APPENDIX A

ADVISORY GROUP MEETING MINUTES

MEETING NOTES

JOB TITLE	City of Penticton Integrated Infrastructure Master Plan		
PROJECT NUMBER	20M-00462-00	**DATE**	24 July 2020
TIME	1PM – 3PM	**VENUE**	Zoom Meeting
SUBJECT	Transportation Advisory Group Meeting No 1		
CLIENT	City of Penticton		

Name	Company	Email
Levi Megenbir	BC Transit	Levi_Megenbir@BCTransit.Com
Adriana McMullen	BC Transit	Adriana_McMullen@BCTransit.Com
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Mike Palosky	Berry & Smith	mikepalosky@berryandsmith.com
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Frank Conci	PIDA	frank@acmotorelectric.com
Dave Dean	ICBC	David.dean@icbc.com
Lynn Allen	Downtown Penticton Association	lynn@downtownpenticton.org
Randy Boras	Neighborhood Group	lakesideroad@shaw.ca
JP Kaumeyer	Neighborhood Group	lakesideroad@shaw.ca
Thom Tischuk	Travel Penticton	thom.tischik@visitpenticton.com
Mignonne Wood	PSDIC/Senior Wellness Society	mignonnewood@shaw.ca
Shoko Kitano	Canadian National Institute for the Blind	Shoko.Kitano@cnib.ca
Chris Fudge	BC Transit	
Robbie Weise	Okanagan College Student	
Elmie Saaltink	Seniors Wellness Society	
Tobi Pettet	City of Penticton	Tobi.Pettet@penticton.ca
JoAnne Kleb	City of Penticton	JoAnne.Kleb@penticton.ca
Ian Chapman	City of Penticton	ian.chapman@penticton.ca
Avi Thiessen	WSP	Avi.thiessen@wsp.com
Mark Merlo	WSP	Mark.merlo@wsp.com

Summary of comments from the transportation advisory group. Presentation by COP and WSP was not summarised as it is attached for reference.

1. PEDESTRIANS

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- Downtown and Lakeshore – Bikes on sidewalks is a safety concerns and its putting pedestrians at risk. How do we keep bikes on the road?
- Timing on pedestrian crossings. Some elderly residents are finding it difficult to cross in time. Mark commented that as a community ages signal crossing times are often increased.
- Rural Traffic – Currently there are narrow shoulders on a lot of rural roads and traffic is going fast. This makes it feel unsafe for pedestrians and cyclists. Slowing traffic down and more shared shoulder would help people feel safer.
    - West Bench has a shared sidewalk cycling facility for reference.
- No sidewalk on Upper Ridgedale, recommended location for sidewalk or shard facility.
- Green Mountain Road – lack of lighting
- Jay walking common in downtown area

2. BICYCLES

- Have there been studies done on bike traffic? Predominantly just bike counts in City data but no origin/destination studies.
- Cycling hub for tourism – Lakeside Road
- Re-evaluate bike route – Carmine Ave vs. Duncan Ave
- Bicycle repair areas on Rail Trail seem like a good idea. Recommend installing more in heavily used biking areas
- Education for motorists regarding bike safety and how to drive around cyclists
- Better bike parking at transit stops: Cherry Lane mall and downtown
- Motorized Scooters/ e-bikes – Where should they be? Should there be regulations on multi-use paths and Rail Trail?

3. TRANSIT

- No cost on transit for younger individuals
- Increased bike racks on regional lines, specifically to Kelowna.
- Issue: No transit to lower density areas/ rural.
  BC Transit Response: RDOS has done regional open houses on transit. Being put on hold for the moment.
- Are there plans to expand West Bench and Redwing service.
- Bicycle bike parking at key location like downtown and Cherry Lane mall.
- Education/ public awareness campaign on biking and transit.
- Add more bus stops on Eastside and Lakeside Road.
- U Pass program with Okanagan College.
- Better coordination with school scheduling.
- Origin/ destination (O/D) study focusing on students (one of the highest transit users in the City) would help prioritise transit schedules and routes to students.
- A citywide O/D study would help in optimizing routes and schedule for the future.

4. GOODS MOVEMENT

- Trucks shortcutting through Lakeside
- There is a city-wide issue in both the CBD and industrial areas where trucks struggle to turn into business and onto some streets.
- Keep trucks off Front Street, Main Street, Westminster.
- There needs to be more control over where trucks overnight park in the City.

5. VEHICLES

- Smyth Drive (Main intersection that goes to Sakha bluffs park) Would be nice to not have to roll down window to listen for traffic in order to leave the cul-de-sac (sight-line issues).
- Lakeside Road – Why can't we use traffic calming on collector roads.
- Balance seems to be more towards traffic than locals on collectors.
- Safe pedestrian crossings need to be more of a priority on collectors.
- The City needs to address speeding.

6. PARKING

- Not taking vehicle to events isn't really an option but coordination of events between transit and events is one option
    - Park and ride shuttle bus service has been provided in the past but was generally not used
    - This option may need more friction such as paid parking at the destination
- Downtown parking are mostly employees, consider timed parking restrictions or metering.
- Support for meter parking in the downtown on Main Street.

- Around Padmore – Recommended resident only parking during business hours
- How are the downtown business being supported if the areas around the downtown are densifying and those people are taking up customer parking?

7. SAFETY

- There are some intersections with poor sightlines that make it really difficult to cross.
- Timing for pedestrian crossings seems to be too short on busier streets.

JOB TITLE	City of Penticton Integrated Infrastructure Master Plan		
PROJECT NUMBER	20M-00462-00	**DATE**	December 10 – 15, 2020
TIME	Varies, 9 Meetings in Total	**VENUE**	Zoom Meeting
SUBJECT	Transportation Advisory Group Engagement No 2		
CLIENT	City of Penticton		

Name	Company	Email	Session Date
Levi Megenbir	BC Transit	Levi_Megenbir@BCTransit.Com	
Adriana McMullen	BC Transit	Adriana_McMullen@BCTransit.Com	
Matt Berry	Berry & Smith	mattb@berryandsmith.com	
Mike Palosky	Berry & Smith	mikepalosky@berryandsmith.com	
Matt Hopkins	PAC	hopkins.matthew@gmail.com	
Frank Conci	PIDA	frank@acmotorelectric.com	
Dave Dean	ICBC	David.dean@icbc.com	
Lynn Allen	Downtown Penticton Association	lynn@downtownpenticton.org	
Randy Boras	Neighborhood Group	lakesideroad@shaw.ca	
JP Kaumeyer	Neighborhood Group	lakesideroad@shaw.ca	
Thom Tischuk	Travel Penticton	thom.tischik@visitpenticton.com	
Mignonne Wood	PSDIC/Senior Wellness Society	mignonnewood@shaw.ca	
Shoko Kitano	Canadian National Institute for the Blind	Shoko.Kitano@cnib.ca	
Chris Fudge	BC Transit		
Robbie Weise	Okanagan College Student		
Elmie Saaltink	Seniors Wellness Society		
Tobi Pettet	City of Penticton	Tobi.Pettet@penticton.ca	
JoAnne Kleb	City of Penticton	JoAnne.Kleb@penticton.ca	
Ian Chapman	City of Penticton	ian.chapman@penticton.ca	
Avi Thiessen	WSP	Avi.thiessen@wsp.com	
Erin Toop	WSP	erin.toop@wsp.com	December 10, 11
Dan Ross	WSP	Dan.ross@wsp.com	December 14
Anika Muhammad	WSP	Anika.muhammad@wsp.com	December 15

SUMMARY OF COMMENTS FROM THE TRANSPORTATION ADVISORY GROUP. PRESENTATION BY COP AND WSP WAS NOT SUMMARISED AS IT IS ATTACHED FOR REFERENCE.

8. PEDESTRIAN PROJECT PRIORITIZATION

- Suggestion to consider increasing the granularity of the pedestrian network in high demand areas or near transit stops to shorten walking distance.
- This is out of scope of this TMP but something to note considering in future studies.
- Noting that the pedestrian prioritization tends to favour urban roads, and how to address pedestrian facilities on rural roads.
- Discussed the traffic calming corridor reviews on Lakeside and Naramata
- Will there be a pedestrian overpass from the new development on East Side Road to Skaha Lake
- South main across from Skaha lake – large development

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9. CYCLING PROJECT PRIORITIZATION

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10. STREET NETWORK PROJECT PRIORITIZATION

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11. SAFETY / TRAFFIC CALMING PRIORITIZATION

- Question about whether we have normalized collision data against traffic volumes to look at collision rates (we have not)
- RCMP are most interested in collisions and speeding, and may be able to forward more data or information.
- Confirmation that speeding is an issue on Highway 97 especially entering the City.
- Overly wide streets – conversion to road narrowing and need to add trees/other infrastructure.
- Need to go through network as a whole to identify which can be narrowed – not within scope of this project

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12. OVERALL TRANSPORTATION PROJECT PRIORITIZATION

- Support for the approach to use safety as the main priority (sentiment was expressed multiple times).
- Question / concern about how walking and cycling are prioritized,

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13. OTHER FEEDBACK AND ISSUES

- Issue with a parking lot flooding near the skateboard park - immediately adjacent to river channel. Riverside Drive opposite from Burnaby Avenue
- Highway 97 between Eckhardt and Skaha Lake Road is very dark, and highway lighting should be considered.
- Will comprehensive parking strategy include forecasting of EV numbers and the number of charging stations required?
- Potential to receive input from City Environmental / Sustainability Coordinator re. Project scope
- Question about whether mode shift targets are included in the TMP.
- Question about whether recommendations for a Vision Zero policy will be included in TMP recommendations
- General concerns about age friendly
- How are aging population and changing transportation needs considered in 25 year projection?
- Based on population density and “worse” case scenario that includes the existing
- Creating walkable centres and nodes as part of OCP
- How are on-demand transit services considered with senior generation
- Is densification considered with creating walkable communities? Official community plan identifies where density occurs.
- Downtown Parking is a problem with new large development not providing enough spaces. Residents will be forced to park on street but home residents won’t have enough space. Is parking part of city development?
- Not enough parking provided with new developments
- There’s not any options for groceries/shopping
- Will be considered in future parking study – it is a tension when parking is relaxed but the update in other modes have not been taken.
- Request for maps to be shared so they can see it?
- Staff option to complete one more review before finalizing
- Joanne to chat with AVi to see if it can be published
- Looking at lighting, benches, shelters, bathrooms? This will be done through the next stage of design

- Shelters are recommended at transit stops where there is high use.
- How much are we looking with RDOS and connecting with other communities (regional transportation)
- BC future transit connecting to transit
- VEhicles – modelling
- Cycling – KVR

– Trail network plan – wsp has from region?? Regional transit systems (andrew reeder)

- Why are we integrating the different utilities and transportation? Need to upgrade for everyone
- Need to upgrade channel parkway trail
- Need to reinitiate the education of cyclists and vehicle interactions – need an ongoing education program

14. BC TRANSIT FEEDBACK

- 2015 Transit Future Plan ID'd a 3% mode share target for transit, and wondering whether we ID'd a mode share target for 2045 as part of TMP.
- Suggestion to incorporate some of the infrastructure items from the 2015 transit future plan:
- Park and Ride Facility
- Improvements to Transit Hub around Cherry Lane
- Incorporate an annual budget for transit stop improvements
- Concern about age friendly and that transit service ends at 6:30, hard to reach these services
- Concerns about shetlers, benches, lighting

15. OUT OF SCOPE

- Travel Penticton has a "Fuel Free" (almost) initiative, which is founded on not needing to drive to have a great time on vacation in Penticton. This is something they would like the City to adopt.
- Consider cycling wayfinding signage
- Perhaps link cycling and walking wayfinding
- Potential to connect efforts on Fuel Free initiative with TMP communication and implementation.
- Question about whether the City has considered an anti-idling bylaw
- Question of whether education and marketing has been included in the TMP scope and comment that this is an important part of behaviour change, street safety, mode shift.
- Question about roundabouts and whether there is any data to show them as safer than lights.
- Question about increasing tree coverage as part of capital projects.
- Consider information sharing between City and electrical utility for best practices in planning for EVs

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APPENDIX B

MODEL DEVLEOPMENT AND ASSUMPTIONS

CITY OF PENTICTON

PENTICTON INTEGRATED INFRASTRUCTURE MASTER PLAN

TRANSPORTATION MASTER PLAN - SYNCHRO MODEL REPORT

PENTICTON INTEGRATED INFRASTRUCTURE MASTER PLAN

TRANSPORTATION MASTER PLAN - SYNCHRO MODEL REPORT

CITY OF PENTICTON

TYPE OF DOCUMENT (VERSION)

PROJECT NO.: 20M
CLIENT REF:
DATE:

WSP

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TABLES

FIGURES

1 INTRODUCTION

This document compiles the background information and assumptions that make up the methodology for the transportation modelling component of the Penticton Integration Infrastructure Master Plan. The information herein combines previously submitted memos (list memos). The content of those memos has been updated to reflect feedback received from the City of Penticton. This document also contains additional information on model calibration, balancing, and analysis methodology.

1.1 METHODOLOGY OVERVIEW

WSP used a Synchro 10 for this study, which addressed the key traffic requirements of the study. Synchro was sufficient to address the demands of this study for a number of reasons:

- Growth is constrained to specific locations within the City and there are no major anticipated shifts in origin-destination patterns. This allows traffic growth to be estimated using a simple growth model and minimal trip generation, distribution and assignment;
- The City has already developed a base Synchro model that is being used to update signal timing plans. WSP will use this base model for consistency; and
- There are recently collected counts available and can be applied to the network and balanced within several sub-zones.

The traffic model was used to develop horizon-year snapshots of the transportation network's traffic flows and capacity constraints.

The model methodology included:

- Defining study intersections;
- Review, update and balance base year model (2020);
- Future land use and traffic growth estimates (2025, 2030, 2040, and, 2045); and
- Traffic analysis and recommendations.

Per the project RFP, the analysis horizons for the transportation plan will be existing (2020), and four future horizons (2025, 2030, 2040 and 2045). All horizons will evaluate an AM and PM Peak (looking only at Weekday traffic).

1.2 STUDY AREA AND INTERSECTIONS

The study area for the TMP covers all of Penticton which includes portions of Highway. WSP, along with input from the City of Penticton, identified a total of 148 intersections to evaluate within the model. The study intersections include a range of intersection types from lower volume rural roads, future intersections and higher volumes centrally located signalized intersections.

The study intersections are illustrated in **Figure 1-1.** A full list of study intersections is included in Table 1-1.

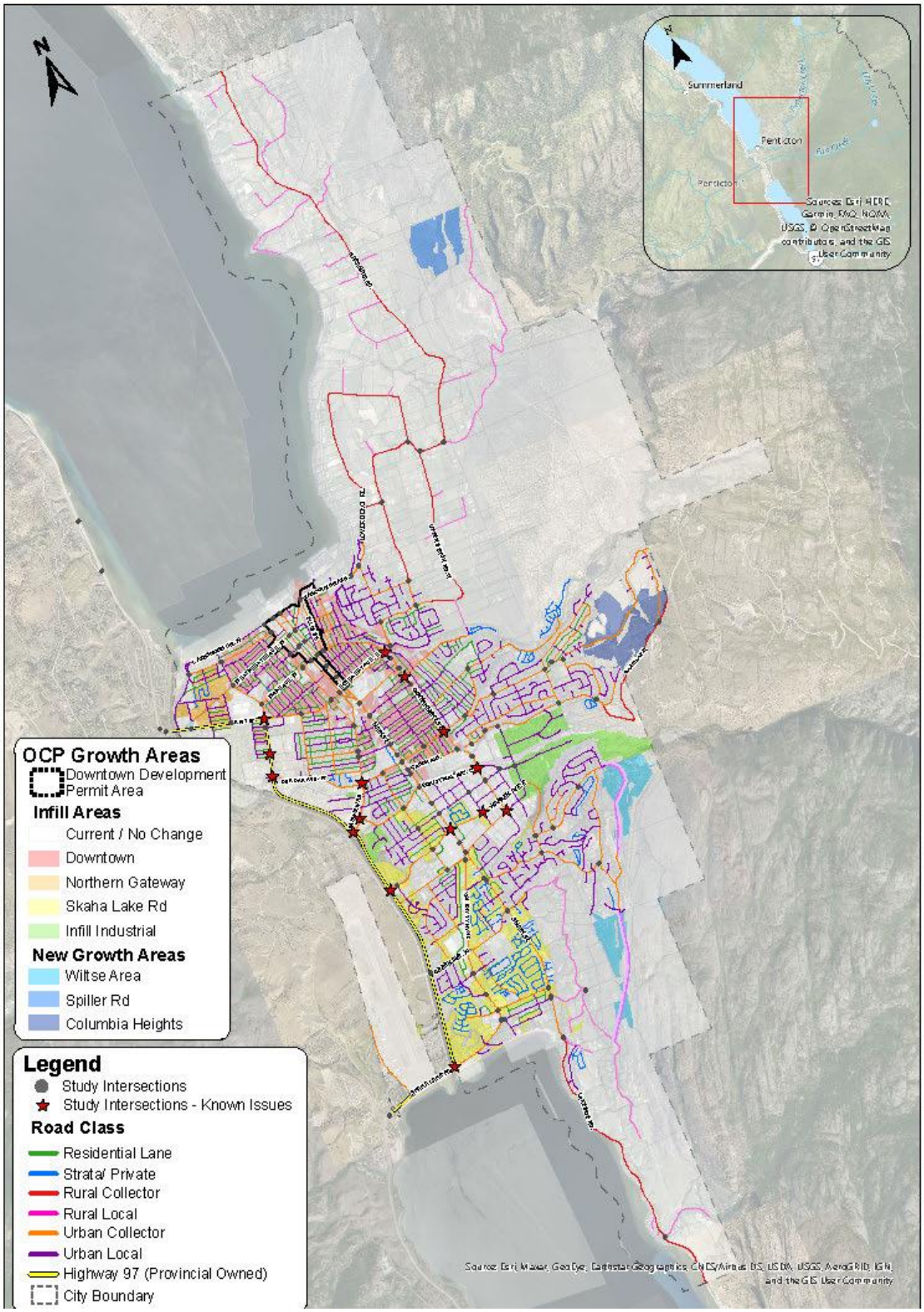


Figure 1-1 Study Intersections

Table 1-1 Transportation Model Study Intersections

MAJOR STREET	MINOR STREET	MAJOR STREET CLASSIFICATION	NODE NUMBER
Hwy 97	Sage Mesa Dr	Arterial	1013
Hwy 97	W Bench Hill Rd	Arterial	1033
Hwy 97 (Eckhardt Ave W)	Westminster Ave W	Arterial	1333
Riverside Dr	Churchill Ave	Local	1524
Highway 97 (Eckhardt Ave W)	Alberni Ave	Arterial	1833
Hwy 97 (Skaha Lake Rd)	Penticton Oliver Hwy	Arterial	1991
Lakeshore Dr W	Power St	Local	2122
Power St	Churchill Ave	Local	2124
Westminster Ave	Power St	Minor Collector	2128
Hwy 97 (Railway St)	Duncan Ave W	Arterial	2145
Hwy 97 (Eckhardt Ave W)	Oakville St	Arterial	2234
Hwy 97 (Railway St)	Fairway Ave	Arterial	2242
Wade Ave W	Power St	Minor Collector	2333
Hwy 97 (Eckhardt Ave W)	Vees Dr / Railway St (Highway 97)	Arterial / Major Collector	2334
Hwy 97 (Railway St)	Pacific Crescent	Arterial	2337
Hwy 97 (Skaha Lake Rd)	Airport Rd	Arterial	2490
Hwy 97 (Channel Pkwy)	Skaha Lake Rd	Arterial	2690
Duncan Ave W	Moosejaw St	Major Collector	2747
Eckhardt Ave W	Moosejaw St	Major Collector	2836
Hwy 97 (Channel Pkwy)	Fairview Rd / Green Mountain Rd	Arterial	2956
Winnipeg St	Lakeshore Dr W	Minor Collector	3021
Winnipeg St	Churchill Ave	Minor Collector	3023
Winnipeg St	Westminster Ave W	Minor Collector	3026
Fairview Rd	Industrial Ave W	Minor Collector	3054
Hwy 97 (Channel Pkwy)	Warren Ave W	Arterial	3064
Hwy 97 (Channel Pkwy)	Green Ave W	Arterial	3077
Martin St	Lakeshore Dr W	Major Collector	3121
Winnipeg St	Nanaimo Ave W	Minor Collector	3128
Winnipeg St	Wade Ave W	Minor Collector	3131

