Highway 97A Enderby / Splatsin Transportation Plan

Final Report V3

Version: Final

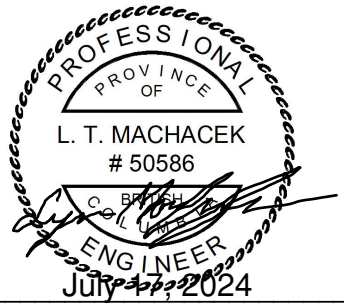
BRITISH COLUMBIA

Ministry of Transportation and Infrastructure

Version	Date Issued	Authored By	Quality Review	Description of Changes
DRAFT	April 27, 2021	Lynn Machacek	Stephen Power	Creation of draft document
FINAL	October 8, 2021	Lynn Machacek	Stephen Power	Document finalization
FINAL V2	March 1, 2022	Lynn Machacek	Stephen Power	Minor comment revisions
FINAL V3	September 2, 2022	Lynn Machacek	Arth Vin	Minor comment revisions

Prepared by:

HDR Corporation



July 17, 2024

Lynn Machacek, P.Eng. (AB, BC)
Goods Movement Practice Lead

EGBC Permit to Practice No. 1001547

ES1 Executive Summary

Highway 97A is the northern gateway to the Okanagan Valley, and connects the communities of the Okanagan with the Trans-Canada Highway and destinations to the east. It is a core route on the National Highway System, and as such is considered to be an important interprovincial corridor. As the Okanagan grows economically and in population, so will travel demand on the highway network.

In 2001, the North Okanagan Shuswap Corridor Management Plan identified safety and capacity issues on Highway 97A through Splatsin and Enderby, and specifically that the capacity of the existing two-lane highway would be exceeded by 2024, based on traffic forecasts at that time.

The Ministry of Transportation and Infrastructure (MoTI) has initiated the Highway 97A Enderby Splatsin Transportation Plan to develop an infrastructure solution strategy with short, medium, and long-term recommendations for Highway 97A within the project area.

The study is intended to compliment the other plans and studies in the area, including the Regional District of the North Okanagan Regional Growth Strategy, City of Enderby Official Community Plan, the Splatsin Comprehensive Community Plan, and the other on-going and related studies. This study directly incorporates Integrated Transportation Planning principles by leveraging past work to identify opportunities for better integration between this transportation planning project and other priorities, with the aim of developing a plan that provides benefits to not only the transportation system, but also considers community, safety, economic and environmental benefits.

ES1.1 Guiding Principles

To guide the option generation and development for the project, a set of guiding principles were created. These were determined based on consultations with the community, and Technical Advisory Committee and Community Liaison Committee (TAC and CLC accordingly). The guiding principles are:

1. Safe
2. Efficient Mobility
3. Multi Modal Corridor
4. Economic Development and Property Access
5. Local Connectivity

A definition of the role of the highway was also developed. Using the previously defined economic role of the highway, current use trends and input from the TAC and CLC, the role of Highway 97A from Stepney Cross Road to the Highway 97A/B junction can be defined as follows:

> ***The role of Highway 97A in the study area is to provide safe and efficient mobility for through traffic, balanced with the community access and connectivity needs of the Enderby and Splatsin communities.***

Integrated Transportation Planning

This plan was developed using an Integrated Transportation Planning (ITP) approach and is consistent with the Ministry's on-going work on their Integrated Transportation Development Strategy (ITDS). The approach considers how transportation systems interact with other aspects and disciplines, and incorporates and leverages synergies between transportation and other domains (such as land use planning and economic development) to produce plans that result in smart, coordinated, sustainable growth and development. The focus areas of the Ministry's ITDS are:

Complete Compact Connected Communities – Transportation planning and transportation projects should be developed to support healthy, diverse communities, and support the provision of a range of affordable transportation and housing options.

Safe and Integrated Transportation Systems – Promote safe, inclusive and sustainable transportation networks by providing users with modal choices, specifically active transportation and transit.

Economic Competitiveness and Prosperity – Incorporate economic development consciously through transportation planning to maximize economic development opportunities, provide connections to jobs and services, and facilitate the movement of goods and people.

Resilience and Climate Action – Develop plans and infrastructure that help lower emissions, reduce environmental impacts, and increase community resilience.

ES.2 Existing Conditions

A review of the existing operation was completed for the highway, and a summary of the review is provided below:

Active Transportation and Transit – Sidewalks are provided along part of the urban portion of the highway within Enderby, and there are no cycling facilities along the highway.

Use – Traffic volumes have increased over the past 10 years, and are forecast to continue increasing. Nearly half of all trips that begin or end in the study area are from south of the study area.

Operation – The rural portions of the highway are operating at level of service E, indicating that drivers often have to closely follow the vehicle in front of them, and that passing opportunities are infrequent. At some of the busier intersections, such as at Canyon Road, it can be difficult to turn on to or off the highway.

Safety – All three study segments have historical observed collision rates that exceed the critical collision rate, and there are a number of high frequency collision locations along the corridor.

Reliability – The highway has experienced an average of less than 1 reported closure a year, with an average of 3 closure hours per year. Closures are primarily due to collisions and vehicle incidents, and the forecasted future annual closure time is below the 10 hour per year closure threshold.

ES.3 Future Conditions

As traffic volumes continue to grow along Highway 97A, travel times and delay will increase accordingly. It will become increasing difficult for drivers to turn off and onto the highway, and highway traffic congestion, currently only significant in the peak summer months, will begin to spread to other parts of the year. Increasing the through travel capacity of the highway will be required to efficiently accommodate future projected traffic volumes.

Existing walking, cycling and transit facilities across and along the highway, particularly in the urban areas, are not consistent with current best practices and guidelines, and improvements in highway crossings and linear active transportation infrastructure are desired.

ES.4 Engagement

Community engagement is an important part of the transportation planning process, and the community and stakeholders were engaged throughout the study.

The TAC and CLC were founded at the start of the project to engage at a detailed level with key community and technical stakeholders. Engagement activities with these groups included a visioning session at the start of the project to help develop the guiding principles, and a number of follow up workshop sessions to guide the project, specifically the option development and screening processes.

Public community engagement was primarily conducted through three in-person community open houses held in Enderby and Splatsin, and these open house events included supplementary online engagement opportunities for the public to provide feedback via the project website. Enderby and Splatsin Councils were engaged with and reported back to regularly throughout the project, and the project team also conducted a number of focused engagement sessions and meetings with key stakeholders.

ES.5 Options Generation and Assessment

Based on the current and projected future operation of the highway, a wide range of options were developed and assessed. The highway was segmented into the three study areas listed below, and multiple options were developed for each segment, including several options for the Highway 97A/B junction at the north end of the study area:

- **South** – Stepney Cross Road to Enderby
- **Centre** – South End of Enderby to North End of Enderby
- **North** – North End of Enderby to Highway 97A/B Junction

The long list of options were screened based on a number of performance criteria, and the options that did not resolve the defined problems or had fatal flaws were removed from consideration.

A total of 8 new options were retained and brought forward for a detailed evaluation. A Multiple Account Evaluation (MAE) was completed for the remaining options based on the BC MoTI MAE framework, and the following categories were used to evaluate the options:

- Financial
- Customer Service
- Social / Community
- Economic Development
- Environmental

ITP principals were incorporated into the Social / Community and Economic Development accounts, including accounts that considered Local Connectivity, Active Transportation, and Development Opportunity to name a few.

ES.6 Recommended Option

Table ES.1 summarizes the recommended options for the corridor. Figure ES-0-1 shows the recommended concept for the entire study area, and Figure ES-0-2 shows the proposed cross sections within Enderby. More detailed conceptual plan drawings are provided in **Appendix A.**

Table ES.1: Recommended Option

Segment	Extents	Recommended Option	Benefit Cost Ratio
South	Stepney Cross Road to Enderby-Splatsin Boundary	Four Lane Highway	**0.62**
Centre	Enderby Splatsin Boundary to Enderby North Boundary	Couplet on Existing Corridor & Vernon Street / Rail Corridor	**1.26**
North	Enderby Boundary to Highway 97A/B Junction	Four Lane Highway	**0.40**
	Highway 97A/B Junction	Northbound Left Turn Grade Separation	**0.35**

The recommended options are estimated to cost a combined **$155.9** million (2020). This estimate includes new construction, property acquisition, planning, design, project management, and a 30% contingency.

An implementation plan is provided and shows how portions of the project can be constructed earlier to provide short and medium term benefits.

Recommended Option: Alignment with Guiding Principles and the Ministry's Integrated Transportation Development Strategy

The recommended option will provide benefits to highway users and the local communities by improving mode choice, improving vehicle travel times and safety, improving access to transit, and supporting economic development and resiliency. It is consistent with the Guiding Principles developed for the project, and aligns with the Ministry's Integrated Transportation Development Strategy goals, including:

Complete Compact Connected Communities

- ☑ Aligns with the long-term plans of the communities
- ☑ Incorporates future community development plans
- ☑ Improves cross-highway community connectivity, including access to schools
- ☑ Opportunity for urban design elements to be incorporated into the Enderby and Splatsin segments

Safe and Integrated Transportation Systems

- ☑ Reduces highway delay and congestion through increased travel capacity
- ☑ Improves safety due to a reduction of accesses and ease of passing
- ☑ Achieves project goals with moderate costs and impacts
- ☑ Supports the development of the rail trail and active transportation
- ☑ Improves access to transit by formalizing bus stops

Economic Competitiveness and Prosperity

- ☑ Provides economic development opportunities along the corridor, including in Enderby and Splatsin
- ☑ Balances highway access and traffic between existing businesses and opportunities for new development
- ☑ Reduces highway travel time for passenger and freight vehicles
- ☑ Use of a couplet instead of four-laning the existing highway minimizes property acquisition needs and impact on private properties

Resilience and Climate Action

- ☑ Avoids sensitive areas near the Shuswap River
- ☑ Has a lower environment and emissions impact than other options
- ☑ Use of couplet creates network redundancy (one side could be converted to two-way operation in an emergency).

Figure ES-0-1: Refined Concept - Entire Corridor

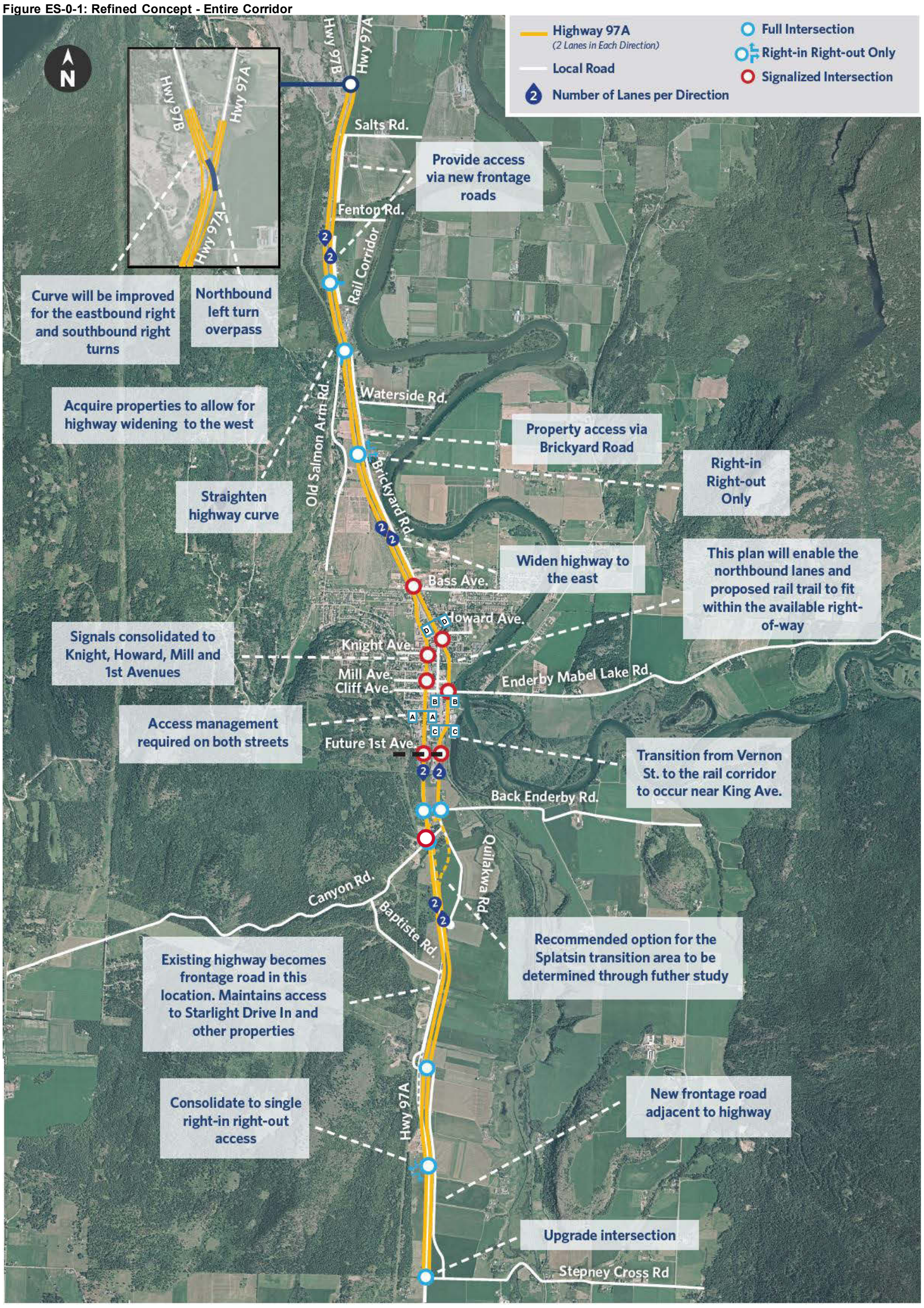
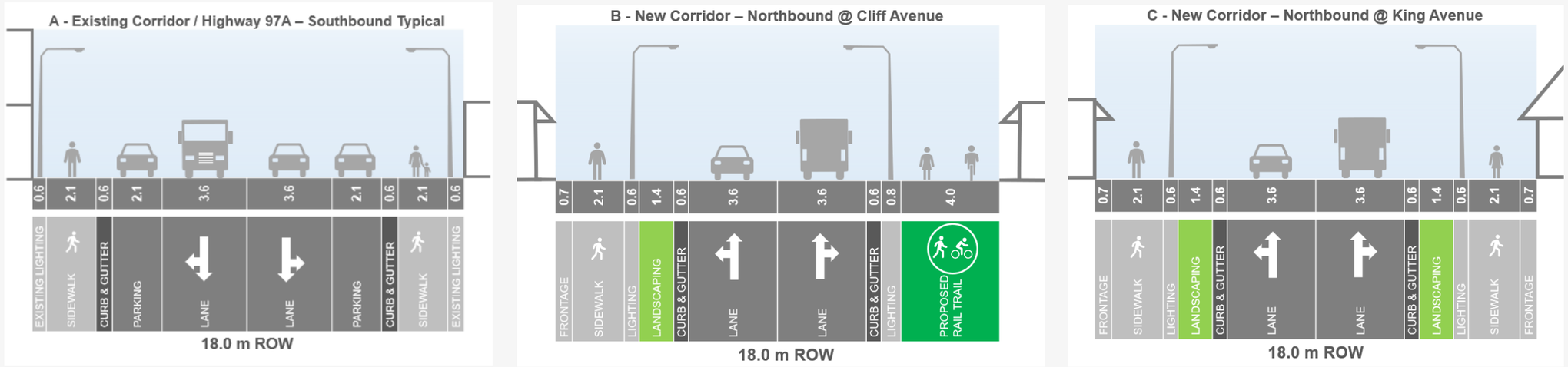


Figure ES-0-2: Cross Sections



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1 Introduction

Highway 97A is the northern gateway to the Okanagan Valley, and connects the communities of the Okanagan with the Trans-Canada Highway and destinations to the east. It is a core route on the National Highway System, and is an important interprovincial corridor. As the Okanagan grows economically and in population, so does travel demand on the highway network.

In 2001, the North Okanagan Shuswap Corridor Management Plan identified safety and capacity issues on Highway 97A through Splatsin and Enderby, and specifically that the capacity of the existing two-lane highway would be exceeded by 2024, based on traffic forecasts at that time. The Ministry of Transportation and Infrastructure (MoTI) has initiated the Highway 97A Enderby Splatsin Transportation Plan to develop and infrastructure solution strategy with short, medium, and long-term recommendations for Highway 97A within the study area.

1.1 Project Area

The study area includes the 11.7 km segment of Highway 97A between the junction of Highways 97A/97B in the north, and Stepney Cross Road in the south. The study area is shown in Figure 1-1.

1.2 Project Scope

The project falls within the Infrastructure Planning phase of the ministry's Project Development Lifecycle. This phase is where potential improvement options are identified and evaluated, both by the project team and by the local community and stakeholders. A business case is then developed for the preferred concept.

1.3 Project Objectives

As forecasted in the North Okanagan Shuswap Corridor Management Plan (NOSCMP), Highway 97A is reaching an important threshold, where significant infrastructure improvements are likely to be required to maintain functionality and minimize impacts on the communities through which it passes. This planning study has defined the functional objectives and problems for the corridor, and includes an assessment of a range of options to address the defined problems.

The study objectives are as follows:

- Investigate and assess existing and future corridor performance and needs by considering future development plans.
- Establish transportation conditions and needs for the highway corridor through the study area for short (5 year), medium (10 year) and long-term (25 year) horizons.
- Develop and evaluate short, medium, and long-term transportation improvement options inclusive of on-line and alternative routes around the communities.
- Enable public participation to assist with the study and the concept generation and evaluation tasks.
- Prepare an infrastructure improvement solution strategy with short, medium, and long-term recommendations for the highway that will inform the Southern Interior Region's Highway Improvement Program.

Figure 1-1: Study Area

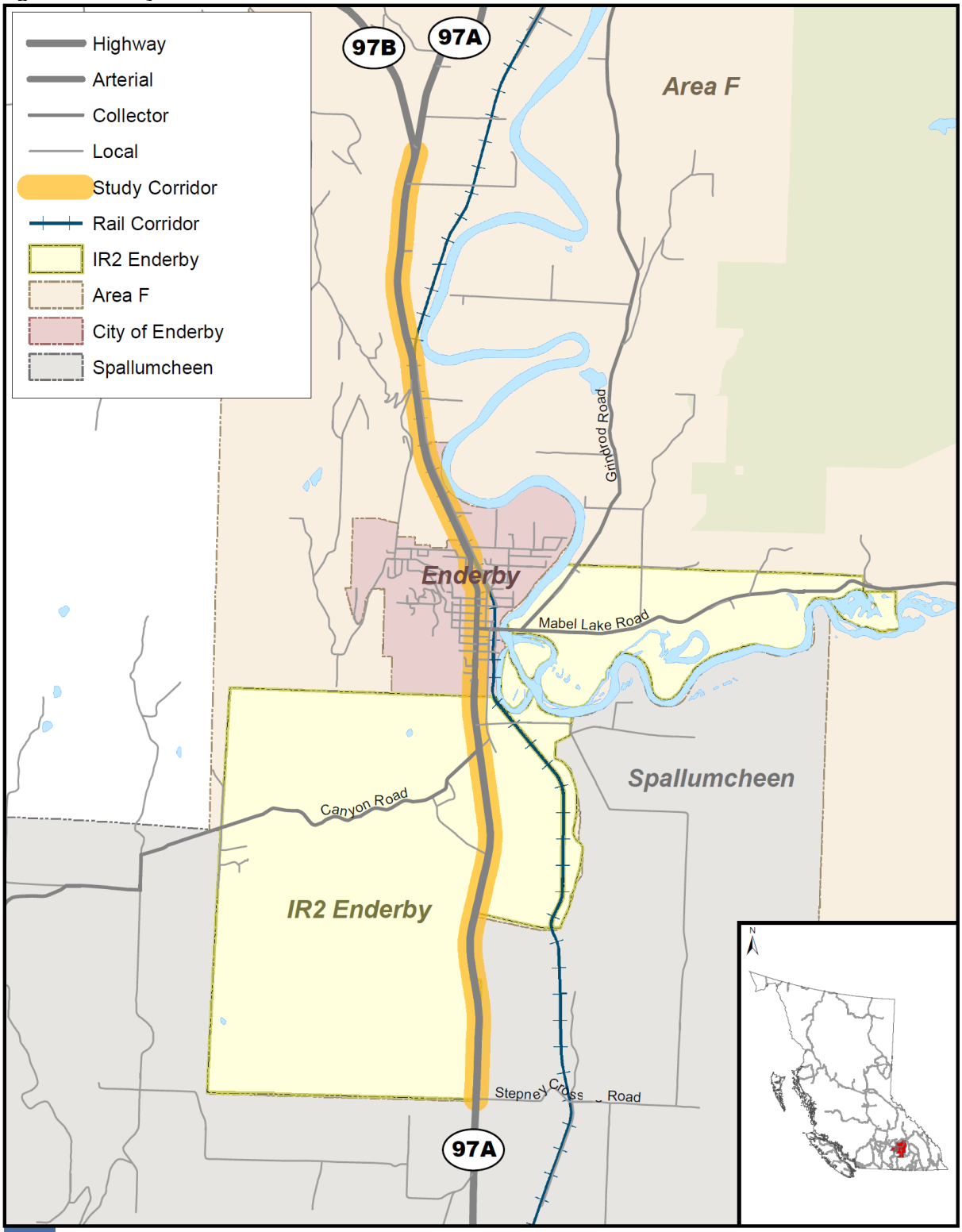


FIGURE 1: HIGHWAY 97A CORRIDOR STUDY AREA

2 Highway Role and Function

The Role defines the purpose of the corridor – a primary trade route (a commuter corridor, etc.), while the Function describes how the corridor performs and its form (e.g. high-speed limited access, high property access, etc.). A corridor, like Highway 97A, serves many roles. The role needs to be clearly defined and priorities placed on the multiple roles.

2.1 Highway Role

Although some of the past reports have described the various economic roles in some detail, none have provided a succinct, clear statement of the role of Highway 97A. The NOSCMP presented a comprehensive discussion of the various economic roles related to goods movement and local/regional development. The role of Highway 97A has not changed significantly since the NOSCMP. It continues to serve as a trade corridor, a connection to the broader Okanagan Valley and community access for the population centres through which is passes.

The Highway 97A corridor has value as a trade route in supporting industry in the region. However, its role as a direct factor in economic development and attracting new industry is minimal. The decisions of industry to locate in a particular location will generally be more influenced by proximity to labour force and markets than by the nature of the highway passing through the community. The highway role in economic development is more closely related to local highway-oriented business and access to non-local customers that the highway brings to the local community.

The importance of Highway 97A as a tourism connection is reflected by the considerably higher summer annual daily traffic volumes (SADT) than average annual daily traffic volumes (AADT). The SADT-AADT ratio has continued to grow (from 1.33 in 2007 to 1.36 in 2017) since the NOSCMP was completed indicating that tourism access to the Okanagan is a growing role.

The NOSCMP noted that a large proportion of trucking on North Okanagan highways had an origin or destination within the North Okanagan, with little long-distance through trucking. Using the previously defined economic role of the highway, current use trends and input from the local stakeholders, the role of Highway 97A from Stepney Cross Road to the Highway 97A/B junction is defined as follows:

The role of Highway 97A in the study area is to provide safe and efficient mobility for through traffic, balanced with the community access and connectivity needs of the Enderby and Splatsin communities.

2.2 Guiding Principles

The following principles were developed to help guide planning for the Highway 97A corridor within the study area. The guidelines are based on input provided by the Technical Advisory Committee and Community Liaison Committee.

1. Safe

Safety for travel along Highway 97A will be consistent with comparable highway facilities elsewhere in the province. Highway access, egress and crossing will be safe and comfortable for all modes. Potential conflicts between wildlife and vehicles will be minimized.

2. Efficient Mobility

Highway 97A will allow vehicles to move through the study area without significant bottlenecks and congestion, providing an experience for drivers that is consistent with the surrounding context. Some delays through urbanized areas should be expected to support strategic access to the communities through which the highway passes.

3. Multi Modal Corridor

The Highway 97A corridor should support all modes of travel, either within the highway right-of-way or on parallel routes such as the former rail corridor. Convenient and comfortable pedestrian crossing opportunities should be provided between key local origins and destinations, and pedestrian facilities should be provided along the corridor in urban areas.

4. Economic Development and Property Access

Highway 97A will provide community access that supports economic development. The highway should support integration with the surrounding community through aesthetic design considerations. While direct property access to/from Highway 97A should be reduced over time, strategic access to communities and important municipal streets should continue to support efficient property access to businesses that rely on highway traffic.

5. Local Connectivity

In addition to being an important provincial highway, Highway 97A is an important element of the local transportation network. It should serve as a connection, not a barrier to local travel and reflect the rural and small town context of the adjacent land use. Opportunities for walking and cycling travel along and across the highway will provide strong local connectivity within urban areas. The highway should be supported by local streets and pathways to provide access to properties, serve local trips and connect to and across the highway without significantly impacting highway operations.

2.3 Highway Function and Form

Table 1 provides a summary of the desirable physical and operating characteristics of Highway 97A to support the guiding principles. The existing corridor refers to the current highway alignment, or potential future alignments close to the current highway that are within built-up areas. Alternate alignment refers to route that is intended to serve through traffic and bypass built-up areas.

Table 1: Highway Form Elements to Support the Guiding Principles

Function	Physical and Operating Characteristics	
	Online / Couplet	Alternate Alignment
Mobility	• High speed in rural areas (posted speed >80km/) • Moderate speed within communities (posted speed 50-60 km/h with minimal intersection delay)	• High speed throughout (posted speed >80km/)
Access	• Strategic access to employment, highway-oriented businesses, and residential areas via the local street network • Minimal and declining direct property access • Moderate access density; intersection spacing in the order of 0.4-1.0 km) • Generally at-grade intersections (signalized, roundabouts or side street stop-controlled as warranted)	• Access to communities via regional network • No direct highway access • Intersection spacing 1.0-3.0 km • Generally at-grade intersections (signalized, roundabouts or side street stop-controlled as warranted)
Network Hierarchy	• Connects to major municipal streets • Continuous parallel local routes	• Connects to a limited number of regional roads that provide access to communities
Transit	• Support transit connections and bus stops	• Supports transit connections, but stops to occur on local network • No on-highway stops
Cycling	• On shoulders in rural areas • On multi-use pathways adjacent to the corridor (e.g., former rail corridor), or on local parallel streets	• On shoulders
Pedestrians	• Safe, comfortable, and frequent crossings in developed areas • Separated sidewalks (e.g. via on-street parking or green buffer, etc)	• Well-marked crossings at intersections

3 Engagement

Local residents and businesses provide important input into the corridor planning process. This section highlights how the community was engaged and how the input was used to support the study.

3.1 Technical Advisory Committee and Community Liaison Committee

Technical Advisory and Community Liaison Committees (TAC and CLC accordingly) were formed at the start of the project. The TAC provided technical input and feedback on the project, and consisted of staff from the following organizations: City of Enderby, Township of Spallumcheen, Regional District of North Okanagan, Splatsin, BC Hydro, Columbia Shuswap Regional District, and Fortis.

The CLC was formed to provide input and feedback on the project from a community perspective, and consisted of the following organizations: School District No 83 of North Okanagan Shuswap, IHA, RCMP, Enderby and District Chamber of Commerce, Community Futures North Okanagan, Splatsin and BC Transit.

The TAC and CLC were one of the first groups that were engaged, and as described in Section 2.2, helped to start the project by providing input on the guiding principles. This input, coupled with additional comments on the current highway use and issues was fundamental to developing the problem definition. In later engagements they also provided important feedback helped to direct the option generation, screening, and development.

3.2 Public Engagement

3.2.1 Community Open Houses

A total of three community open houses were held for the project. They are briefly summarized below, and listed based on date they occurred.

May 1, 2019 – A public workshop was held in Enderby to introduce the public to the project and gather input on the future of the highway corridor. The community helped identify existing issues, which were incorporated into the existing conditions analysis and problem definition. Included in these existing issues were comments on the difficulty of turning onto / crossing highway, concerns with high speeds and safety in some areas, and the desire for specific improvements to certain locations / connections.

Figure 3-1: Word Cloud produced from comments from the May 1, 2019 Engagement Event

July 17, 2019 – A community workshop was held in Splatsin to gather input on the future of the highway, and to discuss potential ideas and option concepts. Some of the main items that were noted by the community were the importance of the intersection of the highway at Canyon Road as an active transportation crossing location, and that there would be economic development opportunities associated with a new highway alignment / couplet through Splatsin that would not be provided by a highway bypass.

October 23, 2019 – An open house was held in Enderby to present the long list of options and gather input on the options and screening process. Attendees where asked where the team should "continue exploring" the different options presented. The majority of respondents were in favour of pursuing the north and south four-lane options that were presented, and the existing highway / former rail corridor couplet was the highest rated option out of all options for the centre segment.

3.2.2 Online Engagement

A project website was set up to communicate the project to the public and receive feedback on the project as it progressed.

3.2.3 Additional Engagement

The project team held a number of other focused engagement session and discussions throughout the project, including with key stakeholders such as the City of Enderby and Splatsin Council, and the Shuswap Rail Alliance / Rail Trail Inter-Jurisdictional Owners.

3.3 Engagement Summary

The public and stakeholder engagement provided invaluable insight into the existing highway operation, issues, and potential improvements. The public and stakeholders also identified a number of new and innovative ideas and options. This input and feedback was directly incorporated throughout the study, and its inclusion noted in a number of locations throughout this report.

4 Existing Conditions

4.1 Previous and Ongoing Reports

Highway 97A and the surrounding municipalities have been studied through a number of local and regional plans. The general insight from these plans indicate that future traffic growth on the highway will generate the need for increased travel capacity. Improvements identified in these previous studies include access management and widening of the highway to reduce delays, changes to the alignment and accesses to improve safety and traffic operations, and the consideration of potential new highway corridors. A summary of the studies is included in Table 2, and full descriptions of each are provided in **Appendix B**. It is also noted that the Splatsin Integrated Land Use and Transportation Plan is currently being developed, and considerations from this planning process have been incorporated into this study.

