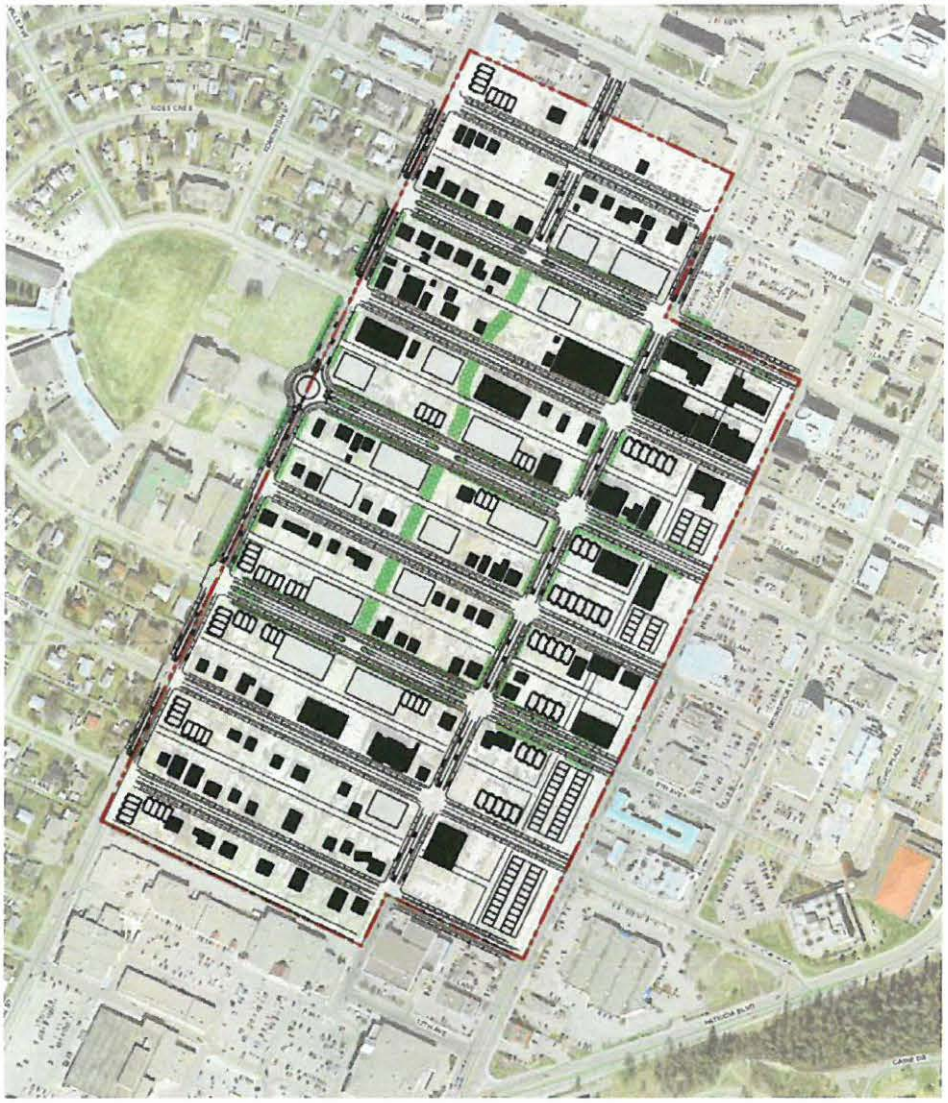


SOURCE: HB LANARC

FIGURE 3.2 FULL OCP BUILD-OUT – 2,000 UNITS

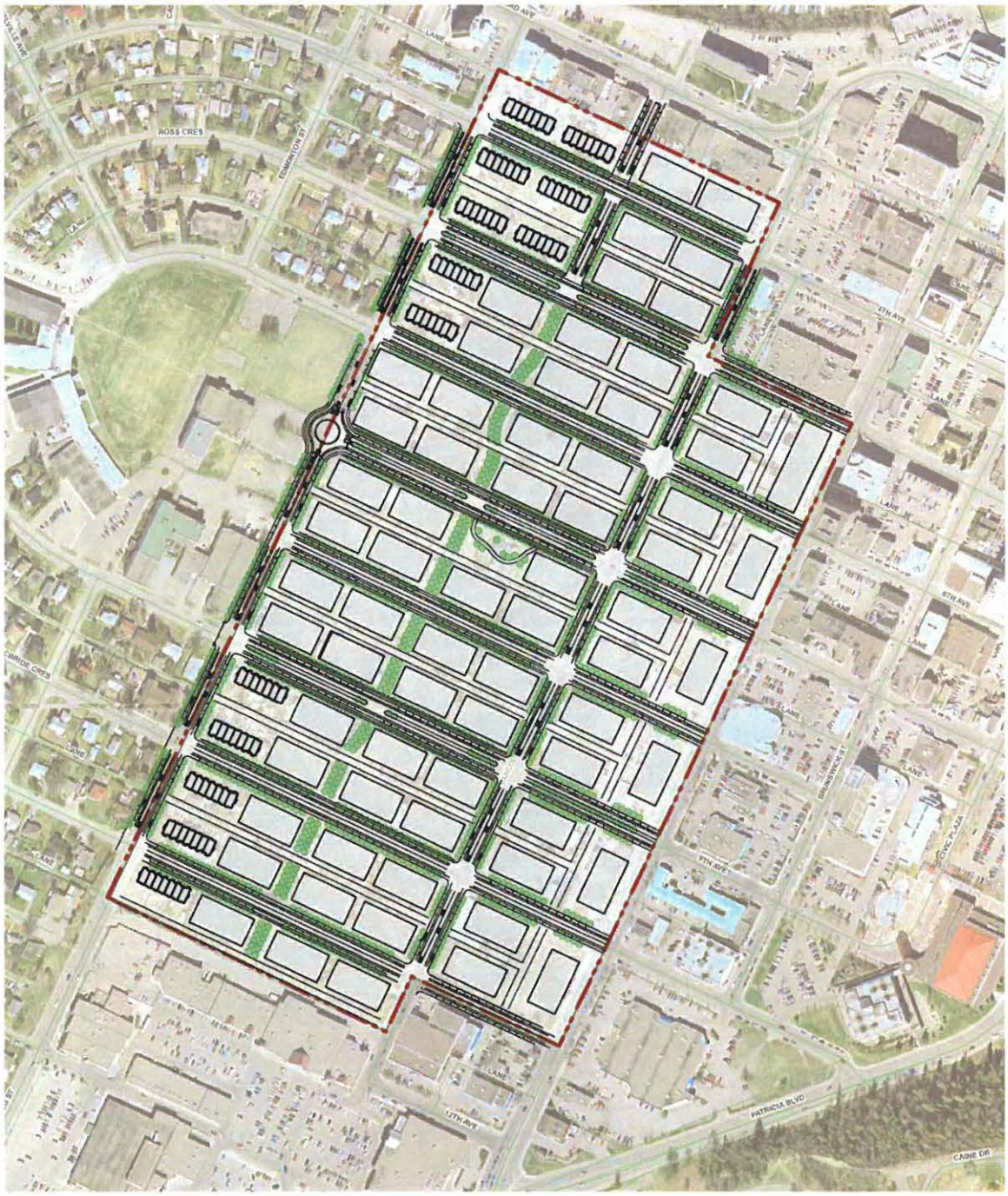
RWICD

The full RWICD build-out is approximately 3,200 residential units and the interim build-out is proposed to be 730 residential units. The interim (15 – 20 year build-out) of RWICD is generally no different in terms of a unit count than the current OCP policy. FIGURE 3.3 and 3.4 display the RWICD condition for the interim and build-out conditions respectively.



SOURCE: HB LANARC

FIGURE 3.3 INTERIM RWICD CONDITION – 730 UNITS



SOURCE: HB LANARC

FIGURE 3.4 FULL RWICD BUILD-OUT – 3,200 UNITS

4 FUTURE TRAFFIC CONDITIONS

4.1 Expected Future Growth

Based on previous studies such as the *City of Prince George Downtown Transportation and Parking Plan*, background traffic growth in Prince George and the Downtown should be considered modest at best.

A further investigation was conducted on the actual growth the area has experienced in the recent past by extracting data from a MoTI permanent count station (P-42-1). TABLE 4.1 displays the data.

TABLE 4.1 GROWTH TREND FOR PRINCE GEORGE

YEAR	AADT
2009	19,707
2008	20,324
2007	20,632
2006	20,728
2005	19,802
2004	18,430
2003	18,107
2002	20,544
2001	20,197
2000	20,210
1999	20,490
1998	21,648

While it was suggested at the start-up meeting for the transportation component of the RWICD urban design study in October 2010 that a 1.5 per annum growth rate should be used, the permanent count station data indicates that Prince George has not experienced a growth in road network volumes. Since the level of improvements required is a function of the traffic volumes assumed, it was determined that a more realistic approach was to consider that as the area builds out, part of the growth would be attributable to the study area (regardless of OCP or RWICD). Thus, the study area is assumed to account for 1 percent of the growth rate, and thus a growth rate of 0.5 percent per annum will be applied. While the City could experience a higher growth rate than the ones used in this

report, the capacity results should be considered as a desired scenario for growth rather than a worst case scenario.

4.2 Analysis Parameters

A start up meeting was held in October 2010 with representatives from the City of Prince George and the Ministry of Transportation and Infrastructure to determine the scenarios which the future traffic assessment is to test.

The City acknowledged that the EMME/2 macroscopic transportation model, which models traffic volumes for a future base year, somewhat overestimates the amount of development likely to occur in the future. For example, the model has two future horizon years – 2016 and 2026, where it was acknowledged that 2016 conditions are more likely to occur by 2030 and 2036 conditions sometime after. Since there was a likely discrepancy in the amount of build-out assumed in the EMME/2 model, it was determined that a more proper approach to modelling RWICD was to apply a growth rate to the base volumes up to the analysis year. Noting that the growth rate to be applied is 0.5 percent (as discussed in Section 4.1), future volumes are forecast by applying this rate to base volumes. It is understood, however, that the Downtown area could experience higher growth rates independent of the growth occuring in the immediate study area. The City feels that Victoria Street may experience growth up to 1.5 percent per annum. While this may be the case, the analysis uses a less conservative approach that is more consistent with the historical growth rates experienced in the area. Subsequent analysis applying additional growth to Victoria Street may be conducted, and this analysis can be tied in to further work when the plans for the study area are more comprehensive.

In terms of the scenarios, Opus was asked to evaluate an interim and build-out condition of both the current OCP and RWICD, ultimately comparing the differences in level of improvement required between the two. Thus, the following scenarios are evaluated:

- Interim OCP Condition – assumed to occur by 2020 - 2026
- Interim RWICD Condition – assumed to occur by 2020 - 2026
- Full Build-Out OCP Condition – assumed to occur by 2030 – 2036
- Full Build-Out RWICD Condition – assumed to occur by 2030 - 2036

In terms of traffic count data, the most recent turning movement count for each intersection was compiled. In light of the fact that volumes in the area have remained constant, the counts were deemed to be representative for their respective intersections while the year in which the counts were undertaken for each intersection may differ. For minor intersections that did not have count data, turning movements were interpolated from adjacent intersections. For the purposes of this high-level review, this was deemed to be sufficient. Certainly new turning movement counts should be undertaken when it comes time to evaluate detailed operating conditions once more comprehensive plans are developed.

4.3 Trip Generation

Since the difference in what the current OCP allows and the RWICD initiative is an additional 2-storeys in density, the trip generation profile for the two scenarios are likely similar (i.e. same ITE Trip Generation Land Use code applies). In order to determine the most appropriate trip generation rates to use for this study, a variety of potential rates were compiled for comparison. TABLE 4.2 summarizes the compiled rates.

TABLE 4.2 TRIP GENERATION RATES FOR OCP AND RWICD SCENARIOS

Land Use	Time	Time	Average Trip Generation vs:	Average Trip Generation Rate	Directional Distribution	
					Entering	Exiting
Single Family Detached Housing (210)	AM	Peak hour adjacent street traffic (weekday)	Dwelling Unit	0.75	25%	75%
		Peak hour of generator (weekday)	Dwelling Unit	0.77	26%	74%
Apartment (220)		Peak hour adjacent street traffic (weekday)	Dwelling Unit	0.51	20%	80%
		Peak hour of generator (weekday)	Dwelling Unit	0.55	29%	71%
Low Rise (221)		Peak hour adjacent street traffic (weekday)	Dwelling Unit	0.46	21%	79%
		Peak hour of generator (weekday)	Dwelling Unit	0.51	20%	80%
Mid Rise (223)		Peak hour adjacent street traffic (weekday)	Dwelling Unit	0.3	31%	69%
		Peak hour of generator (weekday)	Dwelling Unit	0.35	29%	71%

Land Use	Time	Time	Average Trip Generation vs:	Average Trip Generation Rate	Directional Distribution	
					Entering	Exiting
Single Family Detached Housing (210)	PM	Peak hour adjacent street traffic (weekday)	Dwelling Unit	1.01	63%	37%
		Peak hour of generator (weekday)	Dwelling Unit	1.02	64%	36%
Apartment (220)		Peak hour adjacent street traffic (weekday)	Dwelling Unit	0.62	65%	35%
		Peak hour of generator (weekday)	Dwelling Unit	0.67	61%	39%
Low Rise (221)		Peak hour adjacent street traffic (weekday)	Dwelling Unit	0.58	65%	35%
		Peak hour of generator (weekday)	Dwelling Unit	0.62	64%	36%
Mid Rise (223)		Peak hour adjacent street traffic (weekday)	Dwelling Unit	0.39	58%	42%
		Peak hour of generator (weekday)	Dwelling Unit	0.44	59%	41%

The *ITE Trip Generation Handbook* rates generally indicate that medium to higher density dwellings tend to generate trips at rates less than a typical single family home. There is relatively little difference in rates between a low rise and apartment use, which most closely represents the OCP and RWICD use. The AM and PM peak hour rates for the low rise and apartment uses are 0.55 and 0.51 two-way trips per hour in the AM and 0.67 and 0.62 two-way trips per hour in the PM for each use respectively.

While the ITE rates are generally more conservative as the samples include data from US suburban locations, Opus determined in discussion with the City that a low-rise rate would be appropriate for the study. As such, the peak hour trip generation from Land Use Code 221 (Low Rise) was used to assess traffic impacts, with an additional 15 percent discount to account for its close proximity to the downtown and present an even more realistic trip generation for both the type of land use the OCP and RWICD initiative is to promote.

TABLE 4.3 summarizes the resultant trip generation for the respective scenarios.

TABLE 4.3 AM AND PM PEAK HOUR TRIP GENERATION

LAND USE (BUILD-OUT)	INBOUND		OUTBOUND		TWO-WAY TRIPS	
	AM	PM	AM	PM	AM	PM
RWICD	277	1,079	1,110	607	1,387	1,686
OCP	173	675	694	379	867	1,054
NET DIFFERENCE	**104**	**404**	**416**	**228**	**520**	**632**

The OCP scenario would generate up to 867 and 1,054 two-way trips in the AM and PM peak hours respectively. The RWICD scenario would generate up to 1,387 and 1,686 two-way trips respectively. Thus, an additional 1,200 units created by the RWICD scenario would correspond to a net increase of up to 520 and 632 two-way trips respectively. This is a 60 percent increase in traffic generation compared to the OCP scenario.

4.4 Trip Distribution and Assignment

At the suggestion and direction of the City of Prince George, an EMME/2 subconsultant, NovaTrans Engineering, was contracted to perform a select link analysis with EMME/2 in order to determine the existing distribution of traffic in the study area. The select link analysis considers the additional demographics likely to be attributed to the study area. Using the select link analysis data, TABLE 4.4 and TABLE 4.5 presents the general existing distribution of the primarily residential neighbourhood for the AM peak hour. Noting that the EMME/2 model is a PM only model, the distribution is likely reversed for the AM peak hour (should trip purposes be the same). TABLE 4.6 and TABLE 4.7 present the general existing distribution of the primarily residential neighbourhood for the PM peak hour. The inbound and outbound distributions is shown graphically in FIGURE 4.1.

For simplicity, the assignment of site traffic does not take into account the modest 300 units of existing housing that is already in the study area. All of the "new trips" that would be generated by a total build-out 2,000 unit and 3,200 unit scenario are applied to existing traffic plus their respective growth to the forecast horizon. In completing the analysis in this matter, it may overestimate the net traffic generation that would otherwise be allocated to the housing developments, but also presents a conservative case with some base traffic volumes already on the study area road network.

TABLE 4.4 INBOUND TRIP DISTRIBUTION AND ASSIGNMENT - AM PEAK

FROM	AM PEAK
South/East	35% - NB Left in from Victoria
North/East	10% - SB right in from Victoria
North/West	11% - SB Left in from Winnipeg
West	13% - NB Right in from Winnipeg
South	31 % - NB Right in from Winnipeg

TABLE 4.5 OUTBOUND TRIP DISTRIBUTION AND ASSIGNMENT – AM PEAK

TO	AM PEAK
South/East	10% EB Right to Victoria
North/East	10% EB Left to Victoria
North	8% WB Right to Winnipeg, 3rd Left turn
West	15% WB Left to Winnipeg
South/West	16% WB Left to Winnipeg
South	41% Winnipeg to Massey

TABLE 4.6 INBOUND TRIP DISTRIBUTION AND ASSIGNMENT – PM PEAK

FROM	PM PEAK
South/East	10% NB Left from Victoria
North/East	10% SB right from Victoria
North	8% SB left from Winnipeg, 3rd right turn to Winnipeg
West	15% NB right from Winnipeg
South/West	16% NB right from Winnipeg
South	41% Massey to Winnipeg NB right

TABLE 4.7 OUTBOUND TRIP DISTRIBUTION AND ASSIGNMENT – PM PEAK

TO	PM PEAK
South/East	35% - EB Right Out to Victoria
North/East	10% EB Left out to Victoria
North/West	11% WB Right out to Winnipeg
West	13% WB Left out to Winnipeg
South	31% WB Left out to Winnipeg

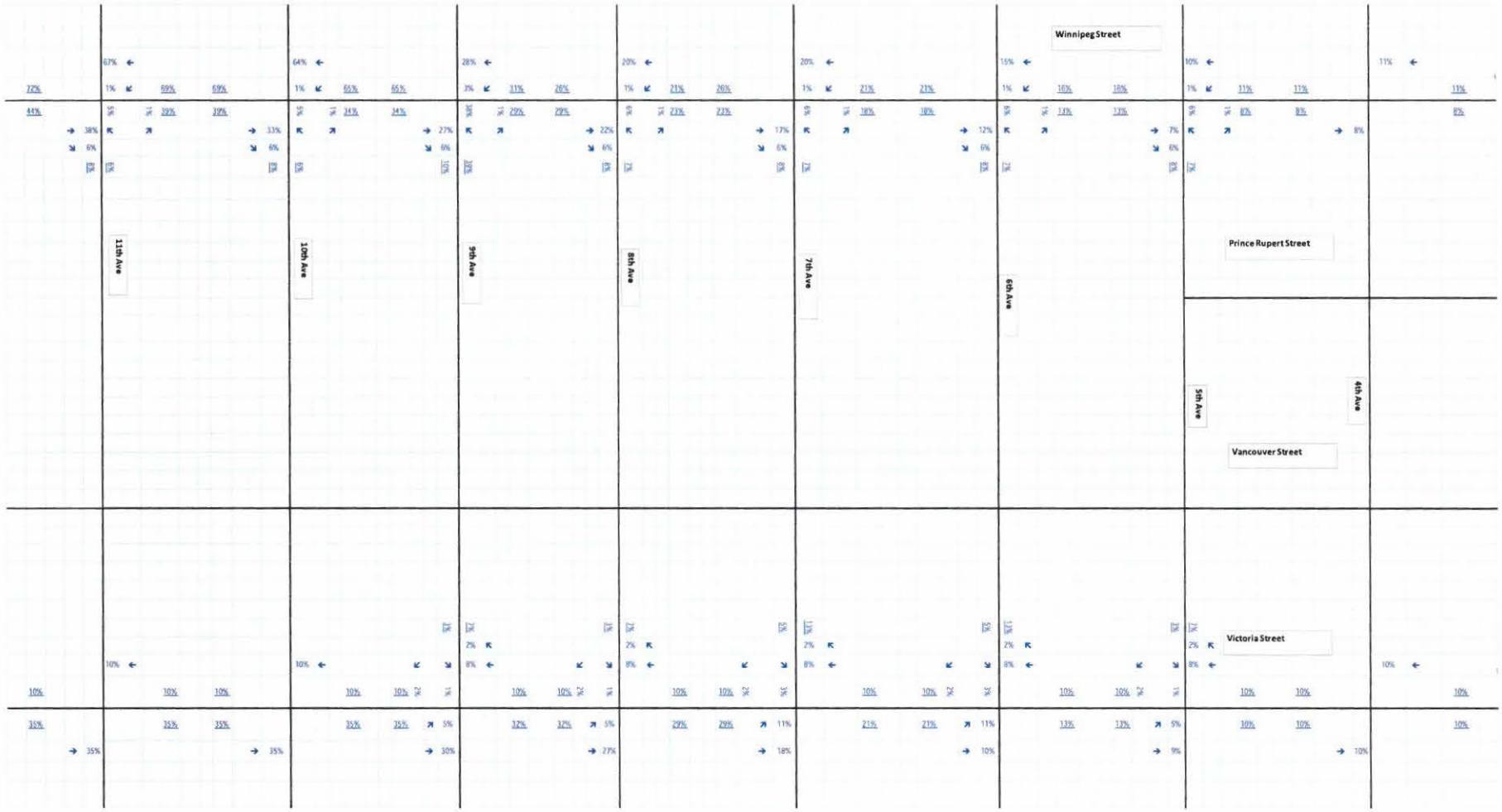


FIGURE 4.1 SITE TRAFFIC ASSIGNMENT

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4.5 Interim Build-Out

Future background and future total conditions were assessed for the interim horizon year 2020. Given that there is relatively little difference between the potential yields of the OCP condition and the RWICD condition (700 residential units versus 730 residential units), future total conditions referenced here will apply to both the OCP and RWICD condition. The scope of the analysis is only restricted to intersections within the study area.

Future Background Conditions- Interim Conditions (2020)

The future background 2020 traffic volumes are shown in FIGURE 4.2 and FIGURE 4.3 for the morning and afternoon peak periods respectively.

