Appendix K

Assessment of Inter-Regional Transit Options

Ministry of Transportation and BC Transit

Malahat Travel Demand Study – Assessment of Inter-Regional Transit Options

Final Report

November 2006

Halcrow Consulting Inc

Halcrow Consulting Inc
Suite 508, 4190 Lougheed Highway, Burnaby, British Columbia V5C 6A8 Canada
Tel +1 (604) 293-2882 Fax +1 (604) 293-2892
www.halcrow.com

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Final Report

Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Approved by
0	1	Draft Report	10/03/06	K. Krajczar
1	1	Final Report	11/23/06	K. Krajczar

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1 Introduction

1.1 Background

1.1.1 The Malahat Highway is a two lane undivided facility that is the primary highway connection between the Capital Regional District (CRD) and north Island communities. The highway is part of the Trans Canada Highway system, which extends between Nanaimo and Victoria, a distance of approximately 90 kilometres.

1.1.2 The highway was constructed as a gravel road in 1911 and has undergone many upgrades since that time. Average daily traffic volumes are currently in the 20,000 to 25,000 range and the highway is experiencing significant congestion as more and more people choose to live in the South Cowichan area and commute to Victoria.

1.1.3 The Ministry of Transportation is currently evaluating different long-term highway improvement options for the Malahat corridor. Multi-modal solutions for the corridor have not been examined in detail, but recently, questions have been raised regarding the feasibility of commuter rail or other transit service between the Cowichan Valley and Victoria and the impact that this might have on future vehicular demand on the Malahat Highway.

1.1.4 The E&N Railway runs parallel to the Malahat Highway and provides connectivity between Victoria and the Cowichan Valley, linking the communities of Duncan, Chemainus, and Ladysmith and extending as far north as Courtney. Within the CRD the railway is being devolved to the Island Corridor Foundation, a group of municipalities and First Nations bordering the existing E&N corridor. On behalf of the City of Langford, Halcrow is currently assessing the ridership potential associated with a commuter rail service between Langford and downtown Victoria. However, the Langford study does not treat the ridership potential between the Cowichan Valley Regional District (CVRD) and the CRD.

1.1.5 While the BC MoT is looking at long-term options within the corridor, including commuter rail, BC Transit is interested in the feasibility of operating a regional transit link between the CVRD and the CRD. BC Transit requires a better understanding of the potential demand for inter-regional transit services in the short-term (2006 to 2008), as well as the relevant and cost-effective transit service options.

1.1.6 Although the Ministry maintains current traffic count information for the highway, the last roadside origin-destination survey was conducted in 1996. Thus, information on travel characteristics (e.g., trip purposes, origin-destinations) is out-of-date. This information, along with current data on travellers' perception of alternative modes and their value of time is required in order to provide a reliable estimate of the potential demand for different transit alternatives.

1.2 Study Objectives and Approach

1.2.1 The objectives of this study are:

- Undertake roadside interview survey to collect travel demand information for the Malahat corridor (e.g., origin-destination, trip purpose, and trip frequency information for travel between CVRD and CRD);
- develop commuter rail service options between Duncan and the CRD with associated operating characteristics such as frequency, travel time, station locations, park-and-ride facilities, bus integration, fare structure etc.;
- undertake stated preference surveys to assess the ridership potential for commuter rail under different operating characteristics and fare structures;
- develop forecasts for commuter rail patronage and the resulting impact on vehicular demand along the Malahat;
- characterize and estimate travel demand for inter-regional transit services between the Cowichan Valley Regional District (CVRD) and the Victoria Regional Transit System (VRTC) in the short-term (2006 to 2008); and
- recommend relevant and cost-effective transit service options to satisfy the identified travel demands.

1.2.2 Major activities included: travel demand and stated preference surveys, model development, transit option development, ridership forecasting and assessment of transit options.

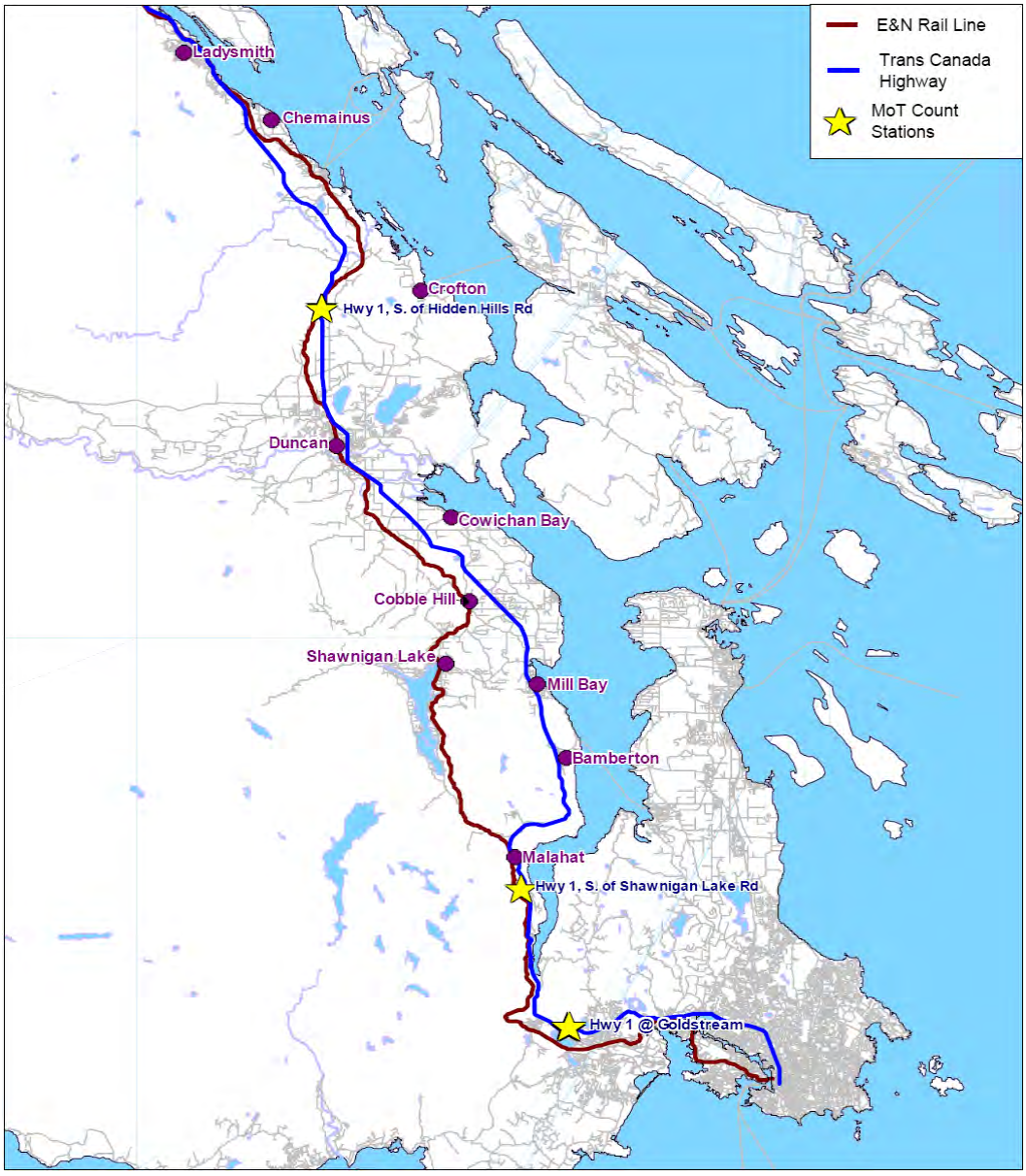
1.2.3 **Figure 1.1** provides a map highlighting the communities along the corridor, Highway 1 and the E&N Railway. The map also shows the location of three Ministry traffic count stations that were used in this study.

1.2.4 It is important to note that the ridership forecasts developed for this study focus on trips between the CRD and CVRD. The proposed service options could also serve markets between the Langford area and Victoria which are not included in this assessment. However, while the additional ridership from Langford to Victoria may decrease the subsidies required to run the service, this increase in ridership will not affect traffic over the Malahat Highway, which is the focus of this study.

1.3 Structure of Report

1.3.1 This report is organized into six sections. The travel survey data is presented in the second section and the third section treats development of the travel demand model. The fourth section of the report describes the bus and commuter rail service options for the CVRD. Ridership forecasts for future and current years are detailed in the fifth section. The summary and conclusions are presented in the sixth and final section of the report.

Figure 1.1 – Study Area Map



2 Traffic and Travel Survey Data

2.1 Introduction

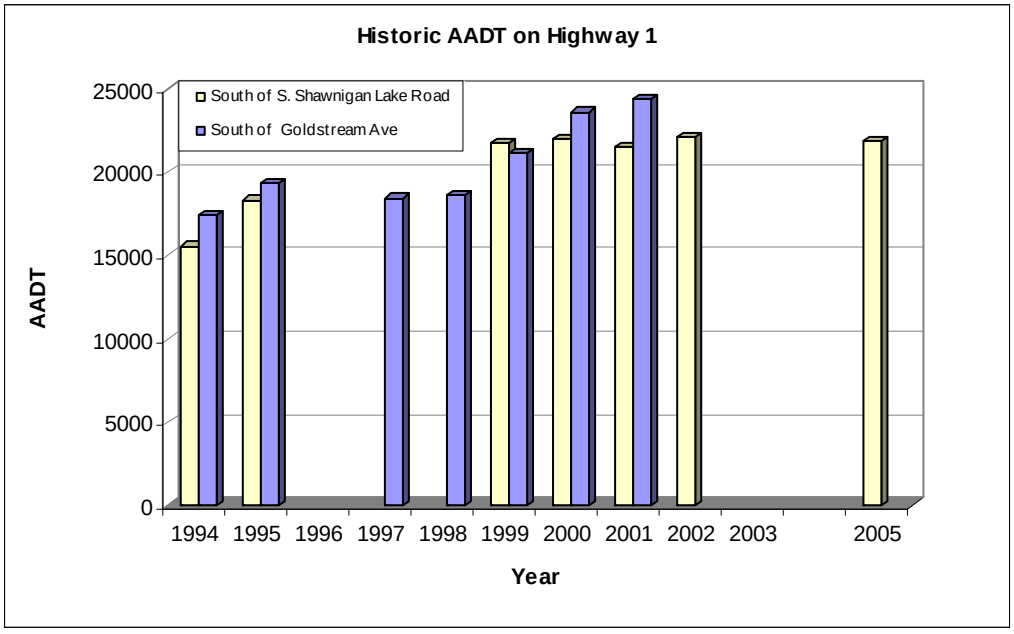
2.1.1 This section provides a summary of existing travel information for the Malahat corridor (e.g., traffic counts, census place of work place of residence, Jack Bell Vanpool data) and an overview of the 2006 counts and surveys undertaken for this study.

2.2 Existing Traffic Count Data

2.2.1 Traffic count data available from the Ministry of Transportation's permanent and short count stations located along the Highway 1 corridor is summarized below.

2.2.2 **Figure 2.1** provides the historic growth in Annual Average Daily Traffic (AADT) at Shawnigan Lake Road and Goldstream Road on Highway 1. Data is not available for all years, so two stations are shown to confirm year to year changes. Note that in 1995, daily traffic levels peaked at both locations. Between 1994 and 2000, the annual compound traffic growth rates were 5.9 percent at Shawnigan and 5.2 percent at Goldstream. Data is not available for the Goldstream location beyond 2001. However, for the Shawnigan location, traffic volumes seem to have more or less stabilized since 2000. This slowing in highway traffic growth appears to be related to capacity constraints during the peak travel periods. At approximately 22,000 vehicles per day, the highway is currently operating at or near its capacity.

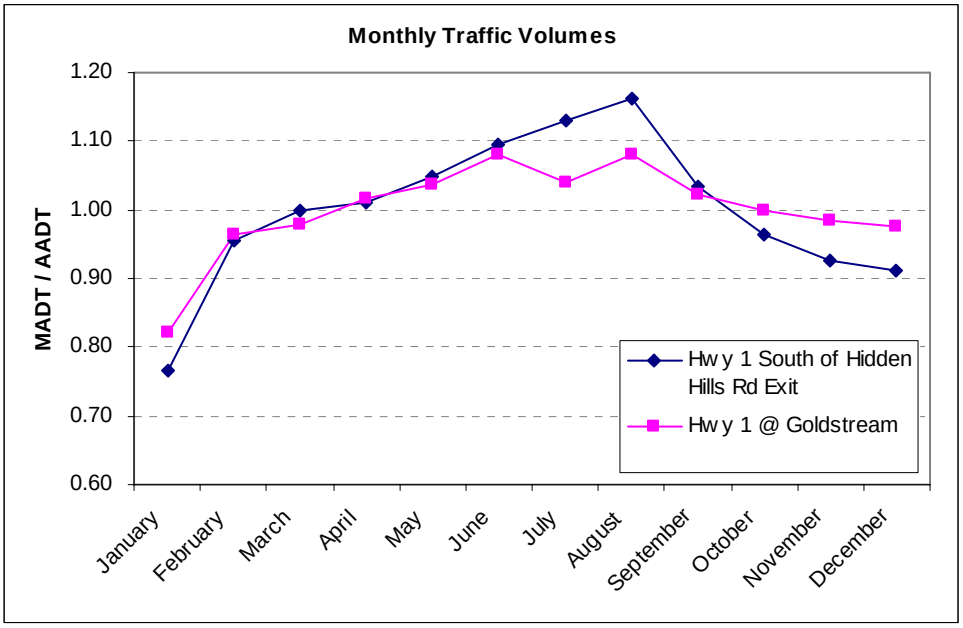
Figure 2.1 - Historic Traffic Growth on the Malahat Hwy (AADT)



2.2.3 While there is no Highway 1 monthly count data available near the study area, two locations to the north and south of the study area, respectively, have monthly count data available for 2005. The northern count station is located near the Hidden Hills Road exit, which is at the south end of the City of Nanaimo. The southern count station is located on Highway 1, to the north of Six Mile Road. These locations provide an indication of the monthly traffic profile on Highway 1 for the southern section on Vancouver Island as shown in **Figure 2.2**.