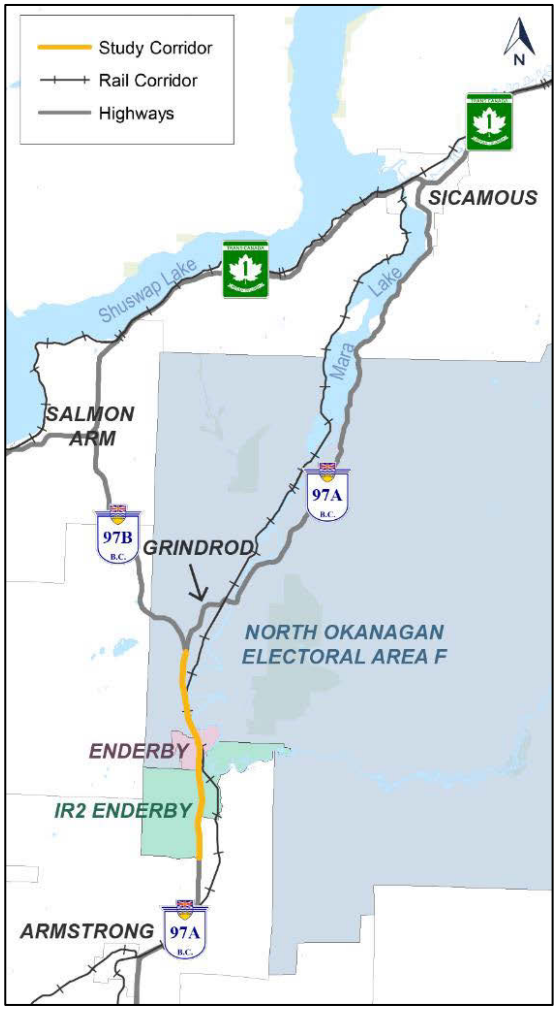
Table 2: Previous and On-going Reports

Transportation Plans		Land Use Plans
Provincial / Regional	**Local**	
• **North Okanagan Shuswap Corridor Management Plan (2001)** – The study created a strategy for the provincial network in the North Okanagan and Shuswap regions, focusing on Highways 97, 97A, 97B and Highway 6. • **Highway 97 Enderby Concept Development (2005) –** Developed interim functional designs for Highway 97A. • **Highway 97 Bypass Assessment (2011) –** An assessment of the demand and capacity to support potential bypasses of Peachland, Enderby, and Kelowna. • **BC Transit North Okanagan Transit Future Plan (2014)** – A transit plan for the North Okanagan that considered expansion of weekday transit service to Enderby. • **Enderby Data Collection Program (2018)** – Collected travel and transportation data to be used in this study.	• **Highway 97A – Enderby Concept Development Report (2005) –** Reviewed the traffic operations and safety conditions on Highway 97A in Enderby, and ultimately recommended a three-lane cross section on the existing highway corridor. • **Highway 97A Enderby Interim Report (2008) –** Studied interim highway operations and options and identified the need for increased capacity in the future. • **Enderby – Splatsin Active Transportation Plan (2014) –** Identified a number of locations for pedestrian improvements, including a new Highway 97A crossing. • **Enderby – Splatsin Riverwalk Extension and Enhancement Plan (2015)** – Included a recommended extension of the Riverwalk Pathway to the Splatsin Community Centre. • **Highway 97A / Canyon Road Intersection Technical Memo (2019) –** Recommended short term improvements for the intersection.	• **Regional District of the North Okanagan Regional Growth Strategy (2011)** – Provides direction for growth in the RDNO. • **Splatsin Comprehensive Community Plan (2013) –** Provides guidance on land use and development in Splatsin. • **City of Enderby Official Community Plan (2014) –** Included the consideration of a two-way highway couplet through Enderby. • **Integrated Community Sustainability Plan (2013) –** Public engagement through the planning process identified transportation and infrastructure as key focus areas.

4.2 Community Profiles

The project study area is within the Regional District of North Okanagan (RDNO), running through the southern portion of Electoral Area F, the City of Enderby, the Splatsin's IR2 Enderby, and is adjacent to the Township of Spallumcheen. Census data and various growth plans provide insight into the demographic makeup, economic activity, land use and urban form along the corridor. The communities along the study corridor are shown in Figure 4-1. Additional community information can be found in **Appendix C**.

Figure 4-1: Communities



Enderby, IR2 Enderby, and Electoral Area F all straddle Highway 97A. The City of Enderby is approximately 20 km south of Salmon Arm, 13 km north of Armstrong and 36 km north of Vernon. IR2 Enderby is located south of Enderby, and Electoral Area F is north and northeast of Enderby.

4.2.1 Demographics

4.2.1.1 RDNO ELECTORAL AREA F

In 2016, the population of Electoral Area F was 4,000 and accounted for approximately 4.7% of the total RDNO population. Although there have been population fluctuations, the population growth in Electoral Area F has been flat since 1996. The average age is 46, which is five years higher than the Region and four years higher than the Province. The population in Electoral Area F is older and aging, and the number of seniors outnumbers children ages 0 to 14.

4.2.1.2 CITY OF ENDERBY

In 2016, Enderby had a population of 2,964 residents, accounting for 3.5% of the RDNO population. Enderby's annual growth rate was 0.37% in the past twenty years, and 0.46% in the past ten years. Enderby has an older and aging population. The average age is 47, which is five years higher than the Provincial average, and seniors (individuals age 65 and older) outnumber children ranging between the ages of 0 and 14.

4.2.1.3 IR2 ENDERBY

IR2 Enderby had population of 316 in 2016, a decrease of 19% from 390 in 2011. However, the average annual growth rate over the last twenty years has been 0.85%, which is higher than the neighbouring communities or Area F, and close to the provincial and national averages. The average age in IR2 Enderby is much lower than Electoral Area F or Enderby, at 38. IR2 has a slightly larger proportion of children than seniors. IR2 has the lowest median total income of all three communities, and the average household size is also larger at 2.5 persons per household compared to 2.3 in Area F and 2.1 in Enderby.

4.2.2 Land Use

4.2.2.1 ELECTORAL AREA F

Land use immediately south of the Highway 97A / 97B intersection is primarily Agricultural Land Reserve (ALR) and Non Urban. Non Urban allows for rural and/or agricultural buildings, structures and uses. This can be generalized as a very low density land use, allowing for one dwelling or building per lot, as well as some light industrial uses and agricultural activities. As the corridor moves south towards Enderby, the land is divided into smaller parcels along the corridor. On the east side, land uses are mostly agricultural or industrial. Industrial activities include the North Enderby Timber Mill. Along the west side of the corridor land uses include a mix of country residential, small holdings, and agricultural. At the City of Enderby limits, along the west side of the corridor, a public land use designation accommodates the Enderby sub-station.

4.2.2.2 ENDERBY

The majority of the land uses that border the highway along the north end of Enderby are a mix of industrial and commercial, and become almost entirely commercial near Mill Avenue. At the south end, the land uses transition from commercial back to industrial. Growth in Enderby has been focused on the west side of the city, primarily in the Country Residential area west of Gunter-Ellison Road and in the area south of Johnston Avenue. The Knoll Neighbourhood Conceptual Plan provides direction for development south of Johnston Avenue, and will be able to accommodate between 800 to 1250 units and a population of 1500 to 2300 over the next 30 to 40 years.

4.2.2.3 IR2 ENDERBY

Splatsin's Enderby IR2 Enderby is located on the southern edge of the City of Enderby. The southern end of the study area passes through the northern portion of IR2. Most of the industrial and commercial development in IR2 Enderby is concentrated along the highway, near the intersection of Back Enderby Road and Quilakwa Crescent / Canyon Road. There are approximately 125 private dwellings in IR2. Many of the residential dwellings are situated along Canyon Road and Baptiste Road. In 2015, the Splatsin Band obtained 29 acres of the abandoned CP rail corridor.

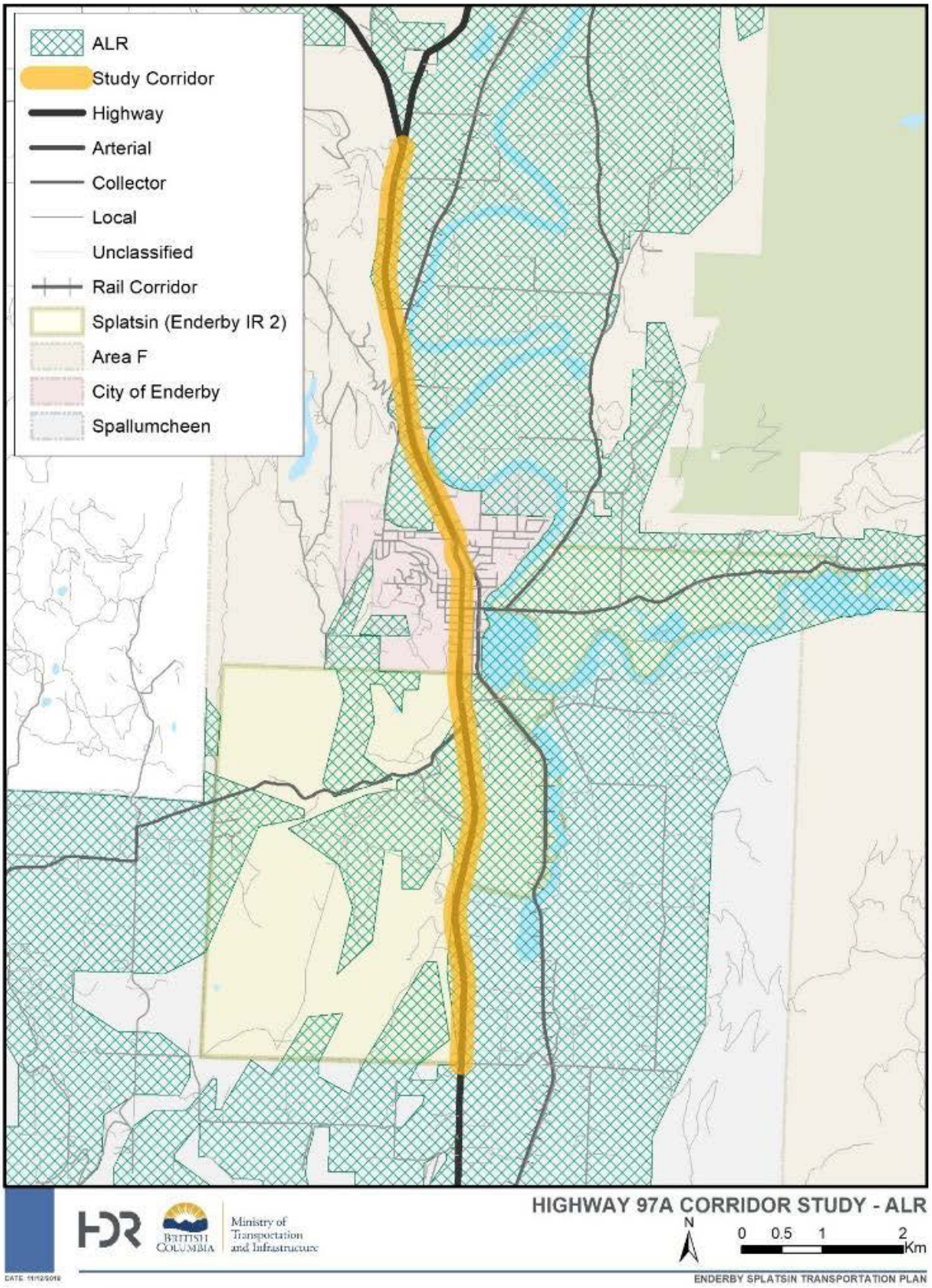
Community amenities include the Splatsin Community Centre, the Quilakwa Stop 'N' Shop, and the Splatsin Teaching Centre.

4.2.3 Industry and Economic Profiles

Highway 97A supports a range of economic activity. It provides access to employment centres and economic generators, and is a connection between the Okanagan Valley and markets to the east. Agriculture has historically been an important component of the local economy. In 2006, farm receipts were estimated to be worth over 100 million dollars and farms provided jobs for 4.6% of the labour force in the North Okanagan[1]. Provincial policies through the Agricultural Land Commission seek to preserve agricultural land and encourage farming on agricultural land. The current Agricultural Land Reserve (ALR) in the study area is shown in Figure 4-2.

[1] RDNO RGS Backgrounder: http://www.rdno.ca/docs/100525_backgrounder.pdf

Figure 4-2: Agricultural Land Reserve



4.3 Transportation Inventory

This section provides a summary of the existing physical transportation infrastructure in the study area. It includes descriptions of the study highway segments, highway intersections and control type, and the local and multi-modal transportation networks in the study area. This section provides the necessary background information to assess the performance of the transportation system.

4.3.1 Corridor Segments

The Highway 97A study corridor extends from Stepney Cross Road in the south to the Highway 97A/97B junction at the north, for a total length of 11.7 km. Within the Ministry's Landmark Kilometre Inventory (LKI) system, the corridor is in LKI Segment 1225, from km 20.8 in the south to km 32.5 in the north. The corridor has been split into three approximately uniform segments based on the road character and adjacent land uses.

South Segment (Stepney Cross Road to Enderby / Splatsin Boundary) is a two-lane rural arterial road, with several at-grade unsignalized intersections and private property accesses. Passing lanes are not provided along the segment, but passing is permitted for much of the length due to the generally straight and flat nature of the road.

Centre Segment (Enderby South Boundary to Enderby North Boundary) is the portion of the highway that passes through Enderby, and is classified as an urban arterial street. Two primary travel lanes are provided, with left turn lanes at major intersections. Intersection density within the town is high (<100m spacing between intersections in many locations), and private property accesses onto the highway are common. Highway 97A is signed as George Street within the City and is the primary north-south route in the town.

North Segment (Enderby North Boundary to Highway 97A/B Junction) is a two-lane rural arterial with several minor intersections and property accesses spaced along the section. Acceleration, deceleration, and northbound left turn lane are provided at the north end of the segment at the Highway 97A/B junction.

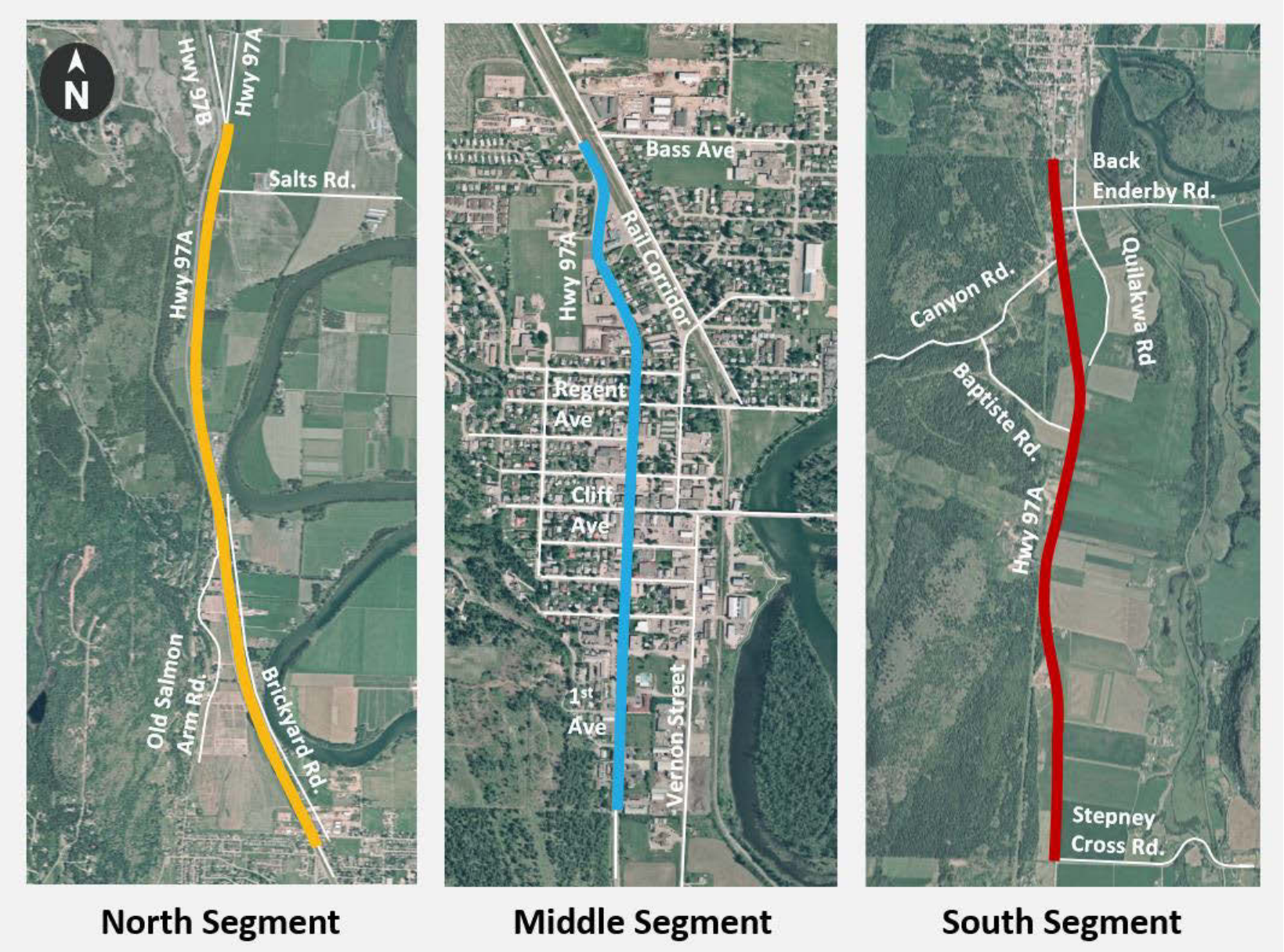
The segments and pertinent information are shown in Figure 4-3 and summarized in Table 3.

Table 3: Highway 97A Study Segments

Segment	Length (km)	Service Class	Posted Speed	Existing AADT*	Average Access Density (Accesses / km)	Shoulder
North - City of Enderby North Boundary (LKI km 27.7) to Highway 97A/B Junction (LKI km 32.5)	4.8	Rural Arterial	Varies 50 – 100 km/h	11,700	West – 3.8 East – 1.9	1.5m paved shoulder
Centre - Enderby-Splatsin Boundary (LKI km 25.7) to City of Enderby North Boundary (LKI km 27.7)	2.0	Urban Arterial	50 km/h	12,200	West – 17.5 East – 14.5	0.8 – 1.5m paved shoulder south of King St and north of Stanley Ave. Urban curb & gutter between
South - Stepney Cross Road (LKI km 20.8) to Enderby-Splatsin Boundary (LKI km 25.7)	4.9	Rural Arterial	Varies between 50 - 100 km/h	12,500	West – 3.1 East – 1.8	1.5m paved shoulder

* Existing AADT – Average annual daily traffic, based on Parson's report from 2017.

Figure 4-3: Study Corridor Segments



4.3.2 Highway 97A

The existing laning configurations and traffic controls along Highway 97A and between each significant intersection are presented in this section.

4.3.2.1 LANING AND INTERSECTION CONTROL

Figure 4-4 shows the lane configurations and traffic control through the study area intersections on Highway 97A. Most intersections are two-way stop controlled with free-flow on Highway 97A, with the exception of the Highway 97A intersections at Hubert Ave and Mill Ave within Enderby, which are signalized.

The right of way for the rural portions of Highway 97A is 30 metres, with paved and graveled shoulders varying between 0.8 – 1.5 metres in the rural sections. Within Enderby, the highway has an urban cross section with curb, gutter and sidewalks, and a right-of-way as low as 18 metres in some areas.

There are a number of other minor accesses and intersections along the highway. A full inventory of these accesses is included in **Appendix D**.

Figure 4-5 shows the posted speed limits along the corridor. The posted speed is 100 km/h at the southern extent of the study area. It drops to 60 km/h south of Canyon Road, and then to 50 km/h at the Splatsin – Enderby boundary. Through Enderby the posted speed limit is 50 km/h, increasing to 100 km/h north of Enderby. The speed drops again approaching the Highway 97A/B junction to 90 km/h.

Appendix E includes pavement condition reports for the study corridor

Figure 4-4: Lane Configuration at Study Area Intersections

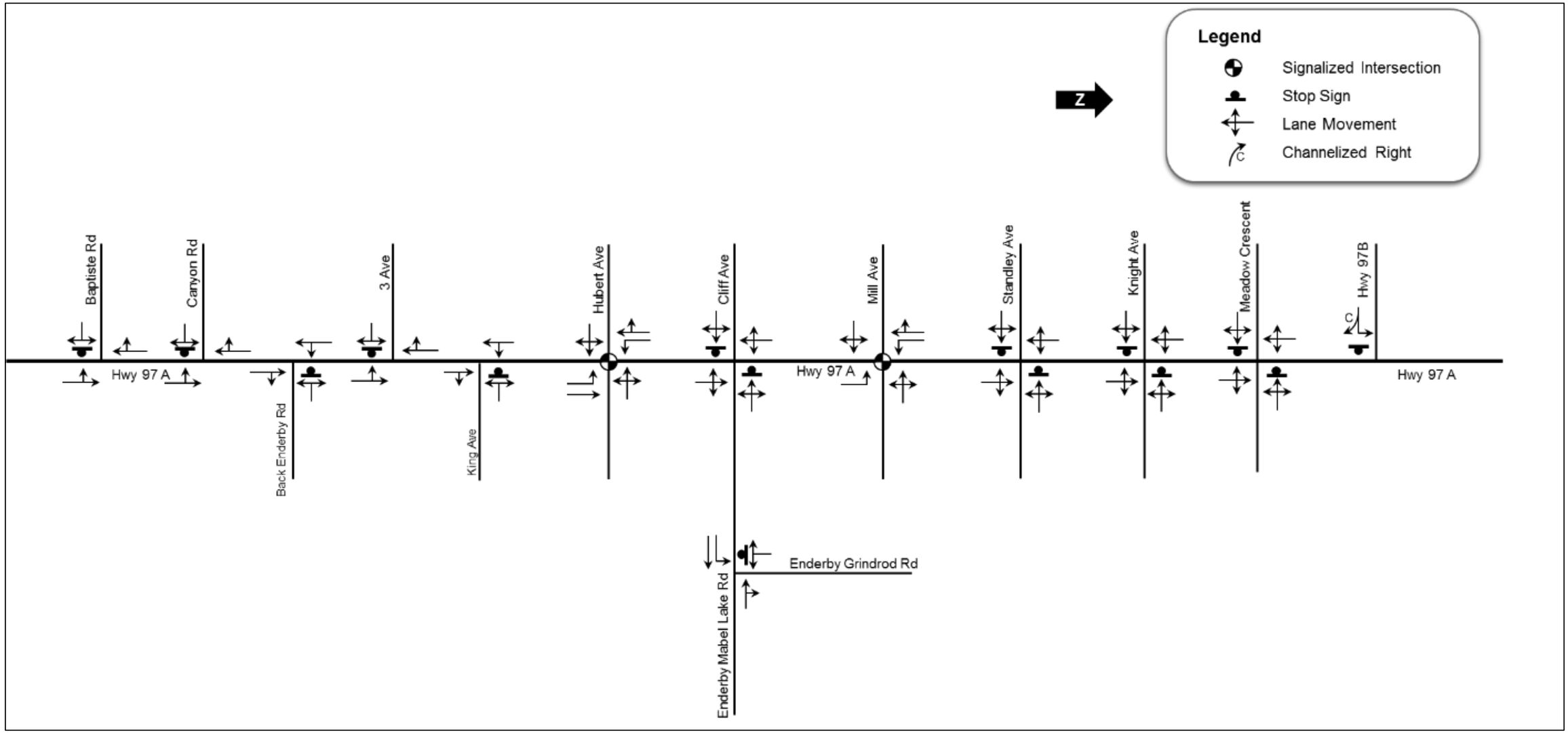
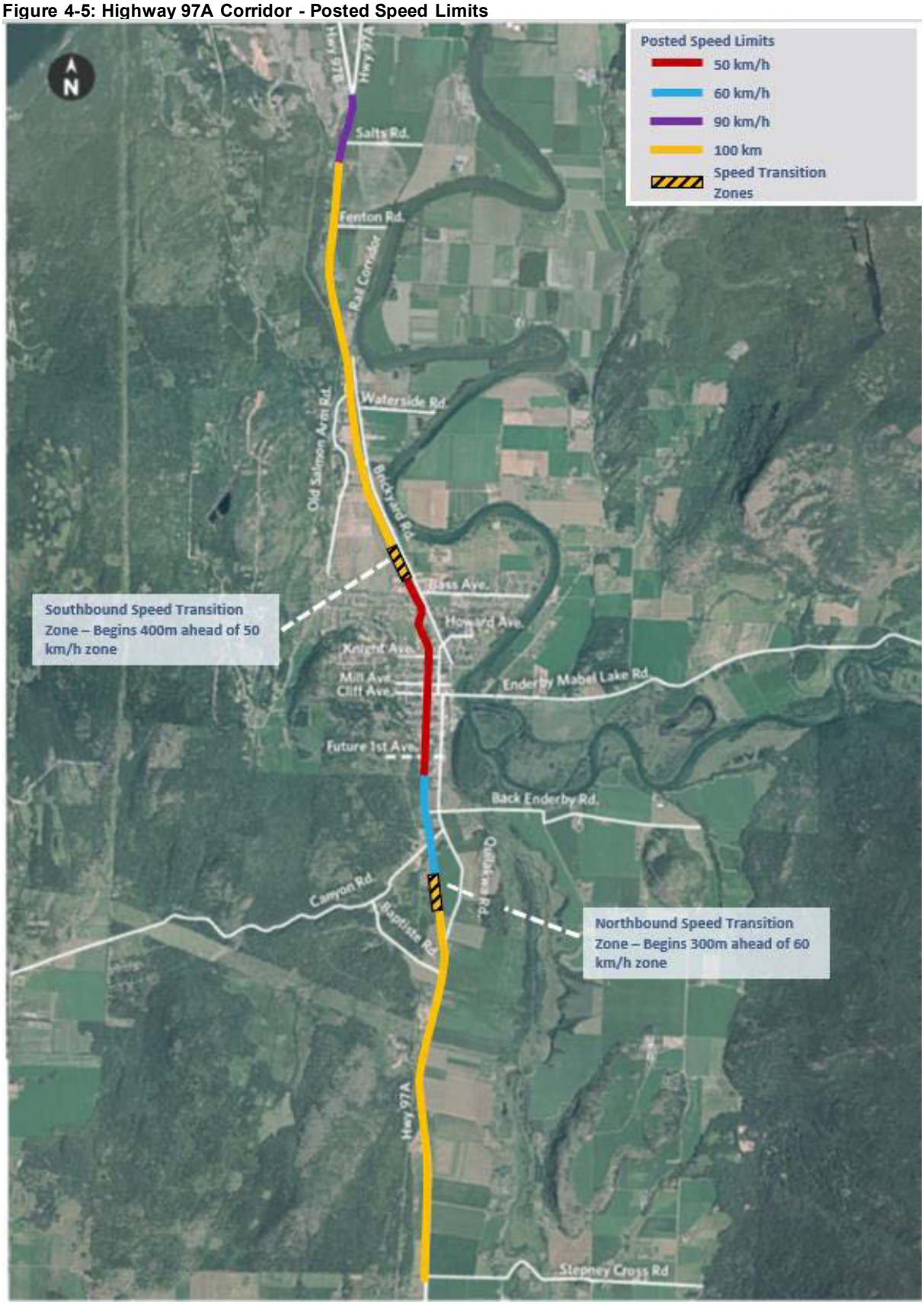


Figure 4-5: Highway 97A Corridor - Posted Speed Limits



4.3.3 Local Network

In addition to its role as a significant provincial and national corridor, Highway 97A is the primary north-south route for travel within Enderby and IR2 Enderby, and is therefore an important component of the local transportation network. The following provides an overview of the local networks.

4.3.3.1 ENDERBY

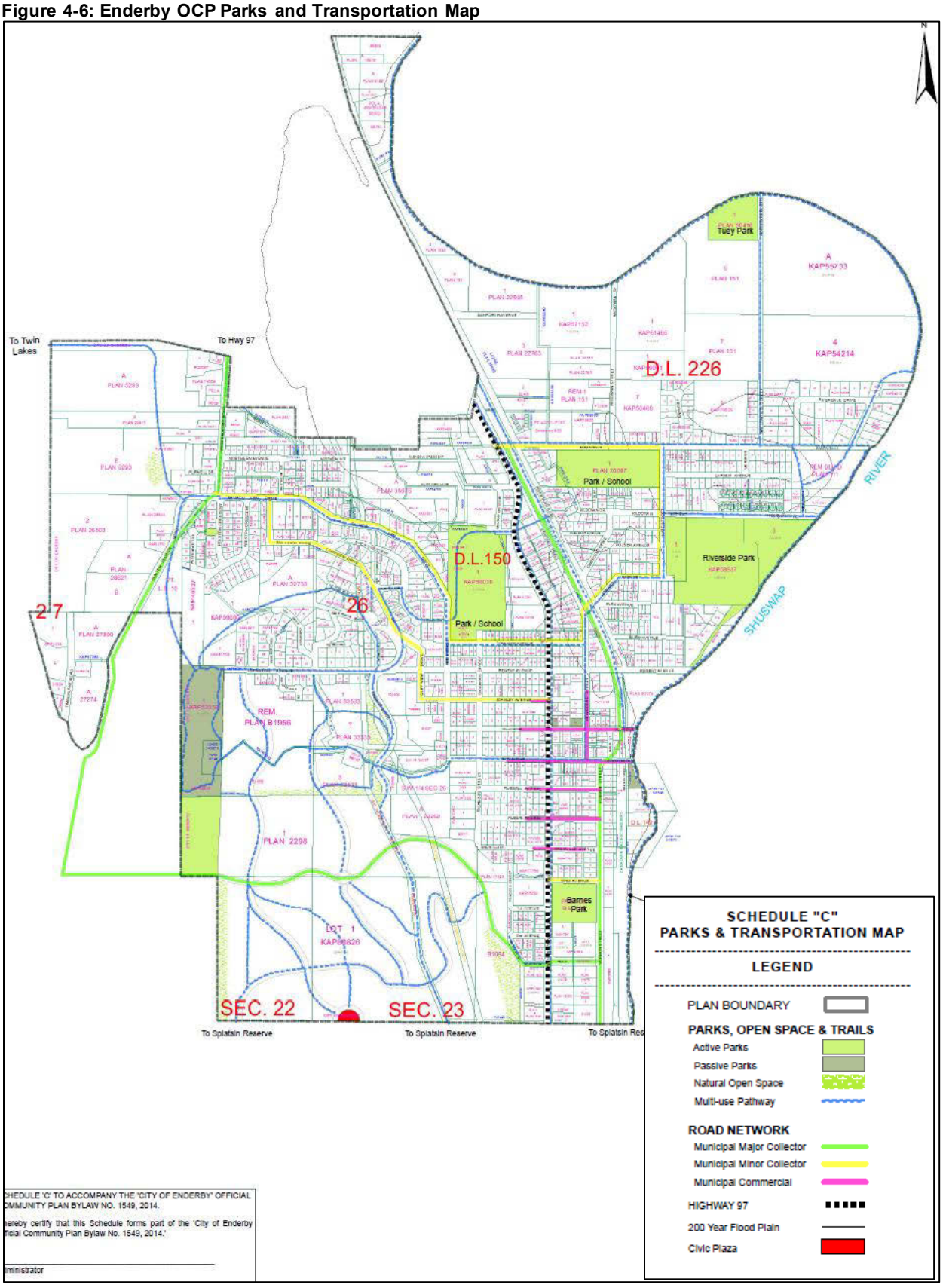
Streets in Enderby are designated as local, minor collector, major collector and commercial. The commercial streets are primarily those that cross Highway 97A through the core of the city, plus Belvedere Street, which parallels the highway. The most significant of these commercial streets is Cliff Avenue, which serves as Enderby's "main street" and provides an eastern connection into the IR2 Enderby, the Regional District of North Okanagan and ultimately to Mabel Lake.