Warren Ave W	Baskin St	Minor Collector	3164
Martin St	Westminster Ave W	Major Collector	3225
Fairview Rd	Duncan Ave W	Minor Collector	3249
Main St	Lakeshore Dr W / Lakeshore Dr E	Major Collector	3321
Martin St	Nanaimo Ave W	Major Collector	3328
Fairview Rd	Calgary Ave	Minor Collector	3346
Main St	Westminster Ave W / Front St	Major Collector	3424
Martin St	Wade Ave W	Major Collector	3431
Winnipeg St	Eckhardt Ave W	Minor Collector	3436
Fairview Rd	Conklin Ave	Minor Collector	3446
Main St	Nanaimo Ave	Major Collector	3527
Main St	Wade Ave W / Wade Ave E	Major Collector	3530
Main St	Padmore Ave W / Padmore Ave E	Major Collector	3632
Main St	White Ave W / White Ave E	Major Collector	3634
Martin St	Eckhardt Ave W	Major Collector	3635
Winnipeg St	Fairview Rd	Minor Collector	3642
Front St	Vancouver Ave	Minor Collector	3720
Ellis St	Nanaimo Ave E	Minor Collector	3727
Wade Ave E	Ellis St	Major Collector	3730
Main St	Eckhardt Ave W / Eckhardt Ave E	Major Collector	3735
Duncan Ave W	Atkinson St	Major Collector	3748
Skaha Lake Rd	Waterford Ave	Major Collector	3779
Skaha Lake Rd	Guelph Ave	Major Collector	3782
Industrial Ave W	Atkinson St	Minor Collector	3856
Skaha Lake Rd	Green Ave W	Major Collector	3876
Skaha Lake Rd	Yorkton Ave	Major Collector	3885
Skaha Lake Rd	Lee Ave	Major Collector	3887
Vancouver Ave	Abbot St	Minor Collector	3920
Main St	Jermyn Ave	Major Collector	3938
Main St	Edmonton Ave	Major Collector	3941
Atkinson St	Okanagan Ave W	Local	3958
Lee Ave	Parkview St	Local	3987

Main St	Preston Ave / Nelson Ave	Major Collector	4043
Main St	Edna Ave	Major Collector	4044
Warren Ave W	Atkinson St	Minor Collector	4061
Skaha Lake Rd	Brandon Ave	Major Collector	4072
Main St	Penticton Ave	Major Collector	4144
Main St	Bennett Ave	Major Collector	4146
Main St	Manor Park Ave / Penticton Plaza Access	Major Collector	4147
Main St	Duncan Ave W / Duncan Ave E	Major Collector	4148
Main St	Carmi Ave	Major Collector	4150
Main St	Granby Ave	Major Collector	4151
Kinney Ave	Atkinson St	Local	4165
Vancouver Ave	Cambie St	Minor Collector	4220
Main St	Industrial Ave W / Industrial Ave E	Major Collector	4253
Main St	Rosetown Ave	Major Collector	4357
Main St	Okanagan Ave W / Okanagan Ave E	Major Collector	4358
Main St	Warran Ave W / Warran Ave E	Major Collector	4460
Main St	McDougall Ave	Major Collector	4462
Skaha Lake Rd	Kinney Ave	Major Collector	4465
Vancouver Ave / Lower Bench Rd	Vancouver Pl	Minor Collector	4520
Duncan Ave E	Manitoba St	Minor Collector	4547
Main St	Dawson Ave	Major Collector	4564
S Main St	Galt Ave	Major Collector	4567
S Main St	Pineview Rd	Major Collector	4568
Government St	Eckhardt Ave E	Major Collector	4633
Government St	Gahan Ave	Major Collector	4634
Lower Bench Rd	Grandview St	Minor Collector	4719
Haven Hill Rd	Johnson Rd	Major Collector	4728
Eckhardt Ave E / Haven Hill Rd	Pickering St / Creekside Rd	Major Collector	4733
Government St	Jermyn Ave	Major Collector	4737
Government St	Forestbrook Dr	Major Collector	4738
Government St	Edmonton Ave	Major Collector	4739

S Main St	Green Ave W / Green Ave E	Major Collector	4773
Lakeside Rd	Brantford Ave	Major Collector	4790
Government St	Nelson Ave	Major Collector	4841
Government St	Edna Ave	Major Collector	4843
S Main St	Yorkton Ave	Major Collector	4885
S Main St	Lee Ave	Major Collector	4887
S Main St	Crescent Hill Rd	Major Collector	4887
Government St	Penticton Ave	Major Collector	4945
Government St	Bennett Ave	Major Collector	4946
Industrial Ave E	Camrose St	Minor Collector	4954
Lower Bench Rd	Tupper Ave	Minor Collector / Local	5016
Government St	Municipal Ave	Major Collector	5046
Government St	Duncan Ave E	Major Collector	5047
Okanagan Ave E	Camrose St	Local	5057
Warren Ave E	Camrose St	Minor Collector	5059
Government St	Carmi Ave	Major Collector	5150
Tupper Ave	Middle Bench Rd N	Minor Collector	5216
Middle Bench Rd S	Westminster Ave E	Local	5224
Johnson Rd	Alder St / Middle Bench Rd S	Major Collector	5228
Carmi Ave	Halifax St	Minor Collector	5250
Lakeside Rd	Smythe Dr	Major Collector	5298
Duncan Ave E	Edgewood Dr	Minor Collector	5348
Government St	Hospital Parkade Entrance	Major Collector	5352
Government St	Industrial Ave E	Major Collector	5354
Government St	Okanagan Ave E	Major Collector	5357
Government St	Warren Ave E	Major Collector	5459
Government St	Dawson Ave	Major Collector	5461
Carmi Ave	Dartmouth St	Minor Collector	5549
Industrial Ave E / Okanagan Ave E	Okanagan Ave E	Local	5556
Valleyview Rd	Crescent Hill Rd	Local	5787
Future connection to Evergreen Dr	Valleyview Rd	Proposed Minor Collector	5791

Edgewood Dr	Penticton Ave	Local	5840
Dartmouth Dr	Wiltse Blvd	Minor Collector	5865
Dartmouth Dr	Pineview Rd	Minor Collector	5868
Carmi Ave	Dartmouth Rd	Minor Collector	5949
Okanagan Ave E	Dartmouth Rd	Local	5957
Warren Ave E / Dartmouth Dr	Dartmouth Rd	Minor Collector	5959
Duncan Ave E	Ridgedale Ave / Woodlands Dr	Minor Collector	6047
Wiltse Blvd	Wiltse Dr	Minor Collector	6165
Munson Ave / Upper Bench Rd N	Upper Bench Rd N	Minor Collector	6213
Upper Bench Rd N	McMillan Ave	Minor Collector / Major Collector	6214
Naramata Rd	Poplar Grove Rd	Major Collector	6307
McMillan Ave / Naramata Rd	Reservoir Rd	Major Collector	6314
Wiltse Blvd	Wiltse Dr / Stocks Crescent	Minor Collector	6562
Pineview Rd	Evergreen Dr	Minor Collector	6571
Duncan Ave E	Columbia St	Minor Collector	6647
Carmi Ave	Columbia St	Minor Collector	6649
Duncan Ave E	Lawrence Ave	Minor Collector / Local	6746
Lawrence Ave	Allison St	Minor Collector	6846
Carmi Ave	Cleland Dr	Minor Collector	7053
Syer Rd	Carmi Ave	Minor Collector	7847
Evergreen Dr	Partridge Dr	Minor Collector	TBD by WSP

2 BASE YEAR MODEL

The base year model is a 2020 AM and PM Peak Hour Model. The base model was updated to reflect a number of baseline assumptions, including identifying correct current geometry, updating traffic volumes based on available counts, balancing traffic volumes, estimating counts where not available inputting available signal timing plans, and a number of analysis assumption inputs. Some of the intersections identified in the model are not included in the Transportation Master Plan Study, but were part of the model delivered to WSP. They have not been updated.

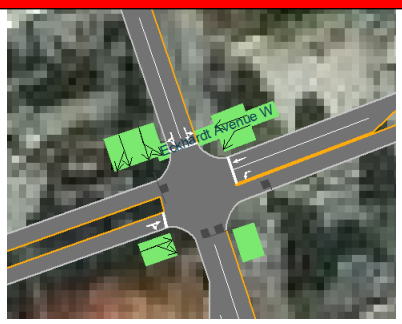
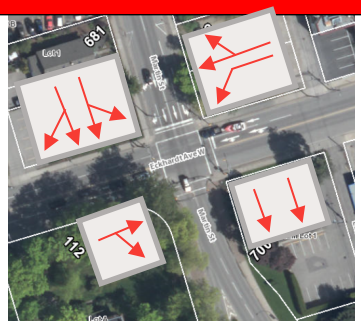
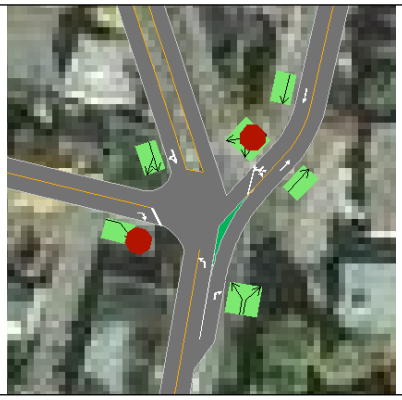
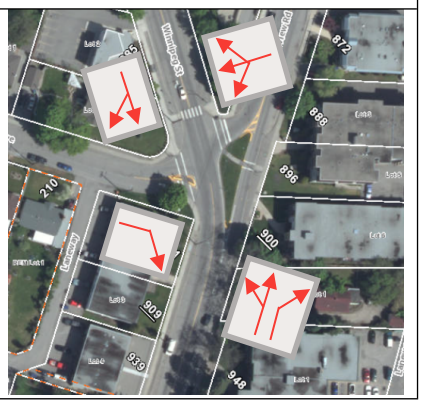
2.1 GEOMETRY UPDATES

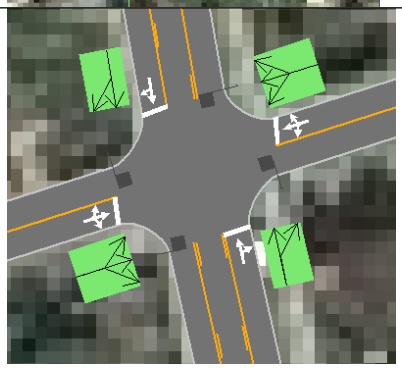
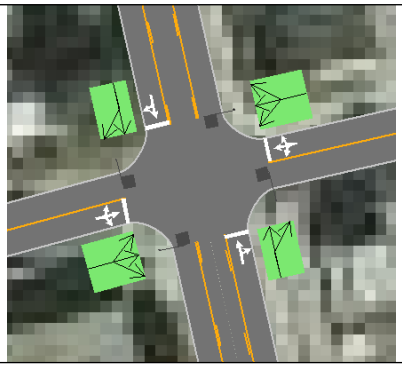
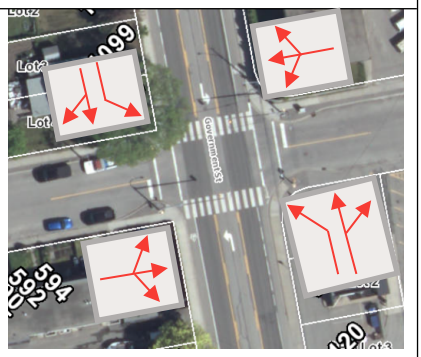
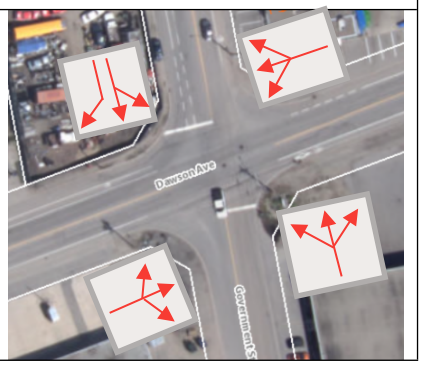
The base model received contained coding for most of the identified study locations, but a review of the network against available aerial data identified a number of locations where minor updates to the network were required. Those locations were validated in the field in August 2020. Any updates have been noted in **Table 2-1.**

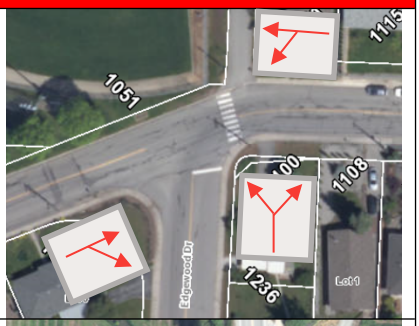
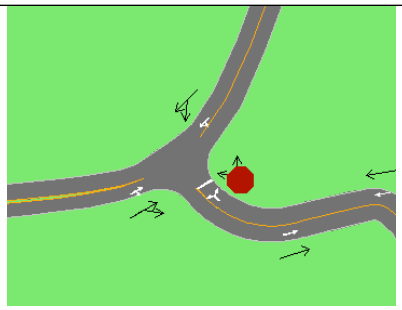
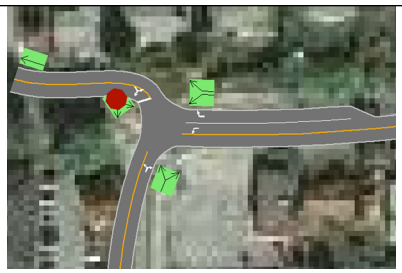
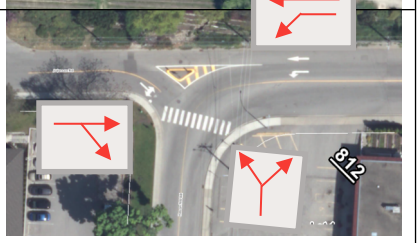
Locations were reviewed using GIS and Google Street View. Locations were discrepancies were noted were then reviewed in through a site visit to identify if any changes were needed.

Additionally, storage lengths in the previous model were quite inconsistently measured. In order to standardize measurements, the methodology of the Canadian Capacity Guide for Signalized Intersections was used. In particular, tapered queuing lanes' storage lengths ended once the road width narrowed to 2.5m. As part of the geometric updates, all lane widths were standardized to 3.5m.

Table 2-1 Geometric Updates to 2020 Base Model

Major Street	Minor Street	Node	Base Model	Confirmed in person (08/28/20)
Martin St	Eckhardt Ave W	3635		
Winnipeg St	Fairview Rd	3642		

Major Street	Minor Street	Node	Base Model	Confirmed in person (08/28/20)
Eckhardt Ave E / Haven Hill Rd	Pickering St / Creekside Rd	4733		
Government St	Forestbrook Dr	4738		
Government St	Nelson Ave	4841		
Government St	Dawson Ave	5461	Not coded in model	

Major Street	Minor Street	Node	Base Model	Confirmed in person (08/28/20)
Edgewood Dr	Penticton Ave	5840	Not coded in model	
Naramata Rd	Poplar Grove Rd	6307	Not in model	
McMillan Ave / Naramata Rd	Reservoir Rd	6314		
Haven Hill Rd	Johnson Rd	4728	 No results from Synchro HCM2000, incompatible with HCM 2010	

2.2 TRAFFIC COUNTS

WSP received traffic counts from the City of Penticton to populate the traffic model. Counts were collected between 2018 and 2020. Counts were entered in the model and standardized to the 2020 study horizon using a 0.65% annual growth (discussed in Section 3.0 in more detail). Counts were not available in all locations, and in those locations data was estimated using engineering judgement based on similar adjacent intersections. Intersections were balanced to approximately 10% where appropriate. Where not available, pedestrian and cycling counts were estimated, again based on nearby intersections. A list of locations where traffic volumes were estimated is summarized in Table 2-2.

Table 2-2 Traffic Volume Estimate Locations

SYNCHRO / TIS ID*	INTERSECTION*
6213	Munson Ave/Upper Bench Road N
1833	Hwy 97 and Alberni Ave
2234	Hwy 97 (Eckhardt Ave) and Oakville St
2337	Hwy 97 (Railway St) and Pacific Crescent
2333	Wade Ave and Power St
3128	Winnipeg St and Nanaimo Ave
3727	Ellis St and Nanaimo Ave
1524	Riverside Drive and Churchill Ave
3023	Winnipeg St and Churchill Ave
3941	Main St and Edmonton Ave
4044	Main St and Edna Ave
4144	Main St and Penticton Ave
4147	Main St and Manor Park Ave / Penticton Plaza Access
4634	Government St and Gahan Ave
4739	Government St and Edmonton Ave
4945	Government St and Penticton Ave
2490	Hwy 97 (Skaha Lake Rd) and Airport Road
3077	Hwy 97 (Channel Pkwy) Green Ave W
3958	Atkinson St and Okanagan Ave W
4567	S Main St ang Galt Ave
4887	S Main St Lee Ave
4886	S Main St and Crescent Hill Rd
5959	Warren Ave E / Dartmouth Dr and Wiltse Blvd

2.3 MODELLING INPUTS

2.3.1 SATURATION FLOW RATE

The saturation flow rate represents the maximum rate of flow in a traffic lane and is a significant factor in deriving lane capacity. The base saturation flow represents the saturation flow rate for a traffic lane that is 12 feet wide and

has no heavy vehicles, a flat grade, no parking, no buses that stop at the intersection, even lane utilization, and no turning vehicles. The local base saturation flow for the City of Penticton was found based on methodology from the 2010 edition of the *Highway Capacity Manual* (HCM).

An overall local base saturation flow rate of **1700 veh/hr/ln** was obtained for the City of Penticton. This value was found through traffic surveys using video footage from three intersections: Main Street / Warren Ave, Government Street / Eckhardt Avenue, and Government Street / Industrial Avenue. Base saturation flows were obtained for a total of six different lanes from the three intersections as shown in the table below.

Lanes and intersections surveyed were chosen primarily based on visibility of queues from the video footage obtained, sufficient vehicle volumes in the lane, and diversity of lane types as explained below:

- As per the HCM's methodology, lanes where a of minimum 8 initial queued vehicles was not observed in any cycle during peak periods were not considered in the final saturation flow calculation.
    - Due to limitations in visibility from the video footage obtained, it was up to the surveyor's judgement whether 8 vehicles were in the initial queue.
- The manual recommended a minimum of 15 cycles with at least 8 initial queued vehicles. A lower threshold of 10 cycles was accepted if 15 cycles could not be obtained due to the low traffic volumes in Penticton.
- A diverse variety of lane types were chosen, including through, through-right, and left-turn lanes. As instructed by the HCM, permissive and protective-permissive left-turn lanes were not considered due to their high random variations in saturation flow.

The following assumptions were made when calculating the base saturation flow:

- Calculations were done using the HCM 2010 methodology
- Intersection grades and lane widths were determined using the Penticton Property Viewer
- All area types were considered "normal" (as opposed to central business district)
- Turning movement and truck percentages were based on observations during the saturation flow surveys

Table 2-3 Saturation Flow Rate Calculation

INTERSECTION ID	MAJOR STREET	MINOR STREET	LANE	LOCAL BASE SATURATION FLOW	NOTES
4460	Main St	Warren Ave	SBT	1754	Only 10 cycles with 8 or more vehicles counted. Could only see queue up to 4 vehicles due to visibility issues.
4460	Main St	Warren Ave	SBTR	1644	Could only see queue up to 4 vehicles due to visibility issues.
4460	Main St	Warren Ave	EBTR	1626	
4633	Government St	Eckhardt Ave	WBL	1836	Protected left-turn lane
5354	Government St	Industrial Ave	NBTR	1598	Only 14 cycles with 8 or more vehicles observed. Could only see queue up to 3 vehicles due to visibility issues.
5354	Government St	Industrial Ave	SBTR	1740	
Average				**1700**	

2.3.2 LOCAL PEAK HOUR

The peak hours were determined to be:

AM Peak: 8:00-9:00 AM

PM Peak: 3:15-4:15 PM

2.3.3 PEAK HOUR FACTOR

PHF values were obtained for each intersection movement for locations where 15-minute interval data was provided, or if the PHF was already provided by the data source.

For locations where the PHF could not be obtained, a median city-wide AM and PM PHF are to be assumed:

Median AM PHF: 0.75

Median PM PHF: 0.82

2.3.4 HEAVY VEHICLES PERCENTAGE

Heavy vehicle percentage values were obtained for each intersection movement where data was provided. For location where HV% could not be obtained, a median city-wide AM and PM HV% are to be assumed.

Median AM HV%: 3%

Median PM HV%: 1%

3 FUTURE MODEL TRAFFIC ESTIMATES

3.1 FUTURE HORIZON OVERVIEW

The future study horizons for the Transportation Master Plan are 2025, 2030, 2040, and 2045. WSP developed models to estimate the traffic volumes for the AM and PM Peak at each of those horizons. The methodology for this approach was presented to the City in the attached memo, and adjusted as the model was developed. The general approach identified for projecting the model to future study horizons, as identified in the Penticton Traffic Model Terms of Reference is to generate trips based on identified population and employment projections in new growth areas, while balancing those with a generalized growth rate in the existing areas of the City.

3.2 GROWTH AREAS

The Growth Areas for the traffic model are based on the OCP future land use horizon, as illustrated in **Figure 1-1**. Growth is divided into infill within the Downtown and Skaha Lake Road, a mix of infill and new development in Northern Gateway and the Industrial Areas, and new residential development in select neighbourhoods at the periphery of the existing build up areas. A summary of the growth areas is included in **Table 3-1**.