Traffic volumes are highest during the summer months (approximately 10-15 percent higher than the AADT), with more pronounced peaks in the north reflecting a higher proportion of tourist traffic. Traffic volumes during the fall months of September and October appear to be closest to the AADT volumes.

Figure 2.2 - Monthly Traffic Volumes on Highway 1



2.2.4 **Figures 2.3** to **2.5** show the 2005 average hourly traffic profiles at the Shawnigan Lake Road count station. This location exhibits a typical commuting profile between the CVRD and the CRD, with the southbound peak period falling between 7:00am and 9:00am and the northbound peak period between 3:00pm and 6:00pm.

Figure 2.3 – 2005 Total Hourly Volumes (Both Directions)

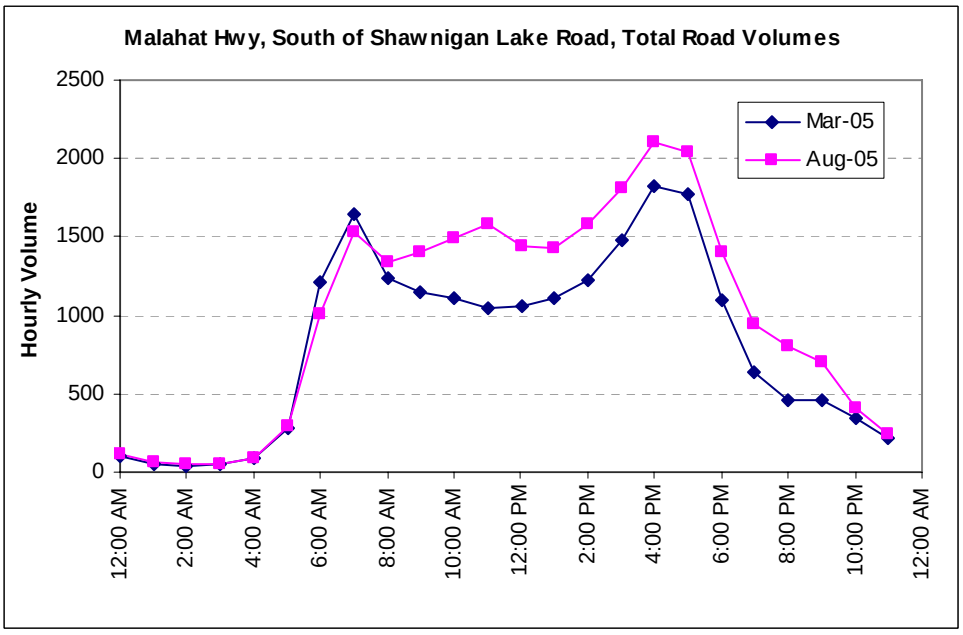


Figure 2.4 – 2005 Northbound Hourly Volumes

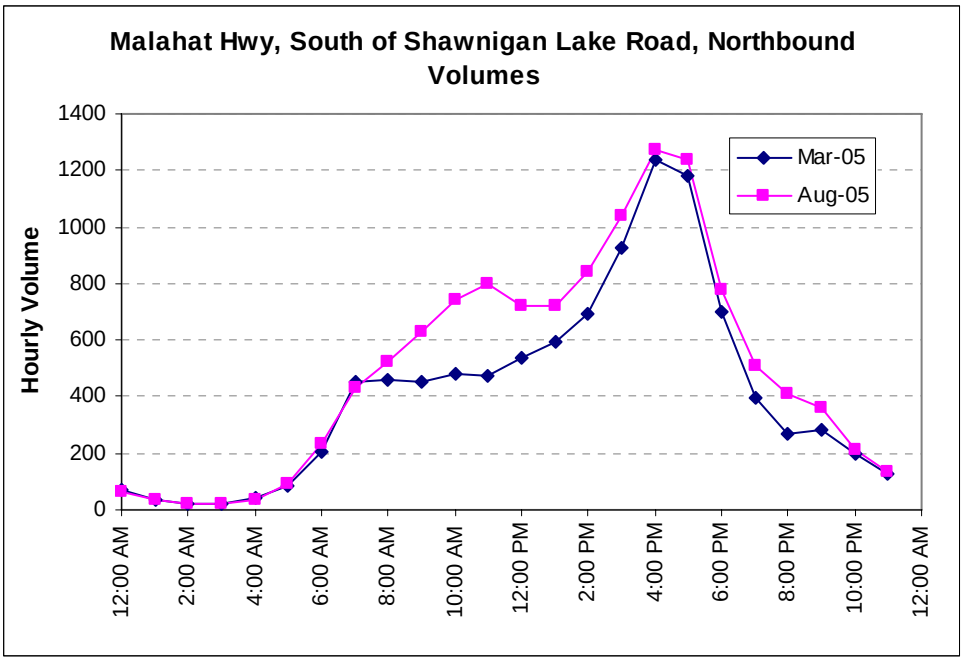
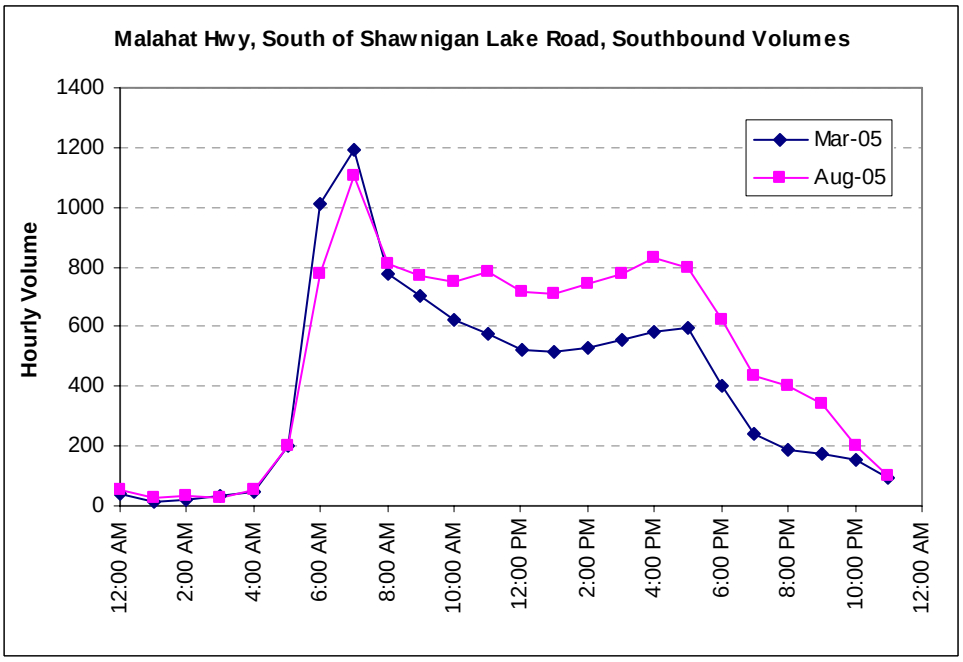


Figure 2.5 – 2005 Southbound Hourly Volumes



2.3 2006 Roadside Survey

Description of Roadside Surveys

2.3.1 A roadside classification count and origin-destination (OD) survey was conducted for four days between 7:00am and 7:00pm from July 31st to August 3rd, 2006. The survey site was located just north of Finlayson Arm Road where the northbound passing lane begins. The survey crew utilized the northbound right lane and shoulder area for surveying purposes, leaving the centre lane open in order to minimize traffic disruptions.

2.3.2 Classification counts were conducted in both directions, while the OD survey focused on northbound traffic (excluding trucks and buses). The purpose of the OD survey was to provide insight into the origins, destinations, and permanent residences of Malahat highway users, as well as the purpose of their trips. A total of 1,320 randomly selected vehicles and drivers completed the roadside origin-destination (OD) survey. A sub-sample of these respondents were asked to take part in a follow-up stated preference survey (SP), with selection for the SP survey based on permanent residence location and frequency of Malahat use. Further information on the SP survey is found in **Section 2.4**. **Appendix A** contains a copy of the roadside OD survey questionnaire.

Summary of Classification Survey Results

2.3.3 **Figures 2.6** and **2.7** provide a comparison of the hourly traffic profiles from the classification survey versus the Shawnigan Lake Road permanent count station (average weekday in July). The roadside classification survey is closely aligned with the permanent count station data indicating the roadside survey days were typical of 2006 summer weekday traffic levels in the corridor.

Figure 2.6 – 2006 Northbound Summer Traffic Volume Comparison

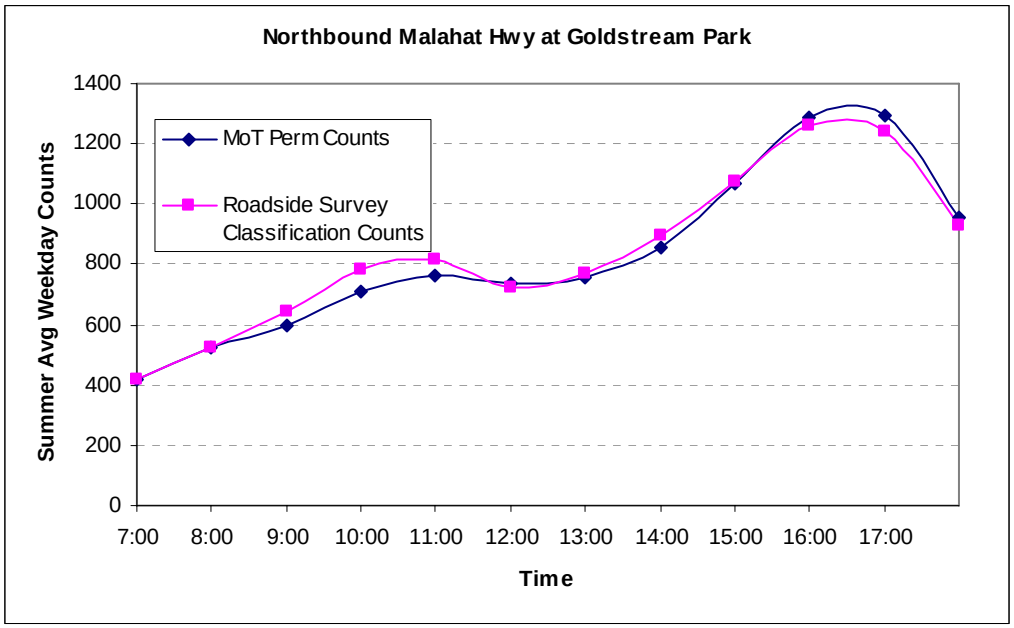
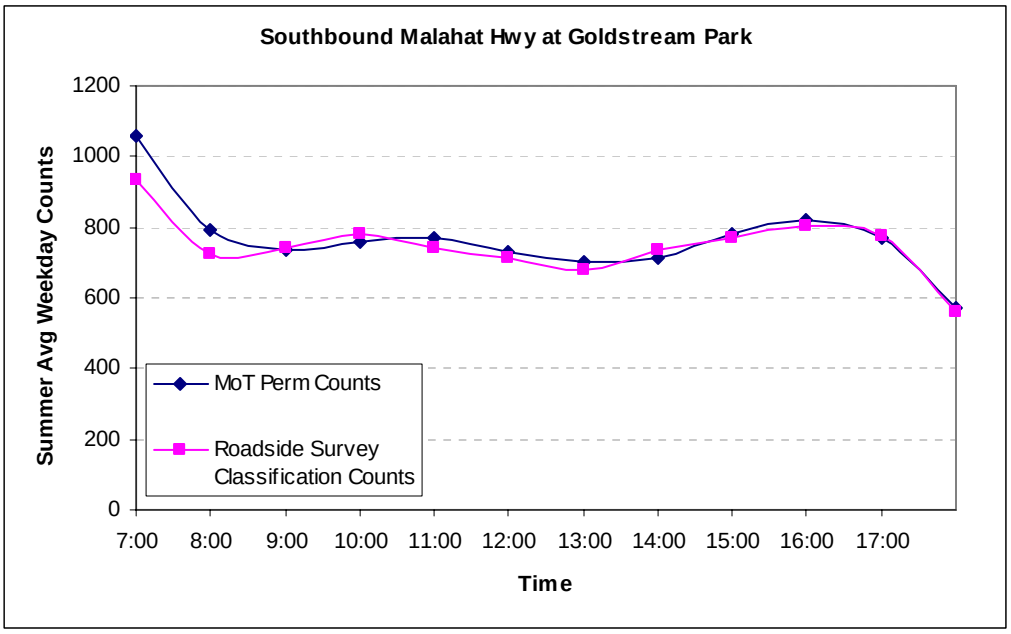


Figure 2.7 – 2006 Southbound Summer Traffic Volume Comparison



2.3.4 Vehicle occupancy counts conducted by roadside observers (when vehicles are not stopped) are prone to error when classifying higher occupancy vehicles. This is due to a myriad of factors (e.g., speed of vehicle, volume, tinted windows and difficulty observing individuals in the rear passenger seats). To address this problem, the occupancy data from the roadside classification survey was compared with the occupancy data derived from the OD survey (which is a statistically valid sample that provides a much higher degree of precision on the proportions of higher occupancy vehicles). This comparison found the single occupancy vehicle percentages to be closely correlated between data sets, but the OD survey showed a much higher percentage of vehicles with three or more persons. Therefore, the occupancy data from the classification survey was adjusted accordingly.