The City's OCP Parks and Transportation Map shown Figure 4-6 indicates a future major collector street along the former rail right-of-way at the north end of the City, connecting to Vernon Street to the south. On the west side of the city, the OCP shows a future major collector from 1st Avenue, extending north and west, eventually connecting to Gunter Ellison Road and West Enderby Road. The minor collector streets generally provide access into the residential areas on either side of the highway on the north side of the city. King Avenue is also designated as a minor collector, providing a connection between Highway 97A and Vernon Street an access to a variety of land uses, including Barnes Park.

4.3.3.2 IR2 ENDERBY

Canyon Road is the primary east-west connection to Highway 97A, and provides access to the core of the Splatsin community. Baptiste Road provides access to a number of residences and is a connection between Highway 97A and Canyon Road. On the east side of the highway, Quilakwa Road connects to Old Vernon Road to the north, which becomes Vernon Street in Enderby. Enderby Mabel Lake Road is the easterly extension of Cliff Avenue, and is an important route in the region, providing access to Mabel Lake. There are several other minor streets that primarily serve a local function.

Figure 4-6: Enderby OCP Parks and Transportation Map



4.3.4 Active Transportation

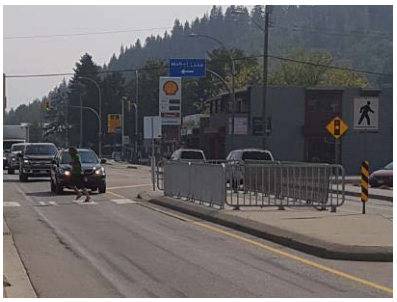
Active transportation is increasingly becoming an important consideration on local networks and the highway system. Existing pedestrian and cycling facilities are shown in Figure 4-7.

4.3.4.1 SIDEWALKS

Sidewalks and other pedestrian facilities along Highway 97A are mostly within the City of Enderby. The existing pedestrian facilities within Enderby are primarily sidewalks, which are currently generally monolithic.

Sidewalk along Highway 97A

The quality of sidewalks along Highway 97A is highly variable, as are the finished surfaces and width. Between Stanley Avenue and the Howard Johnson's access, the sidewalks are separated from the road, with the amount of separation between the sidewalk and the highway varying.



Mid-Block Pedestrian Crossing

Signalized east-west pedestrian crossings are provided at Mill Ave, and Hubert Ave. There is also a pedestrian activated half-signal at Knight Ave, a signalized crossing at King Ave and an unsignalized midblock crossing with a refuge island between Russell Ave and Cliff Ave.

Most roads adjacent to Highway 97A in Enderby have sidewalks on at least one side of the street. Several roads in central Enderby including Russell Ave, Cliff Ave, Belvedere St, and Mill Ave have sidewalks on both sides. The recent renewal of Cliff Ave, Enderby's main street, included significant improvements to the pedestrian realm and streetscaping, including a raised intersection at Belvedere Street and a gateway feature at Highway 97A. The renewal will link to the Jim Watt Heritage River Walk - a paved pedestrian pathway that runs along the Shuswap River from Kildonan Ave to just south of Granville Ave.

Sidewalk types and conditions are variable

Figure 4-7: Study Corridor - Existing Pedestrian Facilities & Pathways

4.3.4.2 PATHWAYS

The City of Enderby's OCP Parks and Transportation map shows a number of planned multi-use pathways that would cross or travel along Highway 97A within Enderby, including on:

- Highway 97A from the northern to southern city limit
- Knight Avenue
- Meadow Crescent
- Cliff Avenue
- 1st Avenue

4.3.4.3 RURAL FACILITIES

Outside the City of Enderby, dedicated pedestrian or cycling facilities along Highway 97A include:

- A trail on the west side of the highway connecting the gas station at Canyon Road and the southern border of Enderby. The trail's quality is not consistent, with its surface material varying between asphalt, gravel, and dirt.
- A pedestrian activated signalized crossing at Canyon Road

There are many off-road trails in the area that do not connect directly with Highway 97A.

4.3.4.4 CYCLING

In Enderby, there are several marked cycling lanes in addition to the previously noted trails and pathways. Stanley Avenue connects the downtown area from Highway 97A (George Street) to Francis Drive via Cliff View Drive with a marked bike lane on both sides of the street. There is a short section of pathway that connects Stanley Ave at Highway 97A to Belvedere Street. Knight Avenue provides a marked bike lane from Highway 97A to Cliff View Drive via Salmon Arm Drive. Local roads running parallel to Highway 97A may also serve as suitable de-facto routes for local cyclists.

There are paved shoulders along much of Highway 97A outside of Enderby that are used for cycling.

4.3.4.5 SICAMOUS TO ARMSTRONG RAIL TRAIL

The Columbia Shuswap Regional District, RDNO, and Splatsin have acquired the former CP rail corridor between Sicamous and Armstrong. The intent is to develop the corridor for use as a recreational cycling and pedestrian trail and potentially a future multi-modal regional active transportation corridor. The corridor is shown in Figure 4-8. At present there is no timeline for the development of the trail or financial commitments.

There is also the potential to connect this corridor to the Okanagan Rail Trail in the south, which would eventually create a continuous trail from Penticton to Sicamous.

Figure 4-8: Sicamous to Armstrong Rail Corridor (Source: CSRD)

4.3.5 Transit

4.3.5.1 LOCAL TRANSIT

Transit service is provided to the City of Enderby and on the Highway 97 corridor by BC Transit as part of the regional transit service system. Route 60 is a commuter route connecting Enderby to Armstrong and Vernon with 4 weekday trips in each direction to Enderby. Route 11 connects Enderby to Salmon Arm with two trips in each direction on Wednesdays only. The bus stops along the study corridor are shown in Figure 4-9,with a formalized bus stop at Mill Avenue / City Hall, and informal stops near Canyon Road on Highway 97A. Bus departure and arrival times of the two routes are scheduled to allow for transfers between the routes.

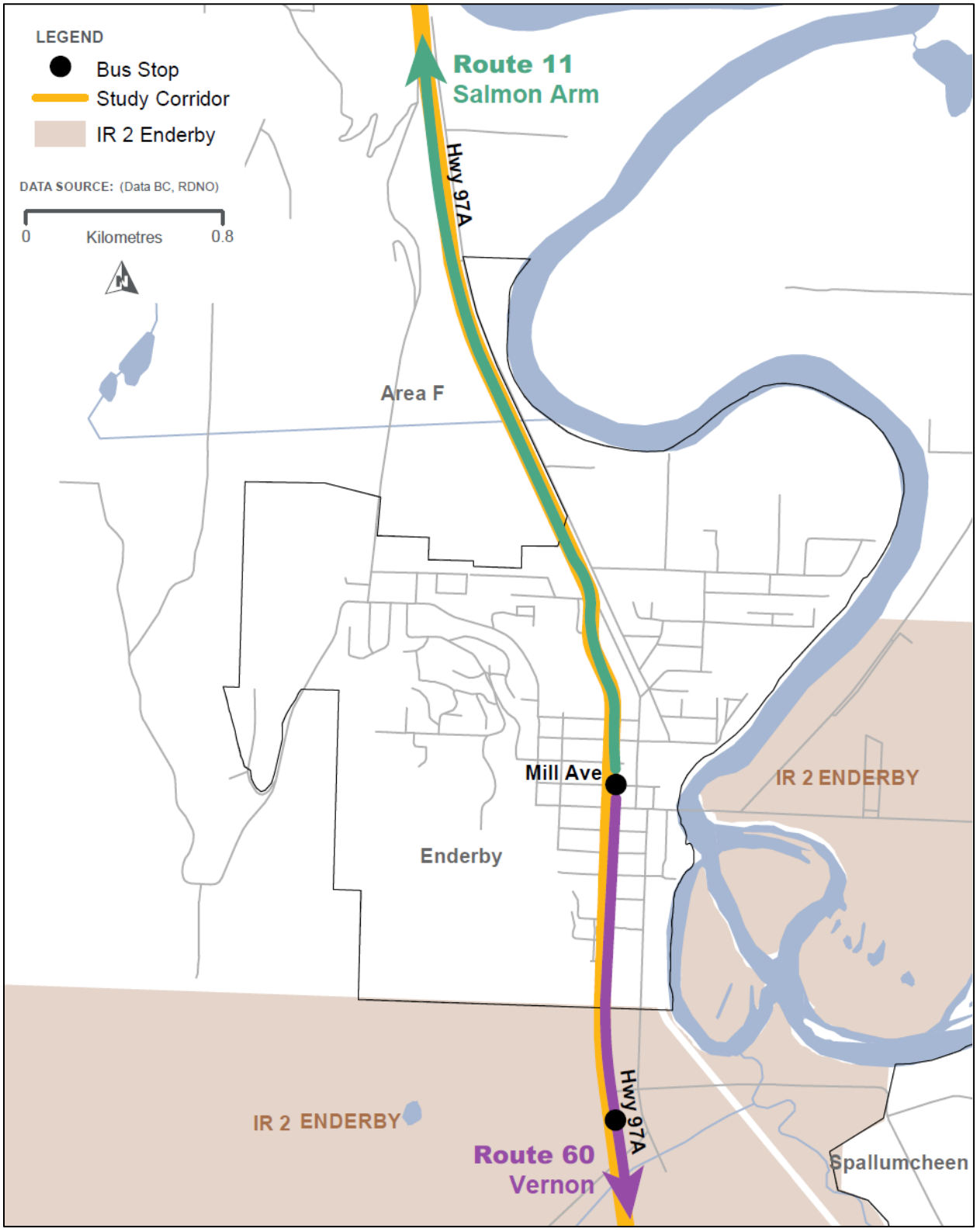
4.3.5.2 INTERCITY TRANSIT

Greyhound Canada discontinued intercity bus service between Salmon Arm and Kelowna, including stops in Enderby, Armstrong, and Vernon. Ebus now operates a new intercity service between Kelowna and Kamloops via Vernon, and the service stops in Enderby, with the bus stop located at the Enderby Chamber of Commerce (on the corner of Vernon Street and Cliff Avenue).

4.3.6 Infrastructure Condition

The section of Highway 97A between the north side of Enderby and the Highway 97A/B junction is scheduled to be repaved in 2021.

Figure 4-9: Local Transit Service



4.4 Existing Transportation System Performance

This section provides a summary of the operation of the existing highway corridor, detailing how the highway is used, its operations, and the existing safety and reliability data. Active transportation and transit are also described. A full description of existing performance can be found in **Appendix F.**

4.4.1 Highway Use

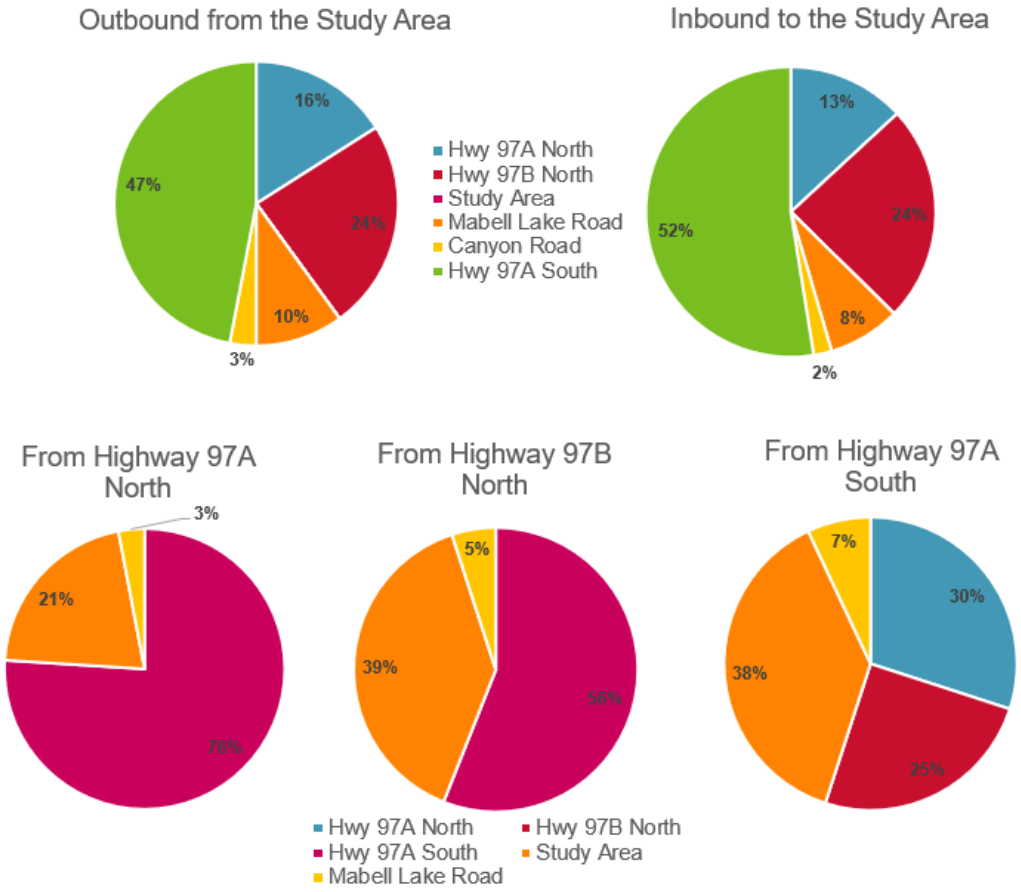
4.4.1.1 COMMUTING

A high portion of residents within the study area commute to destinations outside their home community for work. Travel by personal vehicle is the highest of all modes for both Enderby and Splatsin, and is higher than the provincial and national averages. Public transit use is minimal, and to-work travel via walking, cycling and other modes is relatively high for both communities at 11% for IR2 and 12% for Enderby.

4.4.1.2 ORIGINS AND DESTINATIONS

Origin and destination data for vehicle trips in the study area was retrieved from the *2018 Enderby Data Collection Program*. Figure 4-10 shows the travel patterns for both directions on Highway 97A, and the Internal to External patterns for the study area.

Figure 4-10: Origin Destination Relative Flows



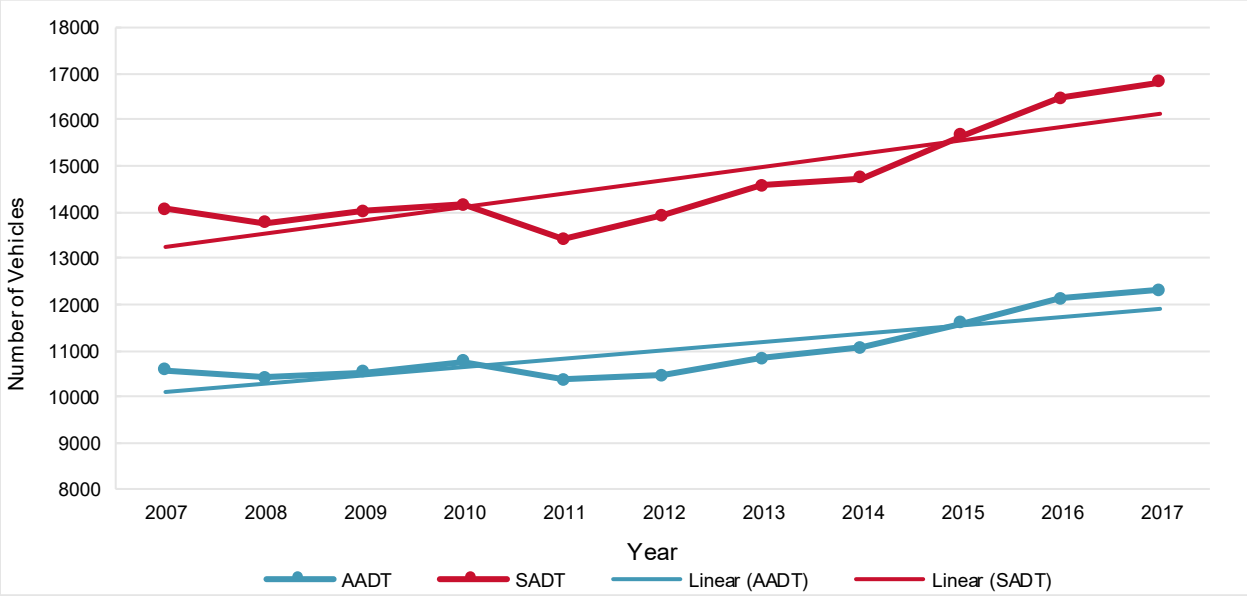
Approximately half off all trips that either begin or end within the study area are from the south on Highway 97A. The remaining trips are then split between Highway 97A (north), Highway 97B (north), Mabel Lake Road and Canyon Road.

The origin destination information shows that approximately 20 to 40% of vehicles traveling on Highway 97A are destined to the study area, and the majority of the remaining trips are destined to travel through the study area to north / south.

4.4.2 Existing Traffic Volumes

A permanent count station (P-24-1NS) is located on Highway 97A south of the Stepney Road intersection, at LKI 1225 km 18.10. Although outside the study area, it is the closest permanent count station and provides a good representation of traffic characteristics on the study corridor. Figure 4-11 shows the historical Annual Average Daily Traffic (AADT) and Summer Average Daily Traffic SADT traffic at this count station, for 2017.

Figure 4-11: Highway 97A Historical Traffic Growth

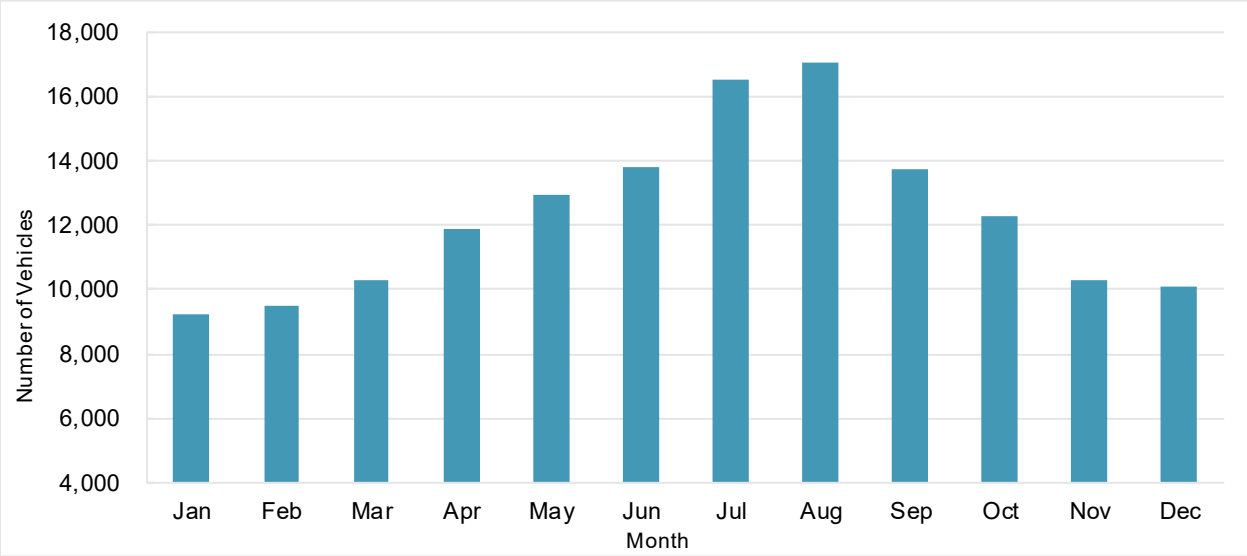


The average growth (non-compounded) on Highway 97A was 1.6% for AADT and 1.9% for SADT. The SADT is also considerably higher than the AADT, with daily volumes between 3,000 and 4,000 vehicles per day higher. SADT was between 29% and 36% higher than the AADT during the 10-year period, and increased at a higher rate than the AADT.

Monthly variations in traffic are presented in Figure 4-12. The graph shows significant peaking in the summer months, with daily traffic recently exceeding 16,000 vehicles per day in July and August.

Non-summer traffic volumes are considerably lower, ranging between 9,000 and 14,000 vehicles per day, with the winter months of January and February having the lowest daily volumes. Traffic growth over the past ten years appears to have been uniformly distributed over all of the months.

Figure 4-12: Highway 97A Monthly Traffic Profile



The AADT and SADT on Highway 97A were also reviewed for each of the study segments, and review is summarized in Table 4. There are small variations in AADT and SADT, with the higher daily volumes occurring on the South Segment. The SADT to AADT ratio through the study area is 1.32.

Table 4 : 2017 AADT and SADT Volumes by Study Segement

Highway 97A Study Segment	AADT	SADT
South Segment	12553	16625
Centre Segment	12193	16147
North Segment	11689	15480

Traffic volumes at specific intersections along the corridor were collected and analyzed, and more detail can be found in Appendix F.

4.4.3 Highway Operation

4.4.3.1 SEGMENT LEVEL OF SERVICE

A two-way/two-lane Level of Service (LOS) analysis was conducted for the two rural highway segments (North and South) using Highway Capacity Software (HCS) version 7.7. Table 5 summarizes the LOS and volume-to-capacity (v/c) ratio for the two-lane rural highway study segments.

Table 5: HCS Segment Operation

Segment	LOS	v/c
South Segment	E	0.62
North Segment	E	0.58

Both rural segments are currently operating at LOS E and with v/c ratios of 0.62 and 0.58 for the South and North Segments respectively. This indicates that travel speeds on both segments are likely constrained, because drivers will be closely following the vehicle in front of them.

4.4.3.2 INTERSECTION LEVEL OF SERVICE

Intersection operations were assessed using Synchro Version 9.1, using the Highway Capacity Manual (HCM 2000) methodology published by the Transportation Research Board National Research Council. Detailed results can be found in **Appendix G**.

The eastbound movement at the intersection of Highway 97A and Canyon Road is operating at LOS E in the PM peak hour. This is due to the high conflicting volumes on Highway 97A, and the moderately high demand for this movement (approximately 100 vehicles in the PM peak hour). These findings are consistent with the existing operation reported in the *2018 Technical Memo* by *McElhanney,* which provided a detailed review of the intersection.

All of the remaining intersections and movements are currently operating within acceptable performance thresholds.

4.4.3.3 TRAVEL TIME

Using Synchro, five runs of SimTraffic simulation were conducted to evaluate the travel time along Highway 97A within the study area during the AM and PM peak hours. The travel time for each segment is shown in Table 6.

Table 6: Highway 97A Travel Time

Segment	Direction	Length (km)	Travel Time (mm:ss)	Average Speed (km/h)
South Segment	SB	4.5	03:12	84
	NB		03:05	88
Centre Segment	SB	2.6	03:05	51
	NB		02:52	44
North Segment	SB	4.5	03:02	89
	NB		03:34	84
Total	SB	11.6	09:18	75
	NB		09:31	73

The travel speeds within the Centre Segment are the lowest, whereas travel along the South and North Segments are generally free flow.

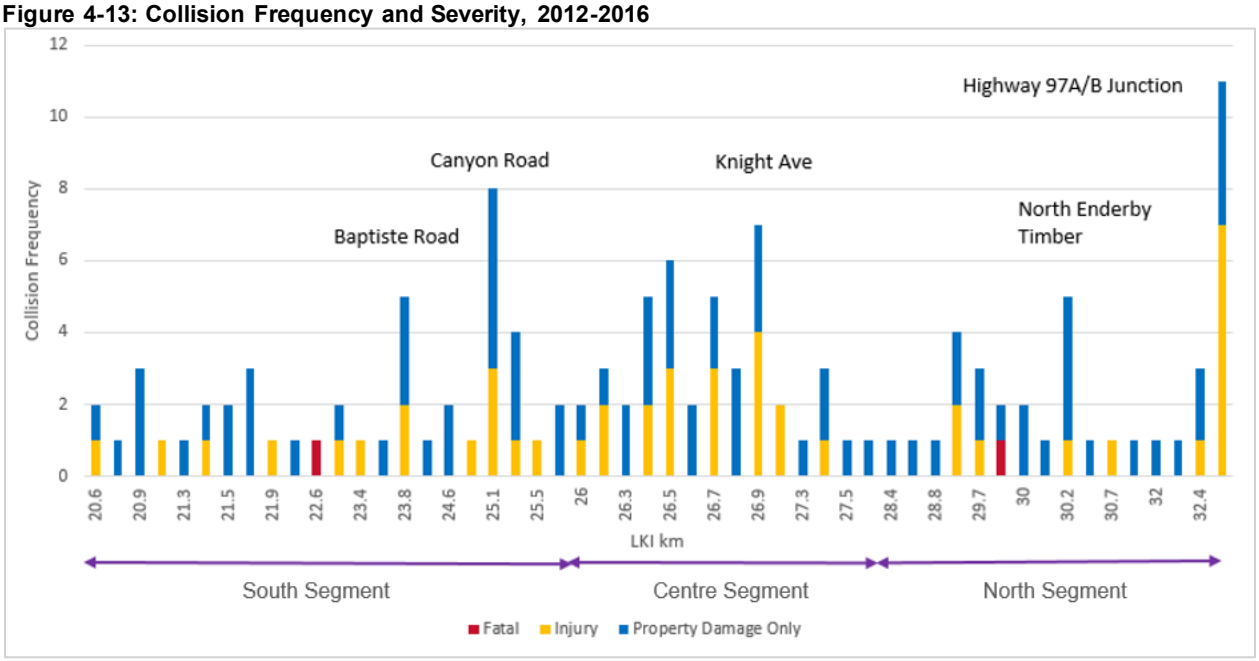
4.4.4 Highway Safety

4.4.4.1 COLLISION OVERVIEW

The MoTI provided historical collision data from the Collision Information System (CIS) for the years 2012 to 2016. The most recent dataset for 2017 was still incomplete when this collision overview was completed.

Figure 4-13 shows the location and frequency of collisions along the corridor. The highest collision frequency locations are Baptiste Road, Canyon Road, Russell Avenue and the junction of Highway 97A/B. The greatest concentration of collisions is within the urban section of Enderby.

Figure 4-13: Collision Frequency and Severity, 2012-2016



4.4.4.2 COLLISION RATES & SEVERITY

The observed collision rate was calculated and compared with the provincial average and critical collision rate. The observed collision rate is compared with the critical and provincial average collisions rates in Table 7.

All segments have observed collision rates that are above both the provincial average collision rate and the critical collision rates. There are however less than 15 collisions per year on each segment, which is typically the threshold to identify a segment as “collision-prone”. The collision severity for each segment is also lower than the Provincial Average Collision Severity Index.

Table 7: Collision Rates

Segment	Observed Collisions (2012- 2016)	Observed Collision Rate (C/MVK)	Provincial Average Collision Rate (C/MVK)*	Critical Collision Rate (C/MVK)	Frequency (Average Collisions/Year)
South Segment (RAU2)	42	**0.42**	0.26	0.40	8.4
Centre Segment (UAU2)	44	**1.11**	0.53	0.84	8.8
North Segment (RAU2)	38	**0.43**	0.26	0.40	7.6

* 2012 – 2016 Provincial Average Collision Rates by highway service class and AADT range

4.4.5 Highway Reliability

9 highway closure occurrences occurred in the study area between 2006 and 2017, with most closures lasting between three and five hours. The study segment experience an average of 3.0 closure hours per year.

4.4.6 Infrastructure Condition

The pavement condition along the study corridor is fair to good, with a Pavement Condition Rating (PCR) greater than 5.0 on all segments.

4.4.7 Active Transportation

4.4.7.1 PEDESTRIAN NETWORK ASSESSMENT

Pedestrian data at the study area intersections is available from the turning movement counts summarized in the *2018 Enderby Data Collection Program*. Pedestrian volumes within Enderby are generally low, with the intersection of Highway 97A and Mill Avenue being one of the busiest locations for pedestrian activity along the highway. At this intersection, 20 to 30 people were observed to be crossing at the intersection during the AM and PM peak hours, or the equivalent of around 1 person every 2-3 minutes.

Pedestrian volumes outside of the city are lower still, but there is a relatively strong pedestrian demand for crossing Highway 97A north of Canyon Road at the controlled crossing. A total of 86 pedestrians used the crossing on the count day of Tuesday July 18, 2017, with peak crossing demands occurring during the mid-day period of 11:00 – 1:00 pm.

Sidewalks are generally provided along Highway 97A within Enderby, but are missing in some sections at the north and south ends of the City. Active transportation facilities outside of Enderby are limited to a trail on the west side of Highway 97A between the south end of Enderby and Canyon Road.

Pedestrians traveling on Highway 97A north of Enderby and south of Canyon Road must use the highway shoulders.

4.4.7.2 CYCLING NETWORK ASSESSMENT

Cycling volumes at the study area intersections were very limited, and no data was available for the off-street paths and cycling facilities.

Designated cycling facilities are not provided on Highway 97A, and cyclists are required to use either the driving lanes or the shoulders, which are provided on the highway at the southern / northern extents of Enderby and outside of the City. The RiverWalk is the primary active multi-use pathway in the study area, and runs along the west side of the Shuswap River, between the Kildonan Boat Launch and Granville Ave.

4.4.7.3 TRANSIT NETWORK ASSESSMENT

Based on the data from the 2016 Census, less than 20 people from the study area used public transit to travel to work each day. There are two outbound bus trips (Route 60) from the City in both the morning and afternoon.

4.4.7.4 ACTIVE TRANSPORTATION & TRANSIT SUMMARY

The active transportation network within the urban portion of the study area (Enderby and Splatsin) provide varying levels of quality. Sidewalks are provided on many streets, and pedestrian levels of service within the City of Enderby are C and D in some areas where sidewalks are provided, and vehicle travel speeds are lower. Cycling facilities are also provided at some locations, and the levels of service of the highway shoulders in the areas outside of Enderby and with lower operating vehicle speeds are C and D in some areas. Transit service to the area is currently limited, with limited use of the existing service.

