# Memo

City of Kelowna

**Date:** October 14, 2011

**To:** City Manager

**From:** Land Use Management, Community Sustainability (AW)

**Application:** OCP10-0008 / TA10-0007 / Z10-0040 **Owner:** John & Alana Marrington
John Balla

**Address:** 2149, 2159, 2169, 2179, 2189 Pandosy St. **Applicant:** Site 360 Consulting Inc.

**Subject:** OCP Amendment, Text Amendment & Rezoning - Supplemental Report

Existing OCP Designation: Multiple Unit Residential - Low Density
Proposed OCP Designation: Health District

Existing Zone: RU6 - Two Dwelling Housing
Proposed Zone: HD2 - Hospital & Health Support Services

## 1.0 RECOMMENDATION

THAT Council receive the Supplemental Report from the Land Use Management Department dated October 14th, 2011 for information;

THAT Council forward a Bylaw authorizing Housing Agreement Bylaw No. 10624 between the City of Kelowna and John & Alana Marrington & John Balla which requires the owner(s) to designate 3 short term rental units dedicated to hospital and cancer patients at a rate equivalent to the Southern Interior Cancer Centre as established by the Ministry of Health Services on Lot 1, D.L. 14, ODYD, Plan 3216 located at 2149 Pandosy Street, Lot 2, D.L. 14, ODYD, Plan 3216 located at 2159 Pandosy Street, Lot 3, D.L. 14, ODYD, Plan 3216 located at 2169 Pandosy Street, Lot 1, D.L. 14, ODYD, Plan 5973 located at 2179 Pandosy Street, Lot 2, D.L.14, ODYD, Plan 5973 located at 2189 Pandosy Street, Kelowna, B.C. for reading consideration.

## 2.0 BACKGROUND

Council originally considered the development proposal at their regular meeting of October 18, 2010 and requested that the applicant proceed with the required infrastructure impact analysis, specifically to embark on a transportation impact assessment. This report provides the supplemental information and an updated Development Engineering memorandum outlining the specific infrastructure requirements.

The applicant has made application for an Official Community Plan amendment to change the future land use designation of the subject properties from the existing Multiple Unit

Residential - Low Density and Single Two Unit Residential designations to the newly proposed "Health District" designation. A Text Amendment application has been submitted in order to add the proposed HD2 - Hospital & Health Support Services to Zoning Bylaw No. 8000. Accordingly, the development proposes to rezone the subject properties from the existing RU6 - Two Dwelling Housing zone to the proposed HD2 - Hospital & Health Support Services zone in order to facilitate the proposed mixed-use development.

## 3.0 PROPOSAL

The proposed HD2 zone will create a zone that provides services to the medical community associated with the Kelowna General Hospital, Interior Health Authority, and UBC Medical Programs that include staff, clients, patients and their families. This zone will provide for a range of institutional, commercial and residential uses. In particular the proposed zone includes the following commercial uses: Personal Service Establishments, Emergency and Protective Services, Extended Medical Treatment Facilities, Health Services, Retail Stores, Health Products, Food Primary, Apartment Hotel and Hotel.

The HD2 zone contemplates a maximum Floor Area Ratio (FAR) of 1.4, which is a density profile similar to the RM5 - Medium Density Multiple Housing Zone and the C4 - Urban Centre Commercial Zone. The proposed height of 16.5m / 4 storeys would also be comparable to a RM5 or C4 form of development. The underground / under-building parking access will be from Royal Avenue, while the loading area will be accessed from the rear lane. The parking podium will be partially underground and cover the entire site.

Although the comprehensive project details will change due to site and design revisions, the original concept proposed a 4 storey mixed use building with 43 residential units and approximately 1152m$^2$ of commercial space located on the ground floor. The proposed development would provide a mix of ownership and rental units, and the rental units would be for both short and long term tenants. The applicant has indicated that the commercial component of the project consists of 7 commercial retail units (CRU's) and a Food Primary Area with a maximum of 32 seats. The applicant's intention is to provide a range of health related commercial uses within the main floor of the proposed development. Notably, the property located at 2189 Pandosy Street is on the City of Kelowna's Heritage Register, and the current concept proposes to incorporate the heritage home into the project build-out.

## 4.0 SUPPLEMENTAL INFORMATION

A comprehensive Transportation Impact Assessment and a subsequent review of this assessment have been completed to summarize the directly attributable transportation and infrastructure issues associated with the proposed development. As part of this undertaking, the appropriate road widenings and infrastructure contributions have now been agreed upon. The applicant will be contributing to a signalized pedestrian crossing at the corner of Pandosy Street and Royal Avenue in addition to dedicating land along the Royal Avenue frontage of the property. Road realignment and urbanization of Royal Avenue has also been finalized in addition to final Glenwood Avenue and public laneway improvements. As such, the infrastructure details that were outstanding at the initial Council meeting have now been confirmed.

Since this application was initially reviewed by Council, revisions have been made to the proposed HD2 zone. While most of the regulations for the proposed development are relatively unchanged, Staff have worked with the applicant to introduce another category within the zone that allows smaller lots to be converted to smaller scale health/medical-related uses. Therefore the HD2 zone will be able to accommodate both significant redevelopments when the appropriate lot consolidations have been made and smaller conversions for single lots.

Staff have also been working with the applicant to secure 3 rental units (1,400ft$^2$) with the intention of exclusive use for Cancer Centre and KGH patients and their families and caregivers at a rate equivalent to that of the BC Cancer Lodge (determined by the BC Ministry of Health). It should be noted that Staff would have preferred to have seen more units of this nature secured in the agreement, as the applicant has indicated that this is the underlying motivation for pursuing this development concept.

Report prepared by:

_____

Alec Warrender, Urban Land Use Planner

**Reviewed by:**

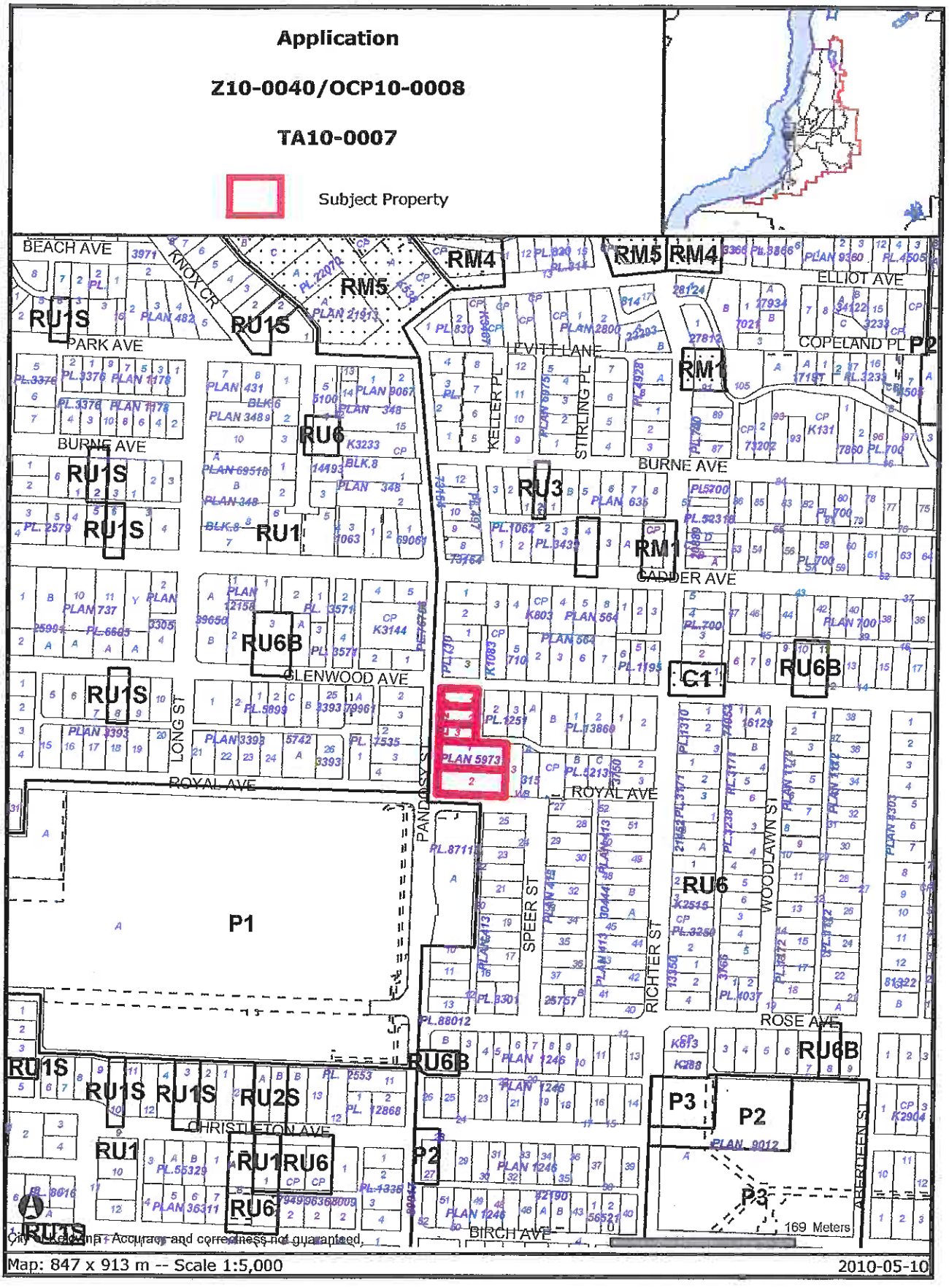
Danielle Noble, Urban Land Use Manager

**Approved for inclusion:**

Shelley Gambacort, Director of Land Use Management

Attachments

- Location Map
- Development Engineering Memorandum (revised)
- Housing Agreement




*Certain layers such as lots, zoning and dp areas are updated bi-weekly. This map is for general information only. The City of Kelowna does not guarantee its accuracy. All information should be verified.*

Schedule "A" - Attachment #1

## HD2 – Hospital and Health Support Services

### 1.1 Purpose

The purpose is to provide a zone for the conversion and new development of buildings that provide services to the medical community associated with the Kelowna General Hospital, Interior Health Authority, and UBC Medical Programs including staff, clients, patients and their families. This zone will provide for a range of institutional, medical-related commercial and complimentary residential uses within the Official Community Plan Health District future land use designation.

### 1.2 Principle Uses

1.2.1 The **principle uses** for properties with a **lot area** of 900m² or more are:

(a) **multiple dwelling housing**
(b) **personal service establishments**
(c) **emergency and protective services**
(d) **care centre, major**
(e) **congregate housing**
(f) **extended medical treatment facilities**
(g) **health services**

1.2.2 The **principle uses** for properties with a **lot area** of less than 900m² are:

(a) **single dwelling housing**
(b) **care centre, minor**
(c) **health services**

### 1.3 Secondary Uses

1.3.1 The **secondary uses** for properties with a **lot area** of 900m² or more are:

(a) **retail stores, health products**
(b) **food primary establishment**
(c) **apartment hotel**
(d) **hotel**
(e) **community recreation services**

1.3.2 The **secondary uses** for properties with a **lot area** of less than 900m² are:

(a) **bed and breakfast homes**
(b) **home based business, major**
(c) **home based businesses, minor**
(d) **secondary suites**

### 1.4 Subdivision Regulations

1.4.1 The subdivision regulations for properties with a **lot area** of 900m² or more are:

(a) The minimum **lot width** is 30.0 m
(b) The minimum **lot depth** is 30.0 m
(c) The minimum **lot area** is 900 $m^2$

1.4.2 The subdivision regulations for properties with a **lot area** of less than 900m² are:

(a) The minimum **lot width** is 13.0 m.
(b) The minimum **lot depth** is 30.0 m.
(c) The minimum **lot area** is 490 m².

## 1.5 Development Regulations

1.5.1 Development Regulations for properties with a **lot area** of 900m² or more are:

(a) The maximum **floor area ratio** is 1.2, except it is 1.3 with a housing agreement pursuant to the provisions of Section 6.9. Where **parking spaces** are provided totally beneath habitable space of a principal **building** or beneath useable common amenity areas providing that in all cases, the **parking spaces** are screened from view, an amount may be added to the **floor area ratio** equal to 0.1 multiplied by the ratio of such **parking spaces** to the total required **parking spaces**, but in no case shall this amount exceed 0.1. The total maximum **floor area ratio** shall not exceed 1.4.
(b) The maximum **site coverage** is 55%. Parking structures that are less than 2.0 m above finished grade and are surfaced with **landscaping** or useable open space shall not be included in the calculation of **site coverage**.
(c) The maximum **height** is 16.5 m.
(d) The minimum site **front yard** is 4.5 m.
(e) The minimum site **side yard** is 4.5 m for a **building** less than 12.0 m in **height** and 6.0 m for portions of a **building** greater than 12.0 m in **height.**
(f) The minimum site **rear yard** is 6.0 m except it is 3.0 m where the **rear yard** abuts a **lane.**
(g) Notwithstanding the site setback requirements, a parking structure that is partially below grade may be located no less than 1.5 m from any **property line** provided that it is less than 2.0 m in **height** above **natural grade** and that a minimum horizontal measurement of 2.0 m on the top surface to the parking structure is either landscaped or made available as useable open space between the furthest project of the **structure** and the **building** face. All **building** setbacks otherwise apply. Where a parking structure is located within the building setbacks consistent with this section, the space between the structure and the property line shall be treated with a high level of landscaping with a landscaped berm to screen the exposed outer wall of the structure.

1.5.2 Development Regulations for properties with a **lot area** of less than 900m² are:

(a) The maximum **site** coverage is 55%.
(b) The maximum **height** is the lesser of 9.5 m or 2 ½ **storeys**, except it is 4.5m for **accessory buildings**.
(c) The minimum **front yard** is 4.5 m.

(d) The minimum **side yard** is 2.0 m for a 1 or 1½ **storey building** and 2.3 m for a 2 or 2 ½ storey building, except it is 4.5 m from a **flanking street**.

(e) The minimum **rear yard** is 6.0 m except it is 3.0 m where the rear yard abuts a lane and it is 1.5 m for **accessory buildings**.

## 1.6 Parking Regulations specific to the HD-2 Zone

The parking regulations that are specific to this zone for the purpose of calculating the number of **parking spaces** required are as follows:

(a) All residential, residential related uses, **apartment hotel** and **hotel** uses shall be calculated as 1 **parking space** per **dwelling** unit.

(b) Leasable areas that are not used for residential, residential related, **apartment hotel** and **hotel** uses shall be calculated as requiring 1.75 stalls per 100 m² of **gross floor area**.

(c) **Health Services** shall be calculated as 2.5 stalls per 100 m² of **gross floor area.**

(d) **Food primary establishment** uses shall be calculated as requiring 1 **parking space** per 4 seating spaces.

## 1.7 Other Regulations

(a) In addition to the regulations listed in this section, other regulations apply. These include, where not consistent with the provisions of this section, the general **development** regulations of Section 6, the **landscaping** and fencing regulations of Section 7, the parking and loading regulations of Section 8 (except as specified by section 1.6 of this zone), and the specific use regulations of Section 9 of Zoning Bylaw No. 8000.

(b) **Secondary uses** can only be present where a **principle use** is established and in continuous use.

(c) **Offices** are limited to those related to **health services** or those that can demonstrate a direct support role for the Kelowna General Hospital, Cottonwoods Care Facility or Interior Health Authority.

(d) **Retail stores, health products** shall be limited to a **floor area** not greater than 350 $m^2$ per **lot**.

(e) When permitted, **food primary establishments** shall be limited to a total capacity of 40 seats.

(f) **Apartment hotel** and **hotel** use shall only be permitted when secondary to **multiple dwelling housing** or **congregate housing**.

(g) A minimum area of 7.5 m² of **private open space** shall be provided per **bachelor dwelling**, **congregate housing** bedroom or **group home** bedroom, 15.0 m² of **private open space** shall be provided per 1 **bedroom dwelling**, and 25.0 m2 of **private open space** shall be provided per **dwelling** with more than 1 **bedroom**.

(h) Level 2 landscape buffers are required for the **front yard** and Level 3 landscape buffers are required in all **side** and **rear yard** setback areas.

(i) Vehicle-oriented or drive through services are not permitted in this zone.

(j) All **vehicle** access must be from the rear **lane.**

(k) Signage shall be in accordance with the regulations of the Sign Bylaw.

(l) A free standing sign with a maximum height of 1.5 m and a sign area of 3.0m² is permitted

Schedule "A"
Text Amendment No. TA10-0007 - Proposed Text Amendments

| Zoning Bylaw No. 8000 | | | |
|---|---|---|---|
| **No.** | **Section** | **Existing Text** | **Proposed Text** |
| 1 | Table of Contents | **Section 17: Health District Zones**<br>17.1 HD1 Kelowna General Hospital 17-1 | **Section 17: Health District Zones**<br>17.1 HD1 Kelowna General Hospital 17-1 |
| 2 | Section 1 - General Administration Section 1.3.1 | **Section 17 - Health District Zones**<br>HD1 Health District 1 Zone | **Section 17 - Health District Zones**<br>HD1 Health District 1 Zone<br>HD2 HD2 - Hospital & Health Support Services |
| 3 | Section 2 - Interpretation<br><br>§2.3.3 General Definitions | nil | **Retail Stores, Health Products** means a retail outlet where products related to the health industry are sold, rented, custom fitted or repaired. Such uses include but are not limited to pharmacies, health food stores, naturopathic stores, uniform stores. |
| 4 | Table 7.1 Minimum Landscape Buffer Treatment Schedule | **Commercial Zones**<br>C1, C2, C3, C4, C5, C6, C7, C8, C9, C2rls, C3lp, C3rls, C3lp/rls, C4lp, C4rls, C4lp/rls, C6lp, C6rls, C6lp/rls, C7lp, C7rls, C7lp/rls, C8lp, C9lp, C9rls, C9lp/rls, C10, C10lp, C10rls, C10lp/rls | **Commercial Zones**<br>C1, C2, C3, C4, C5, C6, C7, C8, C9, C2rls, C3lp, C3rls, C3lp/rls, C4lp, C4rls, C4lp/rls, C6lp, C6rls, C6lp/rls, C7lp, C7rls, C7lp/rls, C8lp, C9lp, C9rls, C9lp/rls, C10, C10lp, C10rls, C10lp/rls, HD2 |

| Sign Bylaw No. 8235 | | | |
|---|---|---|---|
| **No.** | **Section** | **Existing Text** | **Proposed Text** |
| 1 | Section 6.1 | **Higher Density Residential Zones (RM1, RM2, RM3, RM4, RM5, RM6, and RM7)*** | **Higher Density Residential Zones (RM1, RM2, RM3, RM4, RM5, RM6, RM7 and HD1)*** |

# CITY OF KELOWNA

# MEMORANDUM

**Date:** August 22, 2011
**File No.:** Z10-0040

**To:** Land Use Management Department (AW)

**From:** Development Engineering Manager (SM) (Revision 2 Comments)

**Subject:** Pandosy St, Royal Ave, Glenwood Ave Plan 5973 Lots 1,2 Plan 3216 Lots 1,2,3
Proposed Multi Use Development **MARRINGTON**

Development Engineering has the following comments and requirements associated with this application. The road and utility upgrading requirements outlined in this report will be a requirement of this application.

The Development Engineering Technologist for this project is John Filipenko. AScT

1. Domestic Water and Fire Protection

(a) The proposed development site is currently serviced with small diameter water services. The developer's consulting mechanical engineer will determine the domestic and fire protection requirements of this proposed development and establish hydrant requirements and service needs.

(b) Only one service will be permitted for this development. The applicant, at his cost, will arrange for the disconnection of all existing services at the mains and the installation of hydrants and a new larger metered water service from the proposed new main within Royal Avenue (latecomer agreement pending) or alternatively, the existing 150mm main within Glenwood Ave. The estimated cost of this construction for bonding purposes is **$50,000.00**

If it is determined that additional upgrades to the existing water distribution system must be made to achieve the required fire flows, additional bonding will be required.

(c) The developer must obtain the necessary permits and have all existing utility services disconnected prior to removing or demolishing the existing structures. The City of Kelowna water meter contractor must salvage existing water meters, prior to building demolition. If water meters are not salvaged, the developer will be invoiced for the meters.

2. Sanitary Sewer

(a) Our records indicate that this proposed development site is connected with small diameter sewer services. The developer's consulting mechanical engineer will determine the development requirements of this proposed development and establish the service needs.

(b) The applicant, at his cost, will arrange for the installation of one larger service from Glenwood Avenue, as well as the capping of all existing services at the mains. Only one service will be permitted for this development. The estimated cost of construction for bonding purposes is **$35,000.00**

3. Storm Drainage

(a) It will be necessary for the developer to modify storm drainage facilities on Royal Avenue, Glenwood Avenue and lane as required to provide street drainage and an overflow storm drainage relief for the proposed development site. The cost of these works will be included in the road upgrading and road construction items.

(b) It must be understood that the storm drainage systems in this vicinity are relatively shallow as the level of Okanagan Lake influences drainage. The drainage systems are inundated in water at times of high lake levels.

4. Road Improvements

(a) Pandosy Street: The Pandosy Street frontage is fully urbanized. Access modifications will necessitate driveway ramp removals, curb replacement and boulevard restoration. Stamped concrete is the preferred surface treatment between the curb and the sidewalk.
Service disconnects will also require road cuts with pavement and sidewalk restoration. Replacement of damaged works will also be at the developer's expense. The extent of the restoration works will be determined by the City Engineer. The estimated cost of this construction for bonding purposes is **$55,000.00**

(b) Royal Avenue: The urbanization and realignment of Royal Avenue fronting this proposed development will require the realignment of the barrier curb and gutter, catch basin installation, pavement widening, concrete sidewalk. Also required is a landscaped boulevard complete with underground irrigation system, street trees and the re-location of lamp standards as well as the adjustment of utility appurtenances, as required to accommodate the upgrading construction.
The estimated cost of this construction for bonding purposes is **$70,000.00**

(c) Glenwood Avenue: It will be necessary to reconstruct the curb return, transition the gutter line alignment, construct a separate 2.05m sidewalk, modify the storm drainage facilities and provide a fillet pavement. Also required is a landscaped boulevard complete with underground irrigation system, and re-location or adjustment of utility appurtenances if required to accommodate the upgrading construction.
Only the separate sidewalk and landscaped boulevard with underground irrigation needs to be completed at this time. The City wishes to defer the remainder of the upgrades to the Glenwood Avenue frontage. Therefore, cash-in-lieu of immediate construction is required. The cash–in-lieu amount is determined to be **$35,000.00**

The estimated cost of the sidewalk and boulevard construction for bonding purposes is **$10,000.00**

(d) Public Lane: Site access shall be provided from the rear lane. It will be necessary to widen and reconstruct the lane to a commercial paved standard for the full frontage length of this development. Upgrades may also include the removal, re-location or adjustment of existing utility appurtenances to accommodate this development. The estimated cost for this construction for bonding purposes is **$20,000.00**.

5. Transportation Related Requirements

(a) A pedestrian signal at Pandosy Street and Royal Ave. This will be coordinated with the signals at Pandosy Street / Cadder Avenue and Pandosy Street / Rose Avenue intersections. The price for a pedestrian signal similar to the one on Bernard Ave and Bertram St is estimated at **$150,000**.

(b) KGH will contribute $75,000 towards the cost of the signal installation. The cost for a pre-emptive signal for emergency vehicles would be attributed to KGH.

(c) Deleted

(d) A 3m road dedication along the full frontage of Glenwood Ave complete with a 6m radius corner rounding. The ultimate road right-of-way width shall be18.0m.

(e) A 5m road dedication along the full frontage of Royal Ave. The dedication is to line up the intersection on both the east and west side benefiting the pedestrian crossing and to avoid conflict with the vehicles turning left from the west leg of the intersection. The Pandosy St, Royal Ave intersection will be restricted to right in; right out, left in on the easterly portion. The installation of a raised concrete pork chop with signage will to be required. The estimated cost for this construction for bonding purposes is **$20,000**

(f) Truck access to the rear of this development shall be via Pandosy Street, from Glenwood Ave. A frock turn-around shall be provided. Trucks would enter from Glenwood Ave and exit back to Glenwood Avenue and then Pandosy Street.

6. Road Dedication and Subdivision Requirements

(a) Royal Avenue: Dedicate a highway allowance widening of 5.0m along the full frontage length.

(b) Glenwood Avenue: Dedicate an additional road allowance widening of 3.0m along the full frontage.

(c) Provide corner rounding dedications of 6m radius at the property corner intersections of Pandosy St / Royal Ave, Pandosy St / Glenwood Ave.

(d) Lane: Dedicate an additional road allowance widening along the full frontage of the Lane to achieve a commercial right-of-way width of 7.6 meters.

(e) If any road dedication affects lands encumbered by a Utility right-of-way (such as FortisBC, Gas, etc.) please obtain the approval of the utility prior to application for final subdivision approval. Any works required by the utility as a consequence of the road dedication or closer must be incorporated in the construction drawings submitted to the City's Development Manager.

(f) Provide all necessary Statutory Rights-of-Way for any utility corridors required, including those on proposed or existing City Lands.

(g) Lot consolidation

7. Electric Power and Telecommunication Services

The electrical and telecommunication services to this building must be installed in an underground duct system, and the building must be connected by an underground service. It is the developer's responsibility to make a servicing application with the respective electric power, telephone and cable transmission companies to arrange for these services, which would be at the applicant's cost.

8. Engineering

Road and utility construction design, construction supervision, and quality control supervision of all off-site and site services including on-site ground recharge drainage collection and disposal systems, must be performed by an approved consulting civil engineer. Designs must be submitted to the City Engineering Department for review and marked "issued for construction" by the City Engineer before construction may begin.

9. Survey Monuments and Iron Pins

If any legal survey monuments or property iron pins are removed or disturbed during construction, the developer will be invoiced a flat sum of $1,200.00 per incident to cover the cost of replacement and legal registration. Security bonding will not be released until restitution is made.

10. Bonding and Levy Summary

(a) Bonding

| | |
|---|---|
| Water servicing and hydrant installation | $ 50,000.00 |
| Sanitary Sewer service upgrades | $ 35,000.00 |
| Pandosy Street road frontage restoration | $ 55,000.00 |
| Royal Avenue frontage improvements | $ 70,000.00 |
| Pedestrian signal | $150,000.00 |
| Pandosy / royal Raised Median | $ 20,000.00 |
| Glenwood Avenue frontage improvements | $ 10,000.00 |
| Lane frontage improvements | $ 20,000.00 |
| Total Bonding | **$ 410,000.00** |

NOTE: The bonding amounts shown above are comprised of estimated construction costs escalated by 140% to include engineering design and contingency protection and are provided for information purposes only. The owner should engage a consulting civil engineer to provide detailed designs and obtain actual tendered construction costs if he wishes to do so. Bonding for required off-site construction must be provided and may be in the form of cash or an irrevocable letter of credit, in an approved format.
The owner must also enter into a servicing agreement in a form provided by the City.