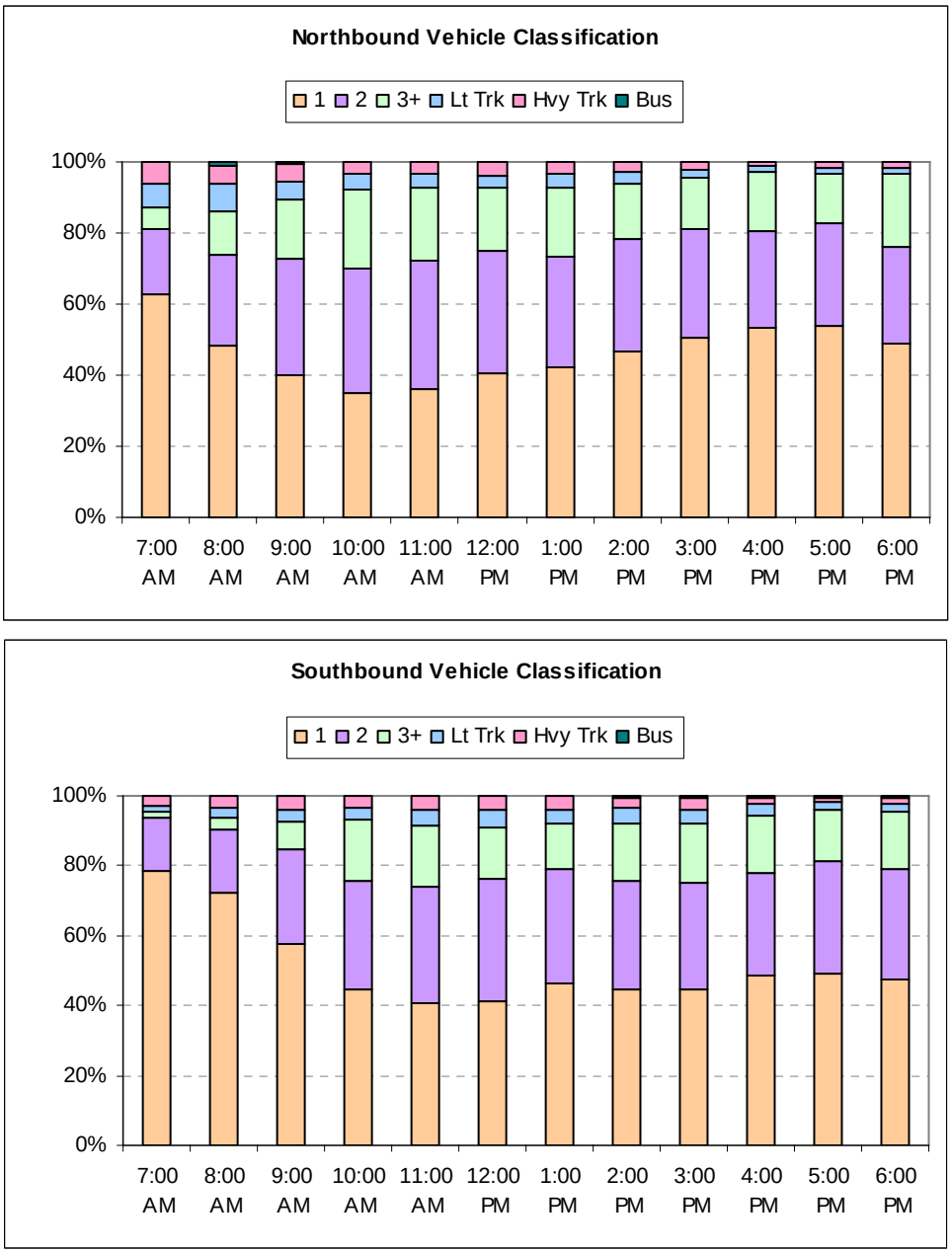
2.3.5 **Table 2.1** provides a summary of the adjusted hourly vehicle classification data for both directions. **Figure 2.8** provides a graphical representation of this data for the north and southbound directions. Average summer weekday vehicle occupancies are in the range of 1.7 to 1.8, with lower occupancies during the morning peak period due to the high proportion of workers commuting in single occupancy vehicles. Light and heavy trucks combined represent 6 to 6.5 percent of the daily traffic in the corridor. Note that 24 hour directional volumes are fairly balanced, but early morning southbound volumes (e.g., 5:00 to 7:00am) are significantly higher than northbound but fall outside the survey period.

Table 2.1 – Vehicle Classification by Direction (Summer Weekday)

NB	PC Occupancy			Lt Trk	Hvy Trk	Bus	Total Vehicles	Total PC	Avg PC Occupancy
	1	2	3+						
7:00 AM	62.7%	18.7%	6.0%	6.7%	5.9%	0.0%	420	370	1.40
8:00 AM	48.4%	25.6%	12.4%	7.6%	4.9%	1.1%	525	455	1.68
9:00 AM	40.2%	32.7%	16.6%	4.8%	5.1%	0.6%	600	535	1.86
10:00 AM	35.0%	34.9%	22.1%	4.8%	3.0%	0.2%	715	655	2.02
11:00 AM	36.2%	35.9%	20.6%	4.2%	3.1%	0.1%	760	700	1.98
12:00 PM	40.4%	34.7%	17.4%	3.8%	3.5%	0.2%	740	685	1.87
1:00 PM	42.3%	30.9%	19.7%	3.7%	3.4%	0.0%	755	700	1.90
2:00 PM	46.6%	32.0%	15.2%	3.2%	2.8%	0.3%	855	805	1.77
3:00 PM	50.6%	30.7%	14.3%	2.4%	1.9%	0.2%	1,065	1,020	1.72
4:00 PM	53.3%	27.2%	16.8%	1.5%	1.3%	0.0%	1,285	1,250	1.74
5:00 PM	53.9%	28.7%	13.9%	2.0%	1.3%	0.1%	1,295	1,250	1.68
6:00 PM	48.9%	27.3%	20.4%	1.8%	1.5%	0.1%	950	915	1.84
Total	46.6%	30.3%	16.8%	3.4%	2.7%	0.2%	9,965	9,340	1.80

SB	PC Occupancy			Lt Trk	Hvy Trk	Bus	Total Vehicles	Total PC	Avg PC Occupancy
	1	2	3+						
7:00 AM	78.4%	15.2%	1.7%	2.1%	2.6%	0.0%	1,060	1,015	1.21
8:00 AM	72.6%	17.7%	3.3%	2.9%	3.5%	0.0%	795	750	1.28
9:00 AM	57.9%	26.8%	8.0%	3.2%	4.1%	0.1%	735	685	1.52
10:00 AM	44.5%	31.0%	17.9%	3.1%	3.5%	0.1%	755	705	1.84
11:00 AM	40.6%	33.6%	17.4%	4.2%	3.9%	0.2%	770	705	1.87
12:00 PM	41.0%	35.0%	14.8%	5.0%	4.0%	0.2%	730	660	1.82
1:00 PM	46.4%	32.4%	13.0%	3.9%	4.0%	0.2%	705	645	1.73
2:00 PM	44.6%	31.1%	16.1%	5.0%	2.7%	0.4%	715	655	1.80
3:00 PM	44.4%	30.9%	17.0%	3.7%	3.5%	0.5%	780	715	1.82
4:00 PM	48.7%	29.3%	16.3%	3.4%	1.9%	0.4%	820	770	1.77
5:00 PM	49.3%	32.3%	14.2%	2.5%	1.3%	0.3%	770	740	1.73
6:00 PM	47.2%	32.1%	16.4%	2.2%	1.8%	0.3%	570	545	1.79
Total	51.3%	28.9%	13.1%	3.5%	3.1%	0.2%	9,205	8,590	1.68

Figure 2.8 – Directional Vehicle Classification Summary



Summary of OD Survey Results

2.3.6 Information from the roadside OD survey was analysed to determine trip purpose, and to develop origin-destination matrices to be used for model development and forecasting purposes. At this stage, the survey results were expanded to hourly flows and then converted from summer average weekday conditions to average fall weekday traffic conditions. This process is described in further detail in **Section 3**.

2.3.7 The following tables provide a brief summary of the OD survey information for the summer period. The trip purpose information is shown for both the summer weekday and the

estimated annual average weekday condition (as the summer trip composition is characterized by significantly more tourist or non-resident trips). The remaining information is shown for the actual summer survey period.

2.3.8 **Table 2.2** shows the breakdown of the northbound vehicle trip purposes by time period for the summer weekday condition. During the summer, approximately 73 percent of the corridor trips are made by residents of the CVRD or CRD, while 27 percent are made by non-residents (e.g., living north of the CVRD or non-Vancouver Island). The resident trips further break down to 27.9 percent work, 1.2 percent business and 44.1 percent other purposes (e.g., shopping, personal business, recreational). During the morning and afternoon peak periods, work trips represent close to 45 percent of the trips in the corridor. Other trips made by residents peak during the midday at approximately 55 percent of the demand. Non-resident trips are highest during the midday and afternoon peak.

Table 2.2 – Summer Weekday Trip Purpose by Time Period (Northbound)

	CRD and CVRD Residents			Non-resident trips	Total
	Work Trips	Business Trips	Other Trips		
AM (7-10 am)	628	23	524	276	1,450
Midday (10am - 4pm)	713	84	2,456	1,327	4,580
Afternoon (4pm - 7pm)	1,261	-	1,139	910	3,310
Total	2,602	108	4,119	2,512	9,340
AM (7-10 am)	43.3%	1.6%	36.1%	19.0%	15.5%
Midday (10am - 4pm)	15.6%	1.8%	53.6%	29.0%	49.0%
Afternoon (4pm - 7pm)	38.1%	0.0%	34.4%	27.5%	35.4%
Total	27.9%	1.2%	44.1%	26.9%	100.0%

2.3.9 As the forecasting process is based on the average fall weekday condition, **Table 2.3** shows the estimated trip composition for this season. In comparison to the average summer weekday, non-resident trips are less pronounced, dropping to approximately 17 percent of the daily traffic, while residents account for 83 percent of the traffic. The resident trips further break down to 35.4 percent work, 1.4 percent business and 46.0 percent other purposes.

Table 2.3 – 2006 Annual Average Weekday Trip Purpose by Time Period (Northbound)

	CRD and CVRD Residents			Non-resident trips	Total
	Work Trips	Business Trips	Other Trips		
AM (7-10 am)	726	24	500	161	1,410
Midday (10am - 4pm)	821	99	2,331	769	4,020
Afternoon (4pm - 7pm)	1,457	-	1,082	531	3,070
Total	3,005	122	3,912	1,460	8,500
AM (7-10 am)	51.5%	1.7%	35.4%	11.4%	16.6%
Midday (10am - 4pm)	20.4%	2.5%	58.0%	19.1%	47.3%
Afternoon (4pm - 7pm)	47.5%	0.0%	35.2%	17.3%	36.1%
Total	35.4%	1.4%	46.0%	17.2%	100.0%

2.3.10 The OD survey also sampled vehicle occupancy of the survey respondents as a means of confirming the roadside classification survey and to determine vehicle occupancy by trip purpose. **Table 2.4** shows the daily vehicle occupancy in the northbound direction by the four trip purpose categories.

Table 2.4 – Summer Daily Vehicle Occupancy by Purpose (Northbound)

NB	PC Occupancy			Total PC	Avg PC Occupancy
	1	2	3+		
Work Trips	83%	14%	4%	2,605	1.23
Business Trips	74%	26%	0%	110	1.26
Other Trips	41%	36%	23%	4,110	1.93
Non-Resident Trips	29%	45%	26%	2,515	2.22
Total	4,650	3,020	1,670	9,340	1.80

2.3.11 **Table 2.5** provides an example of the average summer weekday origin-destination tables for all northbound vehicles (residents and non-residents). The majority of northbound trips originate within the Victoria, Esquimalt and Saanich areas and are destined to South and North Cowichan and points further north. Residents are less likely to be travelling from downtown Victoria than non-residents and more likely to be destined to somewhere within the CVRD. The majority of non-residents are travelling to destinations north of the CVRD.

Table 2.5 – Summer Weekday OD Trip Table (Northbound)

A. Total Passenger Cars						
Origin / Destination	**South Cowichan**	**North Cowichan**	**Ladysmith**	**North Externals**	**Total**	**Percent**
Downtown Victoria	534	361	47	768	1,710	**18%**
Victoria / Esquimalt	1,073	979	122	1,045	3,218	**34%**
Saanich / Sidney	614	796	61	970	2,440	**26%**
View Royal	150	145	19	131	445	**5%**
Langford	248	337	33	80	698	**7%**
Colwood	150	131	9	98	389	**4%**
Sooke / Juan de Fuca	150	103	-	84	337	**4%**
South Externals	28	33	-	42	103	**1%**
Total	2,946	2,885	290	3,218	9,340	**100%**
Percent	**32%**	**31%**	**3%**	**34%**	**100%**	
B. Residents of CRD and CVRD						
Origin / Destination	**South Cowichan**	**North Cowichan**	**Ladysmith**	**North Externals**	**Total**	**Percent**
Downtown Victoria	482	290	-	108	881	**13%**
Victoria / Esquimalt	1,063	918	61	511	2,553	**37%**
Saanich / Sidney	571	660	42	487	1,761	**25%**
View Royal	150	126	9	42	328	**5%**
Langford	248	333	23	42	646	**9%**
Colwood	145	136	9	94	384	**6%**
Sooke / Juan de Fuca	150	94	-	52	295	**4%**
South Externals	28	37	-	37	103	**1%**
Total	2,839	2,595	145	1,372	6,951	**100%**
Percent	**41%**	**37%**	**2%**	**20%**	**100%**	
C. Non-residents						
Origin / Destination	**South Cowichan**	**North Cowichan**	**Ladysmith**	**North Externals**	**Total**	**Percent**
Downtown Victoria	52	70	47	660	829	**35%**
Victoria / Esquimalt	5	61	61	534	660	**28%**
Saanich / Sidney	42	136	14	487	679	**28%**
View Royal	-	14	9	89	112	**5%**
Langford	-	9	9	37	56	**2%**
Colwood	-	-	-	9	9	**0%**
Sooke / Juan de Fuca	-	5	-	33	37	**2%**
South Externals	-	-	-	5	5	**0%**
Total	98	295	141	1,855	2,389	**100%**
Percent	**4%**	**12%**	**6%**	**78%**	**100%**	

2.3.12 The OD survey also asked whether the individual was making a southbound return trip on same day. **Table 2.6** provides a breakdown of those making a southbound trip according to trip purposes. More than half of those surveyed made a reverse trip the same day. Individuals travelling for work and business had the highest return trip rate at close to 80 percent.