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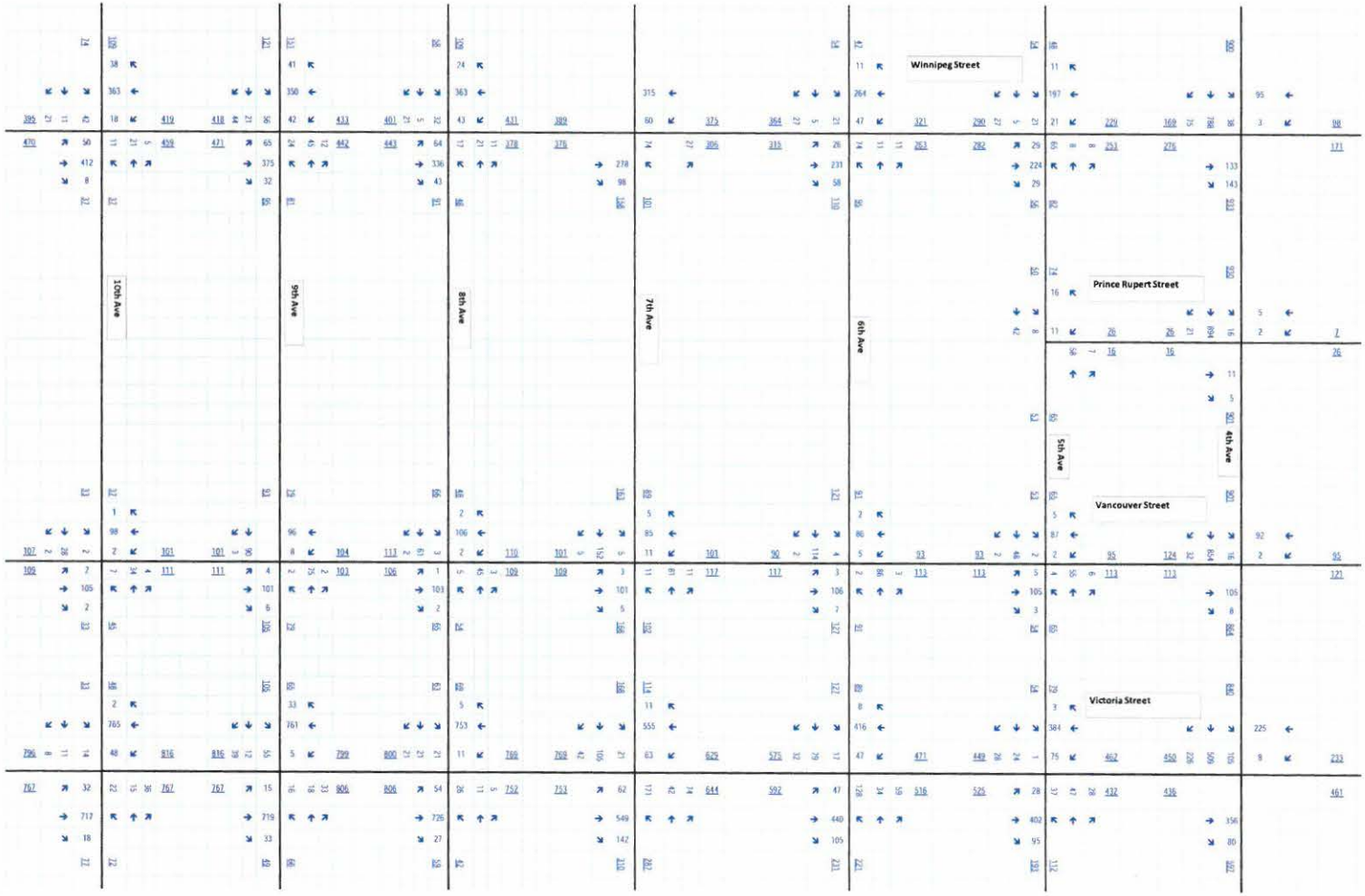

FIGURE 4.2 FUTURE BACKGROUND INTERIM (2020) TRAFFIC VOLUMES – AM PEAK

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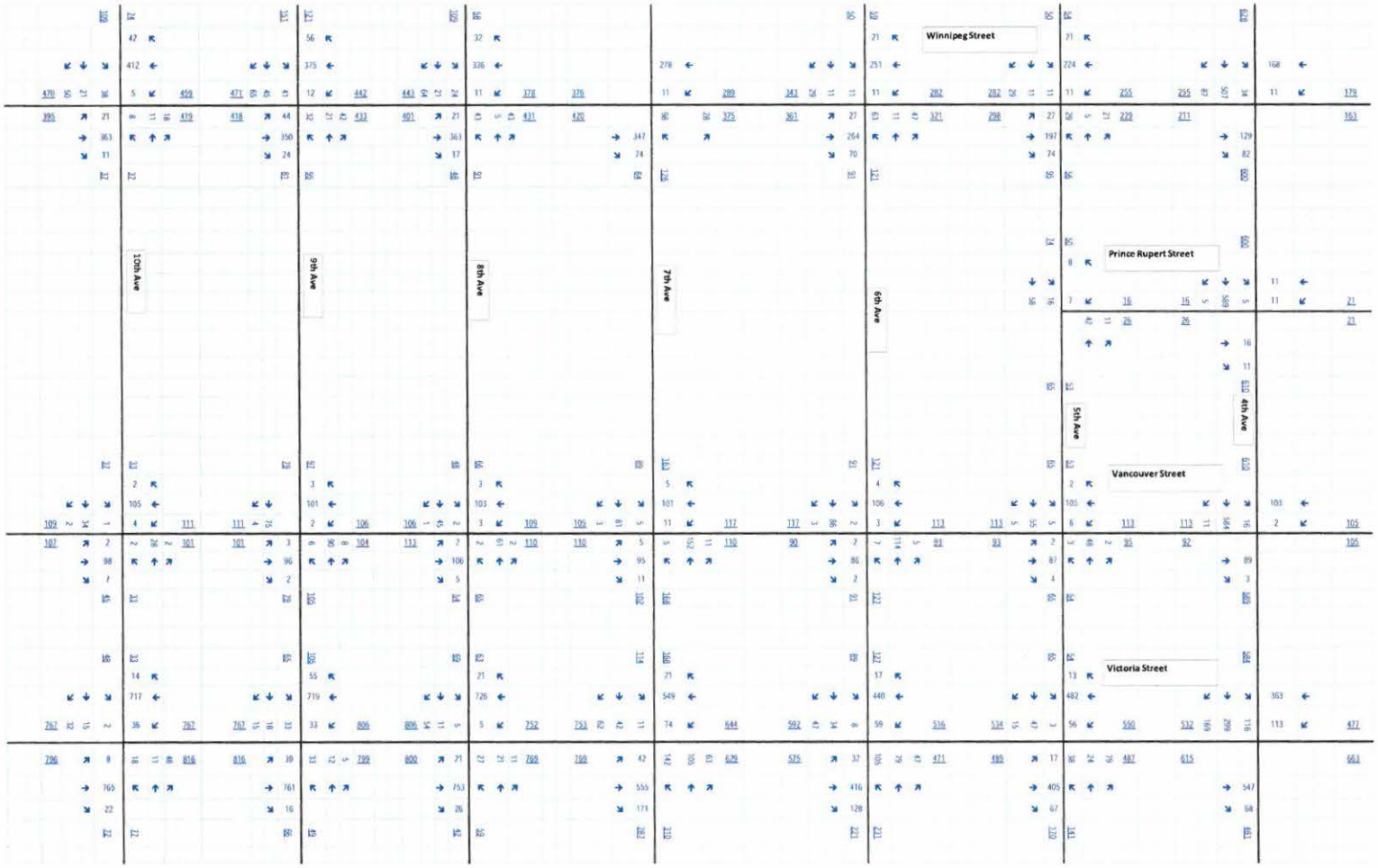

FIGURE 4.3 FUTURE BACKGROUND INTERIM (2020) TRAFFIC VOLUMES – PM PEAK

OPUS

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Existing Laning

Future background conditions using the same laning as is currently marked in the study area was assessed with the interim condition established for 2020. TABLE 4.8 displays the operations analysis outcomes.

TABLE 4.8 FUTURE BACKGROUND INTERIM CONDITIONS -2020 (EXISTING LANING)

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.45	B	0.32	A	Signal
9th Avenue and Winnipeg Street	0.30	A	0.28	A	Pedestrian Signal
4th Avenue and Victoria Street	0.46	A	0.46	A	Signal
6th Avenue and Victoria Street	0.43	A	0.43	A	Signal
7th Avenue and Victoria Street	0.47	A	0.47	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

All intersections in the study area continue to operate at acceptable levels of service.

Revised Laning

With the understanding that the *Smart Growth on the Ground* Plan and the *Downtown Transportation Plan* makes reference to the potential road dieting of study area roads such as 7th Avenue and Winnipeg Street, interim future background conditions were also tested with the revised laning. TABLE 4.9 displays the operations analysis outcomes.

TABLE 4.9 FUTURE BACKGROUND INTERIM CONDITIONS -2020 (REVISED LANING)

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.54	B	0.37	A	Signal
7TH Avenue and Winnipeg Street	NA	A	NA	A	Two-way STOP
9th Avenue and Winnipeg Street	0.38	B	0.41	B	Pedestrian Signal
4th Avenue and Victoria Street	0.46	A	0.46	A	Signal
6th Avenue and Victoria Street	0.43	A	0.43	A	Signal
7th Avenue and Victoria Street	0.53	A	0.49	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

Future Total Conditions - Interim Conditions (2020)

The future total traffic volumes under interim build-out conditions are shown in FIGURE 4.4 and FIGURE 4.5 for the morning and afternoon peak periods respectively.

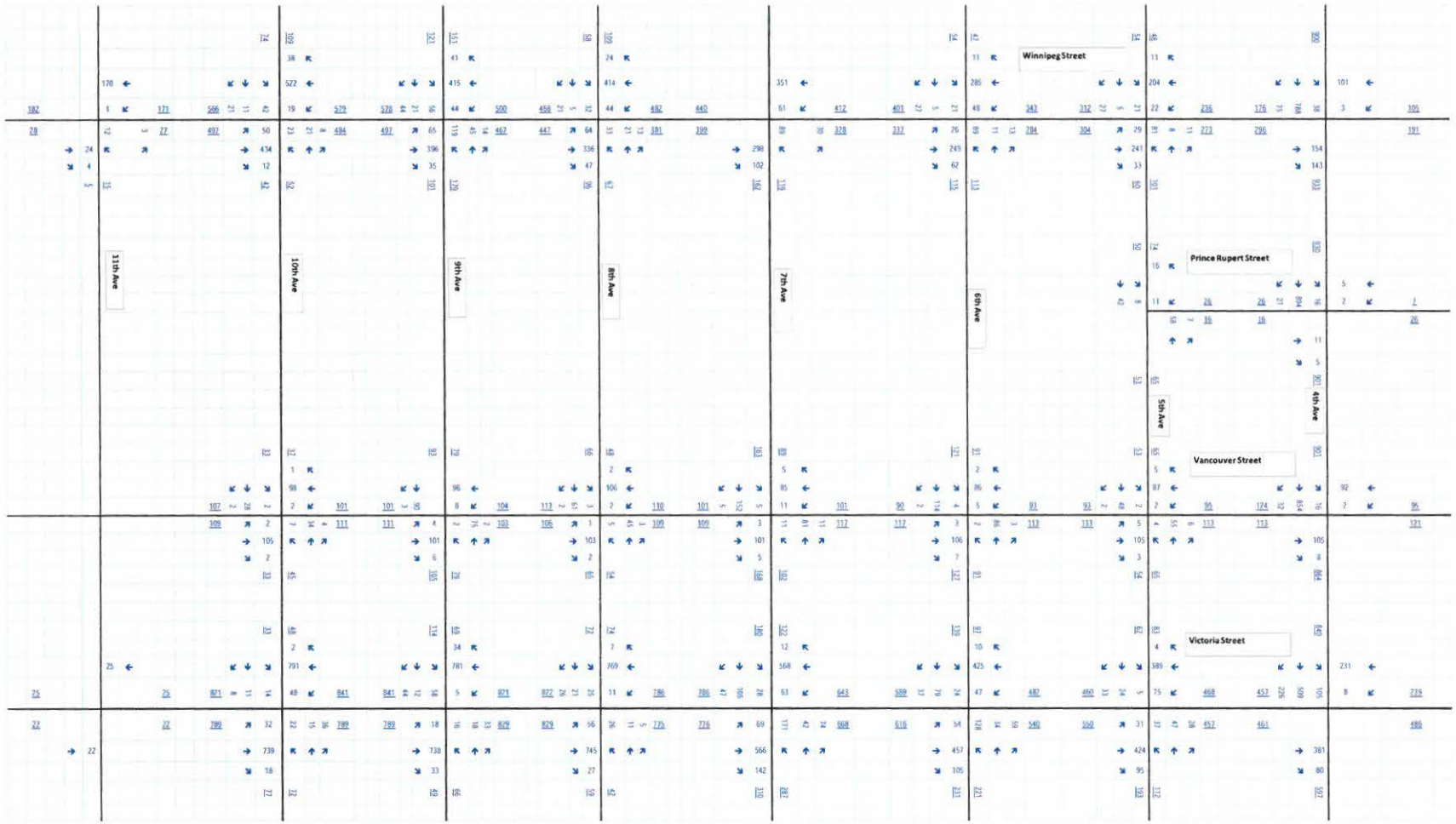

FIGURE 4.4 FUTURE TOTAL (2020) TRAFFIC VOLUMES – AM PEAK

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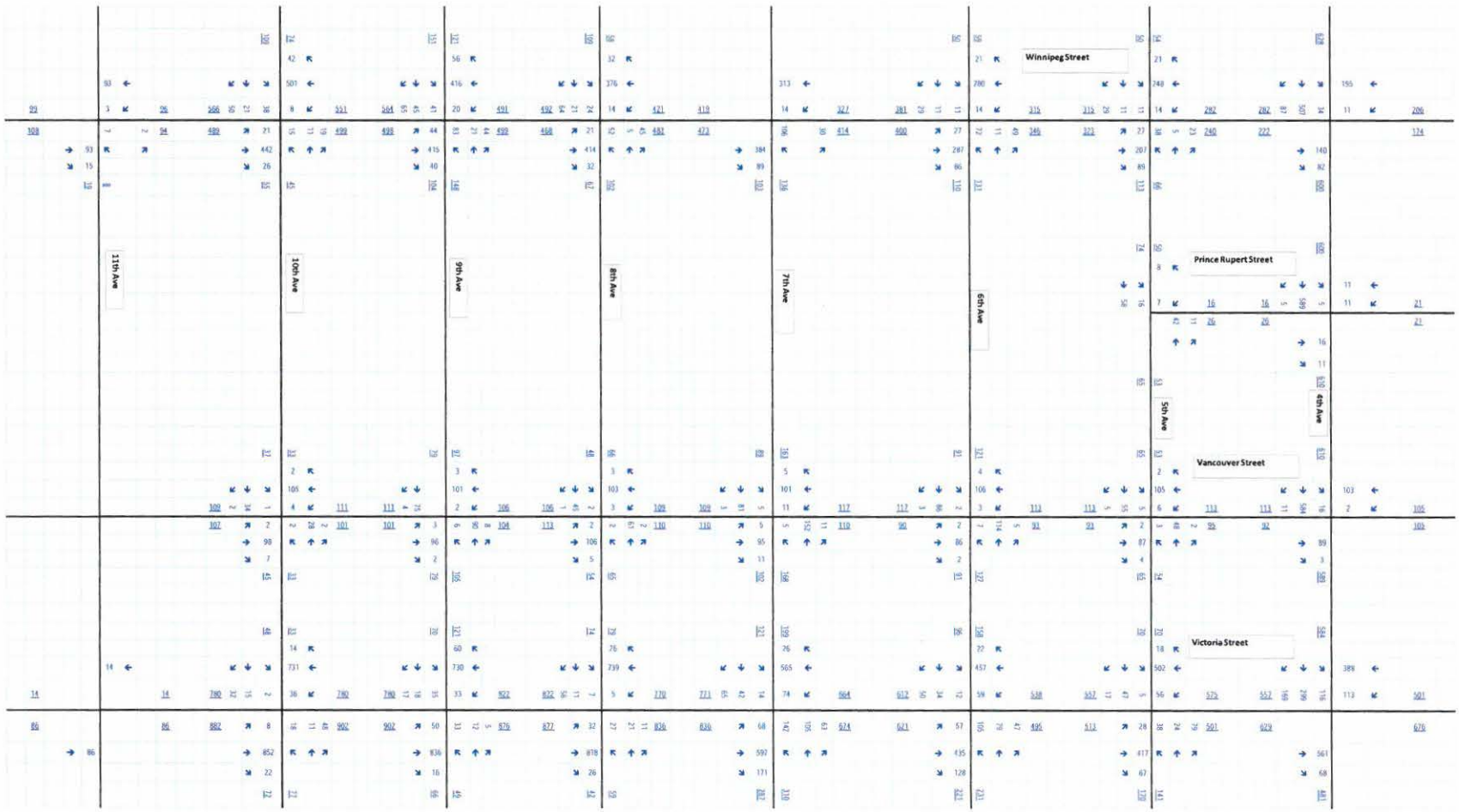

FIGURE 4.5 FUTURE TOTAL (2020) TRAFFIC VOLUMES –PM PEAK

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Existing Laning

Future total conditions using the same laning as is currently marked in the study area was assessed with the interim condition established for 2020. TABLE 4.10 displays the operations analysis outcomes.

TABLE 4.10 FUTURE TOTAL INTERIM CONDITIONS -2020 (EXISTING LANING)

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.46	B	0.33	A	Signal
9th Avenue and Winnipeg Street	0.39	A	0.33	A	Pedestrian Signal
4th Avenue and Victoria Street	0.47	A	0.47	A	Signal
6th Avenue and Victoria Street	0.44	A	0.46	A	Signal
7th Avenue and Victoria Street	0.49	A	0.52	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

All intersections in the study area continue to operate at acceptable levels of service.

Revised Laning

With the understanding that the *Smart Growth on the Ground* Plan and the *Downtown Transportation Plan* makes reference to the potential road dieting of study area roads such as 7th Avenue and Winnipeg Street, interim future total conditions were also tested with the revised laning. TABLE 4.11 displays the operations analysis outcomes.

TABLE 4.11 FUTURE TOTAL INTERIM CONDITIONS -2020 (REVISED LANING)

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.56	B	0.39	A	Signal
7TH Avenue and Winnipeg Street	NA	A	NA	A	Two-way STOP
9th Avenue and Winnipeg Street	0.50	B	0.46	B	Pedestrian Signal
4th Avenue and Victoria Street	0.47	A	0.47	A	Signal
6th Avenue and Victoria Street	0.44	A	0.46	A	Signal
7th Avenue and Victoria Street	0.55	A	0.54	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

All intersections in the study area continue to operate at acceptable levels of service.

4.6 Full Build-Out

Future Background Conditions – 2030

The future background 2030 traffic volumes are shown in FIGURE 4.6 and FIGURE 4.7 for the morning and afternoon peak periods respectively. The scope of the analysis is only restricted to intersections within the study area.

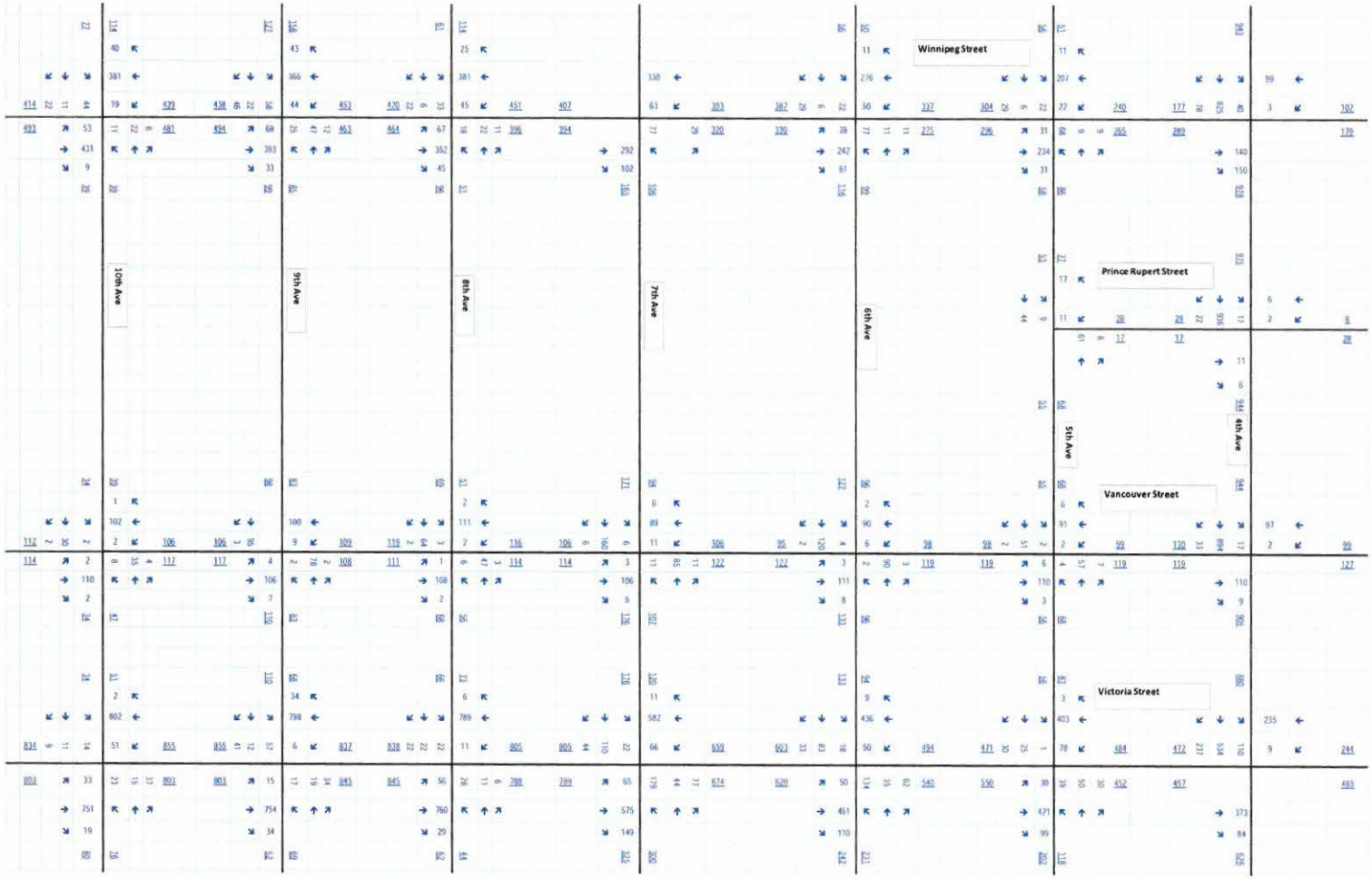

FIGURE 4.6 FUTURE BACKGROUND 2030 TRAFFIC VOLUMES – AM PEAK

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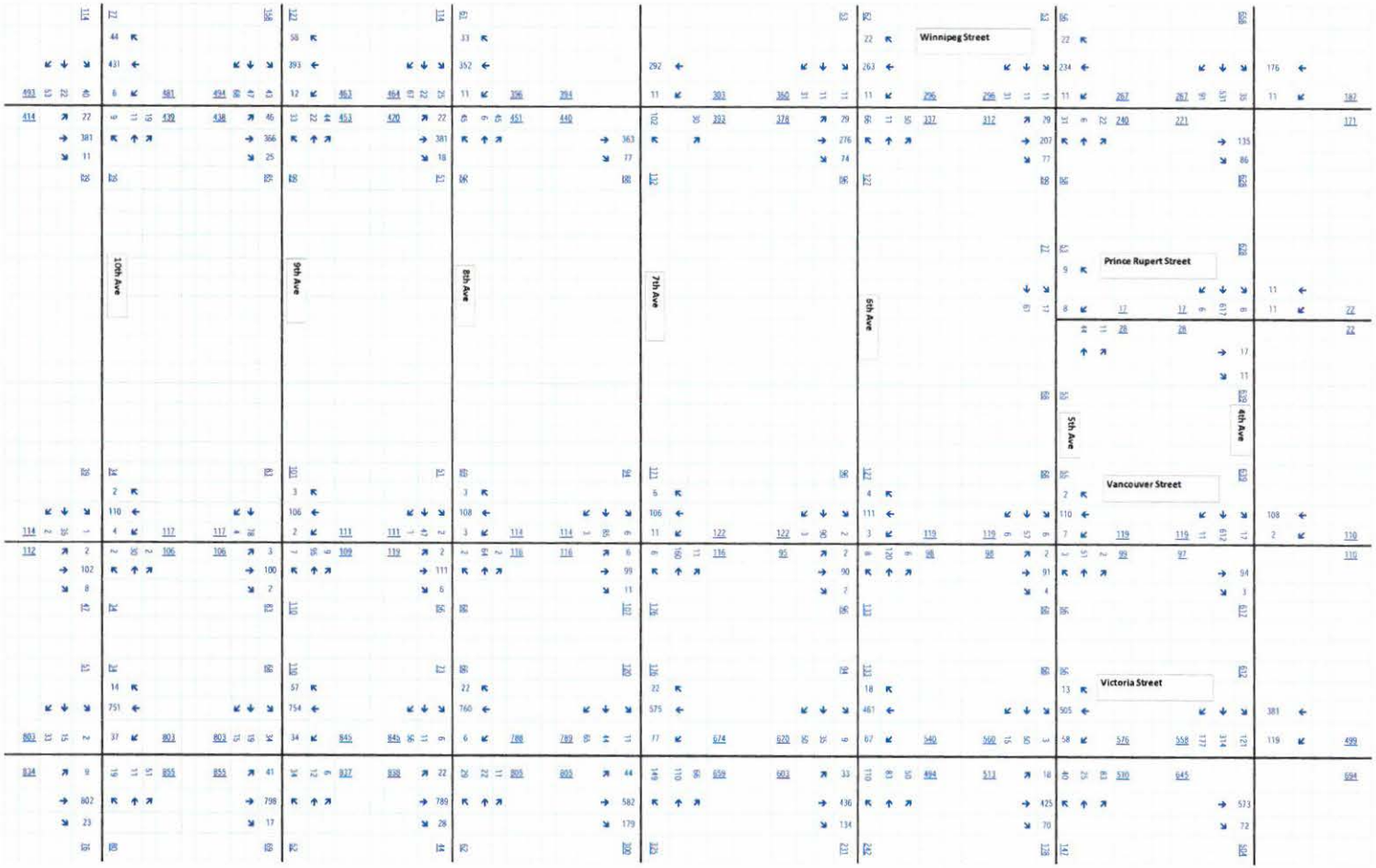

FIGURE 4.7 FUTURE BACKGROUND 2030 TRAFFIC VOLUMES – PM PEAK

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Existing Laning

Future background conditions using the same laning as is currently marked in the study area was assessed with the interim condition established for 2030. TABLE 4.12 displays the operations analysis outcomes.

TABLE 4.12 FUTURE BACKGROUND BUILD-OUT CONDITIONS - 2030 (EXISTING LANING)

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.47	B	0.33	A	Signal
9th Avenue and Winnipeg Street	0.31	A	0.29	A	Pedestrian Signal
4th Avenue and Victoria Street	0.49	B	0.49	A	Signal
6th Avenue and Victoria Street	0.45	A	0.46	A	Signal
7th Avenue and Victoria Street	0.50	A	0.49	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

All intersections in the study area continue to operate at acceptable levels of service even up to the year 2030.

Revised Laning

With the understanding that the *Smart Growth on the Ground* Plan and the *Downtown Transportation Plan* makes reference to the potential road dieting of study area roads such as 7th Avenue and Winnipeg Street, build-out future background conditions were also tested with the revised laning. TABLE 4.13 displays the operations analysis outcomes for 2030 with revised laning.

TABLE 4.13 FUTURE BACKGROUND BUILD-OUT CONDITIONS -2030 (REVISED LANING)

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.57	B	0.39	A	Signal
7TH Avenue and Winnipeg Street	NA	A	NA	A	Two-way STOP
9th Avenue and Winnipeg Street	0.38	B	0.43	B	Pedestrian Signal
4th Avenue and Victoria Street	0.49	B	0.49	A	Signal
6th Avenue and Victoria Street	0.45	A	0.46	A	Signal
7th Avenue and Victoria Street	0.56	A	0.51	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

All intersections in the study area continue to operate at acceptable levels of service even up to the year 2030.

Future Total Conditions – OCP Condition

The future total traffic volumes under full build-out OCP conditions are shown in FIGURE 4.8 and FIGURE 4.9 for the morning and afternoon peak periods respectively.