(b) Levies

(i) Glenwood Rd Frontage improvements

One-time cash payment for future urban upgrading. $35,000.00

11. Administration Charge

An administration charge will be assessed for processing of this application, review and approval of engineering designs and construction inspection. The administration charge is calculated as (3% of Total Off-Site Construction Cost plus HST) **$9,844.80** ($ 8,790.00 + 1,054.80 HST)

Steve Muenz, P. Eng.
Development Engineering Manager
JF/jf

# Collett Manor Transportation Impact Assessment

## Pandosy Street Developments Ltd.


Opus International Consultants (Canada) Limited

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Prepared By

11 February 2011

Greg Cockburn B.APSc, EIT
Transportation Engineer

Reviewed By

11 February 2011

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Date: 11 February 2011
Reference: G/global/jobs/H-90240/ /technical/reports/full report
Status: **Final**

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# EXECUTIVE SUMMARY

This report has assessed the transportation impact of the Collett Manor Development. This development work is expected to be complete and fully operational by 2015.

This report has had some updates from the previous draft, which are highlighted as red text, following discussions and feedback from City of Kelowna Brain Oliveira, to provide more clarity on aspects of this report. This does not imply agreement by the City of Kelowna but rather has been completed to assist in the understanding of this impact assessment.

The Collett Manor development is a four storey mix-use development with a residential curb appearance. It will contain a mix of residential units, medical support facilities, medical equipment retail, sandwich bar, meeting area, and pharmacy. The full development details are shown in Table ES-1 below.

| **Land-Use Description** | **Number of Units** | **Gross Floor Area ($m^2$)** |
|---|---|---|
| Bachelor/Studio | 7 | 4,705 |
| 1-Bedroom | 3 | |
| 2-Bedroom | 33 | |
| Pharmacy | 1 | 272 |
| Medical Ancillary Lease Space | 5 | 780 |
| Food Primary | 1 | 100 |
| Amenity Area (indoor) | N/A | 484 |
| Private Useable Open Space | N/A | 1,219 |
| Underground Parking Lot | 68 | 4,539 |
| **Collett Manor Full Development** | | **12,099** |

**Table ES-1: Collett Manor Development Details**

The traffic models prepared for Collett Manor included future Kelowna General Hospital expansion and clearly show that in future year of 2015, the Pandosy Street/ Royal Avenue and Richter Street/Rose Avenue intersections will have deterioration in level of service below level D. In the future year of 2030, the Pandosy Street/Cadder Avenue and Richter Street/Cadder Avenue intersections will also have deterioration in level of service below level D under base traffic conditions.

The introduction of additional Collett Manor traffic pushes the horizon year of one intersection approach that experiences deterioration to a level of service below D by 2020, up to 2015. No new intersections experience deterioration in level of service below D in the horizon year 2030 with the addition of Collett Manor traffic. Traffic issues are driven by network growth along the restricted north south Pandosy Street corridor. There are 6 separate measures suggested in this report to mitigate and improve the network operation. The key network upgrades to ensure safety and efficiency of the overall network are signalization of the Richter Street/Rose Avenue intersection; dedicated right turn lanes at some intersection approaches at the Pandosy Street/ Royal Avenue, Pandosy Street/Cadder Avenue, Richter Street/Cadder Avenue intersections; and advance left turn signal phasing at the Richter Street/Cadder Avenue intersection.

It has been calculated the Collett Manor will require 70 off-street parking with 3 loading zones. Additionally, 24 class I and 11 class II bicycle parking facilities are required.

In conclusion the 12,099$m^2$ gross floor area of the proposed Collett Manor, with the anticipation of high pedestrian and internal trips, will have no more than minor adverse transportation effects on the surrounding road network and may reduce outside trips to the adjacent Kelowna General Hospital, further reducing the effect of Collett Manor traffic on the surrounding network.

# Table of Contents

## Table of Figures Tables



## Table of Tables

# 1 INTRODUCTION

## 1.1 Study Purpose

The purpose of this report is to assess the transportation affects that the proposed Collett Manor will have on the surrounding road network, including vehicular, pedestrian, and cycle traffic as well as parking demands and any related safety concerns.

With the increasing capabilities of Kelowna General Hospital, a wider array of patients is travelling to the Kelowna region to receive specialized treatments. Due to the nature of patients' visits, they have unique housing requirements, and are quite different from tourists. These unique needs may include characteristics such as special accessibility needs; accessibility to medical supply stores on a regular basis; unlikelihood of attending tourist destinations; and the need to meet with doctors and/or family members regularly. As a result, there is a demand for appropriate short- and long-term lodging for travelling patients above what local hotels can provide. To better serve the unique needs of travelling patients, Pandosy Developments Ltd. is proposing a wellness facility entitled Collett Manor.

This Transportation Impact Assessment has been prepared for the City of Kelowna and will form part of the planning and building permit approval application for this development.

## 1.2 Description of the Collett Manor Site

Due to the medical requirements of the patients, a location adjacent to Kelowna General Hospital has been chosen as the ideal location, as shown in Figure 1.

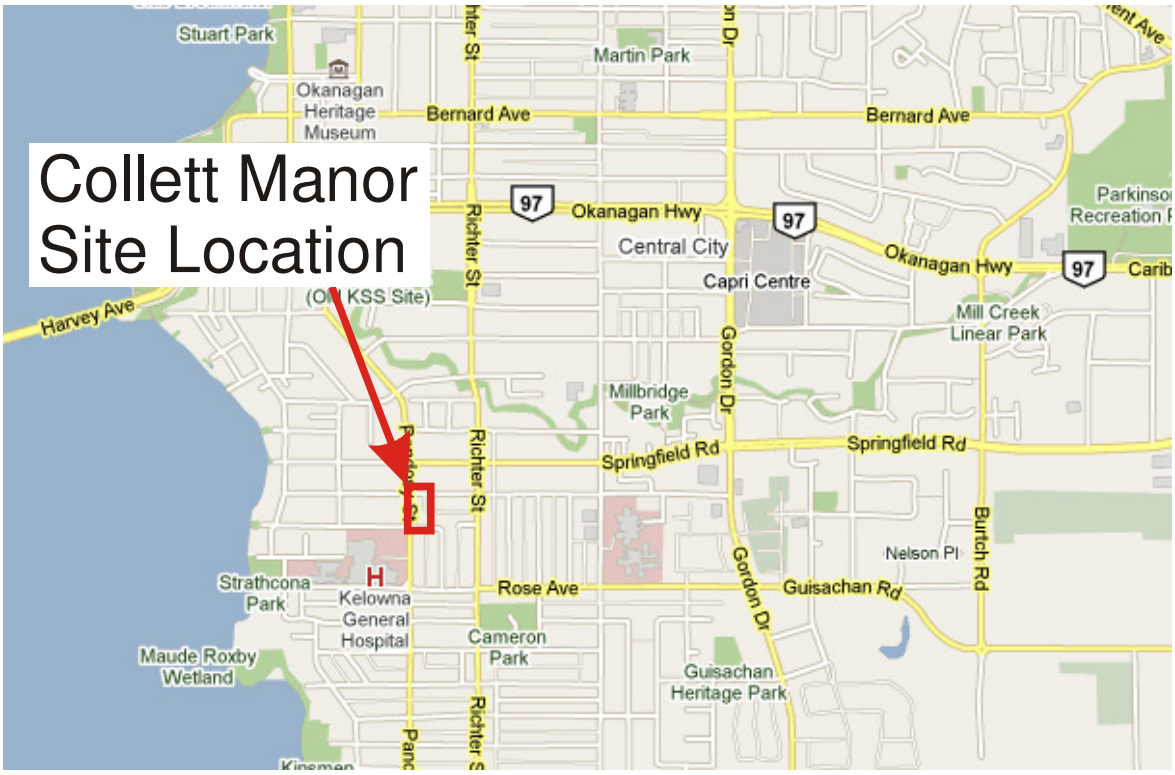


**Figure 1: Kelowna General Hospital Site Location**

The proposed Collett Manor would house a range of land use types, including apartments for short and long-term stay, a pharmacy, health professional offices, various medical equipment retail stores, a sandwich bar, and various lounge areas to meet with doctors and family members. This wide array of services is tailored to the needs of travelling patients to help render them more comfortable for the duration of their treatment.

Figure 2 below illustrates the proposed Collett Manor development plan and layout.

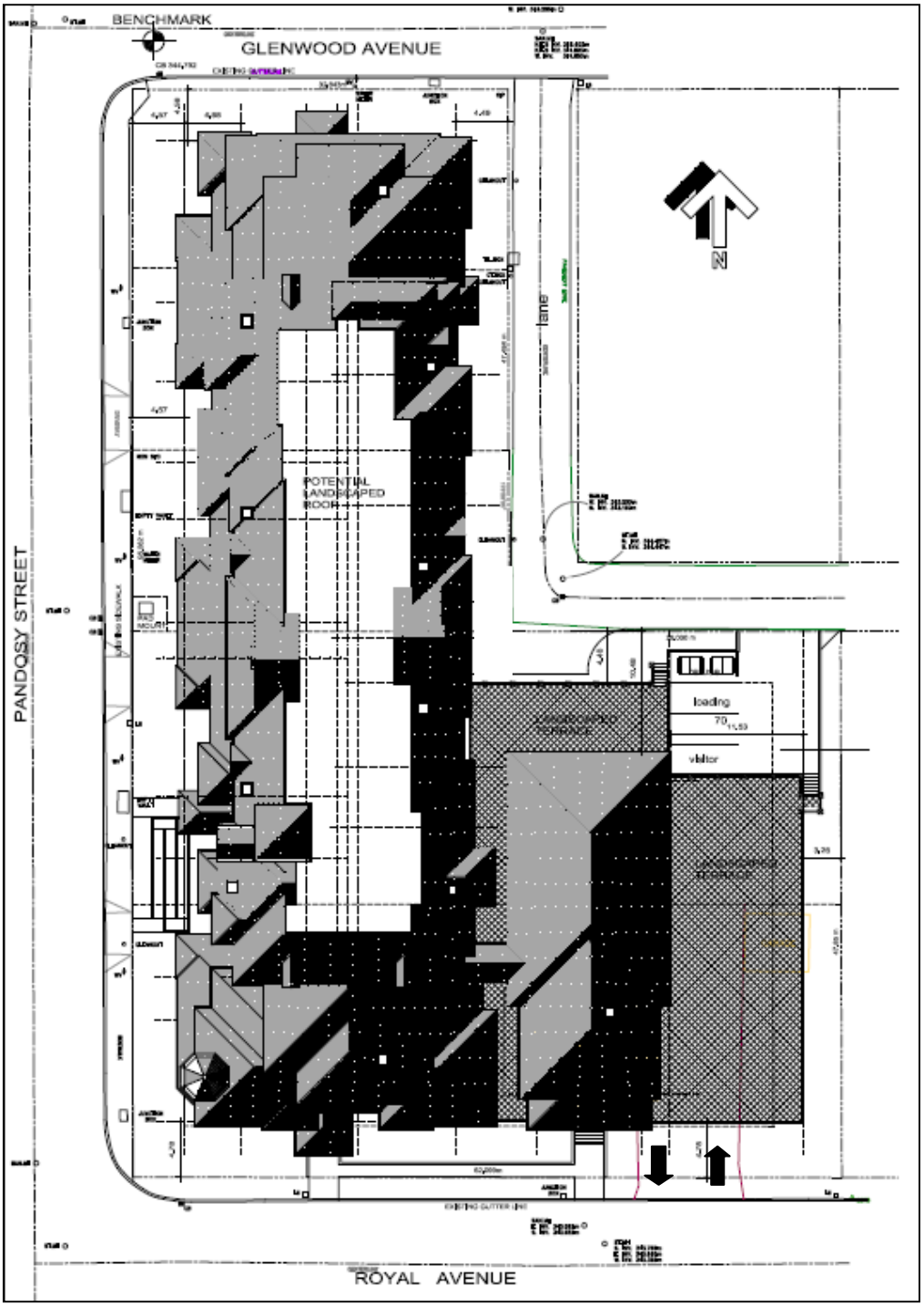


**Figure 2: Collett Manor Development**

Table 1 below shows a breakdown of the various uses within the development and the associated floor areas and unit numbers.

Collect Manor is a 4 storey development with a basement parkade. It has been designed to have a residential street frontage appearance and a rear loading area accessed by a narrow public lane.

The detailed development floor plans are included in Appendix B.

The development has 66 off-street parking stalls and 3 loading zones.

| **Land-Use Description** | **Number of Units** | **Gross Floor Area ($m^2$)** |
|---|---|---|
| Bachelor/Studio | 7 | 4,705 |
| 1-Bedroom | 3 | |
| 2-Bedroom | 33 | |
| Pharmacy | 1 | 272 |
| Medical Ancillary Lease Space | 5 | 780 |
| Food Primary | 1 | 100 |
| Amenity Area (indoor) | N/A | 484 |
| Private Useable Open Space | N/A | 1,219 |
| Underground Parking Lot | 68 | 4,539 |
| **Collett Manor Full Development** | | **12,099** |

**Table 1: Collett Manor Development Scope**

## 1.3 Transportation Impact Assessment Terms of Reference

A detailed Terms of Reference for the Transportation study was developed with Pandosy Developments Ltd. The terms of reference are included with this report as Appendix A.

The key horizon years, growth rates and sensitivity scenarios used for this Transportation study are:

- 2015 Horizon year with partial future Kelowna General Hospital build out, with and without full Collett Manor build out with base traffic factored up using compounding 1.5% annual growth.
- 2030 Horizon year with the future Kelowna General Hospital build out, with and without Collett Manor Build out, with base traffic factored up to 2030 using compounding 1.5% annual growth.
- 2030 Horizon year sensitivity '*worst case scenario'* with the future Kelowna General Hospital build out, with base traffic factored up to 2030 using compounding 1.5% annual growth, 100% new gross floor area utilisation.

The network and 7 key intersections, analysed in this transportation study by Synchro Analysis package were:

1. Cadder Avenue / Pandosy Street
2. Cadder Avenue / Richter Street
3. Royal Avenue / Pandosy Street
4. Rose Avenue / Pandosy Street
5. Glenwood Avenue / Pandosy Street
6. Rose Avenue / Richter Street
7. Rose Avenue / Speer Street

# 2 BASE TRANSPORT NETWORK WITH HOSPITAL GROWTH

## 2.1 Studied Transport Network

The base network intersections which have been analyzed are:

1. Cadder Avenue and Pandosy Street
2. Cadder Avenue Richter Street
3. Rose Avenue and Pandosy Street
4. Rose Avenue and Richter Street
5. Rose Avenue and Speer Street
6. Royal Avenue and Pandosy Street
7. Glenwood Avenue and Pandosy Street

The study intersections were evaluated by calculating the intersection and approach vehicular delays, as indicated by levels of service (LOS). LOS A and B represent an excellent operating condition with minimal or no delays. LOS C and D are typical operating levels when some delays occur. LOS E indicates congested levels, and LOS F indicates a need for improvements to be considered. The road layout for the area surrounding the site, along with the current laning configuration and traffic control for the study intersections, is illustrated in Figure 3.

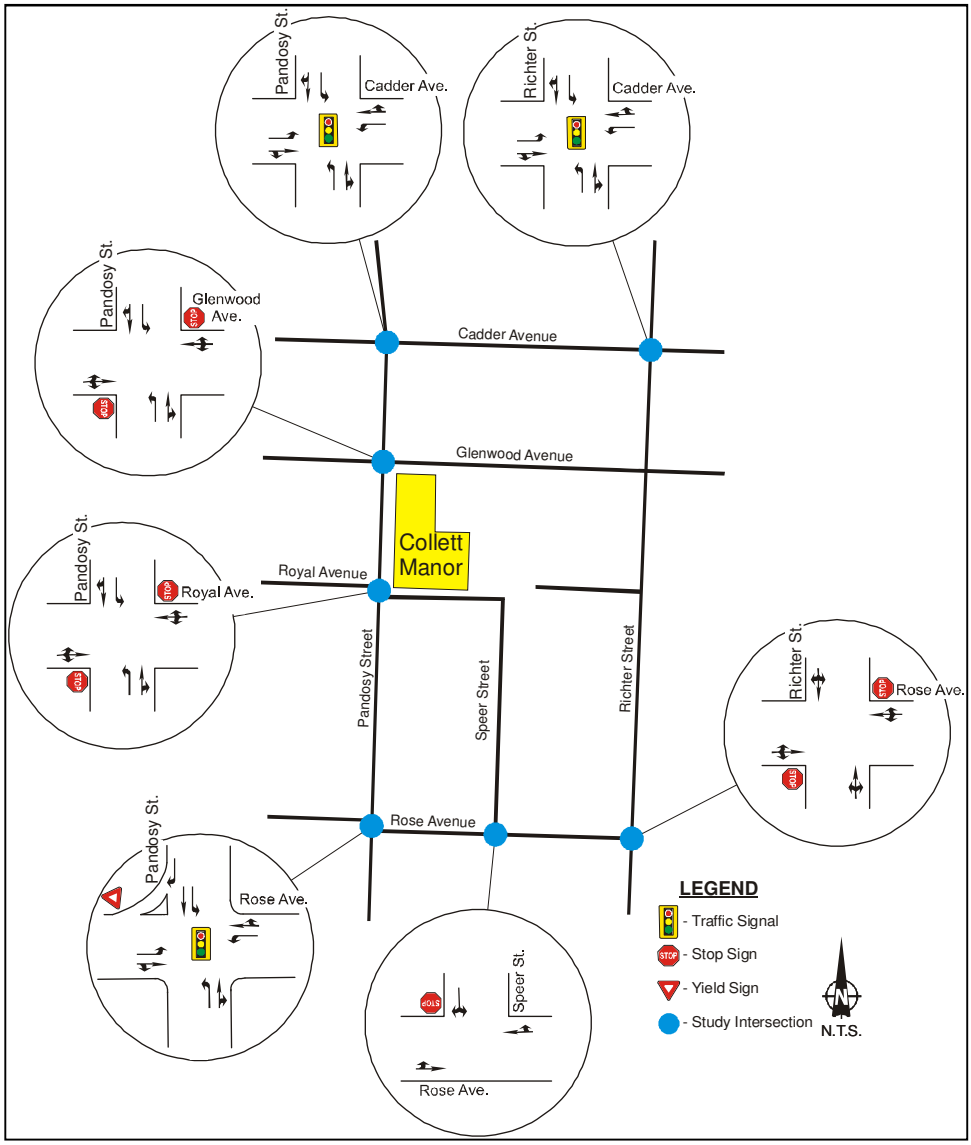


**Figure 3: Study Intersections**

## 2.2 Collett Manor Access Points

The Collett Manor primary access point is on Royal Avenue approximately 57m east of Pandosy Street, as shown in Figure 4.

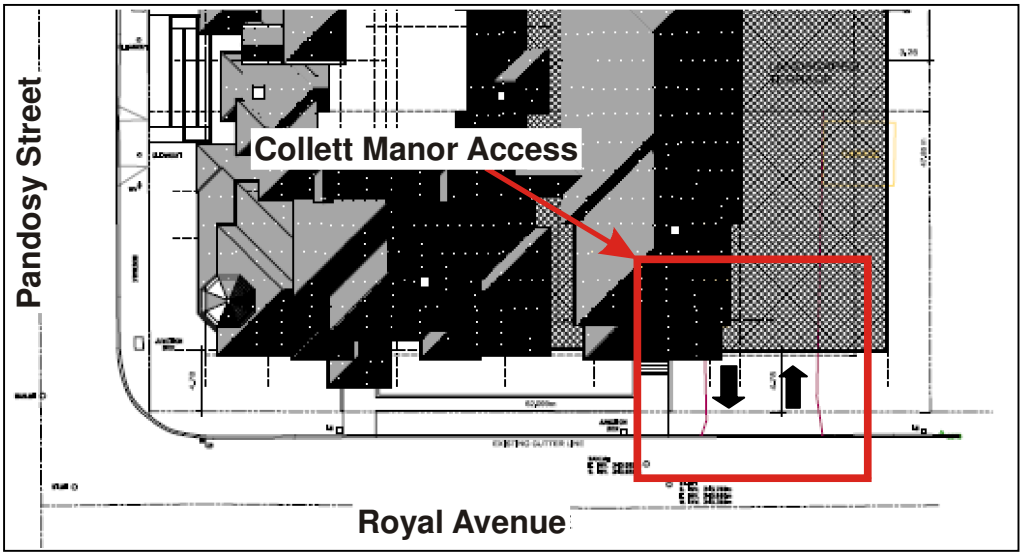


**Figure 4: Collett Manor Access Point**

All movements are permitted both into the site and out of the site. Royal Avenue is a local street with some on-street parking and no sidewalks. Currently the only accesses adjacent to the site are residential; however, the Clinical Support Building for Kelowna General Hospital is planned to go opposite Collett Manor south of Royal Avenue. There is also a residential lane located to the South, across Royal Avenue, opposite Collett Manor that accesses some houses.

Running behind Collett Manor is a narrow 5.2m wide local lane that serves as garbage pickup for some houses as well as rear accesses for some houses. This lane will be used as a loading zone access with infrequent, light use. Service vehicles will be light trucks and delivery vans only. The City of Kelowna development standards for a commercial lane access is 7.6m. It is acknowledged that the lane access is below this standard and it is proposed to provide lane widening to assist in upgrading the access lane along the development frontage.

## 2.3 Traffic Volumes Survey Information

Turning movement counts were conducted on Thursday 11$^{th}$ October 2007 from 0600 to 0900 hours and 1430 to 1700 hours as part of a previous study at four of the seven intersections. The survey day was chosen as being representative of a typical weekday for the region. No special events or circumstances were observed and weather conditions were good. The survey results therefore represent values that can be expected to occur on a typical weekday. Based on the results of turning counts, the weekday am and pm peaks occur between 0800 and 0900 hours and 1600 and 1700 hours.

Turning movement counts for two more intersections were conducted in 2010 as part of a previous project, with City of Kelowna staff providing counts for the remaining intersection of Cadder Avenue and Richter Street.

### *2.3.1 2015 Base Traffic Volumes*

The future 2015 traffic volumes were calculated by applying an annual growth factor of 1.5 percent, compounded annually, (annual growth of 1.5% was agreed with City of Kelowna staff) to all the count data from previous years. Additionally, the traffic generated by Kelowna General Hospital expansion up to the 2015 horizon year was added to the study intersections. Figure 5 shows the future traffic volumes at each of the study intersections during the peak hours in 2015 under base conditions.

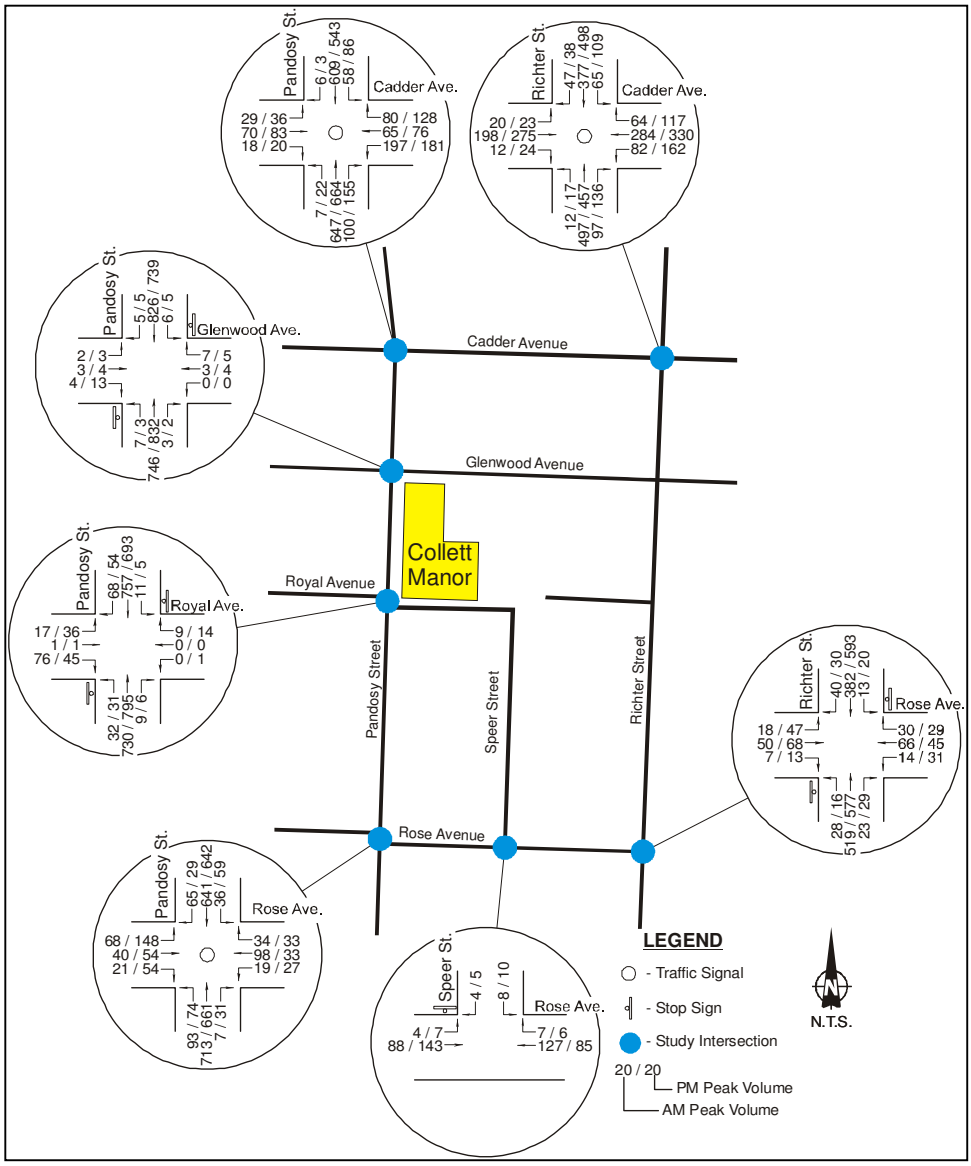


**Figure 5: 2015 Future Build out Intersection Volumes (New Hospital Services Added)**

### *2.3.2 2015 Base Traffic Patterns and Level of Service*

The traffic volumes were then added to Synchro 7 software, by Trafficware, and analysis was run to determine the LOS at each of the intersections according to Highway Capacity Manual. The resulting LOS for each of the study intersections can be seen in Figure 6.