Table 3-1 City of Penticton Growth Areas

NEIGHBOURHOOD	DESCRIPTION
Downtown	Growth will include residential, office, and commercial infill.
Northern Gateway	Growth will include residential and commercial infill
Skaha Lake Road	Growth will include residential, commercial and office infill
Infill Industrial	Industrial area which is assumed to contain all industrial growth in the OCP horizon.
Wiltse Area	Wiltse is assumed to be exclusively residential development.
Spiller Road	Spiller Road is assumed to be exclusively residential development.
Columbia Heights	Columbia Heights is assumed to be exclusively residential development.

Certain land uses, like schools, recreation centres, and local commercial hubs have not been identified in any detail within this breakdown because locations have not been confirmed. As these uses are identified in the future, intersections in proximity to these uses must be reviewed as they have the capacity to generate a significant local demand. To mitigate the absence of these land uses, no internal trip capture has been identified for growth areas for this study. At the long-term overall City model perspective, many of those trips will be captured locally within an internal neighbourhood and have less significant impact on the overall network.

3.3 LAND USE DATA

The Official Community Plan identifies the following future land use needs for Penticton. That data is summarized in **Table 3-2**.

Table 3-2 OCP Land Use Needs

LAND USE	QUANTITY/TYPE
Housing/Residential	150 units/year - 35% Duplex/Infill - 32% Low Rise Apartments (<5 Storeys) - 21% Single Detached - 9% Mid to High Rise Apartments (>5 Storeys) - 3% Mobile Homes
Retail	43,000 sq.ft. of retail floorspace per year
Office	5,000 sq.ft. office space per year, focus on Downtown
Industrial	60 acres in or near Penticton

Using this as a foundation, WSP has worked with the City of Penticton to allocate growth across the City and distribute the growth across the timeline of the study.

3.4 RESIDENTIAL GROWTH

Details on the breakdown of how the OCP population projections were allocated to different categories are discussed in Technical Memo #5, Population Projections. **Table 3-3** summarizes the forecasted residential population breakdowns through to the 2045 OCP Horizon data.

Table 3-3 Residential Growth by Year (Residents)

Year	Horizon	Single Family (Detached)	Multi-Family (Category 1) (1)	Multi-Family (Category 2) (2)	Total Residents
2016	Latest Census	17,455	7,310	9,675	34,440
2017	Baseline	17,575	7,429	9,661	34,665
2025	**5-year horizon**	**18,430**	**8,364**	**9,727**	**36,521**
2030	**10-year horizon**	**18,837**	**8,950**	**9,944**	**37,731**
2040	**20-year horizon**	**19,726**	**10,314**	**10,233**	**40,273**
2045	**25-year OCP horizon**	**19,851**	**10,908**	**10,848**	**41,608**

(1) Multi-Family Category 1 includes semi-detached, row house, duplex and other attached dwellings.
(2) Multi-Family Category 2 includes movable dwellings and apartments.

This overall growth was assigned to the growth areas over the horizon as summarized in **Table 3-4** through **Table 3-8**.

Table 3-4 Current Population (2020 Residents)

NEIGHBOURHOOD	LOW DENSITY	MEDIUM DENSITY	HIGH DENSITY
Downtown	2,156	6,132	1,099
Northern Gateway	217	10	175
Skaha Lake Road	726	144	2,376
Infill Industrial	41	0	0
Wiltse North	0	0	0
Wiltse South	3	0	0
Spiller Road	2	0	0
Columbia Heights	4	0	70
Other	14,426	1,173	5,941
TOTAL	**17,575**	**7,429**	**9,661**

Table 3-5 Five Year Population (2025 Residents)

NEIGHBOURHOOD	LOW DENSITY	MEDIUM DENSITY	HIGH DENSITY
Downtown	2,156	6,704	1,123
Northern Gateway	217	10	175
Skaha Lake Road	726	478	2,420
Infill Industrial	41		
Wiltse North	854	0	0
Wiltse South	3	0	0
Spiller Road	2	0	0
Columbia Heights	4	0	70
Other	14,426	1,173	5,941
TOTAL	18429	8364	9728

Table 3-6 10 Year Population (2030 Residents)

NEIGHBOURHOOD	LOW DENSITY	MEDIUM DENSITY	HIGH DENSITY
Downtown	2,156	6,997	1,231
Northern Gateway	217	10	175
Skaha Lake Road	726	770	2,528
Infill Industrial	41		

Wiltse North	1,128	0	0
Wiltse South	3	0	0
Spiller Road	135	0	0
Columbia Heights	4	0	70
Other	14,426	1,173	5,941
TOTAL	**18,836**	**8,950**	**9,945**

Table 3-7 20 Year Population (2040 Residents)

NEIGHBOURHOOD	LOW DENSITY	MEDIUM DENSITY	HIGH DENSITY
Downtown	2,156	7,434	1,346
Northern Gateway	217	285	234
Skaha Lake Road	726	1,204	2,642
Infill Industrial	41		
Wiltse North	1,128	48	0
Wiltse South	366	0	0
Spiller Road	661	115	0
Columbia Heights	4	56	70
Other	14,426	1,173	5,941
TOTAL	**19,725**	**10,315**	**10,233**

Table 3-8 25 Year (OCP horizon)

NEIGHBOURHOOD	LOW DENSITY	MEDIUM DENSITY	HIGH DENSITY
Downtown	2,156	7,549	1,548
Northern Gateway	217	408	445
Skaha Lake Road	726	1,319	2,844
Infill Industrial	41		
Wiltse North	1,128	97	0
Wiltse South	491	22	0
Spiller Road	661	228	0
Columbia Heights	4	113	70
Other	14,426	1,173	5,941
TOTAL	**19,850**	**10,909**	**10,848**

The annual percentage growth in the Downtown and Skaha Lake Road area for residential population of 0.80% and 2.08% respectively.

3.5 INDUSTRIAL/COMMERCIAL/INSTITUTIONAL

Data for the industrial/commercial and institutional growth allocation was completed in conjunction with the Water and Wastewater modelling completed for the IITMP. Water and Wasterwater modelling is completed using Population Equivalents, and therefore all forecasting identified in the Population Projection Memo is completed using population equivalents. For the transportation model, these equivalents are used determine the rate of growth and the distribution of that growth. **Table 3-9** below shows the Industrial, Commercial and Institutional (ICI) Population Equivalents.

Table 3-9 ICI Population Equivalents

Year	Horizon	Institutional	Commercial	Industrial
2017	Baseline	2942	8713	851
2025	5-year horizon	3100	9705	931
2030	10-year horizon	3202	10385	985
2040	20-year horizon	3418	12097	1025
2045	25-year OCP horizon	3531	13063	1042
Total New Space Needed Per OCP	**25-Year Horizon**	**+147,000 Sq ft (office space)**	**+205,000 (retail)**	**60 Acres (Industrial)**

The commercial space can be distributed as 68,000 sq ft of grocery, 36,000 sq ft of food and beverage, and 30,000 sq of service commercial and an additional 71,000 sq of additional retail floor space. The ICI growth rates (annual) were used to allocate the growth in development space in square foot or acre. Those results are summarized in Table 10.

Table 3-10 Additional Office Space/Commercial/Industrial Space

Year	Horizon	Office Space (1000 sq ft)	Commercial (1000 sq ft)	Industrial (Acres)
2025	5-year horizon	39	47	25
2030	10-year horizon	25	32	17
2040	20-year horizon	54	81	13
2045	25-year OCP horizon	28	46	5
2045 Total	**25 Year Horizon**	**147**	**205**	**60**

The ICI Population Equivalents are assigned to the study neighbourhoods using the following distribution, as identified in the Population Growth Memo. Additionally, that industrial development will be concentrated in the existing industrial area. Planning also confirmed they would like the office split 60% to downtown, 20% to Skaha lake Rd and 20% to Northern Gateway.

Based on the percentage allocations and land uses above, the industrial/institutional/commercial development has been allocated to new neighbourhoods as identified in **Table 3-11.**

Table 3-11 Industrial/Office Space/Retail Growth

OCP Growth Area[1]	Office (1000 sq ft)	Commercial (1000 sq ft)	Industrial (Acres)
Downtown			
2025	23	20	
2030	15	13	
2040	32	44	
2045	17	26	
Total	**87**	**105**	
Skaha Lake Rd			
2025	8	13	
2030	5	9	
2040	11	29	
2045	6	17	
Total	**30**	**68**	
Northern Gateway			
2025	8	0	
2030	5	0	
2040	11	20	
2045	6	12	
Total	**30**	**32**	
Infill Industrial A			
2025			7
2030			5
2040			4
2045			2
Total			**18**
Infill Industrial B			
2025			8
2030			5
2040			4
2045			2
Total			**19**
Infill Industrial C			
2025			10
2030			7
2040			5
2045			2
Total			**24**

4 TRIP GENERATION AND DISTRIBUTION

As described in the Approach, the general approach for trip generation for the model is to develop new trips using the ITE Trip Generation Manual (10th Edition) for greenfield and the industrial development, while growing the existing areas of the City by an annual growth rate that corresponds to the population growth.

For trip generation, low density was identified as single-detached housing (ITE Trip Type 210); medium density development was identified as low rise (ITE Trip Type 220) with a population density of 2.4 people/household; and high density was defined as multi-family housing, (ITE Trip Type 221) with a population density of 1.6 people/household. Residents were used as the analysis unit for Types 220 and 221 as the ITE Trip Data was more robust for those sources.

For each of the greenfield areas, WSP has identified they key routes from the development into the core area. Once the development traffic reaches the screenline, it will be balanced with the 1.1% growth defined for those central areas. This balancing generally resulted in a reduction of the volumes at the periphery of the central area, but that will be discussed in more detail for each neighbourhood below.

4.1 DOWNTOWN/SKAHA LAKE

Based on the population numbers presented in this memo, the growth rate for the central part of the City (Downtown and Skaha Lake Area) is close to 1.1%. All local, collector and arterial streets within the Downtown will have an annual growth rate of 1.1% applied. The area covered by this assumption is shown in **Figure 4-1**.

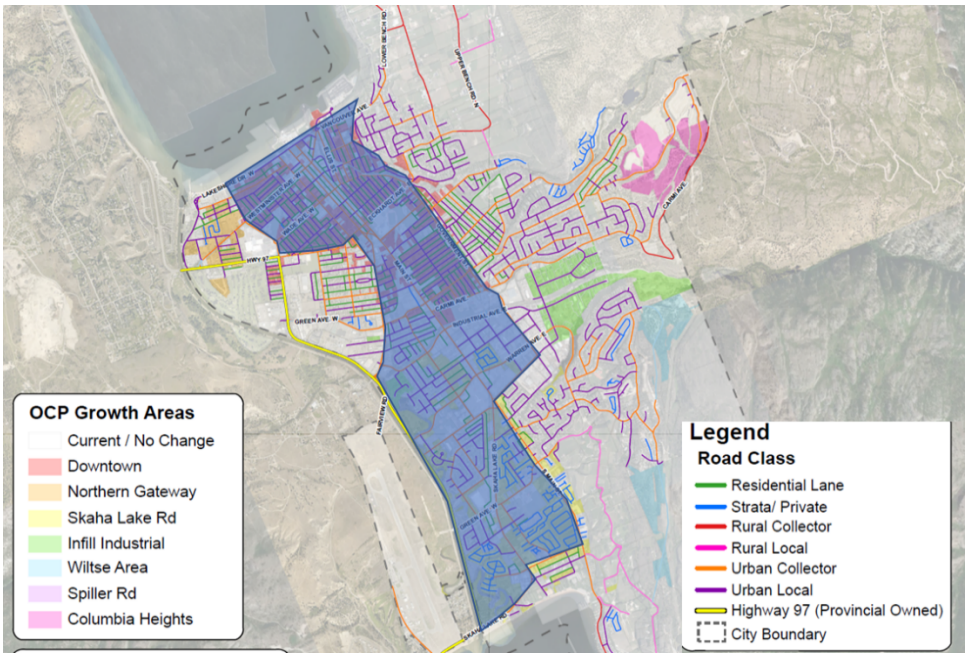


Figure 4-1 Downtown/Skaha Lake Road Growth Area

After the adjacent growth areas had their growth applied, adjustments were made to a number of intersections at the periphery of this growth area to balance volumes and better reflect the traffic patterns anticipated. These adjustments were based on the 2045 growth horizon, but carried down to interim study horizons. Those adjustments are summarized in **Table 4-1**.

Table 4-1 Downtown/Skaha Lake Growth Adjustments

INTERSECTION	AM	PM
3720	Instead of growth rate, adjusted to use trip generation from Spiller Road	Instead of growth rate, adjusted to use trip generation from Spiller Road
3920	Instead of growth rate, adjusted to use trip generation from Spiller Road	Instead of growth rate, adjusted to use trip generation from Spiller Road
4220	Instead of growth rate, adjusted to use trip generation from Spiller Road	Instead of growth rate, adjusted to use trip generation from Spiller Road
2122	Reduced all movements by half the growth rate (0.65% instead of 1.1% to balance with adjacent intersections)	Reduced all movements by half the growth rate (0.65% instead of 1.1% to balance with adjacent intersections)
2124		Reduced all movements by half the growth rate (0.65% instead of 1.1% to balance with adjacent intersections)
2128	Reduced all movements except EB/WB through by half growth rate. Adjusted EB/WB through to balance with adjacent intersections	Reduced all movements except northbound
2333	Reduced all movements except NBT/NBR/SBT to half of the 1.1% growth rate	Reduced all movements except NBT/NBR/SBT/EBR to half of the 1.1% growth rate
2747	Increased EBT/EBL and WBT to balance with Highway	Increased EBT and WBT to balance with Highway
2836		Increased EB and WBT to balance with Highway
4633	Keep north south as the 1.1% growth rate, for other approaches use development traffic from Spiller Road Development Instead	Keep north south as the 1.1% growth rate, for other approaches use development traffic from Spiller Road Development Instead
5354	Used trip generation numbers for turning movements instead of growth rate	Used trip generation numbers for turning movements instead of growth rate
5150	Used trip generation numbers for turning movements instead of growth rate	Used trip generation numbers for turning movements instead of growth rate
5047	Used trip generation numbers for turning movements instead of growth rate	Used trip generation numbers for turning movements instead of growth rate

4.2 NORTHERN GATEWAY

Land uses in Northern Gateway are identified as lower density residential and commercial. Routes into the core area are shown in **Figure 4-1** with the distribution assumptions summarized in **Table 4-3**. Routes were assumed based on the existing traffic distribution on the study roads, and assigned at individual intersections following current turning movements. Trip generation is summarized in **Table 4-4**. Only 25 year trip generation is summarized.

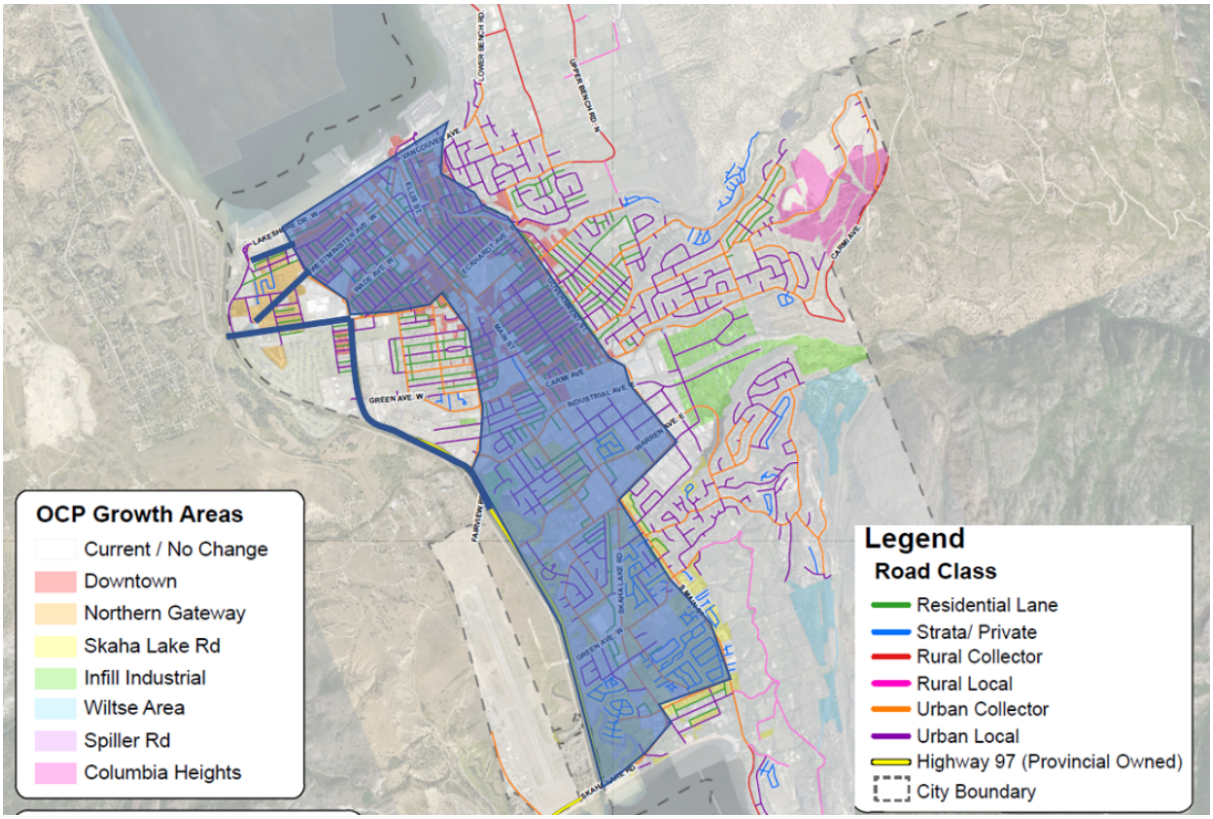


Figure 4-2 Northern Gateway Study Routes

Table 4-2 Northern Gateway Development Trip Distribution

	AM		PM	
	In	**Out**	**In**	**Out**
To/From Built up Urban Area				
Lakeshore Drive (into town)	3%	13%	23%	19%
Churchill Ave (into town)	1%	2%	2%	2%
Westminster Ave (into town)	36%	40%	33%	32%
To/From Highway 97				
NB Via Riverside	1%	6%	1%	1%
NB Via Westminster Ave	29%	18%	15%	26%
NB VIA Alberni	6%	6%	4%	5%
SB/EB Via Riverside	1%	0%	2%	0%
SB/EB VIA Alberni	9%	0%	10%	0%
SB/EB Via Como	1%	0%	1%	0%
SB/EB Via Westminster Ave	12%	14%	9%	16%

Table 4-3 Northern Gateway Trip Generation

LAND USE	INDEPENDENT VARIABLE	RATE	IN RATE	OUT RATE	% PASS-BY	25 YEAR VALUE	TOTAL TRIPS	IN	OUT
AM PEAK									
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.95 Ln(X) - 0.51	23%	77%	0%	165	77	18	59
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.98 Ln(X) - 0.98	26%	74%	0%	169	57	15	42
Commercial	1,000 sq ft	0.91	62%	38%	35%	32	19	12	7
TOTAL							**153**	**44**	**109**
PM PEAK									
Single Family Detached Housing (210)	Residents	T = 0.27(X) + 9.67	66%	34%	0%	-	0	0	0
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.89 Ln(X) - 0.02	63%	37%	0%	165	92	58	34
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.96 Ln(X) - 0.63	61%	39%	0%	248	106	65	41
Commercial	1,000 sq ft	3.81	48%	52%	35%	32	43	20	22
TOTAL							**209**	**124**	**85**

4.3 WILTSE AREA

Witlse North and South are residential areas. Routes into the core area are shown in **Figure 4-3**, with trip distribution summarized in **Table 4-3.** The 25 year trip generation is summarized in **Tables 4-4 and 4-5.**