Table 2.6 – Percent of NB Trips Making SB Trip on Same Day

	Reverse Trip?		Total
	Yes	No	
Work Trips	1,980	625	2,605
Business Trips	90	25	115
Other Trips	2,175	1,930	4,105
Non-Resident Trips	790	1,725	2,515
Total	5,035	4,305	9,340
Work Trips	76%	24%	28%
Business Trips	78%	22%	1%
Other Trips	53%	47%	44%
Non-Resident Trips	31%	69%	27%
Total	54%	46%	100%

2.3.13 Finally, the survey asked the respondent how many days per week they used the Malahat Highway. **Table 2.7** provides a summary of the frequency by trip purpose.

Table 2.7 – Frequency of Use by Trip Purpose

	Trip Frequency				Total
	3+ days per week	1-2 days per week	Monthly	Infrequent (<1 trip / month)	
Work Trips	1,990	345	190	85	2,610
Business Trips	50	45	20	-	115
Other Trips	720	1,155	1,440	780	4,095
Non-Resident Trips	105	170	515	1,730	2,520
Total	2,865	1,715	2,165	2,595	9,340
Work Trips	76.2%	13.2%	7.3%	3.3%	27.9%
Business Trips	43.5%	39.1%	17.4%	0.0%	1.2%
Other Trips	17.6%	28.2%	35.2%	19.0%	43.8%
Non-Resident Trips	4.2%	6.7%	20.4%	68.7%	27.0%
Total	30.7%	18.4%	23.2%	27.8%	100.0%

2.4 Stated Preference Survey

Description of the Stated Preference Survey

2.4.1 To assess the market demand for possible new transit modes between the CVRD and the CRD, a SP survey was undertaken. In a SP survey, potential users of the new transit modes are offered several hypothetical, but realistic, travel scenarios. Based on the choices presented, respondents are asked to state their preferred method of travel.

2.4.2 At the end of each roadside OD interview, if the participant was a resident of the CRD or the CVRD they were asked if they would be willing to take part in an additional survey. Upon agreement, the participant was provided with a SP package containing the survey and a set of instructions for completing the survey. Participants were informed that they would be contacted in several days to provide their responses. Interviewers from the Mustel group then contacted survey participants by telephone to record their preferences.

2.4.3 In this study, residents of the CRD and the CVRD were asked to imagine a trip between South Cowichan and downtown Victoria and were offered a choice between auto, commuter rail, and coach bus service. All participants were given ten randomly selected scenarios, out of

a total of 16 scenarios, and were asked to rank their first and second mode choices for travel based on the variables presented. Each scenario contained a range of variables such as travel time, transit fare, driving and parking costs, station and bus access time, and transit headway. Each survey contained only 10 scenarios in order to reduce the risk of "respondent fatigue." A sample SP survey is provided in **Appendix B**.

2.4.4 Careful consideration was given to the values of each variable within the 16 scenarios, particularly for the auto option, as it is understood that mode biases with respect to auto are generally high. Existing auto users typically do not find other modes of transportation attractive unless they are very competitive in terms of time and cost. Therefore, it is important to provide a range of scenarios that will "force" the existing auto-user to consider the alternate mode. In this survey, auto costs (gas, parking, maintenance) were set for all scenarios at $12 for a one-way trip. Commuter rail fares ranged from $4 to $11 and coach bus fares from $3 to $6 for a one-way trip. Travel time is also an important consideration; auto travel time was set at 45 minutes while bus and rail times varied from 30 minutes to 60 minutes.

2.4.5 **Table 2.8** shows the number of completed SP surveys. Approximately 40 percent of the surveys that were handed out were completed. A total of 220 surveys were completed, giving 2,200 possible observations (as each participant responded to ten scenarios).

Table 2.8 – Completed SP Surveys by Market Segment

	Commuters	Non-Commuters	Total
CVRD Residents	101	47	**148**
CRD Residents	22	50	**72**
Total	**123**	**97**	**220**

2.4.6 The primary output of a SP survey is a series of mathematical (logit) models upon which the diversion of auto demand to rail or bus alternatives can be estimated. A detailed discussion of these models is presented in **Section 3.6**.

2.5 2001 Place of Work / Place of Residence Data

2.5.1 The 2001 Census Place of Work data provides a secondary source of information that can be used to confirm the OD survey results and to identify recent trends. Analysis of the 2001 data suggests that most potential commuters live south of Duncan and are going to Victoria. These data also show that whereas downtown Victoria accounts for less than 25 percent of CRD work trip destinations, half of all transit work travel destinations are to locations in downtown Victoria. As is the case in other Canadian cities, the downtown area attracts the large majority of transit use by so-called "choice" commuters, those who have a car available for their trips. Most, if not all, Cowichan valley commuters have a car available, given the auto-oriented character of their communities.

2.5.2 While the 2001 Census data provide an excellent context for assessing the potential role of transit in serving commuter travel from the Cowichan Valley to the CRD, this information is not current. The 2006 OD survey data is used to estimate the current place of residence and place of work for CVRD residents. **Table 2.9** provides a comparison of the 2006 OD patterns for home to work travel against the 2001 Census Place of Residence by Place of Work Data.

Table 2.9 - Place of Residence by Place of Work for CVRD Residents Working in the CRD

A. 2006 Estimated Place of Residence Place of Work[1]						
POR / POW	**Saanich / Sidney**	**Oak Bay**	**Victoria**	**Esquimalt**	**Western Comm**	**Total**
North Cowichan / Duncan / Cowichan Valley E	167	-	254	87	333	841
Cowichan Valley D	53	35	80	18	27	213
Ladysmith / Cowichan Valley I	44	-	18	-	-	62
Cowichan Valley F	35	-	-	-	18	53
Cowichan Valley A	254	-	314	18	209	795
Cowichan Valley B	365	-	478	158	226	1,226
Cowichan Valley C	158	-	132	53	61	404
Total	1,076	35	1,275	333	874	**3,594**
B. 2001 Census POR POW Data						
POR / POW	**Saanich / Sidney**	**Oak Bay**	**Victoria**	**Esquimalt**	**Western Comm**	**Total**
North Cowichan / Duncan / Cowichan Valley E	155	-	415	90	70	730
Cowichan Valley D	30		100		-	130
Ladysmith / Cowichan Valley I	-		25		-	25
Cowichan Valley F	-				20	20
Cowichan Valley A	115		185	100	70	470
Cowichan Valley B	275	35	515	115	245	1,185
Cowichan Valley C	110		190	60	25	385
Total	685	35	1,430	365	430	**2,945**

1. Estimated based on August 2006 OD survey adjusted to reflect September/October conditions

2.5.3 Based on the 2006 survey, approximately 3,600 CVRD residents work in the CRD, with approximately 1,300 in Victoria. The 3,600 total compares to the approximately 3,000 workers estimated from the 2001 Census and 1,400 in Victoria.

Changing Live-Work Relationships

2.5.4 The comparison of this data suggests that fewer Cowichan Valley commuters are working in Victoria (including the downtown) in 2006 than was the case in 2001, while more are working in Saanich/Sydney and the Western Communities of the CRD. This shift is consistent with the documented suburbanization of people and jobs within the CRD between 1996 and 2001[1] marked by increased suburb-to-suburb commuting and less suburb-to-downtown commuting.

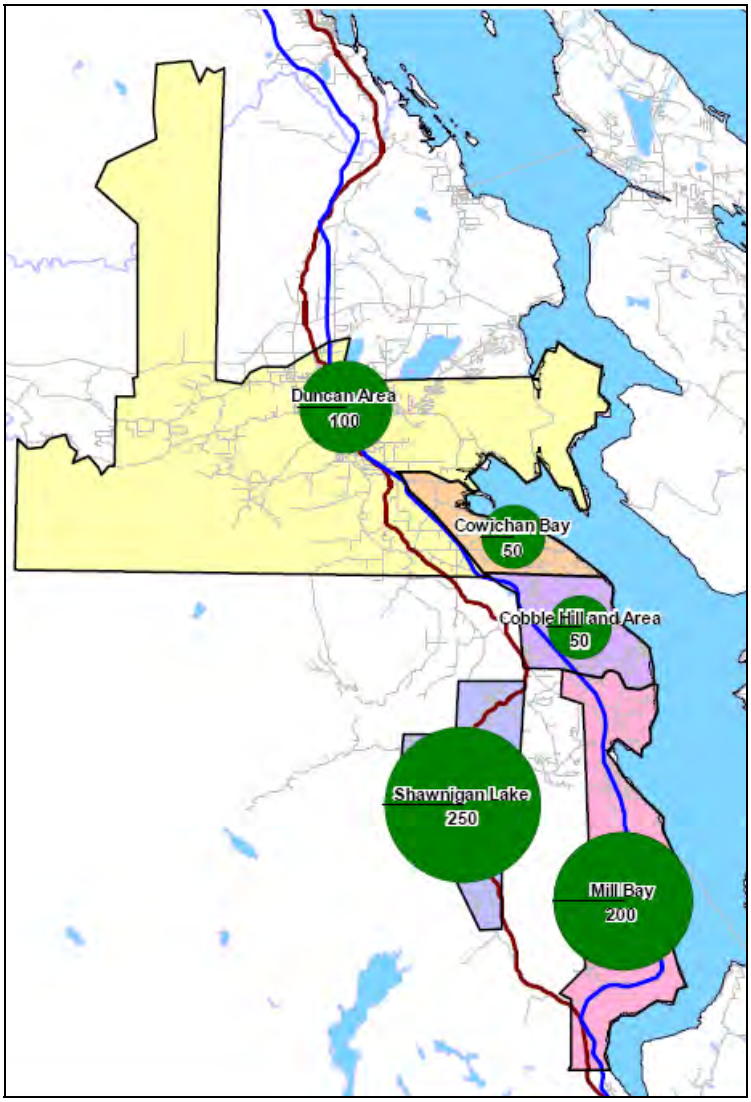
2.5.5 The changes in the Victoria/downtown area as a destination are important in assessing both commuter rail and bus potential. These changes suggest that transit ridership potential has probably declined over the last five years to the extent that fewer work trips are destined to the transit-oriented downtown and more are destined for dispersed suburban workplaces. Furthermore, these trends suggest that unless there is significant growth in jobs in downtown Victoria, the transit market will tend to get smaller over time.

2.5.6 The experience in cities with commuter rail services to their downtowns suggests that such services tend to increase long distance commuting and make more distant suburban communities more desirable places to live for downtown workers.

2.5.7 The 2006 OD survey data suggest that approximately 700 Cowichan Valley residents work in downtown Victoria including approximately 250 from the Shawnigan Lake area, 200 from the Cowichan Valley A- Mill Bay Area, approximately 50 each from the Cowichan Valley C – Cobble Hill and the Cowichan Bay areas, and approximately 100 from the Duncan area, as shown in **Figure 2.9**.

[1] "2001 Census Place To Work And Mode To Work Data" BC Transit, September 2003, page 3.

Figure 2.9 – CVRD Residents working in Downtown Victoria



2.5.8 The 700 downtown commuters are the primary sub-market that could be expected to use public transit services (including van pools, buses or commuter rail) and, therefore, the travel market analysis focused on this primary sub-market. These downtown-destined commuters appear to be concentrated in 5 areas that together account for approximately 90 percent of the total commuters travelling to downtown Victoria: Cowichan Valley E (Duncan Area), Shawnigan Lake and nearby areas, Cowichan Bay, Cobble Hill and area, and Cowichan Valley A South (Bamberton/Malahat and vicinity). These are the communities that would need to be directly served by transit, if this option is to be competitive with the car for commuting.

2.6 Jack Bell Vanpool and Greyhound Travel Data

2.6.1 Vanpools currently provide the only alternative means of transportation for those commuting between the CVRD and the CRD. The Jack Bell Foundation organizes carpooling and vanpooling services by providing vehicles and arranging for ride-sharing groups. Currently, there are approximately 30 vehicles (both vans and cars) in service from the CVRD to the CRD, including 19 vans, indicating approximately 140 riders. Of the 19 vanpools identified

from the Cowichan Valley area, ten are from Duncan, three from Cobble Hill, two from Cowichan Bay, two from Shawnigan Lake, and one each from Lake Cowichan and Crofton. **Table 2.10** shows the residential locations and work destinations of current vanpool users. The large majority of vanpools in operation between the CVRD and the CRD serve South Cowichan Valley residents who work in or near to downtown Victoria. Costs to participate in the vanpool depend on distance travelled, number of riders in the van and fuel costs. A commute from Duncan, the centre of vanpool activity, is approximately 70 km each way (140 km per day) costs approximately $200 per month for each participant, assuming six passengers are sharing the costs of operating an 8 passenger van. This is equivalent to a daily fare of approximately $5.00 each way.