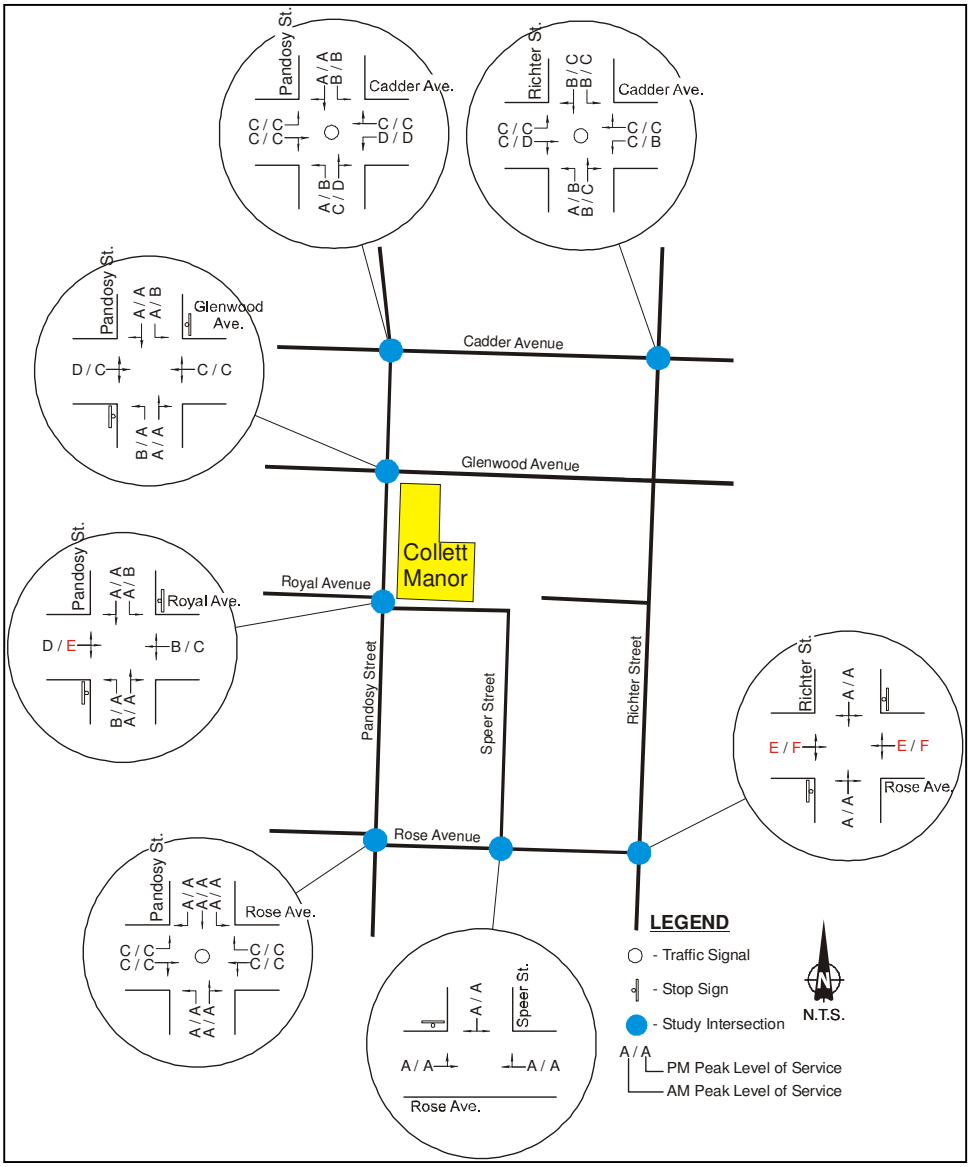


**Figure 6: 2015 Base Intersection Level of Service**

Most of the study intersections experience adequate LOS under 2015 base conditions. The exceptions are the eastbound and westbound Rose Avenue approaches at Richter Street and the eastbound approach of Royal Avenue at Pandosy Street under PM peak. The single-lane Rose Avenue approaches experience a poor LOS due to the high through volumes on Richter Street that prevent through and left-turn movements from finding adequate gaps to cross or turn left, resulting in long delays for all the Rose Avenue movements. This is an existing problem which the City needs to address. Likewise, the eastbound approach of Royal Avenue at Pandosy Street experiences low LOS under PM peak hour due to high through movements on Pandosy Street

preventing the left turn movements, subsequently blocking through and right-turn movements. As shown in Table 2, the queue lengths along Pandosy Street are such that they block adjacent intersections.

| Intersection Approach | Available Queuing Distance (m) | Base Conditions | | | |
|---|---|---|---|---|---|
| | | Queue Length (m) | | Queue Length (veh) | |
| | | AM | PM | AM | PM |
| **Cadder Avenue and Pandosy Street** | | | | | |
| Northbound | 83 | 204 | 235 | 27 | 31 |
| Southbound | 101 | 87 | 73 | 12 | 10 |
| Eastbound | 208 | 21 | 24 | 3 | 4 |
| Westbound | 194 | 24 | 33 | 4 | 5 |
| **Cadder Avenue & Richter Street** | | | | | |
| Northbound | 79 | 127 | 170 | 17 | 23 |
| Southbound | 87 | 79 | 144 | 11 | 19 |
| Eastbound | 194 | 55 | 72 | 8 | 10 |
| Westbound | 375 | 72 | 80 | 10 | 11 |
| **Rose Avenue and Pandosy Street** | | | | | |
| Northbound | 93 | 90 | 111 | 12 | 15 |
| Southbound | 166 | 73 | 94 | 10 | 13 |
| Eastbound | N/A | 13 | 15 | 2 | 2 |
| Westbound | 83 | 25 | 11 | 4 | 2 |

**Table 2: 2015 Queue Lengths at Signalized Study Intersections**

The recommended solutions to alleviate the poor LOS movements will be discussed in Section 8 of this report.

### *2.3.3 2030 Base Traffic Volumes*

The base traffic volumes of 2015 were further grown to 2030 by applying a 1.5 percent annual compounding growth rate. Additionally, the traffic generated by the full expansion of Kelowna General Hospital was added to the study intersections. Figure 7 shows the future traffic volumes at each of the study intersections during the peak hours in 2030 under base conditions.

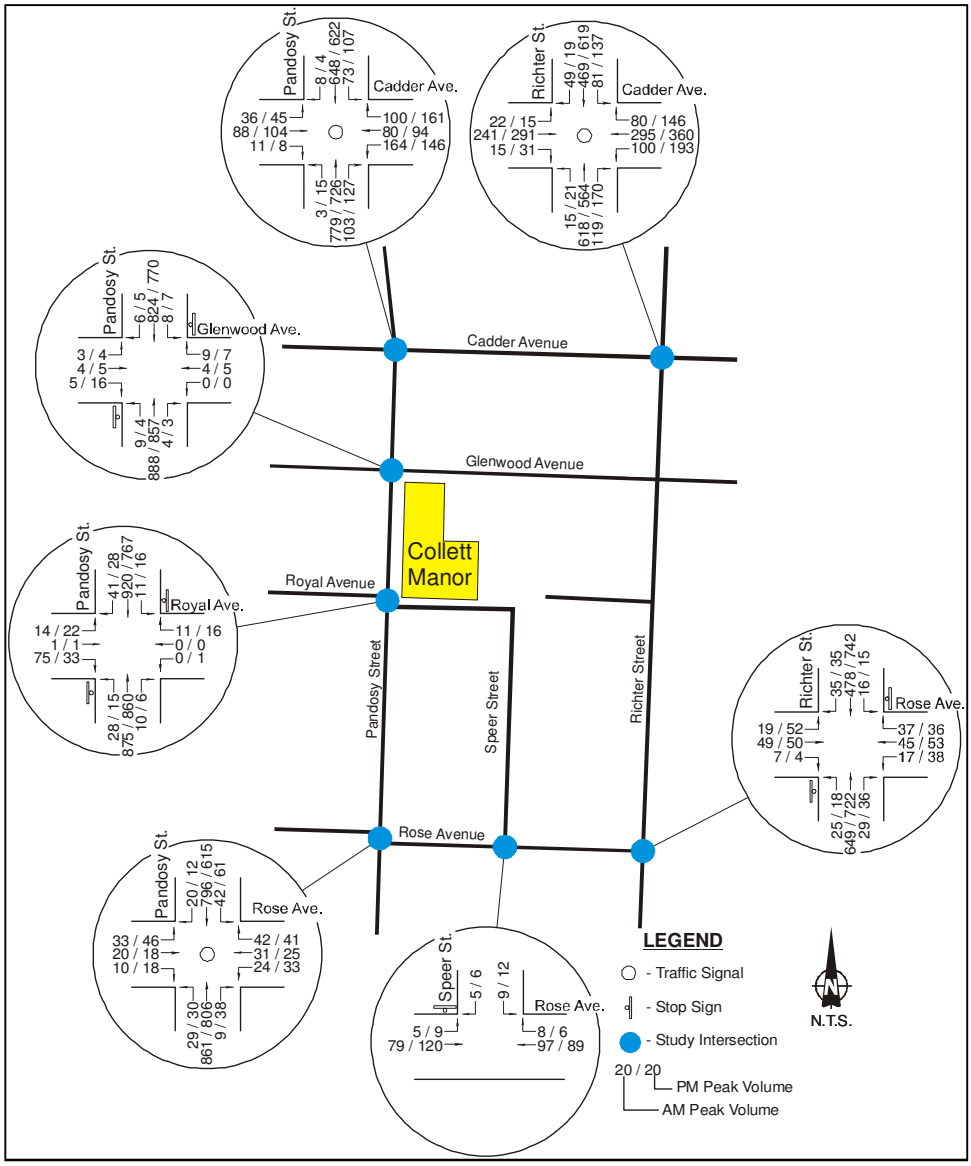


**Figure 7: 2030 Base Traffic Intersection Volumes**

### *2.3.4 2030 Base Conditions Intersection Level of Service*

The traffic volumes were then analyzed using the Synchro 7 software, by Trafficware. The resulting LOS for each of the study intersections under 2030 base conditions are shown in Figure 8.

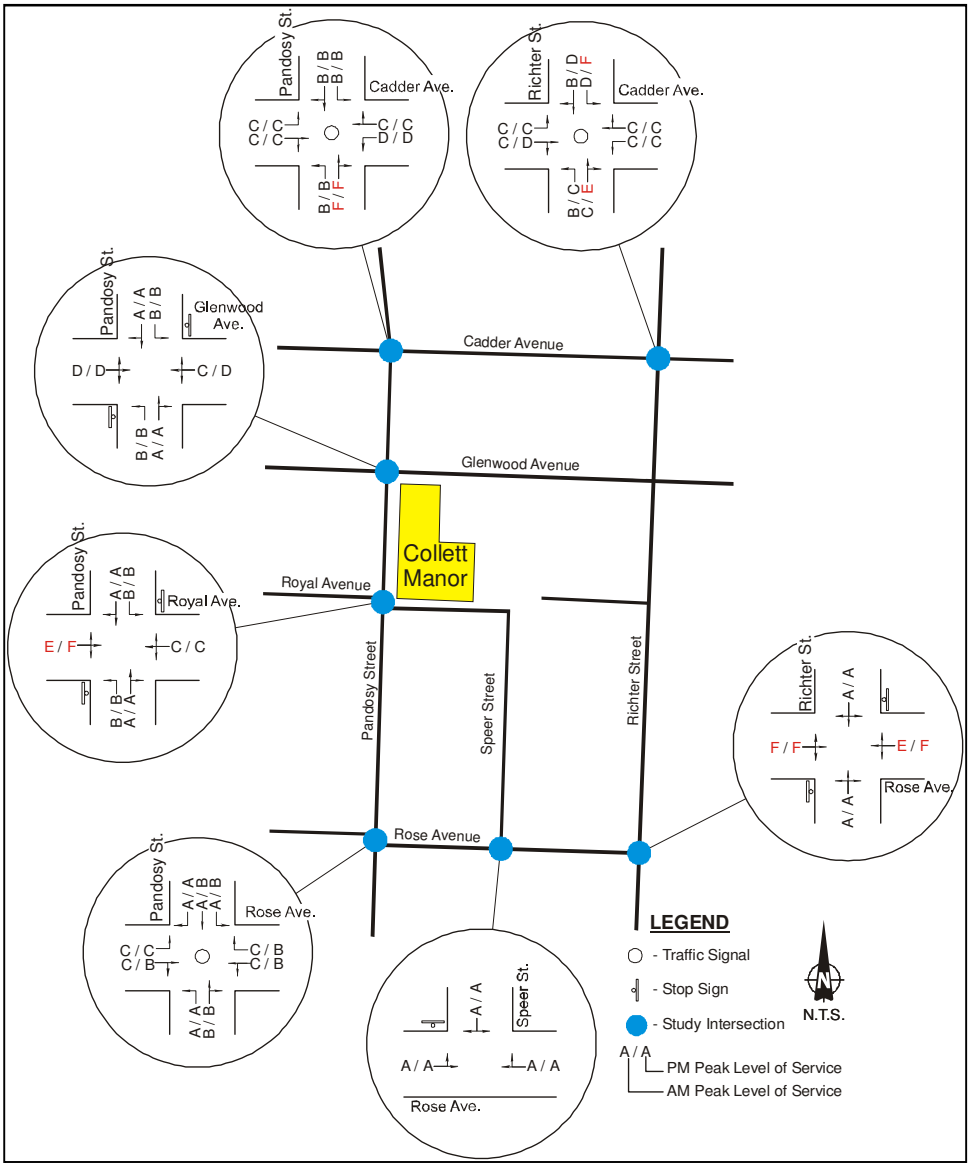


**Figure 8: 2030 Base Intersection Level of Service**

As expected, the intersection approaches that were experiencing poor LOS under 2015 base conditions continue to operate with long delays. The eastbound approach of Royal Avenue at Pandosy Street experiences a LOS E under AM peak conditions in addition to the PM peak, again caused by high through volumes preventing left-turn movements. Two additional intersections experience poor LOS under 2030 base conditions, with the following movements expected to experience LOS E or worse:

- Northbound through/right approach of Cadder Avenue/Pandosy Street under both AM and PM peak;
- Northbound through/right approach of Cadder Avenue/Richter Street under PM peak; and,
- Southbound left approach of Cadder Avenue/Richter Street under PM peak.

The northbound through/right approaches of both Cadder Avenue/Pandosy Street and Cadder Avenue/Richter Street experience poor LOS due to the high number of right turn movements. With the shared through/right lane laning, the delays to the right turn also impact the northbound through movement. The Southbound left

approach of Cadder Avenue/Richter Street experiences poor LOS largely due to the high conflicting through volumes on Richter Street. As to be expected, the queue lengths at the signalized intersection approaches increase under base 2030 conditions, further compounding the existing network problems. Table 3 below shows the queue lengths under 2030 base conditions.

| Intersection Approach | Available Queuing Distance (m) | Base Conditions | | | |
|---|---|---|---|---|---|
| | | Queue Length (m) | | Queue Length (veh) | |
| | | AM | PM | AM | PM |
| **Cadder Avenue and Pandosy Street** | | | | | |
| Northbound | 83 | 271 | 300 | 36 | 40 |
| Southbound | 101 | 120 | 99 | 16 | 14 |
| Eastbound | 208 | 26 | 29 | 4 | 4 |
| Westbound | 194 | 31 | 44 | 5 | 6 |
| **Cadder Avenue & Richter Street** | | | | | |
| Northbound | 79 | 213 | 257 | 29 | 34 |
| Southbound | 87 | 114 | 212 | 15 | 28 |
| Eastbound | 194 | 65 | 84 | 9 | 12 |
| Westbound | 375 | 85 | 98 | 12 | 13 |
| **Rose Avenue and Pandosy Street** | | | | | |
| Northbound | 93 | 170 | 178 | 23 | 24 |
| Southbound | 166 | 113 | 148 | 15 | 20 |
| Eastbound | N/A | 13 | 16 | 2 | 3 |
| Westbound | 83 | 26 | 12 | 4 | 2 |

**Table 3: 2030 Queue Lengths at Signalized Study Intersections**

As with the 2015 base analysis, mitigation measures will be discussed in section 8 of this report.

# 3 DEVELOPMENT TRAFFIC IMPACT

Due to the unique land uses within the Collett Manor, a site specific approach was taken for trip generation purposes.

Through discussions with the client, it was determined that the ITE Trip Generation manual would be used as a reference, but adjusted slightly according to planned usage.

The seven bachelor/studio suites were taken to have five vehicular trips per day. First-principle logic for this is that these units have single person occupancy with a single work trip and 1 to 2 recreation trips. It is assumed that no children or siblings would live in these units.

The one-bedroom suites are estimated to generate six vehicular trips per day. The first-principle logic for this is that these units have a possible two person occupancy with two work trips and 1 recreational trip. It is also assumed that no children or siblings would live in these units.

For the two bedroom suites, it is recognized that some will be leased out as full residential apartments and will have a higher number of daily trips than the units reserved for non-residents. As a result, one third of the thirty three units had eight vehicular trips per day rate applied and the remaining two thirds of the units had five vehicular trips per day rate applied to capture to mixed use. This results in a total of 198 vehicular trips per day for the residential units, without any discounting of trips for mixed use, as shown in Table 4.

| Land Use Type | Unit Numbers | Trips | | ITE Reference Rate |
|---|---|---|---|---|
| | | Weekday | | |
| | | Rate | Total | |
| Bachelor/Studio | 7 | 5 | 36 | Pg 327, land use 220, ITE version 8, 6.65 trips/day |
| 1-Bedroom Suite | 3 | 6 | 18 | Pg 327, land use 220, ITE version 8, 6.65 trips/day |
| 2-Bedroom Suite | 33 | 11 @ 8/day & 22 @ 5/day | 198 | Pg 327, land use 220, ITE version 8, 6.65 trips/day |

**Table 4: Residential Units Trip Generation**

For the remaining land uses, a combination of surveyed data, consultation with the developer, and Institute of Transportation Engineers Trip Generation Rates were used. Due to the proximity to the hospital and mixed use facility, the ITE trip generation rate for Pharmacy without Drive-through was not deemed to be representative of the true trip generation. As a result, a local pharmacy that has similar usage characteristics was surveyed, resulting in an estimate of 250 filled prescriptions per day being used. For the sandwich bar, the expected seating capacity was discussed with the developer and it was determined that it would seat approximately thirty customers. Using this and knowing that there would be a significant number of take-out customers, it is anticipated that during the lunch hour peak, approximately fifty customers would frequent the sandwich bar. To extrapolate this to a full weekday, the peak lunch hour traffic is estimated to account for 40% of the daily

customers, resulting in a total of 125 daily customers. Finally, the anticipated uses for the Medical Ancillary Leasable Area were discussed in detail with the developer. This resulted in the conclusion that two of the units would be used as medical offices and the remaining three as medical supply retailers. The resulting floor areas were then used with ITE rates to generate the weekday trips. The total weekday trips generated by the non-residential land uses within Collett Manor are detailed in Table 5.

| Land Use Type | Floor Area ($ft^2$) | Customers | | ITE Rate or Reference |
|---|---|---|---|---|
| | | Weekday | | |
| | | Rate | Total | |
| Pharmacy | 2927 | 250 Scripts/day | 500 | From local Pharmacy |
| Medical Retail | 6070 | 44.32 | 270 | Pg 1387, land use 814, ITE version 8 |
| Medical Office | 2327 | 36.13 | 86 | Pg 1238, land use 720, ITE version 8 |
| Food Primary (Sandwich Bar) | 1076 | 50 in peak lunch hour (40% of total) | 250 | Based on seating capacity and 125 customers daily. |

**Table 5: Non-Residential Land Use Trip Generation**

After generating the total number of trips that Collett Manor would generate, it was necessary to determine the number of trips that would be either internal within the development or pedestrian trips to the adjacent Kelowna General Hospital. This was done with significant consultation with the developer who has knowledge of other similar facilities.

The bachelor/studio and one bedroom apartment units had a 20% discount applied for pedestrian and internal trips, as a number of these will be used or leased for temporary hospital staff accommodation. The two bedroom units are expected to be largely used by visitors receiving treatment at Kelowna General Hospital; therefore a larger discount of 33% was applied. Similarly, for the medical offices and medical retail stores, it is anticipated that a significant portion of the trips would be by residents or users of Kelowna General Hospital. This resulted in a rate of 33% being applied to the medical retail and medical office land use trips. Finally, due to the close proximity to Kelowna General Hospital, it is envisaged that a large portion of the pharmacy customers would be coming from the hospital or would be residents. As a result, a discount of 50% was applied. Furthermore, through discussion with the surveyed pharmacy, a large number of prescriptions were sent electronically or by telephone and delivered by staff at the pharmacy. Although it is not believed that as many will be delivered at the proposed pharmacy, it is believed that some will be filled by delivery; a discount of 20% was applied with 10 delivery trips per day. The resulting trip generation details can be seen in Table 6.

| Land Use Type | Floor Area ($ft^2$)/ Unit Numbers | Trips/Customers | | Pedestrian or Internal Trips | Special | | **Net Weekday Trips** |
|---|---|---|---|---|---|---|---|
| | | Weekday | | Weekday | Weekday | | |
| | | Rate | Total Trips | Total Trips | Total Trips | Comment | |
| Bachelor/ Studio | 7 | 5 | 36 | 6 | 0 | | **30** |
| 1-Bedroom Suite | 3 | 6 | 18 | 2 | 0 | | **16** |
| 2-Bedroom Suite | 33 | 11 @ 8/day & 22 @ 5/day | 198 | 66 | 0 | | **132** |
| Pharmacy | 2927 | 250 Scripts/day | 500 | 250 | 100 | Electronic or Phone Order (10 delivery trips/day) | **160** |
| Medical Retail | 6070 | 44.32 | 270 | 88 | 0 | | **182** |
| Medical Office | 2327 | 36.13 | 86 | 28 | 0 | | **58** |
| Food Primary (Sandwich Bar) | 1076 | 50 in peak lunch hour (40% of total) | 250 | 200 | 0 | | **50** |
| **Total** | | | **1358** | **640** | **100** | **10** | **628** |

**Table 6: Collett Manor Total Weekday Trip Generation**

As shown in Table 4, the total vehicular trips in and out of the Collett Manor site are estimated to be 628 trips for a full weekday with a 50/50 in/out directional split.

As the above traffic volumes are weekday volumes, it was necessary to estimate the peak hour generated volumes. Each of the AM and PM peak hours were taken to be 15% of the weekday traffic. This peak hour % is conservative with City of Kelowna indicating a rate closer to 10%. Using 15% introduces a factor of safety to this ratio estimate. The directional split for the AM peak was taken to be 70% inbound and 30% outbound, and the PM peak to be 30% inbound and 70% outbound. The peak hour trips can be seen in Table 7.

| **Total Weekday Trips** | **AM Peak** | | **PM Peak** | |
|---|---|---|---|---|
| | **Inbound** | **Outbound** | **Inbound** | **Outbound** |
| 628 | 70% | 30% | 30% | 70% |
| | 66 | 28 | 28 | 66 |

**Table 7: Total Peak Hour Trips**

The resulting trips were then distributed throughout the study intersections based on attractions and population densities in the surrounding areas, as shown in Figure 9.

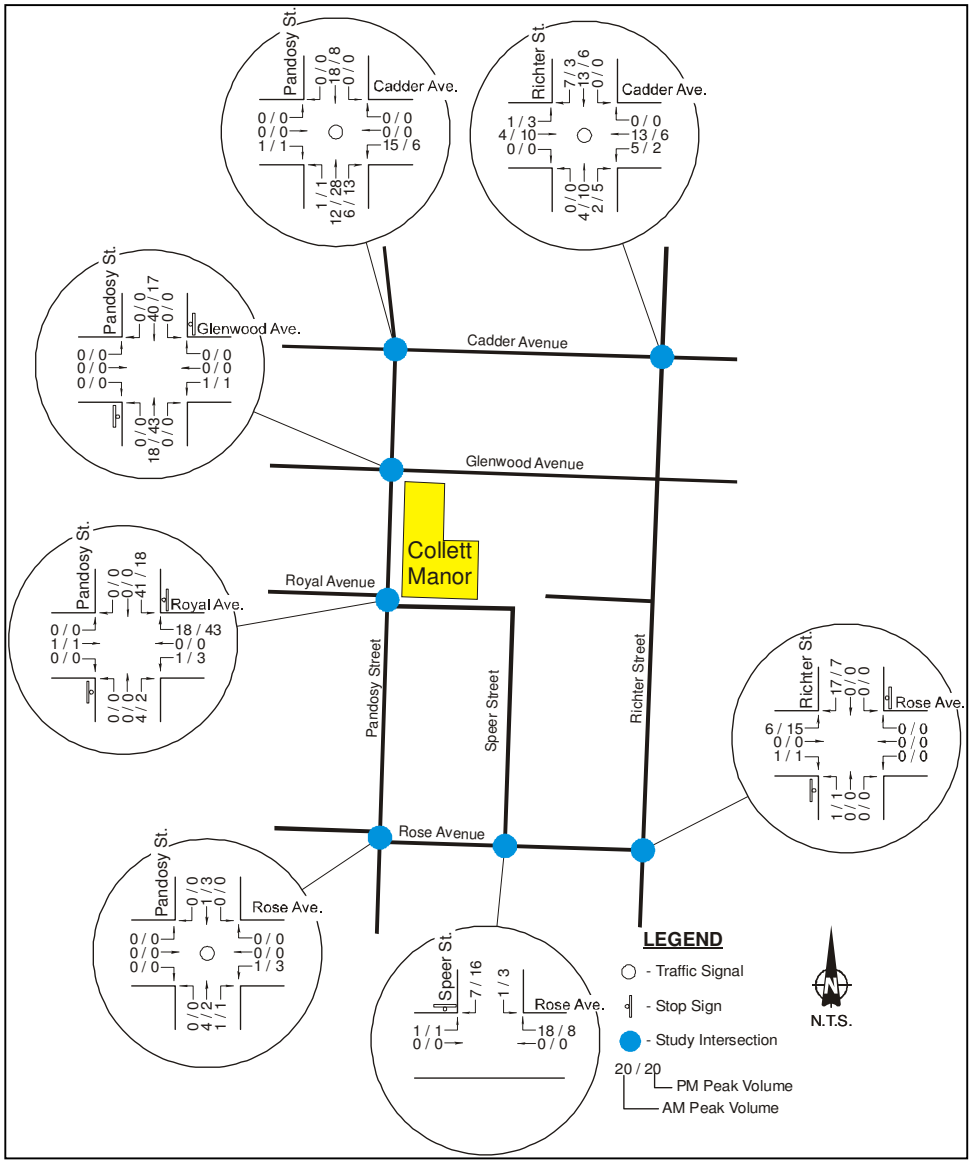


**Figure 9: Collett Manor Trip Assignment**

## 3.1 2015 Peak Hour Traffic Volumes

The traffic generated by the proposed Collett Manor were added to the previous base 2015 traffic volumes to generate the volumes shown in Figure 10.