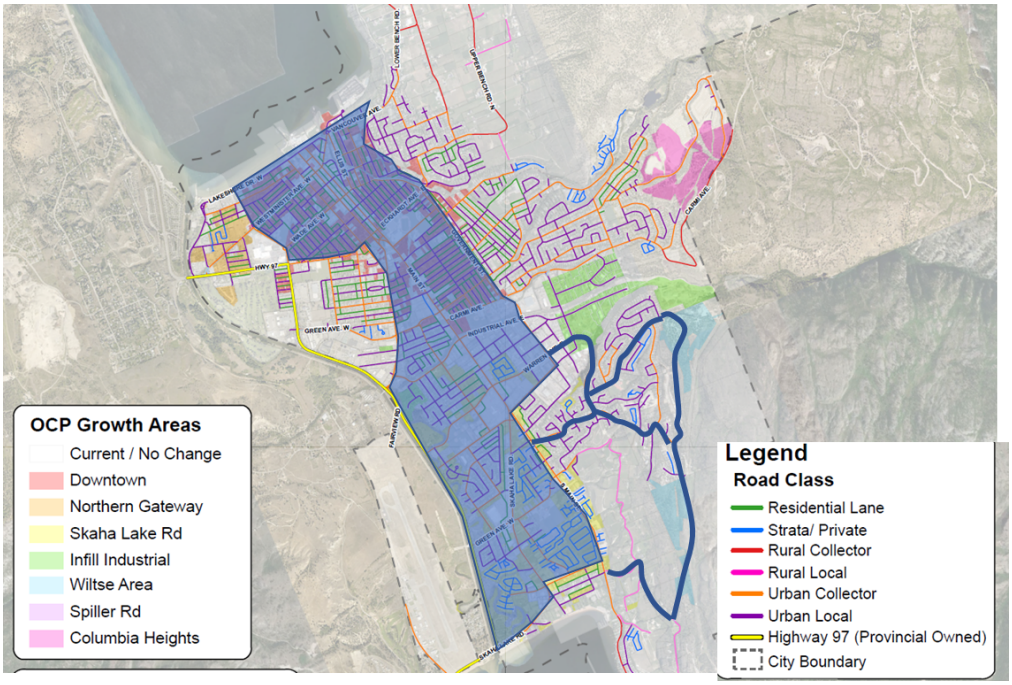


Figure 4-3 Wiltse Area Desire Lines

Table 4-4 Wiltse Area Trip Distribution

	AM		PM	
At Development	In	Out	In	Out
Wiltse North				
Wiltse Boulevard	80%	80%	80%	80%
Partridge Drive	20%	20%	20%	20%
Witlse South				
Evergreen Drive NB	90%	90%	90%	90%
Evergreen Drive SB	5%	5%	10%	10%

Table 4-5 Wiltse North Trip Generation

WILTSE NORTH 25 YEAR AUTO TRIPS

Land Use	Independent Variable	Rate	In rate	Out rate	25 Year Value	Total Trips	In	Out
AM PEAK								
Single Family Detached Housing (210)	Residents	Ln(T) = 0.97 Ln(X) - 1.43	31%	69%	1,128	219	68	151
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.95 Ln(X) - 0.51	23%	77%	41	20	5	16
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.98 Ln(X) - 0.98	26%	74%	0	0	0	0
TOTAL						**239**	**72**	**167**
PM PEAK								
Single Family Detached Housing (210)	Residents	T = 0.27(X) + 9.67	66%	34%	1,128	314	207	107
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.89 Ln(X) - 0.02	63%	37%	41	27	17	10
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.96 Ln(X) - 0.63	61%	39%	0	0	0	0
TOTAL						**341**	**224**	**117**

Table 4-6 Wiltse South Trip Generation

WILTSE SOUTH 25 YEAR AUTO TRIPS

Land Use	Independent Variable	Rate	In rate	Out rate	25 Year Value	Total Trips	In	Out
AM PEAK								
Single Family Detached Housing (210)	Residents	Ln(T) = 0.97 Ln(X) - 1.43	31%	69%	488	97	30	67
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.95 Ln(X) - 0.51	23%	77%	205	94	22	73
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.98 Ln(X) - 0.98	26%	74%	14	5	1	4
TOTAL						**196**	**53**	**143**
PM PEAK								
Single Family Detached Housing (210)	Residents	T = 0.27(X) + 9.67	66%	34%	488	141	93	48
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.89 Ln(X) - 0.02	63%	37%	205	112	70	41
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.96 Ln(X) - 0.63	61%	39%	14	7	4	3
TOTAL						**260**	**168**	**92**

4.4 SPILLER ROAD

Spiller Road is a proposed residential development located in the northeast part of Penticton. Routes into the core area are shown in **Figure 4-4**. Traffic was assigned along each road in the study area towards Penticton based on existing turning movements at all intersections. Trip generation numbers for the 2045 horizon are summarized in **Table 4-17.**

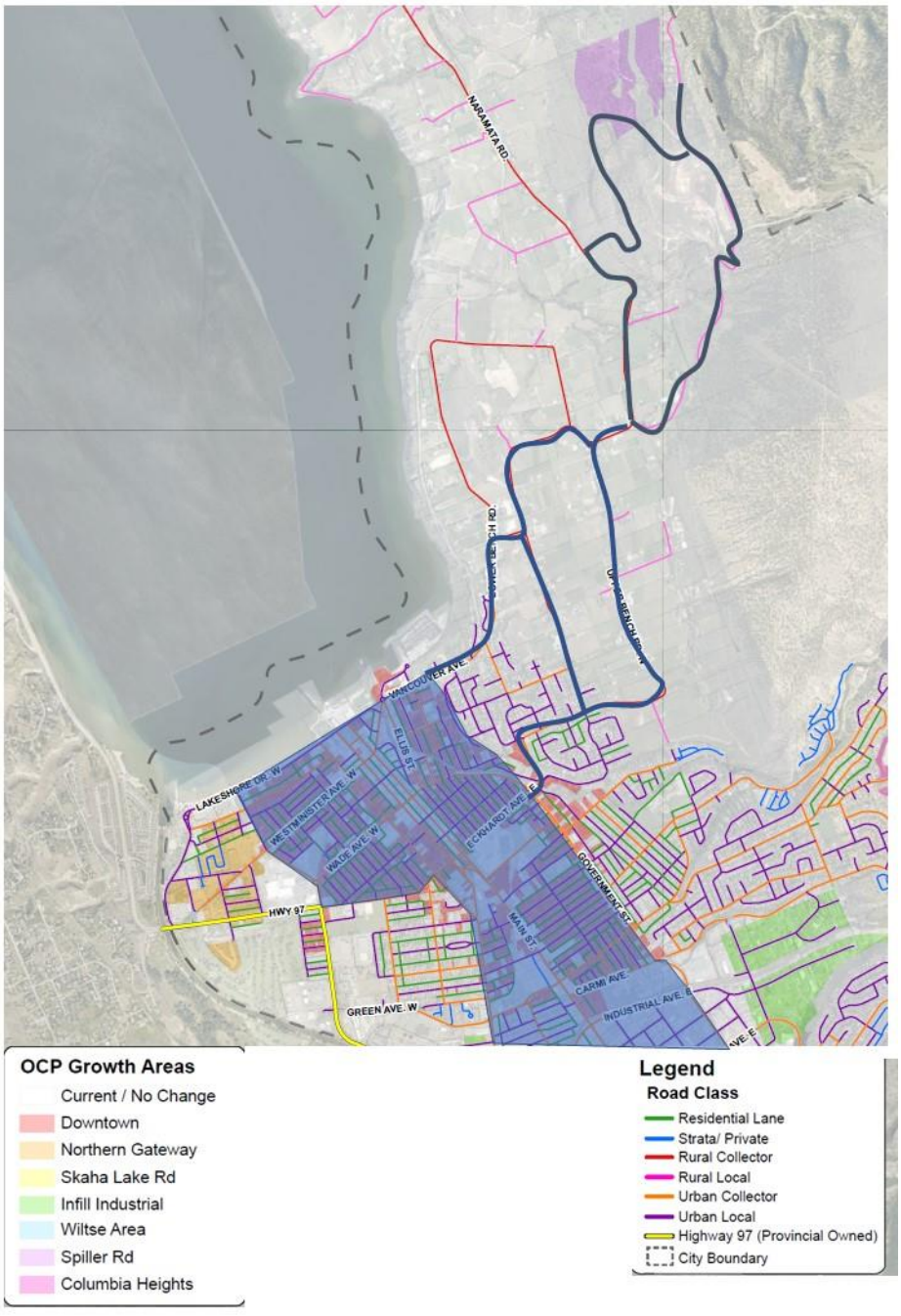


Figure 4-4 Spiller Road Desire Lines

Table 4-7 Spiller Road

SPILLER ROAD 25 YEAR AUTO TRIPS

Land Use	Independent Variable	Rate	In rate	Out rate	25 Year Value	Total Trips	In	Out
AM PEAK								
Single Family Detached Housing (210)	Residents	Ln(T) = 0.97 Ln(X) - 1.43	31%	69%	659	130	40	90
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.95 Ln(X) - 0.51	23%	77%	95	45	10	35
TOTAL						**175**	**51**	**125**
PM PEAK								
Single Family Detached Housing (210)	Residents	T = 0.27(X) + 9.67	66%	34%	659	188	124	64
Multifamily Housing (Low-Rise) (220)	Dwelling Units	Ln(T) = 0.89 Ln(X) - 0.02	63%	37%	95	56	36	21
TOTAL						**244**	**159**	**85**

4.5 COLUMBIA HEIGHTS

Columbia Heights is a proposed residential development located in the east part of Penticton. Routes into the core area are shown in **Figure 4-5,** with trip distribution summarized in **Table 4-8**. and trip generation numbers are identified in Table 15. Traffic will be assigned to each route based on existing volumes or anticipated desire lines into the City.

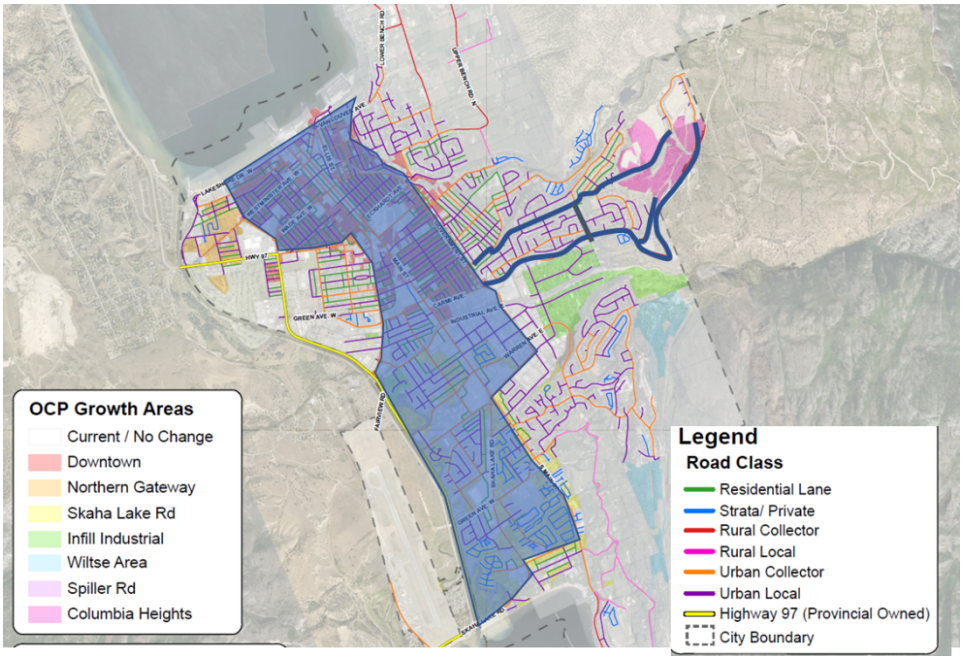


Figure 4-5 Columbia Heights Desire Lines

Table 4-8 Columbia Heights Trip Distribution

	AM		PM	
	In	Out	In	Out
At Development				
Cami Ave	68%	71%	67%	79%
Holden Street	11%	8%	9%	10%
Lawrence Street	21%	21%	24%	11%
At Government (Using Columbia Street to Balance)				
Duncan Ave at Government	51%	70%	60%	50%
Carmi Ave at Government	49%	30%	40%	50%

Table 4-9 Columbia Heights Trip Generation

COLUMBIA HEIGHTS						25 YEAR AUTO TRIPS		
Land Use	**Independent Variable**	**Rate**	**In rate**	**Out rate**	**25 Year Value**	**Total Trips**	**In**	**Out**
AM PEAK								
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.98 Ln(X) - 0.98	26%	74%	71	24	6	18
TOTAL						**24**	**6**	**18**
PM PEAK								
Multifamily Housing (Mid-Rise) (221)	Dwelling Units	Ln(T) = 0.96 Ln(X) - 0.63	61%	39%	71	32	19	12
TOTAL						**32**	**19**	**12**

4.6 INFILL INDUSTRIAL

Additional industrial development will be located around the existing industrial area. Desire lines from the new infill areas are shown in **Figure 4-6** and identified in detail in **Table 4-10**. The 2045 trip generation is summarized in **Table 4-11.**

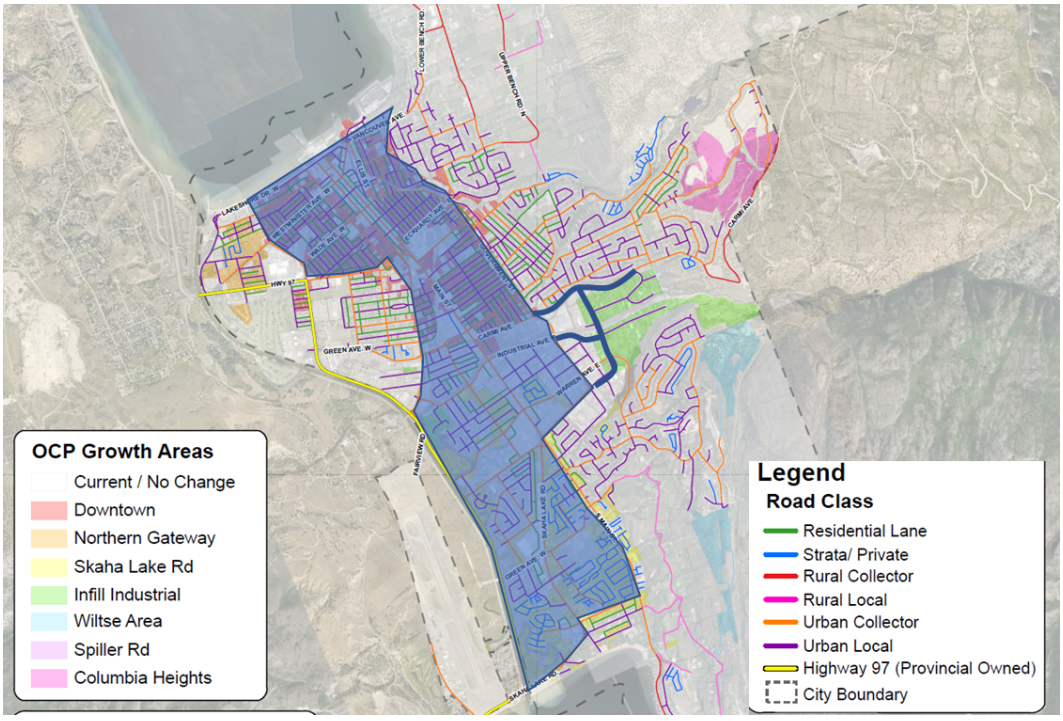


Figure 4-6 Infill Industrial Desire Lines

Table 4-10 Industrial Infill Trip Distribution

	AM		PM	
At Government	in	out	in	out
Carmi	17%	8%	14%	10%
Industrial Ave	32%	31%	25%	24%
Okanagan	4%	3%	7%	3%
Warren Ave	25%	21%	35%	26%
Dawson Road	22%	36%	20%	37%

Table 4-11 Infill Industrial Trip Generation

INFILL A - NEW TRIPS

25 YEAR AUTO TRIPS

Land Use	Independent Variable	Rate	In rate	Out rate	25 Year Value	Total Trips	In	Out
AM PEAK								
General Light Industrial (110)	1000 sqfa	Ln(T) = 0.74 Ln(X) + 0.39	88%	12%	235	84	74	10
PM PEAK								
General Light Industrial (110)	1000 sqfa	Ln(T) = 0.69 Ln(X) + 0.43	13%	87%	235	67	9	58
Infill B - new trips						**25 Year Auto Trips**		
Land Use	**Independent Variable**	**Rate**	**In rate**	**Out rate**	**25 Year Value**	**Total Trips**	**In**	**Out**
AM PEAK								
General Light Industrial (110)	1000 sqfa	Ln(T) = 0.74 Ln(X) + 0.39	88%	12%	248	87	77	10
PM PEAK								
General Light Industrial (110)	1000 sqfa	Ln(T) = 0.69 Ln(X) + 0.43	13%	87%	248	69	9	60
Infill C - new trips						**25 Year Auto Trips**		
Land Use	**Independent Variable**	**Rate**	**In rate**	**Out rate**	**25 Year Value**	**Total Trips**	**In**	**Out**
AM PEAK								
General Light Industrial (110)	1000 sqfa	Ln(T) = 0.74 Ln(X) + 0.39	88%	12%	314	104	91	12
PM PEAK								
General Light Industrial (110)	1000 sqfa	Ln(T) = 0.69 Ln(X) + 0.43	13%	87%	314	81	11	71

4.7 HIGHWAY 97

The growth rate on the intersections along Highway 97 within the study area was considered independently from the rest of the model.

To identify the background growth on Highway 97, WSP reviewed nearby BCMOTI Traffic Count Data. The nearest permanent counter to Penticton is P-26-2NS, located 7.7 km East of Kaleden Junction, south of Okanagan Falls. The average annual AADT growth rate at this location between 2009 and 2019 is 2.1%. The next nearest counter on Highway 97 is on Route 97A, 4.0 km north of the North Access to Armstrong. At this location the average annual growth rate between 2009 and 2018 is 1.9%.

A base assumption of 2% annual growth for **through traffic** on Highway 97 was used. This was only considered for traffic which WSP estimated did not enter or exit the Highway within the boundaries of the City of Penticton. To estimate the impact of this continued background growth at the turning movements for intersections along the Highway into and out of Penticton, the 2020 totals of trips turning into and out of the Penticton were totaled, grown at a rate of 2.0% per year, and then assigned to the network proportionally to the existing turning volumes in 2020.

4.8 SUMMARY

The final traffic volumes for the 5, 10, 20 and 25 year models will be developed using the above identified trip generation and distribution methodology, with manual balancing and review to identify any anomalies. Intersection analysis using Synchro 10 will be completed to identify recommended upgrades to the road network, which will then be reviewed across the other infrastructure plans while considering the public feedback, staff input and various relevant City documents such as the OCP to develop a list of projects for each horizon.

5 TRAFFIC ANALYSIS METHODOLOGY/RESULTS

Intersection analysis will be completed in using Synchro/SimTraffic 10 with the HCM 2010 Methodology. Signal warrants should be completed on stop controlled intersections using the Transportation Association of Canada (TAC) Signal Warrant methodology. Roundabouts should be analyzed using Sidra. I

Roadway threshold can typically be evaluated by looking at a number of parameters including intersection level of service, volume to capacity ratio, queuing and corridor daily volumes. For this study, WSP recommends focusing primarily on intersection volume-to-capacity (v/c) ratio. Turning queues exceeding storage lengths will also be flagged. Level of service can be used to help identify which approaches are experiencing the most significant delays, but as a tool on its own can often obscure the actual operational challenges of an intersection. Using v/c ratios provides a valuable snapshot of whether the intersection has sufficient overall capacity when considering all approaches.

For this study, WSP recommends a v/c ratio of 0.90 for the 2025 and 2030 horizon, but an acceptable v/c ratio of 0.95 for the 2040 and 2045 horizons for City intersections. This higher v/c ratio in future years allows for a little more congestion over time and recognizes the fact that as City's grow more congestion is generally acceptable so as to not focus on building automobile capacity. For Ministry intersections along Highway 97 a constant v/c ratio of 0.90 will be used since this is the Ministry's typical threshold and also reflecting the important nature of the route in moving large volumes of traffic.

APPENDIX C

TRAFFIC CALMING REVIEW

1.0 REVIEW OF STUDY AREA LOCATIONS:

The Traffic Calming review consisted of a review of known traffic calming priority locations and areas of concern throughout the City. Locations were identified based on discussions with the City. Several traffic safety and traffic calming studies were completed at locations throughout the City by Urban Systems from 2017 to 2019. Two local resident reports for Lakeside Road improvements was also shared by the City and reviewed by WSP. Speed and collision data were collected and reviewed at each location. The *Transportation Safety Policy* and Transportation Association of Canada Guideline for Traffic Calming, Second Edition (2018) was applied at each location and high-level traffic calming recommendations were identified.

Table 1 Traffic Calming Study Locations provides a summary of locations and potential traffic calming measures that were identified for review in the description of work and through discussions with the City.