Table 2.10 – Summary of Vanpool Data for South Cowichan Valley

Home Location	Total From South Cowichan	Destination Victoria (all)	Downtown Victoria Or Douglas St.	University of Victoria	Esquimalt
Duncan	10	8	7	1	2
Cowichan Bay	2	2	2		
Cobble Hill	3	3	3		
Shawnigan Lake	2	2	2		
Lake Cowichan	1	1	1		
Crofton	1	1	1		
total van pools	19	17	16	1	2

*Source: Jack Bell Ride-Share Foundation - Island Routes & Cost Breakdown report - August 06

2.6.2 The vanpool data indicates that Duncan accounts for 10 of the 19 vans serving the corridor, with seven of these travelling to downtown Victoria. This implies that more than 40 persons commute regularly between Duncan and downtown Victoria by van while the 2006 roadside survey data suggest that the total commuter market from the Duncan area to downtown Victoria is about 100. The high van pool use reported suggests that the Duncan area may account for a higher proportion of the total transit travel market than is indicated in the 2006 survey (and the 2001 Census). It also points to the strengths of the van pool option for this travel submarket.

2.6.3 Greyhound Bus Lines offer a coach bus service from Victoria to points north on the Island. This service is not intended as a commuter service, but it is currently the only bus service available that connects the CVRD with the CRD. The bus stops in many small communities along Highway 1, with four bus stops between Ladysmith and Duncan, and nine stops between Duncan and downtown Victoria. Bus travel times from Duncan to Victoria range from 50 minutes in the evening to one hour and fifteen minutes during the midday. Southbound buses pass through Duncan six times each day, beginning at 8:45 am and continuing until 10:25 pm. In the northbound direction there are also six buses per day, with buses departing Victoria beginning at 5:30 am and continuing until 7:20 pm. Cost to travel from Victoria to Duncan on the Greyhound bus is $11.40 each way.

3 Travel Demand Model Development

3.1 Introduction

3.1.1 The objective of this study is to evaluate the ridership potential of a range of commuter rail and bus service options operating in the Malahat corridor. For the purpose of this study a PM peak period model was developed focusing on northbound travel between the CRD and the CVRD. Information from the roadside OD survey was adjusted to reflect annual average weekday conditions in the model (otherwise the model would reflect ridership levels during the summer period). Note that daily two-way estimates of ridership are developed based on information from the roadside OD survey and supporting traffic count data.

3.1.2 The travel demand model is comprised of the following components:

- traffic zones and demographics
- road and transit network
- base year trip tables
- travel demand growth models
- mode split models

3.1.3 The model has been implemented using a combination of the EMME/2 software platform and spreadsheets. Note that the CRD Regional Travel Model was used to obtain future CRD demographics and current and future year PM peak period travel times. The following sections provide a description of each model component.

3.2 Traffic Zones and Demographics

3.2.1 The current CRD Regional Travel Model provides traffic zone and network coverage between Sidney and the Western Communities. For this study, the traffic zone system and network was extended north to Ladysmith. **Figure 3.1** shows the traffic zone system developed for the Malahat study area, which divides the area into 25 zones. Within the CVRD, traffic zones were developed based on census subdivision boundaries, and smaller zones surrounding the major municipalities in the region were added. The traffic zone system used for the CRD was based on the Regional Travel Model and features more than 500 zones.

3.2.2 For each CVRD traffic zone, population estimates were developed in five year increments to 2026 by Urban Futures Inc. Based on discussions with regional and municipal planners (as well as on stated Official Community Plan objectives) the magnitude and location of short-term residential development activity within the CVRD was identified and used to allocate future population growth within the region. Forecasts were controlled to BC Stats latest forecast series for Local Health Areas 65, 66 and 67.

3.2.3 **Table 3.1** provides a summary of the CVRD total population by sub-area. The current population of this area is approximately 80,000 and is forecast to grow to 100,000 by 2026 (approximately 1.1 percent compound annual growth rate).

Figure 3.1 – CVRD Traffic Zones

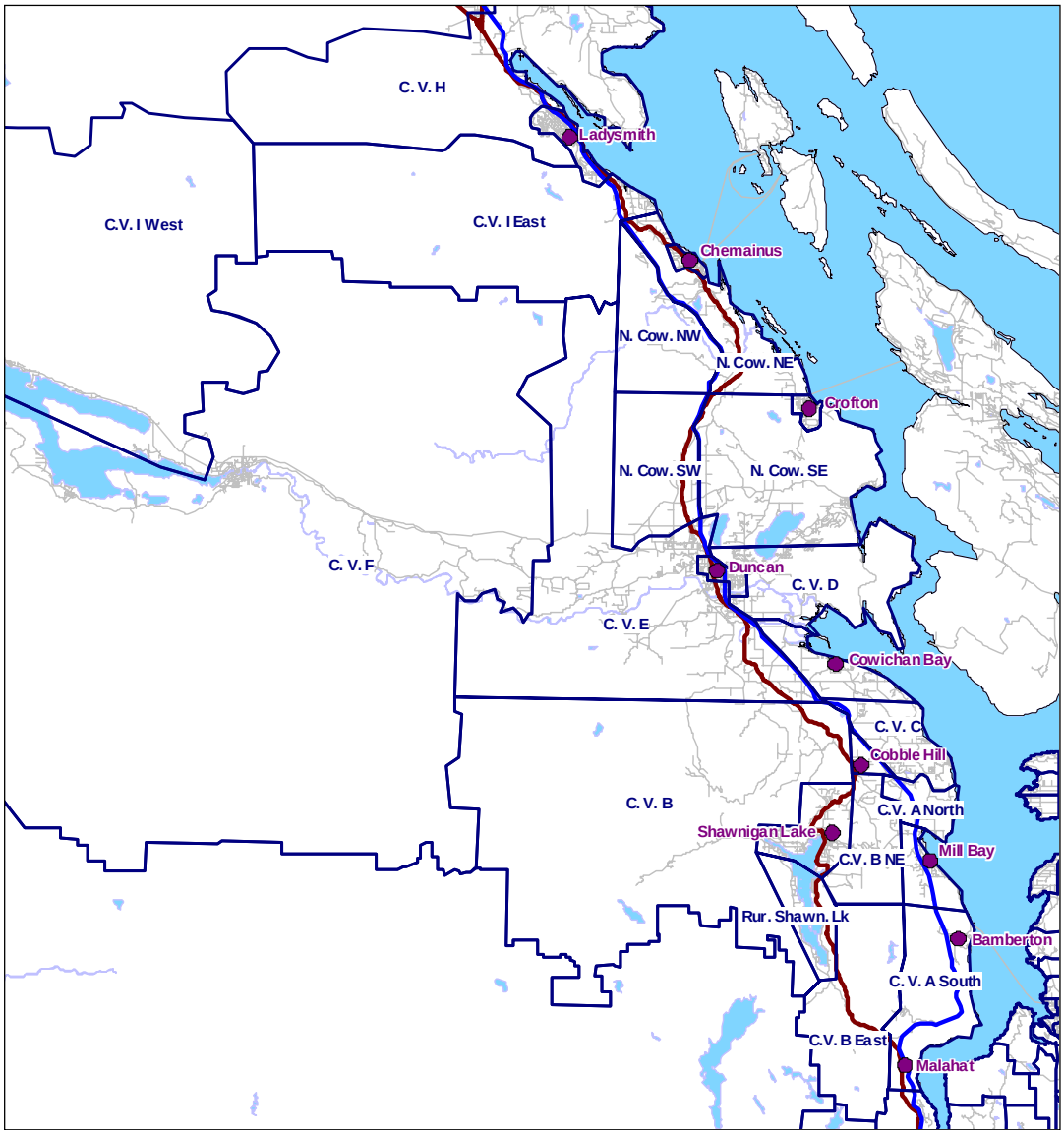


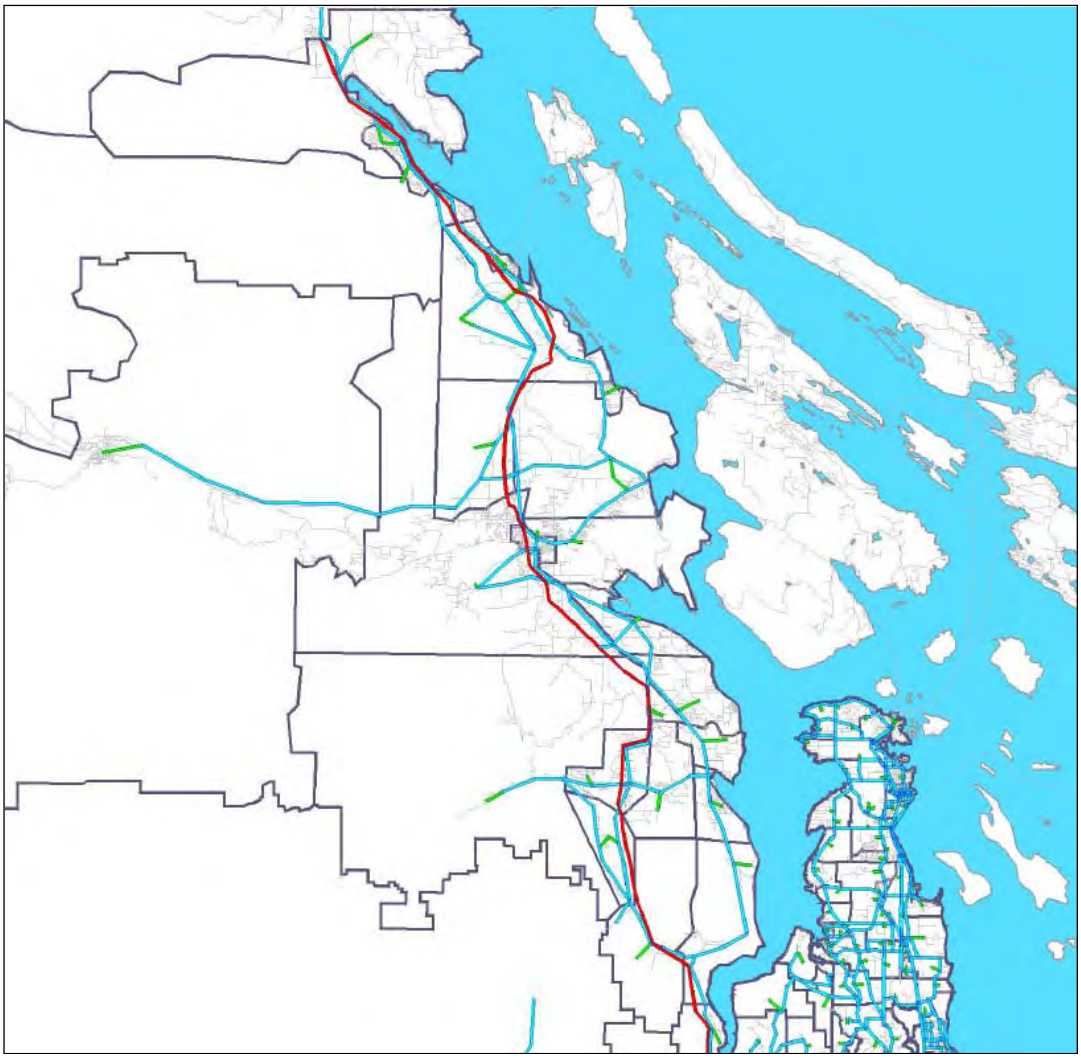
Table 3.1 – CVRD Population Estimates

Traffic Zone Abbreviation	2001	2006	2011	2016	2021	2026	CAGR 06-26
Chemainus	1,936	2,096	2,277	2,475	2,657	2,826	1.5%
Cobble Hill	1,850	1,938	2,074	2,221	2,346	2,455	1.2%
Cowichan Bay	2,720	2,918	3,117	3,302	3,480	3,659	1.1%
C. V. A North	681	740	791	836	884	935	1.2%
C. V. A South	970	1,013	1,075	1,150	1,216	1,309	1.3%
C. V. B	448	477	507	534	559	579	1.0%
C. V. B East	1,830	1,924	2,054	2,207	2,344	2,450	1.2%
C. V. B NE	1,041	1,091	1,164	1,239	1,310	1,378	1.2%
C. V. C	2,840	3,091	3,351	3,637	3,931	4,253	1.6%
C. V. D	3,646	3,851	4,052	4,276	4,505	4,713	1.0%
C. V. E	10,202	10,720	11,218	11,852	12,449	12,760	0.9%
C. V. F	4,993	5,227	5,366	5,502	5,605	5,648	0.4%
C. V. H	2,969	3,182	3,411	3,627	3,815	3,985	1.1%
C. V. I East	2,395	2,609	2,829	3,044	3,239	3,436	1.4%
C. V. I West	1,198	1,270	1,323	1,370	1,405	1,430	0.6%
Crofton	2,699	2,851	3,020	3,205	3,383	3,538	1.1%
Duncan	5,871	6,276	6,750	7,316	7,879	8,416	1.5%
Ladysmith	6,742	7,163	7,672	8,215	8,710	9,116	1.2%
Mill Bay	819	889	954	1,016	1,079	1,151	1.3%
N. Cow. NE	2,165	2,317	2,482	2,650	2,803	2,940	1.2%
N. Cow. NW	744	803	858	913	957	998	1.1%
N. Cow. SE	8,871	9,494	10,085	10,627	11,162	11,709	1.1%
N. Cow. SW	2,028	2,145	2,263	2,377	2,486	2,582	0.9%
Rur. Shaw. Lk	1,102	1,167	1,221	1,280	1,342	1,401	0.9%
Shawnigan Lake	4,395	4,568	4,873	5,176	5,465	5,752	1.2%
Total	**75,155**	**79,821**	**84,788**	**90,047**	**95,013**	**99,420**	**1.1%**

3.3 Road and Transit Network

3.3.1 The baseline road and transit network contained in the CRD Regional Travel Model was expanded to provide coverage of the road network north to Ladysmith. Additionally, the commuter rail service (following the E&N railway) and the proposed bus services were coded into the model as future options. **Figure 3.2** highlights the road and rail network added in the CVRD study area. The rail line is shown as a red line, the road network is shown by blue lines, and green lines represent access to the zones.