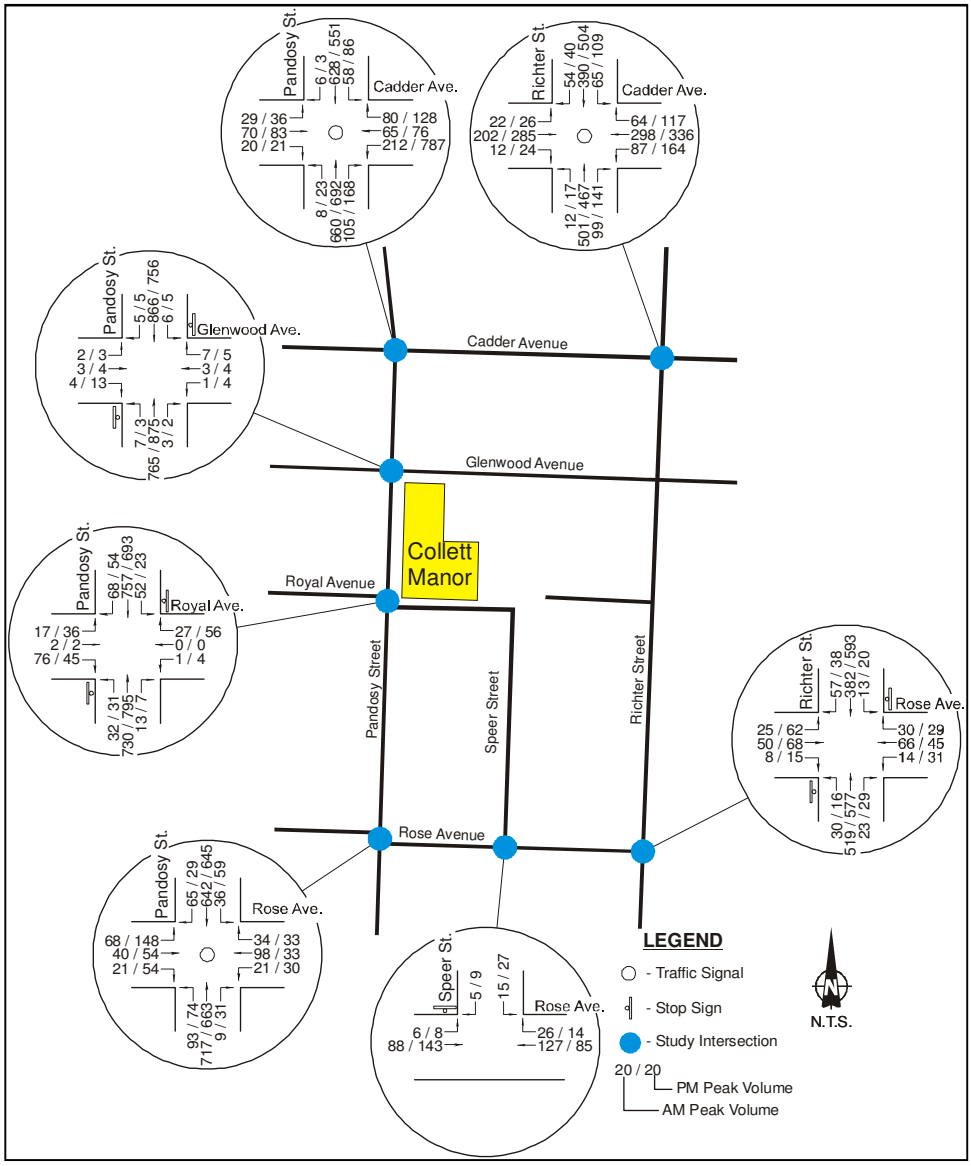


**Figure 10: 2015 Future Build out Intersection Volumes**

## 3.2 2015 Network Level of Service Traffic Conditions

The capacity of the development build out traffic volumes were analyzed with Synchro 7. The resulting LOS for each of the study intersections under 2015 conditions can be seen in Figure 11.

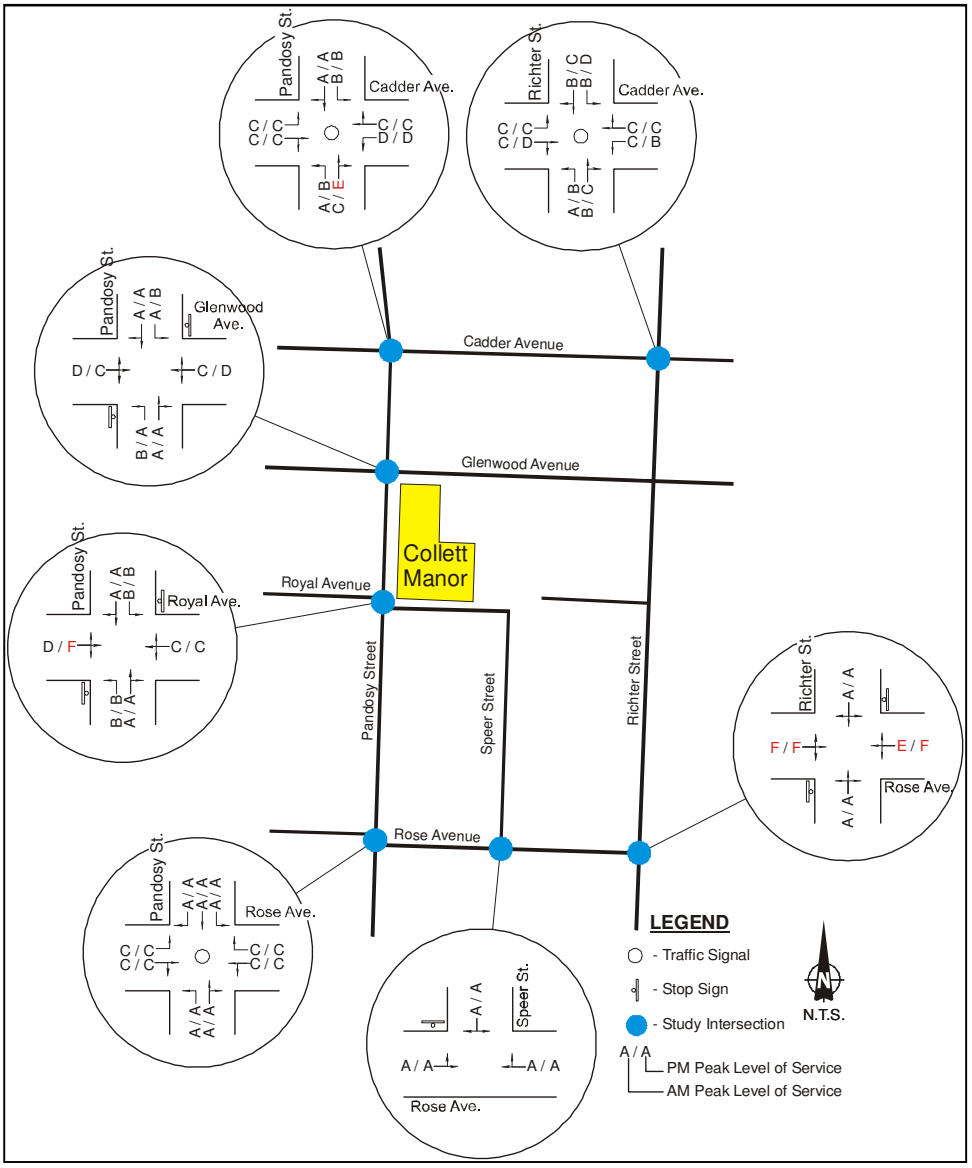


**Figure 11: 2015 Future Build out Intersection Level of Service**

When compared to the base 2015 analysis results, only one intersection experiences a drop in level of service from D to E for pm peak only, and this is for the northbound approach of the Cadder Avenue/Pandosy Street intersection. This drop in level of service is largely due to the increase in northbound through and right-turn movements. Forty-three additional vehicles are estimated to turn right from Royal Avenue at pm peak which is one every 80 seconds. The return cycle time for the Cadder Pandosy intersection for northbound vehicles is every 45 seconds with a total cycle time of 80 seconds. This reduction in level of service will increase the pm peak queue length by about 2 vehicles or 15m. This effect could be compounding but will be self governing as exiting vehicles will be restricted by intersection no stopping clear zone. This cumulative delay in real terms is minor. In general, the analysis indicates that the poor LOS is mainly due to the additional hospital traffic and/or growth in the base traffic.

## 3.3 2030 Traffic Volumes Peak Hour Traffic Volumes

Much like the previous 2015 scenario, the generated trips for the Collett Manor were added to the 2030 base volumes, resulting in the turning movements shown in Figure 12.

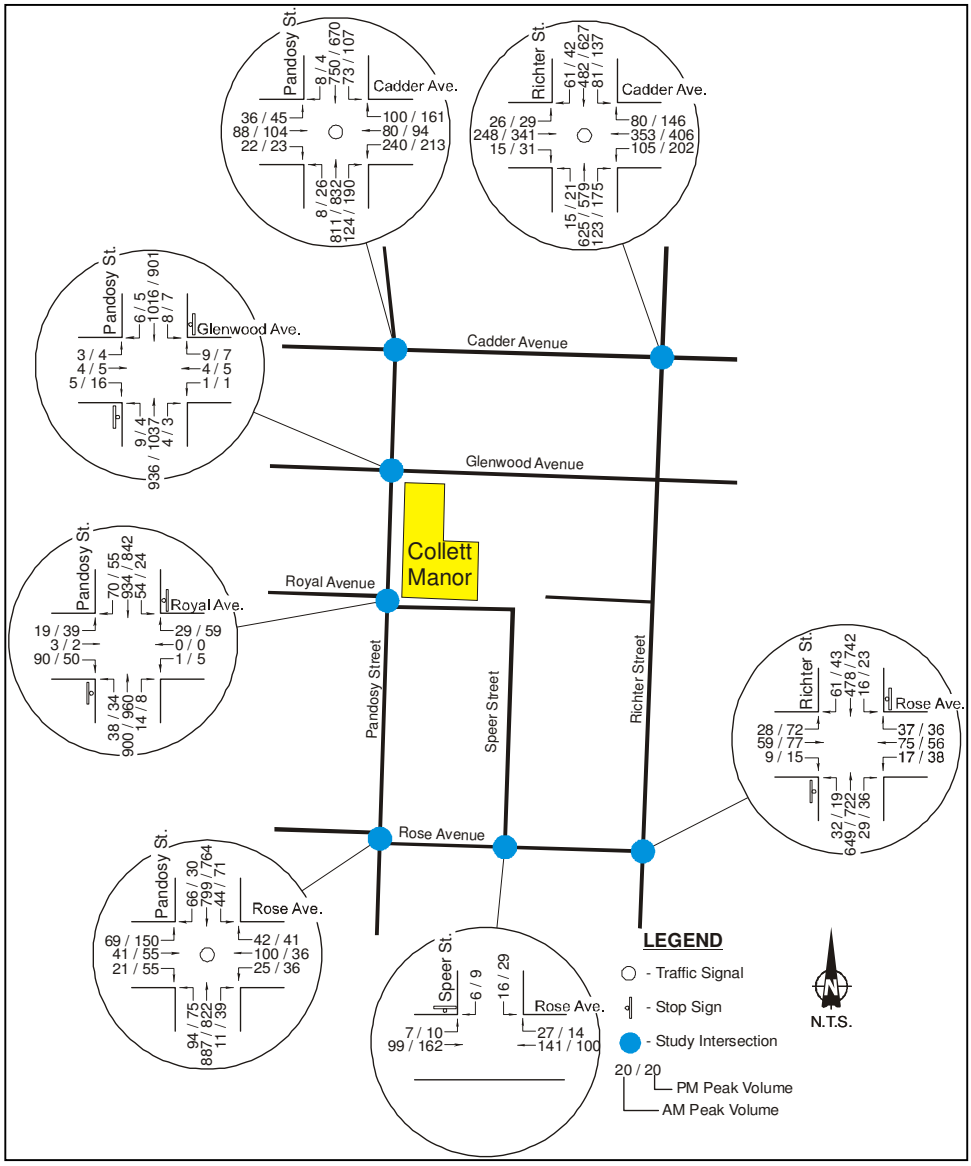


**Figure 12: 2030 Future Build out Intersection Volumes**

## 3.4 2030 Network Level of Service Traffic Conditions

The capacity with the anticipated 2030 combined traffic volumes were reviewed using Synchro 7, and the resulting LOS for each of the study intersections under 2030 conditions can be seen in Figure 13.

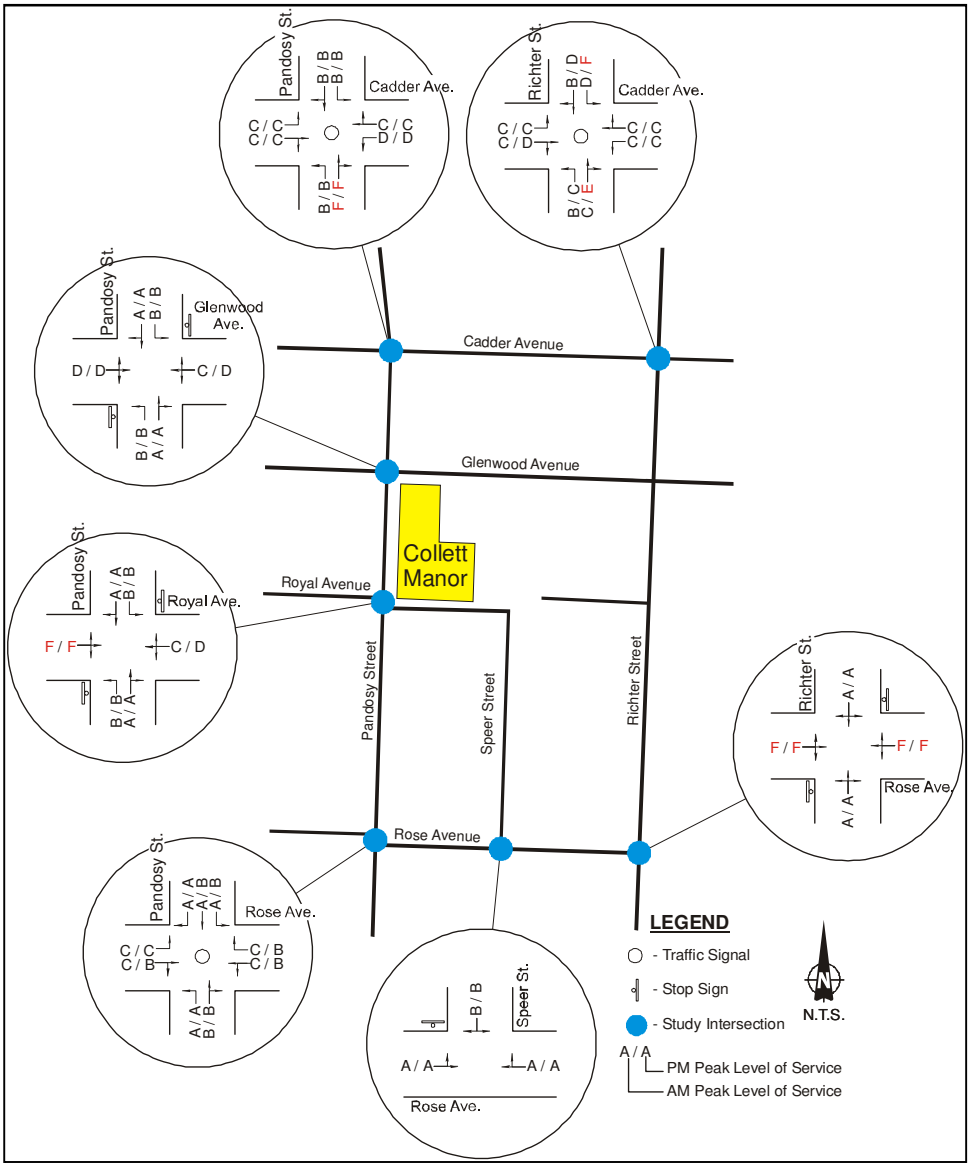


**Figure 13: 2030 Future Build out Intersection Level of Service**

When compared to the 2030 base levels of service, there is no significant reduction in LOS on any of the approaches of the study intersections. The impact of the additional traffic due to Collett Manor is expected to be minor. The poor LOS is therefore mainly due to growth in the base traffic.

## 3.5 Sensitivity Analysis (100% Kelowna General Hospital Growth 2030)

Through discussion with staff at the City of Kelowna and the client, it was determined that there is a need to test the sensitivity of the study intersections to future Hospital use scenarios. It was agreed to consider the 2030 horizon year with 100% use of the 47,900m$^2$ new gross floor area of Kelowna General Hospital.

It is important for the reader to note that the scenario is not envisaged to be representative of the true scenario.

The future scenario with 100% new facilities was only examined for the pm peak hour in the horizon year of 2030. The resulting volumes were analyzed using Synchro. Figure 14 shows the turning movements and LOS, as reported by Synchro, for the 2030 base scenario with 100% new facilities at Kelowna General Hospital.

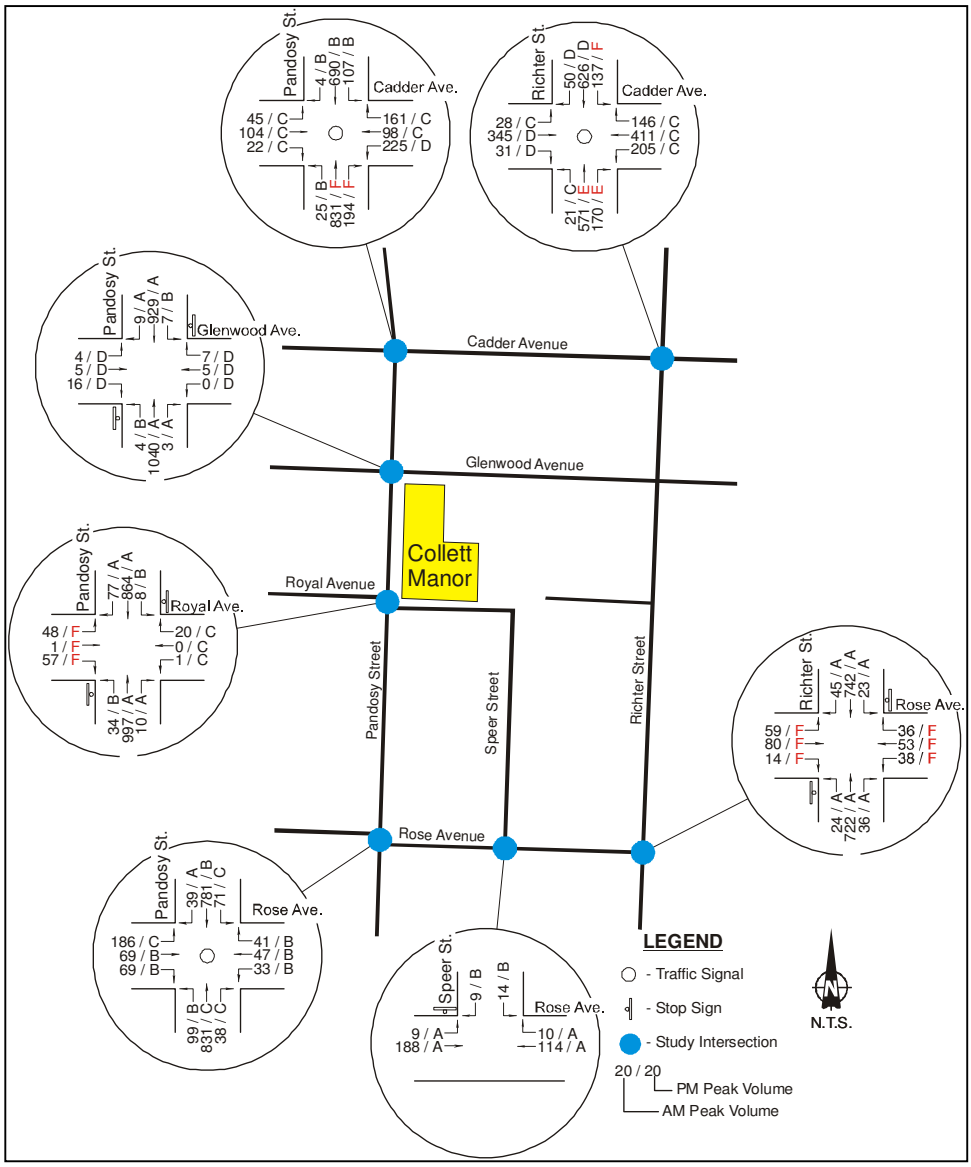


**Figure 14: Base 2030 Sensitivity Analysis Volumes and Traffic Conditions**

When compared to the expected 2030 base levels of service, the analysis indicates little difference in the LOS for all approaches to the study intersections. The additional Collett Manor traffic appears to not have a significant impact on the local road network or at the study intersections.

Once the study intersections were analyzed with 100% new facilities at Kelowna General Hospital, the Collett Manor trips were added to the network and the analysis run again. Figure 15 shows the turning movements and levels of service through the study intersections.

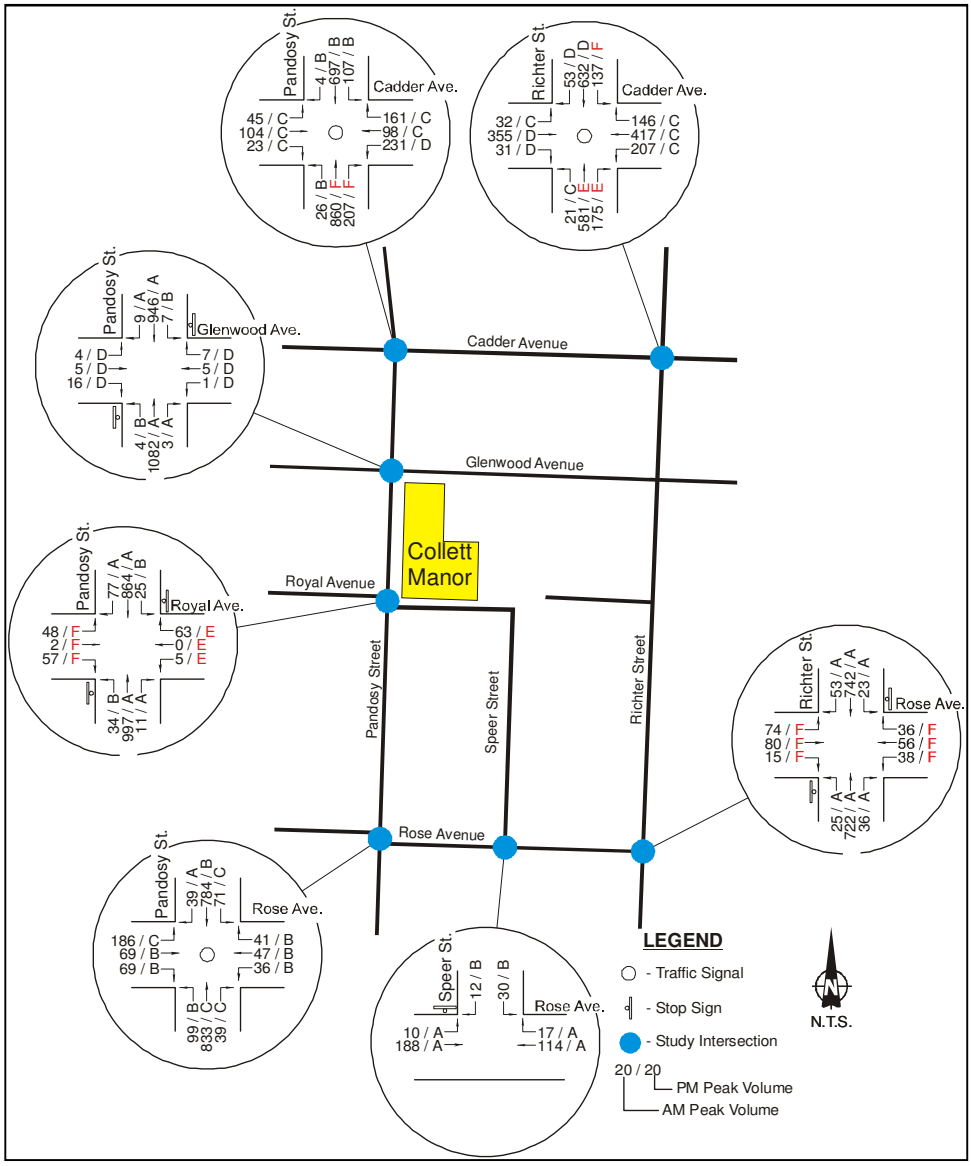


**Figure 15: Total 2030 Sensitivity Analysis Volumes and Traffic Conditions**

When compared to the base 2030 scenario and the base 2030 sensitivity analysis, only one intersection approach experiences a significant drop in level of service. The westbound approach of Royal Avenue at Pandosy Street drops from a LOS D, under planned hospital growth, to a LOS E. This is due to the higher through volumes on Pandosy Street resulting in insufficient gaps to allow for westbound vehicles. For this scenario, the impact of the additional traffic due to Collett Manor is therefore expected to be minor. Section 8 of this report will discuss mitigation measures to improve the level of service at problem intersections.

# 4 SAFETY AND ACCESS

An important part of this Transportation Impact Assessment is to complete a safety review throughout the study area including not only the vehicular corridors, but also cycling and pedestrian corridors. To complete the safety review portion of the study, the Opus team conducted the following tasks:

- Analyzed ICBC collision claims data from 2000 to 2009 for the following two intersections:
  - Pandosy Street and Rose Avenue
  - Pandosy Street and Royal Avenue
- Completed a detailed site review, making observations of geometric characteristics and driver behaviour impacting safety

## 4.1 Collision Analysis

Collision data from 1st January 2000 to 31st December 2009 was provided by City of Kelowna staff for two of the intersections within the study area. A total of 100 collisions were reported, averaging 10 collisions per year. Table 8 shows summary of the collisions.

| Collision Location | Main Collision Type | Total Number of Collisions |
|---|---|---|
| Pandosy Street/Rose Avenue | Rear end on Pandosy Street | 77 |
| Pandosy Street/Royal Avenue | Rear end on Pandosy Street | 23 |

**Table 8: Intersection Collision History**

The intersections of Pandosy Street/Rose Avenue and Pandosy Street/Royal Avenue have a high number of reported rear end collisions. Upon further investigation, no clear trend in time of day or day of the year was discovered. As a result, alternative causes were investigated to explain the high number of rear end collisions. Further review of the collision descriptions indicated that often the driver of the rear ending vehicle was not expecting the vehicle in front to stop. This leads to the conclusion that drivers are being forced to stop unexpectedly or are unsure which path to take and are driving erratically.