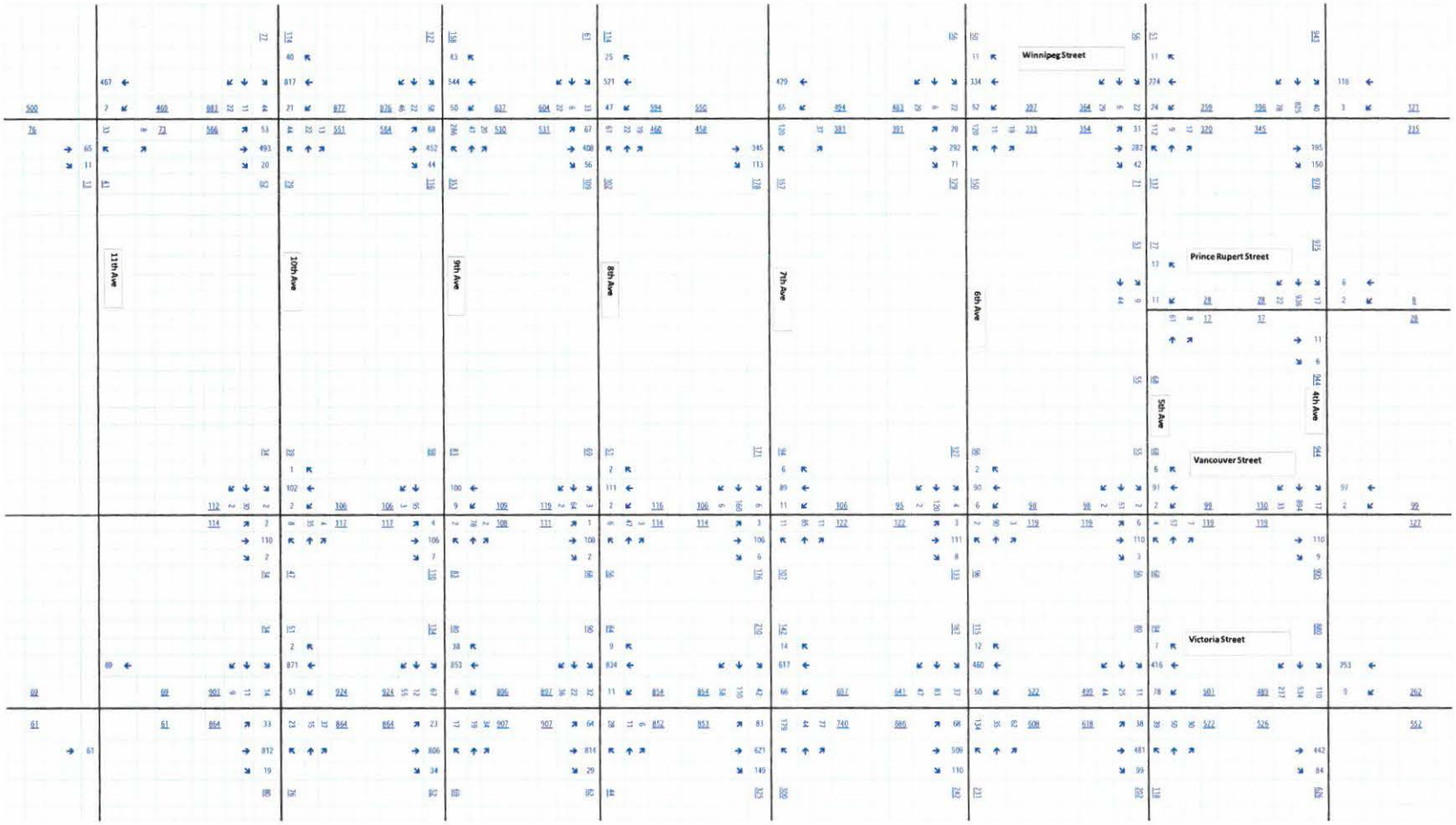

FIGURE 4.8 FUTURE TOTAL 2030 TRAFFIC VOLUMES (OCP CONDITIONS) – AM PEAK

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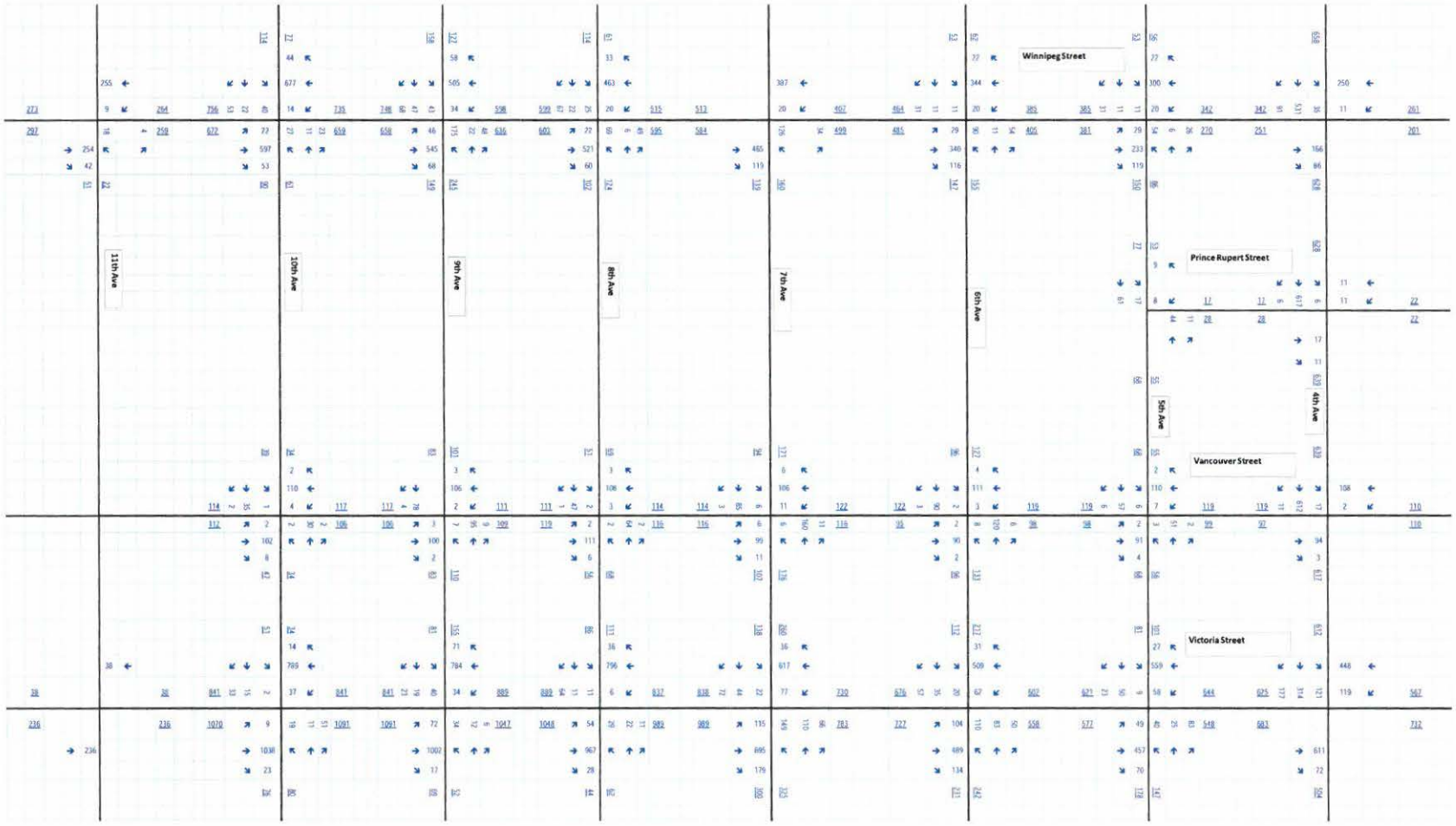

FIGURE 4.9 FUTURE TOTAL 2030 TRAFFIC VOLUMES (OCP CONDITIONS) – PM PEAK

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Existing Laning

Future total conditions using the same laning as is currently marked in the study area was assessed with the build-out condition established for 2030 for the current OCP. TABLE 4.14 displays the operations analysis outcomes.

TABLE 4.14 FUTURE TOTAL BUILD-OUT CONDITIONS -2030 (EXISTING LANING) - OCP

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.49	B	0.36	A	Signal
9th Avenue and Winnipeg Street	0.65	B	0.51	B	Pedestrian Signal
4th Avenue and Victoria Street	0.52	B	0.52	A	Signal
6th Avenue and Victoria Street	0.50	A	0.55	A	Signal
7th Avenue and Victoria Street	0.55	A	0.64	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection.

All intersections in the study area continue to operate at acceptable levels of service.

Revised Laning

With the understanding that the *Smart Growth on the Ground* Plan and the *Downtown Transportation Plan* makes reference to the potential road dieting of study area roads such as 7th Avenue and Winnipeg Street, build-out future total conditions were also tested with the revised laning. TABLE 4.15 displays the operations analysis outcomes.

TABLE 4.15 FUTURE TOTAL BUILD-OUT CONDITIONS -2030 (REVISED LANING) - OCP

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.61	B	0.44	A	Signal
7TH Avenue and Winnipeg Street	NA	A	NA	A	Two-way STOP
9th Avenue and Winnipeg Street	0.73	B	0.66	B	Pedestrian Signal
4th Avenue and Victoria Street	0.52	B	0.52	A	Signal
6th Avenue and Victoria Street	0.50	A	0.55	A	Signal
7th Avenue and Victoria Street	0.61	A	0.66	A	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection

All intersections in the study area continue to operate at acceptable levels of service even up to the year 2030. The delays at 9th Avenue and Winnipeg increase from base conditions, although still under capacity.

Future Total Conditions – RWICD

The future total traffic volumes under full build-out RWICD conditions are shown in FIGURE 4.10 and FIGURE 4.11 for the morning and afternoon peak periods respectively

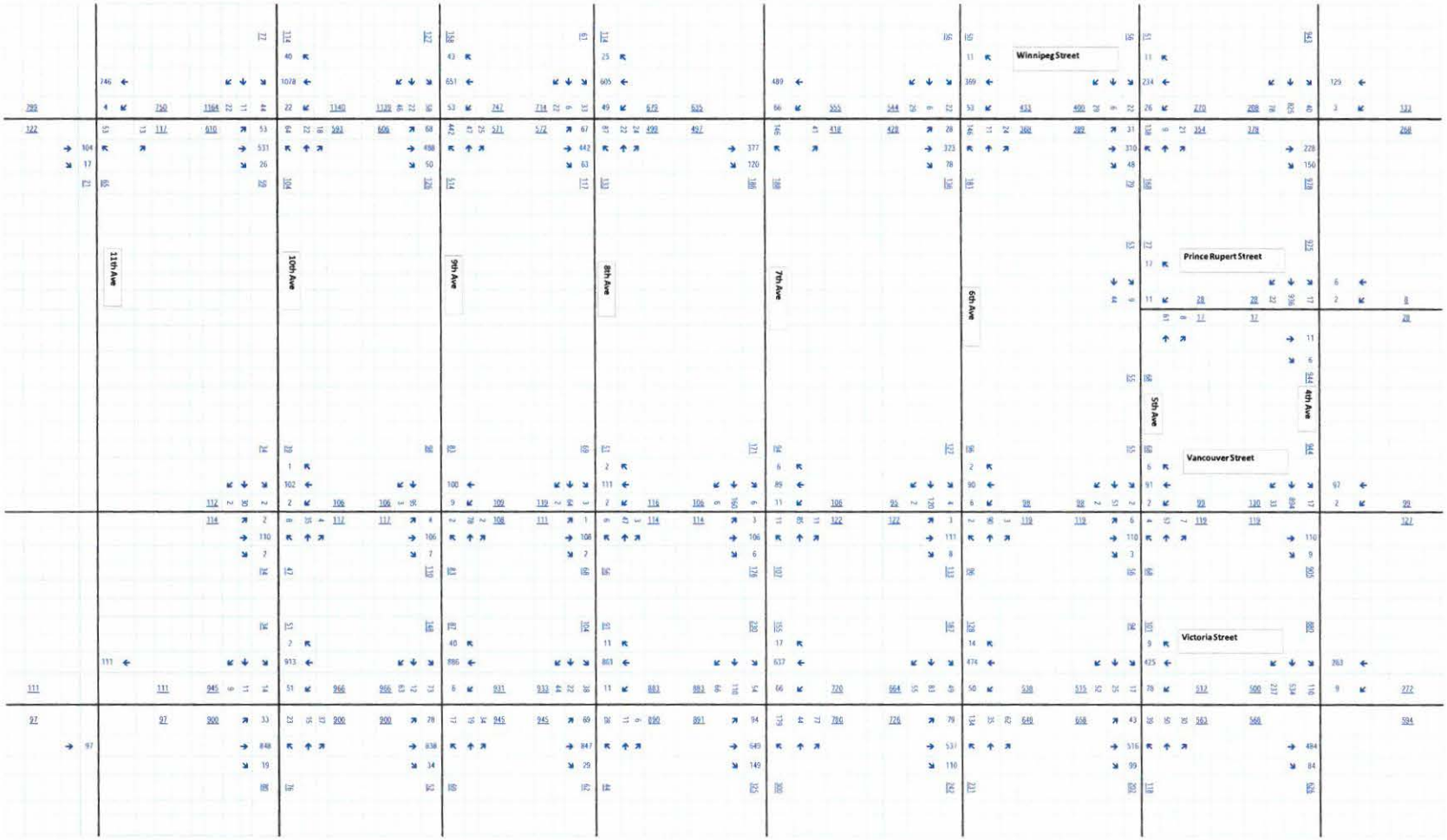

FIGURE 4.10 FUTURE TOTAL 2030 TRAFFIC VOLUMES (RWICD CONDITIONS) – AM PEAK

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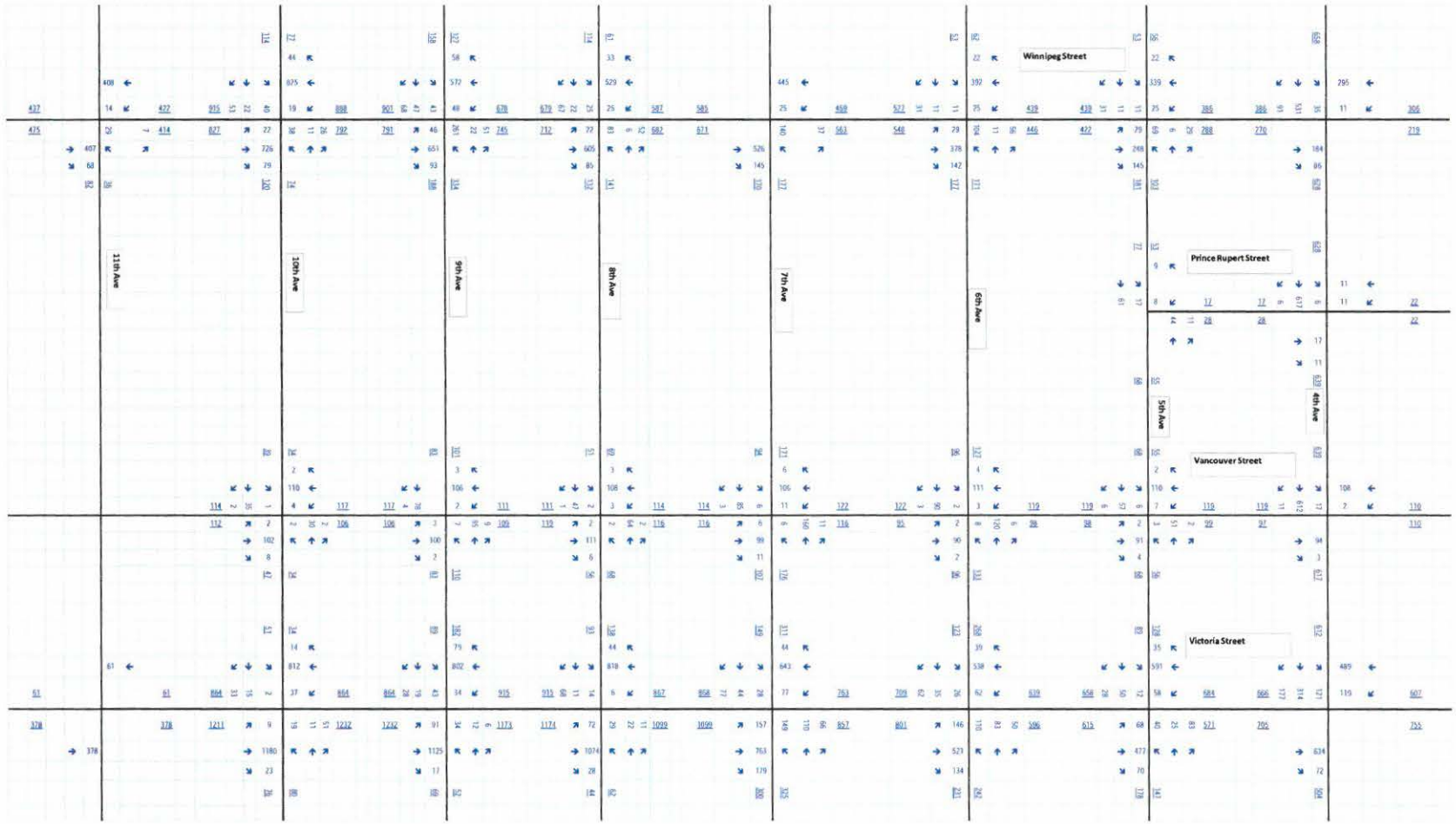

FIGURE 4.11 FUTURE TOTAL 2030 TRAFFIC VOLUMES (RWICD CONDITIONS) – PM PEAK

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Existing Laning

Future total conditions using the same laning as is currently marked in the study area was assessed with the build-out condition established for 2030. TABLE 4.16 displays the operations analysis outcomes.

TABLE 4.16 FUTURE TOTAL BUILD-OUT CONDITIONS -2030 (EXISTING LANING) - RWICD

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.51	B	0.38	A	Signal
9th Avenue and Winnipeg Street	0.81	C	0.67	B	Pedestrian Signal
4th Avenue and Victoria Street	0.54	B	0.54	A	Signal
6th Avenue and Victoria Street	0.53	A	0.62	A	Signal
7th Avenue and Victoria Street	0.58	A	0.75	B	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection

All intersections in the study area continue to operate at acceptable levels of service.

Revised Laning

With the understanding that the *Smart Growth on the Ground* Plan and the *Downtown Transportation Plan* makes reference to the potential road dieting of study area roads such as 7th Avenue and Winnipeg Street, build-out future total conditions for RWICD were also tested with the revised laning. TABLE 4.17 displays the operations analysis outcomes.

TABLE 4.17 FUTURE TOTAL BUILD-OUT CONDITIONS -2030 (REVISED LANING) - RWICD

INTERSECTION	AM PEAK		PM PEAK		COMMENT
	V/C	LOS	V/C	LOS	
4th Avenue and Winnipeg Street	0.64	B	0.45	A	Signal
7TH Avenue and Winnipeg Street	NA	A	NA	A	Two-way STOP
9th Avenue and Winnipeg Street	0.97	C	0.84	B	Pedestrian Signal
4th Avenue and Victoria Street	0.54	B	0.54	A	Signal
6th Avenue and Victoria Street	0.53	A	0.62	A	Signal
7th Avenue and Victoria Street	0.64	A	0.76	B	Signal
7th Avenue and Vancouver Street	NA	A	NA	A	All-way STOP

*The v/c and LOS results presented in the table represent the overall intersection LOS and v/c. It should be noted that some individual movements may experience higher or lower LOS and v/c results at the intersection

All intersections in the study area continue to operate at acceptable levels of service even up to the year 2030. The delays at 9th Avenue and Winnipeg increase from base conditions and the OCP condition, although still under theoretical capacity. Typically when traffic is forecasted to long time horizons, the results should be considered a conservative case if all assumptions made actually fall into place.

Discussion on Impacts to Intersections Within the Study Area

Generally, while the volume-to-capacity ratios are generally under 1.0, the high-level analysis has identified that close attention should be paid to the intersections along Winnipeg Street should development occur, especially with a road diet implemented to Winnipeg Street. The EMME model has assigned a high proportion of traffic to Winnipeg Street based on the fact that it is a parallel route to Victoria Street and may be marginally faster due to the lack of signalization. Also, due to the fact that traffic was equally assigned to the other east-west streets, it meant that traffic was handled equally. Should higher demands be placed on one street over the other, capacity issues may arise at build-out and thus should be considered again once more comprehensive plans for the study area are developed.

While the operational analysis indicates that the road network, as it will be without major geometric changes, can sufficiently accommodate the level of development proposed to the build-out horizon for both the OCP and RWICD conditions, several intersections have been identified for potential improvements considering that Winnipeg Street and 7th Avenue can undergo road diets. These include:

- 9th Avenue and Winnipeg Street – the left turn movement from 9th Avenue to Winnipeg experiences long delays. The pedestrian signal at this location could be upgraded to a full signal or a turn lane could be provided by removing some parking.

- For Victoria Street – demand for the northbound and southbound left turns from Victoria Street will likely be high enough to consider improvements upon the build-out horizon. Potential requirements for turn lanes were previously identified in the *Downtown Transportation and Parking Study*, which analyzed Victoria Street conditions using a medium to conservative (1.5 – 3.0 percent) growth rate. While the current study assumes 0.5 percent per annum growth on Victoria Street, which is in line with the historic growth patterns of Downtown, RWICD traffic accounts for addition traffic on Victoria Street to bring the analysis volumes for future build-out to be more in line with the rates assumed for the *Downtown Transportation and Parking Study*. Having said that, the modifications would not be triggered for a 25-year period, which would almost coincide with the build-out of the OCP or RWICD conditions.

- For 7th Avenue, dedicated left turn lanes to Winnipeg Street and Vancouver Street can be considered upon the implementation of the suggested road diet.

It should be noted that these are suggested improvements for roads within the study area, and the actual improvements cannot be determined until more detailed plans are available (i.e. to determine traffic loads on a block by block basis, more detailed information on how residential units will be allocated is necessary as opposed to the current study that considers all development distributed equally in the study area). Generally, due to the fact that the road network within the study area is a traditional grid, there are numerous options for travellers, which causes the traffic impacts to be distributed equally amongst the network with no one intersection taking a major load. In addition, the distribution of trips is primarily westbound, with a large portion of trips destined to the Downtown more likely walk-based trips.

Impacts to Intersections Outside the Study Area

The following intersections will likely experience the most traffic impact outside the immediate study area and were identified by the City of Prince George's EMME/2 macroscopic transportation modeling software:

- Yellowhead Highway (Victoria Street)/17th Avenue – southbound left turn in the AM peak;
- Carney Street/10th Avenue – may warrant a traffic signal with additional traffic;
- Massey Street / Carney Street – southbound left turn in the AM peak;
- Carney Street / 15th Avenue – southbound left turn in the AM peak;
- Edmonton Street between 13th Avenue and 15th Avenue - this is generally a collector route with the major desire line being travel between 13th Avenue and 15th Avenue via Edmonton Street – traffic calming may be required to reduce attractiveness of the route for cut through traffic or for speed reductions;
- Winnipeg Street / 13th Avenue – the approach to the signalized intersection may need widening; and,
- Winnipeg Street / 15th Avenue Ramps – additional traffic due to the desire to travel east at 15th Avenue.

These intersections should be examined in greater detail for intersection-specific improvements when it comes time to develop the study area.

5 PROPOSED ROUTE CONCEPTS

The *Smart Growth on the Ground Plan* identifies that there are several streets in the study area that will be subject to cross-sectional improvements, once the area is built-out. The operational analysis in the preceding section verified that these cross-sections could accommodate future traffic. Additionally, the right-of-way widths for the roads in the downtown area should be checked, as it is anticipated that the roads constructed at that time may not meet current Bylaw requirements. In consideration of some of the future traffic volumes resulting from the analysis from the previous section, Opus agrees that the following concepts presented herein would be acceptable for both the OCP and RWICD conditions. These concepts include:

- 9th Avenue, 6th Avenue, and Vancouver Street as Commuter Cycling Streets;
- Winnipeg Street as a major arterial with Cycling Lanes; and,
- 7th Avenue as the Ceremonial Boulevard leading into the Crescents Neighbourhood.

5.1 Victoria Street

Victoria Street is generally two multi-purpose travel lanes in each direction with parking. Since it is under the jurisdiction of the Ministry of Transportation and Infrastructure, specific recommendations for a cross-section is not made for the future with the understanding that the changes would need to be approved by the Ministry. Based on the current function, volume, and future volume expected on Victoria Street, no changes are necessary from how the street is currently laid out.

5.2 Winnipeg Street

While Winnipeg Street is presented as a major arterial with cycling lanes, given current and future volumes and a discussion with City Staff, it may make more sense to implement a road diet for Winnipeg Street. Winnipeg Street would be designated as a two-lane arterial with bike lanes. A two-way left turn lane could be used to remove turning conflicts from the through lanes. There is insufficient room on Winnipeg Street to accommodate on-street parking, although occasional transit stops could share the bicycle lanes. There may be an opportunity to implement two 3-metre boulevards (including sidewalks), with two 1.8 metre bike lanes, two 3.6 metre traffic lanes, and a 3.2 metre centre two-way-left turn lane (TWLTL).

5.3 7th Avenue

7th Avenue is designated as a Ceremonial Boulevard. Opus agrees that once the RWICD is constructed, 7th Avenue can operate with one travel lane in each direction with on-street parking on each side, with dedicated left turn lanes at major intersections. FIGURE 5.1 illustrates this concept.

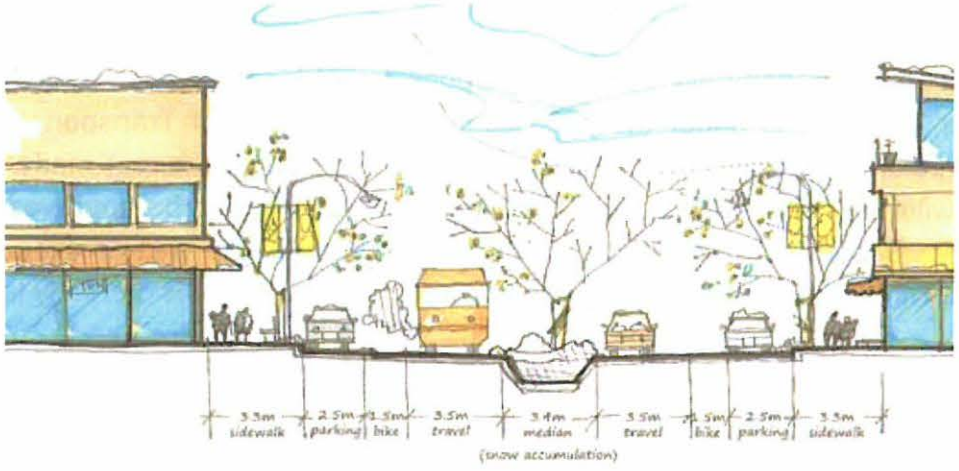


FIGURE 5.1 7TH AVENUE CEREMONIAL BOULEVARD CONCEPT

5.4 9th Avenue, Vancouver Street

9th Avenue, 6th Avenue, and Vancouver Street are designated as a Commuter Cycling Collectors. One general purpose lane would be provided in each direction with a bicycle lanes in each direction (potentially one dedicated and one as a marked wide curb lane) with parking on one side of the road. This concept is illustrated in FIGURE 5.2 below.