5 Future Conditions

5.1 Future Population and Economic Growth

As documented in the existing conditions section, travel demand on Highway 97A has grown in the past 10 years. Travel demand is forecasted to continue to grow, and future traffic growth is anticipated to be primarily driven by:

- Population growth within the study area communities of Enderby, Splatsin (Enderby IR-2) and North Okanagan - Electoral Area F,
- Population growth outside of the study area but in the neighbouring North Okanagan communities (Sicamous, Salmon Arm, Vernon, etc.), and the Okanagan Valley as a whole; and,
- Increased economic activity within the study area and the Okanagan Valley

All of these sources will add to travel demand on Highway 97A. This section explores how these factors relate to traffic growth, including historical growth patterns on Highway 97A and Highway 1. Forecasts for each growth source are discussed, as are the relationships between population growth and highway traffic growth.

5.1.1 Internal Population Growth

This section provides a review of the historical population growth within the study communities and provides future population growth rate estimates.

5.1.1.1 HISTORICAL GROWTH

The historical population of the study area communities is shown in Figure 5-1, based on Statistics Canada Census Data. The total population in the study area increased from approximately 7,000 to 7,300 between 1996 and 2016, which equates to an annual growth rate of approximately 0.2%. The 2016 populations of the communities are labelled on the right side of the graph.

Figure 5-1: Historical Study Area Population Growth

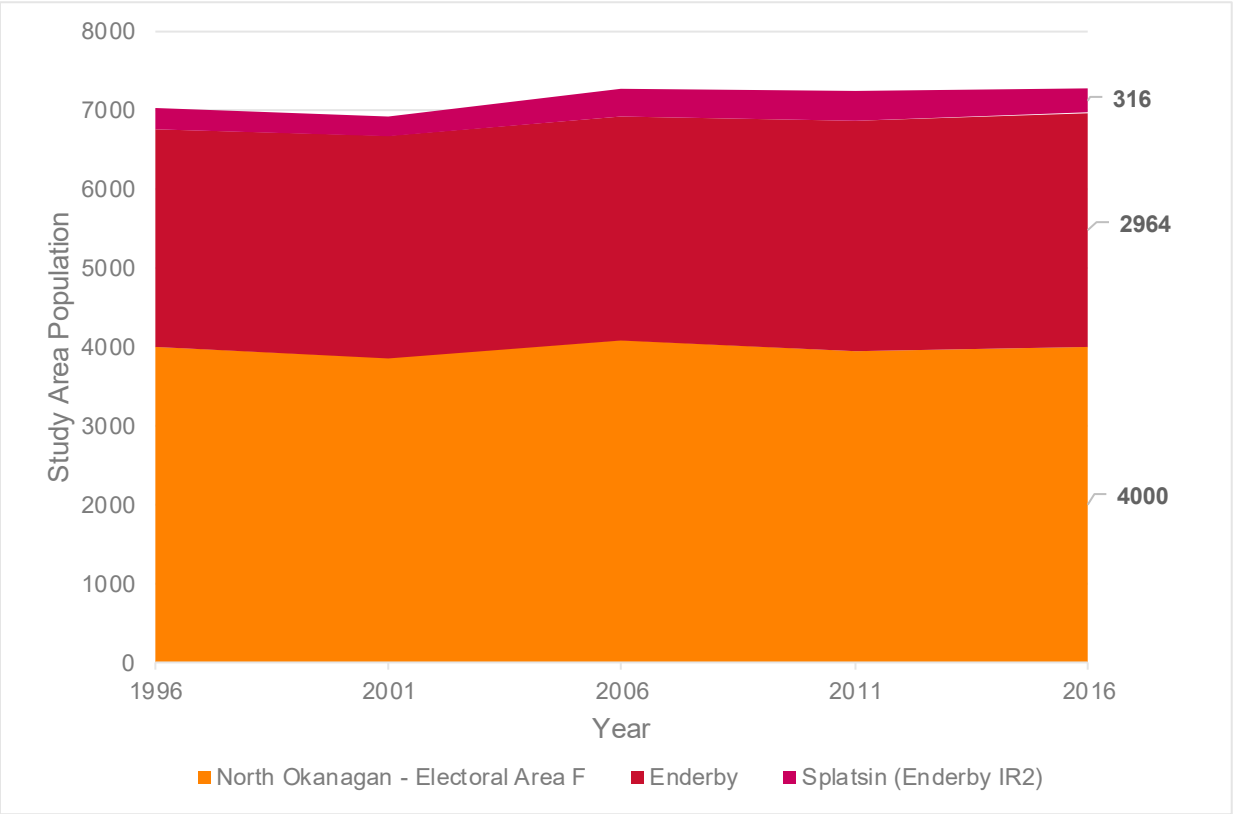


Table 8 shows the share of population growth between the three communities in the past 20 years (1996 – 2016).

Table 8: Historical 20-Year Population Growth Share

Community	Electoral Area F	Enderby	Splatsin	Total
Population Growth (1996-2016)	3	210	49	262
Population Growth Share	1%	80%	19%	100%

5.1.1.2 PROJECTED GROWTH

The study area communities are within the Enderby Local Health Area (LHA), and the majority of the LHA population is within the Electoral Area F, Enderby and Splatsin. BC Stats provides population growth forecasts at the LHA level through the PEOPLE[2] model. The forecast for the Enderby LHA is shown in Table 9.

[2] PEOPLE (Population Extrapolation for Organizational Planning with Less Error) Model 2018 - https://www.bcstats.gov.bc.ca/apps/PopulationProjections.aspx

Table 9: Enderby Local Health Area - Population Growth Forecasts

Year / Horizon	Forecast Population	Forecast Growth (in preceding 5 years)
2018	7288	-0.07%
2023	7506	0.59%
2028	7720	0.56%
2043*	8090	0.29%

* - Population projects were not provided for 2043 but were available up until 2041. 2043 values were extrapolated.

Annual projected growth over the next 25 years ranges between 0.29% and 0.59%, with an average annual growth rate of 0.42%.

5.1.1.2.1 North Okanagan - Electoral Area F

Electoral Area F has a current population of 4,000 residents, and has experienced essentially no growth since 1996 (3,997 in 1996 vs. 4,000 in 2016). No measurable future population growth is anticipated for Electoral Area F.

5.1.1.2.2 Enderby

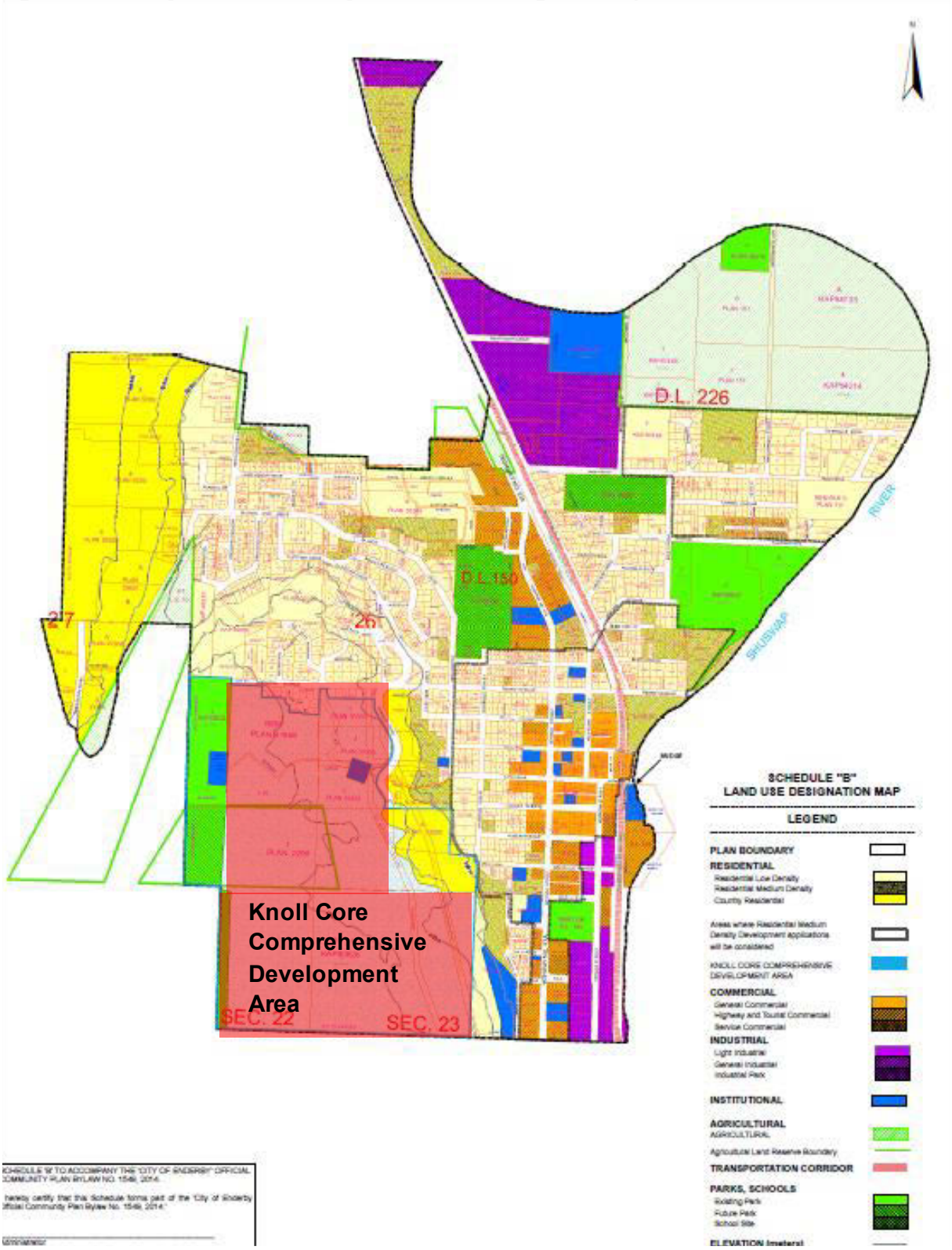
The population of Enderby has grown at an annual rate of approximately 0.5% in the past 10 years. Future population growth rates for the City of Enderby area have been reported in various documents, some of which are summarized in Table 10.

Table 10: Enderby Growth Assumptions in Previous Studies

Document	Year	Rate	Description
City of Enderby Official Community Plan	2014	1.5%	Based on the regional growth strategy, which projected a rate of 1.46%
North Okanagan Regional Growth Strategy	2011	1.46%	The plan forecasts a North Okanagan average growth rate of 1.12% annually up to 2031
North Okanagan Shuswap Corridor Management Plan	2002	1.3 – 1.7%	Regional growth estimate for the North Okanagan

According to the City of Enderby Official Community Plan (OCP), the community currently has approximately 200 infill lots that can be developed. Once these lots are built out, development will be focused within the Knoll. The Knoll is located in the southwest quadrant of the City and is highlighted in Figure 5-2. According to the Knoll Neighbourhood Concept Plan, this new development can accommodate between 800 and 1,250 residential units (approximately 1,500 to 2,300 residents) and is large enough to accommodate 40 to 60 years of development at a study area population growth rate of 0.5%. Access to the Knoll is expected to be provided from Cliff Avenue and a planned extension of 1st Avenue, connecting to Highway 97A.

Figure 5-2: Enderby Official Community Plan Land Use Designation Map



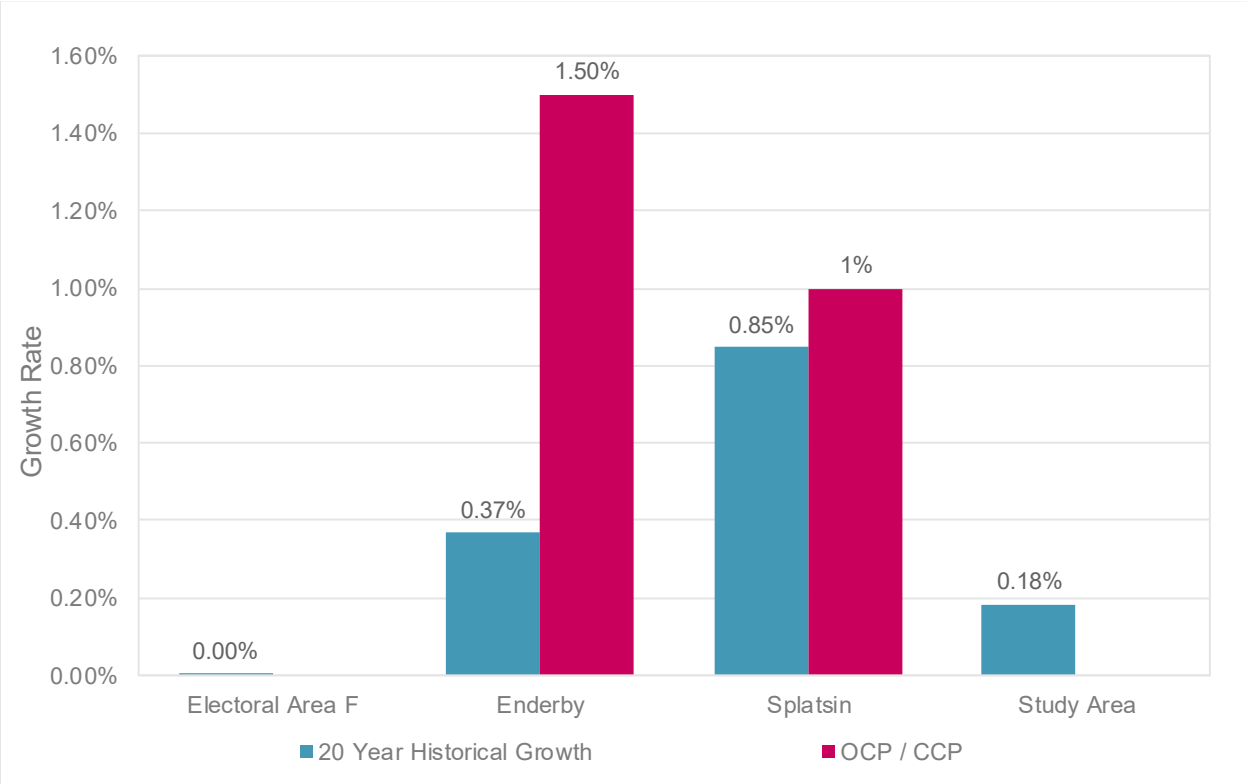
5.1.1.2.3 Splatsin (Enderby IR2)

The 2013 Splatsin Comprehensive Community Plan (CCP) forecasts a population growth rate of between 1% and 2% annually. Splatsin is currently developing their Integrated Land use and Transportation Plan, which may influence the growth rate and patterns in the community.

5.1.1.2.4 Future Population Growth Rate

Figure 5-3 provides a summary of the historical population growth rates for the communities and the forecasted growth rates for the region. The study area includes all three communities (Electoral Area F, Enderby and Splatsin). The historical growth rates for the communities and the region have been lower than future growth rates provided in the Enderby OCP and Splatsin CPP.

Figure 5-3: Comparison of Historical and Future OCP/CCP Growth Rates



PEOPLE forecasts are often the most reliable regional growth forecasts given the rigour involved the forecasting methodology, and because regional growth sums to a provincial total. The PEOPLE population forecast for the Enderby Local Health Area averages 0.42% annually to 2043.

For the purpose of the study, a population growth rate of 0.5% for the study area has been assumed. It is slightly higher than the PEOPLE LHA forecast, allowing for consideration of new economic development possibilities that may affect population growth. The future growth has been allocated to the study area communities based on their share of the growth over the past 20 years, as shown in Table 8.

5.1.2 External Growth

Economic growth in the region and beyond will influence future travel demand in the study area. For example, as demonstrated in the existing conditions assessment, the proportion of study area residents that commute outside the study area for work is high, and many from neighbouring areas commute to the study area communities for work. The population growth projections for the neighbouring communities are presented below.

5.1.2.1 NORTH OKANAGAN

The BC Stats PEOPLE forecast indicates a 20-year population growth rate of 0.8% annually for the North Okanagan Regional District (NORD). This rate is considerably higher than the expected growth rate for the study area communities, but includes areas such as Vernon that are anticipated to grow much faster than the smaller, rural communities.

5.1.2.2 OKANAGAN VALLEY

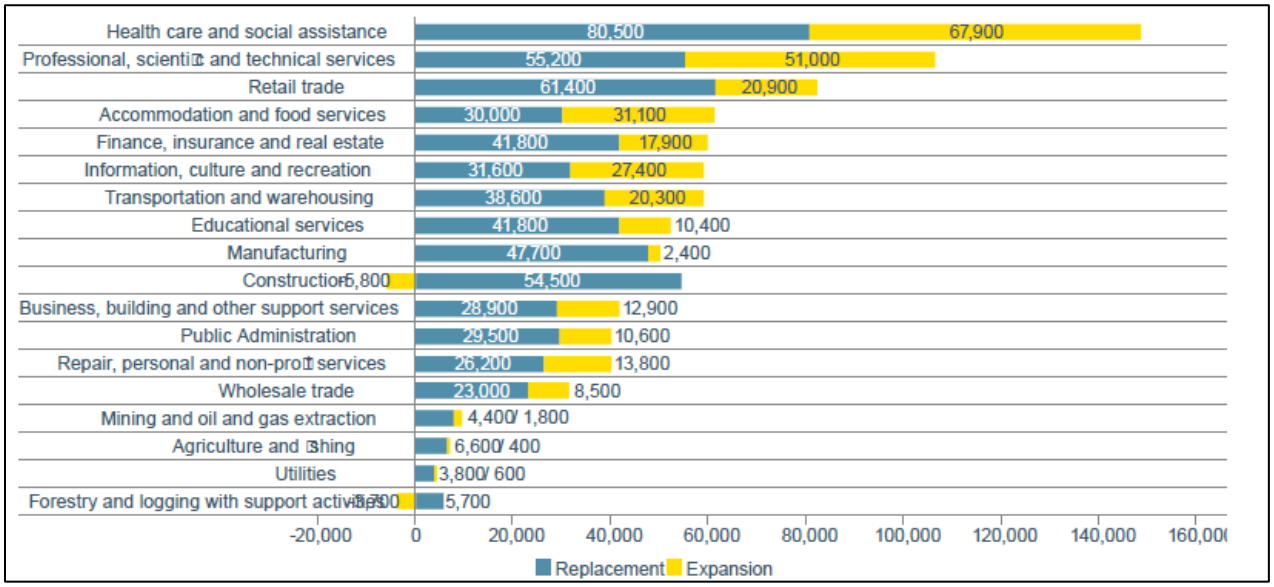
Population and economic growth in the greater Okanagan Valley will have an impact on travel demand on Highway 97A, as the corridor provides a key connection between the Valley, the Trans-Canada Highway (Highway 1) and provinces to the east. The Central Okanagan and Okanagan Similkameen Regional Districts make up the remainder of the Okanagan Valley. The average annual growth rates for the BC Stats PEOPLE population forecasts for these two regions are 1.62% and 0.44% respectively from 2018 to 2041.

5.1.2.3 INDUSTRY & TOURISM GROWTH

WorkBC produces a Labour Market Outlook report each year, and included within this document is the forecasted job growth by industry sector and region.

Figure 5-4 shows the projected job openings by industry for British Columbia. Health care and social assistance, professional services, and retail trade are expected to be the top 3 industry groups with the most job openings in the next 10 years.

Figure 5-4: 2018 – 2028 Job Openings by Industry (Source: 2018 Labour Market Outlook)



Industries such as transportation and warehousing, construction, manufacturing and forestry and agriculture show lower levels of increase, with the job market contracting for construction and forestry. The report also provides region specific job forecasts. The Thompson-Okanagan region employment demand is anticipated to increase by 0.7% on average each year for the next 10 years. The industries in the Thompson-Okanagan region with the highest number of job openings are shown in Table 11, along with the forecasted employment growth in each industry for the next 10 years.

Table 11: Thompson - Okanagan Employment Growth Forecast

Industry	Employment (2018)	Annual Growth Forecast (2018 – 2028)
Other Retail Trade (Excluding Cars and Personal Care)	25,310	0.4%
Hospitals	13,000	1.6%
Nursing & Residential Care	9,220	2.9%
Food Services & Drinking Places	18,960	1.2%
Ambulatory Health Care Services	8,730	2.4%

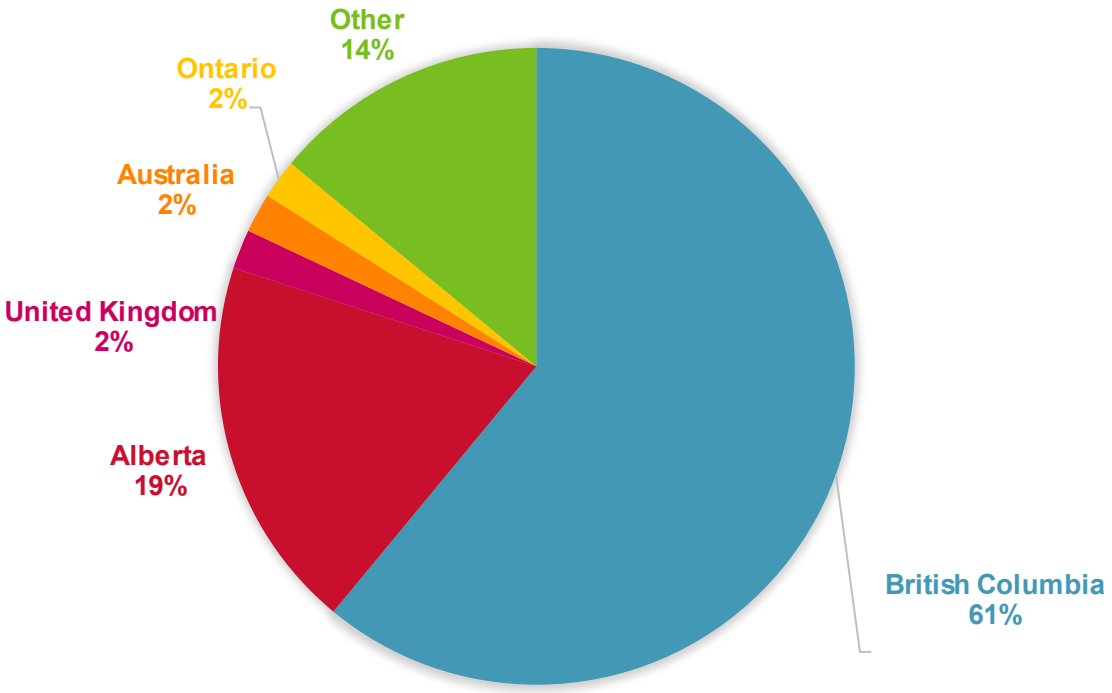
On both the provincial and regional scale, the industries with the highest number of job openings are in the health care and service sectors. While growth in these industries will contribute to increases in travel demand on the study corridor, their growth is not likely to result in increased travel demand beyond the growth accounted for by the population growth.

Growth in these industries is also not likely to increase the percentage of heavy vehicles along the corridor compared with growth in the more traditional regional industries such as forestry and mining.

Tourism is one of the key industry sectors in the Okanagan Valley, particularly for the Central Okanagan, which includes Kelowna. Destination BC provides Regional Tourism Profiles for each region in the province, and the study area is included in the Thompson Okanagan Region. Figure 5-5 shows the origins of visitors to the Thompson Okanagan region; 61% come from within the province, and nearly 1 in 5 visitors (19%) come from Alberta. Many Alberta visitors, particularly those from the Calgary region are likely to use the Trans-Canada Highway and Highway 97A to travel to the Okanagan.

Official growth projections for tourism in the region are not available. However, an economic impact study[3] for tourism in Kelowna in 2011 noted that the total person visits to Kelowna between 2006 and 2011 increased by 26.9%, or over 5% annually. Growth at this high rate is unlikely to be sustainable in the long term, and ultimately is anticipated to trend towards regional population growth.

Figure 5-5: Visitor Origin (Source: May 2017 Regional Tourism Profile)



[3] Economic Impact Study of Tourism in Kelowna, B.C. 2011. http://www.investkelowna.com/application/files/5214/7795/5250/tourism_kelowna_economic_impact_study_-_final_report_29dec2011.pdf

5.2 Future Highway Use

The following section outlines the expected future highway use for the 2043 horizon year, without significant changes in transportation infrastructure or policy. The future use is used as the basis for identifying and defining future problems on the corridor.

Interim horizon years (5, and 10 years) will be evaluated as part of the implementation strategy to assist in creating logical sequencing and timing of improvements for the preferred solution, but are not used in the problem definition or define long-term options.

Additional information can be found in **Appendix F**.

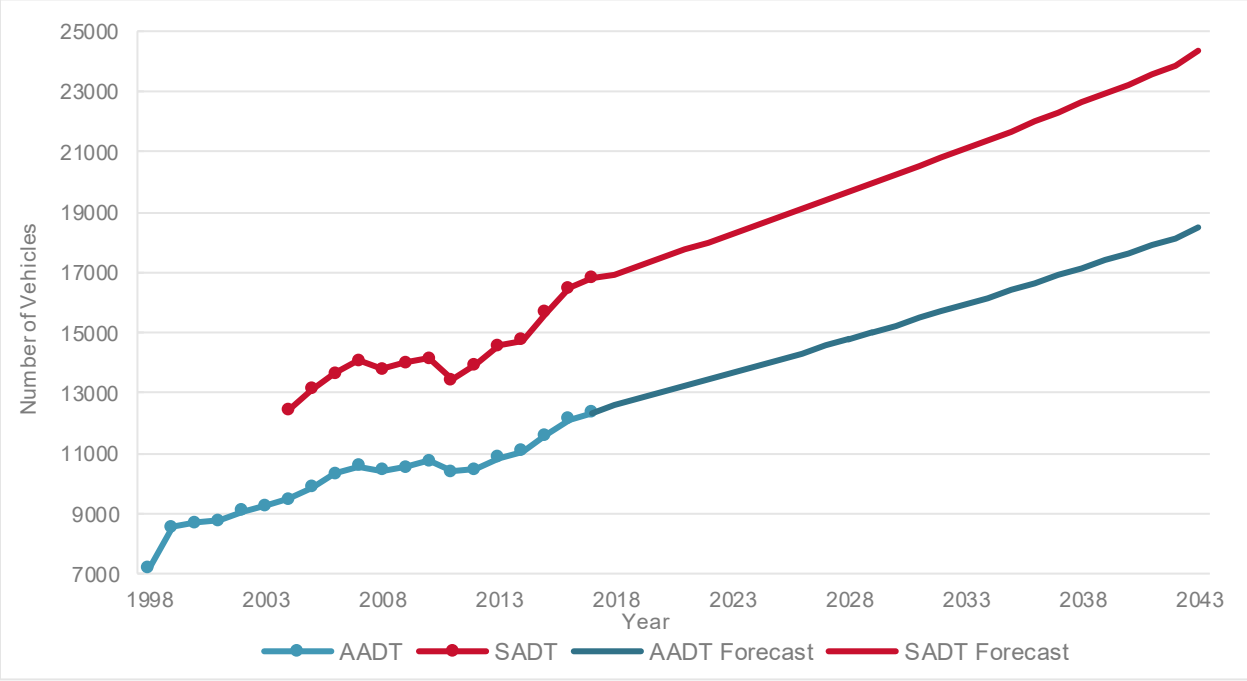
5.2.1 Future Traffic Volumes

Future traffic growth will be influenced by several factors, including local and regional population growth, economic development, land use patterns and even national economic growth. The following provides a summary of future traffic growth influences and the resulting 2043 traffic volume forecast.

5.2.1.1 FUTURE TRAFFIC GROWTH FORECAST

For the 10-year period from 2007 to 2017, the average annual compound growth for AADT and SADT were 1.5% and 1.8% respectively. For context, the population in the study area communities grew by 0.01% annually in the same time period. Based on the review of the historical and anticipated community and traffic growth rates, a 1.5% annual compound growth has been assumed for Highway 97A traffic. Figure 5-6 shows the forecasted traffic growth at permanent count station (P-24-1) based on this growth rate.

Figure 5-6: Highway 97A South of Enderby Historical & Forecasted Traffic (P-24-1)



A study area annual population growth rate of 0.5% (compounded) was assumed for the communities, and was converted to vehicle trips and assigned to the network.

5.2.1.2 AADT FORECAST BY SEGMENT

Table 12 shows the forecasted growth on Highway 97A within each of the study segments as identified in the existing conditions. The existing traffic counts on the corridor were completed in July 2017 as part of the *Enderby Data Collection Program 2018*. Highway through traffic was grown at a rate of 1.5% to the Future Horizon (2017 to 2043), and the projected population growth in Enderby and Splatsin was also added to Highway 97A.

Table 12: Highway 97A AADT Traffic Growth

Segment	Location	AADT		Effective Growth	Influences
		Existing	Future		
South	South of Canyon Road	12,553	18,490	1.50%	Primarily Highway 97A traffic growth, and some growth in traffic due to trips to/from Enderby and Splatsin to the north
Centre	South of Cliff Ave	12,193	18,984	1.72%	A combination of Highway 97A traffic growth, and growth in internal traffic within Enderby due to population growth in Enderby and Splatsin
North	South of Hwy 97A/B Junction	11,689	17,149	1.49%	Primarily Highway 97A traffic growth, and some growth in traffic due to trips to/from Enderby and Splatsin to the south

Growth within Enderby (Centre Segment) is slightly higher than the other segments due to the forecasted study area population growth and resulting internal trips.

The forecast by segment assumes that traffic growth is unconstrained by capacity limitations on the highway and within Enderby itself. These forecasts show that AADT link volumes on the highway could be near 19,000 vpd within Enderby, and between 17,000 vpd and 18,500 vpd outside the city.

5.2.2 Active Transportation and Transit

The future conditions assessment assumes no significant new infrastructure or policy change, outside existing approved plans. Therefore, for the purpose of the assessment, no change in mode splits have been assumed for future conditions. Some mode shift may occur as a result in changing technology and behavioural trends. These effects are generally more pronounced in urban areas. It is unlikely that known technologies and trends will have a significant effect on mode split within the horizon of this study.

The BC Transit *North Okanagan Transit Future Plan 2014* identifies a goal of expanding Route 60 service between 7am and 7pm on weekdays. Increased service hours are a significant factor affecting increased ridership. However, transit frequency and directness are not sufficient to realistically attract significant ridership away from other modes. The increased services hours will provide improvements for residents, but will mostly serve those who are transit-captive.

5.3 Future Transportation System Performance

Based on the forecasted increase travel demand on the highway and in the study area, this section presents the forecasted performance of the Highway 97A study corridor at the 2043 horizon year, and compares the performance with the existing conditions.

5.3.1 Highway Operation

5.3.1.1 SEGMENT LEVEL OF SERVICE

Table 13 shows the existing and future two-way highway level of service for the two rural segments of Highway 97A.

Table 13: HCS Segment Operation

Highway 97A Study Segment	Horizon Year					
	Existing (2017)			Future (2043)		
	LOS	v/c	Percent Time Spent Following	LOS	v/c	Percent Time Spent Following
South Segment	E	0.62	89%	E	0.91	95%
North Segment	E	0.58	87%	E	0.85	93%

The v/c ratios for the highway are projected to increase significantly from the existing conditions. The percentage of time following is also forecasted to grow to beyond 90%, which signifies the lack of passing opportunities due to high opposing volumes. This indicates that the highway will be operating near or even beyond capacity in the future.