It was determined that clear signage is necessary to improve safety along the Pandosy corridor, including way finding signage to access the Hospital and side streets. It is also possible that the sudden stopping at the Pandosy Street/Rose Avenue may be due to signal inconspicuousness; improvements such as larger secondary signals or additional overhead primary signals would address these safety issues.

Finally, installing clear zone markings at intersections along Pandosy Street would ensure that vehicles do not block the intersections and are made aware that queue lengths may extend to adjacent intersections. This would make drivers aware to the possibility that they may have to stop unexpectedly and would help to reduce the number of rear-end collisions along the Pandosy Street corridor.

## 4.2 Site Walkthrough

Once the collision history from ICBC was analyzed, a walkthrough of the study area was conducted to determine other potential problem areas.

In addition to marking crossings on side streets, the crossing of Pandosy Street at Royal Avenue was seen as a significant potential safety concern due to the expected high number of pedestrians travelling from Collett Manor to and from Kelowna General Hospital. Although there is a marked crosswalk, vehicles were seen travelling through the intersection while pedestrians were in the act of crossing the intersection. Furthermore, with the high through volumes on Pandosy Street, pedestrians were observed taking more risk than normal by attempting to cross with smaller crossing gaps in traffic. The existing crossing on Pandosy Street will be removed as part of the CSB project by the City of Kelowna. The Collett Manor development will be served by pedestrians walking down Pandosy and crossing at the Rose Avenue Traffic Signals.

In addition to pedestrian safety, cyclist safety was highlighted as an important consideration. To this end, it is recommended that Rose Avenue be improved such that cyclists coming from the east will be redirected to travel along Cadder Avenue to Richter Street, go south on Richter Street and west on Rose Avenue to Speer Street. As Pandosy Street has little available width for the addition of cycle facilities, this is seen as the safest route for cyclist travelling to and from the site. Currently, Cadder Avenue is the main east-west cross street that provides good cycle facilities with few other options for cyclists coming from the east.

# 5 PARKING IMPACTS

## 5.1 Proposed Parking Provisions of Development

The development has a basement mixed public and private parkade and a rear, ground level loading zone parking area. These parking areas provide:

- 3 disabled parking spaces of 3.7m x 6m, two for residents and one for visitors, this complies with parking bylaw No 8000, section 8.1.7, section 8.1.11(c), BC building code requires 1 disabled space per 100 lots.
- 24 small car parking spaces which make up 37% of all (66 total parks) of 2.5m x 5m, this complies with parking bylaw No 8000, section 8.1.11(a), Where the parked vehicle doors are adjacent to columns, the spaces are required to be widened to 2.7m width in accordance with section 8.1.11(b). No spaces have this issue apart from the end spaces adjacent the walls. These will be widened accordingly.
- 39 standard size parking spaces of 2.5m x 6m this complies with parking bylaw No 8000, section 8.1.11(a), Where the parked vehicle doors are adjacent columns, the spaces are required to be widened to 2.7m width in accordance with section 8.1.11(b), No spaces have this issue apart from the end spaces adjacent the walls. These will be widened accordingly.
- 3 loading zone spaces with a minimum width of 3m accessed from the lane of a width of 5.2m. It is proposed to provide land and widen the lane on one side to permit half the lane widening of 1.2m.
- The lane access permitted to have reversing vehicles.
- 24 Basement class 1 bicycle parking spaces.
- 11 class II bicycle parking spaces at the main entrance.

The total onsite parking summary is:

- 66 parking spaces (including with 3 disabled parks)
- 3 loading zone spaces
- 24 Class 1 bicycle parking spaces
- 11 Class II bicycle parking spaces

## 5.2 City of Kelowna Bylaw 8000 Parking Assessment

An assessment has been undertaken assessing the number of parks required under the Bylaw 8000 requirements Table 8.1, 8.2 and 8.3. This is shown in Table 9 below.

| Land-Use Description | Number of Units | Gross Floor Area ($m^2$) | Parking | Loading | Bicycle |
|---|---|---|---|---|---|
| Bachelor/Studio | 7 | 4,705 | 7 | 1.69 | Class 1 =21.5<br>Class II =4.3 |
| 1-Bedroom | 3 | | 1 | | |
| 2-Bedroom | 33 | | 33 | | |
| Pharmacy | 1 | 1052 | 19 | 0.55 | Class 1 =2.1<br>Class II =6.3 |
| Medical Ancillary Lease Space | 5 | | | | |
| Food Primary (32seats) | 1 | 100 | 8 | 0.04 | Class 1 =0.1 |
| Amenity Area (indoor) | N/A | 484 | 2 | n/a | n/a |
| Private Useable Open Space | N/A | 1,219 | n/a | n/a | n/a |
| **TOTALS** | | | **70** | **3** | **Class 1 =24**<br>**Class II =11** |

**Table 9: Parking Bylaw No 8000 Calculations for parking**

The development meets the requirements for bicycle parking and loading. It has a minor shortfall in the general parking supply by 4 parking spaces or 6%. This is considered acceptable when we consider that all the provided retail, café, amenity area are targeted at internal residential use rather than general public. As well, a number of users will be walking to the site from the adjacent hospital, and would not require parking. Also the combination of facilities will have differing peak parking demand, which will allow for reciprocal parking demand. It is also expected that the minor offsite parking shortfall will have minimal to no adverse effect on the local transportation network.

# 6 MULTI-MODAL TRANSPORT ISSUES

## 6.1 Modal Split of Collett Manor Users

Collett Manor is a unique development to the Kelowna area and hosts a range of uses. As a result, the modal split of the users is difficult to estimate and is likely to be different from other developments in Kelowna. Furthermore, due to the proximity to Kelowna General Hospital and the strong synergy between the two structures, it is envisaged that the Collett Manor trips will have a higher percentage of pedestrians and internal trips. As shown in Table 10, the total expected trips that will be pedestrian or internal trips approaches 50% of the total trips to and from the site.

| Land Use Type | Floor Area (sqft)/ Unit Numbers | Trips/Customers | Pedestrian/Internal | |
|---|---|---|---|---|
| | | Weekday | Weekday | |
| | | Total | Percentage | Total |
| Bachelor/Studio | 7 | 36 | 20% | 6 |
| 1-Bedroom Suite | 3 | 18 | 20% | 2 |
| 2-Bedroom Suite | 33 | 198 | 33% | 66 |
| Pharmacy | 2927 | 500 | 50% | 250 |
| Medical Retail | 6070 | 270 | 33% | 88 |
| Medical Office | 2327 | 86 | 33% | 28 |
| Food Primary (Sandwich Bar) | 1076 | 250 | 80% | 200 |
| **Total** | | **1358** | **47%** | **640** |

**Table 10: Collett Manor Pedestrian/Internal Trips**

Due to the high number of pedestrian and internal trips, this will significantly reduce the traffic effect and assist in achieving the City of Kelowna's higher transportation objectives of reduced vehicle trips.

This development will provide a reduction in vehicle trips to the adjacent Kelowna General Hospital, by providing nearby accommodation so users obtaining treatment can walk directly to their appointment. It will also assist in addressing any parking shortfall for the new hospital expansion by preventing vehicle trips and reducing Hospital parking demand.

## 6.2 Cycling

It is not expected that Collett Manor will have significant bicycle trips, as many of the users will be seeking treatment at Kelowna General Hospital and are not likely to be able to use cycling as a mode of transportation. However, some of the staff, patients requiring recreation and long-term residents may cycle to and from the site. As a result of the walkthrough the study area, it was determined that bicycle infrastructure on the surrounding streets is lacking. More specifically, there are no designated bicycle facilities along Pandosy Street and no east-west connection from Richter Street south of Cadder Avenue. This renders accessing the site by bicycle difficult and forces cyclists to use roads that do not have cycle infrastructure. In line with the City of Kelowna's plan to upgrade Rose Avenue to an arterial road, the addition of bicycle lanes on Rose Avenue will allow for users to travel on Richter Street to Rose Avenue and travel down Rose Avenue to Speer Street and access the site rather than travelling down the busy Pandosy Street and make a dangerous left turn at Royal Avenue.

It is recommended that protected bicycle parking be provided in the underground parking lot. This would be an enclosed area reserved in the parking lot that would provide safe, long-term parking for bicycles. Also, quick access bicycle racks on street level for short-term visitors is recommended.

## 6.3 Walking

As close to 50% of the trips to Collett Manor are anticipated to be by pedestrians or internal, pedestrian safety throughout the study area is a significant concern. The most significant pedestrian issue is the crossing of Pandosy Street at Royal Avenue by pedestrians travelling to and from Kelowna General Hospital.

The existing current signed and marked pedestrian zebra crossing was installed sometime between February and May 2007, by the City of Kelowna Operations Department, following public complaints regarding crossing difficulties. This was triggered in part by a temporary hospital parking lot being established on the CSB building site (south east corner of Pandosy and Royal Avenue). This parking was removed in 2009 when the CSB building site preloading was placed over the parking lot.

In May 2007 pedestrian crossing movements were recorded by field survey, finding 26 pedestrian per hour in pm peak with conflicting pm peak vehicle volume at 1,400 veh/hr. This meets the current Pedestrian Crossing Warrant (Pedestrian crossing Control manual BC April 1994), which requires 20 or more pedestrian per hour and greater than 1000/veh/hr for a signed and marked pedestrian crossing.

Opus has become aware that the City intends to remove the existing marked and signed crossing on Pandosy at Royal Avenue as the CSB parking removal has reduced the demand and the warrant criteria for the current crossing facility.

It is estimated that this development will increase the peak pedestrian volume above the 20 pedestrian/hour again and require the reinstatement of the marked crossing. The pedestrian volumes are estimated to be in the order of 260 pedestrian crossings of Pandosy a day or 26 pedestrian trips in pm peak. This would not trigger the need for amber flashing signal or traffic signals but would meet the warrant for a signed and marked zebra crossing. It is accepted that the City will remove the marked crossing and pedestrians will be encouraged to walk to Rose Avenue to cross Pandosy Street.

Mobility impaired users will also be common on the site. All access points will be fully accessible. Within the accommodation units there will be specifically designed areas for mobility scooter storage. With the café there will also be mobility impaired service areas. It is recommended that the crosswalk on Royal Avenue on the

corner of this property be upgraded and the sidewalk and pedestrian ramp and sidewalk landing area be upgraded to accommodate mobility scooter access. A sidewalk should be provided along the entire property frontage. Additionally, on-site observations indicate that the on-street lighting along Speer Street, Royal Avenue, and Glenwood Avenue adjacent to the site was limited and should be improved to increase safety to all road users after nightfall.

## 6.4 Transit

Currently, only transit route services the study area, the number1 Lakeshore route. It has northbound and southbound stops on Pandosy Street at Rose Avenue and a southbound stop on Pandosy Street between Glenwood Avenue and Cadder Avenue. As the transit stops at Rose Avenue are larger stops and only 200m from the site, transit access is not seen as a significant issue.

# 7 ROYAL AND ROSE NETWORK CHANGES IMPACTS

Two possible network improvements have been considered as part of this network study. In particular whether or not these improvements improve traffic conditions and reduce the adverse Level of Service at key intersections. The two improvements considered are:

1. Royal Avenue extension to the east connecting it through to Richter Street.
2. Rose Avenue complete upgrade to an arterial west – east connector and signalization of intersections.

## 7.1 Royal Avenue Extension

The proposed connection of Royal Avenue from Richter Street to Pandosy Street is not seen as a benefit to the road network within the study area. This is largely because it is not expected that it will have significant impact on the level of service for any of the intersection approaches, and the residential units on the Richter Street portion of Royal Avenue would experience a significant impact as much of the traffic that is expected to travel down Speer Road would instead use Royal Avenue. With no further connectivity beyond Richter Street, vehicles would be making left and right turns onto Richter Street only. With the high through volumes on Richter Street, there would be insufficient gaps to allow for the turning movements. Furthermore, signalization is not a recommended option due to the close proximity to Cadder Avenue and Rose Avenue.

## 7.2 Rose Avenue Upgrade

The proposed upgrade of Rose Avenue to an arterial classification and subsequent signalization of major intersections along Rose Avenue is seen as a significant improvement to the study area. As shown in section 2 and 3 previously, the intersection of Rose Avenue and Richter Street will experience poor LOS under all study conditions. As will be discussed in further detail in section 8 following, the signalization of Rose Avenue and Richter Street intersection is seen as the most appropriate mitigation measure to the delays on the Rose Avenue approaches. Furthermore, if Rose Avenue were upgraded to arterial classification, it would provide a much safer corridor for pedestrians and cyclists travelling in the area which currently do not have sidewalks or bicycle lanes. Finally, the upgrade of Rose Avenue would result in some traffic volume using Rose Avenue to connect to other north/south routes to the east, rather than using Pandosy Street to get to Cadder Avenue, effectively reducing the volumes on Cadder Avenue and Pandosy Street and subsequently improving levels of service. It is noted that further study is required to determine the exact extent of this impact.

# 8 MITIGATION MEASURES

## 8.1 2015 Horizon Year Mitigation Measures

Of the seven study intersections, 3 experience low levels of service in 2015 under base conditions, that is without the building of Collett Manor. These include the following:

1. Royal Avenue & Pandosy Street Eastbound approach, PM Peak
2. Rose Avenue & Richter Street Eastbound approach, AM and PM Peak
3. Rose Avenue & Richter Street Westbound approach, AM and PM Peak

The Royal Avenue eastbound approach at Pandosy Street is the result of high left-turn movements off Royal Avenue and high through volumes on Pandosy Street. The addition of a channelized right-turn lane to the eastbound approach of Royal Avenue will improve the level of service to an acceptable level. For the Rose Avenue & Richter Street intersection, the proposed signalization of the intersection by staff at the City of Kelowna was deemed to be the most appropriate mitigation measure.

With the construction of the proposed Collett Manor, only one intersection approach decreases to an unacceptable LOS, the northbound through/right approach of Pandosy Street at Cadder Avenue. This intersection approach experiences a poor LOS under 2030 base traffic conditions, and it is also known from previous network analysis that this intersection has poor LOS at 2020 under base traffic condition. With the construction of Collett Manor, the poor LOS is experienced earlier in 2015. To alleviate the poor LOS, an additional dedicated right-turn lane to the northbound approach of Pandosy Street is recommended. In summary, although this improvement is required under base traffic conditions, the Collett Manor development results in the improvement being required five years earlier.

This intersection experiences existing queuing delays in pm peak and is an existing problem. The 2015 Collett Manor traffic increases this queue length by only two vehicles at pm peak. This net increase is of a minor nature.

Figure 16 shows the levels of service through the study intersections with the discussed improvement measures under 2015 conditions with both Kelowna General Hospital expansion and Collett Manor traffic.

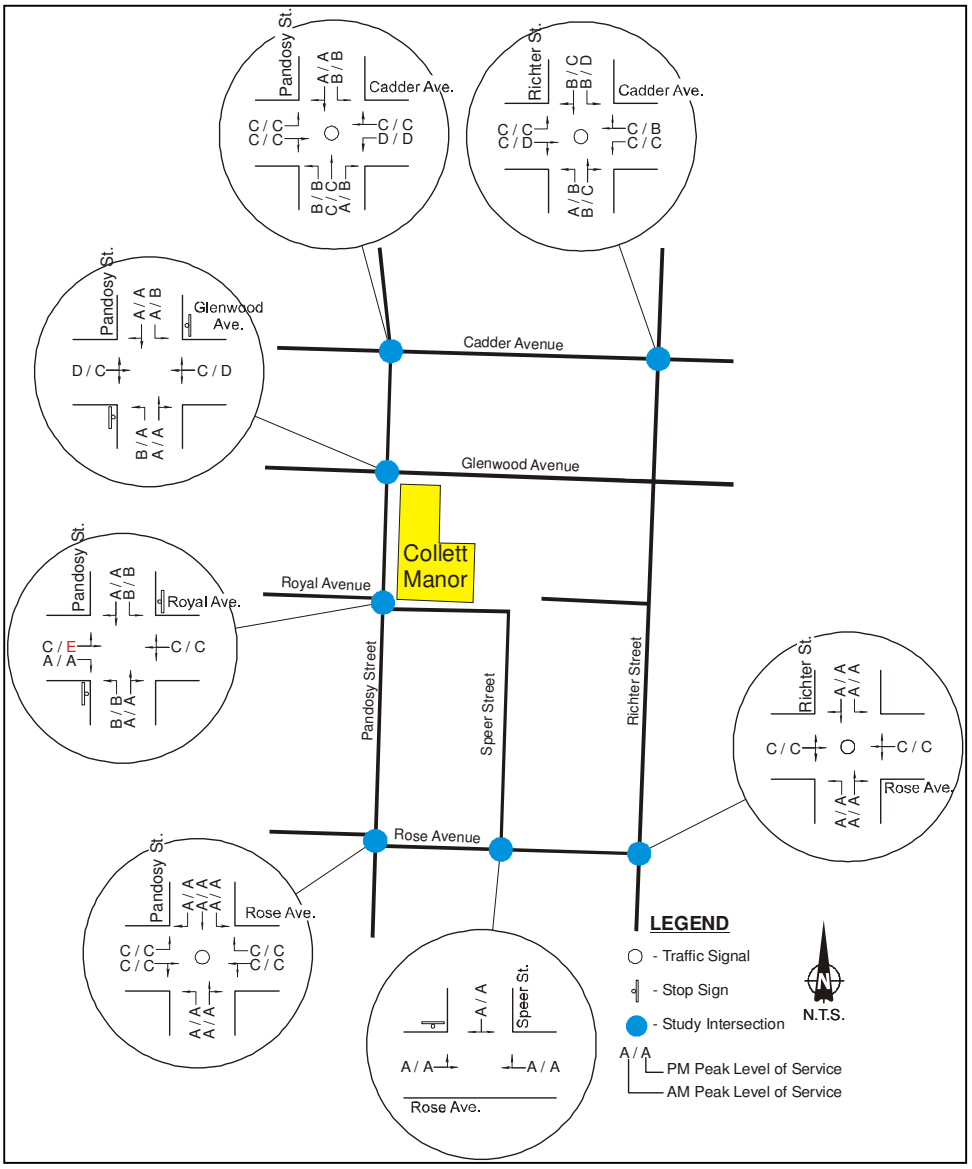


**Figure 16: 2015 Total Level of Service with Mitigation Measures**

## 8.2 2030 Horizon Year Mitigation Measures

For the 2030 horizon year, two additional intersection approaches experience low levels of service. Additionally, two intersection approaches that previously experienced low levels of service under PM peak now experience low levels of service under AM peak as well. All of the approaches experience the low level of service under 2030 base conditions; this is to say without the proposed Collett Manor traffic. The additional intersection approaches are:

1. Cadder Avenue & Pandosy Street Northbound approach, AM Peak
2. Royal Avenue & Pandosy Street Eastbound approach, AM Peak
3. Cadder Avenue & Richter Street Northbound approach, PM Peak
4. Cadder Avenue & Richter Street Southbound approach, PM Peak

As previously discussed, the poor LOS on the northbound approach of Pandosy Street at Cadder Avenue can be alleviated by the addition of a dedicated right-turn lane. Furthermore, the eastbound approach of Royal Avenue at Pandosy Street experiences a poor LOS under AM peak as well as PM peak; the recommended dedicated right-turn lane will improve the LOS to acceptable levels.

The northbound approach of Richter Street at Cadder Avenue experiences poor LOS under PM peak conditions due to the high number of right-turn movements, and as such a dedicated right-turn lane improves the LOS to acceptable levels. The southbound left-turn movement of Richter Street at Cadder Avenue experiences poor LOS as a result of the high northbound through volumes on Richter Street. With the addition of a southbound advanced left-turn phase to the signal timing, the LOS can be improved to acceptable levels while maintaining adequate LOS for other intersection movements.

Figure 17 shows the levels of service through the study intersections with the discussed improvement measures under 2030 conditions with both Kelowna General Hospital expansion and Collett Manor traffic.

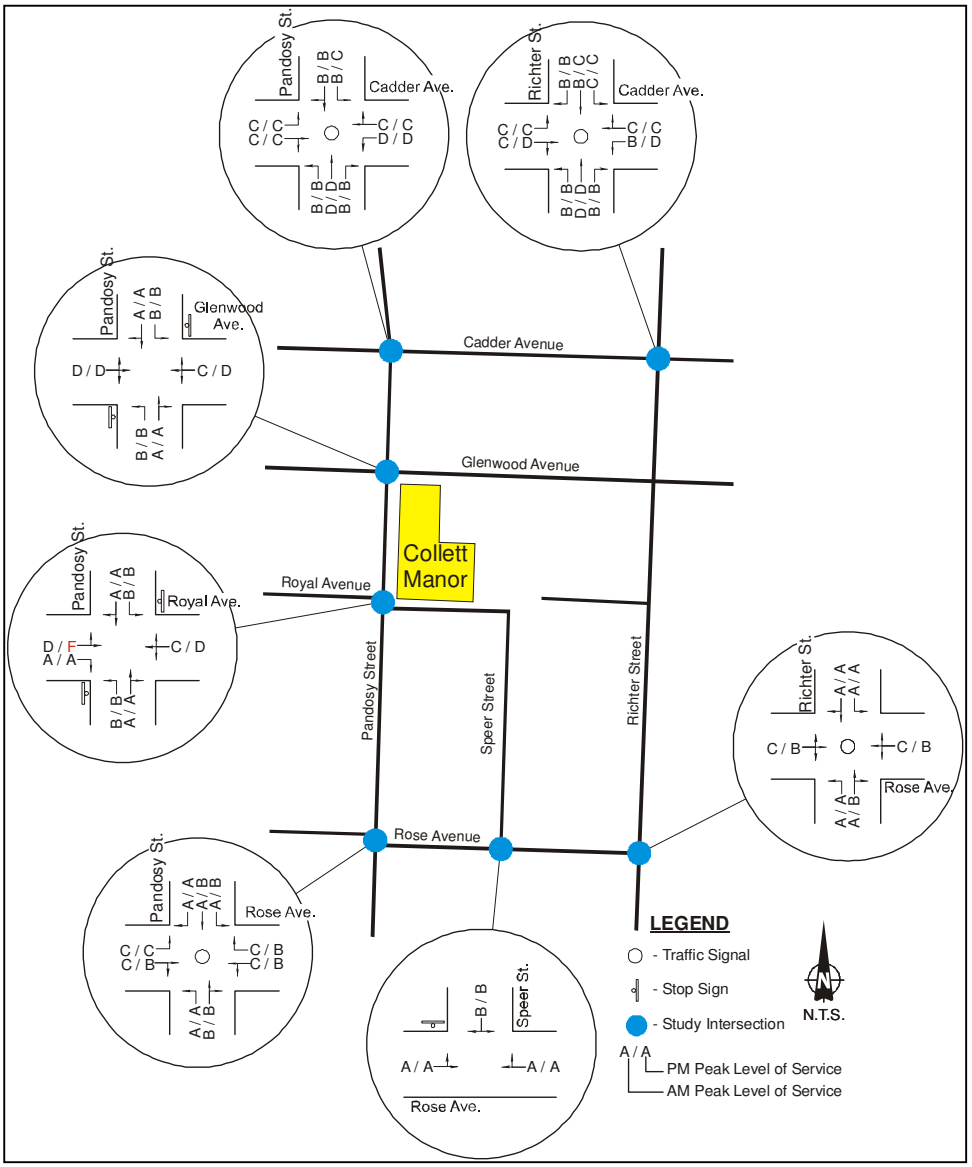


**Figure 17: 2030 Total Level of Service with Mitigation Measures**

# 9 CONCLUSIONS

This report has assessed the full transportation impact of the proposed Collett Manor development. The proposed Collett Manor would function as a support facility to Kelowna General Hospital in that it would house patients receiving short- and long-term treatment at the hospital as well as offer support services such as a pharmacy, medical retail stores, and medical services not offered at the hospital.

Due to the unique nature of the Collett Manor, a combination of surveyed data, discussion with the client, and Institute of Transportation Engineers Trip Generation manual were used to generate the peak hour volumes. Additionally, the modal split discounts were added to the generated trips to determine the final peak hour trips. The subsequent trips were distributed throughout the seven study intersections and Synchro 7 analysis software was used to determine the levels of service for each of the intersections approaches, based on the Highway Capacity Manual methodology. The appropriate Kelowna General Hospital expansion related traffic was included in the two horizon years of 2015 and 2030. The results of the analysis highlighted several intersection approaches that is expected to experience poor levels of service. However, all of the intersections that will experience a poor level of service will do so under base conditions; this is to say regardless of whether Collett Manor is constructed or not. In fact, the traffic generated by Collett Manor will not have a significant impact on the study intersections, except the northbound approach of Pandosy Street at Cadder Avenue. This will experience a low level of service earlier at 2015 rather than 2020 if Collett Manor were not built.

Measures were investigated to mitigate the low levels of service, and the measures that best resolve the problems can be seen in Table 11.

| Intersection | Approach | Horizon Year | Mitigation Measure |
|---|---|---|---|
| Royal Avenue & Pandosy Street | Eastbound | 2015 | Dedicated Right-turn lane |
| Rose Avenue & Richter Street | Eastbound and Westbound | 2015 | Signalization |
| Cadder Avenue & Pandosy Street | Northbound | 2015 | Dedicated Right-turn lane |
| Cadder Avenue & Richter Street | Southbound | 2030 | Dedicated Right-turn lane |
| Cadder Avenue & Richter Street | Southbound | 2030 | Advance left-turn signal phase |
| Cadder Avenue & Richter Street | Northbound | 2030 | Dedicated Right-turn lane |

**Table 11: Study Intersections Mitigations Measures Summary Table**

Although most of the intersection approaches that experience a poor level of service were able to be improved, most of the poor levels of service are the result of traffic volumes approaching or exceeding intersection capacity. As a result, it is recommended that network wide measure be investigated to increase capacity at intersections or re-route traffic to alternate intersections with higher capacity.

The primary safety concern throughout the study area is the pedestrian crossing of Pandosy Street at Royal Avenue. As there is expected to be many pedestrians from Collett Manor visiting Kelowna General Hospital, it is necessary that the pedestrian crossing infrastructure at Royal Avenue (the nearest intersection to Collett Manor and the intersection where pedestrians to and from Collett Manor are anticipated to use to cross Pandosy Street) be retained for pedestrian safety. It will meet the pedestrian crossing warrant and will not introduce

undue delays on Pandosy Street. Additionally, on-street lighting on Speer Street, Royal Avenue, and Glenwood Avenue adjacent to the site should be improved to increase safety to all road users after nightfall. It is accepted that the City will remove the existing pedestrian crossing on Pandosy Street and users of the proposed Collett Manor will cross Pandosy Street at the Rose Avenue Traffic Signals.