TABLE 1 TRAFFIC CALMING STUDY LOCATIONS

Study Area Locations	Potential Traffic Calming Measures
Johnson Road (Upper Bench Road to Middle Bench Road)	• Measures for transition from rural to urban areas at Johnson Road and Middle Bench Road • Intersection improvement or roundabout at Alder Street
Lakeside Road (Brantford Avenue to City Limits) • S. Main Street (Skaha Lake Road, Yorkton Avenue, Lee Avenue) – Most complaints have been at Skaha, Yorkton and residential areas • Brantford Avenue • Finnerty Road • Smythe Drive – The City has done some work reviewing this location with the future proposed development • City Limits	• Speed Reduction • Narrowing of Vehicle Lanes • Widening of bike lane/shoulder area • Measures for transition from rural to urban area (in vicinity of Brantford Avenue and Smythe Drive) • Intersection improvement or roundabout at Smythe Drive
Naramata Road (City Limits to McMillan Avenue) • Randolph Road • Riddle Road • KVR Crossing • Three Mile Road • Reservoir Road • All intersections but particularly those with Wineries	• Speed Reduction • Narrowing of vehicle lanes • Widening of bike lane/shoulder area • Intersection improvement or roundabout at Naramata Road and Reservoir Road
Lower Bench Road (Bankview Road to Tupper Avenue)	• Speed Reduction • Narrowing of vehicle lanes • Widening of bike lane/shoulder area • Measures for transition from rural to urban areas • Intersection improvement or roundabout at Lower Bench Road and Tupper Avenue
Middle Bench Road (Tupper Avenue to Munson Avenue)	• Speed Reduction • Narrowing of vehicle lanes • Widening of bike lane/shoulder area • Intersection improvement or roundabout at Middle Bench Road and Tupper Avenue

Upper Bench Road (Johnson Road to McMillan Avenue)	• Speed Reduction • Narrowing of vehicle lanes • Widening of bike lane/shoulder area • Intersection improvement or roundabout at Upper Bench Road and Naramata Road

Each location was validated by completing a review of speed (85 percentile and median), volume (ADT) data, collision data, context, confirmation of roadway classification and review of traffic safety/traffic calming requests or public engagement results. Those locations that experienced an 85th percentile speed greater than 10 km/h over the speed limit and had volumes greater than 500 vehicles per day in both directions were reviewed in further detail in alignment with the *Traffic Safety Policy*. Collision data, transportation safety and traffic calming requests and public engagement results were reviewed to understand the nature of the safety issue at locations described above.

The TAC Guideline for Traffic Calming provides guidance on applying traffic calming measures based on roadway classification: neighbourhood local/collector, urban arterial and rural arterial. The City of Penticton's roadway classification system differs from TAC for certain roadways because of local context elements such as wineries. A combination of local context and roadway classification were used to identify possible traffic calming measures. Traffic calming measures described in the guideline are grouped into broad categories as follows: vertical deflection, horizontal deflection, roadway narrowing, surface treatment, pavement markings, access restriction, gateways, enforcement, education, shared space and emerging technologies and measures. Measures described in the Traffic Calming Guidelines and their applicability to the rural context where there is no curb and gutter are included in **Table 2** below. Traffic calming measures are considered based on their objectives. Although a measure may not be deemed appropriate by the guidelines for a rural road with no curb and gutter, it may still be considered using alternative materials. For example, a lateral shift may be considered using flexible delineators rather than curb and gutter.

TABLE 2 TRAFFIC CALMING MEASURES SUMMARY

Category	Measure	Suitable for Rural Road? (no curb or gutter)
Vertical Deflection	Raised Crosswalk	No
	Raised Intersection	No
	Speed Cushion	No
	Speed Hump/Table	Possible
Horizontal Deflection	Chicane (one-lane or two-lane)	No
	Curb Radius Reduction	No
	Lateral Shift	No
	Speed Kidney	No
	Traffic Circle/Traffic Button/Mini Roundabout	Yes
Roadway Narrowing	Curb Extension	No
	Lane Narrowing	No
	On-Street Parking	No
	Raised Median Island	Yes
	Road Diet	No
	Vertical Centreline Treatment	Yes
Surface Treatment	Sidewalk Extension/Textured Crosswalk	No
	Textured Pavement	No
	Transverse Rumble Strips	Yes

Pavement Markings	Converging Chevrons	Yes
	Dragon Teeth	Yes
	Full-lane Transverse Bars	Yes
	On-Road 'Sign' Pavement Markings	Yes
	Peripheral Transverse Bars	Yes
Access Restriction	Directional Closure	No
	Full Closure	No
	Intersection Channelization	Yes
	Raised Median through Intersection	Yes
	Right-in/Right-out Island	No
Gateways	A combination of traffic calming measures such as roundabouts, traffic islands, road narrowing, pavement markings, landscaping, etc. Identifies transition zones between rural areas and urban/rural residential zones, villages, or hamlets.	Yes
Enforcement	Aircraft/Drone Radar Enforcement	Yes
	Fixed Speed Enforcement	Yes
	Mobile Speed Enforcement	Yes
	Speed Watch Program	No
Education	Active and Safe Routes to School Program	No
	Pace Car Program	Possible
	Speed Display Devices	Yes
	Targeted Education Campaign	Yes
	Vehicle Activated Signs (VAS)	Yes
Shared Space	Priority for pedestrians and cyclists; Often, no pavement markings, traffic signals, signs, or barriers.	No
Emerging Technologies and Measures	LED Pavement Markings	Possible
	Optical Illusion Pavement Markings	Possible
	Rest-on-Red Signal Phasing	Possible
	Section Control	Possible
	Variable Speed Limits (VSL)	Possible

Enforcement and Education are key elements of traffic safety and should be paired with all traffic safety or traffic calming measures. Enforcement and Education measures were not reviewed in the assessment of traffic calming measures. Shared Space is most appropriate for neighbourhood local roads that shifts the priority from users to cyclists and pedestrians where they are free to cross anywhere. Shared spaces are not appropriate for the locations identified and have not been considered in further detail.

Traffic safety reports completed by Urban Systems and the local resident report for Lakeside Road was considered in the review of potential traffic calming measures.

Summary of Assessment:

A high-level review of each location was completed to determine potential traffic calming measures and is included in Appendix D. All study locations except for Johnson Road and Middle Bench Road/Alder Street and South Main Street warrant traffic calming reviews. Speed data collected at Johnson Road and Middle Bench Road/Alder Street and South Main Street indicate an 85th percentile speed within 10 km/hr of the posted speed limit. Potential traffic calming measures vary by context and location but generally include horizontal deflections, road narrowing, surface treatments, pavement marking, and emerging technology measures. Vertical deflections have noise impacts and can reduce emergency service response times which may not be desirable for residential areas. A combination of traffic calming measures to create gateways is appropriate for Johnson Road, Lakeside Road and Lower Bench Road in advance of residential areas.

Speed reductions and the narrowing of lanes to allocate space towards bike facilities requires careful consideration. Speed reduction through reduced posted speed limits needs to be considered with vehicle operating capabilities, driver capability, behaviour and comfort, mixed modes, collision history, physical characteristics of the road and roadway surrounding (e.g. urban versus rural/adjacent land uses). Speed management strategies are intended to establish operating speeds that match the context of a road using a safe systems approach. Where the operating speed does not match the context of the road, the application of strategies to reduce operating speed may be warranted. The methods cover a range of traffic safety areas such as engineering (road design), enforcement, education, and engagement. Isolated speed limit changes are unlikely to be very effective when the posted speed limit is changed but no other change to the road environment or enforcement is made.

Bike facilities should be focused on serving all ages and abilities in order to support high use of the facility. In order to achieve this, bike facilities need to have appropriate widths and may need to be separated from vehicles based on vehicle volumes and speeds. Road narrowing to provide accessible shoulders should be carefully considered based on context to ensure safety of cyclists. Significant investments may be required to widen roadways in order to provide a high-quality and safe cycling facility.

A more detailed corridor review is required for each location to create a traffic safety and traffic calming plan. The analysis completed through this study identifies possible design interventions that require further review. Although each measure was evaluated independently the application within a corridor design should include a combination of measures.

Johnson Road Between Upper Bench Road and Middle Bench Road:

FIGURE 1 JOHNSON ROAD CONTEXT

Johnson Road transitions from a rural/winery context as shown in Figure 3 to an urban subdivision context in Figure 2 and shoulders transition into sidewalk and parking on one side. Johnson Road is classified as a major collector that transitions from a rural to urban cross section with 5,000 vpd, no bike facilities or truck routes. The paved width of Johnson Road approaching Alder Street/Middle Bench Road is approximately 13.6 m. Lane widths are roughly 4.4 m assuming that on-street parking (2.4 m width) is permitted on both sides. Lane widths of 4.4 m is well above what is required for this corridor. The posted speed limit through this corridor is 50 km/h and has an 85% speed of 65.7 km/h. Speeding is a safety issue through this corridor. ICBC data indicates six collisions at Middle Bench Road and Johnson Road from 2015 – 2019. The urban context of Johnson Road includes abutting residential uses. Vertical deflections and surface treatments causing noise may not be appropriate traffic safety measures.

FIGURE 2 JOHNSON ROAD EAST OF MIDDLE BENCH ROAD – URBAN CONTEXT (GOOGLE STREET VIEW)

FIGURE 3 JOHNSON ROAD RURAL/WINERY CONTEXT (GOOGLE STREET VIEW)

FIGURE 4 JOHNSON ROAD AND ALDER STREET IMPROVEMENTS

The City of Penticton has received some concerns for the intersection of Johnson Road with Alder Street with primary concerns related to cyclist safety, limited visibility through intersection, missing sidewalks and pedestrian safety concerns. In response, the City removed fencing to improve visibility, installed a crosswalk with traffic calming and has added the missing sidewalk to the sidewalk priority list.

Other measures that could be considered to address the rural to urban transition on Johnson Road approaching Alder Street/Middle Bench Road from the east based on the TAC Traffic Calming Guidelines and context include:

- Road Narrowing measures such as lane narrowing, on-street parking, raised-median island, road diet and vertical line treatments may be applied. The application of road narrowing measures should consider design vehicles, on-street parking demand and reallocating space towards sidewalks for pedestrian use. Measures may be combined in a 'gateways' approach to support greater speed reduction.
- Pavement marking measures such as converging chevrons, dragon teeth, full-lane transverse bars, on-road 'Sign' pavement markings and peripheral transverse bars could be applied to this corridor. It is not advised to combine pavement marking measures. There is evidence to support speed reduction with converging chevrons.
- Emerging technology measures such as LED Pavement Markings may be applied through this corridor in advance of hazards. Key locations where this could be applied in advance of the curve between Johnson Road and Upper Bench Road S. and in advance of crosswalks.

Lower Bench Road:

Lower Bench Road is a minor rural collector roadway that transitions from vineyards/farms to residential uses and carries roughly 2,900 vpd. The City of Penticton's GIS network identifies Lower Bench Road as an existing standard bicycle route and not a truck route. Lower Bench road consists of roughly 2.1 m shoulders, and one lane in each direction at 3.2m with an overall ROW of 15.5m. Speed surveys entering the residential area shown in Figure 9 indicate an 85th percentile speed of 61 – 62 km/h where the posted speed limit is 50 km/h. Speeding is an issue through this corridor. ICBC data indicates that collisions are driven largely by accessing driveways. No collisions were identified at Lower Bench Road and Tupper Avenue.

FIGURE 5 LOWER BENCH ROAD TRANSITION (GOOGLE STREET VIEW)

Traffic calming measures that may be applied on Lower Bench Road should be targeted on reducing speeds and giving the driver an indication of a changing context. Vertical deflections may not be appropriate for this area given the noise it creates. Access Restrictions are best applied where there are shortcutting issues or to reduce conflicts and have not been considered for this corridor. Potential traffic calming measures are identified below:

- Horizontal Deflection: lateral shifts are typically applied on urban cross sections but could be trialed through temporary materials on a rural cross section. Careful design consideration will be required to provide space for bicycles.
- Road Narrowing: A raised median island or vertical line treatment could be applied before entering the residential area to indicate a change in environment. If road width permits, this treatment could be combined with a lateral shift and form a 'gateway' affect.
- Pavement Markings: converging chevrons, dragon teeth, full-lane transverse bars or peripheral transverse bars are appropriate for Lower Bench Road.

FIGURE 6 LOWER BENCH ROAD AND TUPPER AVENUE (GOOGLE STREET VIEW)

FIGURE 7 LOWER BENCH ROAD AND TUPPER AVENUE AERIAL (GOOGLE STREET VIEW)

The intersection of Lower Bench Road and Tupper Avenue is stop controlled on the north leg. Traffic analysis is required to confirm the level of service for this intersection and to inform geometric design. Possible treatments that could be applied at this location include: roundabout, curve radius adjustment, and LED Pavement Markings. This intersection could be complimented with advance warning signage and advisory speed reduction through the curve.

Middle Bench Road:

Middle Bench Road is a minor rural collector roadway that carries approximately 2,700 veh/day. Middle Bench Road is identified as a proposed bicycle route and has a posted speed limit of 50 km/h. Middle Bench Road passes through largely vineyard lands and provides access to the recreational area, Munson Mountain. Speed survey conducted between Munson Avenue and Tupper Avenue indicated an 85th percentile speed of between 65-70 km/h. Speeding is an issue through this corridor. ICBC data indicated that most historic collisions occurred near the Uplands Elementary School where the City recently completed traffic calming improvements.

FIGURE 8 MIDDLE BENCH ROAD AND TUPPER AVENUE (GOOGLE STREET VIEW)

Traffic safety measures applied through this corridor should primarily be applied to reduce speed.

FIGURE 9 MUNSON AVENUE/MIDDLE BENCH ROAD N AND MUNSON MOUNTAIN ROAD (GOOGLE STREET VIEW)

Naramata Road:

Naramata Road is designated a major rural collector roadway with posted speed limit of 60 km/h between the north City limit and Evans Avenue where it transitions to 50 km/h and carries between 5,000 and 5,500 veh/day. Naramata's cross section varies but generally has narrow 1.0 m wide shoulders and 3.5 m wide lanes in each direction. Naramata Road is identified for a proposed bicycle route and traverses through vineyards and agricultural lands. There are several important crossings on Naramata Road that include: Three Mile Road which provides access to Three Mile Beach, Riddle Road which provides access to the Three Blind Mice recreational area, and the Kettle Valley Railway (KVR) bicycle crossing. Naramata Road's 85th percentile speed ranged from 62 – 67 km/h north of Randolph Road to 76 km/h north of the KVR crossing.

In addition to specific crossings of Naramata Road there are three key considerations:

- Speed Reduction;
- Narrowing of vehicle lanes; and
- Widening of bike lane/shoulder area.

Speed reduction through reduced posted speed limits needs to be considered with vehicle operating capabilities, driver capability, behaviour and comfort, mixed modes, collision history, physical characteristics of the road and roadway surrounding (e.g. urban versus rural/adjacent land uses). Speed management strategies are intended to establish operating speeds that match the context of a road using a safe systems approach. Where the operating speed does not match the context of the road, the application of strategies to reduce operating speed may be warranted.

The methods cover a range of traffic safety areas such as engineering (road design), enforcement, education, and engagement. Isolated speed limit changes are unlikely to be very effective when the posted speed limit is changed but no other change to the road environment or enforcement is made[1]. Naramata road provides access to several wineries and connecting roadways. ICBC data indicates casualty collisions at Three Mile Road and Randolph Road. Other casualty collisions seem to be result of intoxication, wildlife (deer) or lost of control due to poor weather conditions.

Property damage incidents appear to be a result of wildlife and reversing out of driveways. Given the number of accesses and future provision of cycle facilities, isolated speed reductions may be warranted but should be combined with changes to the road environment, enforcement, education and engagement.

Narrowing of vehicle lanes and widening of bike lane/shoulder area may be considered together. As a rural collector roadway with no truck route, the width of lanes should consider design vehicles such as passenger cars, medium single-unit trucks and tractor semi trailers. Naramata road's design hour directional volume (peak hour) is greater than 450. TAC recommends a lower limit of 3.5 m and a practical lower limit of 3.0 m for through lane widths of rural roadways with design hour directional volume > 450[2].

Given that Naramata Road serves several wineries who may be visited by wine tours in buses and be served by tractor trailers, a lower limit width of 3.3 m could be acceptable. The BC MOTI Active Transportation Guidelines recommends a 1.8 m wide shoulder for roads posted 50 km/hr or less and 5,000 or less vehicles per day. The guidelines also recommend a width of 2.5 m for roads with posted speeds of 70km/hr or less.

To support a bicycle accessible shoulder, lane widths would need to be reduced to 3.3 m and shoulders would need to be widened to 1.8 m preferred. To support a high-quality, safe active transportation facility, widening may be required in some sections.

[1] TAC GDG (2017), Section 2.3.4.6, Chapter 2 – Design Controls, Classification and Consistency

[2] TAC GDG (2017) – Table 4.2.2, page 9, Chapter 4 – Cross Sectional Elements

FIGURE 10 NARAMATA ROAD 100 M NORTH OF RANDOLPH ROAD (GOOGLE STREET VIEW)

There is a higher frequency of collisions at Naramata Road and Randolph Road. Sightlines are obstructed exiting Randolph Road because of road side landscaping and grades. A combination of tree removal on the NE corner as shown in Figure 15 and geometric improvements is warranted. An in-service road safety review is recommended at this location.

FIGURE 11 TREE REMOVAL AT RANDOLPH ROAD (GOOGLE STREET VIEW)

FIGURE 12 NARAMATA ROAD APPROACHING KVR CROSSING FROM NORTH (GOOGLE STREET VIEW)

FIGURE 13 NARAMATA ROAD AND KVR CROSSING (GOOGLE STREET VIEW)

The KVR crossing on Naramata road is an important connection for cyclists. Speed reports 150 m north of the KVR crossing indicate an 85th percentile speed of 75 km/h (15 km/h above the posted speed limit). Although there have been no casualty or property damage collision reports at this location, enhancements to the crossing can be made to improve safety for vulnerable users. A combination of traffic calming measures that may include lateral shift, curb extension, raised median island, vertical centre line treatment, textured crosswalk and transverse rumble strips would support an enhanced crossing and speed reduction. The stopping distance for a design speed of 70 km/h is between 105 – 110 m depending on the grade. Enforcement may be recommended approaching the crossing to support compliance and ensure that drivers stop ahead of the crossing.

FIGURE 14 NARAMATA ROAD AND THREE MILE ROAD (GOOGLE STREET VIEW)

Sightlines at Naramata Road and Three Mile Road are limited because of grade, skew of intersection and vegetation. Urban Systems completed a safety review of this intersection in 2017 and recommended that no changes be made to the stop control. The report found that curve and intersection realignment including property acquisition, utility pole relocation and significant cut/fill would have a low benefit to cost ratio. Instead, the report recommended to trim vegetation to improve intersection sightlines and signage visibility and consider providing vehicle activated curve for speed display sign. Based on a high-level review of this intersection and updated collision data, the recommendations by Urban Systems still apply.

FIGURE 15 NARAMATA ROAD AND RESERVOIR ROAD (GOOGLE STREET VIEW)

Naramata Road and Reservoir Road is a skewed intersection. Four collisions including 1 casualty has occurred at the intersections of McMillan Avenue, Reservoir Road and Naramata Road between 2015 and 2019. Although the collision rate is less than 2 per year, the presence of a casualty warrants further review. As no existing data on speeds or volumes are available, this location warrants an in-service road safety evaluation.

FIGURE 16 NARAMATA ROAD AND RIDDLE ROAD (GOOGLE STREET VIEW)

Naramata Road and Riddle Road is a skewed intersection with grade, signage and utility poles that limits sightlines as drivers exit Riddle Road. Only one collision has occurred at this location from 2015 to 2019. While geometric improvements can improve the intersection, costs may outweigh the benefits. This location should continue to be monitored.

Upper Bench Road:

Upper Bench Road is classified as a Major Rural Collector, carries 5,000 veh/day and has a posted speed limit of 50 km/h. Upper Bench Road connects Johnson Road and McMillian Avenue providing access to agricultural uses including wineries, farms, green houses and pet resorts. No trucks, existing or proposed bike routes are identified for Upper Bench Road. Upper Bench Road is an undivided roadway consisting of 0.7 – 1.0 m shoulders and 3.6 m lanes in either direction. The 85th percentile speed 320 m north of Hillside Avenue is 69 km/h, 19 km/h over the posted speed limit.

ICBC data indicates several collisions throughout the corridor from 2015 – 2019 consisting of casualties and property damage. Most collisions (4) occurred at S Upper Bench Road and Johnson Road, two of four were casualties and two casualties were reported at McMillan Avenue and N Upper Bench Road. The intersection of McMillan Avenue and Upper Bench Road warrant further review.

Traffic calming measures that may be applied on Upper Bench Road should be targeted on reducing speeds. Access Restrictions are best applied where there are shortcutting issues or to reduce conflicts and have not been considered for this corridor. Potential traffic calming measures are identified below:

Horizontal Deflection: lateral shifts are typically applied on urban cross sections but could be trialed through temporary materials on a rural cross section. Careful design consideration will be required to provide space for bicycles.

Pavement Markings: converging chevrons, dragon teeth, full-lane transverse bars or peripheral transverse bars are appropriate for Lower Bench Road.

Education and enforcement strategies are an important consideration for this corridor as there are limited visual cues that can be added to significantly reduce vehicle speeds. Elements such as speed display devices, vehicle activated speed signs and periodic speed enforcement may support reduced speeds.