5.3.1.2 INTERSECTION LEVEL OF SERVICE

In the existing conditions, the only movement that exceeds the performance thresholds is the eastbound approach at the intersection of Highway 97A and Canyon Road, which currently operates at LOS E.

In the future horizon (PM peak hour), growth in traffic is anticipated to bring a number of other intersections and movements closer to capacity. The movements and queues that exceed the performance thresholds in the future horizon are listed Table 14.

Table 14: Movements that Exceed Performance Thresholds (2043 AM and PM Peak Hours)

Intersection	Movement	AM Peak Period			PM Peak Period		
		LOS	v/c	95th Queue (m)	LOS	v/c	95th Queue (m)
Highway 97A & Highway 97B Junction (EB Stop Control)	EBL	C	0.48	21	F	1.07	136
	EBR	C	0.48	21	F	1.07	136
Highway 97A & Knight Ave (EB/WB Stop Control)	EBL/T/R	C	0.14	4	F	0.70	21
	WBL/T/R	D	0.11	3	F	1.94	37
Highway 97A & Stanley Ave (EB/WB Stop Control)	EBL/T/R	C	0.12	3	F	1.09	32
	WBL/T/R	C	0.01	0	F	0.20	6
Highway 97A & Mill Ave (Signalized)	NBT/R	A	0.63	57	B	0.74	95
	SBT/R	A	0.51	40	B	0.79	112
Highway 97A & Cliff Ave (EB/WB Stop Control)	EBL/T/R	D	0.35	12	E	0.47	18

Intersection	Movement	AM Peak Period			PM Peak Period		
		LOS	v/c	95th Queue (m)	LOS	v/c	95th Queue (m)
Highway 97A & Hubert Ave (Signalized)	NBT	A	0.55	75	B	0.71	**140**
	SBT/R	A	0.49	61	B	0.77	**176**
Highway 97A & 1 Ave (Signalized)	NBT	B	0.69	83	B	0.76	**148**
	SBT	B	0.69	84	B	0.84	**198**
Highway 97A & Canyon Road (EB Stop Control)	EBL/R	D	0.52	22	**F**	**1.65**	88

Delays for the minor approaches at a number of the intersections on Highway 97A will exceed the performance thresholds, due to the increase in through traffic on the highway. In particular, the LOS for the minor movements at Knight Avenue, Stanley Avenue, and Canyon Road are anticipated to exceed the thresholds by the future horizon in the PM peak hour. The north and southbound queues at the signalized intersection of Hubert Avenue and Mill Avenue are also anticipated to exceed the available intersection spacing and reach the adjacent intersections.

The eastbound movements from Highway 97B at the Highway 97A/B junction exceed the performance thresholds for mainline movements.

5.3.1.3 TRAVEL TIME

The average existing and forecasted future travel time for each segment is shown in Table 15. The travel times were forecasted using SimTraffic, a micro-simulation modelling add-on of Synchro. The software models each vehicle individually and is used to estimate future delays and travel times.

Table 15: Highway 97A Travel Time

Segment	Direction	Length (km)	Existing (2017)		Future (2043)		Travel Time (% Increase)
			Travel Time (mm:ss)	Average Speed (km/h)	Travel Time (mm:ss)	Average Speed (km/h)	
South	SB	4.5	03:12	84	3:15	83	1%
	NB		03:05	88	3:17	83	6%
Centre	SB	2.6	03:05	51	3:35	44	16%
	NB		02:52	44	3:23	38	18%
North	SB	4.5	03:02	89	3:05	88	2%
	NB		03:34	84	3:42	81	4%
Total	**SB**	**11.6**	**09:18**	**75**	**9:54**	**70**	**6%**
	NB		**09:31**	**73**	**10:22**	**68**	**9%**

The existing travel time for the corridor is slightly less than 9.5 minutes, with an average corridor travel speed of approximately 74 km/h. In the future, both the north and southbound travel times are anticipated to increase, with the southbound travel time increasing by 6%, and the northbound travel time increasing by 9% which is equivalent to over 30 seconds. It is noted that a significant portion of the travel time increase on the Centre Segment is due to the addition of a signalized intersection at 1 Avenue.

5.3.2 Safety

This section presents projected collision statistics to the future horizon.

5.3.2.1 COLLISION RATES & SEVERITY

Table 16 shows the forecasted number of collisions on the corridor, assuming that the collision rate remains constant and the number of collisions grow at the same rate as the highway traffic growth (1.5% annually).

Table 16: Collisions by Segment and Severity

Segment	Existing Observed Collisions - 2012 - 2016					Future Average Collision per Year (Forecasted)
	Fatal	Injury	PDO	Total	Frequency (Average Collisions/Year)	
South Segment	1	13	28	42	8.4	12.4
Centre Segment	0	18	26	44	8.8	13.0
North Segment	1	12	25	38	7.6	11.2
Total	2	43	79	124	24.8	36.5

There are currently more than 3 collision per year on each segment, and there are forecasted to continue to be more than 3 collisions per year on each segment in the future horizon.

Existing locations with high collision frequencies include the intersections of Highway 97A with Baptiste Road, Canyon Road, Knight Avenue, the highway segment south of North Enderby Timber, and the Highway 97A / Highway 97B junction. The distribution of future collisions are anticipated to be similar to the historical data if the road network is not significantly changed. The exception may be at 1st Avenue once development in the Knoll occurs. While collision frequency will likely increase due to an increase in exposure, the collision rate is expected to be consistent with other newly designed comparable intersections.

5.3.3 Highway Reliability

Table 17 compares the existing annual closures per year on the corridor with a forecast for future closures and durations based on traffic growth. Future highway reliability, closure events, and durations are forecast to increase somewhat with increased traffic growth, but are not forecast to reach the 10 hour per year threshold by the future horizon.

Table 17: Road Closure Forecast

Parameter	Existing	Future (2043)*
Closures per year	0.81	1.08
Average closure duration	3:45	3:45
Closure duration per year (hr:mm)	3:02	4:02

*- Calculated based on increasing the collision and vehicle incident-based closures using forecasted traffic volume increase.

5.4 Problem Identification and Definition

This section describes the existing and future performance assessments and describes the differences between the existing and future operations.

5.4.1 Desired Performance Criteria

The desired performance criteria are based on the metrics typically used by the MoTI, and are presented in Table 18. The performance criteria are used to identify highway operation issues, and are one of the main elements used to develop the corridor problem definition.

Table 18: Performance Thresholds

Measure	Threshold	Analysis Method
Mainline Performance		
Two-Lane Highway	LOS C or better based on: - Percent time spent following < 50% - Average Travel Speed < 75 km/h	Highway Capacity Software (HCS) Version 7.7 and Highway Capacity Manual (HCM) 6.
Signalized Intersection Performance		
Mainline Through Movements	LOS D or better v/c ratio < 0.85	Trafficware Synchro & SimTraffic
Mainline Turning Movements	LOS D or better v/c ratio < 0.90	
Side-street Movements	LOS E or better v/c ratio < 0.90	
All movements	95th % Queue ≥ Available Storage or Intersection Spacing	
Unsignalized Intersection Performance		
Mainline Through / Turning Movements	LOS C or better v/c ratio < 0.85	Trafficware Synchro & SimTraffic
Side-street Movements	LOS D or better v/c ratio < 0.90	
All movements	95th % Queue ≥ Available Storage or Intersection Spacing	
Safety		
Collision Rate and Frequency	Collision Rate ≥ Critical Collision Rate AND Collision Frequency ≥ 3/year	CR=PR+2.576*SQRT(PR/EXP)+1/(2*EXP) Where: CR=Critical Collision Rate PR=Provincial Average Collision rate for relevant service class and AADT range (as provided by BC MoTI for 2012 to 2016) EXP=Exposure, expressed in million vehicle kilometres
Collision Severity and Frequency	Collision Severity Index ≥ Average Collision Severity Index for similar facility AND Collision Frequency ≥ 3/year	CSI=%FAT * 100 + %INJ * 10 + %PDO * 1 Where: CSI=Collision Severity Index %FAT=percentage of collisions involving a fatality %INJ=percentage of collisions involving personal injury %PDO=percentage of collisions involving property damage only
Reliability		
Average Closure Duration per Year	>10 hours of closure per year	Based on Drive BC Incident data
Pavement Condition		
Pavement Condition Rating (PCR)	PCR < 5.0	From Pavement Condition Ratings provided by BC MoTI.

5.4.2 Problem Identification

Table 19 provides a summary of the problems identified each segment, and the locations / parameters where thresholds have been exceeded. This will serve as the basis for the definition of the overall problems on the corridor.

5.4.2.1 MOBILITY

By 2043, the rural sections of Highway 97A are anticipated to continue to operate at LOS E, and volume to capacity ratios will increase significantly. Some intersection movements will be at or near capacity. Travel time through the corridor is forecasted to increase by up to 30 seconds, depending on the travel direction and time of day, and the highway is likely to become more difficult to access from un-signalized intersections. Additionally, while passing is permitted on most of the rural sections, passing opportunities are anticipated to decrease further due to a lack of gaps in opposing traffic.

The primary source of these identified issues is the growth in traffic, combined with a high number of existing minor accesses.

5.4.2.2 SAFETY

The existing collision data indicates that all of the highway segments are currently above the critical collision rates, and all segments have more than the average of 3 collisions per year.
Reliability

5.4.2.3 RELIABILITY

The reliability of the highway segment is below the 10-hour annual threshold, and the operation is currently uninterrupted by closures the majority of the year.

5.4.2.4 INFRASTRUCTURE CONDITION

The Pavement Condition Ratings (PCR) provided by the Ministry indicates that all segments of the highway have a rating of either Fair or Good. No sections are in immediate need of rehabilitation.

Table 19: Problem Identification Summary

Segment	Traffic Operations Comparison							Existing Collisions		
	Existing			Future						
	LOS	v/c	Travel Time	LOS	v/c	Travel Time	Int. Past Threshold	Rate	Severity	Average Collisions per Year
South	E	0.62	SB – 3:12 NB – 3:05	**E**	**0.98**	SB – 3:14 NB – 3:16	- Canyon Rd (EB)	**0.41**	6.1	**8.4**
Centre	-	-	SB – 3:05 NB – 2:52	-	-	SB – 3:21 NB – 3:22	- Knight Ave (EB / WB) - Stanley Ave (EB / WB) - Cliff Ave (EB)	**1.07**	4.7	**8.8**
North	E	0.58	SB – 3:02 NB – 3:34	**E**	**0.91**	SB – 3:05 NB – 3:50	- Hwy 97B Jct	**0.41**	6.4	**7.6**

5.4.3 Problem Definition

The following section summarizes the relationships between the identified problems and their causes, and is used to help identified options to improve the corridor and address the issues.

5.4.3.1 SOUTH SEGMENT

5.4.3.1.1 Segment Summary

The South segment is currently operating beyond the LOS threshold (LOS E). The observed collision rate for the segment exceeds the Critical Collision Rate, with high collision frequencies at the intersections of Highway 97A with Canyon Road and Baptiste Road. Stakeholders noted that it was often difficult to turn left (eastbound) from Canyon Road onto the highway.

Travel times are anticipated to increase with increasing traffic volumes, especially for the northbound movement, and travel speeds are anticipated to be approximately 83 km/h during the peak periods, less than the posted speed limit of 100 km/h for much of the segment.

5.4.3.1.2 Highway 97A & Baptiste Road

The eastbound stop controlled intersection is located on the south end of a curve on Highway 97A, and is in the middle of a northbound no passing zone. The types of collisions at the intersection are varied, with some off road and wildlife collisions. Stakeholders noted frequent animal collisions at this location.

Many of the collisions recorded at or near the intersection are not necessarily related to Baptiste Road or traffic turning, and there is no clear trend in historical collision causes.

5.4.3.1.3 Highway 97A & Canyon Road

The intersection of Highway 97A and Canyon Road was recently reviewed as part of a separate study, *Highway 97A / Canyon Road Intersection: Enderby – Problem Definition Memo and Summary Technical Memo*, included in **Appendix H**. The study found that the eastbound leg of the intersection operates beyond traditional performance thresholds for all three analysis horizons considered (2018, 2023, and 2028), and that the intersection is collision prone. The 85th percentile speed for northbound drivers at the intersection was 80 km/h, 20 km/h over the posted speed limit.

Signalization warrants were conducted at the intersection, with two out of the nine warrant tests concluding that a traffic signal was warranted. As alternatives that have a lower impact on traffic had not yet been tried, the study recommended modifications to the existing speed transition zone, transverse pavement markings, a speed reader board for the northbound movement, and removal of some of the existing signage along the highway as short term improvements instead of a traffic signal at this time. All short-term improvements, except for the speed reader board have since been implemented.

5.4.3.2 CENTRE SEGMENT

5.4.3.2.1 Segment Summary

The Centre Segment is the urban segment of the study area, and starts and ends at the boundaries of the City of Enderby. The northbound and southbound through movements at the signalized intersections of Highway 97A with Hubert and Mill Avenues have peak period queues

that will extend up to and past the adjacent intersections. The short spacing between intersections (typically 90 metres) contributes to the issue and limits the ability to create sufficient turn lane storage. The stop-controlled intersections of Highway 97A with Cliff, Stanley and Knight Avenues all have movements that exceed the thresholds in the future horizon, and drivers will likely experience difficulties turning onto the highway from these intersections. While the high delays for the minor street approaches at these unsignalized intersections exceeds the thresholds, the conditions are typical of stop-controlled intersections on a busy street. There are reasonable alternate routes through signalized intersections that drivers may use. Therefore, not all of these intersections were included as specific problem locations in this section.

The observed collision rate on the segment exceeds the critical rate, and the highest number of collisions occurred at the cross-streets of Hubert, Russell, Mill and Knight Avenues.

Stakeholders noted that it can be difficult to turn onto Highway 97A at the unsignalized intersection, and that there are pedestrian desire lines across the highway that are not aligned with the existing pedestrian crossings.

5.4.3.2.2 Highway 97A & Hubert Avenue

The intersection of Highway 97A and Hubert Avenue is one of the busier intersections within Enderby, with moderate levels of minor approach traffic (100-200 two-way trips on the minor legs). The intersection is generally anticipated to operate within thresholds in the future horizon, although the northbound and southbound queues are expected to extended back to the upstream intersection on a regular basis as highway volumes increase.

The existing types of collisions at the intersection do not suggest a specific pattern, but are instead believed to be primarily related to the significance of the intersection in the local context and the higher level of traffic volumes on the minor approaches compared to the other intersection within Enderby.

5.4.3.2.3 Highway 97A & Russell Avenue

Over half of the recorded historical collisions for the intersection were northbound rear ends. Stakeholders noted that the mid-block crossing on Highway 97A between Russell and Cliff Avenues was unexpected, and the crossing could be a factor in the type of collisions recorded at this location. The mid-block crossing was added in 2012. A review of collision data before and after the introduction of the mid-block crossing suggests that northbound rear-end collision increased after 2012. However, this assessment should be used within caution as the size of the data set is too small to draw firm conclusions.

Another potential factor influencing collision types could be the lack of a northbound left or right turn lane, requiring vehicles turning northbound left or right to wait in the through lane.

5.4.3.2.4 Highway 97A & Mill Avenue

The intersection of Highway 97A and Mill Avenue is signalized, and similar to Hubert Avenue, is anticipated to operate generally within the thresholds in the future horizon, except for the northbound and southbound queue lengths. The queues are projected to reach and extended beyond the adjacent intersections.

It is the first fully signalized intersection in Enderby that vehicles encounter when approaching from the north, which may be contributing to the high proportion of southbound collisions. Stakeholders reported that vehicles, and particularly trucks, may speed through this section of the highway, attempting to clear through both signals without stopping.

5.4.3.2.5 Highway 97A & Knight Avenue

The intersection of Highway 97A and Knight Avenue has a pedestrian activated half signal, and the east and westbound approaches are forecasted to operate beyond the thresholds in the future horizon. The intersection was assessed as a two-way stop control intersection, where in practice pedestrians crossing at the intersection (using the associated signal) will create the occasional gap for east/west traffic.

Nearly half of the collisions recorded at the intersection were northbound rear ends. A northbound left turn lane is currently provided at the intersection, and it was added in the last 10 years. There is insufficient data to determine the effect of the addition of the northbound left turn lane. Based on the observed pedestrian volumes at the intersection, it is possible that the infrequent use of the pedestrian signal may be unexpected for some drivers as they approach the intersection, as the traffic signal for the northbound and southbound movements would nearly always been green.

5.4.3.2.6 Highway 97A, between Knight Avenue and North Limit of Enderby

Although the number of collisions recorded in this section between 2012 and 2016 did not indicate an issue, the number of collisions recorded before 2012 and stakeholder comments in the area warranted a further consideration.

Knight Avenue acts as the northern boundary of the core of Enderby. To the north the highway is more suburban and curves through the section. Private property accesses exist on both sides of the highway, but there are only two other public intersections (Meadow Crescent and Cliffview Lane / Evergreen Street) on the highway segment between Knight Avenue and the north edge of Enderby. The types of collisions that occurred within this segment include a number of off road and 90-degree intersection collisions. These types of collisions are consistent with the curving nature of the section, and the high frequency of private accesses along it.

Stakeholders noted multiple issues on this section of Highway 97A, including the design of the Highway 97A and Cliffview Lane intersection and poor sight lines at some of the accesses due to the curvature of the road. It was also noted that a major pedestrian desire line crosses this highway section between M.V. Beattie Elementary school and the destinations on the east side of the highway.

5.4.3.3 NORTH SEGMENT

5.4.3.3.1 Segment Summary

The North Segment is currently operating worse than the LOS performance thresholds identified for the segment, with percent time spent following at 87% and travel speeds being between 84 to 89 km/h depending on the direction.

The observed collision rate on the segment currently exceeds the Critical Collision Rate. Existing high frequency collision locations on the segment include the Highway 97A / Highway 97B junction, and the section of Highway 97A adjacent to North Enderby Timber.

Despite passing being permitted along most of this segment, finding gaps in opposing traffic to pass is considered to be challenging due to the opposing traffic volumes, and the availability of gaps will decrease as traffic volumes rise. Growth in highway traffic will reduce gaps available for passing, which could lead to drivers taking more risks when passing.

5.4.3.3.2 Highway 97A between Old Salmon Road and North Enderby Timber

The section of Highway 97A between Old Salmon Arm Road and North Enderby Timber has several property accesses with possible sightline limitations due to trees and grade on the inside corner (west) of the highway curve. Travel time and congestion on the North Segment may be worse than shown in the analysis, as vehicles turning to/from the Highway at these locations may interrupt through traffic operations.

The collisions in this section include a high proportion of rear end collisions in both directions. It is possible that these collisions are due to vehicles slowing down and/or turning onto the highway from Old Salmon Road and the south North Enderby Timber access. The area was also identified by stakeholders, with comments regarding flooding near the North Enderby Timber south access, and comments regarding poor sight lines at the Old Salmon Arm Road Intersection.

5.4.3.3.3 Highway 97A & Highway 97B Junction

The junction between Highway 97A and 97B is the northern extent of the study corridor, and is currently operating within the capacity and LOS thresholds. The intersection has historically had a high collision frequency, with many of the collisions occurring between southbound vehicles and those turning eastbound left and northbound left. The eastbound movement at the intersection is anticipated to exceed the performance thresholds in the future horizon, with high v/c ratios and delay.

There are significant grades at the intersection, with Highway 97B approaching Highway 97A at a downgrade and sharp vertical curves on Highway 97A approaching the intersection. This may result in reduced sight lines for southbound vehicles, which could be a factor in the recorded collisions. The southbound right turn and northbound left turn deceleration and storage lane lengths may also be factors in the high collision frequency at the intersection.

6 Option Generation and Screening

Options were developed to address the issues summarized in the problem definition. The options are conceptual in nature and reflect ideas from the study team, the public, stakeholders, and/or were previously considered in past studies. Options were screened out if an option:

- contains fatal flaws (e.g., significant technical feasibility constraints, major social or environmental impacts, etc.;
- does not address an identified problem; and/or
- is unlikely to be successful when compared with competitive options.

The long list options were assessed based on Highway Performance, Community, Environmental and Engineering categories.

A summary of the option screening and recommendations are presented in Table 20. Options that have been screened out (not recommended for further consideration in this study) are those that have either minimal benefits compared to other options or significant impacts that outweigh their benefits.

The full set of options considered, including details and descriptions of each option, and the detailed screening can be found in **Appendix I and Appendix J**.

Table 20: Screening Summary

Type	Option	Screening Recommendation	
South Segment	A-FF-1: Four Lanes with Access Management	• Achieves project goals with moderate cost and impacts	✓
South Segment - Transition	A-TR-1: Transition at Back Enderby Road	• Higher anticipated community impact and severance effect at Canyon Road, but potentially better short term economic development opportunities for Splatsin	✓
	A-TR-2: Transition at Canyon Road	• Significant impacts to community and properties along Quilakwa Crescent	✗
	A-TR-3: Transition South of Canyon Road	• Achieves project goals with moderate cost and impacts • Wildlife risks to be investigated	✓
Centre Segment - Free Flow	B-FF-1: At Grade with Interchanges	• Significant community severance effects and cost • Much higher cost than other options with similar benefits (B-4L-2)	✗
	B-FF-2: Elevated Through Lanes	• Much higher cost than other options with similar benefits (B-4L-2)	✗
	B-FF-3: Highway Trench with Local Street Overpasses	• Significant community severance effects and cost • Much higher cost than other options with similar benefits (B-4L-2)	✗
	B-FF-4: Cut & Cover Tunnel (Existing Corridor)	• Significant community impacts during construction • Much higher cost than other options with similar benefits (B-4L-2)	✗
	B-FF-5: Cut & Cover Tunnel (Rail Corridor)	• River proximity significantly increases risk • Much higher cost than other options with similar benefits (B-4L-2)	✗
	B-4L-1: Existing Corridor	• Significant property acquisition require • Higher cost than other options with similar benefits (B-CO-1)	✗

Type	Option	Screening Recommendation	
Centre Segment - Four Lane	B-4L-2: Vernon Street / Rail Corridor	• Achieves project goals with moderate impacts • River proximity, archaeological and wildlife risks to be investigated	✓
Centre Segment - Couplet	B-CO-1: Existing & Vernon Street / Rail Corridor	• Increases highway capacity with moderate impacts • River proximity, archaeological and wildlife risks to be investigated	✓
	B-CO-2: Vernon Street & Rail Corridor	• Achieves project goals with moderate impacts • River proximity, archaeological and wildlife risks to be investigated	✓
Centre Segment - Network Capacity Increase	B-NC-1: 3-Lane Existing Highway and Vernon Street / Rail Corridor	• Achieves project goals with moderate impacts • River proximity, archaeological and wildlife risks to be investigated	✓
North Segment	C-FF-1: Four Lanes with Access Management	• Achieves project goals with moderate cost and impacts	✓
	C-IS-1: Highway 97A/B Junction Intersection Improvements	• Can achieve project goals without requiring grade separation	✓
	C-IS-2: Highway 97A/B Junction Grade Separation	• Achieves project goals with moderate cost and impacts	✓
Alternative Corridors Option Long List	AC-1: Highway 97B Extension to Starlight Drive-In	• Approximately 3 minutes in highway travel time savings. • Significant costs, land acquisition and disruption • Challenging terrain	✗
	AC-2: Highway 97B Extension to Lansdowne Road	• Approximately 5 minutes in highway travel time savings. • Significant costs, land acquisition and disruption • Challenging terrain	✗
	AC-3: Highway 97A Extension to Enderby	• Significant costs, land acquisition and community disruption both within and north of Enderby • River proximity risks	✗
	AC-4: Highway 97A Extension to Stepney Road	• Significant costs, land acquisition and community disruption for the residents along the route. • River proximity, archaeological and wildlife risks along the corridor	✗

7 Multiple Account Evaluation

Multiple Account Evaluation (MAE) is used by the Ministry to evaluate and compare transportation projects. This section details the MAE completed for the remaining options. All proposed options are compared against the base case, which is defined as the existing highway receiving the minimum level of expenditure require to maintain a minimum acceptable level of service[4].

7.1 MAE Framework

The Ministry uses a five account MAE framework, with Financial, Customer Service, Social / Community, Economic Development, and Environmental accounts. Specific criteria within this framework have been developed to suit the project. The following significance descriptions are generally used:

- **Positive** – The option is more desirable than the base case for the criterion
- **Neutral** – No material improvement compared to the base case
- **Negative** – The option is less desirable than the base case for the criterion

For residential and non-residential property acquisition, the following descriptions are used to show how many properties are anticipated to be impacted:

- **High** – 20 properties or more
- **Medium** – 5 to 20 properties
- **Low** – less than 5 properties
- **None** – No properties

A summary of each account is provided below, and a detailed description of each account can be found in **Appendix K**.

- **Financial** – Includes all lifecycle costs, discounted to present value.
- **Customer Service** – Accounts for the change in costs to highway users due to changes in travel time, collisions, and vehicle operating costs.
- **Social / Community** – Includes the benefits and impacts to the community, such as noise, visual effects, and non-quantitated connectivity / travel impacts and benefits.
- **Economic Development** – Captures economic benefits and impacts
- **Environmental** – Accounts for environmental and archeological impacts

Supporting information for the MAE can be found in **Appendices O, P and Q.**

[4] Benefit Cost Analysis Guidebook - https://www2.gov.bc.ca/assets/gov/driving-and-transportation/transportation-infrastructure/planning/tools/benefit_cost_analysis_guidebook.pdf

7.2 Evaluation – South Segment

This section summarizes the evaluation for the entire South Segment between Stepney Cross Road and the Enderby / Splatsin Boundary. Only one option (four laning the existing corridor with accesses) was retained through the screening process, with two sub options retained for the Splatsin transition.

7.2.1 Four Lanes with Access Management

This option includes widening the highway to four lanes, accesses management, and frontage roads to provide access to some of the properties along the corridor. It also includes a new northbound highway transition segment from the existing corridor to Old Vernon Road. The primary intersections with the highway will be at Back Enderby Road, Canyon Road, Baptiste Road, and Stepney Cross Road, and these intersections will be maintained and upgraded.

Travel speeds on this segment are currently limited by the high volume of traffic, and vehicles are estimated to spend 95% of their time following the vehicle in front of them during peak periods. Observed collisions on the segment exceed the critical collision rate, and high collision areas include the intersections with Canyon Road and Baptiste Road. This project will increase the travel capacity of the segment, and the intersection improvements and access management measures will create intersections that are more safe and will be easier for vehicles to turn on and off from. Access management will reduce the total number of accesses on the highway segment to 4, and new frontage roads will be required to provide access to some properties along the corridor. The collision rate is forecasted to decrease from 0.40 to 0.34, and the collision severity index is anticipated to fall from 5.6 to 4.1.

Property costs estimates were obtained from the ministry for some of the potentially impacted properties along the south segment. Property costs were not available for all sites, and so a high level cost estimate approach was used to estimate the costs for the remaining sites on per hectare basis. The total property cost for this segment is the combination of both cost estimates, and additional details can be found in Appendix R.

The evaluation is summarized in Table 21.