A sidewalk upgrade should be undertaken along the Collett Manor frontage along Royal Avenue. The crosswalk across Royal Avenue and pedestrian ramps should also be upgraded.

This net discounted traffic affect has not been modelled explicitly and to the total cumulative effects of this development on top of the Hospital traffic has been considered as a worst case scenario.

Furthermore, when compared to the proposed new zoning for this applicants land in the newest Official Community Plan, which has the lots as Low Density Multiple Family Development, the incremental impact of the proposed development is small. Using the proposed Low Density Multiple Family Development, it has been estimated that approximately 40 units could be built on the lots under consideration, based on the RM3 zone. The maximum density that could be developed under the RM3 zone is a Floor Area Ratio of 0.75. That means that you could construct a net floor area equal to 0.75 times the area of the subject properties. The site is is 4519 square metres so the maximum floor area would be 3389 square metres or 36,481 square feet. If you considered a building with an average of 900 square foot units, this would allow you about 40 units and would require about 60 parking stalls.

Using the trip generation rate applied to the 2-bedroom in this report, 8 trips per day per unit, general use not related to the hospital, the trips generated is estimated at 320 daily trips. Taking 15% of the daily trips being in the peak hours, this translates to 48 trips in the peak hours. When compared to the trips generated by the proposed Collett Manor, estimated at 94 trips in the peak hour, it is clear that the cumulative network impact of the proposed Collett Manor is not large. To this end, under the Ministry of Transportation's Site Impact Analysis Requirements Manual, proposed uses exceeding approximately 100 trips constitute noticeable traffic impact. Since the trip generation for the proposed use and the additional increase over what is permitted being just 46 veh/hour is less than this threshold, the adjacent road network is likely able to handle the additional traffic and the traffic impact should be indiscernible to the current traffic conditions at build-out.

Finally, through discussion with staff at the City of Kelowna, some question regarding the discount applied to the trip generation. As a result, a discussion was held by which new discounts were agreed upon. A further analysis was completed applying an ITE generation of 6.7 veh/unit to all 33 units as if they operated as full private residential units. The agreed upon trips can be seen in Table 12 following with a comparison to the trips used in this report.

.

| Total Weekday Trips | | AM Peak | | PM Peak | |
|---|---|---|---|---|---|
| | | Inbound | Outbound | Inbound | Outbound |
| Original | 628 | 70% | 30% | 30% | 70% |
| | | 66 | 28 | 28 | 66 |
| Updated | 654 | 69 | 29 | 29 | 69 |

**Table 12: Discussed Trip Generation**

As can be seen, the net peak hour trip increase is only 4 trips per hour. This increase has very little effect on the study intersections, only one intersection approach has a change in LOS, the southbound through movement of Pandosy Street and Cadder Avenue under 2015 AM peak conditions drops to a LOS B, all other intersection approaches have the same levels of service.

The overall impact of the proposed Collett Manor to the surrounding transportation network is minimal. The additional trips on the network will be a small portion of the existing traffic and with the close proximity to Kelowna General Hospital and supporting services; it will reduce the trips to and from the hospital site, although this was not explicitly accounted for. If we consider the net overall effect of reduced hospital vehicle trips and reduced hospital parking demand, the Collett manor facility may well have a beneficial effect to the hospital area traffic flows.

# Appendix A Terms of Reference

## Terms of Reference

The proposed Terms of Reference for the Traffic Impact Assessment for the proposed Collett Manor, to be located at the 2100 block of Pandosy Street, as shown in Figure 1 below.

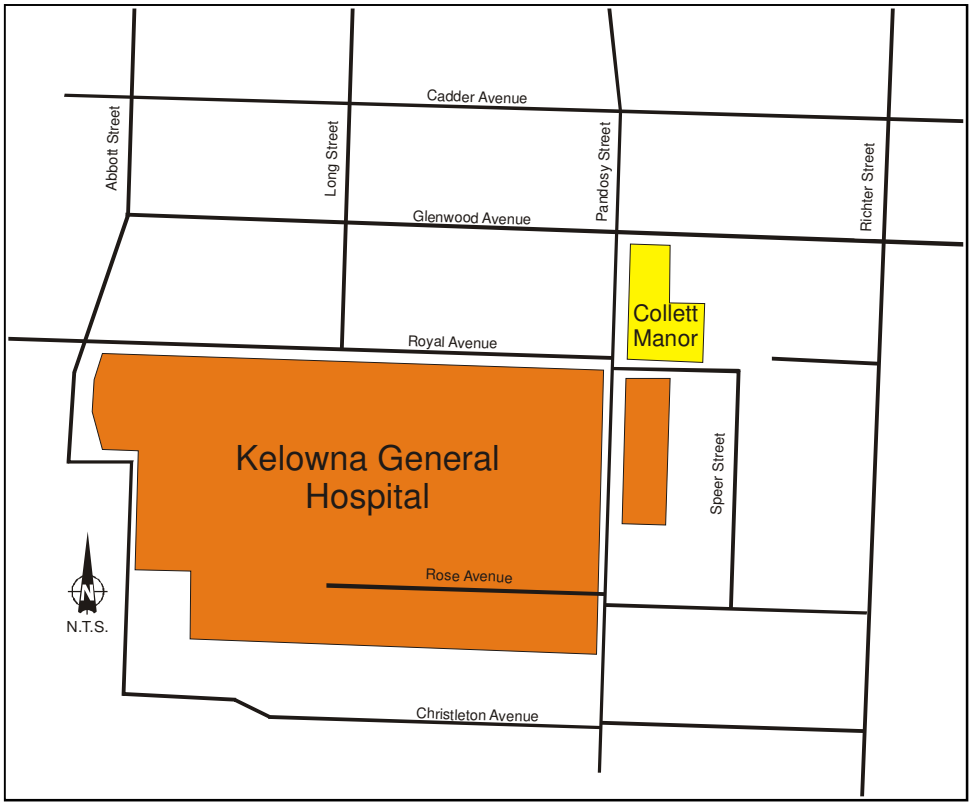


**Figure 18: Collett Manor Site Location**

The proposal is for a short term high density residential development offering accommodation for adjacent health facilities and services at Kelowna General Hospital.

This development is within the wider Kelowna General Hospital network and the previously prepared and calibrated Kelowna General Hospital traffic model will be used to analyse this development.

These terms of reference outline the analysis method and outputs that will be provided for planning and transportation impact engineering assessment.

***Project Definition and Scope***

The project is to develop a 4 storey multi-use short term accommodation complex with a mix of different sized apartments to provide for both patients and patient support family/friends who are undergoing treatment at the adjacent Kelowna general Hospital. There will be related health services, visitors lounge for family meeting or specialist meetings, a small pharmacy and small café, all primarily serving accommodation guests and/or hospital visitors. Figure 1 below shows an aerial schematic of the development.

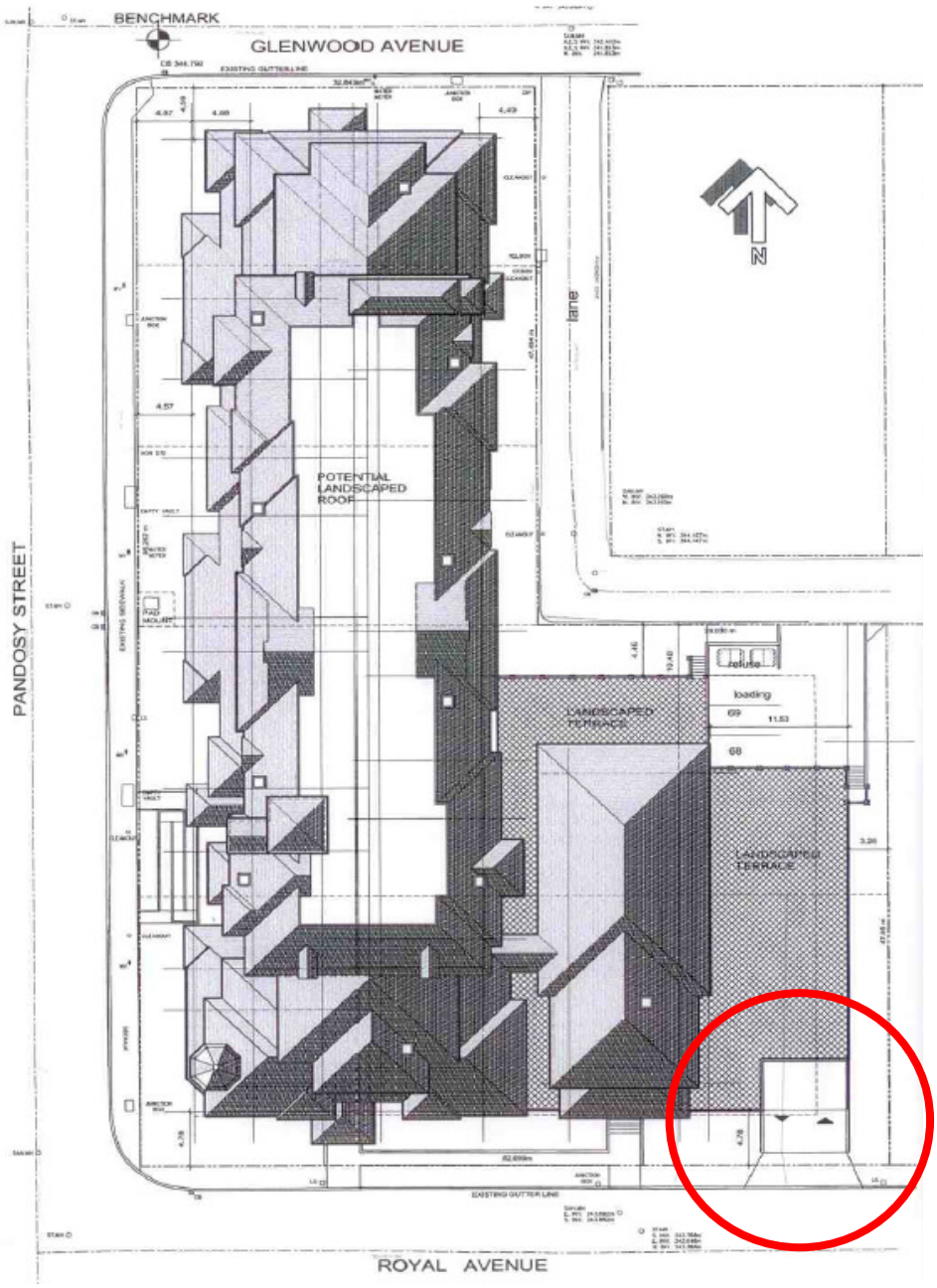


Figure 1 Aerial View of Development with main access off Royal Avenue to underground parkade “circled”

The project facility breakdown is shown below in table 1 with typical traffic generation.

| Land-Use Description | Number of Units | Gross Floor Area ($m^2$) |
|---|---|---|
| Bachelor/Studio | 7 | 4,705 |
| 1-Bedroom | 3 | |
| 2-Bedroom | 33 | |
| Pharmacy | 1 | 272 |
| Medical Ancillary Lease Space | 5 | 780 |
| Food Primary | 1 | 100 |
| Amenity Area (indoor) | N/A | 484 |
| Private Useable Open Space | N/A | 1,219 |
| Underground Parking Lot | 68 | 4,539 |
| **Collett Manor Full Development** | | **12,099** |

**Table 1: Land Use Details**

***Existing Network Considerations***

The key network considerations to be reviewed by TIA:

- Minimal increase of traffic on Speer Street.
- Careful consideration of layout of Royal Avenue intersection with Pandosy and related LOS. Consideration of two lane exit from Royal Avenue.
- Traffic calming on Speer Street or limit of left turn exit from Development.
- Peak hour queuing impact on Pandosy.
- Cumulative impact on top of KGH development.

***Traffic Impact***

Intersection capacity analysis will be based on the methods outlined in the Highway Capacity Manual (Transportation Research Board, 2000), using Synchro 7 software and assumed to be completed for the following network intersections:

- Cadder Avenue and Pandosy Street
- Royal Avenue and Pandosy Street
- Glenwood Avenue and Pandosy Street
- Glenwood Avenue and Richter Street
- Rose Avenue and Pandosy Street
- Cadder Avenue and Richter Street

- Rose Avenue and Richter Street

Three horizon years for the above seven intersections will be analyzed:

- 2015 AM and PM Peak hours (22% Hospital Growth with construction of only Centennial, CSB and UBC)
- 2030 AM and PM Peak hours (22% Hospital Growth)
- 2030 AM and PM Peak hours ( 100% Hospital development)

Background growth will be as used for KGH of 1.5% compounding.

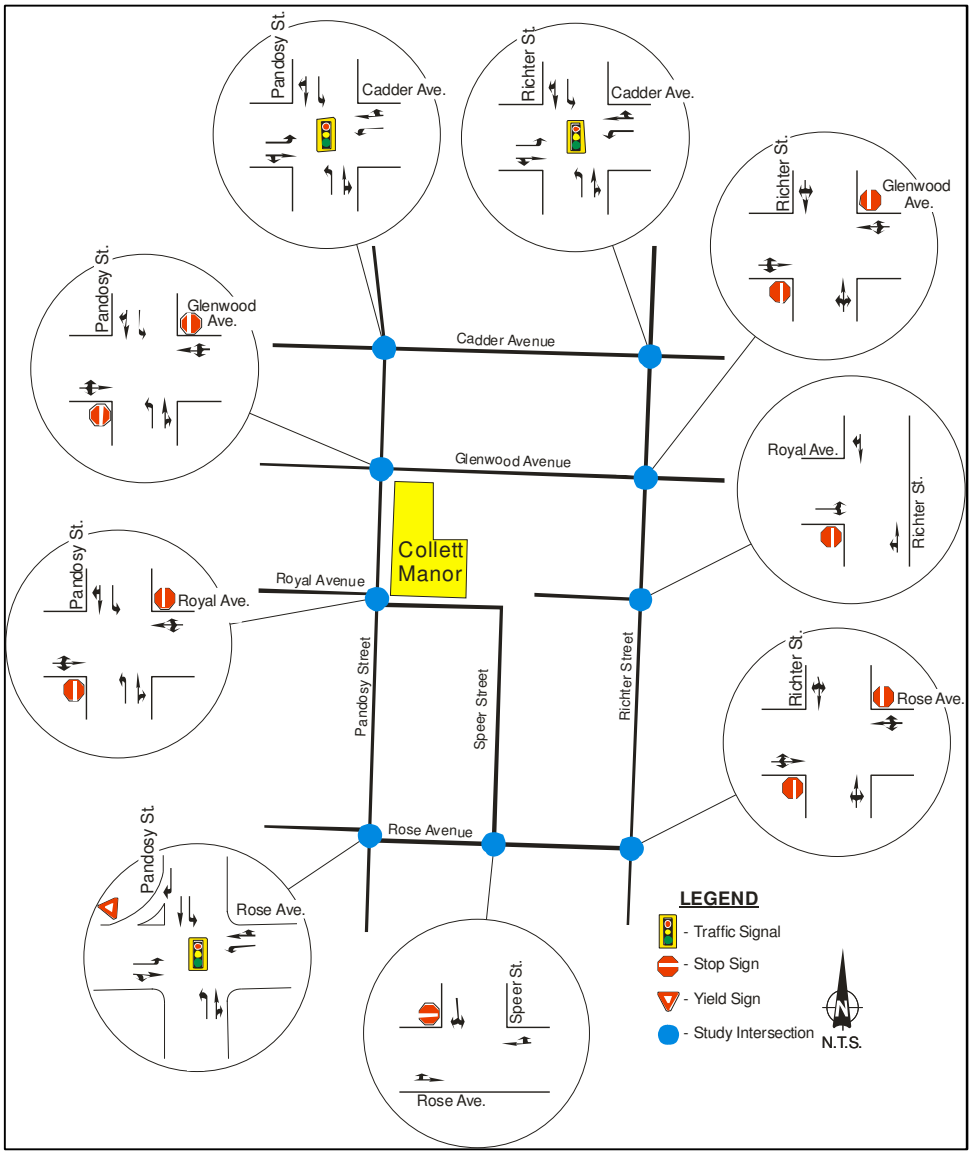


**Figure 2 Network Intersections Analysed**

A base scenario will firstly be modelling in which the existing Two Dwelling Housing land use will be use to determine the current generated trips and the existing capacity and performance will be determined. Next, the planned future re-zoning of the lots to Low Density Multiple Housing will be analyzed to determine the incremental effect of the new zoning. Finally, the proposed land use will be analyzed for its' further incremental effect over the existing and planned land uses. It is believed that in this way the true effect of the proposed Collett Manor development will have on the network can be determined.

Trips generated by the site redevelopment proposal will be estimated based on land use information provided with a detailed breakdown of land use type within the multi-use facility. Land use types identified in the Institute of Transportation Engineers (ITE) Trip Generation, 8th Edition will be used to calculate site trips. Table 1 below shows the ITE land uses we are proposing to use:

It is believed that since the development will act as support to Kelowna General Hospital, the modal split of development related traffic will be more heavily weighted to pedestrians than typical for Kelowna. This is furthered by the intention that the facility will be primarily used by patients receiving extended treatment at the hospital or by users from out of town visiting patients at the hospital. The trip generation and modal split will be discussed with City staff prior to progressing further in the analysis. This facility will have a net reduction of trips to KGH which needs to be considered when assessing overall network effect.

Once the trips for the proposed Collett Manor are generated and an appropriate modal split is agreed upon, the trips will be distributed and assigned to the study area road network according to the number of land use and road layout scenarios to be tested.

The 2020 Model run will include full Kelowna General Hospital build out (22% growth) and the 2030 model will include 22% growth and full 100% Kelowna General Hospital growth, as worst case example.

Two additional scenarios will be tested for their affect on the network intersections including connecting Royal Avenue through to Richter Street and upgrading Rose Avenue to an arterial designation through to Ethel Street.

If it is determined from the modelling that any of the study intersections experience a Level of Service D or lower due to development related traffic, modifications to the roadway or changes to the traffic control devices will be recommended. Conceptual drawings may be provided for illustrative purposes as required; however, it is acknowledged the preparation of functional roadway designs is beyond the scope of this study.

Finally, it is understood that safety of all road users must be ensured. To this end, a high-level review of the existing and anticipated road safety issues will be conducted to ensure that the recommended capacity improvements are safe. Additionally, a detailed review of the safety associated with the site access location and geometric design will be conducted and alternatives will be suggested if deemed unsatisfactory.

The results of the traffic study will be presented in an electronic (pdf) draft report, summarizing the methodology and findings of the study. The draft report will be submitted to the client and the City for review. Following review of the draft report, a final version will be produced in hard and electronic formats. Three bound copies will be submitted.

***Key TIA table of contents***

# Appendix B Floor Plans of Development

# Appendix C Synchro Outputs for 2020

# Appendix D Parking Layout


OPUS

# Review of Collett Manor TIA
## City of Kelowna



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2011 April 29

City of Kelowna
Regional Services
1435 Water Street
Kelowna, BC V1Y 1J4

Attention: Ron Westlake, P.Eng.
Director

Dear Sir,

**Re: Review of Collett Manor Transportation Impact Assessment**

The attached report documents our review of the *Collett Manor Transportation Impact Assessment Report* undertaken by Opus International Consultants (Canada) Ltd. In particular, it addresses the three outstanding issues that the City of Kelowna is considering regarding the development of Collett Manor:

- The need and configuration of a northbound right turn lane on Pandosy Street at Cadder Avenue;
- The need for a pedestrian activated signal on Pandosy Street at Royal Avenue; and
- The need and possible realignments of Royal Avenue as it intersects with Pandosy Street.

I trust the information contained herein will assist the City in the review of the transportation impacts of the development. If you have any questions, I am available to discuss the report at your convenience.

Yours truly,

D.C. DEAN ASSOCIATES INC.

David Dean, P.Eng.

dcdean
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City of Kelowna

# Review of Collett Manor TIA

FINAL

2011 April 29

# Table of Contents

# 1. Introduction

Pandosy Developments Ltd. is proposing a wellness facility entitled Collett Manor to be located on the northeast corner of Pandosy Street and Royal Avenue, near the Kelowna General Hospital as shown in Figure 1. The proposed development uses include apartments for short and long-term stay, a pharmacy, health professional offices, various medical equipment retail stores, a sandwich bar, and various lounge areas to meet with doctors and family members.

**Figure 1**
**Development Location**


Opus International Consultants (Canada) Limited undertook a detailed Transportation Impact Assessment for the proposed development entitled *Collett Manor Transportation Impact Assessment Report* dated February 2011. This report discussed the existing and future background traffic characteristics (including growth from hospital expansion) and the impact of generating new transportation demands caused by the Collett Manor development. The report identified mobility and safety issues and recommended mitigation measures required to address the issues.

Opus International and the City of Kelowna have been discussing the conclusions of the report. Agreement has been reached on many issues, but there are a few key issues where the City is requiring further consideration. D.C. Dean Associates Inc. has therefore been retained by the City to review the report and provide an independent opinion of these issues.

# 2. Purpose

The purpose of this review is to provide an independent assessment of the following three key issues remaining to be resolved regarding the transportation impacts of the Collett Manor development:

- The need and configuration of a northbound right turn lane on Pandosy Street at Cadder Avenue;
- The need for a pedestrian activated signal on Pandosy Street at Royal Avenue; and
- The need and possible realignments of Royal Avenue as it intersects with Pandosy Street.

# 3. Background

## 3.1. Local Area

The proposed development is located at the northeast corner of Pandosy Street and Royal Avenue. Currently these lands, and those surrounding the hospital are zoned residential. Changes to the Official Community Plan are currently being considered to create a future Hospital Precinct zone as shown in Figure 2. Royal Avenue will therefore be the division between residential lands to the north and the hospital precinct to the south.

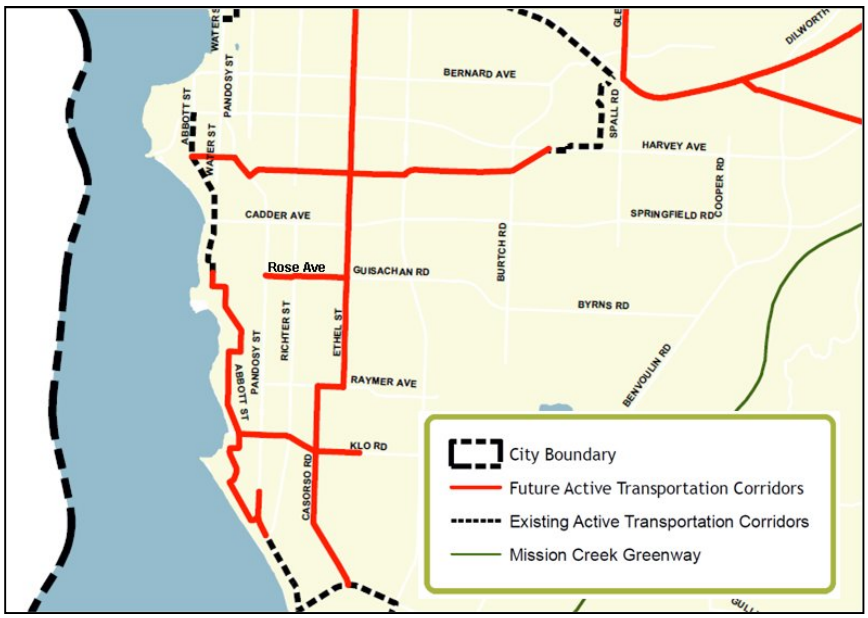
**Figure 2**
**Proposed Official Community Plan**


As shown in Figure 3 Pandosy Street is classified as a 2 Lane Arterial, Rose Avenue as a 2 Lane Arterial with a centre turn lane, Cadder Avenue as a 4 Lane Arterial, and Royal Avenue as a local road. With the possible expansion of the hospital precinct area, the opportunity exists to connect Royal Avenue from Pandosy Street through to Richter Street, thereby providing a local service road that effectively separates the residential lands from the hospital precinct.

**Figure 3**
**20 Year Major Road Network**

As shown in Figure 4, Active Transportation Corridors for the use of pedestrians, recreational and commuter cyclists are planned to be constructed on Ethel Street (connecting the Casorso path to the downtown and through to the Rails with Trails, Rose Avenue (from the Ethel multi-use path to the hospital) and Abbot Street (part of the lake front multi-use corridor). Cyclists on Richter Street will continue to use the bike lanes, and those on Pandosy Street will continue to share the roadway with vehicles.

**Figure 4**
**Active Transportation Corridors**




## 3.2. Collision History

This review concentrates on the two intersections on Pandosy Street at Royal Avenue and at Cadder Avenue. A review of the collision history from 2007 to 2009 was conducted to determine if any road safety trends are showing up in the collision characteristics. The temporal distributions of the collisions are shown in Figure 5, collision types are shown in Figure 6, and the collision diagrams in Figures 7 and 8.

It is noted that collision frequency peaks during the noon and afternoon peak traffic periods. This is reflective of increased traffic volumes causing increased congestion. The relatively high proportion of rear end collisions (64%) also suggests congestion contributes to collisions through this corridor.

For the two intersections there were 5 collisions where vulnerable users (cyclists / pedestrians) were hit. In addition, comments in some of the rear end collision reports indicated the front vehicles stopped quickly for pedestrians crossing Pandosy. These numbers support the TIA report's comments that there is an increased presence of vulnerable users near the hospital.

There has been a relatively high number of northbound rear end collisions at the Pandosy Street and Cadder Avenue intersection. This could be reflective of the queues and delays experienced northbound. Likewise, half of the collisions occurring at Pandosy Street and Royal Avenue are northbound rear end collisions.