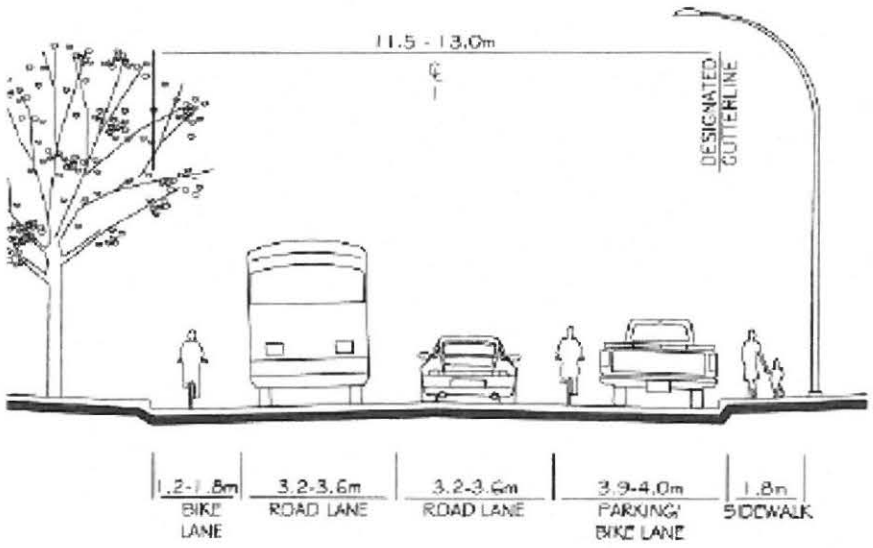


FIGURE 5.2 9TH AVENUE AND VANCOUVER STREET CONCEPT

5.5 6th Avenue

6th Avenue is designated as a Commuter Cycling Local Road. Two travel lanes with one separated bike lane can be provided. One of the lanes can be time restricted to provide parking at off-peak times or to provide an additional travel lane during peak times. Once it becomes clearer whether additional on-street parking is required, a decision can be made whether to include or exclude parking from this concept. This concept is illustrated in FIGURE 5.3 below.

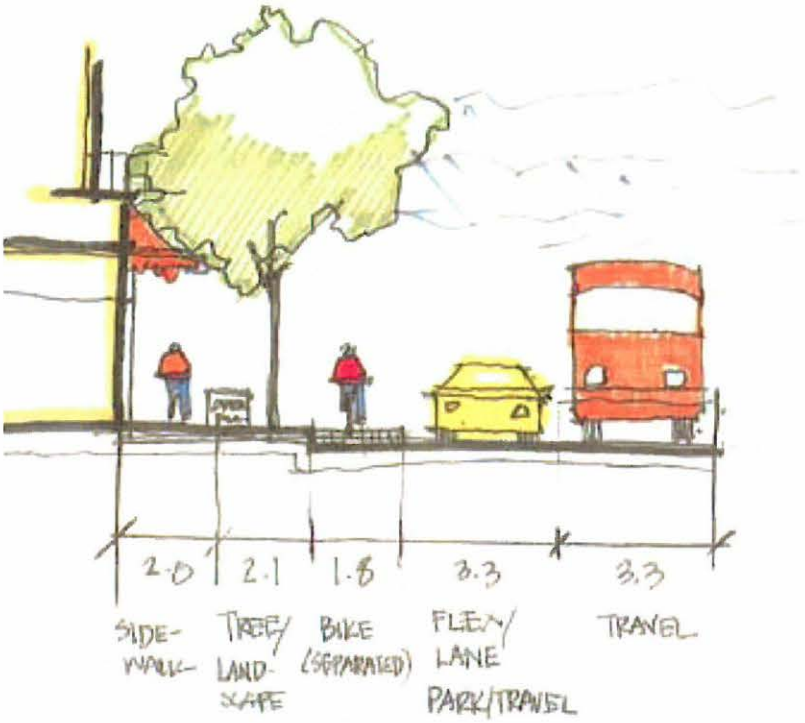


FIGURE 5.3 POTENTIAL BOULEVARD TRAIL

5.6 5th Avenue, 8th Avenue, 10th Avenue, 11th Avenue

5th Avenue, 8th Avenue, 10th Avenue, and 11th Avenue are all currently designated as local roads and can continue to be designated as such. Thus, there is no need to change the way local roads are currently constructed as per existing specifications of the *Subdivision and Development Servicing Bylaw No. 7652, 2004.*

6 PARKING

6.1 Proposed Site Use – Parking Requirements

According to the development details given in the Urban Design Study, the following parameters will be the likely scenario for RWICD:

- Interim Build-Out of 700 units by 2020; and
- Full Build-Out of 3,200 units by 2030 based on the RWICD initiatives, or 2,000 units by 2030 based on existing policy.

To understand the implications for parking, a parking requirements assessment was conducted based on the current Prince George Zoning Bylaw. The parking requirements pertaining to the horizon year analyzed is summarized in TABLE 5.1.

TABLE 6.1 PARKING REQUIREMENTS

SCENARIO	Unit Count	Bylaw Rate	Parking Requirement (spaces)
Existing Policy/RWICD - Interim	700	1 per bachelor and 1 bed, 1.5 per 2 bed, and 1.75 per 3-bed + 1 per 7 units for visitor (0.14)	1,050 stalls + 105 visitors
Build-Out – OCP Policy	2,000		3,000 stalls + 300 visitors
Build-Out - RWICD	3,200		4,800 stalls + 480 visitors

- Considers all units will be 2-bedroom units – typically a given residential apartment building will be predominantly 2-bedroom, with the number of bachelor/1-bedroom suites and 3-bedroom + suites almost effectively cancelling each other out.

Required parking for a 5-6 storey residential building based on current City standards is roughly 90 – 100 stalls for a 6 storey building, and roughly 70 - 80 units for a 5 storey building. Underground structured parking is desirable from an urban design point of view. However, it can be prohibitively expensive, undermining the financial viability of development.

As such, a range of surface parking options were explored by HB Lanarc, the planning consultant, to maximize the potential to introduce 5 and 6 storey wood-frame buildings from a market and financial perspective. These options included accommodating parking requirements through surface parking partially tucked under the building, and by accommodating some parking (such as visitor parking) on-street through both back-in angled parking and parallel parking. However, to accommodate the City's current parking requirements, additional surface parking would be required in addition to the tuck-under and on-street parking, which would accommodate roughly half of required parking. This could be partially addressed through reductions to existing parking requirements, which, in tandem with a range of surface parking approaches, could accommodate parking for 5 and 6 storey apartments without the need for underground structured parking.

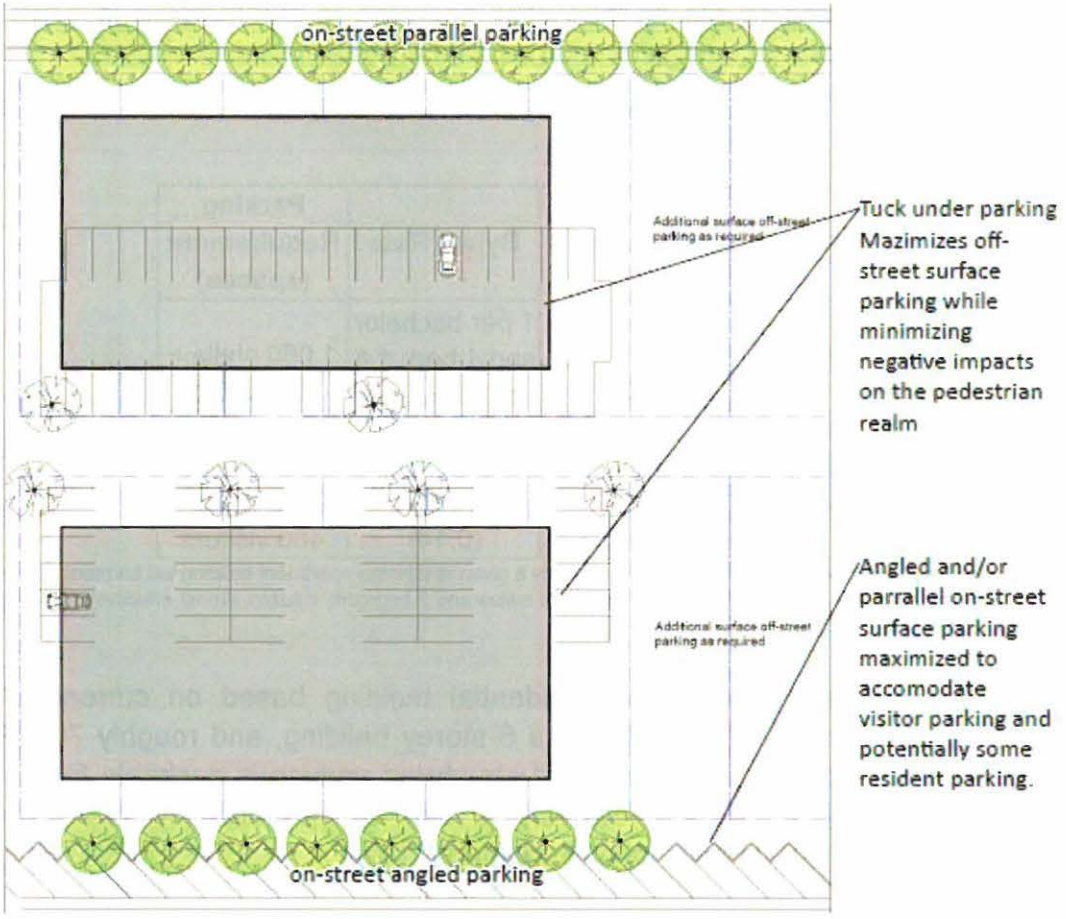


FIGURE 6.1 POTENTIAL PARKING OPTIONS

Unless there is a significant mode shift which allows for the provision of parking at half the rate required as per the current Bylaw, the business case for RWICD may need to be revisited since sufficient parking may be difficult to be fully available.

6.2 Parking Analysis

The parking analysis utilized a projected modal split target of a 15 percent shift from vehicle mode. Assuming that the Bylaw rates reflect the actual parking demand (i.e. minimum Bylaw rate is the minimum parking demand) and the understanding that the visitor Bylaw parking requirements are to be met on-street, the road network on-street parking can likely accommodate the visitor demand and any residual residential parking demand, allowing a reduction on the minimum Bylaw requirements to be achieved under the OCP condition. While a 15 percent reduction should be targeted, demand should be monitored to gauge whether this can be achieved. It should be noted, however, that while a 15 percent modal split shift should be targeted, ultimately parking demand is a function of vehicle ownership. While the resident may be using transit or walking to work, as long as a vehicle is owned, there will be a contribution towards parking demand. Thus, it is pertinent that demands are continually monitored during the process in which vehicle ownership reduction in the area should be observed for any correlation to mode shift.

Assuming that a 15 percent reduction in parking from the Bylaw requirements can be achieved on the basis that vehicle ownership decreases by the corresponding amount due to TDM measures resulting from the 15 percent mode shift target, at least 85 percent of the parking can be supplied on-site (i.e. supplied by the building that requires the parking) and 15 percent of the parking would be required to be supplied as a pool of parking on-street as the worst case scenario. Typically, municipalities tend not to allow on-street parking to be considered towards the total supply of parking pertaining to the subject building, as on-street parking is typically used for visitors. In this case, should the visitor parking requirements be waived if on-street parking can be considered for this purpose, the RWICD would still be required to provide additional off-site parking for residential uses, if individual buildings do not intend to provide the minimum Bylaw requirement. TABLE 6.2 summarizes the requirement.

TABLE 6.2 PARKING ANALYSIS

SCENARIO	Unit Count	Parking Requirement (spaces)	Parking Provided On-Site (85%)	Parking Required (Off site)
Build-Out Policy	2,000	3,000 stalls + 300 visitors	2,550	750
Build-Out RWICD	3,200	4,800 stalls + 480 visitors	4,080	1,200

As TABLE 6.2 suggests, 750 additional parking stalls would be required to accommodate the OCP build-out scenario and 1,200 additional parking stalls would be required to accommodate the RWICD build-out. Further analysis is completed in anticipation of the potential on-street parking available. Parking available includes:

- 7th Avenue (both sides)
- 9th Avenue, Vancouver Street (one side)
- 6th Avenue (one side)
- 5th Avenue, 8th Avenue, 10th Avenue, and 11th Avenue (both sides)
- Prince Rupert Street (both sides)

Based on these parameters, it was determined that the total supply of parking available is approximately 835 stalls, assuming a standard vehicle length of 6.5 metres. Victoria Street was not considered towards the parking supply as parking along Victoria Street is generally short-term and for the purpose of the commercial/retail developments along that corridor. FIGURE 5.2 and TABLE 5.3 illustrates this.

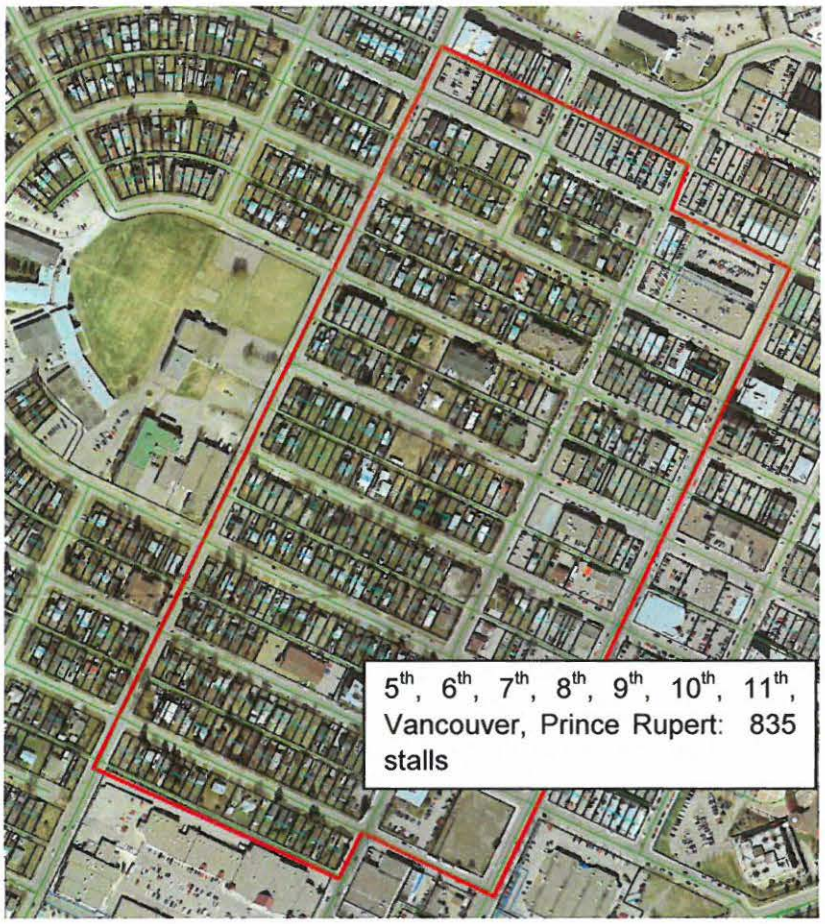


FIGURE 6.2 POTENTIAL ON-STREET PARKING

TABLE 6.3 POTENTIAL ON-STREET SUPPLY

STREET	PARKING PROVIDED	Segment Length (m)	Approximate Parking Supply	Parking Required (Off site)
Vancouver St	One side	500	75	450 residential + 300 visitors for OCP = 750 stalls
Prince Rupert St.	Both sides	150	45	
5th Avenue	Both sides	350	110	
6th Avenue	Both sides	350	110	
7th Avenue	Both sides	350	110	
8th Avenue	Both sides	350	110	720 + 480 visitors for RWICD = 1,200 stalls
9th Avenue	One side	350	55	
10th Avenue	Both sides	350	110	
11th Avenue	Both sides	350	110	
TOTAL			**835**	

As the analysis suggests, with a 15 percent reduction of parking to be provided on-site, the OCP condition is barely met for build-out. A demand of 750 stalls would result if the Bylaw rates are a true indication of actual demand for apartment buildings in the study area. Furthermore, depending on the background parking utilization for the study area streets, the residual capacity between the 835 on-street stalls potentially available and the demand of 750 stalls may be less.

However, this analysis indicates that the RWICD build-out demand would not be accommodated should the Bylaw rates be the actual demand for RWICD units. A shortfall of up to 370 stalls would result, if 85 percent of the Bylaw requirements were provided on site. This indicates that upwards of 90 percent of the required parking would have to be provided on-site, assuming that all of the visitor parking would be absorbed by the on-street parking.

Having said that, knowing that the RWICD buildings would be required to provide upwards of 90 percent of the requirement even with some TDM may indicate that potentially expensive underground parking solutions may be necessary. The large shortfall in parking based on current on-street allowances may mean that even if drastic angled-parking solutions are examined in the hopes of increasing supply may not result in the RWICD buildings reducing on-site requirements significantly. Noting that this type of parking is expensive, a true market study and business case should be considered before adopting the RWICD as a policy direction.

6.3 Parking Policy Recommendations

Due to the fact that a significant amount of off-street residential parking would still be required for the RWICD scenario, creating surface parking lots adjacent to the buildings is a likely scenario. However, this may be an issue from an urban form/design perspective, as the relatively short blocks between north-south streets would not allow for a more continuous block of residential developments.

In light of this, access and servicing should be provided via a laneway to eliminate the need to have driveways directly accessing a City street. Should surface parking be considered, consolidating parking for several buildings at a time should be pursued. Furthermore, angled parking is not recommended as the number of stalls achieved through angled parking will not be significantly greater than the number of parallel parking spaces given the short blocks between north-south streets. Furthermore, angled parking would take up more City right-of-way.

7 TRANSPORTATION DEMAND MANAGEMENT

7.1 Definition

As part of developing a comprehensive transportation strategy for the Residential Wood Frame Innovation Comprehensive District, it is pertinent that Transportation Demand Management is implemented in the primarily residential neighbourhood should it be constructed. The District should intend to provide features to facilitate the use of alternative modes and a decreased dependency on the automobile and reduce trip production noting the constraints in being able to supply parking and potentially costly alternative of requiring infrastructure improvements within the study area (turn lanes, traffic signals) or for the downstream transportation network.

Transportation Demand Management (TDM) is a general term for strategies that would result in more efficient use of transportation resources. These strategies focus on reducing the need or scope for new transportation infrastructure by managing demands through improved efficiency. This section provides information on TDM strategies that are most appropriate to the RWICD context.

TDM can help achieve the goals it has stated in its Official Community Plan (OCP) and Transportation Plan, as well as other planning documents. The following transportation principles are listed in the Prince George OCP:

- Develop and maintain a suitable transportation network that reflects the various functions intended for major roads, including truck movement.
- Ensure provision of a range of transportation options including vehicles, transit, and bicycles, offering both mobility and access.
- Cooperate with transportation agencies and private companies to meet the needs of residents and businesses.
- Encourage reduction of reliance on the private automobile through comprehensive Transportation Demand Management.

7.2 Objectives

The following are objectives for the implementation of TDM measures that can be kick-started with development:

- To reduce single occupancy vehicles trips by 15 percent.
- To increase walk and bicycle trips from 5 to 10 percent of mode share.
- To increase transit ridership from 10 to 15 percent of mode share

7.3 Implementation Strategy

Strategies to decrease external trips and to meet the goals stated in the OCP are suggested for the following:

Transit
Goal: Increase transit ridership and options

- Frequent bus service from past RWICD for downtown Prince George routes
- Shuttle/transit bus between RWICD and major employment sites
- Rideshare.

Pedestrians and Bicycles
Goal: Increase walking and bicycle trips.

- Implement the bicycle laning concepts for RWICD as presented in Section 6.
- Bicycle racks and storage facilities are required for all residential developments in RWICD.
- End of trip facilities such as bike showers and change rooms should be required for all commercial developments in RWICD (if pursued).
- A car co-op or charge up ports for electric vehicles would be recommended for the residential developments in the study area.

Amenities/Land Use
Goal: To reduce the need to shop off or travel.

- Encourage the growth of local business and employment opportunities on the in the Downtown and in RWICD.
- Home-based businesses.
- The Downtown will provide some employment uses and options for places to shop at.

TABLE 7.1 summarizes the proposed TDM measures, their priority, and indicates whether the measure is specific to the RWICD and the adjacent Downtown.

TABLE 7.1 PRIORITIZATION OF TDM MEASURES

	LONG TERM	SHORT TERM
TRANSIT		
Express Bus or Shuttle to/from downtown	•	
Express Bus or Shuttle to/from major employment	•	
Rideshare		•
PEDESTRIANS AND BICYCLES		
Provide bicycle lanes in RWICD		•
Bicycle racks and storage facilities at residences		•
End of trip facilities		•
AMENITIES AND LAND USE		
Encourage the growth of local business and employment opportunities in RWICD/Downtown		•
Home-based businesses		•
The Downtown will provide some employment uses and options for places to shop at		•

8 CONCLUSIONS AND RECOMMENDATIONS

The general findings of this study are:

- Under existing conditions, the current functional classifications for the study area road network are appropriate. No roads operate over or under the suggested Average Annual Daily Traffic (AADT) range for their respective functional class.

- Under existing conditions, all intersections in the study area operate at acceptable levels of service.

- Winnipeg Street carries modest volumes and there is no need to accommodate these volumes over two travel lanes in each direction. The desire for the road diet should be based on improving safety (e.g. sight distances) and creating additional infrastructure for cycling. There is likely a case for a road diet, by providing one general purpose lane in each direction and a centre two-way-left-turn-lane (TWLTL).

- The OCP condition proposes to add 2,000 residential units by build-out and the RWICD condition proposes to add 3,200 residential units by build-out. For reference, the EMME/2 macroscopic transportation model indicates that only 500 residents currently reside in the study area. From a traffic generation perspective, the OCP condition generates up to 867 and 1,054 total two-way trips in the AM and PM peak hours respectively and the RWICD condition generates 1,387 and 1,686 total two-way trips in the AM and PM peak hours respectively. Increasing the density of uses from the current OCP condition of 3 - 4 storey buildings to the RWICD condition of 4 – 6 storey buildings constitutes a net increase in traffic by 520 and 632 two-way trips in the AM and PM peak hours respectively, or an increase in traffic levels by 60 percent.

- While the RWICD constitutes a net increase of 60 percent compared to the OCP condition, the traffic impact analysis finds that there are no additional improvements that would be required under the RWICD condition as compared to the OCP condition.

- The City's EMME/2 macroscopic transportation model was used to determine the existing assignment and distribution. For this task, Opus contracted NovaTrans Engineering. In general, the model found the following distribution for the primarily residential study area:

    - The distribution is predominantly to the west (towards Highway 97). The model predicts that approximately 80 percent of traffic will come to/from that direction. It reflects that the employment areas are predominantly in that direction. The model predicts that most of the traffic will utilize Winnipeg Street, and this should be treated as a conservative estimate as the route is likely faster than Victoria Street due to a lack of traffic signals. The inbound distribution from the south is split between Victoria Street and Winnipeg Street (35 percent and 44 percent respectively).

    - The distribution to the north/east is generally the remaining 20 percent. In terms of inbound and outbound traffic assignment, the model predicts the assignment being split roughly equally between Winnipeg Street and Victoria Street.

- The following intersections will likely experience the most traffic impact outside the immediate study area and were identified by the City of Prince George's EMME/2 macroscopic transportation modeling software:

    - Yellowhead Highway (Victoria Street)/17th Avenue – southbound left turn in the AM peak;
    - Carney Street/10th Avenue – may warrant a traffic signal with additional traffic;
    - Massey Street / Carney Street – southbound left turn in the AM peak;
    - Carney Street / 15th Avenue – southbound left turn in the AM peak;
    - Edmonton Street between 13th Avenue and 15th Avenue - this is generally a collector route with the major desire line being travel between 13th Avenue and 15th Avenue via Edmonton Street – traffic

calming may be required to reduce attractiveness of the route for cut through traffic or for speed reductions;
- Winnipeg Street / 13th Avenue – the approach to the signalized intersection may need widening; and,
- Winnipeg Street / 15th Avenue Ramps – additional traffic due to the desire to travel east at 15th Avenue.

These intersections should be examined in greater detail for intersection-specific improvements when it comes time to develop the study area.

- The study area road network continues to operate with generally acceptable levels of service to build-out. This considers that Winnipeg Street and 7th Avenue can undergo road diets. A road diet for Winnipeg Street considers that sight lines should be protected and will be improved. However, upon the build-out horizon, several intersections will experience higher delays and should be monitored for improvement. These include:
  - 9th Avenue and Winnipeg Street – the left turn movement from 9th Avenue to Winnipeg experiences long delays. The pedestrian signal at this location could be upgraded to a full signal or a turn lane could be provided by removing some parking.
  - For Victoria Street – demand for the northbound and southbound left turns from Victoria Street will likely be high enough to consider improvements upon the build-out horizon. Potential requirements for turn lanes were previously identified in the *Downtown Transportation and Parking Study*, which analyzed Victoria Street conditions using a medium to conservative (1.5 – 3.0 percent) growth rate. While the current study assumes 0.5 percent per annum growth on Victoria Street, which is in line with the historic growth patterns of Downtown, RWICD traffic accounts for addition traffic on Victoria Street to bring the analysis volumes for future build-out to be more in line with the rates assumed for the *Downtown Transportation and Parking Study*. Having said that, the modifications would not be triggered for a 25-year period, which would almost coincide with the build-out of the OCP or RWICD conditions.
  - For 7th Avenue, dedicated left turn lanes to Winnipeg Street and Vancouver Street can be considered upon the implementation of the suggested road diet.