Figure 7-1: South Segment - 4 Lane Option

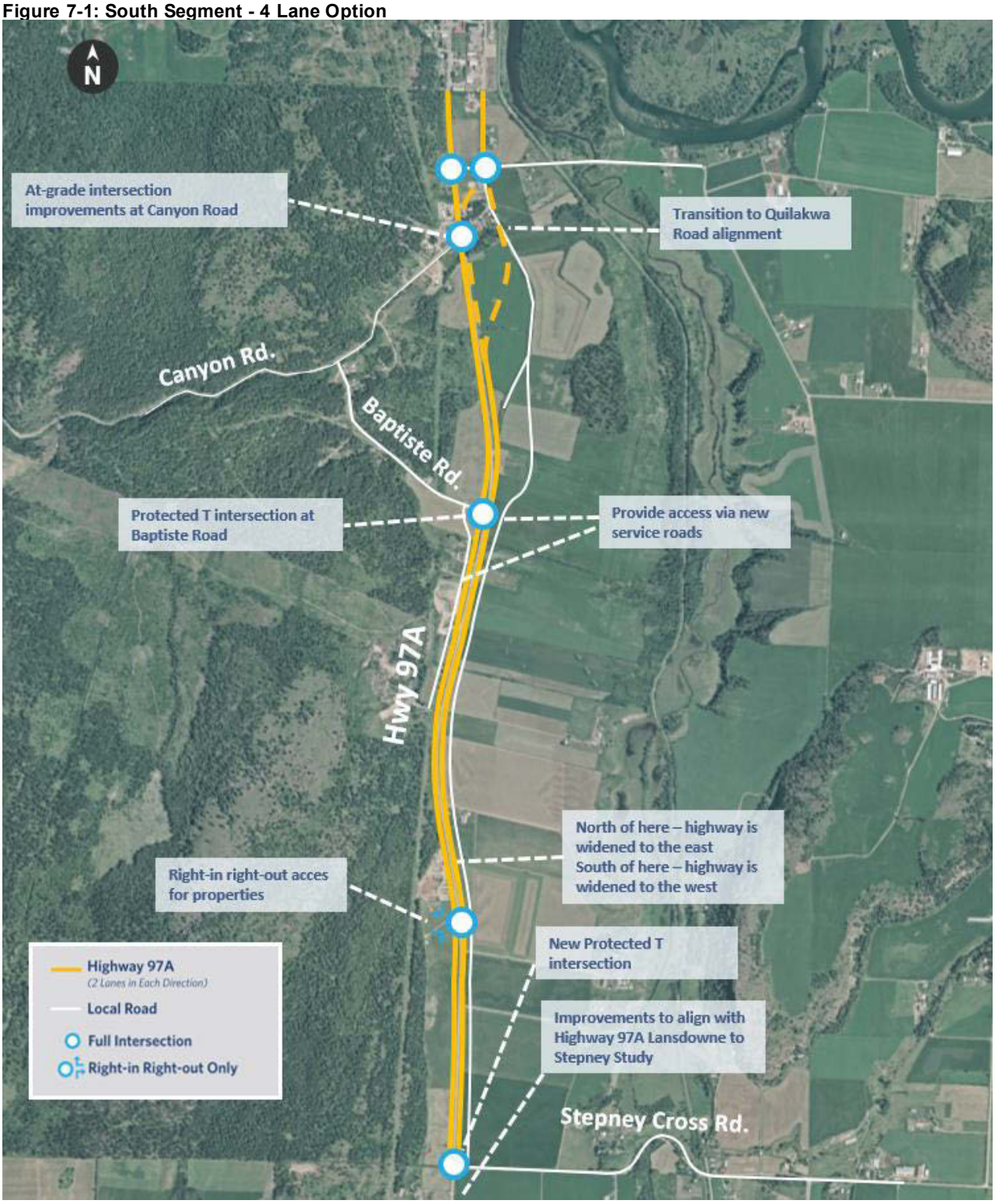


Table 21: South Segment - 4 Lane Option Evaluation Summary

Account		Base Case	Four Lane Existing Corridor	Evaluation Notes
Financial (NPV of Costs)	Capital Cost	$-	$61,687,000	Most costs are for the construction of two new northbound lanes, with some costs for property acquisition, intersection improvements, and the provision of frontage roads.
	Maintenance & Resurfacing	$1,323,000	$1,892,000	
	Residual Value	$(604,000)	$(15,320,000)	
	Total Life Cycle Cost	$719,000	$48,258,000	
Customer Service (NPV of Benefits)	Highway Travel Time	-	$(22,588,000)	Provides considerable travel time benefits due to the increase in travel speeds along the highway. Total travel time benefit is estimated to be in the order of $22.6 million. Safety benefits are anticipated to also be significant, as the widening will reduce collision frequencies and severities. Vehicle operating costs are projected to increase due to increased travel speeds resulting in higher fuel consumption.
	Safety	-	$(14,418,000)	
	Vehicle Operating Cost	-	$7,678,000	
	Total Customer Service	-	$(29,328,000)	
Social / Community	Local Connectivity	Neutral	Negative	The project will reduce Local Connectivity, as a number of existing private accesses will be consolidated and served with new frontage roads, and local residents and landowners will have to travel further to access their properties. A frontage road will be built on the east side of the highway between Stepney Cross Road and Quilakwa Road to provide private property access, and a new frontage road will be built south of Batiste Road to provide access to the Starlight Drive-In Theatre and adjacent properties. The remaining properties on the east side of the highway (near the south end of the study area) would be serviced either through a combined right-in right-out access, or a new frontage road / local connection to the south (out of the study area). Despite these impacts to local access, access consolidation and improvements at the remaining intersections will make turning onto and off the highway will become easier. The project will support Active Transportation to the same extent as the Base Case.
	Noise and Visual Effects	Neutral	Neutral	
	Active Transportation	Neutral	Neutral	
	Rail Trail	Neutral	Neutral	
	Residential Property Acquisition	None	Medium	
	Non-Residential Property Acquisition	None	High	
	Residential Equity	Neutral	Negative	
Economic Development	Development Opportunity	Neutral	Positive	Significant new economic development benefits for the Splatsin community near the transition. The replacement of existing direct highway accesses with frontage roads and improvement of select intersections is anticipated to have an overall neutral effect on the utility and access of the adjacent farmlands.
	Existing Business Access and Visibility	Neutral	Neutral	
	Agricultural Access	Neutral	Neutral	
Environmental	Environmental	-	Negative	GHG gas emissions will be higher with the proposed option, as the existing speeds are slower, and vehicles are more fuel efficient when travelling at relatively lower travel speeds, near 70 km/h[5]. A portion of the route will intercept portions of an archaeological site and historic place, and there is a high potential for unregistered sites in the area. On an environmental note, the segment would require the removal/impact to a portion of a blue-listed shrub species, likely require upgrades to riparian crossings, and traverses a known wildlife passage area. Strategic highway widening and maintaining the existing corridor will help to reduce the area that the project crosses. There are known and potential archaeological sites along the corridor, including recorded cemeteries near Quilakwa Drive and the BC Hydro corridor. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	-	Negative	
	Annual GHG Emissions (Tonnes)	9,561	11,891	
BCR		-	0.62	
NPV		-	$(18,210,824)	

[5] BC MoTI ShortBEN Fuel Consumption Model, 2019

7.3 Evaluation – Centre Segment

Four options for this segment were maintained through the screening process, and are evaluated below. Some of the Centre segment options included alternatives where either the Rail Corridor or Vernon Street (south of Cliff Avenue) was considered.

The preferred alternative is identified in Section 8.

7.3.1 Four Lane Vernon Street / Rail Corridor

For this option, the highway would be realigned from its existing route, and a new four lane highway would be built on either Vernon Street or the rail corridor. The existing highway corridor could be repurposed as a local street.

Five primary signalized intersections would be provided on the new highway alignment at Bass, Howard, Cliff, Hubert, and 1st Avenues. All other accesses and existing side streets intersections would be rerouted where possible or closed. Property acquisition would likely be required for properties that can no longer be provided reasonable access. For the Vernon Street alternative of the option, the crossing of Cliff Avenue will require property acquisition, but the rail corridor version would also present challenges due to proximity to the bridge and the Shuswap River.

This option will address the existing highway traffic operation issues within Enderby by increasing the through capacity of the highway and implementing access management along the corridor. Constructing a highway along this “new” corridor will enable stricter access management control than on the existing corridor as there have been fewer driveways and streets built along this corridor compared to the existing corridor, and much of the route (the rail corridor portion) does not have development or accesses along it.

Average future travel time speeds for the option are estimated to be 42 km/h, and average future travel time is estimated to be 40 seconds shorter than the base case. As the project will reduce the number of accesses and intersections on the highway, and as all new intersections will be constructed based on the latest standards, the collision rate and severity for the option will be significantly lower than the base case (0.78 vs. 0.33 collision rate and 5.2 vs. 4.5).

A summary of the evaluation is presented in Table 22.

Figure 7-2: Centre Segment - Vernon Street / Rail Corridor 4-Laning

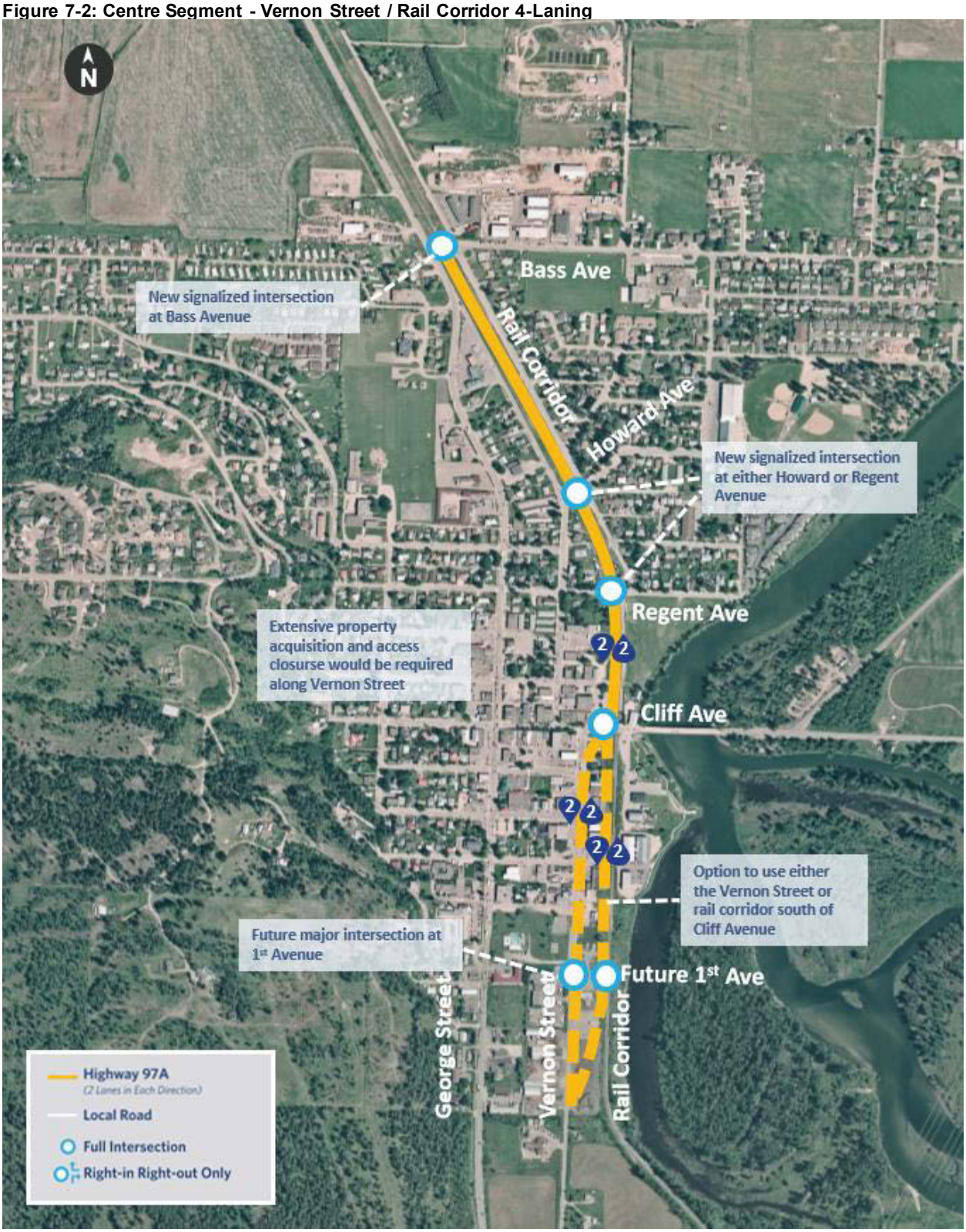


Table 22: Centre Segment - Vernon Street / Rail Corridor 4-Laning Evaluation Summary

Account		Value	Notes
Financial (NPV of Costs)	Capital Cost	$57,911,000	The most expensive of the Centre Segment options.
	Maintenance & Resurfacing	$798,000	
	Residual Value	$(14,253,000)	
	Total Life Cycle Cost	$44,455,000	
Customer Service (NPV of Benefits)	Highway Travel Time	$2,910,000	Safety and vehicle operating costs for this option are lower than for the base case, but are generally higher than the other Centre Segment options. The option will require more large signalized intersections, which will not enable efficient traffic progression in both primary travel directions compared to the couplet options, limiting the travel speeds and time benefits. In addition, the two-way configuration of this option will have a higher collision rate (0.33 vs. 0.29) than the two one-way couplet options. Highway travel time costs will also be higher than the other options due to a lower overall highway travel speeds.
	Safety	$(12,732,000)	
	Vehicle Operating Cost	$(145,000)	
	Total Customer Service	$(9,967,000)	
Social / Community	Local Connectivity	Positive	The option will improve Local Connectivity, as moving the highway east and onto the rail corridor will significantly reduce volumes on the existing corridor, enabling the existing narrow Highway 97A cross section to be maintained, and allowing for continued frequent active transportation and vehicle crossings. The option performs worse than the other options for many of the other Social / Community accounts, with negative rankings for the Noise and Visual effects, and Rail Trail accounts. The option will occupy more rail corridor ROW that any other, and have the highest negative impacts on the Rail Trail and the neighbouring residential communities due to its size and forecasted traffic volumes.
	Noise and Visual Effects	Negative	
	Active Transportation	Neutral	
	Rail Trail	Negative	
	Residential Property Acquisition	Low	
	Non-Residential Property Acquisition	Medium	
	Residential Equity	Negative	
Economic Development	Development Opportunity	Neutral	Will provide some economic development opportunities along the new highway corridor, but these new opportunities may come at the expense of businesses along the existing highway corridor. The wide cross section, infrequent intersection spacing, and intensive access management that will be required for this option may also make it more difficult for highway travelers to access businesses within Enderby (compared to the other options).
	Existing Business Access and Visibility	Negative	
	Agricultural Access	Positive	
Environmental	Environmental	Neutral	A four-lane corridor within the former rail right of way would be within 30 metres of the Shuswap River for approximately 420 metres. The project would therefore likely be subject to additional restrictions and require habitat offsetting to compensate for the disturbance to the riparian area which has a "Very High" Aquatic Habitat Index[6]. A corridor entirely along Vernon Street would have less environmental impact, and overall would be characterized as Neutral in the Environmental Account. There are no previously identified archaeological sites near the option, but the adjacent areas that have been assessed indicate a very high archaeological potential. Additionally, areas in close proximity to the Shuswap River have also been identified to have high archaeological potential. Negligible GHG emissions reductions are anticipated with this option, as the consolidation of intersections on the highway will result in longer travel times to/from the intersections for local traffic, and counteract the benefits provided by improved operation on the highway. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	Unknown / Negative	
	Annual GHG Emissions (Tonnes)	4,126	
BCR		0.23	
NPV		$(34,177,432)	

[6] The Aquatic Habitat Index is a type of ecological sensitivity index that was prepared for the following study of the Shuswap River. Ecoscape (Ecoscape Environmental Consultants Ltd.) 2011. Lower Shuswap River Inventory, Mapping, and Aquatic Habitat Index. A Living Document – Version 1.1. Ecoscape File No. 10-642. Prepared for: Regional District North Okanagan, City of Enderby, Department of Fisheries and Oceans. Prepared by Ecoscape Environmental Consultants Ltd., Kelowna, BC. 72 pp. + appendices.

7.3.2 Couplet on Existing Corridor & Vernon Street / Rail Corridor

This option creates a highway couplet within Enderby by repurposing the existing highway corridor to southbound travel only (two travel lanes), and modifying either Vernon Street or the rail corridor to accommodate two northbound travel lanes. Varying levels of access management will be implemented along the corridors. On the southbound corridor, major existing accesses that cannot be easily moved will be converted to effectively right-in right-out accesses (many will be left-in left-out due to one-way travel), while the new northbound corridor will have fewer access and intersections overall. Signalized intersections will be located along the southbound corridor at Cliff, Hubert, and 1st Avenue, and on the northbound corridor at Howard / Regent, Cliff, and 1st Avenues, with a combined two-way signalized intersection at Bass Avenue.

Stakeholders noted that it can be difficult to turn onto the highway, and converting the highway into a one-way couplet will make it easier to turn on and off of, as all turning vehicles will only have to yield to traffic from one direction at a time (as opposed to two directions for existing left turns onto the highway).

The option will provide an estimated average highway time savings of over one minute in the future horizon compared to the base case, with travel speeds nearly 10 km/h faster than the base case. Collision rates and severities will also be considerably better than the base case (0.29 vs. 0.78 collision rate and 4.5 vs. 5.2), and will be tied for the lowest out of all of the Centre Segment options.

A summary of the evaluation is presented in Table 23.

Figure 7-3: Centre Segment - Existing & Vernon Street / Rail Corridor Couplet

Table 23: Centre Segment - Existing & Vernon Street / Rail Corridor Couplet Evaluation Summary

Account		Value	Notes
Financial (NPV of Costs)	Capital Cost	$31,253,000	By reusing the existing highway corridor for southbound travel, this option will cost significantly less than the other options, particularly the new four-lane corridor option. This is due to the reduced need for ROW on the rail corridor (lower property acquisition costs) and lower amounts of physical infrastructure required overall, and the existing two highway lanes can be essentially re-used as is.
	Maintenance & Resurfacing	$825,000	
	Residual Value	$(7,644,000)	
	Total Life Cycle Cost	$24,434,000	
Customer Service (NPV of Benefits)	Highway Travel Time	$(14,978,000)	The one-way operation of the highway corridor couplet will enable signal coordination between the future signalized intersections on corridor. This will result in reduced travel times compared to the base case and four lane option, and the lowest overall travel costs out of all the options. This is partially because the option will have more highway intersections and crossing points, reducing the distances that local vehicles will have to travel to cross the highway, and because side street delays for the option are lower than the two-way options, meaning vehicles will find it easier to turn onto and off of the highway. Collision costs are also forecasted to be lower than the other options, as the collision rate on one-way facilities is less than two-way facilities, partially due to the elimination of some conflicting movements at intersections (such as those between opposing through and left turning vehicles).
	Safety	$(13,647,000)	
	Vehicle Operating Cost	$(1,824,000)	
	Total Customer Service	$(30,449,000)	
Social / Community	Local Connectivity	Neutral	The option ranks lower than the options for Local Connectivity, as the one-way nature of the highway will make some trips more circuitous and difficult to navigate for some residents and to some destinations. The option will require the least amount of property acquisition out of all the options, and also require the least amount of rail corridor ROW, lowering costs, and limiting the impact of the highway on the future Rail Trail. This option performs well on the Residential Equity account, as it maintains some highway traffic on the existing highway corridor, but will also disperse someone to the rail corridor, spreading the benefits and impacts of highway proximity across a wide residential area. It will also have the least amount of residential property acquisition impact.
	Noise and Visual Effects	Positive	
	Active Transportation	Neutral	
	Rail Trail	Neutral	
	Residential Property Acquisition	Low	
	Non-Residential Property Acquisition	None	
	Residential Equity	Neutral	
Economic Development	Development Opportunity	Neutral	By providing a new northbound highway corridor the option will provide highway access to new land, encouraging economic development. However, the extent of the benefit will be less pronounced than other options, as the one-way operation will somewhat limit future development potential along the northbound corridor. That said, similar to the Residential Equity category, the option performs well on Business Equity, as it will maintain traffic on the existing corridor, but also open up a new corridor for highway oriented benefits, spreading out the economic benefits and impacts of the highway.
	Existing Business Access and Visibility	Neutral	
	Agricultural Access	Positive	
Environmental	Environmental	Neutral	A corridor within the former rail right of way would be within 30 metres of the Shuswap River for approximately 420 metres. The project would likely be subject to the restrictions and require habitat offsetting to compensate for the disturbance to the riparian area which has a "Very High" Aquatic Habitat Index. A corridor entirely along Vernon Street would have a lower environmental impact, and is ranked as Neutral in the Environmental account. There are no previously identified archaeological sites within this area, but the adjacent areas that have been assessed indicate a high archaeological potential. Additionally, areas in close proximity to the Shuswap River have also been indicated to have high archaeological potential. The option will reduce GHG emissions compared to the base case by a modest amount, and has lowest GHG emission out of all options for the Segment. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	Unknown / Negative	
	Annual GHG Emissions (Tonnes)	4,111	
BCR		1.26	
NPV		$6,325,060	

7.3.3 Couplet on Vernon Street and Rail Corridor

This option creates a highway couplet within Enderby by repurposing Vernon Street to southbound travel and building a new road on the rail corridor for northbound travel. Space for the potential future Rail Trail would be reserved within the right-of-way and incorporated into the design.

The two highway segments would likely be constructed together as one two-way cross section north of Cliff Avenue, and would split south Cliff Avenue. The couplet would rejoin together to a two-way cross section before connecting to the existing highway in Splatsin. Utilizing a couplet concept south of Cliff Avenue will reduce the total right of way required within a single corridor, and would limit the need for property acquisition and assess management along either corridor. Major intersections would be located at Bass, Howard, Cliff, Hubert, and 1st Avenues.

This option will increase the travel capacity of the highway within Enderby, but will do so on two existing under-utilized corridors, keeping highway traffic off the existing highway corridor and out of the centre of Enderby (George Street). Future travel time for the option will be a minute quicker than the base case, tied for the lowest out of all the Centre Segment options. All new intersections will be constructed based on the latest guidelines, reducing traffic on the existing highway corridor, which has a number of intersections where the observed collision rates exceed the critical rates.

The primary difference between this option at the Couplet on the Existing Corridor and Vernon Street / Rail Corridor is that in this option the entire highway will be located on Vernon Street and the Rail Corridor, and the existing highway can be repurposed as a local street. This will result in a number of benefits and impacts. Local residents will need to travel further to reach the highway, but will not have to use the highway to travel north/south through the community. The project will free up the existing highway corridor to be repurposed, potentially enabling streetscaping and active transportation improvements, but the project will also have a larger footprint on existing partially undeveloped land, and will create a larger single barrier within the City, specifically north of Cliff Avenue.

A summary of the evaluation is presented in Table 24.

Figure 7-4: Centre Segment - Vernon Street & Rail Corridor Couplet

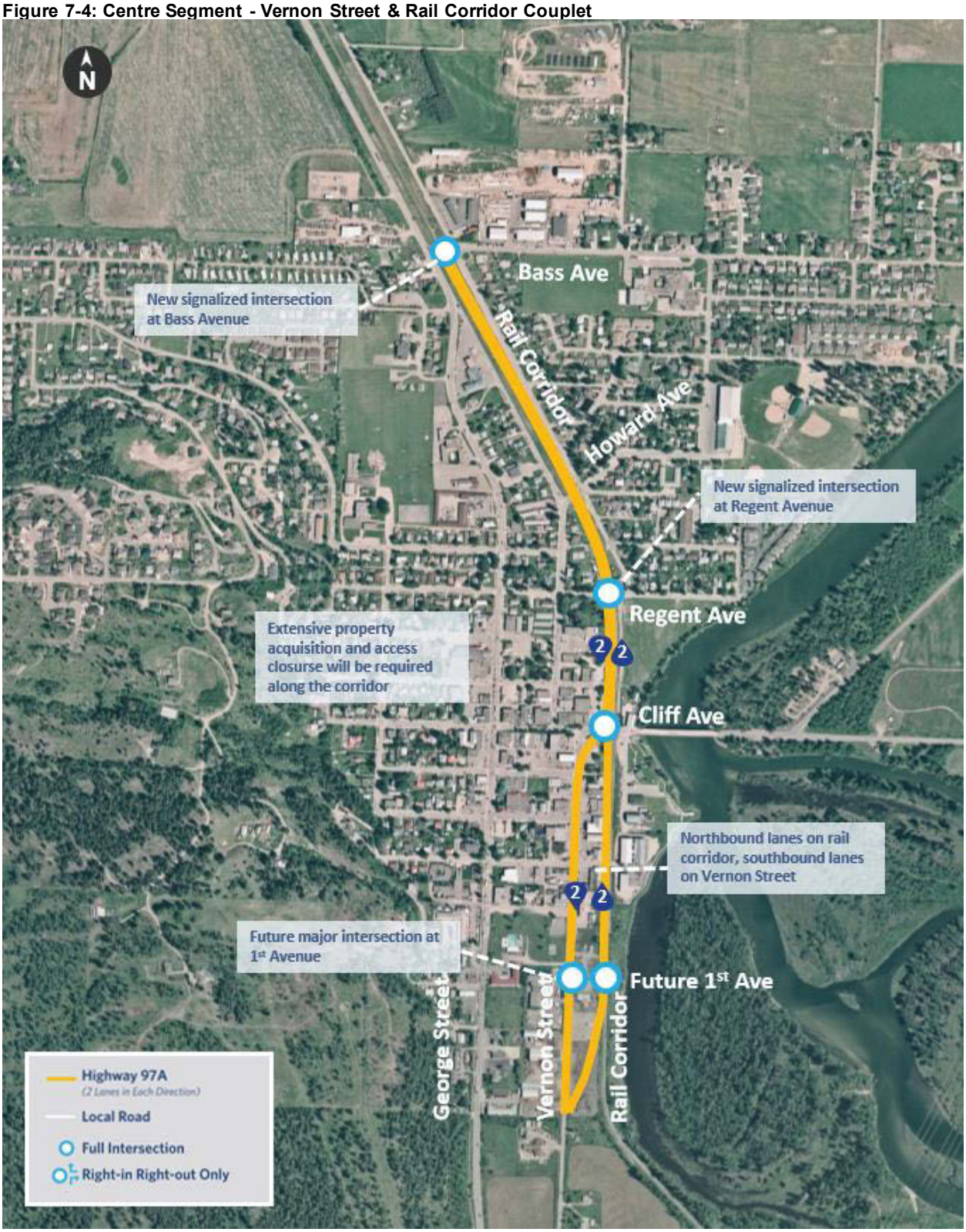


Table 24: Centre Segment - Vernon Street & Rail Corridor Couplet Evaluation Summary

Account		Value	Notes
Financial (NPV of Costs)	Capital Cost	$50,911,000	At $27 million, the lifecycle cost of this option is the second highest, and is nearly double the cost of the cheaper couplet option. The new four lane road corridor between Cliff Avenue and Bass Avenue will require moderate additional ROW and costs, and while portions of Vernon Street can be re-used, it is anticipated to require a near complete re-build to bring it up to highway standards.
	Maintenance & Resurfacing	$798,000	
	Residual Value	$(12,542,000)	
	Total Life Cycle Cost	$39,166,000	
Customer Service (NPV of Benefits)	Highway Travel Time	$(11,900,000)	This option will have the third lowest highway travel time costs, significantly lower than the base case and four lane option, and is tied for lowest safety costs. Similar to the previous option, one-way operation on much of the corridor will enable efficient coordination between signalized intersections, reducing highway travel times, while making it easier for local vehicles to turn on and off the highway.
	Safety	$(13,647,000)	
	Vehicle Operating Cost	$(1,711,000)	
	Total Customer Service	$(27,258,000)	
Social / Community	Local Connectivity	Positive	The option performed the same or better than all other options on the Local Connectivity, Noise and Visual Impact, Active Transportation and Rail Trail accounts. This is because the option will disperse the benefits and impacts of highway traffic throughout the community, while repurposing underutilized ROW for a new use.
	Noise and Visual Effects	Positive	
	Active Transportation	Neutral	
	Rail Trail	Negative	
	Residential Property Acquisition	Low	
	Non-Residential Property Acquisition	Low	
	Residential Equity	Neutral	
Economic Development	Development Opportunity	Positive	The option will provide significant opportunities for new highway oriented businesses along the corridor, specifically for the land between the Rail Corridor and Vernon Street. However, it will provide this benefit at the potential expense of existing businesses along the current highway corridor, as the project will remove all through highway traffic from the centre of Enderby.
	Existing Business Access and Visibility	Negative	
	Agricultural Access	Positive	
Environmental	Environmental	Negative	The northbound corridor would be within the former rail ROW and would be within 30 metres of the Shuswap River for approximately 420 metres. It would likely be subject to restrictions and require habitat offsetting to compensate for the disturbance to the riparian area, which has a “Very High” Aquatic Habitat Index. It is ranked Negative in the Environmental Account. There are no previously identified archaeological sites within the option area, but the adjacent areas that have been assessed indicate very high archaeological potential. Additionally, areas in close proximity to the Shuswap River have been identified as having a high archaeological potential. The option will reduce GHG emissions compared to the base case by a modest amount due to improved highway operation. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	Unknown / Negative	
	Annual GHG Emissions (Tonnes)	4,116	
BCR		0.70	
NPV		$(11,598,190)	

7.3.4 3-Lane Existing Highway and Vernon Street / Rail Corridor

For this option the existing corridor would be adjusted to provide two southbound lanes and one northbound lane, and a new highway corridor on either Vernon Road or the rail corridor (or a combination of both) would provide two northbound lanes and one southbound lane. Highway traffic at either ends of Enderby would be routed to the street with two lanes depending on the direction, i.e., to Vernon Street/rail corridor for northbound traffic and the existing highway for southbound traffic. The option would operate much like a couplet, with the provision of the opposing lanes maintaining north-south travel on both streets, resulting in greater local network connectivity than the couplet options. The opposing single lanes would end before both highway legs merged at either end of the City.

The option would increase the travel capacity of the highway and maintain two-way traffic flow on the existing corridor, and require less ROW that a traditional four lane cross section. Separating the primary northbound and southbound highway traffic flows onto two different corridors will lower the impact of highway traffic on adjacent properties (compared to one single corridor) and will reduce the need for access management.

However, as the option will maintain two-way traffic flow on the existing corridor, it will require more extensive access management than the other couplet options. Additionally, fitting an additional through lane on the existing corridor, while maintaining sidewalks on both sides would be challenging, and could result in property acquisition to accommodate turn lanes at major intersections.

A summary of the evaluation is presented in Table 25.

Figure 7-5: Centre Segment - Existing & Vernon Street / Rail Corridor Network Capacity Increase

Table 25: Centre Segment - Existing & Vernon Street / Rail Corridor Network Capacity Increase Evaluation Summary

Account		Value	Notes
Financial (NPV of Costs)	Capital Cost	$43,433,000	The total life cycle cost of the option is estimated to be in the middle of the options for this segment, as much the existing highway corridor can be repurposed.
	Maintenance & Resurfacing	$798,000	
	Residual Value	$(10,715,000)	
	Total Life Cycle Cost	$33,516,000	
Customer Service (NPV of Benefits)	Highway Travel Time	$(12,850,000)	Travel times and vehicle operating costs for this option will be comparable with the other couplet options, and better than the four-lane two-way option. However, collision costs for this option are anticipated to be significantly higher than the couplet options, as the collision rate for two-way facilities is higher than for one-way facilities. Average collision severity is also anticipated to be higher than the couplet options, as the more dangerous head-on and left turn/head-on collisions only typically occur when there is two-way operation.
	Safety	$(5,928,000)	
	Vehicle Operating Cost	$(1,644,000)	
	Total Customer Service	$(20,422,000)	
Social / Community	Local Connectivity	Positive	The option performs well from a Local Connectivity perspective, as two-way operation and frequent crossing opportunities will be maintained on the existing corridor, and will be introduced on a new north-south corridor through Enderby. The option performs worse on the other Social / Community accounts, as the wider cross section required to enable two-way operation (three lanes for each corridor) will have higher visual and property impacts, and will require more ROW on the rail corridor than one of the other couplet options.
	Noise and Visual Effects	Neutral	
	Active Transportation	Neutral	
	Rail Trail	Negative	
	Residential Property Acquisition	Low	
	Non-Residential Property Acquisition	Medium	
	Residential Equity	Neutral	
Economic Development	Development Opportunity	Neutral	The option will provide a balance of new business opportunities on the new corridor, while maintaining some highway traffic on the existing corridor near existing businesses. However the two-way nature of the highway legs will require more access management that the other couplet options, impacting business access along the existing corridor.
	Existing Business Access and Visibility	Neutral	
	Agricultural Access	Positive	
Environmental	Environmental	Neutral	A corridor within the former rail right of way would be within 30 metres of the Shuswap River for approximately 420 metres. The project would likely be subject to restrictions and require habitat offsetting to compensate for the disturbance to the riparian area which has a "Very High" Aquatic Habitat Index. A corridor entirely along Vernon Street would have less environmental impact, and has been ranked as Neutral in the Environmental category. There are no previously identified archaeological sites within this area, but the adjacent areas that have been assessed indicate a very high archaeological potential. Additionally, areas in close proximity to the Shuswap River have also been indicated to have high archaeological potential. The option will reduce GHG emissions compared to the base case by a modest amount due to improved highway operation. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	Unknown / Negative	
	Annual GHG Emissions (Tonnes)	4,113	
BCR		0.62	
NPV		$(12,783,512)	

7.3.5 Centre Segment Evaluation Summary

Table 26 presents the evaluation of each option for comparison.

The Existing Corridor and Vernon Street / Rail corridor option has the lowest lifecycle cost, is one of the best performing options in terms of customer service benefits, is the only option with a benefit cost ratio that exceeds 1.0, and performs reasonably well in the other categories. The option also has some of the lowest residential and business property impacts, while still providing some business development opportunities. Therefore this option has been selected as the preferred option for the segment.