FIGURE 17 UPPER BENCH ROAD 320M NORTH OF HILLSIDE AVENUE (GOOGLE STREET VIEW)

APPENDIX D

TRAFFIC CALMING TABLE

										Traffic Calming Measure																																	
										Vertical Deflection	Horizontal Deflection						Road Narrowing						Surface Treatment			Pavement Markings					Access Restriction						Gateways	Emerging Technologies					
Location	Year	ADT	85th Percentile Speed (km/hr)	Posted Speed Limit	Penticton Roadway Classification	TAC Equivalent Classification (GDG)	ICBC Collisions 2014-2018	Transportation Safety and Traffic Calming Requests	Traffic Calming Warranted ?	Vertical Deflection	Chicane (One-Lane)	Chicane (Two-lane)	Curb Radius Reduction	Lateral Shift	Speed Kidney	Traffic Circle/Traffic Button/Mini Roundabout	Curb Extension /Neckdown/Choker	Lane Narrowing	On-Street Parking	Raised Median Island	Road Diet	Vertical Centreline Treatment	Sidewalk Extension /Textured Crosswalk	Textured pavement	Transverse Rumble Strips	Converging Chevrons	Dragon Teeth	Full-lane Transverse Bars	On-Road 'Sign' Pavement Markings	Peripheral transverse Bars	Directional Closure	Diverter	Full Closure	Intersection Channelization	Raised Median through Intersection	Right-in/right-out island	Gateways	Led Pavement Marking	Optical Illusion Pavement Markings	Rest-on-Red Singal Phasing	Section Control	Variable Speed Limits (VSL)
Johnson Rd between Upper Bench Rd and Middle Bench Rd	2020	5371	66	50	Major Rural/Urban Collector	Rural Collector or Arterial	<8	No	Yes	Possible	X	X	X	x	X	X	x	Possible	Possible	Possible	Possible	Possible	x	x	X	Possible	Possible	Possible	Possible	Possible	x	x	x	x	x	x	Possible	Possible	x	x	x	x
Johnson Road and Middle Bench Road (through intersection)	2018	6902	48	50	Major Urban Collector	Urban Collector	<8	Yes	No	X	X	X	X	x	X	Possible	Possible	Possible	Possible	Possible	Possible	Possible	x	x	X	Possible	Possible	Possible	Possible	Possible	x	x	x	x	x	x	Possible	Possible	x	x	x	x
Lakeside Rd @ City Limits	2015	3421	71	70	Major Rural Collector	Rural Collector	<8	No	Yes	X	x	x	x	x	x	x	x	Possible	x	x	x	x	x	x	x	Possible	Possible	Possible	Possible	Possible	x	x	x	x	x	x	x	Possible	x	x	x	x
Lakeside Road @ Finnerty Road	2017	5437	58	50	Major Rural Collector	Rural Collector	<8	Yes	Yes	x	x	x	Possible	x	x	Possible	Possible	X	x	Possible	x	Possible	Possible	x	x	x	x	x	Possible	x	x	x	x	x	x	x	Possible	x	Possible	x	x	x
Lakeside Rd 100m south of Smythe Dr	2020	4000	72	50	Major Rural Collector	Rural Collector or Arterial	<8	Yes	Yes	X	X	X	Possible	Possible	X	Possible	Possible	Possible	x	Possible	x	Possible	Possible	x	Possible	Possible	Possible	Possible	Possible	Possible	x	x	x	x	x	x	Possible	Possible	Possible	x	x	x
S. Main Street (Lakeside Rd) 200m south of Lee Ave	2020	6077	59	50	Major Urban Collector	Urban Collector	<8	Yes	Yes	X	x	x	X	Possible	X	X	Possible	Possible	Possible	Possible	Possible	Possible	Possible	x	X	x	x	x	x	Possible	x	x	x	x	x	x	Possible	x	Possible	x	x	x
South Main Street	2014	6237	61	50	Major Urban Collector	Urban Collector	26-50 at Green Ave W	Yes	Yes - corridor study	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lower Bench Rd 10m north of 99 Lower Bench Rd	2020	2896	62	50	Minor Rural Collector	Rural Collector or Arterial	<8	No	Yes	Possible	X	X	X	Possible	X	X	x	x	x	Possible	x	Possible	x	x	x	Possible	Possible	Possible	x	Possible	x	x	x	x	x	x	Possible	x	x	x	X	x
Middle Bench Rd between Munson Ave and Tupper Ave	2020	2710	67	50	Minor Rural Collector	Rural Collector or Arterial	<8	Yes	Yes	X	X	X	X	Possible	X	X	X	x	x	Possible	x	Possible	x	x	x	Possible	x	Possible	Possible	Possible	x	x	x	x	x	x	x	Possible	x	x	X	x
Naramata Rd 100m north of Randolph Rd	2020	5570.5	68	50	Major Rural Collector	Rural Collector or Arterial	<8	No	Yes	X	X	X	Possible	X	X	X	x	x	x	x	x	Possible	x	x	x	Possible	x	Possible	x	Possible	x	x	x	x	x	x	x	Possible	x	x	Possible	x
Naramata Rd 150m north of KVR crossing	2020	5044.5	76	60	Major Rural Collector	Rural Collector or Arterial	<8	Yes	Yes	X	X	X	X	Possible	X	X	Possible	x	x	Possible	x	Possible	Possible	x	Possible	Possible	x	Possible	Possible	Possible	x	x	x	x	x	x	x	Possible	Possible	x	Possible	x
Upper Bench Rd 320m north of Hillside Ave	2020	5027	69	50	Major Rural Collector	Rural Collector or Arterial	<8	Yes	Yes	X	X	X	X	x	X	X	x	x	x	Possible	x	Possible	x	x	x	Possible	x	Possible	x	Possible	x	x	x	x	x	x	x	x	x	x	Possible	x

Location	Direction 1 Avg	Direction 2 Avg	Sum
Johnson Rd between Upper Bench Rd and Middle Bench Rd	2656.5	2714.5	5371
Lakeside Rd 100m south of Smythe Dr	2007	1993	4000
Lakeside Rd 200m south of Lee Ave	3061.5	3015.5	6077
Lower Bench Rd 10m north of 99 Lower Bench Rd	1468	1428	2896
Middle Bench Rd between Munson Ave and Tupper Ave	1376.5	1333.5	2710
Naramatta Rd 100m north of Randolph Rd	2785.5	2785	5570.5
Naramatta Rd 150m north of KVR crossing	2522	2522.5	5044.5
Upper Bench Rd 320m north of Hillside Ave	2481.5	2545.5	5027

APPENDIX E

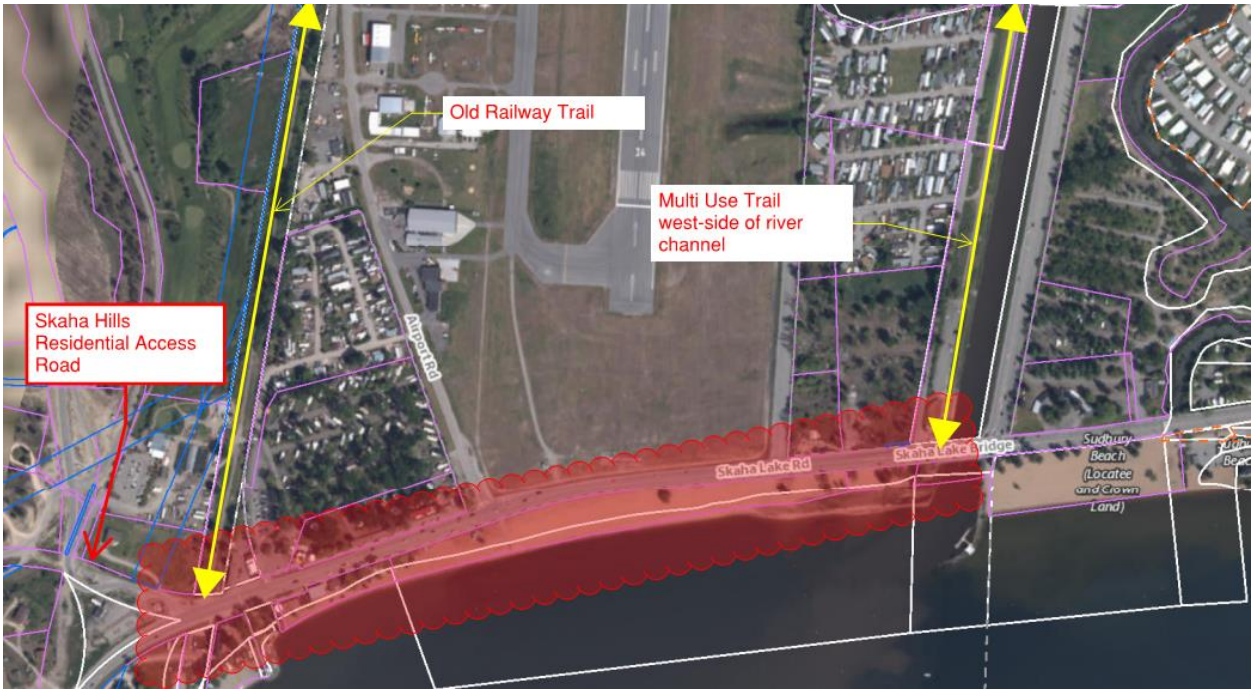
SKAHA LAKE ROAD

Skaha Lake Road Feasibility of Cycling Infrastructure

Introduction:

The City of Penticton has identified the provision of a cycling facility on Highway 97 between the Channel Parkway and the Skaha Hills residential development access road (Figure 1) to support the connection of the proposed 'Lake to Lake' bike route to the existing multi-use trail along the west side of the river channel, the existing old railway trail at Wrights Beach Camp, and the growing residential development on Skaha Hills Drive / Penticton Oliver Highway.

Figure 1 Study Area



The City is interested in exploring technical solutions that would allow for the construction of connecting bicycle infrastructure within the existing highway corridor and including if necessary, an expansion of the corridor to provide the required width.

WSP completed a review of past corridor studies, traffic counts, site visit and a review of current standards to develop cycling facility options along the corridor. Three different bike facility options were considered along the corridor including Multi-Use Pathway, Uni-Directional Bike Lanes on both sides and Bi-Directional Bike Lanes. 4 lane configurations at 60 km/hr posted speed and addition of bike facility requires property acquisition and ROW widening in all three options. 3 lane configurations with centre-turning lane and 50 km/hr posted speed enables the addition of a bike facility within existing right-of-way but would result in reduced traffic capacity on Skaha Lake Road between Airport Road and Channel Parkway. Significant consultation with BC Ministry of Transportation and Infrastructure will be required to confirm design options.

Context:

Highway 97 transitions into Skaha Lake Road from west to east as it enters the City of Penticton urban area. Highway 97 is owned and operated by the B.C Ministry of Transportation and Infrastructure (MOTI) and is a major truck route through Penticton. Highway 97 from the Channel Parkway to Skaha Hills Access Road is bounded by PIB Locatee owned land to the south and Transport Canada (Penticton Regional Airport) to the north.

Highway 97 is classified as arterial road with a 60 km/hr posted speed limit in the City of Penticton's Official Community plan, has a roughly 20 m right-of-way, and is currently a 4-lane highway with 3.7 m lanes and shoulder widths varying from 1.1 m to 2.0 m. The paved right-of-way is most constrained at a point approximately 100 m east of Skaha Hills access road at 17.5 m width over the bridge. A 1.2 m sidewalk is provided on the north side of Highway 97 between the Channel Parkway Trail and the Sun Leisure Mobile Parkway. Highway 97 generally aligns with a rural undivided arterial classification except for short sections where there is curb and gutter. The cross section aligns with Figure 440.B Typical Section Rural Arterial in the BC Supplement to TAC Geometric Design Guide[1].

Constraints:

Highway 97 from the Channel Parkway to the Skaha Hills residential development access road is constrained to a roughly 20 m ROW. The ROW is further constrained to a width of 17.5 m east of Lakeside Villa Inn & Suites over a bridge as shown in Figure 2.

Figure 2 17.5 m Constrained ROW – Source: Google Street View

The corridor is limited on the north-side by fencing from Channel Parkway to Airport Road (Figure 3) and on the south-side by fencing from Channel Parkway to Wright's Beach Camp. Utility poles are located outside of the road ROW from Airport Road continuing west to the Skaha Hills access road. Property owners north and south of the corridor include Transportation Canada and PIB Locatee (First Nations) which restrict opportunities to acquire property to expand the facility to support bicycle infrastructure.

[1] BC Ministry of Transportation and Infrastructure, Supplement to TAC Geometric Design Guide for Canadian Roads (2019), 440-2.

Figure 3 Skaha Lake Road Looking West

Traffic Volumes:

Traffic counts completed in 2019 indicate an ADT of roughly 17,000 vehicles per day west of the Highway 97 and Skaha Lake Road intersection. An ADT of 17,000 vehicles per day suggests that a lane reduction from four to three lanes could be supported with signal optimization at intersections. However, traffic volumes are expected to grow on Highway 97 as the Skaha Hills residential area continues to develop. When complete, the resort-style Skaha Hills residential development will comprise seven neighbourhoods on 550 acres of land north of Skaha Lake Road and host an extensive network of hiking and cycle trails. As of the time of this report (2020), the first three neighbourhoods: The Views, The Vista's and The Ridge were being sold with the next neighbourhood "The Bench" available for registration.

WSP completed a review of previous studies including Skaha Lake Road Diet Review[2] and Skaha Lake Road Traffic Study[3]. The Skaha Lake Road Diet Review recommended that Skaha Lake Road be reduced from a 4 to 3 lane cross section with a two-way centre left turn lane where it connects to South Beach Drive, east of the Channel Parkway. This recommendation was based on 2012 projected volumes to 2022 and intersection evaluations at Highway 97/Skaha Lake Road and Yorkton Avenue/Skaha Lake Road. The review was limited to the study area of Skaha Lake Road from Yorkton Avenue to Highway 97 and did not test any modifications to the Skaha Lake Road and Highway 97 intersection. The Highway 97 and Skaha Lake Road intersection continued to perform well with a PM level of service (LOS) C in all

[2] Urban Systems Ltd., Skaha Lake Road Diet Review (2012)
[3] Urban Systems Ltd., Skaha Lake Road Traffic Study (2009)

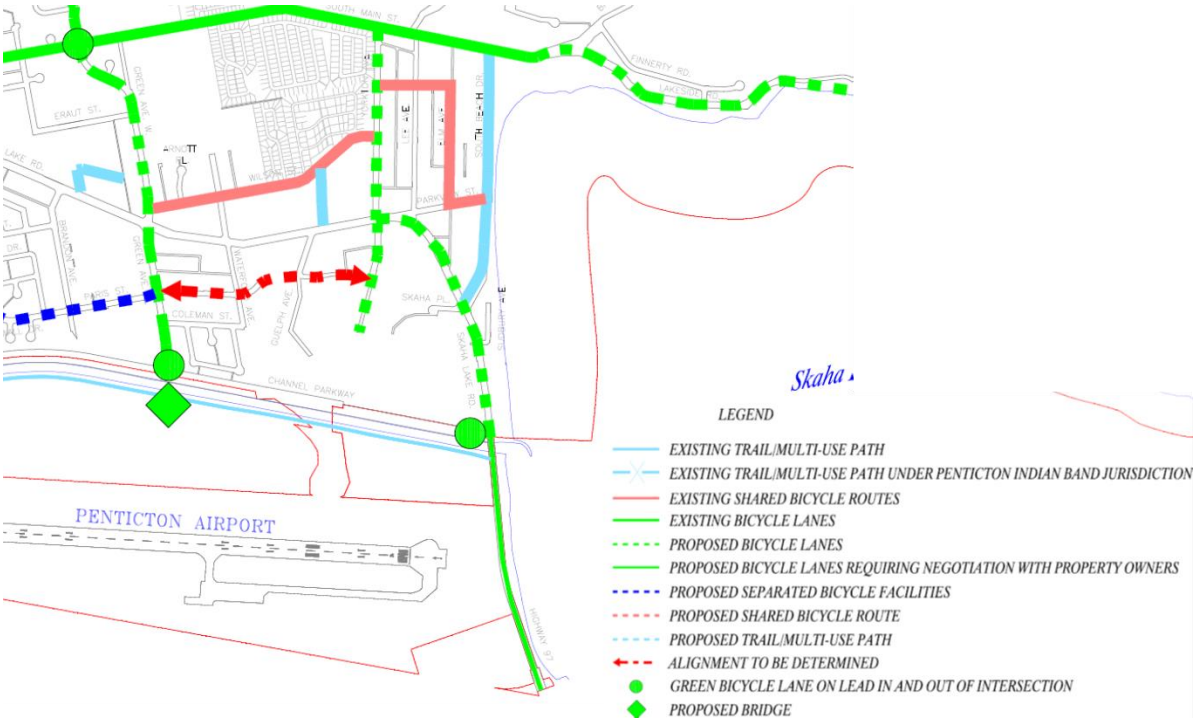
directions with the exception of southbound right with an LOS A. 2012 Traffic Volumes were not included with the report.

The Skaha Lake Road Traffic Study identified that BC MOTI's main objective for Highway 97 was to maintain mobility and that any modifications to Skaha Lake Road should prevent congestion or interferences on the highway. Traffic analysis would be required to demonstrate that there are no significant impacts to capacity with lane reduction. The Skaha Lake Road Traffic Study report did not include any development assumptions for Skaha Hills Residential Development Area.

Bicycle Infrastructure:

The 2012 City of Penticton Cycling Plan identifies the provision of bike lanes on Skaha Lake Road/Highway 97 from Yorkton Avenue continuing west with proposed bike lanes requiring negotiation of property owners on Highway 97 as shown in Figure 2.

Figure 3 Trails and Cycling Network [4]



The 2019 British Columbia Active Transportation Guide recommends either a Protected Bicycle Lane or Multi-Use Pathway for volumes greater than 4,000 vehicles per day and motor vehicle speed over 50 km/hr[5] in Urban/Suburban/Developed Rural Core Contexts. Protected bike lanes may include either unidirectional lanes or a bi-directional lane.

[4] City of Penticton, Trails and Cycling Network (2016)

[5] BC Ministry of Transportation and Infrastructure, British Columbia Active Transportation Design Guide (2019), 132

Multi-Use Pathways (MUP):

"Multi-use pathways are off-street pathways that are physically separated from motor vehicle traffic and can be used by any non-motorized user. This includes people walking, cycling, and using other forms of active transportation such as skateboarding, kick scootering, and in-line skating"[6]. MUPs accommodate bi-directional travel for all users and are appropriate parallel to an adjacent roadway or highway and are most appropriate when unbroken by frequent driveways and alleyways[7].