- It should be noted that the additional development intensity has been analyzed with, and would require full use of the traffic lanes in all seasons. For this reason, it is pertinent to avoid prolonged storage of snow in the roadway.

- While the EMME/2 model has predicted that the impact will occur at the aforementioned intersections, once detailed plans for the OCP condition or RWICD condition are available, the detailed operational analysis for the intersections should be conducted to determine turn lane storage lengths, deceleration lengths, tapers, etc. It should be understood that this report only identifies the potential problems the network will face and suggest mitigation without doing detailed analysis to identify construction or design parameters. Detailed modelling can be undertaken using standard traffic capacity analysis software.

- Regarding parking, it is understood that creating a supply of structured parking under each building may be prohibitively expensive. The parking analysis utilized a projected modal split target of a 15 percent shift from vehicle mode. Assuming that the Bylaw rates reflect the actual parking demand (i.e. minimum Bylaw rate is the minimum parking demand), the road network on-street parking can likely accommodate the visitor demand and any residual residential parking demand, allowing a reduction on the minimum Bylaw requirements of approximately 15 percent to be achieved under the OCP condition. However, under the RWICD scenario, a significant amount of parking would be required according to the current Bylaw, and as such, only a small portion of the overall parking requirement could actually be accommodated on-street. Thus, a large proportion of the parking requirement under the RWICD scenario would still be required off-street.

- While a 15 percent parking reduction should be targeted, demand should be monitored to gauge whether this can be achieved. It should be noted, however, that while a 15 percent modal split shift should be targeted, ultimately parking demand is a function of vehicle ownership. While the resident may be using transit or walking to work, as long as a vehicle is owned, there will be a contribution towards parking demand. Thus, it is pertinent that demands are continually monitored during the process in which vehicle ownership reduction in the area should be observed for any correlation to mode shift.

- Due to the fact that a significant amount of off-street residential parking would still be required for the RWICD scenario, creating surface parking lots adjacent to the buildings is a likely scenario. However, this may be an issue from an urban form/design perspective, as the relatively short blocks between north-south streets would not allow for a more continuous block of residential developments. Furthermore, the "tuck under" parking and heavy parking demand for parking expected by the RWICD scenario suggests the need to revisit underground parking options for some of the proposed buildings.

The general recommendations of this study are:

Recommended Road Improvements

- Road diet Winnipeg Street to one general purpose lane in each direction with a two-way-left-turn-lane to calm traffic and provide space for bike lanes. The road diet would also improve safety, as the proposed lane modifications should address any existing sight distance issues.
- 7th Avenue as a Ceremonial Boulevard with one general purpose lane in each direction, a centre median with left turn lanes at major intersections, dedicated bike lanes and parking on both sides of the street.
- 9th Avenue, 6th Avenue, and Vancouver Street to be designated as Commuter Cycling collectors.
- Potential roundabout / traffic circle to replace the 4-way stop at 7th and Vancouver, although the intersection could still operate as a 4-way stop to build-out based on the projected volumes. While the 4-way stop is likely the lowest cost option, the roundabout could be considered only as a gateway feature; however, it would not actually improve operations otherwise experienced under a 4-way stop condition.
- While the intersection treatment for Winnipeg Street and 7th Avenue is suggested as a roundabout / traffic circle as a gateway feature and given the volumes could operate with this intersection configuration upon build-out, this scenario was not specifically addressed as it was understood that the City would like to implement a road diet with a two-way-left turn lane (TWLTL). Given the TWLTL configuration, Winnipeg Street could still operate under free flow conditions, with the 7th Avenue approach to Winnipeg Street be under stop-control. If it is desired to implement a

roundabout / traffic circle, a more detailed operations and design study should take place.

Parking

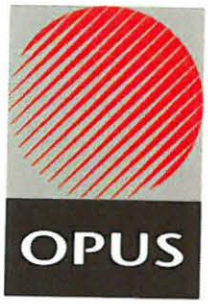
- Should a reduction in the amount of off-street parking be desired, areas where a pool of structured parking may be available for all study area residents should be examined.
- Visitor parking minimum Bylaw requirements can likely be met on-street under both the OCP and RWICD condition. Should either condition be pursued, the City could exempt all residential development in the study area from requiring to provide on-site visitor parking with the understanding that parking could be provided on-street. However, current City policy restricts on-street parking at night in some parts of this neighbourhood for the purposes of snow removal. This would have to be rationalized in the future if this policy is carried through.
- A 15 percent reduction in parking demand should be a target based on suggested the modal split shift target of 15 percent. While a 15 percent parking reduction should be targeted, demand should be monitored to gauge whether this can be achieved. The RWICD scenario will still require a significant amount of parking to be provided off-street and strategies for accomodating this parking require examination.
- Alternative strategies for demand reduction should be evaluated for the RWICD with the understanding that a rather mid-range modal split shift target of 15 percent would not allow for a correspondingly significant reduction in the on-site provision of parking. Further measures may be required to achieve a larger decrease in vehicle ownership levels compared to current levels. Mode split targets can only be met with further investment in pedestrian facilities and cycle facilities in the study area.
- Prior to deciding on a formal parking strategy/solution, the City should conduct parking surveys for similar buildings to determine if the Bylaw requirements actually reflect the true parking demand for the type of use or whether the requirements could be further reduced. Should actual demand be less than the Bylaw requirement, it is possible that both OCP and RWICD conditions would not need to provide the amount of parking as currently calculated that this assessment is based upon.

- Access and servicing should be provided via a laneway to eliminate the need to have driveways directly accessing a City street. If surface parking be considered, consolidating parking for several buildings at a time should be pursued.
- Angled parking is not recommended as the number of stalls achieved through angled parking will not be significantly greater than the number of parallel parking spaces given the short blocks between north-south streets. Furthermore, angled parking would take up more City right-of-way.

Transportation Demand Management

- A modal split shift target of 15 percent from vehicle modes at the minimum should be the objective for this area, noting its proximity to the Downtown.
- Transit and land use measures should form the bulk of the TDM strategy, with the goal of increasing walking and bicycle trips and reduce the need for residents to travel in single occupancy vehicles.
- Bicycle racks, storage facilities, and end of trip facilities should be provided in all commercial developments (if pursued) in the study area.
- A car co-op or charge up ports for electric vehicles would be recommended for the residential developments in the study area.

It should be noted that once the actual scope, nature, and pattern of the RWICD development is established, more detailed traffic analysis should be undertaken to confirm location-specific requirements. It is recommended that the Ministry of Transportation and Infrastructure (MoTI) be consulted as a key stakeholder and included in the scope development of any future transportation studies on the RWICD. The next step in the RWICD planning is unknown as it is dependent on Council's direction which could be a number of likely possibilities, which could include amending the existing Neighbourhood Plan, or amending the OCP through its review.



- Traffic Operations
- Transportation Planning
- Road Safety Engineering
- Transit and Sustainability
- Asset Management
- Project Management

Appendix B: RWICD Servicing and Infrastructure Backgrounder.

HB LANARC

PLANNING DESIGN SUSTAINABILITY

RESIDENTIAL WOOD FRAME INOVATION COMPREHENSIVE DISTRICT

SERVICING & INFRASTRUCTURE ANALYSIS

DECEMBER 2010

OPUS DAYTONKNIGHT CONSULTANTS LTD.

708.001

HB LANARC

PLANNING DESIGN SUSTAINABILITY

RESIDENTIAL WOOD FRAME INOVATION COMPREHENSIVE DISTRICT SERVICING AND INFRASTRUCTURE ANALYSIS

EXECUTIVE SUMMARY

On behalf of HB Lanarc planning consultants and the City of Prince George, Dayton & Knight Ltd. evaluated the capacity of existing water, sanitary sewer, and storm infrastructure to service the proposed RWICD development area. The study evaluated infrastructure capacities under existing developed conditions, and for development that includes proposed multi-family mid-rise (four to six storey) buildings of wood construction.

The study identified servicing limitations for each of the water, sanitary sewer, and storm sewer systems. Existing infrastructure cannot service potential future build out levels of development for either four or six storey wood construction. Limited amounts of multi-family development can be supported in the proposed RWICD area, subject to limitations on development location, building size, density, type of construction, and methods of storm water disposal.

The responsibility for controlling the maximum size of a building permitted in a municipality in relation to the locally available firefighting capability rests with the municipality. Evaluation of a variety of forms and size of building construction has identified that buildings constructed entirely of wood, in four to six storeys, may require greater water supply for firefighting than is available from the existing City of Prince George water distribution system. In order to consider buildings constructed entirely of wood in four to six storeys, the City of Prince George should consider policy that limits development to that which the City can adequately provide water for fire protection. This could include requirements for specific fire protection engineering analysis that considers factors that affect fire risk such as:

- Building size
- Type of construction (ie. wood vs. fire retardant treated wood)
- Occupancy
- Building location, spacing, and exposure to other buildings
- Sprinklers
- Enhancement of the reliability and / or fire rating of fire separations

Notwithstanding analysis of specific development proposals, the City of Prince George should update its FUS Public Fire Protection Classification grading in order to better understand the capacities of its community fire defences including water supply, fire department, fire prevention, emergency communications, building construction controls, and hazard levels.

Assuming that development controls will be in place to limit required fire flows to those typical of multi-family development (150 – 200 L/s), required water system improvements include:

- Installation of 200mm diameter watermain looping along Winnipeg Street from 5th Avenue to 11th Avenue.
- Replacement of the existing 100 mm diameter watermain with 200mm diameter pipe along 8th Avenue from Winnipeg Street to Brunswick Street.
- Installation of 200 mm diameter watermain looping on Brunswick Street, from 7th Avenue to 8th Avenue.
- Installation of additional fire hydrants in order to provide the required hydrant spacing and access from fire trucks to buildings.

The estimate cost of these improvements $1.8 million.

Storm mains within and downstream of the RWICD area are known to have limited capacities. Pipes within the RWICD area that cannot convey storm flows from the 1 in 5 year or 1 in 10 year storm include:

- Various pipe segments along Winnipeg, Vancouver, and Victoria Streets
- 7th Avenue, between Vancouver and Victoria

There are also storm drainage deficiencies downstream of the RWICD area. These include:

- Vancouver and Victoria Street
- Winnipeg Street and Patricia Boulevard trunk storm mains

While storm pipes within the RWICD area may be upgraded to provide required capacity it may not be economically feasible to upgrade critical downstream storm drainage pipes (Patricia Boulevard & Winnipeg Street trunk mains) to the capacity required to suit RWICD development.

The RWICD development area has the potential to increase impervious areas such as roads, building roof tops, and parking lots, with possible negative storm water related impacts. In order to avoid significant capital improvements to the downstream storm sewers, development in the RWICD area will need to limit post development flows pre-development levels by either:

- Limiting the net increase in impervious area.
- Implementing Low Impact Development (LID) practices (i.e. recharge chamber, infiltration storm water disposal fields, perforated storm drain pipes, bio-swales, rain gardens) that would utilize native permeable sand and gravel soils to infiltrate a portion of the storm run-off.
- Implementing on-site storm water detention.

Sanitary sewer pipes within and downstream of the RWICD area have limited remaining capacity. RWICD development may require downstream sewermain upgrades depending on where, when and how much development proceeds. Table ES-1, below, demonstrates the remaining flow capacity in critical pipes and the estimated amount of serviceable development for each sanitary sewer catchment area in the proposed RWICD area.

TABLE ES-1
REMAINING SEWER CAPACITIES AND ALLOWABLE DEVELOPMENT

Catchment Area	Remaining Pipe Capacity (L/s)	Equivalent Population Increase	Number of Dwelling Units
4th – 5th Avenue (From Winnipeg to Vancouver)	11.3	613	245
5th – 8th Avenue (From Winnipeg to Victoria)	9.5	483	193
8th – 10th Avenue (From Winnipeg to Victoria)	12.9	668	267
11th Avenue (From Winnipeg to Victoria)	18.9	652	261
Total		2206	882

Existing sanitary sewer lift stations downstream of the RWICD area are estimated to have capacity to service RWICD development to levels anticipated in the next 15 – 25 years. PW 102 and 103 would need upgrade if build out levels of RWICD development were to be considered. The replacement cost of PW 103 has previously been estimated to be approximately $1.4 million (in 2006 dollars).

Existing fire protection, storm drainage and sanitary sewer infrastructure have the potential to limit the amount of serviceable development in the RWICD area. In order to facilitate development of mid-rise buildings of wood construction in the RWICD area the City should:

- Implement watermain upgrades along Winnipeg Street and 8th Avenue in order to rectify existing water system / fire protection deficiencies, at a cost of approximately $1.8 million.

- Require site specific design and fire protection analysis of proposed developments.

- Update the City's Fire Underwriter's Survey Public Fire Protection Classifications Survey

- Require development in the RWICD to implement on-site storm water control measures.

- The sanitary sewer system upgrades identified in this study may not be needed in the foreseeable future. The City should confirm downstream sanitary sewermain capacities as development proposals are considered. This should include monitoring of sewer flows in critical sewermains downstream of the RWICD area and upstream of PW 102 and 103.

HB LANARC

PLANNING DESIGN SUSTAINABILITY

RESIDENTIAL WOOD FRAME INOVATION COMREHENSIVE DISTRICT SERVICING & INFRASTRUCTURE ANALYSIS

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HB LANARC

PLANNING DESIGN SUSTAINABILITY

RESIDENTIAL WOOD FRAME INOVATION COMPREHENSIVE DISTRICT SERVICING AND INFRASTRUCTURE ANALYSIS

1.0 INTRODUCTION

The City of Prince George has engaged HB Lanarc planning consultants to complete a planning and design study of a proposed Residential Wood Innovation Comprehensive District (RWICD) development area. The RWICD would specifically consider mid-rise buildings (four to six storeys) of combustible (wood) construction. This follows the B.C. Government's recent changes to the B.C. Building Code that now permit mid-rise buildings (four to six storeys) to be of combustible (wood) construction.

HB Lanarc's planning process is divided into three phases including:

- Phase 1 - Background and technical analysis to identify preliminary options
- Phase 2 - Community consultation
- Phase 3 - Final report & presentation to council

Dayton and Knight prepared this "desk top" analysis of existing infrastructure capacities, limitations, and opportunities in order to guide HB Lanarc when developing neighbourhood plan options for the RWICD area.

2.0 EXISTING INFRASTRUCTURE

The RWICD area is currently serviced with buried water, storm sewer, and sanitary sewer mains. The age of the infrastructure is generally between 40 and 50 years, with capacities that may have been intended for lower population densities than would be proposed by RWICD re-development. This section describes an inventory of the existing infrastructure and identifies obvious servicing opportunities, limitations, and constraints.

2.1 WATER SYSTEM

The RWICD area is within Pressure Zone 1 of the City of Prince George water system. Pressure Zone 1 encompasses the downtown business core and adjacent residential areas. Pressure Zone 1 is roughly bounded by the Fraser River to the east, the Nechako River to the North, Cowart Road to the south, and Highway 16 / Freeman Street to the west. The zone is supplied with water from PW 601 / 602, with balancing and fire protection provided by the Carney Hill reservoir, PW 803.

The water distribution system in the area of the RWICD generally includes cast iron watermains ranging in diameter from 100 mm to 350 mm. Watermains are generally located on the north side of the avenues from 4th Avenue to 11th Avenue with interconnecting (looping) watermains on Winnipeg Street and Vancouver Street. Fire hydrants for fire protection are generally located at the intersections of the avenues with Winnipeg Street and Vancouver Street and at mid block locations of many of the avenues.

The water distribution system pipes are believed to be of cast iron construction that would date to original development of the area in the 1960's. While the pipes are reaching the latter one-third of their design life cycle, we are not aware of any site specific condition inspections or leakage tests. Where watermains are required to be replaced or upgraded either as a result of age, poor condition, or capacity, the watermain would be required to be installed to the City's minimum standard of 200mm diameter.

2.1.1 City of Prince George Design Guidelines

In order to provide adequate service, the water distribution system must be able to provide water during the anticipated Maximum Day Demand plus the required fire flow without service pressures dropping below 20 psi at the fire location and without pressures dropping below 30 psi at other locations in the system. In the case proposed for RWICD, the increase in population will affect the Maximum Day Demand, while the combined potential for increase in density with wood construction is expected to affect the required fire flows.

2.1.1.1 Maximum Day Demands

The City's design per capita demand of 475 Liters / Capita / Day, a proposed population (from HB Lanarc's proposed development plans), and a Peaking Factor of 2.5 have been used to calculate the estimated Maximum Day Demands for a given area within the RWICD.

From the City's water model, existing Maximum Day Demand in the RWICD area is estimated to be in the order of 21 L/s. This daily water demand is modeled at approximately 20 nodes on the existing water model.

For future RWICD development with 800 dwelling units over 15 – 25 years and build out of up to 3200 units, Maximum Day Demand is estimated to increase

to 40 L/s and 105 L/s respectively. The proposed increase in population could add as much as 2 – 5 L/s of domestic demand on each node in the RWICD area.

2.1.1.2 Fire Flows

Table 2-1, below, from the City of Prince George design guidelines illustrates the minimum required fire flows by land use. While the City's design guidelines for fire flows are not development / site specific, (and may be subject to conformance with the Fire Underwriters Survey requirements) they provide an initial reference for evaluation of the fire flow capacity of the existing water distribution system.

TABLE 2-1
MINIMUM REQUIRED FIRE FLOWS (Design Guidelines)

LAND USE	FIRE FLOW (L/s)
Single Family Residential	60
Mobile Home Parks	85
Apartments / Townhouses	125
Commercial	150
Institutional	150
Industrial	250

2.1.2 Fire Underwriter's Survey – Required Fire Flows

Fire Underwriter's Survey (FUS) is a national organization funded by the private insurance industry to survey fire protection conditions in Canadian municipalities, providing data and advisory services to fire insurance underwriters and public officials. The surveys measure the ability of a community to prevent and control the major fires

that may be expected to occur, based on the risk presented in the community. One of the components that the FUS evaluates is the adequacy of the fire flows available from the municipal water supply system.

The FUS guide for determining water system requirements for fire protection is the document – Water Supply for Public Fire Protection, 1999 published by the Fire Underwriters Survey (FUS). Part two of the FUS document provides guidelines for the determination of the required fire flow for a particular site or development. An estimate of the fire flow required for a given area may be determined by the following formula.

$F = 220C\sqrt{A}$

Where:

$F =$ required fire flow in litres per minute.

$C =$ coefficient related to the type of construction

= 1.5 for wood frame construction (structure essentially all combustible)

= 1.0 for ordinary construction (brick or masonry walls, combustible floor and interior)

= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls

= 0.6 for fire-resistive construction (fully protected frame, floors, roof)

$A =$ total floor area in square meters. For fire resistive building construction, the area considers the largest two adjoining floors, and can be adjusted to allow for fire protection measures such as fire walls. For wood construction, were fire resistance rating is not available, the area includes all storeys in the building being considered.

The fire flow calculated above is then adjusted (up or down) by percentages that vary depending on factors such as building occupancy / hazard, sprinkler systems, and exposure to other buildings or hazards. The FUS guide is specific in noting that a certain amount of experience in fire protection engineering is required for its effective application. For this study, we have reviewed the FUS requirements with the British Columbia FUS office:

Mr. Michael Currie, A.Sc.T,
Public Fire Protection Specialist
Phone: 1-800-665-5661

Based upon the FUS methods (described above) we have calculated required fire flows for existing policy with walls of non-combustible construction and for the proposed RWICD development, that would allow exterior walls of wood construction as allowed by Section 3 of the B.C. Building Code. The calculated fire flows are shown in Table 2-2 below, and 2-3 on the following page.

TABLE 2-2
FUS REQUIRED FIRE FLOWS – ORDINARY (NON-COMBUSTIBLE) CONSTRUCTION

Building Size / Construction[1,2]	Occupancy Hazard[3]	Sprinkler[4]	Exposure[5]	Fire Flow (L/s)
1,800 m^2, masonry wall construction, four storey, low exposure to other buildings	-15 %	-50%	+20%	180
1,200 m^2, fire retardant treated wood construction, six storey, building with low exposure to other buildings	-15%	-50%	+20%	211

TABLE 2-3
FUS REQUIRED FIRE FLOWS – MID RISE BUILIDNGS OF WOOD CONSTRUCTION

Building Size / Construction[1,2]	Occupancy Hazard[3]	Sprinkler[4]	Exposure[5]	Fire Flow (L/s)
1,800 m^2, wood construction, four storey, low exposure to other buildings	-15 %	-50%	+20%	280
1,800 m^2, wood construction, four storey, highly exposed building	-15%	-50%	+50%	400
1,200 m^2, wood construction, six storey, low exposure to other buildings	-15%	-50%	+20%	280
1,200 m^2, wood construction, six storey, highly exposed building	-15%	-50%	+50%	400

Notes:

1. Building size assumes the maximum allowable total floor area under Part 3 of the building code for Group C (residential) buildings, where the total floor area is limited to 7,200 square meters, for sprinkler protected mid rise buildings.
2. For Table 2-2, C = 1.0. For Table 2-3, wood frame construction requires C = 1.5 due to the fuel load of wood construction. Building Code requirement for non-combustible exterior cladding offsets the additional exposure of six storey construction, but does not affect any credit to the fuel load or combustibility of the structure.
3. Apartments and dwellings are examples of low hazard occupancies where a credit is applied due to the relatively low combustibility expected of the building's contents.
4. Assumes all new mid-rise buildings will be sprinklered, as required by the B.C. Building Code.
5. 20% exposure charge equals a relatively low exposure where an allowance of 5% may be added to the required fire flow for each side of the building that exposes surrounding buildings that are located within 30 – 45 meters of the building under consideration. Similarly, a 50% exposure charge equals a higher exposure where several buildings are located within 10 – 30 meters of the building under consideration. In no instance shall the exposure surcharge exceed 75%.

The examples in Table 2-2 and 2-3 demonstrate the range of required fire flows that may be required, depending on the building size, type of construction, and exposure to other buildings. It is important to note that even for existing OCP policy (that allows four storey wood construction to the limits of the Building Code), the required fire flow is higher than typical municipal standards for multi-family development and higher than may be reasonably provided by the City of Prince George water supply.

In order to consider buildings constructed entirely of wood in four to six storeys, the City of Prince George should consider policy that strictly controls the development proposals to those which the City can adequately provide water for fire protection. This is expected to require site specific design and fire protection engineering analysis that may result in requirements that are more restrictive than Part 3 of the Building Code such as:

- Limiting building footprint or fire area to less than allowed by the Building Code. This could require incorporation of additional fire walls into building design.

- Restrictions on wood construction on exterior walls or requirements for fire retardant treated wood framing.

- Limits to building location, spacing and exposure to other buildings. For example, the fire flows calculated above with 20% exposure surcharges assume a building that is separated by at least 30 meters from other buildings of similar height and size.

2.1.3 Fire Underwriter's Survey – Public Fire Protection Classification (PFPC)

The FUS Public Fire Protection Classification system is used to evaluate the essential features of a community's fire defences including water supply, fire department, fire

prevention, emergency communications, building construction controls, and hazard levels. The last FUS evaluation of the City of Prince George's fire fighting capabilities was completed in 1985. The study is now 25 years old and is out of date. A new FUS PFPC evaluation should be considered, regardless of whether RWICD development is considered.

2.1.4 Part 3 Building Code Revisions – Technical References and Practice Bulletin

The B.C. Government's recent changes to the B.C. Building Code permit mid-rise buildings (four to six storeys) to be of combustible (wood) construction. In implementing the Building Code changes, a number of due diligence investigations and studies were completed with regards to fire protection requirements and risks. These are available on the B.C. Ministry of Housing web site at: www.housing.gov.bc.ca/building/wood_frame and include:

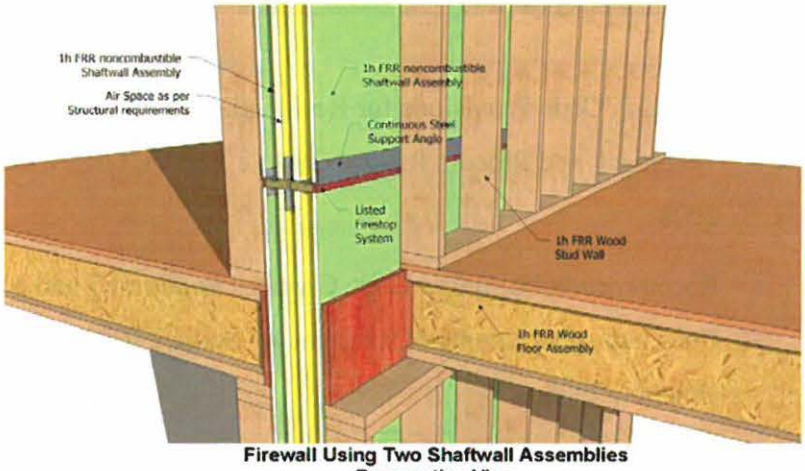
- Building Code Provisions for Residential Buildings and Identification of Technical and Process Risks – Stage 1 Report, GHL Consultants Ltd, October 2008
- Recommended Building Code Changes to permit 5 and 6 Storey Wood-Frame Buildings of Residential Occupancy – Stage 2 Report, GHL Consultants Ltd, October, 2008
- Review of Proposed Building Code Changes to Permit 5 and 6 Storey Wood-Frame Construction, Senez Reed Calder Engineering Inc, November, 2008
- Technical and Process Risks in 5 and 6 Storey Wood-Frame Buildings of Residential Occupancy, January, 2009

Recognizing the complexities of the recent Building Code changes allowing mid-rise buildings of wood construction, Association of Professional Engineers and Geoscientists of British Columbia (APEGBC) has developed a technical and practice bulletin specific

to the issue. A copy of the bulletin is available at http://www.apeg.bc.ca/sixstoreywoodframe.html.