Table 26: Centre Segment Evaluation Summary Table

Account		Base Case	Four Lane Vernon Street / Rail Corridor	Couplet - Existing and Vernon Street / Rail	Couplet - Vernon Street / Rail	Network Capacity - Existing Highway and Vernon / Rail Corridor
Financial (NPV of Costs)	Capital Cost	$-	$57,911,000	$31,253,000	$50,911,000	$43,433,000
	Maintenance & Resurfacing	$578,000	$798,000	$825,000	$798,000	$798,000
	Residual Value	$(268,000)	$(14,253,000)	$(7,644,000)	$(12,542,000)	$(10,715,000)
	Total Life Cycle Cost	$310,000	$44,455,000	$24,434,000	$39,166,000	$33,516,000
Customer Service (NPV of Benefits)	Highway Travel Time	$-	$2,910,000	$(14,978,000)	$(11,900,000)	$(12,850,000)
	Safety	$-	$(12,732,000)	$(13,647,000)	$(13,647,000)	$(5,928,000)
	Vehicle Operating Cost	$-	$(145,000)	$(1,824,000)	$(1,711,000)	$(1,644,000)
	Total Customer Service	$-	$(9,967,000)	$(30,449,000)	$(27,258,000)	$(20,422,000)
Social / Community	Local Connectivity	Neutral	Positive	Neutral	Positive	Positive
	Noise and Visual Effects	Neutral	Negative	Positive	Positive	Neutral
	Active Transportation	Neutral	Neutral	Neutral	Neutral	Neutral
	Rail Trail	Neutral	Negative	Neutral	Negative	Negative
	Residential Property Acquisition	None	Low	Low	Low	Low
	Non-Residential Property Acquisition	None	Medium	None	Low	Medium
	Residential Equity	Neutral	Negative	Neutral	Neutral	Neutral
Economic Development	Development Opportunity	Neutral	Neutral	Neutral	Positive	Neutral
	Existing Business Access and Visibility	Neutral	Negative	Neutral	Negative	Neutral
	Agricultural Access	Neutral	Positive	Positive	Positive	Positive
Environmental	Environmental	-	Neutral	Neutral	Negative	Neutral
	Archaeological	-	Unknown / Negative	Unknown / Negative	Unknown / Negative	Unknown / Negative
	Annual GHG Emissions (Tonnes)	4,122	4,126	4,111	4,116	4,113
BCR		-	0.23	1.26	0.70	0.62
NPV		-	$(34,177,432)	$6,325,060	$(11,598,190)	$(12,783,512)

7.4 Evaluation – North Segment

Only one option was maintained for the Segment through the screening process, and it is evaluated below.

7.4.1 Four Lanes with Access Management

This option includes widening the highway to four lanes, accesses management, and frontage roads to maintain private property access. The primary intersections with the highway are at Glenmary Road / Old Salmon Arm Road, Brickyard Road, and a new access for North Enderby Timber. Access to Salts Road will be from a new frontage road connected to the North Enderby Timber access. The existing deficient curve in the highway north of Old Salmon Arm Road (and south of North Enderby Timber) will be realigned with adequate geometry, and sight lines will be improved at this location.

Travel speeds on this segment are currently limited by high traffic volumes, and vehicles are estimated to spend 93% of their time following the vehicle in front of them. High frequency collision areas include the section near North Enderby Timber and at the junction between Highway 97A and B. This project will increase the travel capacity of the segment, and the intersection improvements and access management measures will create intersections that are safer and will be easier for vehicles to turn on and off from. The highway will be widened east into the rail corridor on the southern portion of the segment, and will generally be widened to the west on the north portion, with property acquisition required due to the widening and access consolidation.

The option evaluation is summarized in Table 27.

Figure 7-6: North Segment - 4 Lane Option

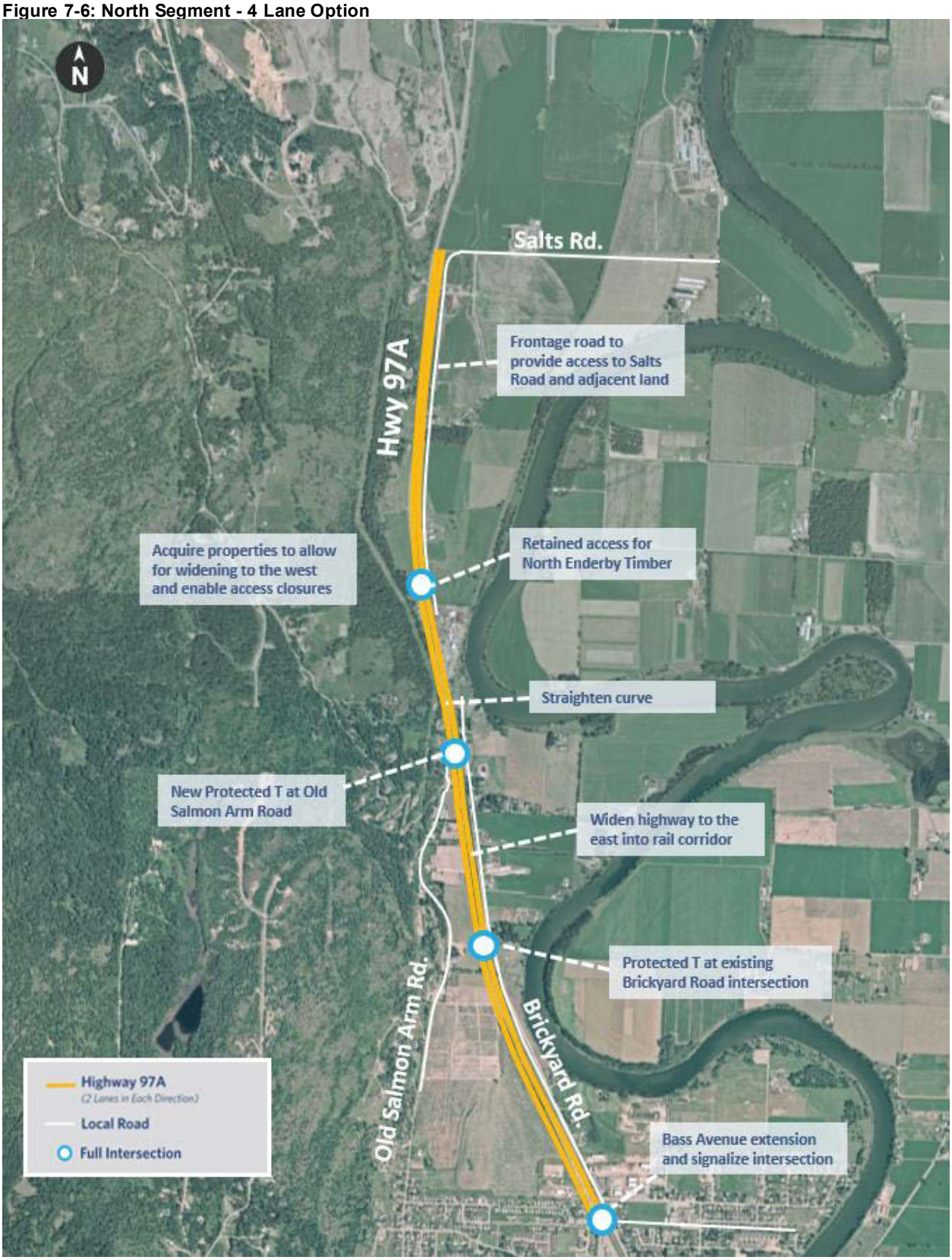


Table 27: North Segment - 4 Lane Option Evaluation Summary

Account		Base Case	Four Lane Existing Corridor	Notes
Financial (NPV of Costs)	Capital Cost	$-	$51,403,000	The majority of the cost is for the construction of two new northbound lanes, with some costs for property acquisition, curve straightening, and the provision of frontage roads.
	Maintenance & Resurfacing	$1,322,000	$1,878,000	
	Residual Value	$(613,000)	$(12,811,000)	
	Total Life Cycle Cost	$709,000	$40,470,000	
Customer Service (NPV of Benefits)	Highway Travel Time	$-	$(19,517,000)	The project provides considerable travel time benefits due to increased travel speeds along the highway. The total travel time benefit is estimated to be in the order $21 million. Safety benefits are anticipated to be marginal, as the highway segment (excluding the Highway 97A/B junction) has a relatively low collision rate. Operating costs are projected to increase due to the reduced fuel efficiency associated with increased travel speeds.
	Safety	$-	$(3,560,000)	
	Vehicle Operating Cost	$-	$7,174,000	
	Total Life Cycle Cost	$-	$(15,903,000)	
Social / Community	Local Connectivity	Neutral	Negative	The project will reduce Local Connectivity, as a number of existing private accesses will be closed, and local residents will have to use the new accesses roads and travel further to access the highway. In addition, property acquisition will impact a total of 25 separate properties, with acquisition required to accommodate the highway widening, new access roads, and to acquire entire properties where it will no longer be cost effective to maintain access. The project will support Active Transportation to the same extent as the Base Case.
	Noise and Visual Effects	Neutral	Neutral	
	Active Transportation	Neutral	Neutral	
	Rail Trail	Neutral	Neutral	
	Residential Property Acquisition	None	Medium	
	Non-Residential Property Acquisition	None	Medium	
	Residential Equity	Neutral	Negative	
Economic Development	Development Opportunity	Neutral	Neutral	The option will provide benefits in terms of improved business travel along the highway, but will impact access to existing farms and businesses. In particular, North Enderby Timber, which now has two direct highway accesses, will be accessed through the existing Brickyard Road.
	Existing Business Access and Visibility	Neutral	Negative	
	Agricultural Access	Neutral	Positive	
Environmental	Environmental	-	Negative	GHG gas emissions will be higher with the proposed option due to the higher travel speeds that the project will enable. Widening the highway into the rail corridor for the southern portion of the segment will be beneficial from an environmental standpoint, as there will be limited greenfield disturbance for much of the corridor. Other environmental considerations for the segment include the need to protect and improve current stream crossings through standard design / construction practices. The project would also need to consider improvements to wildlife crossings to reduce current wildlife collision rates and improve the ease of highway crossings. There are no previously registered archaeological sites or historic places within the buffer area for this segment. However, past studies have indicated that there is a high archaeological potential in the area, and nine specific areas of archeological potential have been identified within the segment. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	-	Unknown / Negative	
	Annual GHG Emissions (Tonnes)	8,721	10,847	
BCR		-	0.40	
NPV			$(23,857,239)	

7.5 Highway 97A/B Junction

Two options were retained through the screening process for the Highway 97A/B, and they are evaluated below.

7.5.1 Highway 97A/B Junction At-Grade Improvements

This option will maintain the junction of Highway 97A/B at grade, and the eastbound left turn movement will be removed from the intersection to meet the traffic operational thresholds. The option includes turn lane extensions for the northbound left and southbound right turns, improvements to the southbound sight lines from Highway 97A via re-grading, and improvement to the southeast bound right turn from Highway 97B to Highway 97A to enable free flow right turns into the future outside travel lane on the highway.

The southbound sight lines will be improved by raising portions of the north leg of the intersection on Highway 97A.

The option will address the traffic capacity and geometric issues at the intersection, and help reduce some types of collisions.

The evaluation of the option has been summarized in Table 28.

Figure 7-7: Highway 97A/B Junction At-Grade Improvements

Table 28: Highway 97A/B Junction At-Grade Improvements Evaluation Summary

Account		Base Case	At Grade Improvements	Notes
Financial (NPV of Costs)	Capital Cost	$-	$4,590,000	Costs are primarily for the extension of the turn lanes, and the re-grading of the southbound approach.
	Maintenance & Resurfacing	$202,000	$151,000	
	Residual Value	$(115,000)	$(539,000)	
	Total Life Cycle Cost	$87,000	$4,203,000	
Customer Service (NPV of Benefits)	Highway Travel Time	$-	$(347,000)	The project will provide a modest amount of travel time and vehicle operating cost benefits due to the reduction of delays and increased vehicle speeds through the intersection. It will also provide modest safety benefits due to the improvement of certain turning movements and the elimination of other conflicts due to the removal of the eastbound left turn.
	Safety	$-	$(387,000)	
	Vehicle Operating Cost	$-	$(463,000)	
	Total Customer Service	$-	$(1,197,000)	
Social / Community	Local Connectivity	Neutral	Negative	The project will reduce Local Connectivity due to the removal of the eastbound left turn, although the number of people completing this maneuver is current limited. Drivers currently making this turn would be expected to either turn right and then travel south to conduct a U-turn at the northern most upgraded intersection to travel north to Highway 97A, or use Highway 1 to reach Highway 97A instead. The project will support Active Transportation to the same extent as the Base Case.
	Noise and Visual Effects	Neutral	Neutral	
	Active Transportation	Neutral	Neutral	
	Rail Trail	-	-	
	Residential Property Acquisition	None	None	
	Non-Residential Property Acquisition	None	Low	
	Residential Equity	Neutral	Negative	
Economic Development	Development Opportunity	-	-	The option will provide negligible benefits in terms of economic development.
	Existing Business Access and Visibility	-	-	
	Agricultural Access	Neutral	Neutral	
Environmental	Environmental	-	Neutral	The option will reduce GHG emissions at the intersection by approximately 28 tonnes per year, or a 22% reduction, due to reductions in delay at the intersection. There are no registered environmental sites with the area. The project would potentially require the upgrading of an existing steam crossing near the junction. There are no registered archaeological sites within the study area, but there is considered a high likelihood for archaeological potential, partially due to the 5 previously identified AOP sites nearby. As the footprint of this option would be smaller than the other Highway 97A/B junction option, it is considered to have a lower potential for environmental and archaeological impact. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	-	Unknown / Negative	
	Annual GHG Emissions (Tonnes)	127	99	
BCR		-	0.29	
NPV		-	$(2,917,914)	

7.5.2 Highway 97A/B Grade Separation

For this option the northbound left turn movement will be grade separated through the use of a fly-over. The option includes all of the changes proposed for the at-grade operation, expect for the removal of the eastbound left turn movement at the intersection, as this movement will be able to remain at the at grade intersection once the conflicting northbound left turning vehicles are removed.

Approximately half of all trips at the intersection are to/from the northwest on Highway 97B, and the other half are to/from the north on Highway 97A. This results in very high northbound left turning demand, which conflicts with the high southbound through movements and southeast bound left turn movements. By accommodating the northbound left turn movement with a grade separated fly-over, the option will remove a major conflicting movement, and improve the traffic operations and safety of the intersection.

The evaluation of the option has been summarized in the following accounts

Figure 7-8: Highway 97A/B Grade Separation

Table 29: Highway 97A/B Grade Separation Evaluation Summary

Account		Base Case	Grade Separation	Notes
Financial (NPV of Costs)	Capital Cost	$-	$11,582,000	Approximately half of the cost being for the northbound left turn flyover, and the other half for the at-grade improvements. The at-grade improvement costs are primarily for the extension of the turn lanes, and the re-grading of the southbound approach.
	Maintenance & Resurfacing	$202,000	$191,000	
	Residual Value	$(115,000)	$(980,000)	
	Total Life Cycle Cost	$87,000	$10,792,000	
Customer Service (NPV of Benefits)	Highway Travel Time	$-	$(1,091,000)	The project will provide significant travel time and vehicle operating cost benefits, by essentially eliminating intersection delay for the northbound left turn movement. The removal of this movement will reduce the number of vehicles through the at-grade intersection, and will result in a reduction in the collision rate (from an estimated 0.39 to 0.13), and the significant associated safety benefits.
	Safety	$-	$(1,410,000)	
	Vehicle Operating Cost	$-	$(1,287,000)	
	Total Life Cycle Cost	$-	$(3,788,000)	
Social / Community	Local Connectivity	Neutral	Neutral	The project will have a negligible impact on the community and neighbouring residents in the area, as it will only require small amounts of undeveloped land for the improvements, and will maintain all existing intersection movements. The project will support Active Transportation to the same extent as the Base Case.
	Noise and Visual Effects	Neutral	Neutral	
	Active Transportation	-	-	
	Rail Trail	-	-	
	Residential Property Acquisition	None	None	
	Non-Residential Property Acquisition	None	Low	
	Residential Equity	Neutral	Neutral	
Economic Development	Development Opportunity	-	-	The option will provide negligible benefits in terms of economic development.
	Existing Business Access and Visibility	-	-	
	Agricultural Access	Neutral	Positive	
Environmental	Environmental	-	Neutral	The option will reduce GHG emissions at the intersection by approximately 77 tonnes per year, or a 60% reduction, due to reductions in delay at the intersection. There are no registered environmental sites with the area. The project would potentially require the upgrading of an existing steam crossing near the junction. There are no registered archaeological sites within the study area, but there is considered a high likelihood for archaeological potential, partially due to the 5 previously identified AOP sites nearby. As the footprint of this option would be larger than the other Highway 97A/B junction option, it would have a higher environmental impact and potential for archaeological sites. An AIA would need be completed during the design phase (or prior to it) for archeological site management.
	Archaeological	-	Unknown / Negative	
	Annual GHG Emissions (Tonnes)	127	50	
BCA		-	0.35	
NPV		-	$(6,917,559)	

8 Recommended Option

8.1 Recommended Option

Based on the multiple account evaluation of the segment options, and subsequent discussions with the project team and stakeholders, the recommended long-term options for the study area are listed by segment below. Table 30 summarizes the recommended option.

Table 30: Recommended Option

Segment	Extents	Recommended Option
South	Stepney Cross Road to Enderby-Splatsin Boundary	Four Lane Highway
Centre	Enderby Splatsin Boundary to Enderby North Boundary	Couplet on Existing Corridor & Vernon Street / Rail Corridor
North	Enderby Boundary to Highway 97A/B Junction	Four Lane Highway
	Highway 97A/B Junction	Northbound Left Turn Grade Separation

South Segment – Four Lane Highway with Transition

- Widened highway along the highway corridor, south of Baptiste Road
- New two-lane northbound transition to connect to Quilakwa Road, which becomes Vernon Street
- Convert existing highway segment near Canyon Road to southbound travel
- Full movement upgraded intersections to be provided at Stepney Cross Road, and south of the Starlight Drive-In
- The highway corridor would be realigned to the east, and the existing highway corridor between Baptiste Road and the new access to the south would be repurposed as a frontage road
- Existing Quilakwa and Baptiste Road intersections would be closed
- A new frontage road would be built on the east side of the highway to provide access from Stepney Cross Road

Centre Segment – Couplet on Existing Corridor & Vernon Street / Rail Corridor

- Repurpose the existing highway corridor to southbound travel only (two lanes)
- Add a new northbound corridor along Vernon Street and the former rail corridor, with a transition between the two corridors occurring near King Avenue
- Signalized intersections on the northbound corridor at 1st, Cliff, and Howard Avenues
- Signalized intersections on the southbound corridor at Knight, Mill, and 1st Avenues
- Removal of the existing signalized intersection at Hubert Avenue
- Couplet legs to join at the new signalized intersection at Bass Avenue

North Segment – Four Lane Highway & Highway 97A/B Junction Grade Separation

- The highway would be widened to the east (into the former rail corridor) on the south end, and to the west on the northern portion of the corridor
- Straighten highway curve near Old Salmon Arm Road
- Full movement intersections to be included at Brickyard Road, Old Salmon Arm Road, and a new intersection location north of North Enderby Timber
- A northbound left turn flyover would be added at the Highway 97A/B junction
- Geometric intersection improvements at the Highway 97A/B junction including improving the eastbound and southbound right turn radii, and re-grading the southbound approach

8.2 Concept Refinements

Since the multiple account evaluation process was initiated, a number of refinements were identified for each of the preferred options. This section provides a summary of the general refinements that were made by segment.

8.2.1 South Segment Refinement

The original concept included an upgraded full movement intersection at Baptiste Road, and a frontage road along the entire east side of the highway.

The potential for Baptiste Road to be re-aligned to the BC Hydro corridor in the future was identified by the Splatsin community (between Canyon Road and Highway 97A). To accommodate this, the concept now includes a new full movement T-intersection south of the hydro corridor. The new intersection would provide access to Baptiste Road and the Starlight Drive-In, and be able to connect to a future Baptiste Road alignment along the BC Hydro corridor in the future if desired. The proposed scheme uses the existing highway corridor as a frontage road, and a new four lane highway segment would be built to the east. This concept, with the re-use of the highway as a frontage road, would avoid the recorded cemetery / archaeological site on the west side of the highway and the Starlight Drive-In.

The revised concept also includes a shorter frontage road on the east side of the highway, to avoid conflicting with the existing cemetery near Highway 97 / Quilakwa Drive.

Additional work will be required to confirm the preferred transition option within Splatsin. This work will include continued coordination with Splatsin's on-going Integrated Land Use and Transportation Planning effort, and on-going community consultation. Recommendations from these should inform the selection of the transition option, and can be incorporated into any next preliminary design steps.

8.2.2 Centre Segment Refinement

The originally evaluated concept for the Centre Segment proposed that the southern portion of the northbound alignment (between the Enderby/Splatsin boundary and Cliff Avenue) be either on Vernon Street or the former rail corridor entirely.

After the environmental investigation and review of both potential corridors, it was determined that neither option was ideal, as an all rail corridor option would fall within the riparian buffer

area of the Shuswap River, and an all Vernon Street option would require extensive property acquisition and a skewed intersection at Cliff Avenue.

Therefore the preferred option for the Centre Segment has the southernmost portion of the northbound corridor on Vernon Street, the middle portion of the northbound corridor within the former rail corridor, with a transition between the two occurring near King Avenue. This refined option addresses both of the issues noted above.

Signalized intersections proposed at Knight, Mill and Bass Avenues on the southbound leg. The signalized intersections on the southbound leg will essentially maintain the existing traffic control scheme on the existing highway corridor, with the current Knight Avenue pedestrian crossing being upgraded to a full signal when warranted.

On the northbound leg, new signalized intersections will be located at Cliff, Howard, and Bass Avenues. Howard Avenue has been selected over Regent Avenue as it is currently the primary travel route between the northeast portion of Enderby and the rest of Enderby, and Howard transitions seamlessly to the north-south Evergreen Street, providing a direct connection to central Enderby. This signalized intersection will also include a high quality active transportation crossing, as it is one of the primary travel paths between the residential areas in Enderby and the MV Beattie Elementary and AL Fortune Secondary Schools.

Although the future intersection of the highway with Bass Avenue only shows three legs, the proposed option does not preclude the future extension of Bass Avenue to the west of the intersection. This would require some property acquisition. A roundabout at Bass Avenue was considered instead of a signalized intersection, but it was found to be unfeasible due to the amount of land that it would require.

Local access management will be required along Howard Avenue near the proposed intersection, including restricting southbound left turns from Evergreen Street to Howard Avenue, and closing Brickyard Road north and south of Howard Avenue on the east side of the highway corridor. These are recommended to allow efficient local traffic operations. Residents that currently use this portion of Brickyard Road will be required to use either the new Bass Avenue connection, use Kate Street to access Howard Avenue, or travel south to Regent Avenue. A schematic for this location is shown in Figure 8-1.

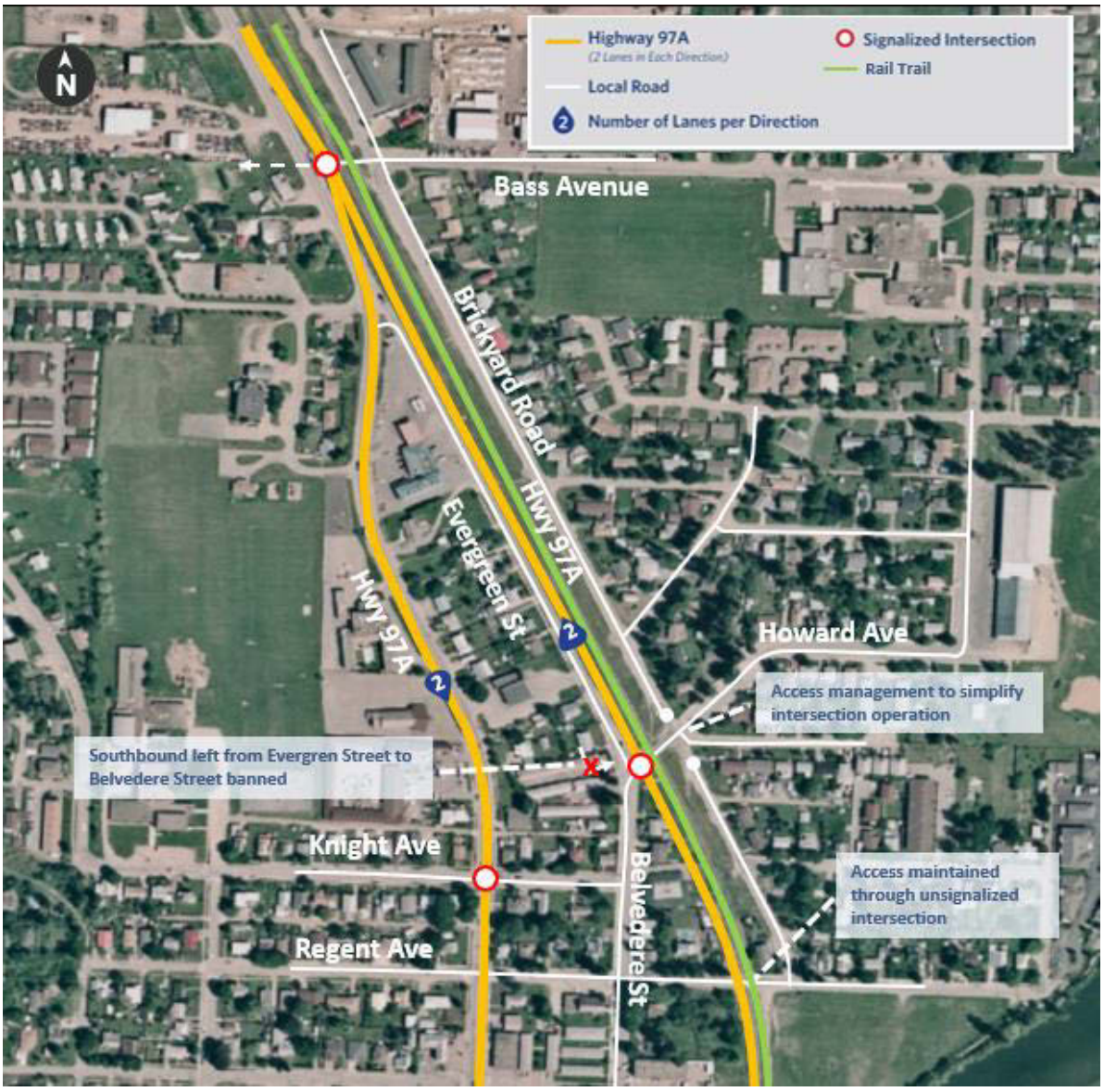
An unsignalized intersection is recommended for Regent Avenue, and it would enable both vehicular and active transportation crossing movements, just to a lesser degree than at Howard Avenue.

Traffic signals are also included at the highway intersections along 1st Avenue, and should be installed when warranted, with a potential trigger being the proposed Knoll Hill development area. Additionally, the existing Hubert Avenue signal could be removed, as it will no longer be required once the existing corridor is converted to one-way traffic.

East-west stop controlled intersections are recommended at the remainder of the highway intersections on both the northbound and southbound corridors, and they will be sufficient for the existing limited travel volumes on these routes. It is also noted that, if high highway traffic

volumes make crossing difficult during peak periods, the highway will still be able to be crossed by making a right turn and then a left turn at the next street.

Figure 8-1: Enderby Northbound Highway Leg at Howard – Refinement Details



8.2.2.1 RAIL TRAIL INTEGRATION

The preferred centre segment concept uses the former rail right-of-way for approximately 1.3 km within the City of Enderby, and this space will need to be shared with the proposed Shuswap North Okanagan Rail Trail. The concept maximizes the space between the highway's northbound lanes and the rail trail by placing the northbound lanes of the couplet on the west edge of the right-of-way and the rail trail on the east edge. This means that there will be typically about 10 metres of space between the highway lanes and the rail trail, providing an opportunity for streetscaping or other amenities to support the rail trail and to create a gateway to Enderby. At the conceptual level, specific treatments have not been identified, but should be considered as part of detailed planning for the highway and rail trail.

At key intersections, such as Cliff Avenue, the rail trail is shifted in the concept so that it is adjacent to the highway, allowing the highway and rail trail to be within the same intersection. Rail trail users would use the traffic signal to cross Cliff Avenue.

The concept is intended to provide as much flexibility as possible, while allowing both facilities to co-exist. It may be appropriate to realign either the rail trail or highway in the design phase to create parking, trail head amenities, or other public space to improve the overall user experience and benefits to Enderby.

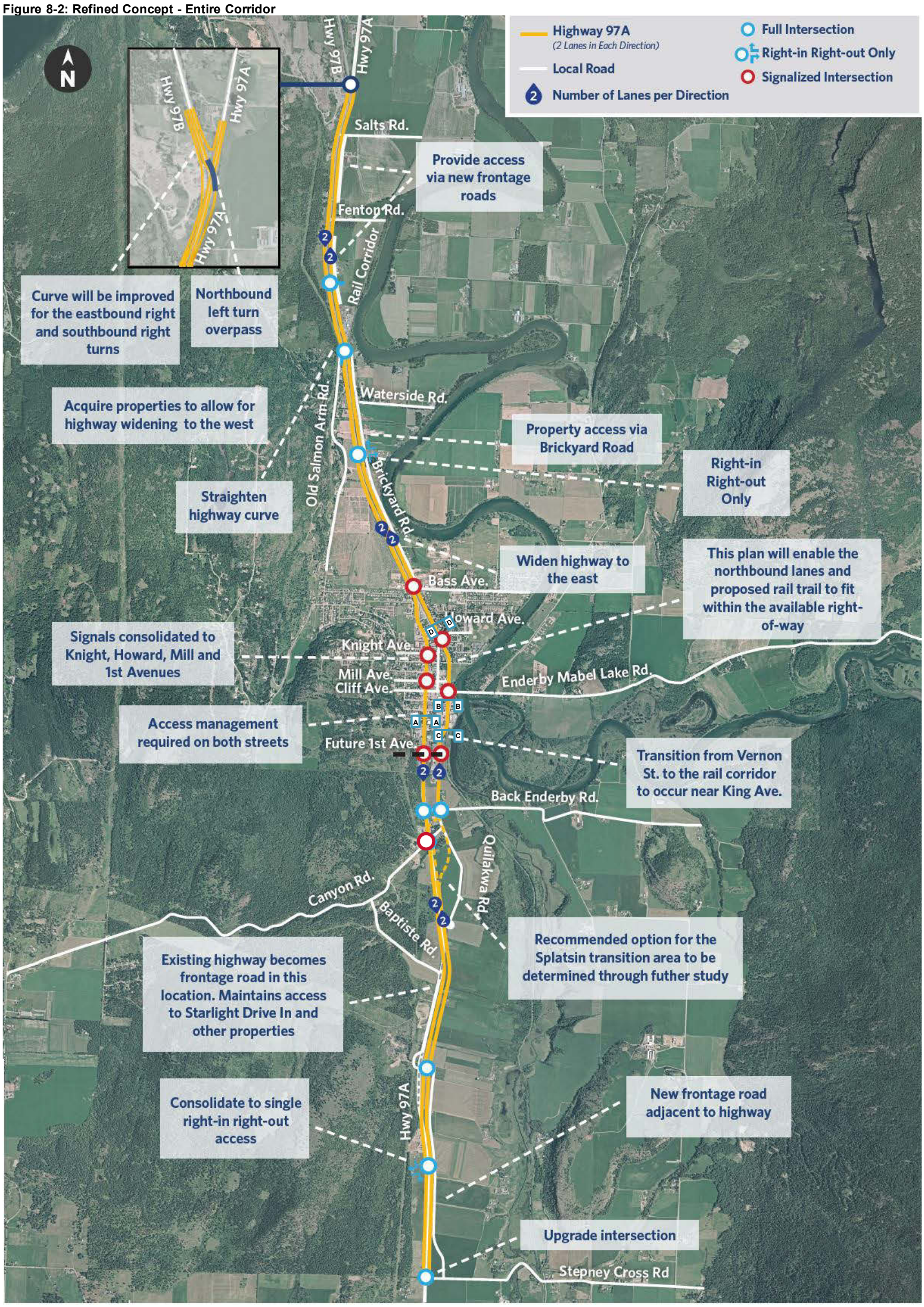
8.2.3 North Segment Refinement

The refined concept for the North Segment is very similar to the evaluated four lane option. A new full movement intersection will be located between Fenton Road and North Enderby Timber to provide access to North Enderby Timber and the adjacent properties via a frontage road.