**Figure 5**
**Temporal Distribution**

**Pandosy Street and Royal Avenue** | **Pandosy Street and Cadder Avenue**

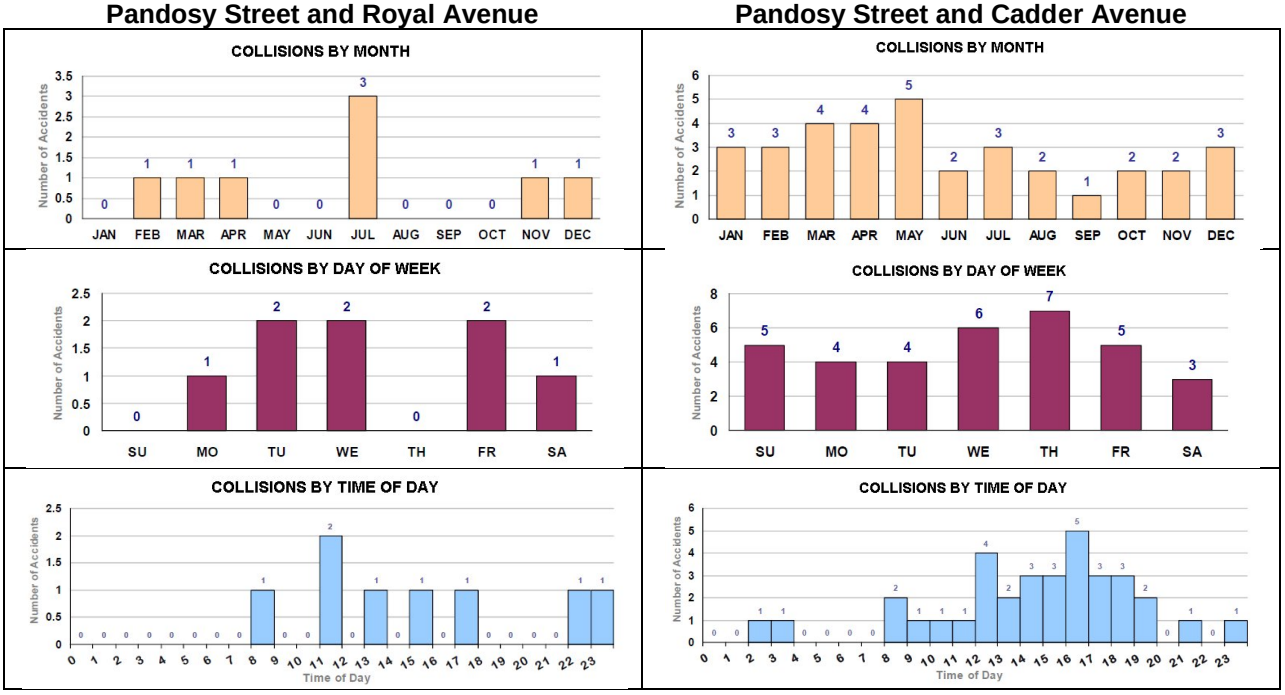



**Figure 6**
**Types of Collisions**

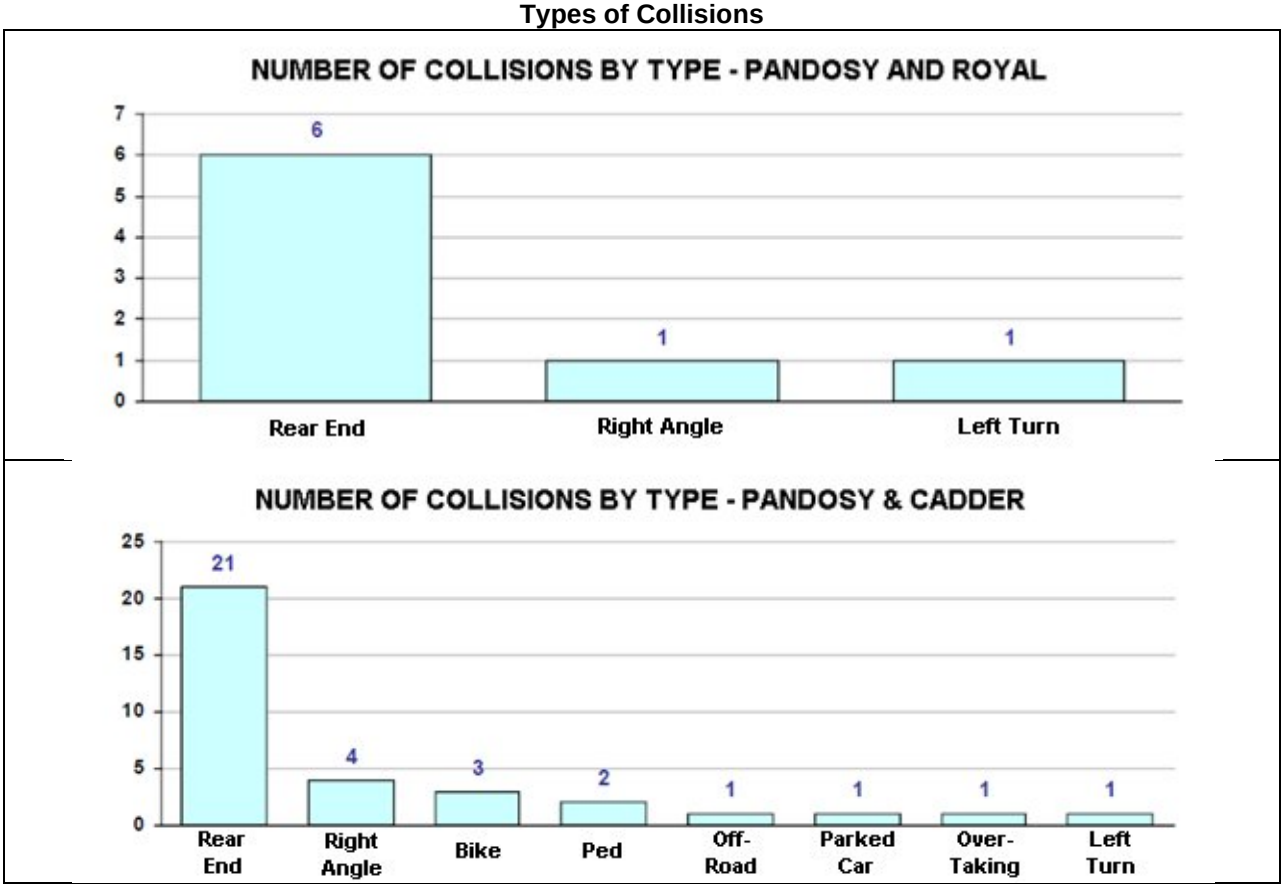


**Figure 7**
**Collision Diagram – Pandosy Street and Royal Avenue**

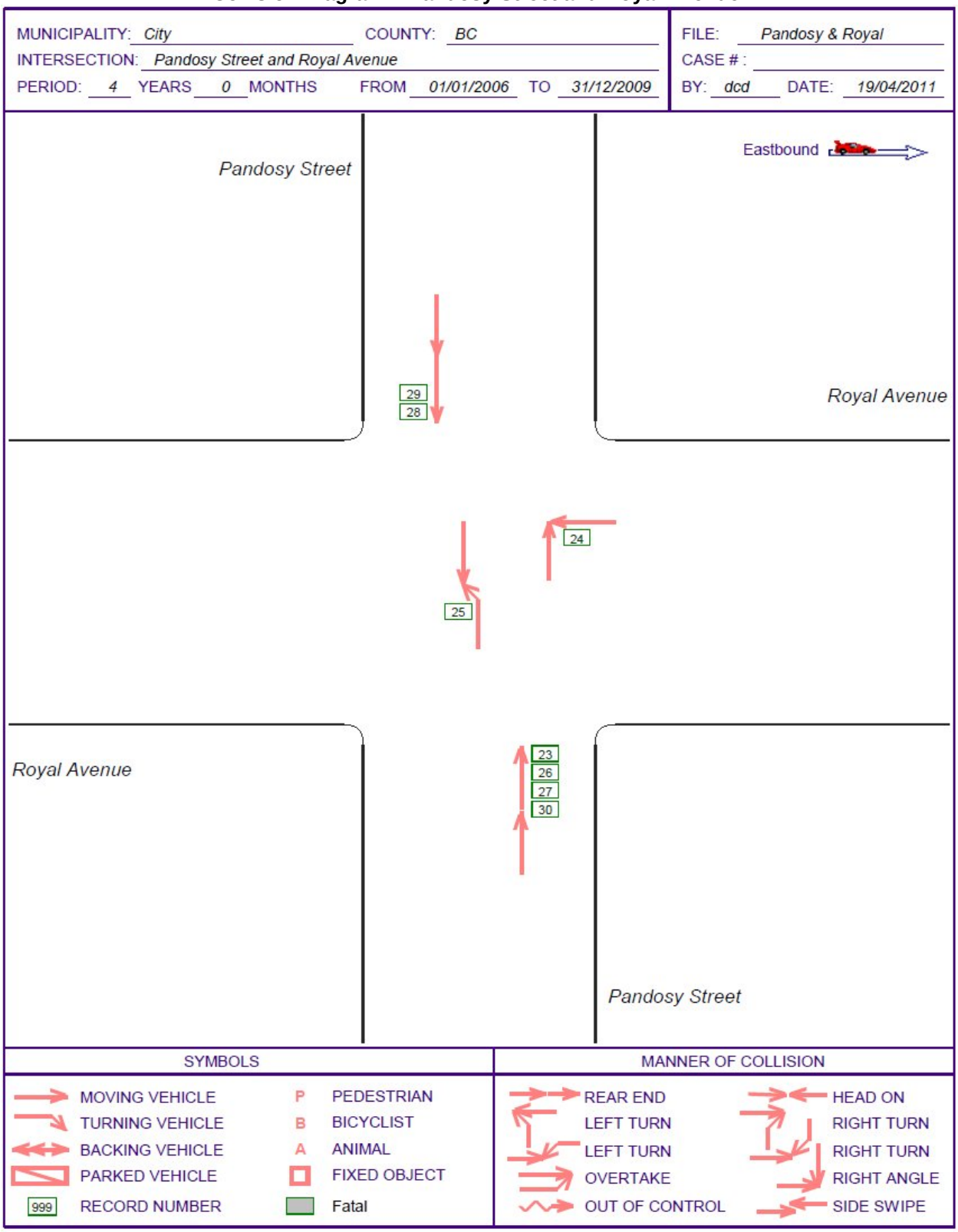
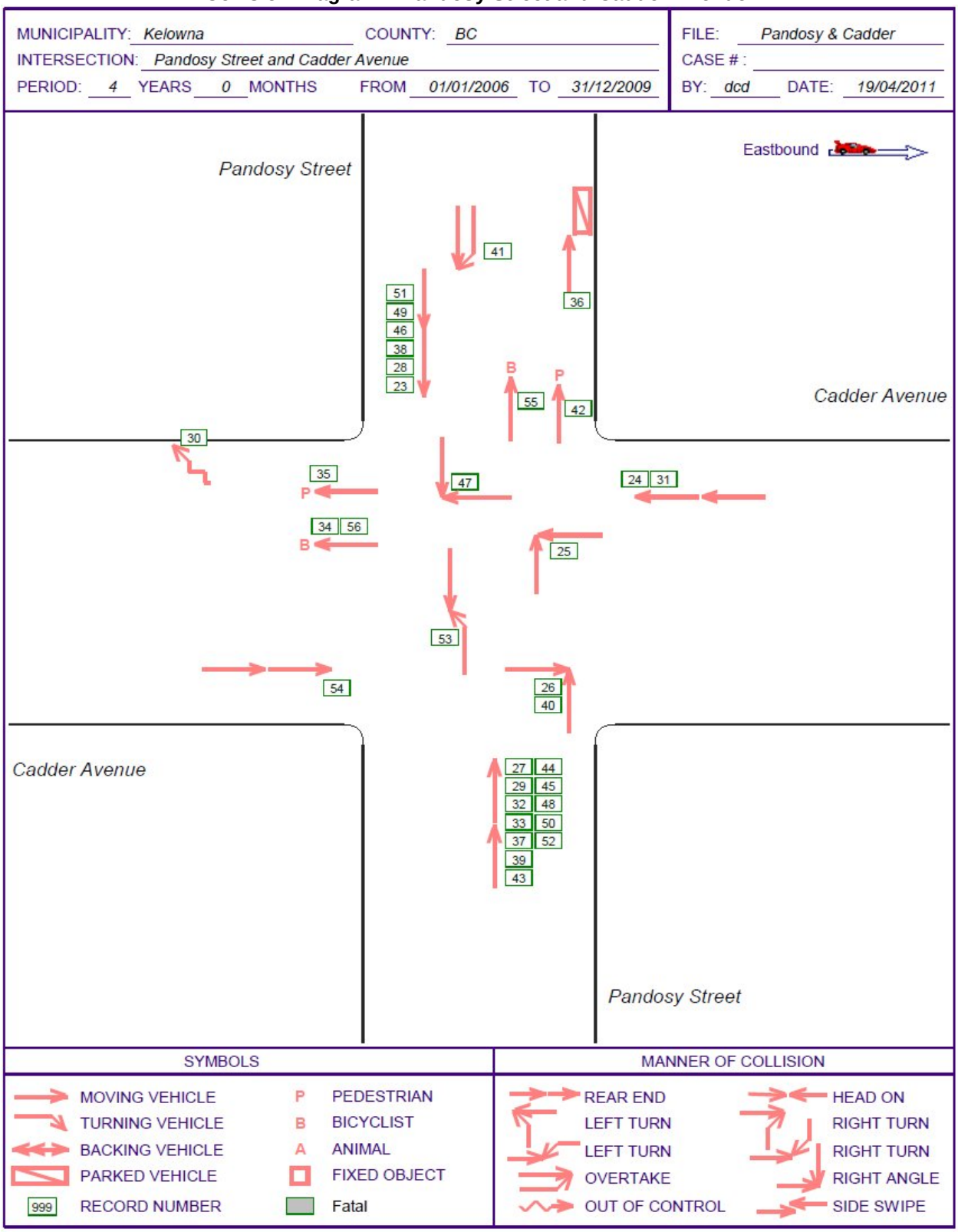


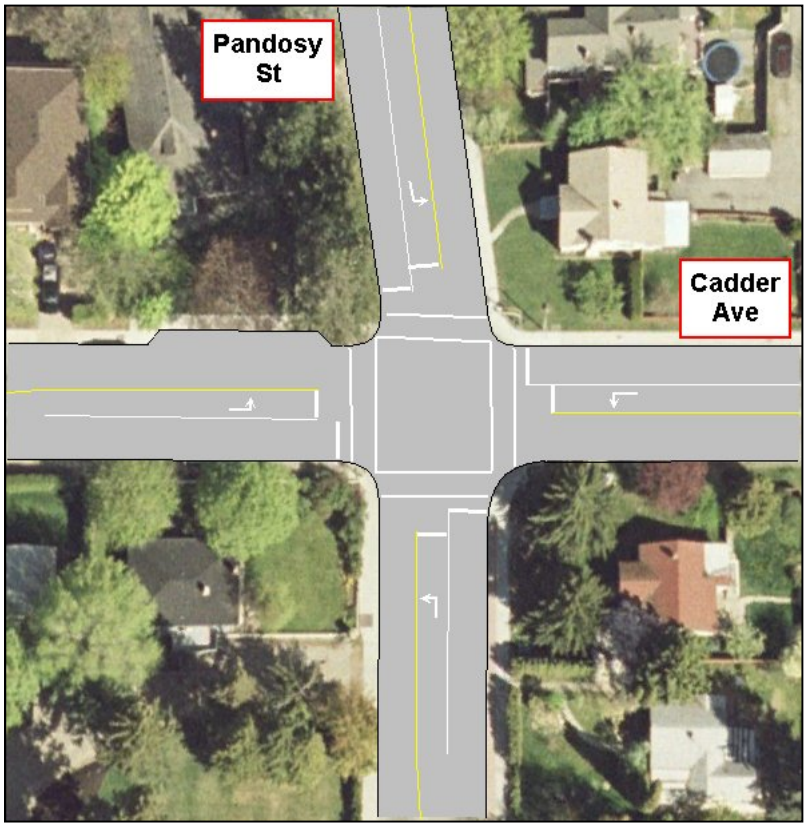
**Figure 8**
**Collision Diagram – Pandosy Street and Cadder Avenue**



## 4. Pandosy Street at Cadder Avenue – Northbound Right Turn Lane

The intersection of Pandosy Street and Cadder Avenue is a four legged traffic signal controlled intersection having one through lane plus one left turn lane in each direction. The traffic signal also has pedestrian activation, and crosswalks are located on each leg of the intersection. Figure 9 shows the laning configuration as it exists today.

**Figure 9**
**Pandosy Street and Cadder Avenue**



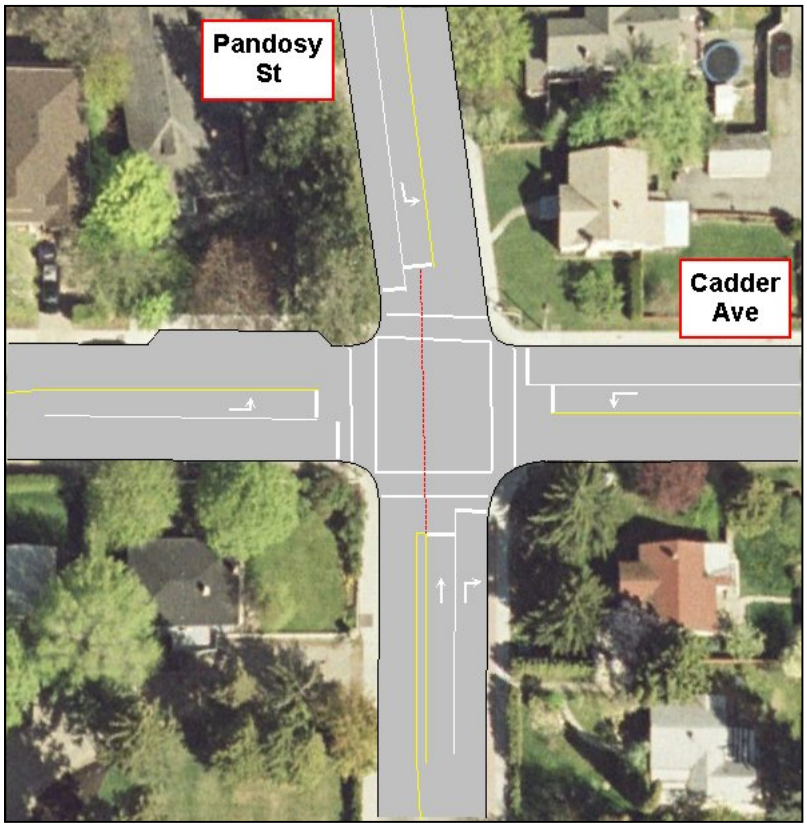

The transportation impact assessment indicates that all traffic movements at this intersection in the base 2015 scenario operate at an acceptable level of service LOS D or better. It further indicates that background traffic growth projections (without the Collett Manor development) identify a level of service LOS F for northbound through and right turn approach to the intersection for both AM and PM peak periods at the 2030 horizon.

With the addition of traffic generated from the Collett Manor development, the 2015 level of service for the northbound through and right turn approach decreases in the PM peak period to an unacceptable level of service LOS E. It is therefore advancing the deterioration of the level of service at this intersection, and improvements need to be undertaken to mitigate the resulting congestion. The TIA report recommends the addition of a northbound right turn lane. The provision of a right turn lane would not only reduce the expected delays, it would improve safety

– the Canadian Guide to In-service Road Safety Reviews identifies a collision reduction factor of 30% to 40% of rear-end collisions. With the existing traffic volumes, 12 northbound rear end collisions have occurred in the past four years.

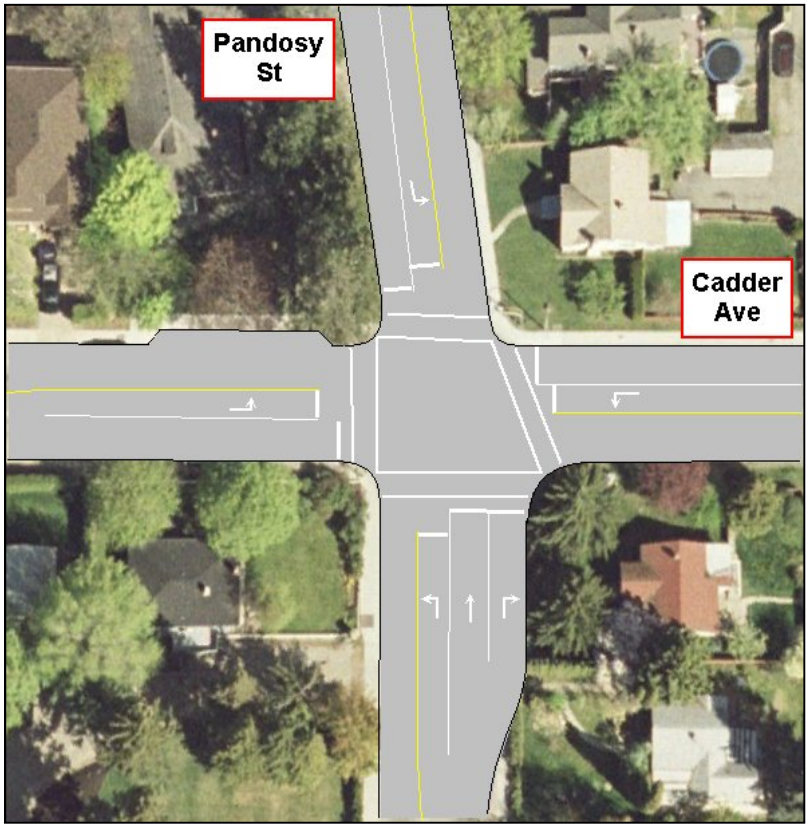
Opus International has suggested to the City that in order to maintain the existing curb to curb width on Pandosy Street at Cadder Avenue, the provision of the northbound left turn lane can be eliminated in favour of a dedicated right turn lane. Their proposal suggests removing the northbound left turn movements on Pandosy Street at Cadder Avenue, re-lining the paint lines and signs/markings to accommodate a northbound through lane and northbound right turn lane, while maintaining a southbound left turn lane and combined southbound through/right turn lane. This is illustrated in Figure 10 (the red dashed line is the extension of the edge of the northbound through lane after narrowing lanes as much as possible).

**Figure 10**
**Pandosy Street Northbound Right Turn Lane at Cadder Street – Opus Proposal**




The City prefers the traditional way of adding a right turn lane which would necessitate the widening of the northbound approach to add a right turn lane adjacent the existing through lane. This concept would maintain all traffic movements including the northbound left turn, but would be costlier due to new construction (property acquisition would not be required as the City already owns property on the southeast corner). Figure 11 illustrates this concept.

**Figure 11**
**Pandosy Street Northbound Right Turn Lane at Cadder Street – Traditional Approach**




Relative to the traditional right-turn lane approach the Opus proposal offers the following benefits:

- The south leg width of the intersection remains within existing curb and gutter and therefore reduces construction costs;
- The pedestrian crossing width of the south leg of Pandosy remains the same for pedestrians; and
- Removing northbound left turns reduces conflicts at Pandosy and Cadder (but relocates them to other intersections which may accommodate left turns better or worse than at Cadder).

Conversely, the Opus proposal has the following negative implications:

- Mobility is restricted as northbound left turn movements are prohibited thereby creating circuitous routing that increases the number of intersection movements (although in 2030 it is projected that there will only be 26 northbound left turns per hour at Cadder Avenue / Pandosy Street);
- Unexpected non-compliance of left turn restrictions could lead to stopped vehicles in the northbound through lane, thereby increasing potential for rear end collisions;

- Non-compliant left turns create off-set left turns that restrict sight lines of through traffic in both the north and south direction, thereby increasing potential for left turn opposing collisions;
- Inconsistency of laning configurations could lead to northbound right turn lane being used as through lane, thereby increasing potential for overtaking collisions;
- Inconsistency of laning configurations could lead to southbound left-turn drivers believing vehicles in northbound through lane will be turning left, thereby increasing potential for left turn opposing collisions;
- Northbound right turn traffic reduces sight lines between westbound traffic and northbound through traffic, thereby increasing potential for angle collisions; and
- Lane widths need to be reduced to accommodate inside northbound through lane to be east of southbound left turn lane, thereby increasing potential for sideswipe collisions.

It is our view that the safety implications of the Opus proposal are significant enough to outweigh the benefits.

## 5. Pandosy Street at Royal Avenue – Pedestrian Signal

The transportation impact assessment identified that the Collett Manor would generate an estimated 260 pedestrian crossings a day of Pandosy Street at Royal Avenue, or 26 pedestrian trips in the PM peak hour. The assessment indicated that this warrants a marked and signed pedestrian crossing, but would not trigger the need for amber flashing signal or traffic signals.

Our review of the pedestrian crossing needs at the Pandosy / Royal intersection considers the following issues:

- Pedestrian crossing warrant analysis
- Types of pedestrian users and motorists
- Function of the Pandosy Street corridor

This review did not have access to the warrant calculations of the assessment; instead it calculates the warrant with information at hand and notes where additional information could influence the decision.

It is noted that the pedestrian volumes used in the transportation impact assessment calculations were those generated by the Collett Manor development. No traffic count was undertaken to take into consideration existing pedestrian crossing demand; however, our site observations identified existing pedestrian crossings are occurring. Observed pedestrians appeared to be hospital workers, and could be walking to nearby residences or to nearby residential parking spaces (excessive parking spaces in back lanes were observed in some

residences). A more accurate warrant analysis could be based on an existing pedestrian count, as well as consideration of the future pedestrian traffic that will be generated by the lower floors of the building currently being constructed on the old surface parking lot.

The warrant procedure in the Pedestrian Crossing Manual for British Columbia bases pedestrian volumes on Equivalent Adult Units (EAU) which addresses the relative weighting of a child, senior, or physically challenged person in relation to an adult. The factors used to convert to EAU's are:

| | Factor |
|---|---|
| Children (≤12 years) | x 2.0 |
| Seniors (≥65 years) | x 1.5 |
| Physically Challenged Adults | x 2.0 |
| | x 1.0 |

For the warrant analysis shown in Figure 12, it was assumed that 50% of the 26 Collett Manor pedestrians were seniors, and that 25% were physically challenged. This resulted in 39 EAU's. Figure 12 also indicates that interpolation was required to determine the crossing opportunities for a 12 metre wide road (width of Pandosy Street at Royal Avenue).