Standard requirements for MUPs on provincial highways is guided by section F of the British Columbia Active Transportation Guide. Standard requirements for multi-use pathways or off-street roadside pathways are as follows for Highway 97 (Table F-27)[8]:

- Off-street pathway width: 3.0 to 4.0 m (2.0 m if constrained)
- Lane Width: 3.6 m
- Shoulder Width: 1.5 – 2.0 m
- Clear Zone: Required in rural contexts, however, Highway 97 does not currently include a clear zone with fencing and curbs in short sections
- Standard Concrete Roadside Barrier: minimum width from the edge of barrier to the outside edge of pavement is 3.5 for two-way bicycle traffic and 2.5 m for one-way bicycle traffic.
- Offset between the off-street pathway and the back of the roadside barrier: greater of the Barrier Deflection Distance or the minimum horizontal clearance between cyclists and the vertical obstruction (0.5 metre for objects >0.75 metres in height)

Figure F-67[9] illustrates a typical MUP configuration in a constrained area:

[6] BC Ministry of Transportation and Infrastructure, British Columbia Active Transportation Design Guide (2019), E-10

[7] See note 5

[8] BC Ministry of Transportation and Infrastructure , British Columbia Active Transportation Design Guide (2019), F-11

[9] BC Ministry of Transportation and Infrastructure, British Columbia Active Transportation Design Guide (2019), F-13

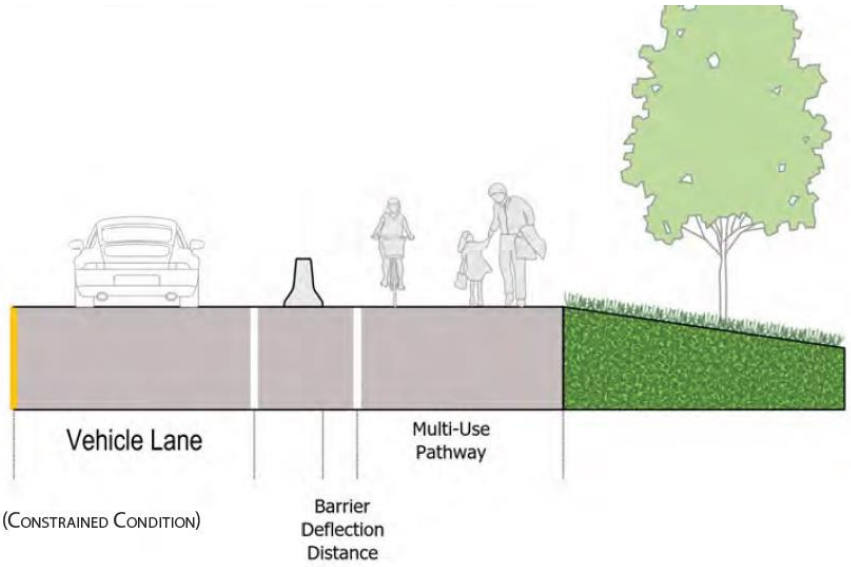


FIGURE F-67 // PROTECTED MULTI-USE PATHWAY (CONSTRAINED CONDITION)

Protected Bike Lanes:

Protected bicycle lanes are dedicated facilities for the exclusive use of people cycling and using other active modes (such as in-line skating, using kick scooters, and skateboarding, where permitted through local and regional government bylaws). Protected bicycle lanes are physically separated from motor vehicles and pedestrians by vertical and/or horizontal elements[10]. Protected bicycle lanes can be either bi-directional or uni-directional as described in the Active Transportation Guide:

[10] BC Ministry of Transportation and Infrastructure, British Columbia Active Transportation Design Guide (2019), D-30

Figure 4 Unidirectional Protected Bike Lane[11]

Figure 5 Bidirectional Protected Bike Lane

Figure 6 Uni-directional Protected Bike Lane Cross Section[12]

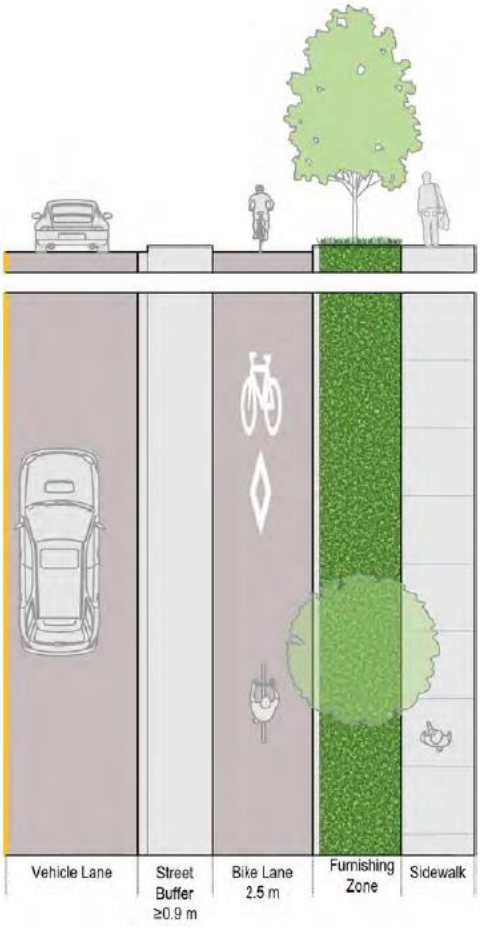


FIGURE D-38 // UNI-DIRECTIONAL PROTECTED BICYCLE LANE CROSS-SECTION -NO ON-STREET PARKING (DESIRED WIDTH)

Figure 7 Bi-directional Protected Bike Lane Cross Section[13]

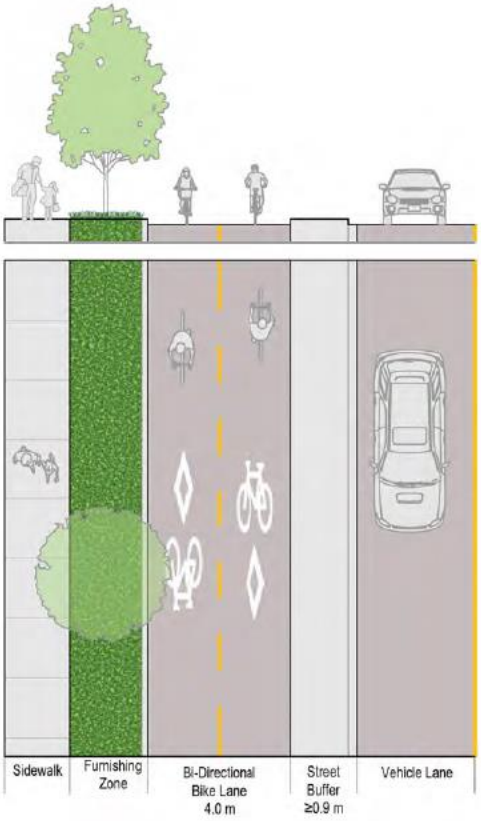


FIGURE D-40 // BI-DIRECTIONAL PROTECTED BICYCLE LANE CROSS-SECTION - NO ON-STREET PARKING (DESIRED WIDTH)

Standard requirements for protected bike lanes are described in Section D.3. of the British Columbia Active Transportation Guide (2019). The BC Supplement to TAC Geometric Design Guide (2019) does not currently provided guidance of protected bicycle lanes on provincial highways. Standard requirements based on section D.3 and F.1 of the British Columbia Active Transportation Guide (2019) are as follows:

- Uni-Directional Bicycle Through Zone: 2.5 m (1.8 m if constrained)
- Bi-Directional Bicycle Through Zone: 4.0 m (3.0 m if constrained)
- Lane Width: 3.6 m
- Shoulder Width: 1.5 – 2.0 m
- Street Buffer: Greater than or equal to 0.9 m (0.6 m if constrained)
- Offset between the off-street pathway and the back of the roadside barrier: greater of the Barrier Deflection Distance or the minimum horizontal clearance between cyclists and the vertical obstruction (0.5 metre for objects >0.75 metres in height)

High-Level Option Assessment:

A bike facility on the Highway 97 corridor is in alignment with the City's bike network plan and would support active transportation access for residents of the Skaha Hills Development. Bike facility selection must consider motor vehicle volumes, speeds, and accessibility for all ages and abilities. Other considerations associated with facility selection include access to destinations, network connectivity, conflict points, intersection operations and road right-of-way impacts.

Property ownership north and south of the corridor by Transport Canada and PIB Locattee (First Nations) limit opportunities for property acquisition to support an expanded corridor with bicycle infrastructure. To support short-term implementation of bicycle infrastructure and reduce negotiation with adjacent property owners, options are evaluated based on reconfiguring Highway 97 existing ROW.

Cross section options include design elements at 60 km/hr and 50 km/hr at four and three lane configurations for a minimum 20 m ROW urban cross section[14] and 17.5 m ROW at constrained locations. A three-lane configuration at 60 km/hr does not align with the City of Penticton's policy on road diets.

[11] BC Ministry of Transportation and Infrastructure, British Columbia Active Transportation Design Guide (2019), D-46

[12] BC Ministry of Transportation and Infrastructure, British Columbia Active Transportation Design Guide (2019), D-35

[13] BC Ministry of Transportation and Infrastructure, British Columbia Active Transportation Design Guide (2019), D-36

[14] BC Ministry of Transportation and Infrastructure, Supplement to TAC Geometric Design Guide for Canadian Roads (2019), 450-1.

Three options were considered with three different bike facilities and evaluated based on fit within existing ROW:

Table 1 Option Evaluation within Existing ROW assuming Urban Cross Section

	Option A: Multi-Use Pathway	Option B: Uni-Directional Bike Lanes	Option C : Bi-Directional Bike Lane
60 km/hr with 4 lanes & Standard Dimensions	Not Possible	Not Possible	Not Possible
50 km/hr with 4 lanes & Standard Dimensions	Not Possible	Not Possible	Not Possible
50 km/hr with 3 lanes & reduced lane widths	Possible	Possible	Possible
50 km/hr with 4 lanes & Constrained Dimensions	Possible	Possible	Possible

Any reductions in posted speed limits and modifications to cross section elements will require significant consultation with MOTI. Cross section elements that vary between 60 and 50 km/hr include lane widths that may be reduced from 3.6 m to 3.4 m. The TAC Geometric Design Guidelines for Canada Roads[15], permits lane reductions up to 3.3 m for lanes for urban roads with high amounts of bus and trucks but a lane reduction to this extent may not be supported by MOTI. Traffic analysis completed on Skaha Lake Road confirmed that a 4 lane configuration is required from Highway 97/Channel Parkway to Airport Road. A reduction of 4 to 3 lanes would result in reduced capacity and should be evaluated in greater detail in the context of future growth and intersection operations and in consultation with MOTI.

Highway 97 has two main roadway connections on the north side including Airport Road and the Skaha Hills Residential Development access road and five other minor access roads and driveways. The southside of Highway 97 includes five minor accesses and driveways to residences and the Wright's Beach Camp. Multi-use pathway and bi-directional bike lane can be assumed on either the north or south side. A south side alignment reduces the number of conflicts with accesses and driveways and provides a more scenic route but requires careful design to cross Highway 97 to connect with the MUP on the Channel Parkway and the Railway Trail at Wright's Beach Camp. Alignment on the north side facilitates better connections to MUP's but introduces a greater number of conflicts with roadways and accesses and restricts access to the Skaha Lake Beach. A more detailed evaluation should be completed to determine the appropriate alignment. A summary of high-level pros and cons of each bike facility is provided below:

Option A: Multi-Use Pathway

Figure 8 illustrates a 4-lane standard cross section at posted speed of 60 km/hr with MUP on the south side of Highway 97. Figure 9 illustrates a 3-lane cross section with reduced lane widths at posted speed of 50 km/hr and MUP on south side of Highway 97. Although the MUP alignment has been shown on the south-side it can be moved to the north-side of Highway 97 without significantly changing the cross-

[15] Transportation Association of Canada, "Chapter 4 – Cross Section Elements", Geometric Design Guide for Canadian Roads (2017), 9

section. A third option shown in Figure 10 includes a 4-lane cross section with constrained dimensions on a ROW of 19.8 m.

Pros: A multi-use pathway has the benefit of facilitating movement of both cyclists and pedestrians from the Channel Parkway to the Skaha Hills Residential Development. MOTI has applied MUP adjacent to provincial highways in the past which may suggest support.

Cons: A MUP on one-side permits access to destinations on only on-side of the Highway. A MUP on one side poses a challenge to connectivity further east on Skaha Lake Road if the City pursues uni-directional bike lanes in the future as per the Bike Network Plan (2012). A multi-use pathway in four-lane configuration at 60 km/hr or 50 km/hr cannot be achieved with standard dimensions within existing ROW. Property acquisition and widening is required to support a multi-use pathway or constrained dimensions must be applied on multiple elements.

Figure 8 60 km/hr Standard MUP with 4 lanes

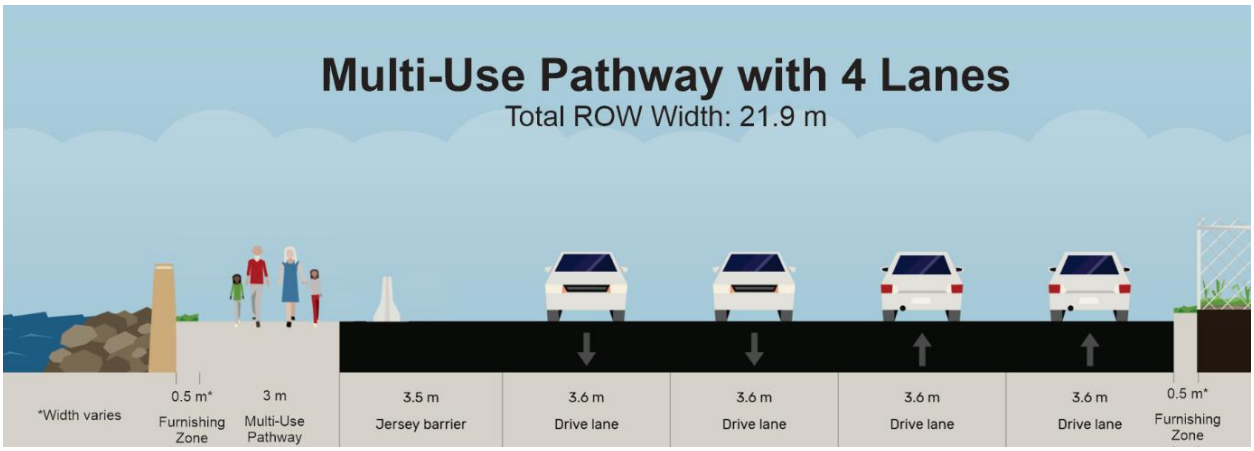


Figure 9 50 km/hr MUP with 3 lanes

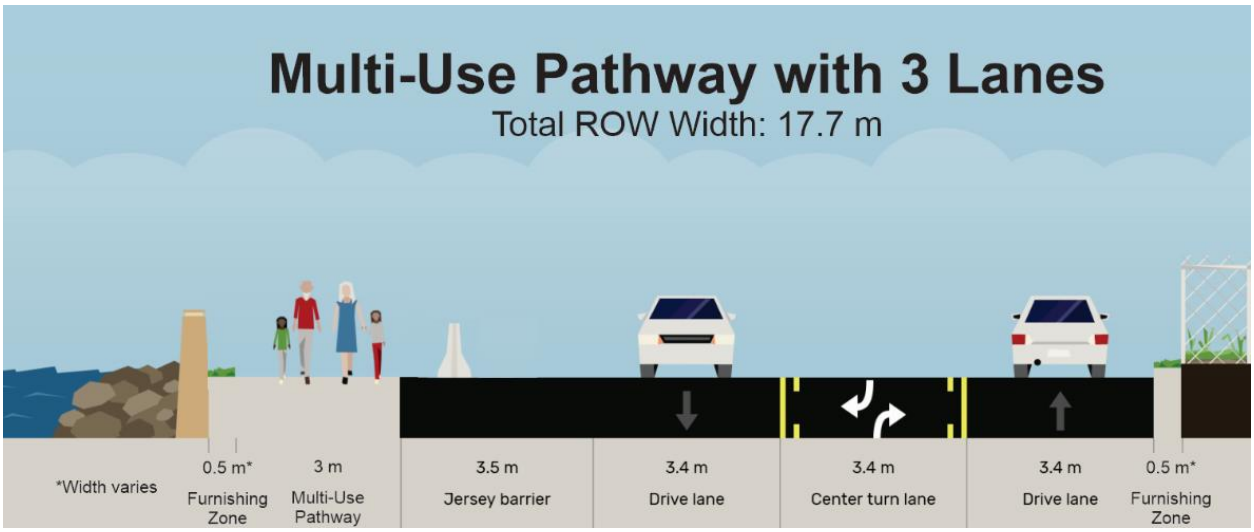
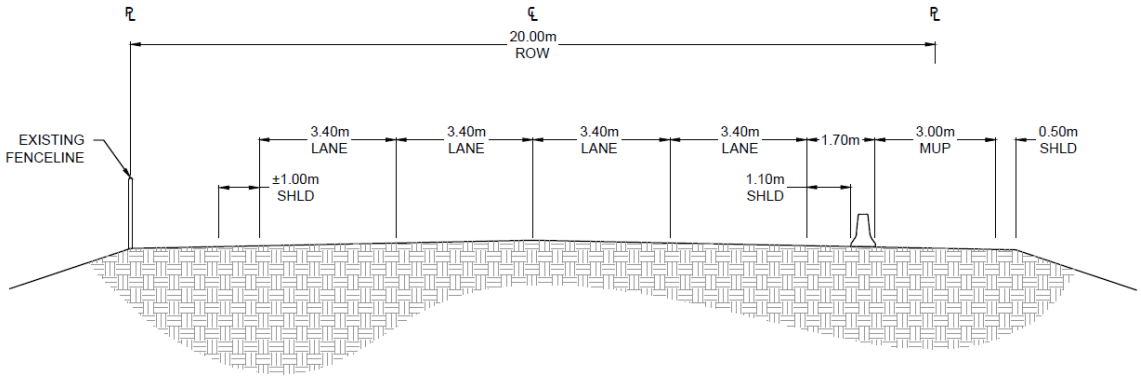


Figure 10 50 km/hr MUP with 4 lanes and constrained dimensions



Option B: Uni-Directional Protected Bike Lanes

Figure 11 illustrates a 4-lane standard cross section at posted speed of 60 km/hr with uni-directional bike lanes on both sides of Highway 97. Figure 12 illustrates a 3-lane cross section with reduced lane widths at posted speed of 50 km/hr with uni-directional bike lanes on both sides of Highway 97. Figure 13 includes a 4-lane cross section with posted speed of 50 km/hr and constrained dimensions with ROW of 20.6 m. The cross-section shown in Figure 13 could be further adjusted by reducing the shoulder/barrier width from 1.7 m to 1.4 m. Bike lane widths have included a barrier deflection distance of 0.5 m.

Pros: Uni-directional protected bike lanes in each direction on Highway 97 supports connectivity of cyclists to destinations north and south of Highway 97 and simplifies movements at intersections. Uni-directional protected bike lanes have the added benefit of simplifying the transition from future proposed bike lanes further east on Skaha Lake Road. Although there are a greater number of conflict points with uni-directional protected bike lanes in each direction, they are more predictable than a bi-directional facility on one side. Uni-directional bike lanes provides the optimal bike facility for cyclists.

Cons: A uni-directional bike lane only facilitates connections for cyclists and other micro-mobility users– pedestrians are not permitted. A uni-directional protected bike lane in each direction in four- lane configuration at 60 km/hr or 50 km/hr cannot be achieved using standard dimensions within the existing ROW. Property acquisition and widening is required to support uni-directional bike lanes.

Figure 11 60 km/hr Uni-directional Bike Lane with 4 lanes

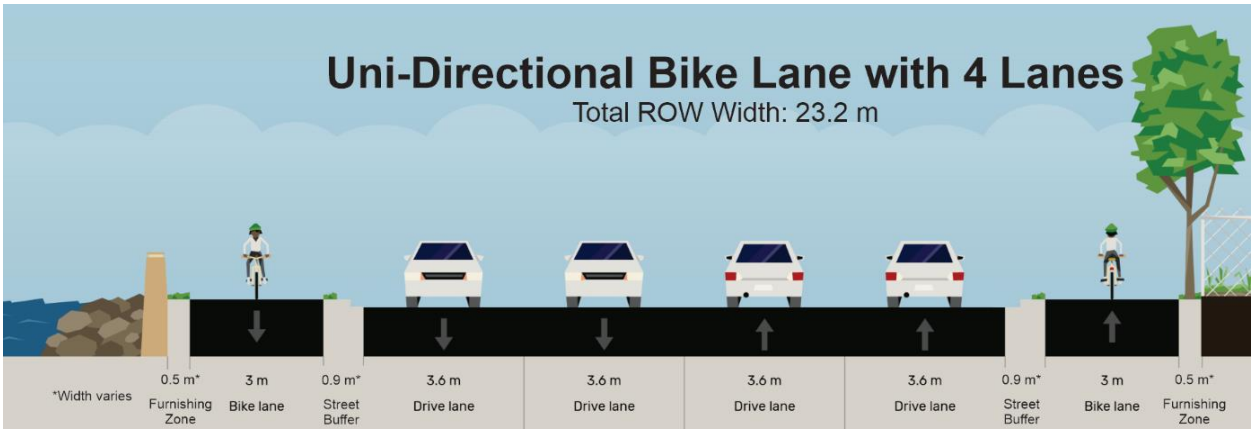
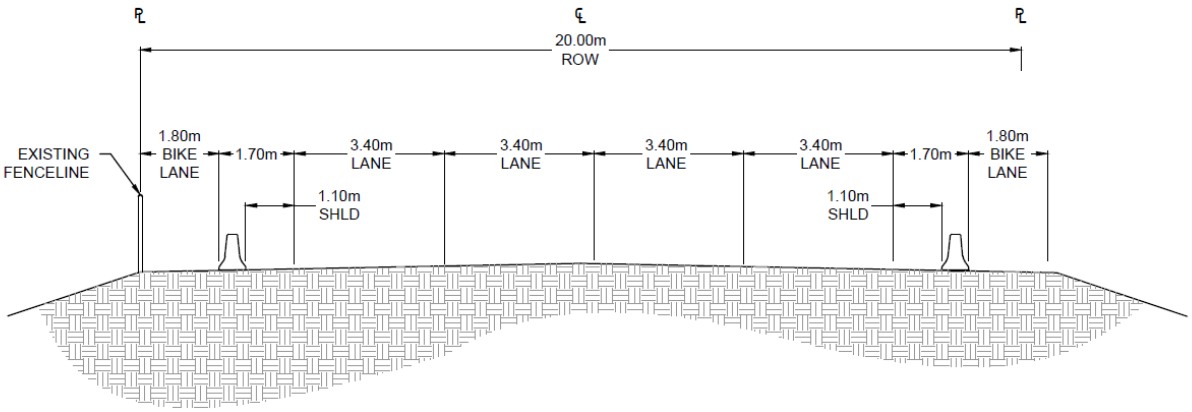


Figure 12 50 km/hr Uni-directional bike lane with 3 lanes

Figure 13 50 km/hr Uni-directional bike lanes with 4 lanes and constrained dimensions



Option C: Bi-directional Protected Bike Lanes

Figure 14 illustrates a 4-lane standard cross section at posted speed of 60 km/hr with a bi-directional bike lane on the south side of Highway 97. Figure 15 illustrates a 3-lane cross section with reduced lane widths at posted speed of 50 km/hr with a bi-directional bike lane on the south side of Highway 97. Bike lane widths have included a barrier deflection distance of 0.5 m. Although the MUP alignment has been shown on the south-side it can be moved to the north-side of Highway 97 without significantly changing the cross-section.