8.3 Recommended Conceptual Design

Figure 8-2 shows the recommended refined concept along the entire corridor, and conceptual drawings of the entire study corridor are provided in **Appendix A**. It is noted that these are conceptual level drawings, and some details, such as sidewalks and landscaping, have been left out for simplicity.

Figure 8-2: Refined Concept - Entire Corridor



8.3.1 Concept Cross Sections

To clearly show the proposed highway couplet form within Enderby, and the linear active transportation facilities along the highway, Figure 8-3 how the future cross sections along the highway at select locations. Cross section locations are described in each title, and the letter corresponds with a location from Figure 8-2. The dimensions proposed are based on the BC MOTI Supplement to TAC Geometric Design Guide and the BC Active Transportation Design Guide[7]. It is noted that the former rail corridor ROW is not a uniform width through Enderby, and that some sections narrow to around 18 meters, which means that the large separation between the highway and the proposed future rail trail will need to be reduced in these areas. The same reduction may also be desirable at major intersections / road crossing (bringing active transportation users closer to the intersection) to improve the visibility of these users to drivers.

8.3.2 Intersections / Access Management

The recommended couplet option within Enderby and portions of Splatsin will enable many of the existing accesses and intersections to remain open as they are today along the existing highway corridor and on Vernon Street. There will be a need for higher capacity signalized intersections at some locations. The locations where signals are recommended were indicated in Figure 8-2, and are listed below:

- Bass Avenue (signal)
- Howard Avenue (NB corridor)
- Knight Avenue (SB corridor)
- Mill Avenue (SB corridor)
- Cliff Avenue (NB Corridor)
- Future 1st Avenue (both corridors)
- Canyon Road

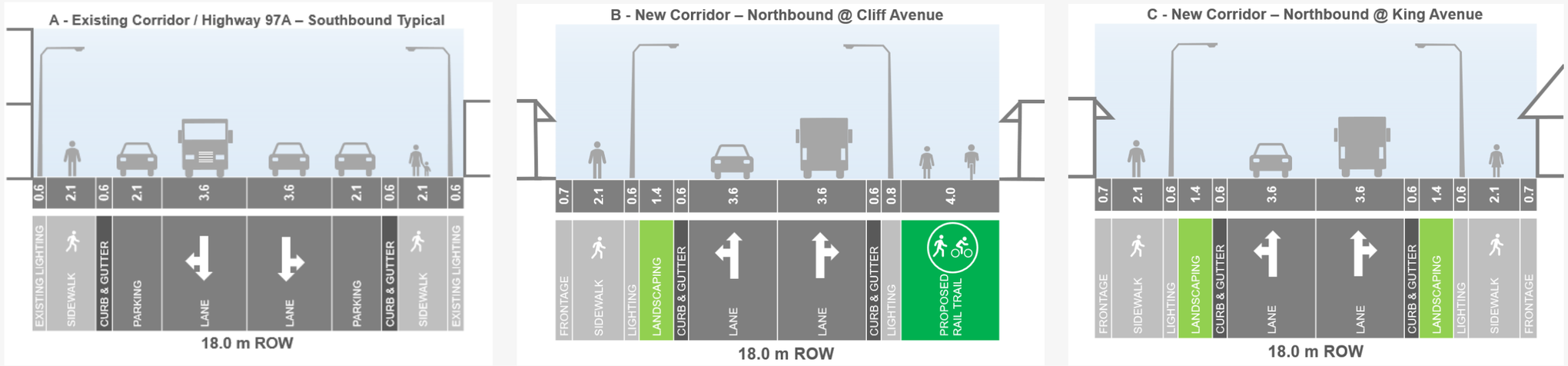
These locations were chosen based on the following:

- Traffic capacity, and the need for east-west connectivity;
- Existing major intersection locations;
- The preferred major roads in Enderby, as identified earlier in the project; and,
- The signals at Knight and Howard Avenues will improve east-west crossing comfort for pedestrians in these areas, particularly to/from the nearby schools.

It is noted that these proposed major intersection locations are based on our best understanding of the conditions in Enderby, but the specific locations may need to be adjusted as the City and Splatsin continue to evolve. The remaining intersections along the highway corridors will be able to remain open to all movements (through and left / right turns), as the one-way nature of the highway couplet will enable east-west stop controlled intersections to operate sufficiently. TAC signalization warrants are provided in **Appendix L.**

[7] The cross section element width of 3.6m for a lane, 0.6m gutter, and 0.7m setback are all based on the BC MOTI Supplement to TAC Geometric Design Guide (Section 400), as is the 2.0m urban clear zone (620.13). Sidewalk widths on Vernon Street (2.1m) are based on the BC Active Transportation Design Guide for Industrial areas (Table C-5), and the multi-use pathway / rail trail north of King Avenue is based on the guideline value for multi-use pathways on arterial corridors (Table E-20).

Figure 8-3: Cross Sections



8.3.3 Active Transportation and Transit

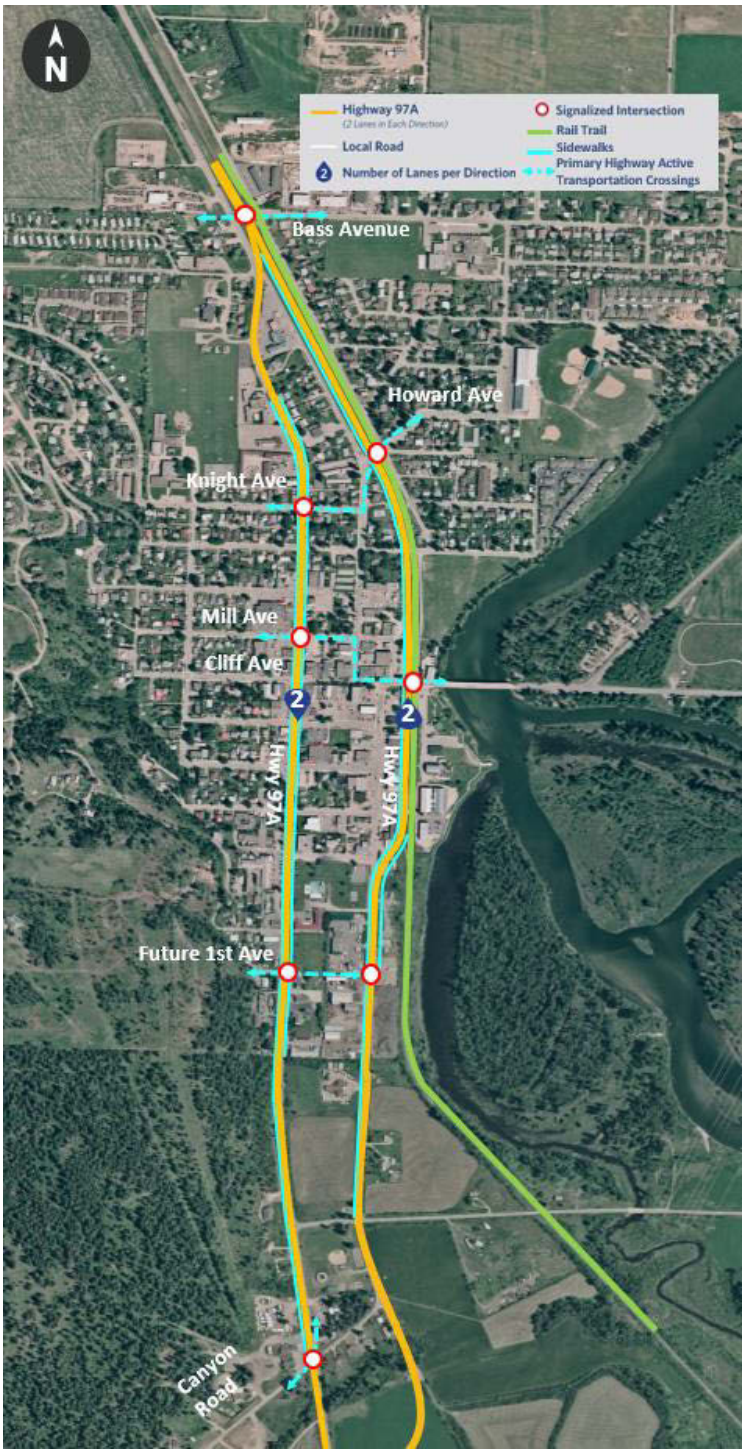
In addition to the linear active transportation facilities proposed along the highway corridors within Enderby (as presented in the concept cross sections), this section details the addition recommended active transportation and transit facilities to be included with the project.

8.3.3.1 MAJOR HIGHWAY CROSSING

While east-west pedestrian crossings will be permitted across much of the northbound and southbound highway corridors within Enderby and Splatsin (at all intersections unless otherwise marked), there is also a need for high quality active transportation crossings to make it easier / more comfortable to cross for all users, including those with mobility impairments and children, specifically within the urban areas. High quality active transportation crossings in this case can be described as signal protected crossings, that connect key origins and destinations in the community, or connect to major north-south active transportation routes.

Figure 8-4 shows the recommended high quality active transportation crossing locations, and all will offer protection via a signalized intersection. The design of these crossings and routes should follow the guidance from the BC Active Transportation Design Guide.

Figure 8-4: Primary Highway Active Transportation Crossing Locations



8.3.3.2 OTHER HIGHWAY CROSSING

In addition to the major active transportation crossing opportunities provided, it is recommended that highway crossing opportunities are provided every 200m (or ever other intersection) between the identified primary highway crossings. These intersections should be treated to make crossings easier and safer (through the use of curb bulges, painted crosswalks, etc.), even if a traffic signal isn't provided.

The following features can be implemented at either all other intersections or at select intersection within Enderby and Splatsin:

- Curb bulges to shorten the crossing distance and make pedestrians more visible
- Pedestrian crossing signal (optional if a signal is not provided)
- Parking restrictions on either side of the crossing to improve vehicle to pedestrian sight lines (applicable to the southbound leg only)
- Crosswalks, either painted, textured or both
- Roll-over curbs to enable compact intersection designs while accommodating larger truck swept paths
- Landscaping and streetscaping near the intersections / pedestrian crossings to signal that the area is a pedestrian area to drivers (such as lighting, garbage bins, small trees / plans, benches, etc.)

Figure 8-5 shows an example of a one-way street Medicine Hat, AB, with many of these treatments to show what the intersections along the highway could look like.

Figure 8-5: Pedestrian Friendly Intersection Treatment

Source: Google Maps, 5th Avenue and 2nd Street SE in Medicine Hat, AB.

It is recommended that the City of Enderby and Splatsin identify their desired “secondary” highway active transportation locations within each community. These secondary crossings could be provided along major pedestrian desire lines, or at a regular interval, such as at every other intersection.

8.3.3.3 TRANSIT

The highway will continue to be used as a transit route for inter-city transit services between Enderby the Salmon Arm and Vernon. A new official bus stop is recommended at the intersection of Highway 97A and Canyon Road in the interim to serve the Splatsin community, and the existing central bus stop located in Enderby will be sufficient and compatible with the recommended improve option.

8.4 Total Project Evaluation Summary

An evaluation of the refined recommended concept is summarized in Table 31, and described in the following sections.

A Class 5 Cost estimate was conducted using the elemental parametric method, and was developed based on the BC Ministry guidelines including the ministry's *Project Cost Estimating Guidelines* and values from the *Sample Project Cost Estimate Worksheet Template*. The cost estimate took into account property acquisition, new road construction, sidewalks, and estimates for landscaping, stormwater and utility changes. The cost estimate is based on 2020 costs.

Non direct construction costs were included as additional factors, including values for project management (4.5%) , planning and design (10%), construction supervision (7%), environmental and archaeological costs (5%) and contingency (30%). These values, and the unit costs used for different project components, were based on either guidance from Ministry documentation, or HDR's industry experience on similar projects.

The detailed conceptual cost estimate for the preferred option, including key inputs and assumptions, can be found in **Appendix M**.

Table 31: Recommended Option Combined Evaluation Summary

Account		Base Case	Recommended Option
Financial (NPV of Costs)	Capital Cost (including 30% contingency)	$-	$155,925,000
	Maintenance & Resurfacing	$2,102,000	$4,786,000
	Residual Value	$(996,000)	$(36,755,000)
	Total Life Cycle Cost	$1,106,000	$123,954,000
Customer Service (NPV of Benefits)	Highway Travel Time	$-	$(58,174,000)
	Safety	$-	$(33,035,000)
	Vehicle Operating Cost	$-	$11,741,000
	Total Customer Service Benefits	$-	$(79,468,000)
Social / Community	Local Connectivity	Neutral	Negative
	Noise and Visual Effects	Neutral	Positive
	Active Transportation	Neutral	Neutral
	Rail Trail	Neutral	Neutral
	Residential Property Acquisition	0	17
	Non-Residential Property Acquisition	0	51
	Residential Equity	Neutral	Varies
Economic Development	Development Opportunity	Neutral	Neutral
	Existing Business Access and Visibility	Neutral	Varies
	Agricultural Access	Neutral	Positive
Environmental	Environmental	Neutral	Neutral
	Archaeological	Neutral	Unknown / Negative
	Annual GHG Emissions (Tonnes)	22,531	26,899
BCR		-	0.64
NPV		-	$(42,660,562)

8.4.1 Financial

The combined project option is estimated to have a total lifecycle cost of $155.9 million, with the majority of the costs for four laning the rural highway sections outside of Enderby.

8.4.2 Customer Service

The project will provide significant travel time benefits due to increased travel speeds along the corridor. Considerable safety benefits are also forecasted, primarily due to the significant forecasted improvements within Enderby and at the Highway 97A/B junction, as the existing 2-lane highway segment north of Enderby has a low existing observed collision rate (when the Highway 97A/B junction is excluded).

Vehicle operating costs for the option as a whole are anticipated to increase, due to the increase in travel speeds along the highway segment, as fuel economy typically decreases as travel speeds increase above 70 – 80 km/h.

8.4.3 Social / Community

The project will require some property acquisition along the entire corridor, but the refined concept attempts to minimize acquisition and impacts where possible by shifting the highway alignment within the available ROW, through the retention of some existing accesses as right-in right-out, and the replacement of others with new full intersection accesses that will be accessible via a service road.

Within Enderby, the selected option will enable existing accesses to residential properties to remain much as they are today along the existing highway, and will enable frequent and high quality active transportation crossings to be implemented throughout the community. While some access management will be required, the couplet option will essentially halve traffic volumes on the existing highway corridor through Enderby, spreading the benefits and impacts of highway proximity on residents. The portions of the highway that are within the former rail ROW have been offset to the west, providing ample room for the future inclusion of the rail trail active transportation pathway, and a buffer space between the two facilities. Portions of the corridor will be shared both within Enderby and to the north (up to North Enderby Timber).

8.4.4 Economic Development

The project option will provide benefits in terms of improved business travel along the rural portion of the highway, but will impact access to existing farms and businesses. In particular, North Enderby Timber, which currently has two direct highway accesses, will now be accessed through a new frontage road that will connect to the north end of the site, and a new full movement intersection.

Within Enderby, the provision of a new northbound highway corridor will provide highway access to new lands, supporting economic development, while at the same time maintaining traffic on the existing corridor, spreading out the economic benefits and impacts of the highway. The proposed one-way concept will result in some level of circuitous routing for some trips, but the level of additional travel will generally be minimal due to the close block spacing in Enderby.

In Splatsin, the preferred transition solution will provide space for a future economic development area, as desired by the community (in between the future two highway segments, south of Quilakwa Crescent).

8.4.5 Environmental

Due to the increase in vehicle speeds and reduced fuel economy on the rural highway segment, the project is anticipated to increase GHG emissions by over 4,000 tonnes annually, or an increase of approximately 20%.

Environmental impacts of the combined project are anticipated to be Neutral, and the Archaeological impacts are anticipated to be Unknown/Negative compared to the base case. The environmental and archaeological impacts of the option have been limited by providing much of the additional highway capacity either within the existing right-of-way or within existing disturbed areas such as the on the former rail corridor. Additionally, locating the Vernon Street to Rail Corridor transition near King Street will enable the proposed northbound leg to avoid the Shuswap riparian buffer area.

Key environmental considerations that will need to be incorporated into the preliminary design of the project include the wildlife crossings on the rural segments, and the improvement of existing stream crossing along the route through standard in-design mitigation measures. There are no previously registered archaeological sites with the proposed new construction areas of the project (environmental site EdQs-38 is adjacent to the existing highway corridor / future southbound leg). However, much of the proposed option is within an area of high to very high archaeological potential, and a number of specific AOPs have been identified along / adjacent to the route. Additional in-field archaeological assessments will be required to refine the alignment and develop the design of the project in more detail.

A Limited Stage 1 Preliminary Site Investigation[8] was conducted for the central segment within Enderby to identify former or current actives near the proposed project (northbound leg) that may represent areas of potential environmental concern (APECs) and the associated potential contaminants of concern (PCOCs). The report is included in **Appendix N**.

The study identified two APECs within the northbound corridor and twenty-two APECS with the Local Study Area (250 of the proposed northbound corridor). The report recommended additional investigations to evaluate the APECs prior to construction activities, and to evaluate if the APECs represent an area of environmental concern.

[8] Limited Stage 1 Preliminary Site Investigation – MOTI southern Interior Region Highway 97A Enderby/Splatsin Transportation Plan, Golder, December 24, 2020.

9 Implementation

9.1 Implementation Strategy

This conceptual plan is intended to provide direction for future improvements to the Highway 97A corridor, and to inform the Southern Interior Region's Highway Improvement Program. It is expected that priorities will change over time, and it may be necessary to adjust the implementation sequencing to take advantage of funding and other opportunities. Changing trends and technology will further contribute to future uncertainty. In particular, project and programs in the later phases will likely change over time.

The implementation strategy was developed by identifying portions of the final option that would provide value and address the identified problems in the short and medium term on their own, before large, more expensive portions of the project are required. The recommended option has inherent phasing opportunities, enabling certain portions of the final option to be completed in advance, reducing the strain on the existing highway before the entire corridor is upgraded. Such potential staging opportunities include the early completion of the northbound highway leg within Enderby for two-way operation (to reduce local traffic on the highway), and the Highway 97 A/B junction grade separation improvements. These projects and others can be built before much of the rest of the project is completed and would provide meaningful interim benefits.

Based on the best current information, Table 32 presents the recommended implementation strategy to build the option, and Figure 9-1 graphically displays the implementation plan.

9.1.1 Phase 1 (Short Term)

In the near term, we recommend addressing capacity issues at key intersections within the urban portion of the study area, particularly at Canyon Road and Knight Avenue, when warranted for signalization.

This will improve operations at these intersections in the short term, and the improvements will remain valuable as these intersections will be maintained as major highway intersections / crossing locations.

9.1.2 Phase 2 (Medium Term)

In the medium-term horizon (~10 years), we recommend building the new northbound highway corridor within Enderby, but operating it as a two-way road initially. This will provide an alternate north-south route in Enderby to relieve some of the pressure on Highway 97A. The new intersection at Bass Avenue can be constructed, and either the Splatsin Transition can be constructed with a temporary intersection to the south Highway 97A segment, or the south end of the new road can merely transition to Vernon Street / Old Vernon Road, without requiring the Splatsin Transition.

Traffic operations at the Highway 97A/B intersection will continue to decline, and we recommend completing the grade separation once warranted, which is anticipated to be in the medium term.

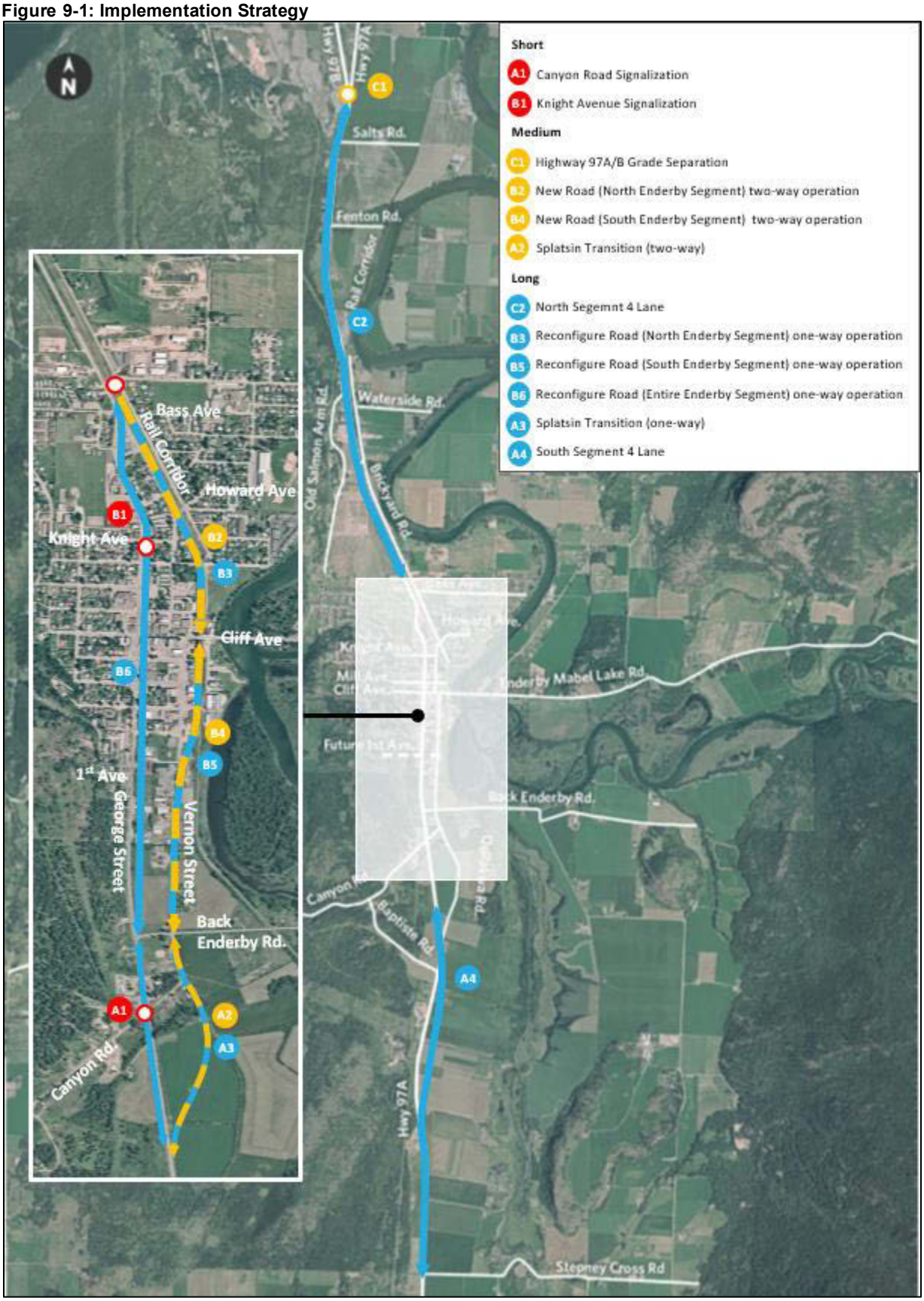
9.1.3 Phase 3 (Long Term)

The project would be completed in the third and final phase by 4-laning the north and south highway sections, connecting them to the new northbound corridor in Enderby, and converting traffic to one-way operation on both couplet legs in Enderby. This can be accompanied by street-scaping improvements on the existing highway corridor within Enderby.

Table 32: Implementation Strategy

Time Frame	ID	Component	Description
Short Term - 5 Years	C1	Canyon Road Short Term Improvements	- Signalized Intersection
	B1	Enderby Short Term Improvements	- Signalized Intersection
Medium Term - 10 Years	C1	Highway 97A/B Grade Separation	- Northbound left turn fly over, and curb radii improvements. - To transition to two-lane Highway 97A south of the junction.
	B2	North Segment Enderby (two-way)	- Construct the northbound couplet leg between Cliff Avenue and Bass Avenue, including a new signalized intersection at Bass Avenue, and operate as two-way road - Traffic signals at Cliff and Howard Avenues - Access Management at Bass and Howard Avenues - Could coincide with Rail Trail implementation
	B4	South Segment Enderby (two-way)	- Construct the northbound couplet leg between Back Enderby Road and Cliff Avenue, and operate as two-way road - Traffic signal at Cliff Avenues - Could be built concurrently, or before or after the segment between Cliff and Bass Avenues. - Could coincide with Rail Trail implementation
	A2	Splatsin Transition (two-way)	- Construct transition to connect to the new Vernon Street corridor, and operate as two-way road
Long Term - 25 Years	C2	North Segment Four Laning	- Four lane between Bass Avenue and Highway 97A/B junction - Construct frontage roads, and full movement intersections at Brickyard Road, Salmon Arm Road, Fenton Road, and new intersection north of NET
	B3 B5 B6 A3	One-way conversion (Enderby and Splatsin)	- Convert existing corridor and new corridor to one-way operation on each - Remove existing traffic signal at Hubert Avenue
	A4	South Segment Four Laning	- Four lane between Splatsin Transition and Stepney Cross Road - Construct frontage roads, and full movement intersections at Stepney Cross Road and re-aligned Baptiste Access - Right in-right out southern access

Figure 9-1: Implementation Strategy



9.2 Risk Register

To assess the potential risks that could interfere with the design and implementation of the project, primary projects risks were identified and quantified. Strategies to mitigate the risks were developed and should be implemented to reduce the risk of project schedule and cost increases.

Key risks and risks areas that were identified are shown in Table 33, along with the recommended mitigation measures.

Table 33: Key Risks and Recommended Mitigation Measures

Risk	Description	Recommended Mitigation Measure
Potential challenges using the former rail corridor	The former rail corridor is not owned by the Ministry. While the charter for the corridor enables it to be used for a future regional transportation connection, the Ministry has not yet entered into a formal agreement for its use.	Recommend that the Ministry pursue an agreement to use the rail corridor within Enderby in the next phase of the project
Archaeological Remains	Many of the areas near / along the preferred option corridor have a high likelihood of having archaeological artifacts within them, and finding artifacts during construction could result in costly delays and/or require changes to the highway alignment.	Recommend that detailed environmental and archaeological studies are conducted early in the next phase of the project, particularly in greenfield areas and areas with high archaeological potential.
Construction Costs	An increase in construction material or labour costs would have a large impact on the overall project budget.	Accept risk
Geotechnical Conditions	Constructability, and the suitability of existing soils are somewhat unknown, and some portions of the project. Additionally, some components of the recommended option, such as the curve straightening on the north segment near Old Salmon Arm Road, will require significant cuts and slope stabilization.	Geotechnical investigations, particularly along the new greenfield corridor areas and at the north segment curve straightening should be conducted early in the next stage of the project.
Land Acquisition	The preferred project will require full and/or partial acquisition of a number of properties and changes to existing accesses. Negotiating with landowners, First Nations, and CP holders could be a timely and costly process.	Recommend that the Ministry begin negotiations and start to acquire key properties that are required for the proposed projects, specifically within Splatsin and near constrained areas, where there is limited opportunity to shift the corridor (within Enderby, near the Highway 97A/B junction, and near the north segment curve straightening.)

The full register is included in **Appendix O**. The total value of risks identified is $177 million and the expected value of risks (amount of each risk multiplied by the probability of the risk occurring) is $73 million or 47% of the total estimated project value.

9.3 Future Design Considerations

There are a number of design details, specifically within the urban portions of the study area, that will be important for the overall function of the recommended option, and these are described in the following section.

9.3.1 Animal Crossings

Frequent animal crossings of the rural sections of the highway were identified through consultation with the community and stakeholders, and has been substantiated through existing collision records. There is a known deer crossing on the southern segment (south of Canyon Road), and potentially other crossing areas for deer and other wildlife on the other segments.

It is recommended that the potential for design treatments to address wildlife crossings be studied further and considered in the next stages of the project.

9.3.2 Additional Design Considerations

Highway 97A is an important regional connection and has high truck volumes within the study area. Through stakeholder engagement the community noted that there may be a potential need to better accommodate truck parking near the Quilakwa Stop N Shop. The potential for this should be considered further in the next design phase in collaboration with CVSE and other stakeholders.

9.4 Next Steps

This study provides a recommended option and implementation strategy to improve the Highway 97A corridor. The next step of this project is to acquire funding to begin the Preliminary Design for the identified Phase 1 (Short Term) elements:

- Canyon Road Short Term Improvements – Intersection Signalization
- Enderby Short Term Improvements – Intersection Signalization

Through this work, additional details related to the improvements, including property impacts, geotechnical conditions, environmental and archaeological impacts, and project costs can be further investigated, understood, and refined. Additional public and stakeholder engagement and direct engagement with the potentially affected property owners will also be required. Programming priorities for Phase 2 (Medium Term) and Phase 3 (Long Term) improvements can also be assessed at this time.

Funding has not been approved for any phase of the project. Funding can be initially pursued for the Preliminary Design and supporting work to complete Phase 1.