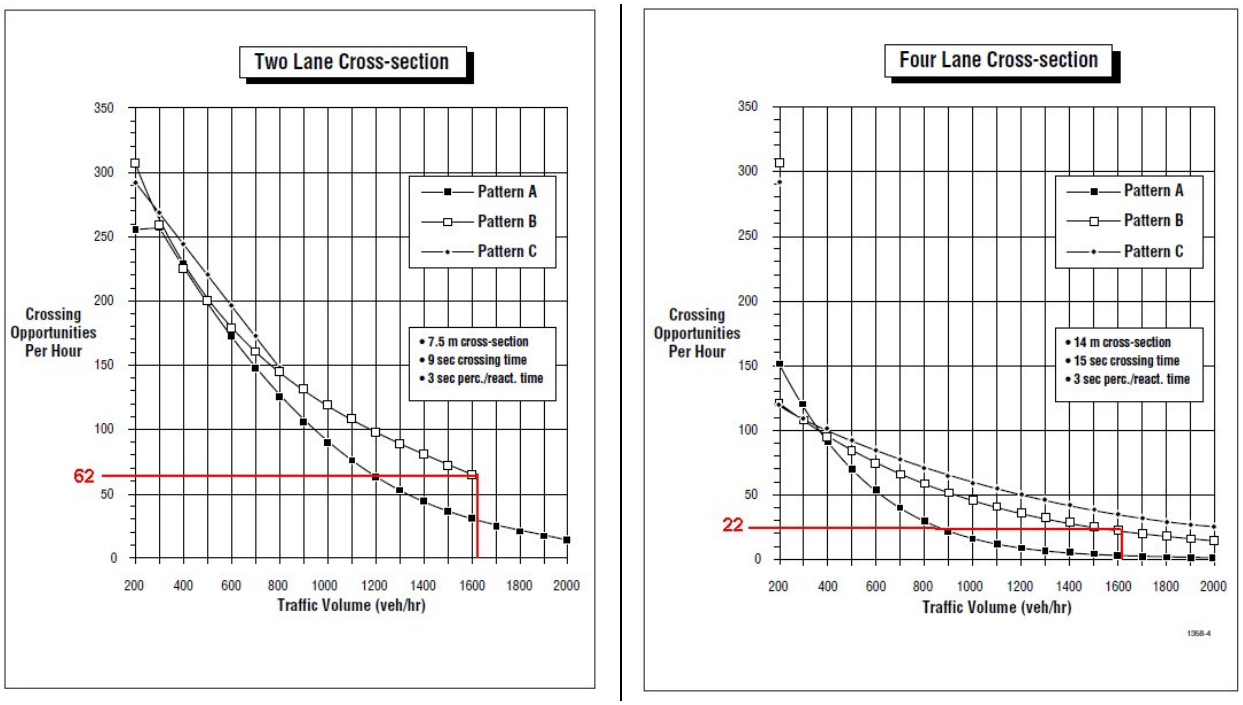
The warrant calculations based on the Collett Manor pedestrians identifies a need for a Special Crosswalk. However, it would only take an additional 16 EAU's to change the warrant result to a Pedestrian Signal. The existing pedestrian traffic together with any new pedestrian traffic from the building currently under construction could very well contribute these 16 EAU's.

The above warrant calculations take into account the issues of seniors and physically disabled pedestrians in a typical pedestrian network. Consideration should be given at this location to the special circumstances that will contribute to the pedestrian user types. In addition to the typical senior and disabled pedestrian circumstances, Collett Manor residents will require additional special accessibility needs, and could be emotionally and mentally distracted due to the reasons for their hospital visits. Area drivers may as well be distracted more than usual through the Pandosy Street corridor. Hospital destined traffic may not be familiar with Kelowna's street system and/or hospital parking facilities and may be looking for their destination as opposed to crossing pedestrians. Pedestrian crossing warrants are guidelines that allow for engineering judgement in cases such as this to provide greater crossing control.

A valid reason to not provide greater crossing control where it is not needed is the mobility impact on the road corridor and the safety impact of unexpected stopping requirements. The existing queuing from the adjacent signals through the Royal Avenue intersection reduces this concern. Indeed, the existing queuing through the intersection creates the safety concern of pedestrians crossing on the crosswalk through queued vehicles in one direction into the opposite direction travel lane where vehicles are moving at speed. The City of Kelowna

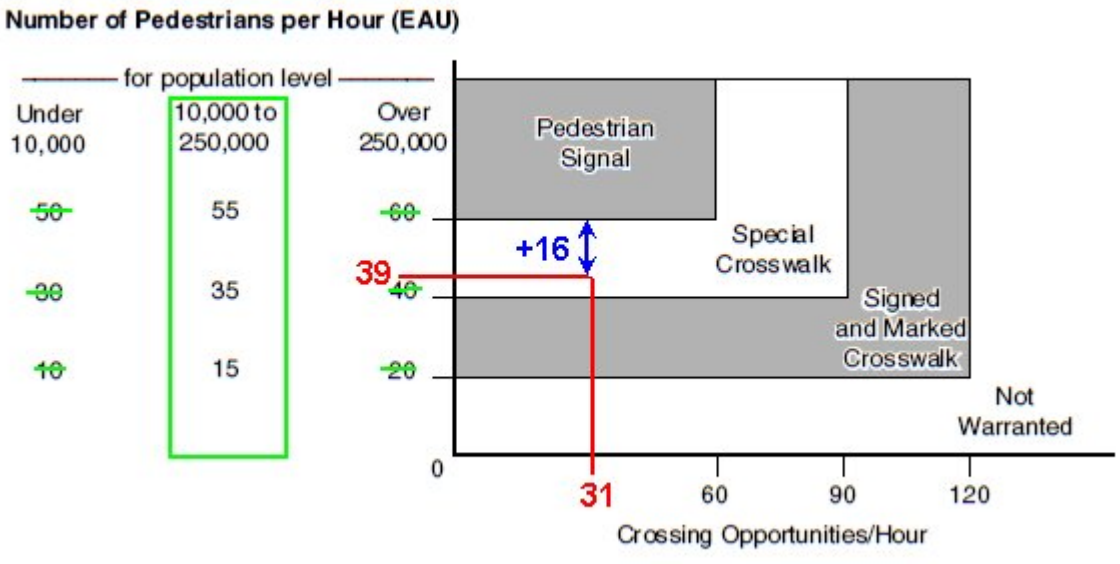
**Figure 12**
**Pedestrian Crossing Warrant – Pandosy Street at Royal Avenue**

Crossing Opportunities per Hour




Interpolating, a 12 metre wide road has 31 Crossing Opportunities per hour

Pedestrian Crossing Warrant



recognizes the congestion currently occurring on Pandosy Street, and expects it to continue in the future as Pandosy remains a two lane roadway. The installation of a traffic signal on Pandosy Street at Royal Avenue would not be a violation of traffic expectation given the current conditions.

In reviewing the warrant based solely on the Collett Manor pedestrian demand, the potential for existing and future demand, and the types of pedestrian users and motorists, we believe the installation of a pedestrian signal on Pandosy Street at Royal Avenue would be an appropriate measure.

# 6. Pandosy Street at Royal Avenue – Realignment

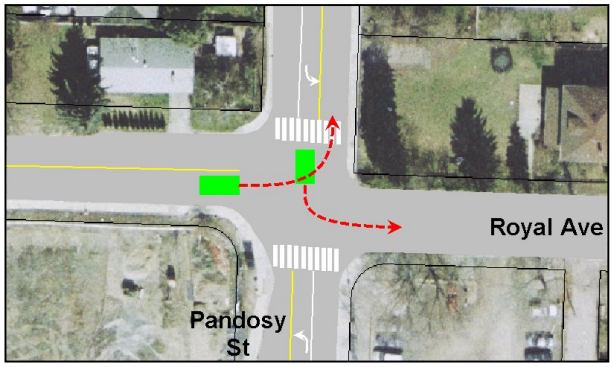
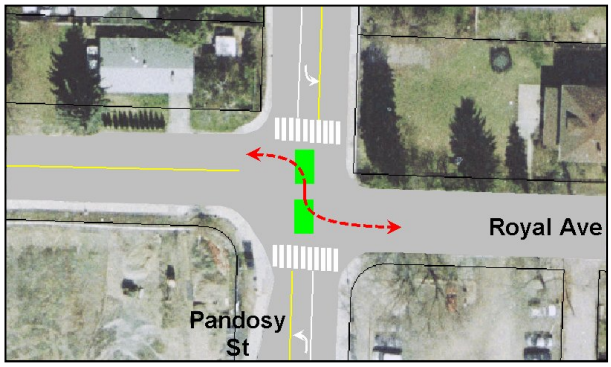
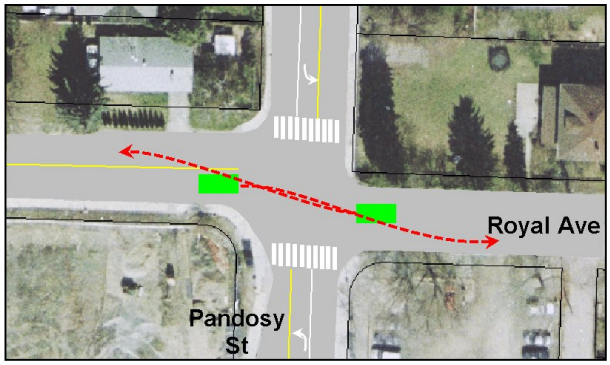
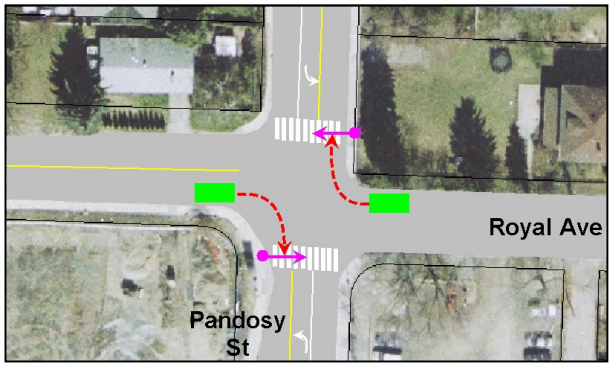
The City's long term road network plan includes the connection of Royal Avenue from Richter Avenue to Pandosy Street. There would be no further connectivity beyond Richter Street thereby retaining the existing 'T' intersection at Royal and Richter. The transportation impact assessment states that this connection is not seen as a benefit to the road network within the study area. This assessment is valid from the sense of the main grid road network plan and the existing adjacent land use. However, local area plans for the area include the extension of the Hospital precinct area from Pandosy Street to Richter Street. Royal Avenue will then be an important access road to the precinct expansion area, and would serve as its boundary adjacent to the residential area. The hospital precinct expansion could generate relatively large traffic volumes including employee, visitor, and service vehicle access to the precinct buildings. Connectivity between Pandosy Street and Richter Street would provide the function of access without requiring circuitous routing on the main road system. In conjunction with the hospital precinct expansion, it is therefore considered a worthwhile connection.

Given the future plans for a connection and redevelopment of the lands south of Royal Avenue to include hospital precinct land use, consideration is given to the realignment of the Royal Avenue intersection with Pandosy Street. The conflicts associated with an off-set intersection will be described, potential concepts for realignment will be identified, and an estimate of the safety benefits of the realignment will be calculated.

## 6.1. Off-set Intersection Conflicts

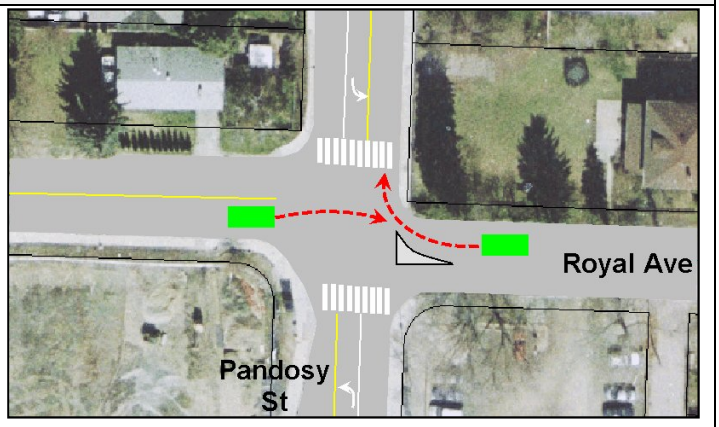
Royal Avenue at Pandosy Street is currently off-set with the north property line west of Pandosy Street 10 metres north of the property line east of Pandosy. Figure 13 illustrates the vehicle-vehicle and vehicle-pedestrian conflicts associated with the existing off-set.

**Figure 13**
**Off-set Intersection Conflicts**

| Issue | Sketch |
|---|---|
| 1. Southbound left turning vehicles waiting for gap block eastbound left turning vehicles. This is a common route for emergency vehicles. |   |
| 2. Northbound left turning vehicles conflict with southbound left turning vehicles resulting in confusion as the vehicles approach one another. Some drivers would turn left in front of the opposing left turning vehicle; others would try to turn left past the other vehicle. |   |
| 3. Eastbound / Westbound through movements are misaligned and have the potential for sideswipe collisions, particularly if one vehicle is arriving at the intersection as the other vehicle is making its through movement. |   |
| 4. Northeast and southwest corners have the Pandosy Street crosswalks off-set from Royal Avenue by approximately 6 metres, thereby reducing the visibility of the pedestrian from eastbound and westbound right turning motorists. |   |

There has been discussion that westbound on Royal Avenue may have an interim restriction on turning movements that would restrict the east leg to be right-in, right-out, and left-in only. This would be achieved by constructing a median on the east leg as shown in Figure 14. All conflicts identified above would remain, except the eastbound / westbound through movement conflict could become an eastbound through / westbound right turn conflict as shown in the figure.

**Figure 14**
**Restricted Movements on East Leg of Royal Avenue and Pandosy Street**

| Issue | Sketch |
|---|---|
| 1. Eastbound through movement may proceed straight into westbound right turn lane. |   |

## 6.2. Proposed Realignment Concepts

As part of the rezoning procedure of the Collett Manor development, it has been identified by the City that a road dedication on the north side of Royal Avenue of 5 metres is required as shown in Figure 15. In addition, for future realignment needs, an additional 5 metres is required in a Road Reserve Agreement. The road dedication allows for some realignment of the Pandosy Street and Royal Avenue intersection, whereas the full 10 metre taking allows for Royal Avenue to be taken straight through in the alignment of its east and west ends.

Figure 15
Road Dedication / Reserve Agreement

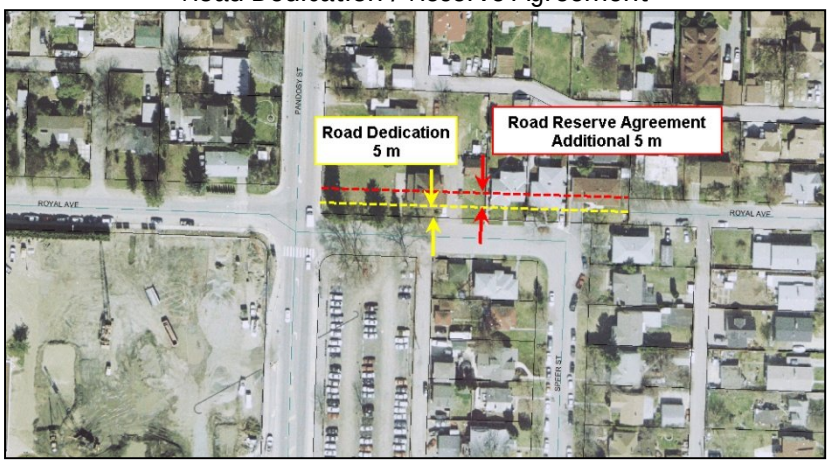
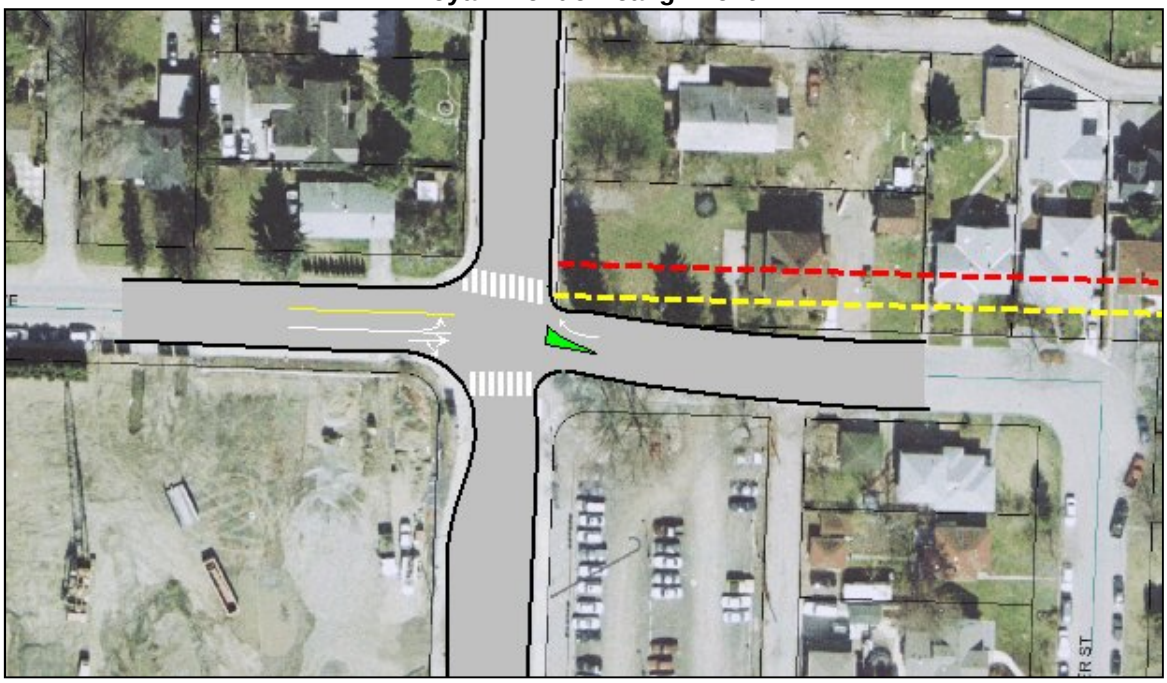



Figure 16 shows a concept for the realignment of Royal Avenue based on the 5 metre road dedication. Property was not available on the southwest corner of the intersection, otherwise

that would have been used to flatten out the realignment. The realignment will address to some degree the conflict issues identified in the previous section, which should result in a decreased collision potential. More conflict reduction could be achieved with further widening at either the northeast or southwest corners. The following section attempts to quantify the potential reduction.

**Figure 16**
**Royal Avenue Realignment**



## 6.3. Safety Modeling of Realignment

A safety modeling exercise was completed for the intersection of Pandosy Street and Royal Avenue, in order to determine the safety impact due to the Collett Manor development and the potential realignment of the intersection, which is currently misaligned. Safety modeling involves the application of collision prediction models and collision modification factors to reflect different design and operational features of a roadway facility. It is noted that safety modeling is currently the preferred method of safety analysis and is described extensively in AASHTO's recently released Highway Safety Manual (HSM).

In order to develop the safety model for the intersection of Pandosy Street and Royal Avenue, the first step was to obtain a relevant collision prediction model (CPM). Research work by the University of British Columbia produced a CPM for an urban, un-signalized intersection, with stop control on the minor leg. The model was developed using data from the City of Kamloops, so it is felt that the model would be sufficiently accurate for the intersection in Kelowna. The CPM is as follows:

$$\text{Coll./yr} = \left(0.00078 \times V_{\text{Major}}^{0.7646} \times V_{\text{Minor}}^{0.2432} \times \text{Exp}^{-0.6671(\text{Type})}\right) / 3$$

Where: $V_{Major}$ = Major road traffic volume (AADT)
$V_{Minor}$ = Minor road traffic volume (AADT)
Type = Intersection type (0 for 4-Leg and 1 for T-type intersection)

As shown above, the CPM requires the AADT traffic volume. As such, the AM and PM traffic volumes were used with an adjustment factor to convert to AADT. The AM and PM traffic volumes were averaged and then a 12.5% conversion was applied (i.e., the peak hour volumes represented 12.5% of the AADT volume).

Another important consideration in developing the safety model for the Pandosy Street at Royal Avenue intersection is finding a collision modification factor (CMF) to represent the safety impacts caused by the misalignment of the intersection. A CMF specifically for urban, misaligned intersection could not be found. However, a reliable CMF for intersection skew (i.e., a skewed angle between intersecting roadways) was available in the HSM, which is assumed to be a reasonable approximation for the effects caused by intersection offset. In fact, the CMF may be somewhat conservative. The expression for the CMF for intersection skew angle is as follows:

$$CMF = e^{(0.0054 \times SKEW)}$$

Where: SKEW = Skew angle between intersecting roadways

The intersection skew angle for Pandosy Street at Royal Avenue was estimated at approximately 20 degrees, which produced a CMF of 1.114. This means that the intersection skew angle (or off-set in this case) causes an increase of 11% increase in collisions at the intersection, as compared to a non-misaligned intersection.

The CPM was tested to check the validity of the model by comparing the predicted number of collisions for the existing scenario (no Collett Manor development and a misaligned intersection) with the observed / historical collision data. The CPM predicted a total of 2.03 collisions per year at the intersection (using the 2015 traffic volumes and the CMF for the misalignment), which compares very favorably with the observed collision history, which is on average, 2.0 collisions per year (based on collision records from 2006 to 2009 inclusive).

A matrix of 4 different scenarios was developed to understand the impact of the Collett Manor development and the intersection misalignment. These included the following scenarios, and it is noted that the baseline condition is shown as Scenario 3 (i.e., NO development and WITH intersection misalignment).

Scenario 1: NO development and NO intersection misalignment
Scenario 2: WITH development and NO intersection misalignment
Scenario 3: NO development and WITH intersection misalignment (BASELINE)
Scenario 4: WITH development and WITH intersection misalignment

The results were also run for two time periods, namely 2015 and 2030 since the safety model does not perform in a linear manner. The results for the 2015 time period are shown in the first table and the results for the 2030 time period are shown in the second table.

**Table 1**
**2015 Safety Performance Results:**

| Traffic Volume | Street | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|---|
| Peak Hour | Pandosy<br>Royal | 1596<br>100 | 1628<br>133 | 1596<br>100 | 1628<br>133 |
| AADT | Pandosy<br>Royal | 12768<br>800 | 13024<br>1064 | 12768<br>800 | 13024<br>1064 |
| Collisions / Year: | | 1.82 | 1.98 | 2.03 | 2.21 |
| **% Increase wrt Baseline:** | | **-10.2** | **-2.3** | **N/A** | **+8.8** |

**Table 2**
**2030 Safety Performance Results:**

| Traffic Volume | Street | Scenario 1 | Scenario 2 | Scenario 3 | Scenario 4 |
|---|---|---|---|---|---|
| Peak Hour | Pandosy<br>Royal | 1789<br>87 | 1967<br>149 | 1789<br>87 | 1967<br>149 |
| AADT | Pandosy<br>Royal | 14312<br>696 | 15736<br>1192 | 14312<br>696 | 15736<br>1192 |
| Collisions / Year: | | 1.92 | 2.36 | 2.14 | 2.62 |
| **% Increase wrt Baseline:** | | **-10.2** | **+10.0** | **N/A** | **+22.6** |

Therefore, with the development it is estimated that realigning the intersection will reduce collisions by approximately 11 to 13% over the first 15 years. It is suggested that this provides sufficient justification for the realignment of the intersection that is achievable with a 5 metre road dedication; however, the justification of further realignment based on a 10 metre wide dedication should be based on the performance of the initial realignment.

# 7. Summary

Based on a review of Opus International Consultants (Canada) Limited's *Collett Manor Transportation Impact Assessment*, a review of the collision history, and a site visit the following conclusions have been reached.

- The expected traffic volumes at the Pandosy Street and Cadder Avenue intersection are sufficient at the 2015 horizon (with development) to justify the addition of a northbound right turn lane. This addition will reduce delays and improve road safety. Insufficient road width exists on the north and south legs of Pandosy Street to reassign lane space to include a separate right turn lane without creating unacceptable safety concerns. The traditional approach of widening for a separate northbound right turn lane is recommended.

- Insufficient data has been used in the assessment of the pedestrian crossing control at the intersection of Pandosy Street and Royal Avenue. Analysis in this report indicates that if existing pedestrian volumes create an additional 16 equivalent adult units, a pedestrian signal is warranted. Moreover, given the potential for future pedestrian traffic, the type of pedestrian activity, and the distractions for area motorists it is recommended that engineering judgement be used to advance a pedestrian signal even if revised warrant calculations fall short of the pedestrian signal warrant.

- Improvements can be made to the off-set intersection of Pandosy Street and Royal Avenue with a 5 metre road dedication. It is estimated that the realignment would reduce collisions at the intersection by 11 to 13% over the next 15 years. The City is protecting lands for the possibility of a straight alignment connection of Royal Avenue, but the improvements would be costly and cannot be justified by the expected collision reduction at this time. It is suggested that the decision to proceed should be assisted by the performance of the initial realignment.

July 8, 2011
File No.: 1210-35

Mr. Andrew Bruce
Senior Project Manager
Site 360 Consulting/MMM
540 Leon Avenue
Kelowna, B.C. V1Y 6J6
Email: ABruce@site360.ca

Dear Mr. Bruce:

SUBJECT: Dispute Resolution - Marrington Project
File No. Z10-0040

This letter addresses the dispute resolution meeting held June 9th, 2011 regarding servicing requirements for the above project and your subsequent email of July 6, 2011. The matters in dispute were; the requirements of the City for the developer to fund a pedestrian signal at a cost of $150,000 and the requirement for a 5.0 meter road reserve along Royal Avenue in addition to 5.0 meters for road widening. I will respond to each item separately.

1) Pedestrian Signal Requirement - Your consultant provided considerable information indicating that this development was not the sole trigger for this infrastructure upgrade as considerable background pedestrian movement already exists. Conversely, City staff provided information that indicated that this development will trigger the need for the full pedestrian signal and consistent with City requirements are requesting full payment. After reviewing the information provided by your consultant and considering all the factors of what is occurring in this area (Hospital impacts, OCP transportation and land use plans, consideration of Royal Avenue use and extension) I do not support City staff's recommendation for full payment. There is considerable information that this full signal is also a requirement due to road network considerations and background activity. I support your consultant's recommendation that the costs be shared. My decision is that the signal costs be shared equally between the City and developer.

2) Requirement for a 5 meter road reserve- The City has indicated it intends to extend Royal Avenue through to Richter Street as boundary of the Hospital zone. Due to alignment issues with Royal Avenue west of Pandosy Street there is a need for a road reserve in addition to the 5 meter road dedication. Through Mr. Muenz I have requested that you provide information on whether the intersection can be done in a manner such that Royal Avenue can be constructed within the current right of way with the 5 meter dedication that your client has already agreed to. My reason for requesting this is that I believe the overall property acquisition impacts for this extension to Richter Street will be less if most of the road is kept to the south. Assuming this can be accomplished with minimal impact on your client's development I will not support the City's requirement for a 5 meter road reserve for the full frontage along Royal Avenue. If not, please advise and I will give further consideration to my decision.

**Community Services**
1435 Water Street
Kelowna, BC V1Y 1J4
TEL 250 469-8500
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**kelowna.ca**

I believe the decisions given are consistent with your clients' interests and also provide the City the infrastructure to support the needs in this area. Should your clients not support my decision, please arrange the next stage in the dispute process with Mr. Jim Paterson, General Manager, Community Sustainability. Be advised that should you go that course, Mr. Paterson is not held to the decisions I have reached and may reach decision contrary to those I have made.

Should you require any clarification with my decisions, please advise.

Yours truly,

JohnVos, P. Eng.
General Manager, Community Services

cc. Development Engineering Manager
Regional Services Director
Land Use Management Director
Transportation Planning Technician

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