In addition to considering structural and building envelope design issues, the bulletin addresses issues unique to the practice of Fire Protection Engineering. While compliance with Part 3 of the Building Code is currently under the architect's responsibility, it is recognized that a Fire Protection Engineer may need to become involved in mid-rise construction projects in order to provide specialized knowledge of fire safety and fire protection engineering. Figure 2-2, below illustrates the potential design of a non-combustible wood frame fire wall assembly that requires specific knowledge of the principles of Fire Protection Engineering.

APPENDIX F: NON-COMBUSTIBLE WALL ASSESSMBLIES



Firewall Using Two Shaftwall Assemblies
Perspective View

Figure 2-2
Non-Combustible Wood Frame Wall Assemblies

2.1.5 B.C Building Code - Fire Fighting Assumptions

The assumptions of the Building Code with respect to fire protection and public safety are explained in Division B – Appendix A of the Code as follows:

"The B.C. Building Code assumes that fire fighting capabilities are available in the event of a fire emergency. The requirements of the Code, however, do not relate the size and type of construction of a building to the level of municipal fire protection. The responsibility for controlling the maximum size of a building permitted in a municipality in relation to the locally available firefighting capability rests with the municipality.

If a proposed building is too large, either in terms of floor area or height, to receive reasonable protection from the municipal fire department, fire protection requirements in addition to those prescribed in the Code, may be necessary.

Alternatively, the municipality may, in light of its firefighting capability, elect to introduce zoning restrictions to ensure that the maximum building size is related to available municipal fire protection facilities. This is, by necessity, a somewhat arbitrary decision that should be made in consultation with the local firefighting service."

These objective and policy statements of the Building Code highlight the City of Prince George's need to carefully consider it's ability to provide adequate fire protection if it is to allow mid-rise (four to six storey) buildings of combustible (wood frame) construction in the RWICD area. As described in 2.1.3, above, the City's ability to provide adequate fire protection depends upon a number of factors, including available water supply.

2.1.6 Existing Available Water Supply for Fire Protection

As shown in Figure 2-1, based on analysis of the City of Prince George water model, we have estimated the available fire flows in the RWICD area. Under existing Maximum Day Demand conditions, available fire flows vary significantly in the area and range from as low as 60 L/s to as high as 460 L/s.

Available fire flows along the Vancouver Street corridor range from 360 – 460 L/s and are expected to be suitable for the proposed RWICD development,

At several locations along 8th Avenue (as a result of un-looped 100 mm diameter watermains), fire flows are estimated to be as low as 60 L/s. These fire flows are near the minimum recommended for single family detached residential development and are not suitable for multi-family development.

Due to a lack of watermain looping, available fire flows along the Winnipeg Street corridor are lower than desirable for multi-family development. Fire flows are also estimated to be lower than required at the mid block locations from 6th Avenue to 10th Avenue.

2.1.7 Water Distribution System Modeling – Recommended Improvements

The estimated future Maximum Day Demands for each horizon (15 – 25 years and build out) were added to the City's water model, with similar modeling results. The modeling indicated that it may not be practical or economically feasible for the City's water distribution system to provide the highest FUS fire flows (280 – 400 L/s) in all areas of the RWICD area. After discussion with City staff, it was agreed that fire flows in the range of 150 – 200 L/s (typical for multi-family development, commercial and institutional land uses) was a more reasonable expectation of the City's water system in the RWICD area.

Assuming that development controls, where required, will be in place to limit required fire flows to 150 – 200 L/s, a series of required improvements to the water distribution system have been identified as follows:

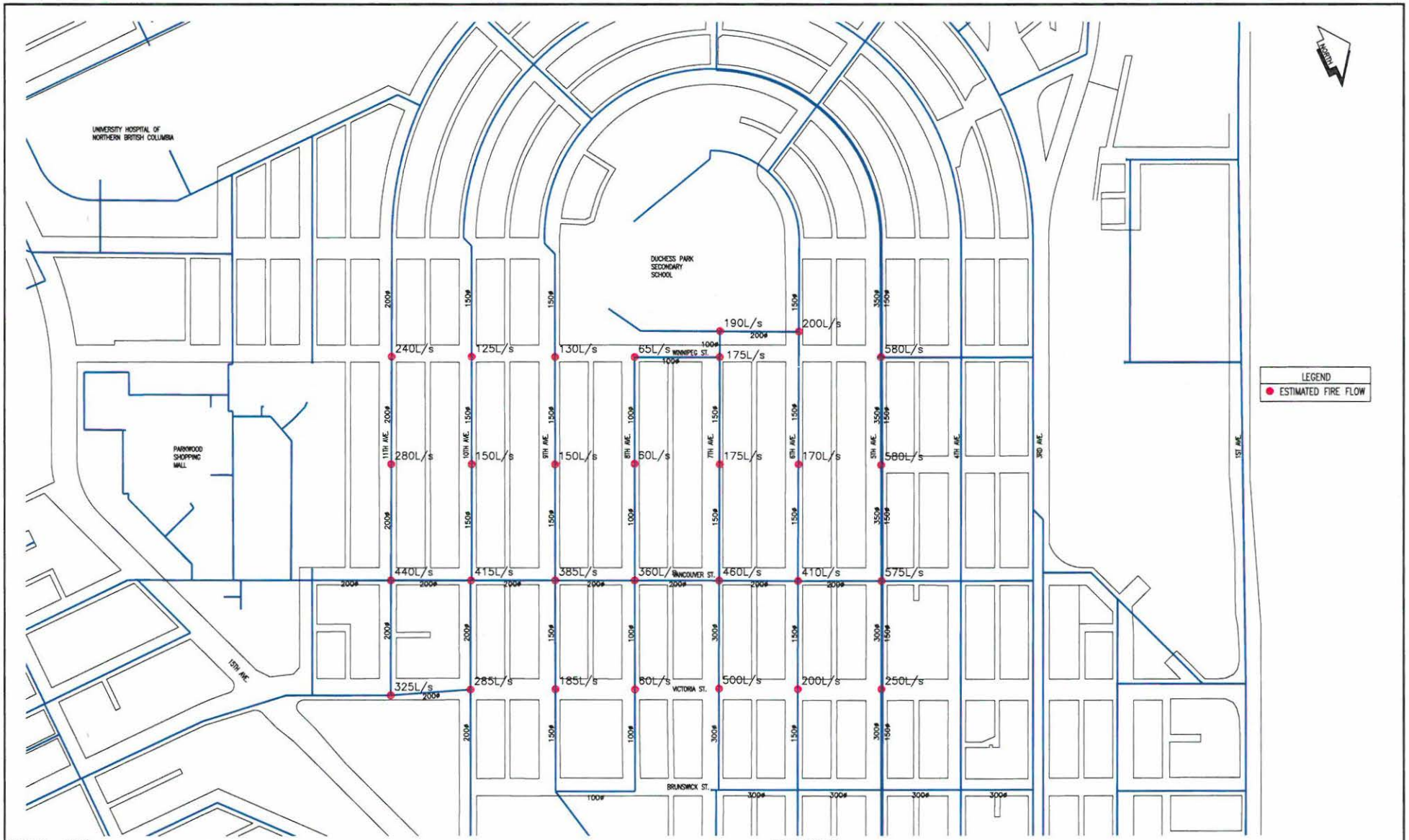
- Installation of 200mm diameter watermain looping along Winnipeg Street from 5th Avenue to 11th Avenue.
- Replacement of the existing 100 mm diameter watermain with 200mm diameter pipe along 8th Avenue from Winnipeg to Brunswick Street.
- Installation of 200 mm diameter watermain looping on Brunswick Street, from 7th to 8th Avenue.
- Installation of additional fire hydrants at mid block locations in order to provide the required hydrant spacing and access from fire trucks to buildings.

Figure 2-3 illustrates the estimated available fire flows in the RWICD area (at future build out, assuming approximately 3200 units and 7700 people in the RWICD area) if these improvements are implemented.

The estimated cost of implementing these improvements is estimated to be in the order of $1.82 million as shown in Table 2-4. The unit rate costs have been provided by the City of Prince George include new watermain, gate valves and fittings and road restoration. Allowances for service connection have been included along 8th Avenue.

TABLE 2-4
ESTIMATED COSTS – RWICD WATER SYSTEM IMPROVEMENTS

Description	Quantity (m)	Unit Rate	Amount
Winnipeg Street Watermain	570	$1000/m	$570,000
8th Avenue Watermain	500	$1350/m	$675,000
Brunswick Street Watermain Looping	100	$1000/m	$100,000
Subtotal			$1,345,000
Engineering & Contingency (35%)			$470,000
Total (say)			$1,815,000



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HB LANARC
CITY OF PRINCE GEORGE – RWICD
AVAILABLE FIRE FLOWS – EXISTING MAXIMUM DAY DEMAND CONDITIONS

FIGURE 2-1

PLOT: FULL 1:1 HALF 1:2

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HB LANARC
CITY OF PRINCE GEORGE – RWICD
AVAILABLE FIRE FLOWS – (FUTURE MAXIMUM DAY DEMAND) REQUIRED INFRASTRUCTURE

FIGURE 2-3

2.2 STORM SEWER SYSTEM

The proposed RWICD area is within the City of Prince George drainage referred to as the Hudson's Bay Slough Watershed. The watershed includes a distinctly identified urban drainage zone, which includes significant developed areas of the City that are primarily serviced by buried stormwater drainage systems. The RWICD area is within a sub-catchment of the urban system that has been referred to as the Winnipeg Street / Patricia Boulevard catchment. The name of this sub-catchment refers to the trunk sewermains along Winnipeg Street and Patricia Boulevard that service large areas of the downtown core (including the RWICD area).

2.2.1 City of Prince George Design Guidelines

The City of Prince George design guidelines with regards to storm drainage are comprehensive, with the stated goals, policies, and level of service requirements. The City's level of service objectives for the minor system of buried pipe storm requires that the city avoid property damage and flooding, and minimize inconvenience to the public due to run-off from more frequent rainfall events. This generally requires that the buried storm pipes have capacity to convey the storm flows from the 1 in 5 and 1in10 year storm.

2.2.2 Existing Storm Sewer Capacity

The City's storm sewer infrastructure in the RWICD area was evaluated in the Hudson's Bay Slough Drainage Study. From this study and from previous flooding experience, storm mains within and downstream of the RWICD area are known to have limited capacities.

Pipes within the RWICD area that cannot convey storm flows from the 1 in 5 year or 1 in 10 year storm include:

- Various pipe segments along Winnipeg, Vancouver, and Victoria Streets
- 7th Avenue, between Vancouver and Victoria

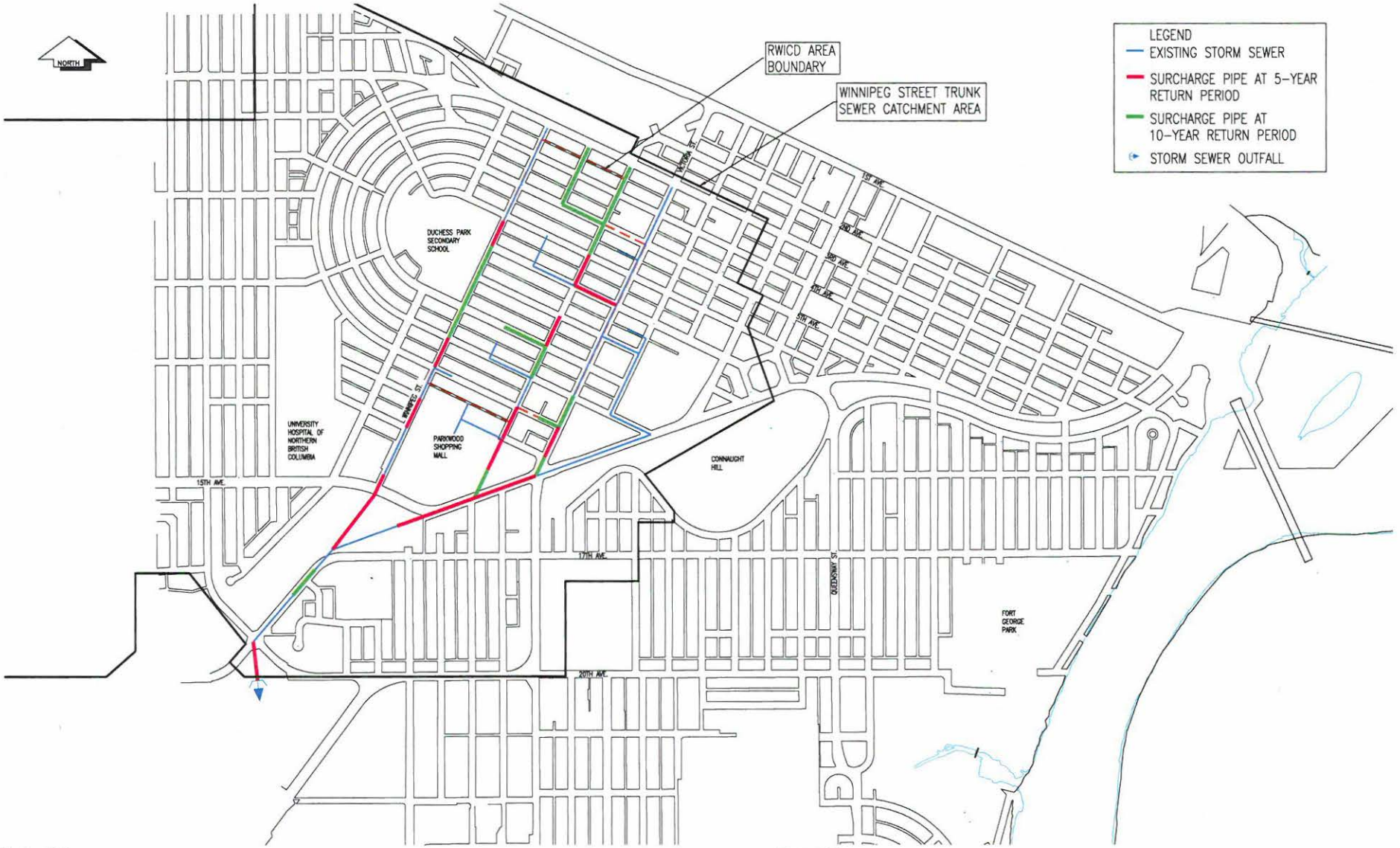
There are also storm drainage deficiencies downstream of the RWICD area. These include:

- Vancouver and Victoria Street
- Winnipeg Street and Patricia Boulevard trunk storm mains

Figure 2-4 illustrates the pipes within and downstream of the RWICD area that do not have sufficient capacity to convey existing stormwater resulting from the 5 year and 10 year return period storm event.

Where storm drainage facilities do not have capacity for the 1 in 10 year return period storm, or allowing for such capacity is economically not feasible, site planning and landscaping practices may need to be adjusted to allow for reduction of stormwater flows. For larger developments, current storm water management strategies strive to limit post-development storm flows to pre-development levels. This can be achieved by a combination of three strategies:

- Minimize creation of impervious area,
- Return development related run-off from impervious surfaces back into the ground or re-use it on the development site,
- Store run-off and release it slowly back to the downstream pipes and environment.



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HB LANARC
CITY OF PRINCE GEORGE – RWICD
STORM MODEL RESULTS – EXISTING INFRASTRUCTURE

FIGURE 2-4

2.2.3 Increase in Impervious Area

Land development changes the landscaped surface, especially with regards to increased impervious areas such as roads, building roof tops and parking lots, has the potential to cause impacts that include:

- Increased peak storm flows;
- Increased duration of storm flows;
- Decreased groundwater recharge; and
- Seasonal flow volume shifts.

Development of six storey buildings in the RWICD area will require significant off-street paved parking areas in order to meet the requirements of the zoning bylaw. This increase in impervious area has the potential to result in increased storm flows. For example, the City of Prince George design guidelines (Table 5.3.5.2.1) suggests a percent imperviousness for various types of land use. For the RWICD area, where the land use could change from a low density single family residential (approximately 20 units / Ha) to high density residential (approximately 140 units / Ha), the percent imperviousness could increase significantly. Figure 2-5 on the following page illustrates the possible increase. By comparison of paved areas or run-off coefficients the possible increase in pervious area can be seen to be in the order of 100%. This increase in paved areas or imperviousness could result in a direct increase in storm flows, and exceed downstream storm sewer capacity, if not properly accounted for.

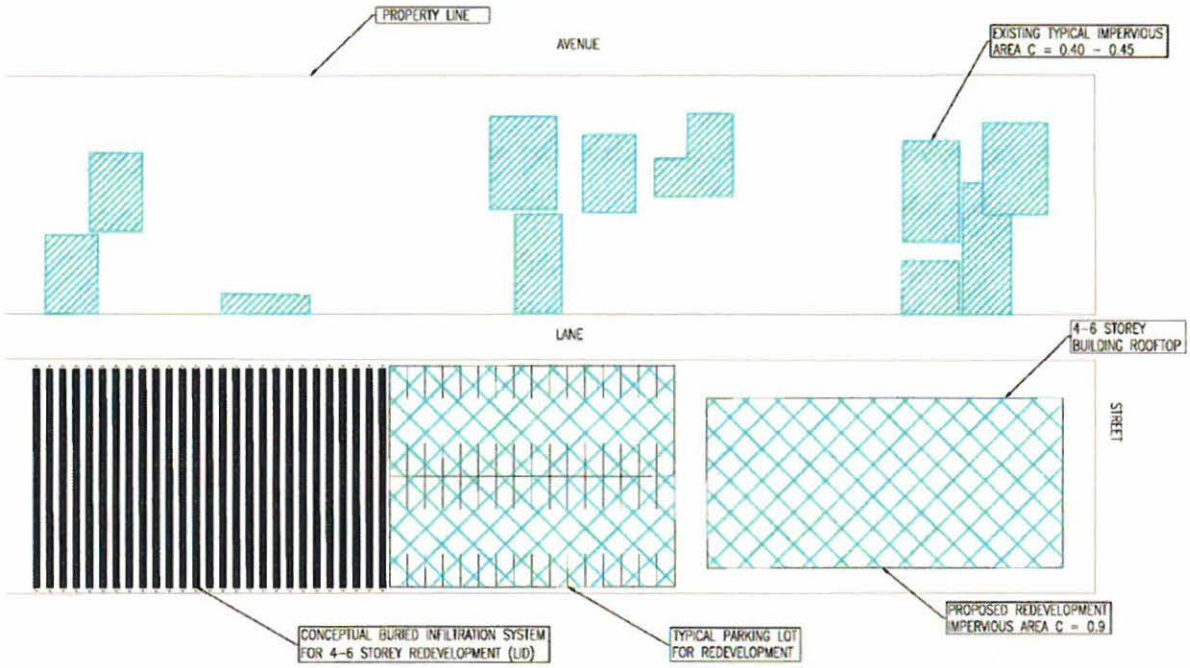


Figure 2-5

Typical Block Impervious Area Comparison

2.2.4 Best Management Practices and Low Impact Development

As discussed above, where RWICD development would result in an increase in impervious area, the downstream storm drainage system is not expected to have capacity for the increased storm water flows. As an alternative strategy to large scale storm sewer infrastructure improvements, Associated Engineering recommended the City of Prince George attempt to apply on-site Best Management Practices to new development proposals. By reducing or eliminating flow impacts on the storm system, upgrades to the storm sewer infrastructure may not be required in order to accommodate in-fill development or re-development.

Past experience with development in the vicinity of the RWICD (Parkwood Shopping Mall, Duchess Park Senior Secondary, and other downtown development or soils investigation) indicates that the area is underlain by sand and gravel deposits that will

have capacity to infiltrate storm water. Infiltration based approaches to run-off control have been referred to as Low Impact Development (LID), where infiltration of storm water into the underlying soil is used to reduce the amount of effective impervious area that directs surface run-off to the buried pipe storm drainage system.

Large scale infiltration of run-off from parking lots and roadways may be problematic unless other filtration and treatment measures are implemented to account for grit from winter sanding and for hydrocarbons, oil, etc. from vehicles. Infiltration of run-off from roof surfaces is not expected to require the same degree of pre-treatment and may be an effective measure of reducing the peak storm water flow to the drainage system. In order to implement LID, specific space and design allowances will be required for each development or building site. Considerations of importance include:

- The soils should be suitable for active infiltration at rates compatible with the design flow rates generated from the development. A Geotechnical Engineer's report based upon field infiltration tests must justify the design.
- Adequate pre-treatment should be provided, especially if infiltration of stormwater from paved parking lot surfaces is proposed.
- A positive drainage outlet should be provided to allow for system overflow to the system of major drainage without flooding property.
- Where possible locate infiltration facilities in greenways, parks or open spaces in order to allow access for future maintenance. Where facilities are proposed to be located beneath paved surfaces, provide specific access for future maintenance.
- There are no City wells or private wells down gradient of the recharge location.
- There is no potential for slope instability or landslide in the RWICD area.
- There is no concern that augmenting groundwater migration will impact existing development downstream.

- Consider future operation and maintenance including possible mechanisms for enforcement via bylaw or development permit clauses.

As stated above, successful implementation of LID is heavily dependent upon the adequacy of the design and infiltrative capacity of the soils. An appropriate level of hydro-geotechnical and preliminary design investigation should be considered early in the development planning and approval stages.

2.2.5 On-site Storm Water Detention

In some instances, storm water detention measures may be designed and constructed to store run-off and release it slowly back to the downstream pipes and environment. Storm water detention may be in the form of surface, roof top, and underground or buried storage.

Surface storage, in the form of wet or dry ponds, is usually restricted to areas where sufficient open space exists or large parcels of land are proposed for development. While there can be aesthetic advantages to pond detention, the space requirements may not be well suited to the RWICD area. Parking lot storage is an other methods of surface storage than may be used to attenuate peak storm water flows. The design of parking lots graded to temporarily pond water during storm events requires care to ensure proper operation during cold weather and to ensure that ponded water does not excessively interfere with use of the parking facilities.

In areas where surface detention is not feasible, underground detention may be an option. Underground storage utilizes some form of buried storage volume, either in line with or off line of the piped storm system to temporarily store peak storm water flows unit such time as the storm event passes and storm water can be released to the piped storm system or infiltration system at a controlled rate. While it may be technically difficult or economically challenging to achieve the entire required storage volume underground,

underground storage may also be used to reduce the over-all surface area / foot print requirements of infiltration facilities. There are a number of proprietary systems on the market that combine buried storage with infiltration.

2.2.6 Source Controls

In order that storm water control measures (BMP's, LID) such as on-site storage or infiltration may be effectively implemented, source control measures may be required in to remove contaminants such as oil / grease hydrocarbons from vehicles. It will also be desirable to allow for the pre-treatment removal of silt / sand sediments that can accumulate from winter sanding operations in order to protect the longevity of on-site stormwater systems.

2.3 SANITARY SEWER SYSTEM

The City of Prince George operates a buried pipe sanitary sewer collection and pumping system that conveys sewage flows from the downtown core to the Lansdowne Wastewater Treatment Plant. Within the RWICD area, the system of buried gravity sewer pipes is located either in rear lanes (from 4th Avenue to 8th Avenue) or in the front road right of way (from 8th Avenue to 11th Avenue).

While the sewer catchment areas are generally defined by the sewermains running parallel to the Avenues, there are also interconnecting sewers between 3rd and 5th Avenue and 9th and 10th Avenue along Vancouver Street. Care is required when evaluating the sewer system to ensure the flow direction and catchment of these interconnecting sewers is properly defined. The sewermains are divided into four main catchment areas that convey sewer flows to two intermediate lift stations (PW 102 & PW 103), prior to the City's largest sewage pumping station, PW 101, at the intersection of Victoria Street and Milburn.

2.3.1 City of Prince George Design Guidelines

The City's design guidelines state that sanitary sewers shall be designed such that the maximum depth of flow in the pipe shall not exceed 50% of the diameter of the pipe. This requirement is similar to other design guidelines such as the MMCD. In practice, a sewermain is not upgraded until the flow depth exceeds 85% of the pipe diameter, or in very exceptional cases until surcharging of manholes or service connections is imminent.

2.3.2 Sanitary Sewer Collection System – Existing Conditions

The City of Prince George sanitary sewer collection system was evaluated by McElhanney in 2001. The 2001 study found that "the City of Prince George's sewer

system has been designed and constructed with appropriate consideration for the impacts of growth. It is generally in excellent shape and is well able to handle most future developments".

The 2001 study estimated contribution sewer flows for and compared pipe capacities. The study identified pipes that were or would in the future, theoretically, be flowing at less than 50% pipe depth, 50 – 85% of pipe depth, and greater than 85% of pipe depth.

The study evaluated the sanitary sewer system under existing conditions and found only one pipe (20th Avenue & Norwood) downstream of the RWICD area that is estimated to be over 85% capacity. Under existing conditions almost all pipes within and downstream of the RWICD area were estimated to be flowing at less than 50% of full pipe depth.