Figure 3.2 – CVRD Road and Rail Network



3.4 Development of Base Year Demand Matrices

3.4.1 The Roadside Interview Origin-Destination survey was undertaken Monday through Thursday between July 31st and August 3rd, 2006. As the objective of this study is to estimate the potential ridership of a range of commuter-oriented transit services, the survey information was factored to reflect a typical fall weekday when commuting patterns return to "normal". Following these seasonal adjustments, PM peak period trip matrices were extracted for a typical fall 2006 weekday condition.

Total Trip Adjustment Factor

3.4.2 The first step in the factoring process involved the analysis of historic monthly traffic count data for relevant count stations. From 1994 until 2002, the ratio of AADT to SADT was consistently 0.91. Exceptions to this include 1994 and 1995 where the ratios were 0.93 and 0.89, respectively. Therefore, it can be assumed that the average fall weekday traffic is approximately 91 percent of the average summer weekday traffic (recall that traffic volumes

during the fall months of September and October are similar to AADT volumes as shown earlier in **Figure 2.2**).

3.4.3 It is important to note that while fall traffic volumes are lower than summer volumes, various trip purposes such as school and work trips are typically higher. Factors were generated in order to adjust the number of trips by purpose for each season.

Non-resident/Tourist Trip Factor

3.4.4 BC Tourism provides monthly data for typical tourist facilities on Vancouver Island such as BC Ferries, airports, US Customs, and Visitor Information Centres. BC Ferries passenger counts were selected to be representative of typical tourist activity on Vancouver Island, and were used to determine an adjustment factor for summer to fall. Analysis of monthly ferry passenger data shows that daily fall passenger volumes are approximately 58 percent of summer volumes. Therefore, the summer to fall adjustment factor of 0.58 was used for tourist traffic using the Malahat Highway. For this study, all travellers who were not residents of the CVRD or the CRD were considered to be tourists.

Resident Commuting Trip Factor

3.4.5 Information on the average number of vacation days per person per month was analysed along with summer tourism data to determine typical vacation patterns for workers. It was determined that approximately 5 percent of employees take leave during the fall, and between 15-20 percent of employees do not attend work on a typical summer day (not including sick days in both cases). This estimate includes jobs such as teaching, which have holidays during the summer months. Therefore, 95 percent of employees are at work during the fall and 80-85 percent of employees are present during the summer months, resulting in a summer to fall adjustment factor for work-related trips of 1.15.

Resident "Other Trip" Factor

3.4.6 The remaining trip purposes include activities such as personal business, shopping and recreation for residents of the CRD and CVRD. By applying the work and tourism factors and subtracting this from the fall total trip estimate, a factor was determined for other trips. This resulted in an adjustment factor of 0.93, which is very close to the total trip factor.

PM Peak Period Fall Trip Tables

3.4.7 Based on a review of corridor traffic count data, the PM peak period was determined to fall between 4:00 pm and 6:00 pm. The adjusted fall OD trip matrices for this time period were extracted from the RSI data. **Table 3.2** provides an example of the PM peak period OD matrices for total passenger cars and total persons in passenger cars. Note that more detailed trip matrices by individual traffic zone and trip purpose are used in the forecasting process, and only residents of the CVRD and the CRD are considered in the transit forecasting calculations.

Table 3.2 – PM Peak Period Trip Matrices (Northbound)

A. Total Passenger Cars					
Origin / Destination	**South Cowichan**	**North Cowichan**	**Ladysmith**	**North Externals**	**Total**
Downtown Victoria	169	90	7	128	394
Victoria / Esquimalt	348	254	21	181	804
Saanich / Sidney	181	196	14	177	568
View Royal	47	34	5	23	108
Langford	73	90	7	14	184
Colwood	45	37	1	25	108
Sooke / Juan de Fuca	43	24	-	14	81
South Externals	7	9	-	7	23
Total	912	735	55	568	2,271
B. Total Persons in Passenger Cars					
Origin / Destination	**South Cowichan**	**North Cowichan**	**Ladysmith**	**North Externals**	**Total**
Downtown Victoria	236	142	16	266	660
Victoria / Esquimalt	478	393	42	361	1,275
Saanich / Sidney	261	314	23	342	940
View Royal	65	55	7	46	174
Langford	106	137	12	28	283
Colwood	64	55	3	39	161
Sooke / Juan de Fuca	63	39	-	29	131
South Externals	11	14	-	15	39
Total	1,284	1,150	103	1,125	3,662

3.5 Growth Model

3.5.1 A variety of regional trends influence travel growth. Heanue[2] identifies three main factors that have driven the increase in person and vehicular travel following the post-war period:

- Demographic factors, such as growth in population and households, auto ownership, and licensed drivers.
- Economic factors, such as labour force participation, employment, transportation costs, and income.
- Lifestyle choice factors, such as smaller household size and campus-style office parks.

3.5.2 With respect to travel on an individual facility, other factors such as the facility's capacity and the availability of improved alternate routes or modes will affect demand.

3.5.3 In order to predict future ridership levels, a growth model was developed to factor the base year matrices to reflect trends in traffic and future population and economic growth. Between 1994 and 2000, annual daily traffic was growing at approximately 5 percent per annum. Since 2000, traffic volumes appear to have more or less stabilized as the highway is approaching capacity (especially in the peak hours).

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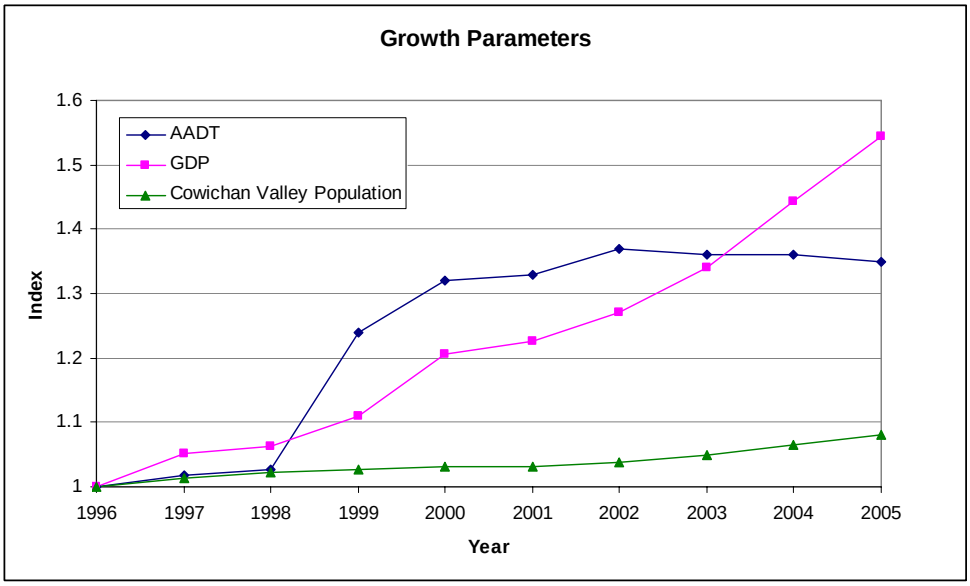
[2] Heanue K (1998) Highway capacity expansion and induced travel: evidence and implications. Transportation Research Circular. No. 48 1.

3.5.4 Comparison with historic population growth shows that the CVRD grew at 0.4 percent per annum between 1996 and 2001, increasing to 1.2 percent per annum between 2001 and 2006. CRD growth rates were similar, but with higher growth rates in western communities like Langford, which grew at 2.7 percent per annum over the last five years.

3.5.5 Analysis of Canadian gross domestic product (GDP) data shows a fairly stable annual growth rate of approximately 5 percent over the last 15 years. In the last 5 years, British Columbia's GDP has grown at close to 6 percent.

3.5.6 **Figure 3.3** provides a comparison of traffic growth to growth in population and GDP. This suggests that prior to reaching capacity, the Malahat traffic was growing significantly faster than population, at approximately the same rate as national GDP. However, in the last 5 years, traffic growth has lagged behind population growth due to capacity constraints.

Figure 3.3 – Growth Factor Comparison



3.5.7 As a two-lane rural highway, the Malahat could reach a maximum daily capacity of approximately 23,000 – 26,000 vehicles per day (AADT) and is currently operating just over 22,000 AADT. The actual daily capacity will vary depending on the travel characteristics of road users and their ability to shift their trips outside the peak periods.

3.5.8 Traffic forecasts were prepared based on sub-area population growth for the region, constrained to a theoretical daily capacity of 26,000. The OD survey data was indexed to population growth, with each entry factored by the population predictions for the home zone of the traveller, until the theoretical capacity was reached. This effectively assumes that as population in the region grows, road users will begin to shift their travel patterns to take advantage of available capacity outside the peak periods. This is a common phenomenon throughout North America as traffic congestion worsens and employees and other travellers adjust their travel time accordingly.

3.6 Mode Split Model

Model Description

3.6.1 The prime output of the SP surveys is a series of mode split models that predict the diversion from automobile to new commuter rail or express bus options. The surveys were designed to

develop models for the following resident markets: (i) commuters; and (ii) non-commuters (e.g., shopping, recreational, personal business).

3.6.2 Following a review and verification of the SP data (e.g., testing for illogical respondents), the data was analyzed to estimate mode split models by market segment. Model estimation is an iterative process where various mode split structures are examined (e.g., multi-nomial logit, nested-logit) and different data combinations are assessed (e.g., exclusion/inclusion of non-traders, usage of 1st only preference or 1st and 2nd preference data, etc.) for their statistical validity. Approximately 40 models were estimated and tested as part of this process and the final model took the form of a multi-nomial logit model as illustrated below:

$$P_{rail} = \frac{exp(U_{rail})}{(exp(U_{auto}) + exp(U_{rail}) + exp(U_{bus}))}$$

where:

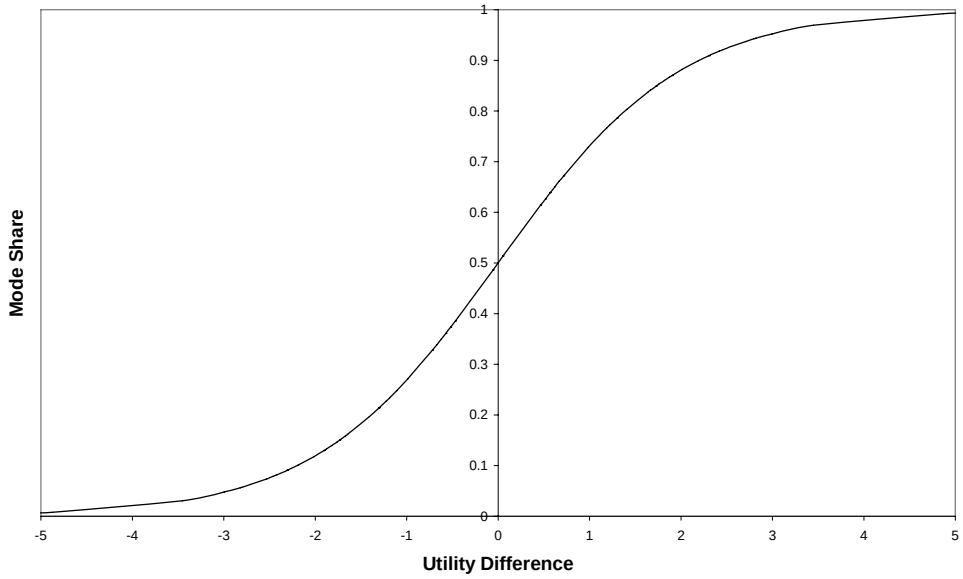
$U_{auto} = c1xIVT+c2xFare$

$U_{rail} = c1xIVT+c2xFare+c3xHdwy+c4xAccess+Bias_{rail}$

$U_{bus} = c1xIVT+c2xFare+c3xHdwy+c4xAccess+Bias_{bus}$

3.6.3 The logit model operates by comparing the 'utility' of travel by each mode with the utility of the alternative – the new rail link - at the most disaggregate level and returns a forecast mode share based upon the difference in utility. An example of the relationship between difference in utility and mode share is shown in **Figure 3.4**.

Figure 3.4 – Logit Curve



3.6.4 The utility (or disutility) of travel is based on the conversion of the different aspects of the journey (travel time, waiting time, travel cost, etc.) into a standard unit to enable a direct comparison to be made across modes. For example, if all trip characteristics were to be converted into units of in-vehicle time, the comparison may be made, for instance, of a trip by car of 45 generalized minutes compared with a trip by rail of 60 generalized minutes, resulting in a forecast mode share.

3.6.5 **Table 3.4** presents the key parameters or weightings derived for the final set of models. All the coefficients have intuitively correct signs (i.e., negative as a person's utility will decrease when time, fare or headway increase). All the main attribute coefficients have significant t-statistics (i.e., >1.96). Finally, the mode biases relative to the automobile are both negative as expected (reflecting a preference for the automobile, all things being equal). Note that the rail bias is lower than bus, reflecting a preference for rail over bus.