Pros: A bi-directional protected bike lane on the southside of Highway 97 minimizes the number of conflicts with intersections, driveways and accesses as compared to alignment on the north side or uni-directional bike lanes. A bi-directional protected bike lane provides a high quality facility for cyclists and other micro-mobility users.

Cons: Although there is a lower number of conflicts when aligned to the south side as compared to the north or with uni-directional bike lanes, they are more complex and less familiar to drivers. Cyclists can access destinations on only one-side of the highway. A bi-directional protected bike lane does not support pedestrian movement. A bi-directional protected bike at 60 km/hr or 50 km/hr with 4 lanes and standard dimensions cannot be achieved within the existing ROW. Property acquisition and widening is required to support a bi-directional bike lanes.

Figure 14 60 km/hr Bi-Directional Bike Lane with 4 lanes

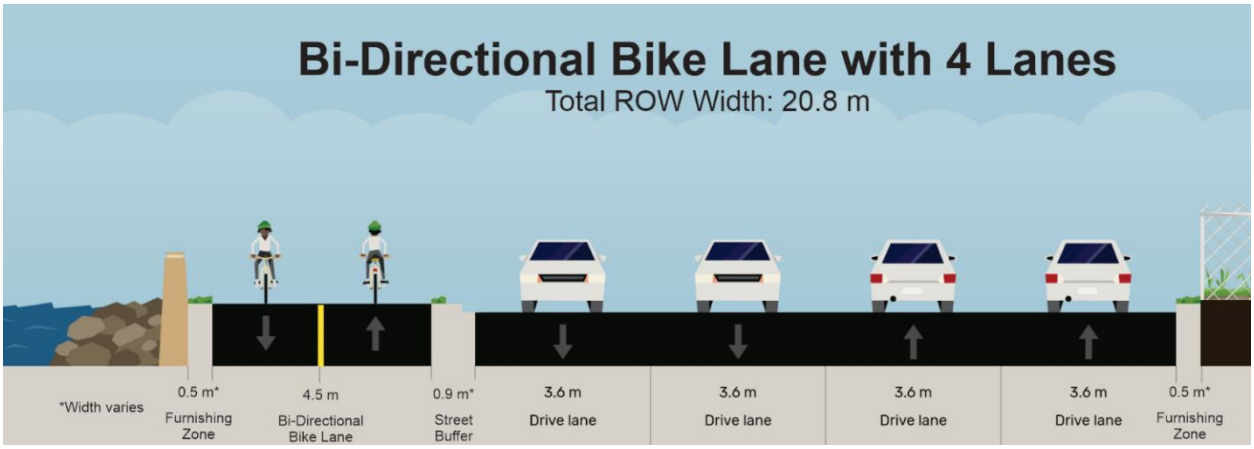
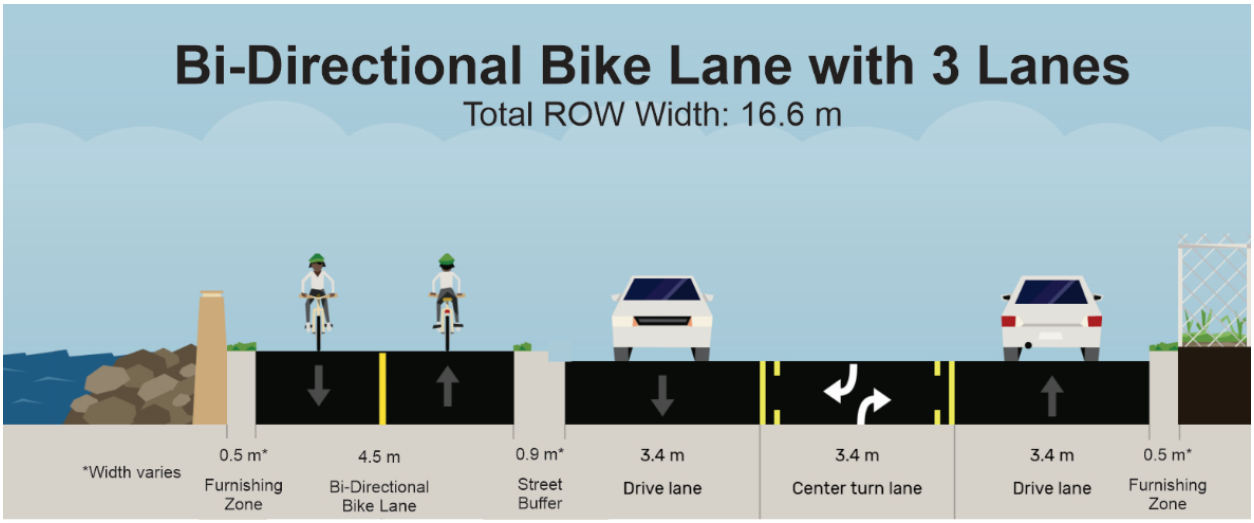


Figure 15 50 km/hr Bi-Directional Bike Lane with 3 lanes



Conclusion:

The implementation of bike facilities on Highway 97 between the Channel Parkway and Skaha Hills Residential Development within existing ROW will require a reduction in speed and application of constrained dimensions or reduction in lanes from four to three. Key criteria associated with bike facility selection on Highway 97 between the Channel Parkway and Skaha Hills Residential Development includes:

- Connectivity
- Safety
- Available ROW
- Implementation Horizon

Uni-directional protected bike lanes provide the best alignment with long-term bike network plans and support a high-quality 'Lake to Lake' bike route but eliminates the opportunity for pedestrian connectivity through the corridor. A multi-use pathway would facilitate a connection for both cyclists and pedestrians.[16]

Intersection and driveway/access conflicts will require additional signage and potential signalization to address turning vehicle conflicts. Lane reduction, speed reduction and advanced signage may be required in advance of constrained locations.

Highway 97 between the Skaha Lake Residential Development and Channel Parkway represents an important connection for cyclists and supports the development of a 'Lake to Lake' bike route. The highway has a constrained corridor, carries high volumes of vehicles and is a designated truck route. Significant collaboration will be required to implement this facility with the BC Ministry of

[16] Upon further review and discussion of the corridor, a multi-use-path located on the north side cross-section has been developed. Long-term configurations also include the addition of sidewalks on north and south sides which assume widening and property acquisition.

Transportation and Infrastructure going forward. Additional studies are recommended to confirm future traffic volumes and determine the viability of roadway reallocation.

APPENDIX F

LAKESIDE ROAD MEMO

MEMO

TO: Mitch Moroziuk, P.Eng., MBA

FROM: Avi Thiessen, P.Eng.

SUBJECT: **Lakeside Road Safety Measures**

DATE: **November 26, 2020**

Mitch,

This memo outlines our understanding, review, analysis, and recommendations to date on the proposed traffic safety measures for Lakeside Road in Penticton – from the intersection of Lee Avenue in the north to the city boundary in the south.

The following data was included and/or referenced in our review:

- Direct discussions with the City
- Transportation Association of Canada (TAC) – Traffic Calming Guidelines, 2018
- ICBC Collision Statistics 2014-2018
- Site visit and direct observation of conditions, June 2020
- Most recent OCP Engagement Summary
- City Transportation Safety Policy, 2016
- City OCP and Road Hierarchy
- City-provided list of transportation safety and traffic calming requests, 2020
- Lakeside Corridor Residents (LCR) Survey, 2020 – Randy Boras, M.Sc., P.Eng. and LCR resident
- Lakeside Road Report – Improvement Options from Residents, 2020 – primary author Randy Boras, M.Sc., P.Eng. and LCR resident
- Smythe Lakeside Roundabout Concept and Report, 2020 – Peter Truch, P.Eng., PTOE
- 72-hour speed surveys on Lakeside Road, September 2020 (2 locations)

The main takeaway from our review is that driving behaviour and conditions on the roadway do warrant some design mitigation, mostly by reducing speeds through lane width reduction and

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threshold treatments for built-up areas. These can be phased by shorter and longer-term mitigation measures.

Closer consideration of spot-specific areas of visibility obstruction and possible lighting improvements are also recommended. All recommendations allow the road to retain its multiple function as primary access to residences, business, and recreational areas. Based on the data provided, the case for downgrading the road's function and explicitly restricting freight movement to local accesses only has not been established and is not supported.

CONTEXT

LOCATION AND CONSTRAINTS

Lakeside Road is a north-south road that is designated as a Major Collector in the OCP and runs along the southeast of Penticton. It is bordered by Skaha Lake on the west and the Skaha Bluffs on the east. The study area portion of Lakeside Road is approximately 4 kilometres long from Lee Avenue in the north to the city's southern boundary. It operates with a posted 50 km/hr speed limit.

Lakeside Road is the only contiguous road on the east side of Skaha Lake between Penticton and the community of Okanagan Falls. The Average Daily Traffic in each direction is 2,000 vehicles. The road serves multiple functions. It is used as an alternative access road to Okanagan Falls, the only access road to several wineries and businesses on the east side of the lake, and recreational areas. It is also the sole access to two small residential communities that line the road: 1) one that stretches north from Smythe Road for approximately 1.4 kilometre, and 2) another that extends south from Skaha Marina for about 800 metres.

The road cross section is a consistent 10m – 12m along the corridor, with two 3.5m-wide travel lanes for north and southbound movements, and shoulders that vary from a total of 3m to 5m (1.5m – 2.5m on either side). The shoulders are marked out as on-road cycle lanes where minimum width permits. The road is designated as a future cycle route.

However, the proximity of the bluff rock face on the east side of the road constrains this shoulder width in many locations. The west side shoulder is similarly constrained in locations by road geometry and conflicts with residential driveways and hydro poles.

The road consistently meanders around the bluff face and rarely offers northbound or southbound motorists a direct line of vision of oncoming conflicts beyond 150m. In both directions, there are residents with driveways just after sharp curve with poor visibility. Residential driveways, mostly lining the west, lake-side of the road, front directly onto the southbound lane of traffic and motorists exiting these driveways have their visibility of oncoming vehicles further constrained by road curvature, parked vehicles, and Hydro infrastructure.

There are no posted parking restrictions on either side of the road, although space for parking is severely restricted by limited shoulder width along much of the corridor, particularly on the eastern, bluff-side of the road.

PREVIOUS INVESTIGATIONS

The City has recently investigated conditions and complaints on this stretch of road. It has also received several reports from local residents on conditions with recommendations to reduce conflict risk. These include several rounds of investigation and concept design for mitigation of

the intersection of Lakeside Road and Smythe Road from consultant Peter Truch, P.Eng., PTOE, and two reports from local resident Randy Boras, P.Eng.

The review of the Lakeside Road and Smythe Road intersection considered and evaluated several options to improve safety, speeds, and visibility from this intersection and prioritized a roundabout to reduce speeds, provide better mutual visibility of northbound, southbound, and eastbound motorists at the eastern (Smythe Road) approaches.

The residents' study offered several recommendations to reduce conflict risks along the road, including, but not limited to:

- Reduce vehicle lane widths
- Reduce posted speeds at residential areas
- Improved crosswalk infrastructure
- Select intersection upgrades
- Truck traffic restrictions
- Other associated informational signage on the road

CRASH DATA

The ICBC data includes crashes on Lakeside Road. For the 5 years from 2014 to 2018 there were 15 crashes. Of those 15 crashes 8 had injuries, 2 of which were on Smyth (25%). For context, in that same period there were 450 reported crashes on Hwy 97 (in Penticton) and 400 on Main Street. On Lakeside Road, the ICBC crashes break down in to two general types:

1. Head-on collisions involving one party veering into the oncoming lane. Whether this is due to a combination of factors including unsafe speeds, road conditions, lighting, fatigue, alcohol, carelessness, or momentary distraction are not indicated in the data. There was only a pattern of inability to drive to the conditions of the meandering road.
2. Conditions of visibility to / from the Smythe Road intersection. The east approach of Smythe Road is a hill that curves into the intersection at Lakeside Road. Visibility from the east approach is obscured from the south by the bluff face rock.

SPEED DATA

The 2019 Speed Monitoring Report findings are referenced in Mr. Boras' July 2020 report and noted an 85th percentile speed of 64 km/hr in the vicinity of the residential areas.

Two additional 3-day speed surveys were conducted as part of this master planning exercise. One recorded speeds and volumes south of the intersection of Smythe Road and another south of Lee Avenue. They recorded 85th percentile speeds of 72 km/hr and 59 km/hr, respectively.

These recorded speeds warrant mitigation in accordance with the guidelines set out in the Transportation Association of Canada (TAC)'s Traffic Calming Guidelines.

PRELIMINARY RECOMMENDED MITIGATION

We stress that as of the release of this memo, the measures noted in this memo are preliminary only. They are based on our interpretation of the data, observations, discussions with staff, and

applied best practice. They have not yet been reviewed by City engineers and have not been discussed with other staff.

The proposed mitigation still requires further analysis and confirmation of compliance with City engineering and maintenance practices but they all address some fundamental findings from the sum of previous and current investigations and acknowledgement of site conditions:

- Although posted for 50 km/hr, the road's existing alignment and overall design comfortably permit vehicle travel well over 10 km's/hr beyond this posted limit. Unlike other provinces, BC provincial design practices do not typically include a 'speeding contingency' for lower-speed roads.
- The data indicates that even despite recorded speeding, overall motorists speeds are lower in and around the road's residential areas and more urbanized north end (near Lee Avenue and Skaha Lake Park). The fastest average speeds are recorded on the road' more isolated stretches.
- There is warranted cause to revisit the conditions of the Lakeside Road and Smythe Road intersection.
- Crash data only records the worst-outcome events. It does not record crashes that were deemed too minor to report, near misses, or the perception of crash risk and safety from road users and those effects on quality of life. The recommendations therefore attempt to consider these non-recorded events in a manner that does not prejudice the mitigation of known and confirmed road risk conditions.

PRELIMINARY RECOMMENDATIONS

The recommendations outlined below are to be considered as a compromise of measures intended to reduce confirmed speed-risk factors while permitting the road to continue to function as a serviceable access to businesses, residences, and recreational land uses as well as a secondary route to Okanagan Falls and points south. Several of these are also noted in the residents' report from Randy Boras, P.Eng., 2020.

SHORT TERM

1. Reduce the northbound and southbound lane widths to 3.3m. This is a TAC-recommended minimum width that will safely accommodate small trucks and buses. This can be done relatively cheaply and with minimal short-term maintenance. Shorter term options to reduce the existing lane widths include:
    - Lane width reduction centered on the carriageway. In most cases this would keep the centerline where it is. This treatment could be combined with City Posts on the fog lines to reduce vehicle crossover onto the shoulders.
    - Restripe the existing lanes and introduce supplemental markings to roadside edges to further reduce the perception of road width (i.e. widened buffers, widening and painting of cycle lanes, zig zags, converging chevrons, transverse bars, and/or dragon teeth).
2. Introduce some 'urban / residential' treatments for residential areas. There are two residential area along Lakeside Rd. One is just south of the Skaha Marina (approximately

800m) and the other is from 4511 Lakeside Road to just past Smythe Dr. (approximately 1.4km). The main focus of the recommended treatments is for the second residential zone with south bound treatments starting before 4511 Lakeside Road and northbound treatments starting before Smythe Dr. However, these treatments could also be apply to the Skaha Marina residential area.

- Reduce the posted speed in the 'urban/ residential' areas to 40km/hr.
- Roadside or overhead gantry gateway with notice of reduced 40 km/hr speed, with posted 'Welcome to Skaha Lane Community' message or similar.
- Additional lighting for night time visibility and reinforcement of transition area
- Advance notification signage of transition / speed reduction area
- Pedestrian notification signage at gateway or in advance of gateway
- Add lane narrowing, markings, and other physical indicators (city posts, curbs, etc) to highlight the start of a residential zone.

3. Pedestrian-actuated crossings with flashing beacons and pedestrian-level lighting near community mail boxes (4554 Lakeside Road). While this locations would likely not satisfy traditional pedestrian infrastructure crossing warrants, the combination of known speeding, lack of any formal crossing infrastructure, and likely desire paths warrants some infrastructure based on qualitative considerations. This crossing would also help emphasise the urban/ residential community.
4. Installation of convex mirrors at select locations to enhance oncoming vehicle visibility and give more confidence and advance warning for motorists exiting residential driveways at curved sections of Lakeside Road.
5. On-street parking designation areas based on areas of recorded parking demand. Formal parking prohibition from entirety of eastern (bluff side) half of Lakeside Road and limiting on-street parking to areas adjacent to residential land uses on the west side – with restrictions at road curvatures in accordance with TAC and MoTI road design practices.
6. Improve Smythe Road approach visibility. In the short term this could include:
   - Removal of obstructing vegetation at southeast corner.
   - Realignment of existing residential driveway from southeast leg / east approach and removal/reinforcement of some bluff face to improve visibility of oncoming northbound vehicles.
   - Improved lighting
7. Continued RCMP speed enforcement.

LONGER TERM

The road's many alignment, conflict, and topographical constraints render some recommendations as more long-term considerations:

1. Currently the cycling facilities (from the North) end at Skaha Marina. This cycling infrastructure should be extended to the south to provide dedicated room for cyclists.

There are two options for extending cycling facilities to the south: continuing the existing bicycle lanes or a cycle track/ multiuse trail on one side of the road. Both options will require feasibility review and long-term reconstruction of roadway to accommodate. These facilities could be on the road or physically separated with posts, curbs, channel/ ditches, or barriers.

For a cycle track/ multiuse trail, the road would need to be moved to one side or the other with minimal (0.3m) shoulder on the non- cycle track side. This will create room on the other side for part or all of a cycle track/ multiuse trail. The recent Pelmewash Parkway redesign in the Lake Country is one example of this type of cross section.

2. Smythe Road roundabout – Visibility, safety, and capacity improvements in accordance with P. Truch's roundabout concept design report.
3. Relocation or formalization of driveway on southeast corner of Smythe Road and Lakeside. This driveway currently has very bad sightlines and is located too close to Lakeside Road.
    - If a roundabout is constructed, this driveway could be added as a leg (assuming the geometry works);
    - otherwise, this driveway should be relocated further east on Smythe Road.

Traffic calming is often approached incrementally. If a combination of the short term and long term measures do not achieve the desired reduction in vehicle speed, more aggressive measures can be taken. On Lakeside Road, these measures would include speed humps, and/ or raised crossings. Although speed humps/ raised crossings slow vehicles, they often engender significant opposition. It is recommended that there is public engagement prior to more aggressive traffic calming measures.

NOT RECOMMENDED

At present, the following measures outlined in supplemental reports **are not presently** recommended:

- Road reclassification – Lakeside Road should remain a major collector, due to its multi-purpose function and plurality of serviced land uses and uses.
- Truck prohibition – The road services local businesses and is a secondary route to Okanagan Falls and areas to the south. It further requires accessibility for local delivery vehicles for residents. The proportion of commercial vehicles choosing to utilize Lakeside Road instead of the provincial highway on the west side of the lake is not known and, given Lakeside's much slower and less direct route, is likely to be much lower. Enforcement will be a costly allocation of RCMP resources for what will likely be negligible benefit.
- Horizontal deflection measures (i.e. chicanes, islands, etc.) – not recommended on a major collector roadway serving multiple functions as collector road access, local resident access, and secondary through route to all points north, east, and south of Skaha Lake.

- Raised pedestrian crossings, speed humps, rumble strips – although these are proven to be effective, the support of local residents for the inevitable noise-induced effects of these measures has not yet been achieved.

Avi Thiessen, P.Eng.
Project Manager

APPENDIX G

PARKING STRATEGY ELEMENT

Some key elements to consider in scoping a parking strategy are:

- Identify all issues and stakeholders
    - informs data collection
    - Informs jurisdictional scan
    - Informs public engagement strategy
- Conduct a jurisdictional scan or practice review for approaches to key issues
- Assess existing conditions and collect data to help understand issues identified in first step
    - Background Document Review
        - OCP
        - Zoning Bylaw
        - Residential parking permits
        - Metered parking rates
    - Example data collection
        - Count parking supply, occupancy and turnover
            - On-street parking
            - Off-street parking
            - Determine who is parking via license plate surveys
        - Account for different parking uses
            - HOV/carpool parking
            - EV charging stations
            - Carshare parking
            - Pick up and drop off zones
            - Loading zones
- Develop policy framework
    - Provision of parking
    - Customer experience
    - Parking management
    - Leveraging new technology
- Develop implementation plan