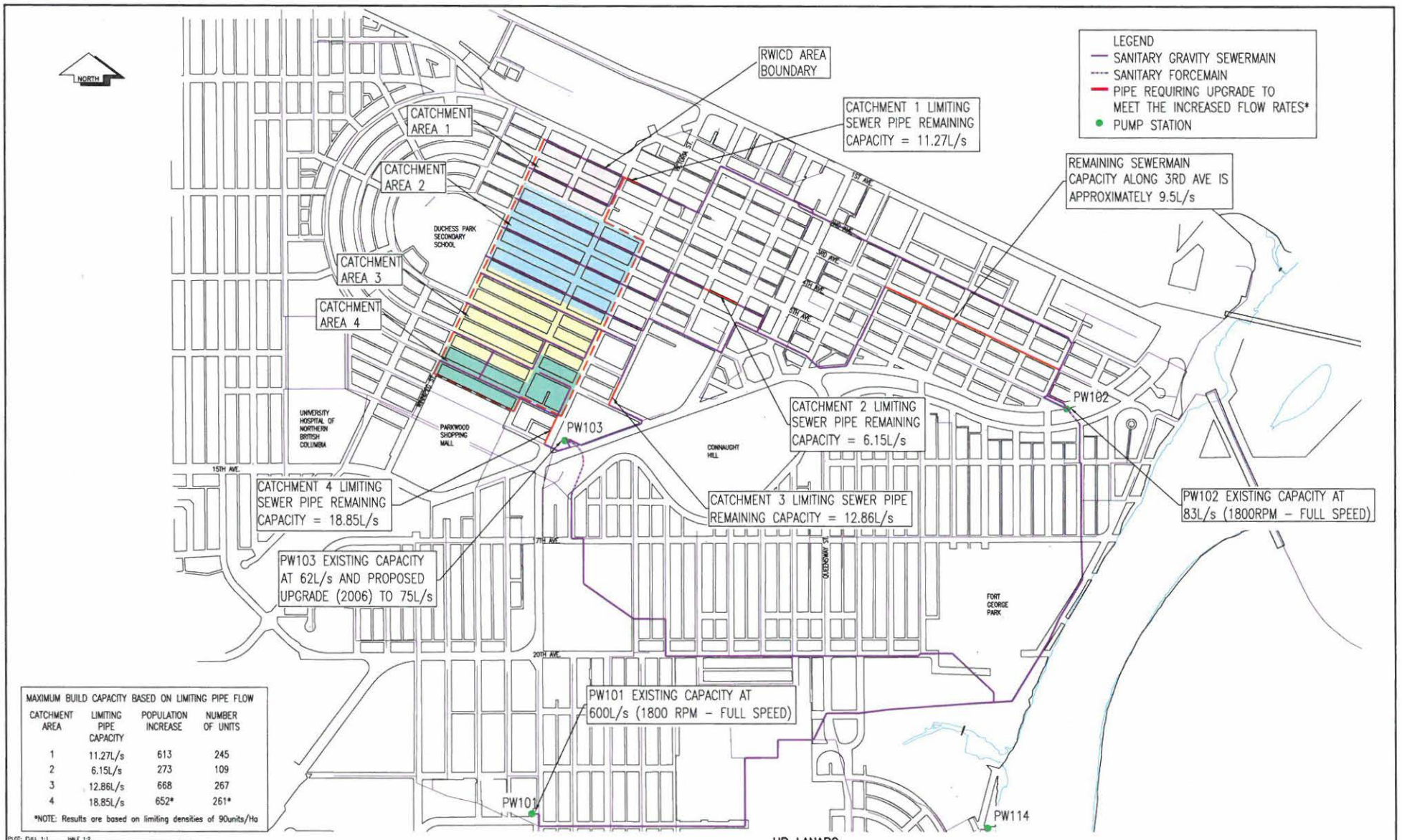
2.3.3 Sanitary Sewer Collection System – Available Capacities

Recognizing the sanitary sewer limitations based on the re-development scenarios developed by HB Lanarc, we have identified critical sections of sewermain for each catchment and identified the amount of development that can be serviced without requiring sewermain upgrades. All of the scenarios analyzed assumed that there was no other downtown re-development that would compete for the available capacity in the critical sewer pipes. These limitations are illustrated in Figure 2-6 and summarized in Table 2-4 below.

TABLE 2-5
REMAINING SEWER CAPACITIES AND ALLOWABLE DEVELOPMENT

Catchment Area	Available Capacity in Critical Pipe Downstream (L/s)	Equivalent Population Increase	Number of Dwelling Units
1	11.3	613	245
2	9.5	483	193
3	12.9	668	267
4	18.9	652	261
Total		2206	882

Table 2-5 demonstrates the amount of development within the RWICD area that can be serviced by the existing sanitary sewer system (without upgrades).



MAXIMUM BUILD CAPACITY BASED ON LIMITING PIPE FLOW

CATCHMENT AREA	LIMITING PIPE CAPACITY	POPULATION INCREASE	NUMBER OF UNITS
1	11.27L/s	613	245
2	6.15L/s	273	109
3	12.86L/s	668	267
4	18.85L/s	652*	261*

*NOTE: Results are based on limiting densities of 90units/Ha

PLOT: FULL 1:1 HALF 1:2

Dayton & Knight Ltd.
CONSULTING ENGINEERS
CEL 708.001

SCALE 1:10,000

HB LANARC
CITY OF PRINCE GEORGE - RWICD
SANITARY SEWER CATCHMENT AREAS AND PIPE CAPACITY - LIMITING CONDITIONS

FIGURE 2-6

2.3.4 Sanitary Sewer Collection System – Full Build Out (2000 – 3200 Dwelling Units)

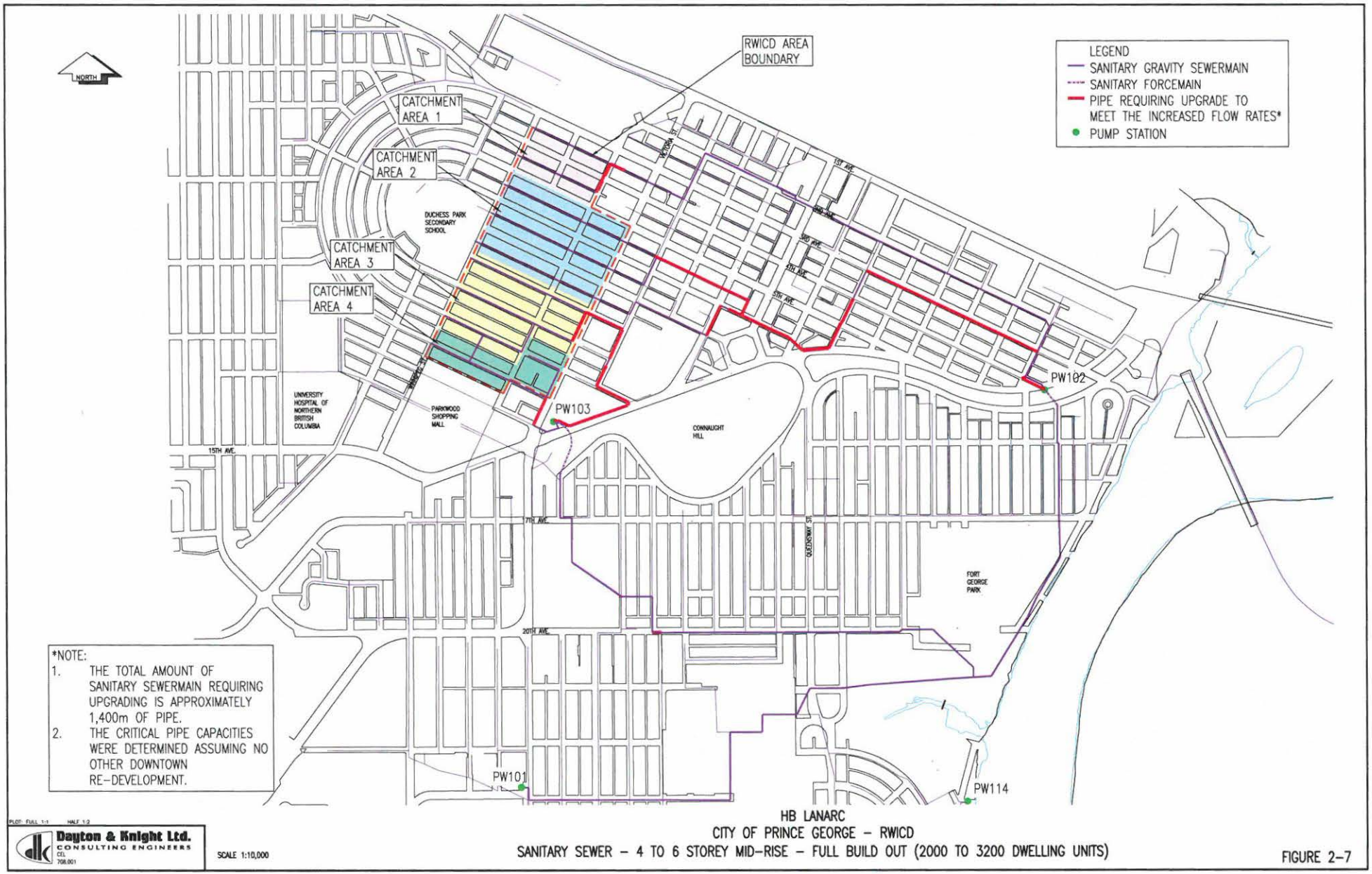
As shown in Figure 2-7, full build out levels of RWICD development could require approximately 2,600m of sanitary sewermain upgrade. Allowing for pipe replacement, road restoration, and service connection replacement, the unit cost of sewermain upgrade is estimated to be in the order of $1,450 per meter. Including allowances for engineering and contingency, the total cost of sewermain upgrades could be in the order of $5 million, in order to service build out levels of RWICD development.

2.3.5 Sanitary Sewer Collection System – 15 to 25 Year Horizon (700 - 730 Dwelling Units)

As shown in Figure 2-8, based on conceptual development plans developed by HB Lanarc, development to levels estimated in a 15 – 25 year horizon of RWICD development would also require downstream sewermain upgrades, particularly downstream of catchment areas 2 and 3. Approximately 1,400m of pipe might require replacement, at costs of approximately $2.75 million, depending on when, where, and how much mid-rise development is proposed in the RWICD area.

2.3.6 Sanitary Sewer Flow Monitoring

The City's sanitary sewer model may be conservative in it's estimates of remaining sewermain capacities. 2002 data from flow monitoring upstream of PW 102 was not useable. The City should re-confirm sanitary sewermain flows and capacities downstream of the RWICD area as development proposals are considered. In order to confirm sewermain capacities and to calibrate the accuracy of the City's sewer model, the City should monitor existing sewer flows in critical sewermains and upstream of PW 102 and 103.



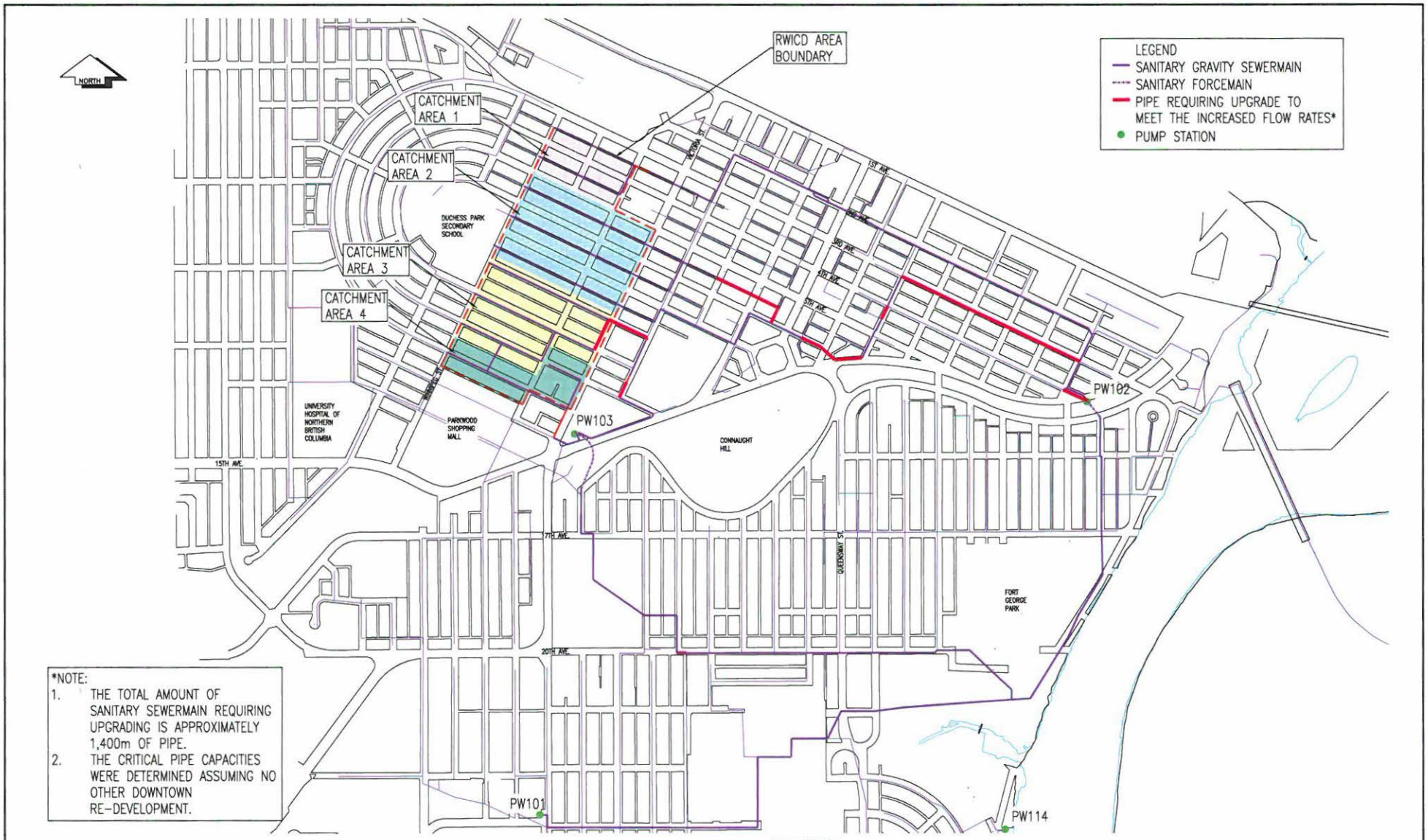
PLOT: FULL 1:1 HALF 1:2

Dayton & Knight Ltd.
CONSULTING ENGINEERS
CEL 708.001

SCALE 1:10,000

HB LANARC
CITY OF PRINCE GEORGE – RWICD
SANITARY SEWER – 4 TO 6 STOREY MID-RISE – FULL BUILD OUT (2000 TO 3200 DWELLING UNITS)

FIGURE 2-7



PLOT: FULL 1:1 HALF 1:2

Dayton & Knight Ltd.
CONSULTING ENGINEERS
CEL 708.001

SCALE 1:10,000

HB LANARC
CITY OF PRINCE GEORGE – RWICD
SANITARY SEWER – 4 TO 6 STOREY MID-RISE – 15 TO 25 YEAR HORIZON (700 TO 730 DWELLING UNITS)

FIGURE 2-8

Sanitary Sewer Pumping Stations

As discussed above, the RWICD is serviced by two larger sewer sub-catchment areas that are each serviced by sewage pumping stations, PW 102 and PW 103. Each of these pumps to gravity trunk sewermain that drain to one of the City's main sewer pumping station, PW 101.

2.3.7.1 PW 102

A review of design brief records for PW 102 indicates that the specified pumps are Flygt CT 3170 MT, with 30 Hp motors and 442 Impellers. At full speed of 1800 RPM, the system / pump curves indicate the pump output to be 83 L/s. This is the same as the capacity of the 450 mm diameter pump station inlet piping. The design brief also indicates the design allowed for build out of the RWICD area as high density multi-family with a density of 370 people / Ha. The design brief for PW 102 would indicate that PW 102 was intended to have capacity that would allow for build out of the RWICD area.

The City's sanitary sewer model estimates existing flows at PW 102 are 26 L/s. Previous flow monitoring indicated peak flows as high as 53 L/s. We assume the difference relates to I & I during periods of extreme rainfall or snowmelt. Assuming the worst case, PW 102 would have remaining capacity in the range of 30 L/s. Under this assumption PW 102 does not have capacity to service build out of the RWICD area with mid-rise construction with four to six storey buildings (additional sewer flows of approximately 56 – 66 L/s), but has capacity to service the RWICD area to levels anticipated by HB Lanarc in the next 15 – 25 years (catchment area 1 and 2 flows of approximately 30 L/s for approximately 440 - 550 additional units)

2.3.7.2 PW 103

Dayton & Knight completed a pre-design report for the proposed upgrade of PW 103 in 2006. The study identified the existing capacity as 62 L/s and suggested a design capacity of 75 L/s. With estimated existing inflows of 39 L/s, PW 103 does not have sufficient surplus capacity to service build out levels of RWICD development (flows as high as 60 L/s from catchment areas 3 and 4), but has capacity to service the RWICD area to levels anticipated by HB Lanarc in the next 15 – 25 years (catchment area 3 and 4 flow of approximately 23 L/s for 300 - 350 units)

2.3.7.3 PW 101

The 2001 study estimated that the capacity of PW 101 would be exceeded in the "not too distant future" and suggested that replacement of the diesel driven pump might be required, including a new generator for back-up power, at a cost of approximately 0.5 million dollars. This recommendation was based on an assumed pump output of 189 L/s, which matches the existing model estimate of pump station inflows. Via the variable frequency drives and reduced pump speed, PW 101 is known be operated at much less its maximum capacity. As the capacity of PW 101 is much higher (approximately 600 L/s) when the pumps are run at full speed, we expect PW101 will have capacity for any level of RWICD development.

2.4 SUMMARY AND RECOMMENDATIONS

Evaluation of existing infrastructure capacities and servicing limitations, relative to the RWICD area, identified constraints with respect to fire protection, storm drainage, and sanitary sewer servicing. Results of the analysis and recommendations are provided below.

1. In order to consider buildings constructed entirely of wood in four to six storeys, the City of Prince George should consider policy that limits development to that which the City can provide adequate water supply for fire protection. This should include requirements for development specific fire protection engineering analysis. Depending on the location, size and type of construction proposed, development requirements that are more restrictive than Part 3 of the Building Code such as:

    - Limits to building footprint or floor area to less than that currently allowed by the Building Code or requirements for incorporation of additional fire walls into building design

    - Limits to the amount of wood construction in exterior wall assemblies or requirements for fire retardant treated wood framing

    - Limits to building location and spacing in order to minimize exposure to other buildings to less than 30 meters.

2. In order to provide water supply for fire protection at levels that are typical for multi-family development (150 -200 L/s), the City should implement improvements to the water distribution. Recommended water distribution system improvements include:

- Installation of 200mm diameter watermain looping along Winnipeg Street from 5th Avenue to 11th Avenue, at a cost of approximately $770,000 (including E&C).

- Replacement of the existing 100 mm diameter watermain with 200mm diameter pipe along 8th Avenue from Winnipeg Street to Brunswick Street, at a cost of approximately $910,000 (including E&C)

- Installation of 200 mm diameter watermain looping on Brunswick Street, from 7th Avenue to 8th Avenue, at a cost of approximately $135,000 (including E&C).

- Installation of additional fire hydrants in order to provide the required hydrant spacing and access from fire trucks to buildings.

3. The FUS Public Fire Protection Classification system is used to evaluate the essential features of a community's fire defences including water supply, fire department, fire prevention, emergency communications, building construction controls, and hazard levels. The last FUS evaluation of the City of Prince George's fire fighting capabilities was completed in 1985. The City should update its FUS Public Fire Protection Classification grading.

4. Storm mains within and downstream of the RWICD area are known to have limited capacities. Pipes within the RWICD area that cannot convey storm flows from the 1 in 5 year or 1 in 10 year storm include:

   - Various pipe segments along Winnipeg, Vancouver, and Victoria Streets
   - 7th Avenue, between Vancouver and Victoria

There are also storm drainage deficiencies downstream of the RWICD area. These include:

- Vancouver and Victoria Street
- Winnipeg Street and Patricia Boulevard trunk storm mains

It may not be economically feasible to upgrade critical downstream storm drainage pipes (Patricia Boulevard & Winnipeg Street trunk mains) to the capacity required to suit RWICD development.

5. In order to avoid significant capital improvements to downstream storm sewers, and to limit post-development storm flows to pre-development levels, development in the RWICD area should be required to implement on-site storm water control measures such as:

    - Limiting the net increase in impervious area.

    - Low Impact Development (LID) practices (i.e. recharge chamber, infiltration storm water disposal fields, perforated storm drain pipes, bio-swales, rain gardens) that would utilize native permeable sand and gravel soils to infiltrate a portion of the storm run-off.

    - On-site storm water detention.

6. The City's sanitary sewer model indicates that sanitary sewer pipes within and downstream of the RWICD area have limited remaining capacity. Over the next 15 – 25 years, approximately 1,400m of pipe might require replacement, at costs of approximately $2.75 million, depending on when, where, and how much mid-rise development is proposed in the RWICD area. In the longer term, in order to accommodate full build out of the RWICD area, as much as 2.6 km of downstream

sewermain might require upgrade at an estimated cost of approximately $5 million (2010 dollars, including E&C).

7. Existing sanitary sewer lift stations downstream of the RWICD area are estimated to have capacity to service RWICD development to levels anticipated in the next 15 – 25 years. PW 102 and 103 would need upgrade if build out levels of RWICD development were to be considered. The replacement cost of PW 103 has previously been estimated to be approximately $1.4 million (2006 dollars, including E&C).

8. The sanitary sewer system upgrades identified in this study may not be needed in the foreseeable future. The City should confirm downstream sanitary sewermain capacities as development proposals are considered. This should include monitoring of sewer flows in critical sewermains downstream of the RWICD area and upstream of PW 102 and 103.

REFERENCES

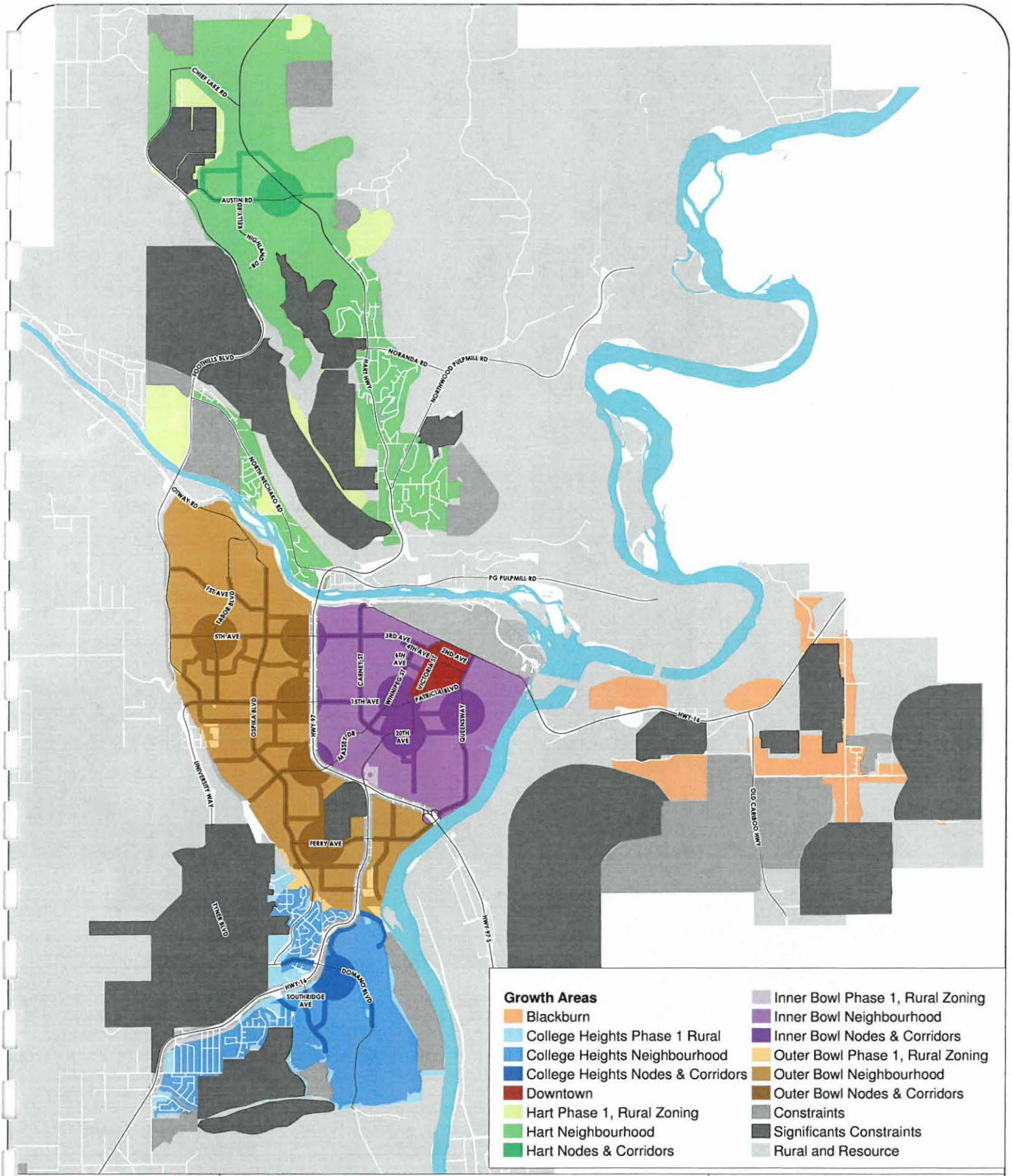
2001 Sanitary Sewer Study, McElhanney Consulting Services Ltd., June, 2002.

City of Prince George Design Guidelines, Development Services Department, Draft, July 2001.

Hudson's Bay Slough Watershed Drainage Plan, Associated Engineering, 2005.