Table 3.4 – Summary of Stated Preference Survey Results

Variable	Commuters		Non-Commuters	
	Coeff Estimate	T-Statistic	Coeff Estimate	T-Statistic
In-Vehicle Time	-0.024	-8.0	-0.019	-6.8
Fare	-0.193	-12.6	-0.188	-13.9
Headway	-0.020	-8.0	-0.015	-6.7
Access	-0.019	-3.0	-0.025	-4.4
Bias Bus	-1.512	-10.2	-1.568	-12.1
Bias Rail	-0.474	-3.6	-0.758	-6.5

3.6.6 From these parameter values, attribute valuations can be derived, including the assumed values of time (VOT), as shown in **Table 3.5**.

Table 3.5 –Stated Preference Values of Time and Transit Weights

Purpose	VOT ($/hr)	Weights		Constants (min)	
		Access	Hway	Bus	Train
Commuter	$ 7.58	0.8	0.8	-62	-19
Non-commuter	$ 5.99	1.3	0.8	-84	-40

Travel Time Assumptions

3.6.7 Auto and transit times between CVRD and CRD zones were extracted from the EMME2 network model. Access times to each rail station or bus stop were also extracted from the EMME/2 transport model on a zone by zone basis.

Cost Assumptions

3.6.8 Parking charges within the CRD were based on the zonal values contained in the CRD model. Half of the daily parking charge was allocated to the PM peak trip (as the other half is attributed to the AM trip).

3.6.9 Auto operating costs include fuel, tires and maintenance and were assumed to be $0.15/km.

3.6.10 Transit fares are described in **Section 4** and were approximately $0.10/km for bus and $0.18/km for commuter rail.

4 Bus and Commuter Rail Service Options

4.1 Bus Service Alternatives

4.1.1 Commuter bus services using standard transit buses (or motor coaches) can be provided between downtown Victoria and those communities within the Cowichan Valley that are home to downtown-oriented workers. The travel market analysis, summarized in **Sections 2.5** and **2.6**, suggests that the primary market for transit services in the short-term would be the 700 CVRD residents working in downtown Victoria. These downtown-destined commuters are concentrated in five areas that together account for approximately 90 percent of the total commuters travelling to downtown Victoria: Cowichan Valley E (Duncan Area), Shawnigan Lake and nearby areas, Cowichan Bay, Cobble Hill and area, and Cowichan Valley A South (Bamberton/Malahat and vicinity).

4.1.2 In developing the bus service option, the intent was to provide these commuters with a competitive transit option by connecting each community to downtown Victoria by the most direct route possible. Given the current travel market characteristics, a series of bus routing options were examined before defining two routes for testing that would serve the communities that appear to have the highest ridership potential:

- Route A would run from Duncan to downtown Victoria via the Trans Canada Highway serving Cowichan Bay, Cobble Hill, Mill Bay, Bamberton, and Malahat.
- Route B would run from the Shawnigan Lake community to downtown Victoria, serving South Shawnigan Lake and Malahat, via Shawnigan Lake Road and the Trans Canada highway.

4.1.3 **Table 4.1** summarizes the travel distances, times, speeds and costs assumed for the two bus routes.

Table 4.1 – Express Bus Travel Distances, Times and Fares

Route A - Downtown Victoria to Duncan				
From Downtown Victoria To:	Distance:	Travel Time:	Average Speed:	Fare Estimate
	km	min.	km/h	$/trip
Douglas&Finlayson	3	6	38	$3.00
Millstream Road	15	24	40	$3.00
Malahat	31	44	50	$3.00
Bamberton	38	51	60	$4.00
Mill Bay	46	59	60	$4.50
Cobble Hill	52	65	60	$5.00
Cowichan Bay	59	73	55	$6.00
Duncan	70	84	60	$7.00

Fares assume $3.00 minimum and $.10 per km (rounded to the nearest $.50)

Route B - Downtown Victoria to Shawnigan Lake				
From Downtown Victoria To:	Distance:	Travel Time:	Average Speed:	Fare Estimate
	km	min.	km/h	$/trip
Douglas&Finlayson	3	6	38	$3.00
Millstream Road	15	24	40	$3.00
Malahat	31	44	50	$3.00
S. Shawnigan Lake	38	51	50	$4.00
Shawnigan Lake	45	59	45	$4.50

Fares assume $3.00 minimum and $.10 per km (rounded to the nearest $.50)

4.1.4 The two bus routes are illustrated in **Figure 4.1**. For testing purposes, it was assumed that the bus routes would operate during the two-hour AM and PM peak periods at 20 or 40 minute headways.

4.1.5 Fares are assumed to vary by distance at an average cost of approximately $0.10 per km so that fares to downtown would vary from approximately $7.00 each way to/from Duncan and approximately $4.50 each way to/from Shawnigan Lake. It is assumed that these fares would be fully integrated with the Victoria Regional Transit System (VRTS) fares so that passengers could transfer to or from VRTS buses to complete their trips without paying a second fare.

4.1.6 Access to the bus service from home is assumed to be primarily by car (park-n-ride or kiss-n-ride with parking lots at each location that would be sufficiently large to accommodate the demand) and the intent is to ensure that the residents of the main commuter communities are within a 5-10 minute drive of the bus stop, while recognizing that persons not living in these communities would drive farther.

4.1.7 Access to the bus service in the CRD is assumed to be primarily by walking to the two main stops; Millstream to serve the Langford area, and the downtown transit terminal. However, it is also assumed that buses would stop on request on Douglas Street between Findlayson and Pandora to make the service as attractive as possible to persons working or visiting locations within this corridor.

4.1.8 Travel times on the two bus routes were estimated recognizing existing bus operating speeds in the various communities, average highway operating speeds, and passenger service times (off highway). Based on the rationalized times between the proposed stops, the travel time between Duncan and downtown Victoria was estimated to be 84 minutes whereas travel time from Shawnigan Lake would be 59 minutes.

4.1.9 The bus operating costs to provide 3 trips on each route in the AM and PM (using 6 buses) were estimated to be approximately $500,000 per year based on the following assumptions:

a) Buses would operate from home bases near the Duncan and Shawnigan Lake communities but be parked in downtown Victoria between the AM and PM.

b) The daily operating hours for six buses (required to provide three buses on each route) would be approximately 16 hours per day.

c) The six operators would be paid for a full eight hours per day but would travel to and from their home communities by bus or van during the midday. This would necessitate split shifts where the time between the start of each driver's first inbound trip and the end of the second return trip could not be longer than 12 hours.

d) The basic service involving three inbound buses on each of the two routes in the AM, returning in the PM (16 hours per day) would require six buses and operators and would cost $1,248/day (16 x $78/hr – CVRD operating cost provided by BC Transit which includes drivers' wages and benefits).

e) Given minimum guarantees (8 hours per driver subject to a 12 hour spread) and assuming that operators would be returned to base after the AM and driven downtown in the PM for the return trip, using a van operated by the contractor or a bus operated by one of the drivers, an additional labour charge of $736 would be required for six drivers ($23/hour driver cost x 32 hours – the time not paid under point d).

4.1.10 This preliminary operating cost estimate excludes the following:

a) the costs associated with returning drivers to/from base.

b) the costs of storing six buses during the day in the downtown area.

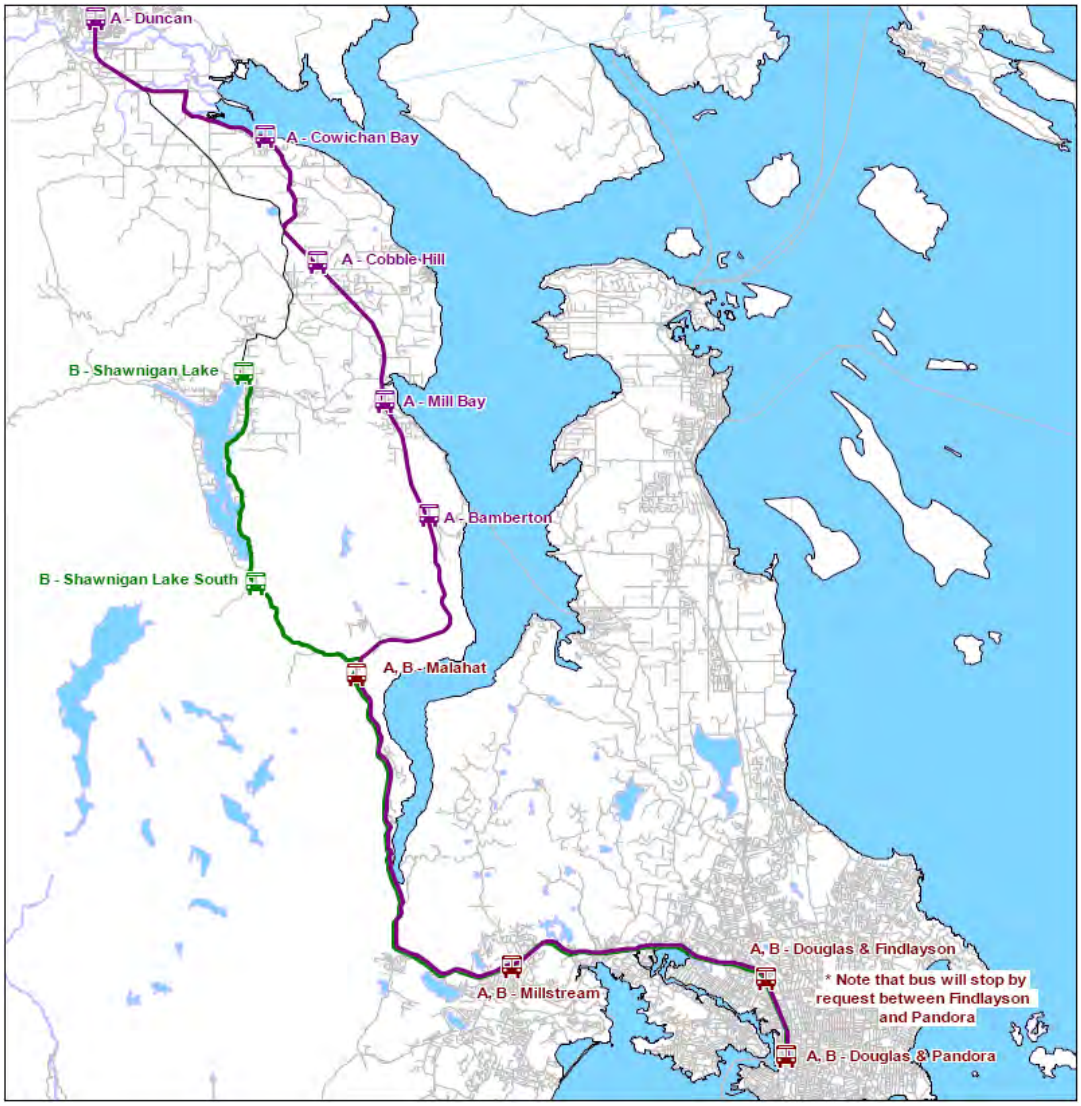
c) the cost of a spare bus for maintenance, for those times when one or more of the six buses may not be operable. Typically an additional "maintenance spare" bus would have to be available to ensure the availability of six buses at all times. With a private company providing the service, this would normally not require the purchase of an additional bus, but rather would involve an additional charge for the use of one of the operator's buses to provide the service, during the times when one of the regular buses may be under repair.

4.1.11 Considering the above points, the actual bus operating costs could be higher, depending on the details of the operation.

4.1.12 Bus capital costs for the six buses required to provide three trips in the AM and PM would be approximately $270,000 per year. The daily 'bus rent' costs were estimated at $178.57 per day per bus (or $1071.42 per day for six buses) using a capital debt service cost of $45,000 per bus per annum provided by BC Transit and assuming 252 days operation per year for the commuter service.

4.1.13 Total annual costs to operate the two routes providing three inbound trips in the AM and three outbound trips in the PM in 2006 would be at least $770,000 per year. This is shown in Table 5 for Option 1A, the 40 minute frequency option which assumes three buses on each route. The cost of providing 20 minute service, which would require six buses per route (a total of 12 buses), would involve a total cost of more than $1.5 million per year.

Figure 4.1 – Proposed Express Bus Services



4.2 Commuter Rail

4.2.1 Commuter rail service can be provided between downtown Victoria and Ladysmith, travelling southbound during the AM peak period and northbound during the PM peak period. Available vehicle types range from bi-level equipment now used by West Coast express in Vancouver to the current Budd rail diesel cars (RDCs) now used by VIA rail on the E&NR. However, order of magnitude estimates of demand, as well as the condition of the existing infrastructure suggest that VIA Rail-type equipment appears most appropriate. Since these vehicles are no longer manufactured, it would be necessary to acquire refurbished used vehicles.

4.2.2 Individual RDCs normally have a seating configuration that provides 90 seats. Unless high-level platforms are constructed in stations, these cars are not readily accessible by persons with physical disadvantages. Depending upon forecast demand and frequency of service, train consists of either 2 car or 3 car RDCs would be used. Park-and-ride facilities would be

provided at all rail stations within the CVRD, and local bus service would be integrated with the stations.