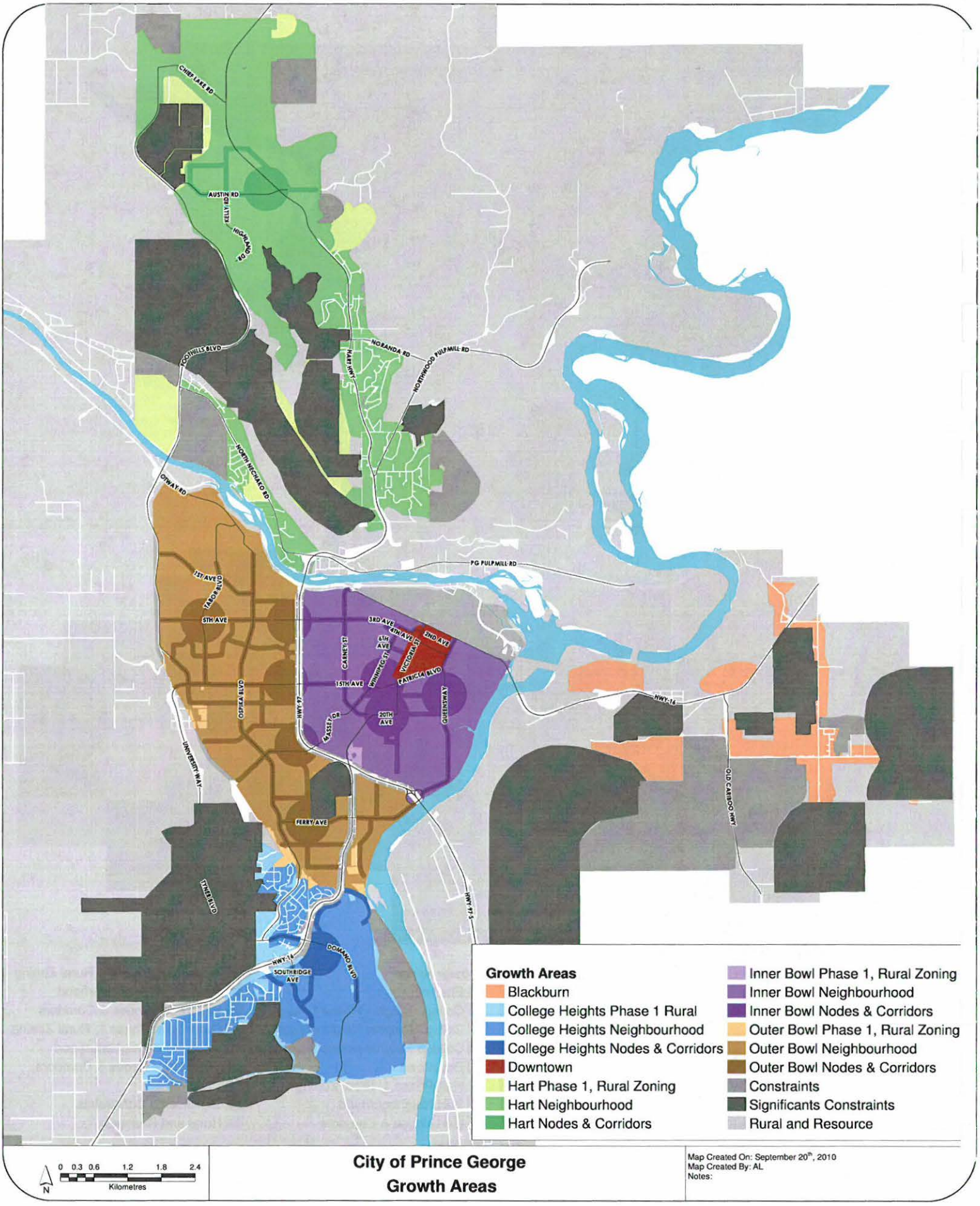
Water Supply for Public Fire Protection, Fire Underwriter Survey, 1999.

Appendix C: myPG Draft OCP Growth Scenarios



City of Prince George
Growth Areas

Map Created On: September 20th, 2010
Map Created By: AL
Notes:


CHIEF LAKE RD
AUSTIN RD
KELLY RD
HIGHLAND DR
FOOTHILLS BLVD
NORTH NECHAKO RD
OTWAY RD
NORANDA RD
HART HWY
NORTHWOOD PULPMILL RD
PG PULPMILL RD
1ST AVE
TABOR BLVD
5TH AVE
3RD AVE
4TH AVE
2ND AVE
4TH AVE
CARNEY ST
WINNIPEG ST
VICTORIA ST
PATRICIA BLVD
15TH AVE
QUEENSWAY
20TH AVE
MASSEY DR
HWY-97
OSPIKA BLVD
UNIVERSITY WAY
FERRY AVE
HWY-16
OLD CARIBOO HWY
TAYLOR BLVD
HWY-97S
HWY-16
SOUTHRIDGE AVE
DOMANO BLVD
Growth Areas
Blackburn
College Heights Phase 1 Rural
College Heights Neighbourhood
College Heights Nodes & Corridors
Downtown
Hart Phase 1, Rural Zoning
Hart Neighbourhood
Hart Nodes & Corridors
Inner Bowl Phase 1, Rural Zoning
Inner Bowl Neighbourhood
Inner Bowl Nodes & Corridors
Outer Bowl Phase 1, Rural Zoning
Outer Bowl Neighbourhood
Outer Bowl Nodes & Corridors
Constraints
Significants Constraints
Rural and Resource
N
0 0.3 0.6 1.2 1.8 2.4
Kilometres
City of Prince George
Growth Areas
Map Created On: September 20th, 2010
Map Created By: AL
Notes:

City of Prince George DRAFT Growth Scenarios (October, 2010)

Name	Dispersed	Centres and Corridors	Compact	Base Case
Blackburn	100	50	0	165
College Heights Neighbourhood	710	450	300	1130
College Heights Nodes & Corridors	130	290	650	155
College Heights Phase 1, Rural Zoning	135	60	0	145
Downtown	80	900	900	0
Hart Neighbourhood	540	400	250	1010
Hart Nodes & Corridors	40	200	465	80
Hart Phase 1, Rural Zoning	225	0	0	40
Inner Bowl	680	680	1050	70
Inner Bowl Nodes & Corridors	260	840	1325	40
Inner Bowl Phase 1, Rural Zoning	5	5	0	0
Outer Bowl	1000	650	300	410
Outer Bowl Nodes & Corridors	365	860	260	190
Outer Bowl Phase 1, Rural Zoning	30	15	0	0
Constraints	1100	0	0	1315
Significant Constraints	0	0	0	200
Rural and Resource	100	100	0	550
Total	5500	5500	5500	5500

Appendix D: Public Feedback

1.	[signature]	C. Castle	1677 7th Ave P.G. 562-5692.
2.	[signature]	D. Cutts	Prince George
3.	[signature]	C. Cutts	Sherwood Park, AB
4.	[signature]	M. Cutts	P.G. BC.
5.	[signature]	C. Lakanen	P.G, B.C. 617-1046
6.	[signature]	D. MARCOTTE	P.G. BC. 562-0760
7.	[signature]	J. Smaaslet	PG BC.
8.	[signature]	J. Church	PG B.C 640-8828
9.	Janell Karantzos	[signature]	PG, BC
10.	[signature] Martens		Vanderhoof 250867491
11.	Kristine Martens		Vanderhoof 250 567 49
12.	[signature]		Vanderhoof
13.	[signature]	K. Hill	P.G.
14.	[signature]	M. Wees	PG.
15.	[signature]	D. Fornelli	PG
16.	[signature]	B. Freindorf	P.G.
17.	[signature]	H. Callaghan	P.G.

18. Cory Ch C. Church PG BC

19. Angela Church A. Church PG BC

20. Rick Callaghan PG B.C.

21. Kelly-jo Tagami PG BC

22. Tari Callaghan. PG. BC.

23 Corbine Callaghan PG. BC.

24 Andrea Formanczyk P.G. BC

25 Alec Stewart P.G. BC.

26 [illegible] Formanczyk P.G. BC.

27 [signature] PG BC

28 [signature] P.G. - B.C.

29 Mary Weiss P.G. BC

30 Sharon Seconds P.G. - B.C.

31 Elden Tombs Elden Tombs PG BC

32 Rene Ammundsen P.G. B.C.

33 Rene Ammundsen P.G. B.C

34 L. Tregos PG BC.

35	Stephanie Lajoie			250-962-6596
36	Lindsay Knight		Pr. George	962-6192
37	Mallory Lajoie.		P.G	604-721-1540.
38	Chris Crosby		P.G	250-963-9540
39	Lorne Duncan		P.G	250-964-2088
40	Angela Campbell		P.G.	250301-6542.
41	Leslie Campbell		A.G.	250-964-7669
42	Dana Lakanen		P.G	250-971-2527
43	Faye Johnson		P.G.	250-971-2284.
44	Anna Cook		Prince George	
45	Kayla Cherkas	Kayla Cherkas	Prince George	
46	Brandy Miller		P.G.	
47	Imelda Palfy		D.C.	250-782-5992
48	Gerardine Palfy		P.G	250-640-5992.
49	Lynette Carver		England.	
50	Heather Carver		England.	
51			Prince George	
52	Rosalind Solonas	ROSALIND SOLONAS	Prince George	
53			P.G	
54			P.G.	
55			P.G.	
56	M. Meyer		P.G.	
57	Cheryl Christie		P.G	
58	Madison Mitchell		P.G.	(250) 563 4365
59	A. Eberle		P.G	
60	M Eberle		P.G.	
61	Wendy Vankoll		P.G.	
62	Jenni Vankoll		P.G	
63	Ruth Sullivan	RUTH SULLIVAN	P.G.	
64	Tarah Young		P.G	
65	Cheryl Young		P.G.	
66	Casey Castle.		Pr. George.	
67	Gary Castle		Pr. Geo.	
68				

69	Janessa Vandenberg	Janessa Vandenberg	Smithers B.C.
70	Kristi Vandenberg	Kristi Vandenberg	Telkwa B.C.
71	Diane Roberge.	Diane Roberge	Prince George B.C
72	Megan Campbell	Megan Campbell	Prince George B.C
73	Abby Cherry		Prince George BC
74	Verna Boonstra.		Telkwa, BC.
75	Kathleen Vandenberg	Kathleen Vandenberg	Telkwa BC
76	Wendy Boonstra		Telkwa. B.C.
77	Lisa Turner		Prince George BC
78	Tanya Konkin		Prince George B.C
79	Nicole Michael	Nicole Michael	Prince George BC
80	Donna Pratt		P.G
81	Marcella Lupul		P G
82	Britlany Lupul		P.G, B.C
83	Taylore Thomas	Taylore Thomas	P.G, B.C
84			
85			

Flip chart 1:

6 storey – 50 units

Where are the best locations?

- 11th Ave (4 & 6) storey.
  - Adjacent to Parkwood Mall. 6 storey only shown at Vancouver & 11th Ave.
  - Vacant lots
  - Underground parking would work well here due to topography.
- Along Victoria – Commerical. Below w/ res above.
- Vancouver – Commerical, perhaps w/ res above.
- A number of models to consider i.e. beyong SF homes – eg. Aging population that want lower maintenance, near amenities. Eg. Young people to live near amenities and activities.
- 4th Ave – Commerical with resid.

Concern

- On-street parking restrictions
  - Time limitations
  - Snow removal.

  Combo of:
  - Tuck-under parking
  - On-street – above ground.
- Parking out front of businesses may add to the feel (animates street)
- Streets – are they wide enough to accommodate street traffic?
- Weather a consideration for walkability.
- Aging population may decrease depending on vehicles.
- Sound – difference between concrete and steel vs wood.
- The 4 or 6 story high does not necessarily have to be wood.

Amenities

- Smaller grocery stores
- Daycare
- Greenspace (incl. Duchess Pk)
- Community gardens
- Street calming features – Winnipeg Street feels too wide, speed.
- When considering higher density, need for elementary school.
- Greenway along 7th Ave, very wide, Green medians at ends.
- Greenway (old Prince Rupert Rd) need to be well lit.
- "Blue" park on 7th Ave if further densification.

Shadow impact?

Best locations

- Vancouver, Prince Rupert, 4th Ave & 5th Ave – European Model
- Courtyard
- 6-storey from Vancouver St and then less as you transition inwards
- Affordable rental housing eg – University Students.
- Ped lighting, eyes on street.
- Ecra: currently and on-street parking problem which could become worse with densification. Provide more off-street parking.

Concerns

- Does this not conflict with Downtown Densification? – Demand may be more within transitional area. As it may be more attractive to live here.
- 4 storeys is fine as is.
- A market study would have to analyze a number of items on this.
- What about other typologies? SFD, townhouses etc?
- Limitations on "stepping back" development.

Flip chart 2:

Parking

- City will not allow on st.
- Snow removal and street park
- If you create lane access to need higher sources levels for snow clearance.
- 4,5,6 storey will require snow clearance in lanes at greater frequency.

- 6 storey only between Victoria and Vancouver.

- Not too many multi-family on the block.

- Parks/greenspace in a few key locations.

- Buffer mall with taller residential.

- Traffic concerns on 3rd and Winnipeg (stop sign is bad – needs light). Plus fire trucks will have problems with usability with high buildings if they travel on 7th ave a lot.

- Sidewalks on north side.
- Both sides on wider avenues.
- Crosswalks at Winnipeg, Vancouver and Victoria.
- Seniors near mall, hospital and clinic.

Flip chart 3:

- School needs (Primary) – How far do our youth need to walk?
- Do we want to have such large buildings?
- Is first floor residential a problem with snow?
- Need to balance safety
- Why 6 storey?
- Which comes first, residential and commercial.
- Don't want continuous large 4 or 6.
- Or continous narrow lots.
- It will produce slums.
- Where do you park.
- Recently moved, but wouldn't support "high rise" 6 storey
- Like commercial with residential. Above on Victoria. Step down to residential.
- Concern about light access.
- Need variety.
- Need green space.
- Look at other building styles.

- Victoria to Van allow mixed comm. + res.
- 60' will give you private green space.
- 4 storey needs articulation and green space on site.
- There is a need for a sidewalk where 4th goes into 5th.
- Sidewalk needed on 10th at Bus stop.
- Street lighting on ends!
- What about carriage homes on single family lots.
- Walk to local conveniences (walkability).
- Research done on market demand for Apt. Vs. Sf.
- Traffic calming needed.
- Over 65s want single family too!
- Transition of bulk is reasonable 4-single storey
- If you don't have underground parking is bad and we have on-street parking problems now in some areas.
- Concern with operation of traffic circle.
- Homogenous form NOT desirable.
- Whole block doesn't need to be parking at read – not front.
- Parking to be used in set-back areas between 4 storey buildings.
- Integrating green space in parking areas.
- Wood is great but not the issue – form is.
- 6 storey is economic opportunity.

- Mixed use + res. + com. Mix on a "whole block" basis could work – this may not be affordable for new home buyers.
- Storey can transition (about) on Parkwood Mall.
- Flood plain concerns.
- Is there the demand for 6 storey?
- 6 storey along Victoria and near Parkwood.
- Some courtyard centered buildings.

Feedback forms:

City of Prince George – Residential Wood-frame Initiative Questionnaire

Question 1: Would you like to see 6 storey wood-frame buildings in this area?

- No, I don't think the market demand is there yet. Perhaps in 20 years after the downtown (East of Victoria) is built up.
- Yes.
- No.
- No.
- No.
- No, unless on Victoria Street.
- 6 Storey – No!!! Doesn't matter what they are made of. 4 stories or less – ok, provided not too dense.
- Only in transition areas between Victoria and Vancouver. No 6 storey between Vancouver and Winnipeg.
- In a specific area, between Vancouver and Victoria St.
- No – maybe between Victoria and Vancouver, but with commercial on the main floor. I don't care what type of material is used to build as it is the height. Limit the number of 2, 3, 4 story buildings in this area.
- No! Except between Victoria and Vancouver.
- No.
- No, I feel 6 story units would be too much, too tall and too much traffic and parking. *(This is crossed out and replaced with* Yes.)
- Yes! Something innovative for economical densification. However keep a good mix.

- A very limited number. Noise quality is reduced inside and outside. Poor insulation up and down ie. Hear toilet flushing – walking – heating.
- Yes.
- No – would like to see concrete in this size. Prefer no higher than 4 storey.
- Yes, between 6 + storey buildings to the East and the 5 storey buildings to the west.
- No to the 6 storey buildings/ Wood frame is fine.
- I think they are feasible where topography presents graded heights therefore I think 6 storey would be the most appropriate at the end of the blocks. I think a market study needs to be done to determine why 4 storey buildings are not being built.
- Along Victoria/Vanc St with Commercial on the bottom. – Need to be one green space between and minimal surface parking lots.

- No, I would not. As it was explained to me, it would be too expensive to provide underground parking, therefore where would the people park? I feel 4 storeys with ground floor parking are perfectly adequate.
- I see it as a heritage block.
- No – It is of my opinion that any construction and ground disturbance can compromise the existing neighbouring sanitary sewers, water systems that runs back alley. The existing system is likely 8 decades of age.
- No. It would be nice to keep this a heritage subdivision.
- No – this is a family neighbourhood – it should stay that way.
- I love the downtown area just the way it is. Downtown PG is a Heritage area and the beauty of it should be preserved. A building of that sort should be in a newer area of PG.
- No, it would be disproportionate for the rest of the residence in this area.
- No, this is more of a residential heritage area. A 6 storey building belongs on Victoria Street with all the other tall buildings. No!
- No, this is more of a heritage area. Large apt. complex would ruin the area. No way!!!!
- No, this is a residential area and it would change the impression/feeling of the area.
- No, leave as single family dwellings.
- No, this is a residential area. Keep it that way.
- No – very out of place.
- No. I would think it is a residential area.
- No, this is a residential area with many long term residents. This is not something our area needs.
- No; Older neighbourhood, don't change the heritage look of single dwellings.

Question 2: If so, where, and what should they look like?

- Throughout area as demand and economics dictate.
- 3 or 4 (or possibly 5 stories) over 1 storey commercial. No further west than Victoria.

- Commercial with residential above.
- Should be consistent with existing structures aesthetically. Ie. Not featureless boxes.
- Closer to Victoria. In planned zoning if correct design.
- Corner lots for 4 storey and 6 storey Victoria to Van St.
- Fire light at 7th and Winnipeg. Light at 3rd from Winnipeg. It's really hard getting onto 3rd.
- Only between Victoria and Vancouver and possibly next to Parkwood. Would like to see commercial on main level with apartments above.
- 2 Storey of commercial, 4 of residential.
- Between Victoria and Vancouver Streets. On 11th Ave along the backside of the mall. Lower buildings building up to higher buildings on Victoria.
- Greenery (house looking) Victorian look town houses. Garages in back of town house.
- Between Vancouver and Victoria Streets and 4th and 9th Ave.
- The existing Crescents neighbourhood plan allows 4 storey. That is sufficient! By trying to put in 6 storey you create conflict in an existing single family area and you pull potential housing away from the real downtown!
- Along Victoria, Winnipeg or along a common central green space. Parking built underneath or ½ underneath to provide covered parking. Not open ugly lots.
- Varied designs – push engineers and architects to be creative (box models are unacceptable) Green belts. Weed to look at energy, efficiency . Look to day light buildings; also thermal.
- I like the idea of business underneath and condos on top, around Victoria and Vancouver Streets.
- They are not suited to be in that area.
- Parks and greenways would be ideal as long as they are regularly maintained and monitored against vagrancy. If the city wishes to urbanize they should take into account that we are a small city and that people enjoy the fact that there isn't a lot of large structures. Three storey buildings should be the max. Let housing neighbourhoods be just that!

Question 3: What kinds of public realm amenities (sidewalks, street trees, parks, greenways, etc.) should accompany the gradual densification of this area, and where?

- As population increases, an elementary school and appropriate green space would be required.
- Extend Rupert Street as green space. Build condos with green space around the parking and for BBQs.
- All *(with arrow underlining "What kinds of").*
- Sidewalks leading to downtown. Park/courtyards throughout area.
- Sidewalks on both sides of street. Frequent street lights. More crosswalks. Bike lanes. Traffic calming.
- All to support a sense of community and pride ie. Sidewalks, trees, lights, roundabouts, bike lanes.

- Sidewalks both sides, trees, bike lanes.
- Improve sidewalks and green space.
- Widen streets, sidewalks, street lights, more parking.
- 7th ave should become a greener walking space. Ensure green space.
- Safe walkways, safe bike routes, good access to bus transportation, neighbourhood stores ie. Groceries, hairdresser, bank.
- Neighbourhood parks and large buildings should be surrounded by lawn and greenery and possibly a fence (like a courtyard).
- Lighting – park – backalley – pave them. Street signs, reduce development costs, parking.
- Sidewalks on both sides of each wide avenue. Sidewalks on North side of each narrow avenue. Connected by crosswalks between Winnipeg and Victoria Streets.
- Ornamental street lights and street signs. 7th Ave a greenway planted with elm trees ; like Millan addition has now. More cobblestone walkways. Make a cobblestone street to calm traffic.
- Green walkway, blvds, trees.
- All of the above; but need to be major streets with other streets as residential with roundabouts. City needs to decide where they want development – golf course, downtown, College Hills, Westgate or this area??

Question 4: Other comments.

- We need more sidewalks, fewer potholes, more crosswalks, more streetlights, and no 6 story buildings west of Victoria.
- Nowhere, ever (*"see 5 and 6 storey wood frame buildings be permitted in the future" is underlined*).
- As a senior I would prefer semi or row housing with individual green space. Also for the value of my house could NEVER dream of moving into a condo because of cost.
- % of space = rentals. Encourage work/live space with businesses on the bottom.
- There is a lack of understanding what can be done with wood. Wood is eco-friendly vs concrete. There are lots of designs with wood elsewhere which can make wood attractive. There is a need to look at better use of energy. Contact the University of Washington and Power Smart.

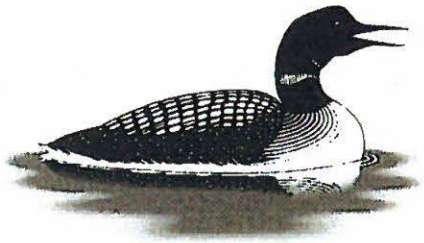
Summary

A total of 62 feedback forms were received, 51 of which strongly indicated that 6 storey wood frame buildings would not be suitable in this area. Several people noted that this is a well developed heritage area which is primarily made up of single family houses. They feel that the introduction of 6 storey buildings would affect the character of the area and would look very out of place.

Of the 11 that responded positively to the introduction of 6 storey buildings, the majority indicated that they should be placed in the area between Victoria and Vancouver Streets. Additionally, the buildings should be mixed use rather than exclusively residential and should be architecturally interesting.

Additional amenities that should accompany the densification of the area include:

- Additional Green space & Street Trees;
- Sidewalks on both sides of street;
- Frequent street lights & crosswalks;
- Bike lanes;
- Access to bus transportation & neighbourhood amenities;
- Increased lighting.



William & Virginia Karr
203 – 1638 6th Avenue
Prince George, BC, V2L 3N6
karr@mag-net.com

Tiina Watt, Long range Planner
City of Prince George Planning & Development
1100 Patricia Boulevard
Prince George, BC, V2L 3V9

November 6, 2010

Dear Ms Watt,

We are writing concerning the "Proposed Residential Wood Innovation Comprehensive District" for Prince George – 12th Ave. to 3rd etc.

While increasing the downtown density of Prince George might look like a good thing for many reasons, we see the following problems:

- To the best of our knowledge, there are no elementary schools close enough for students to walk to. This will mean far more car traffic on local streets. One advantage of dense areas is that students can walk to school.

- More larger buildings means that there will be more pollution involved in heating unless you also require such buildings to heat with geothermal.

- Will the current infrastructure support the proposed increase in density?

As to requiring wood construction, this could in future cause undue problems because local wood may become uneconomic because of widespread deforestation due to the pine beetle infestation. Also, what old growth forests we have left might be far more important as carbon sinks than for construction.

Thanks for considering our views,

Virginia Karr
William Karr

City of Prince George – Residential Wood-frame Initiative
Questionnaire

CITY OF PRINCE GEORGE

Watt, Kristiina

From: Ellisha [ellisha77ca@hotmail.com]
Sent: Tuesday, November 16, 2010 4:47 PM
To: Watt, Kristiina
Subject: Community Design Workshop

I was unable to attend the meeting on November 2 in regards to the Residential Wood Innovation Comprehensive District where 6 storey buildings would be permitted in the historical area of prince George. While I commend the use of wood in building, I do not believe that 6 storey residences would benefit our neighbourhood. They would be huge monstrosities in among the mostly quaint, historical houses that are in this area. I don't mind duplexes or perhaps 3 storey buildings, but 6 storey buildings are just too large for our area.

I think that the current structural plans should not be altered. I do understand the desire for economic growth in downtown Prince George, however, I know that with the majority of businesses and new housing being built in the College Heights area, the downtown area is not attracting the desired population type. As someone who lives here, more undesirable housing will only attract people who are undesirable to our neighbourhood. Most people I know do not want to live down town as they feel that it is "dangerous" to live down here. Unfortunately, I have to agree. I live here but no longer feel safe in my own home, there are many people on the streets at all hours and it seems to be getting worse and not better. I think the city should be more concerned with getting Prince George off the number 1 spot on the most criminal activity list in Canada than changing established Community Plans for the worse.

Sincerely

Ellisha Nelson
1696 5th Ave

The Prince George Citizen
150 Brunswick st
Prince George. BC.

Mar 18. 2010

Dear Editor:

She came from the best of stock, a shinning example.... She had the finest of everything, envied by all those around her. In her time she was tall and statley and as the years slipped by she remained steadfast, her exterior slightly faded, but inside she shone. Every holiday and special occassion she would greet her guests adorned in her finest. family and friends all loved her, and looked back with fondness, remembering delightful times spent celebrating. Oh what laughter and joy she saw!

Eighty plus years are behind her now, but still our fabulous old gal stands strong. her loving families have cared for her, loved her, poured their hearts into her. However saddly soon she will be shrouded by darkness and what was once a brilliant testimony to craftsmanship, built for the Checkley family in 1929, our grand old gal will have a six storey apartment building constructed right next door.

The beautiful english style garden in the rear of our home has been visited by many. They are invited to linger and take lunch amongst the perrenial beds, while gold fish dance and frolic in their sunken pond. Flowers and scrubs (gifts from friends) will now struggle to bloom being hidden from the warmth of the life giving sun.

For those of you that love and cherish your oldtimers for their ambiance and historic value, watch and listen to make sure developers can't go forward any longer and build huge projects next door to you, stripping our heritage style homes of their heartwarming character.

I live at 1677 - 7th Ave. between Vancouver and Winnipeg streets so for you lovers of hardwood floors, local Douglas Fir beams, and sash windows with lath and plaster walls (what stories they could tell) I plead with you, don't let this travesty occurr. My home is open Tues. to Sat. 9:30 to 5:30 if you would allow your precious signature to speak for you and say no to oversized buildings in our neighbourhood tainting the skyscape, I welcome you and say thank you.

Sadly
Mr. & Mrs. C. Castle