4.2.3 For the existing railway infrastructure, it would be possible to operate 3 trains per direction per day at 20 minute intervals (e.g., 3 AM inbound and 3 PM outbound). However, for a new commuter rail service, it is fairly common to start with 1 train per direction per day and increase capacity or frequency as demand dictates. For the purpose of this study, two frequency levels were examined:

- 1 train per direction per day (timed to coincide with median work start and end times)
- 3 trains per direction per day (operating on 20 minute frequency during the AM and PM peaks)

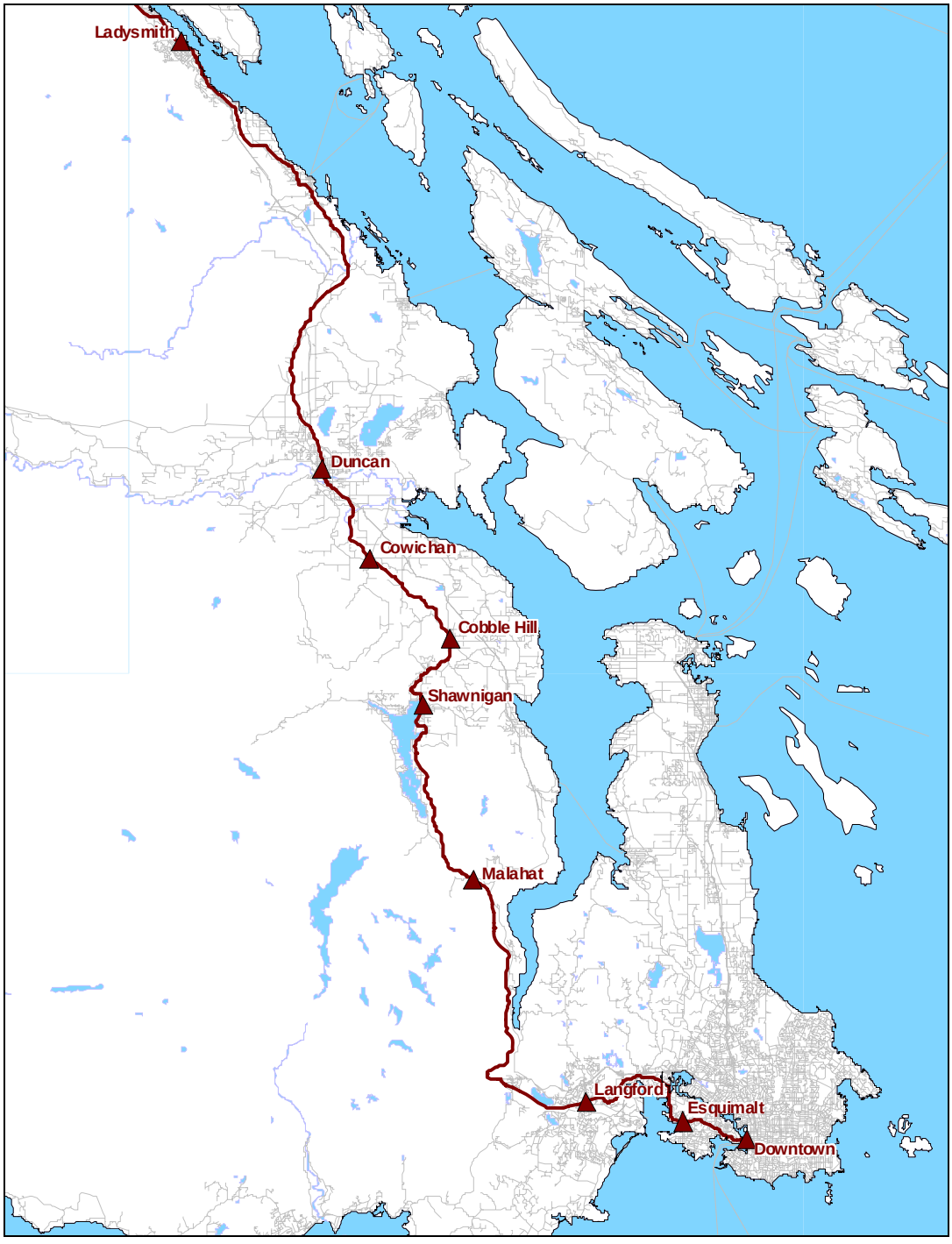
4.2.4 Since total travel time between downtown Victoria and Duncan, including stop time, is estimated to be one and a half hours, there is no opportunity to use trains more than once each during the peak period. Total travel time from downtown Victoria to Ladysmith is estimated to be two hours.

4.2.5 For the purpose of this analysis, the one-way fares for rail service would be $11 to Duncan and $16 to Ladysmith. The cost of travel on the CRD transit system would be included in the rail fares. The fare estimate is based on the 2005 West Coast Express fares and is pro-rated by travel time. Proposed station locations are shown in **Figure 4.2**, with estimated travel times and fares in **Table 4.2**.

Table 4.2 - Rail Travel Times and Fares

From Downtown Victoria To:	Distance:	Travel Time:	Average Speed:	Fare Estimate
	km	min.	km/h	$/trip
Esquimalt	6	14	26	$3.00
Langford	13	22	35	$3.00
Malahat	32	43	45	$5.50
Shawinigan	45	58	47	$8.00
Cobble Hill	50	63	48	$8.50
Cowichan	58	73	48	$10.00
Duncan	64	82	47	$11.00
Ladysmith	93	115	49	$16.00

Figure 4.2 – Proposed Commuter Rail Line



4.2.6 Clearly, these fares are a matter of policy with regard to the extent of service subsidies. However, these fares would not cover costs of operation, let alone the capital costs of railway infrastructure improvements required and the procurement of vehicles.

4.2.7 The extent of infrastructure improvements is unclear at this time. The route presently lacks any form of right-of-way protection from the standpoint of both adjacent land use and pedestrians. In addition, there is a significant number of unprotected grade crossings with roads, the net effect of both being fairly strict constraints on maximum operating speeds.

4.2.8 For purpose of preliminary cost analysis, the following assumptions have been made:

- $2 million to $3 million (depending upon service frequency) has been allowed for minor station improvements, fare machines, and the installation of grade crossing protection at critical locations,
- refurbished Budd RDCs, which would require one crew person per car could be procured for about $1.5 million each, with a reliable service life of 10 years,
- no allowance has been made for spare vehicles,
- one additional crew member has been allowed for vacations, overtime, and sickness,
- service would be provided on weekdays only, or about 240 days per year (allowing for statutory holidays),
- labour work rules would permit split shifts so that one crew would operate both inbound and outbound trains on the same day, and
- typical unit operating costs for similar services are used in estimating annual operating costs.

4.2.9 Based on the above assumptions and the final operating characteristics, a preliminary cost estimate for this service could range between $1.3 and $3.5 million per year (See **Appendix D** for a detailed cost summary). Depending on the ridership levels, the daily one-way cost per trip could fall anywhere between $20 and $73. **Section 5** provides ridership estimates for various operating configurations, which can be used to determine an appropriate operating configuration and the associated cost per ride.

5 Ridership Forecasts

5.1 Scenario Descriptions

5.1.1 Based on the models described in **Section 3**, ridership forecasts were developed for commuter rail and express bus in three time horizons (2006, 2016 and 2026). Details of the express bus and commuter rail options are described in **Section 4** and summarized below and in **Table 5.1**:

- **Express Bus Option 1A** – featuring two routes (A-Duncan and B-Shawnigan Lake), 40 minute peak period frequency, fares ranging from $3 to $7 ($7 between downtown Victoria and Duncan), travel time between Duncan and downtown Victoria at 84 minutes;
- **Express Bus Option 1B** – the same as 1A except running at a 20 minute frequency during the peak periods;
- **Commuter Rail Option 2A** – featuring 1 train per day per direction, fares between $2 and $16 ($11 between downtown Victoria and Duncan), travel time between Duncan and downtown Victoria at 82 minutes; and
- **Commuter Rail Option 2B** – the same as 2A except running 3 trains per day per direction.

5.1.2 Note that today the average automobile travel time between downtown Victoria and Duncan is approximately 60 minutes and the vehicle operating costs are $9. Average daily parking charges in downtown Victoria are approximately $4, of which the cost would be equally divided between the morning and afternoon commute.

Table 5.1 – Scenario Summary

	Bus		Rail	
	Option 1A	**Option 1B**	**Option 2A**	**Option 2B**
# of Buses/Trains	6 Buses	12 Buses	1 Train	3 Trains
Frequency	40 minute	20 minute	N/A	20 minute
Fare (Victoria to Duncan)	$7	$7	$11	$11
2006 Travel Time (Victoria to Duncan)	84 min	84 min	82 min	82 min

5.2 Ridership Forecasts

5.2.1 **Table 5.2** provides a summary of the PM peak period and daily ridership forecasts for the Express Bus and Commuter Rail options. It is important to note that these ridership forecasts focus on trips between the CRD and CVRD. The proposed service options could also serve markets between the Langford area and Victoria which are not included in these estimates. However, while the additional ridership from Langford to Victoria may decrease the subsidies required to run the service, this increase in ridership will not affect traffic over the Malahat Highway, as is the focus of this study.

Table 5.2 – PM and Daily Ridership Forecasts

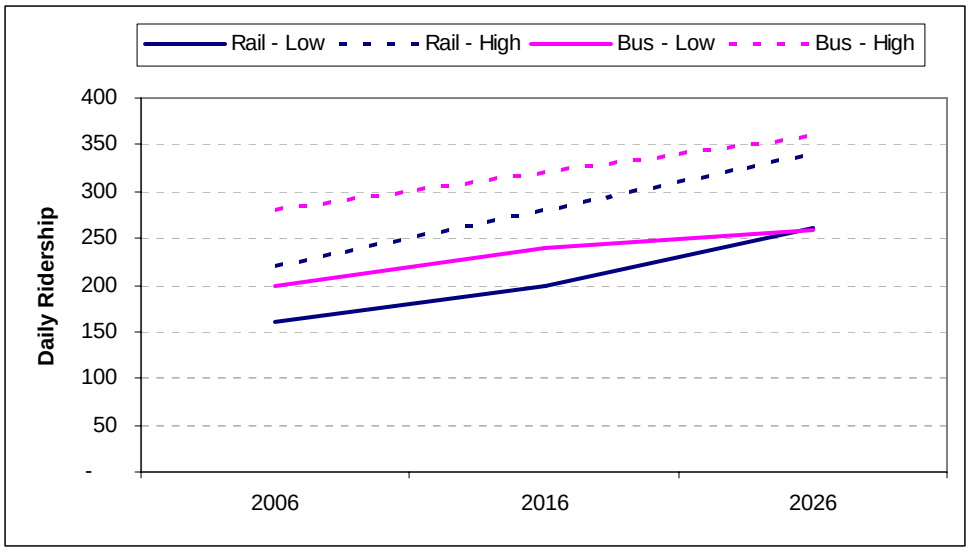
	2006		2016		2026	
Express Bus	**40 min**	**20 min**	**40 min**	**20 min**	**40 min**	**20 min**
PM Peak (NB)	100	140	120	160	130	180
Daily Total (NB & SB)	200	280	240	320	260	360
Commuter Rail	**1 Train**	**3 Trains**	**1 Train**	**3 Trains**	**1 Train**	**3 Trains**
PM Peak (NB)	80	110	100	140	130	170
Daily Total (NB & SB)	160	220	200	280	260	340

5.2.2 In 2006, the two express bus routes could expect to attract between 200 to 280 daily trips in total (depending on frequency), while the commuter rail service could capture between 160 and 220 per day. Note that these forecasts represent fully ramped ridership and should be adjusted downward in the first few years as the system matures and customers become aware of the service and modify their behaviour (typically 70 percent of the forecast in year 1, 85 percent in year 2, etc.). These ridership levels translate to less than 1 percent of the daily traffic on the Malahat Highway and approximately 4 percent of the PM peak period traffic (note that the average vehicle occupancy for commuters is approximately 1.25).

5.2.3 By 2026, the express bus routes could generate between 260 and 360 daily trips. For commuter rail, the status quo could generate 260 to 340 daily trips.

5.2.4 **Figure 5.1** provides a plot of the daily ridership estimates for the bus and rail options. While the SP surveys indicated that commuter rail is preferred over bus (all things being equal), the express bus offers a more direct service to key destinations at a lower cost, resulting in higher ridership. Under status quo, the growth in bus ridership would decline as congestion increases, while commuter rail ridership would start to catch up.

Figure 5.1 – Daily Ridership Estimates



5.2.5 **Table 5.3** shows the PM peak period origin and destinations for the 2006 commuter rail trips (assuming 3 trains per direction) and the corresponding mode shares. The majority of the ridership would be to/from downtown Victoria. Overall, commuter rail could attract approximately 3 percent of the PM peak person demand in the corridor and up to 4 percent of the vehicle demand (as commuters have lower vehicle occupancies).

Table 5.3 – 2006 PM Peak Period Commuter Rail OD's (3 Train Option)

A. PM Peak Period Commuter Rail Ridership - 3 Trains					
Origin / Destination	**South Cowichan**	**North Cowichan**	**Ladysmith**	**North Externals**	**Total**
Downtown Victoria	62	21	2		85
Victoria / Esquimalt	20	3	1		24
Saanich / Sidney					
View Royal					
Langford	1				1
Colwood					
Sooke / Juan de Fuca					
South Externals					
Total	83	24	3	-	110
B. Percentage of Total Demand Travelling by Commuter Rail					
Origin / Destination	**South Cowichan**	**North Cowichan**	**Ladysmith**	**North Externals**	**Total**
Downtown Victoria	26%	15%	12%		13%
Victoria / Esquimalt	4%	1%	2%		2%
Saanich / Sidney					
View Royal					
Langford	1%				
Colwood					
Sooke / Juan de Fuca					
South Externals					
Total	6%	2%	3%	0%	3%

5.3 Preliminary Cost and Performance Statistics

5.3.1 Based on the above ridership estimates and the preliminary cost information presented in **Section 4**, annual performance statistics are presented in **Table 5.4**.

Table 5.4 – Preliminary Cost and Performance Statistics

	Option 1A 40 minute frequency 3 buses per route		Option 1B 20 minute frequency 6 buses per route		Option 2A 1 Train 2 Cars/train		Option 2B 3 Trains 2 car/train	
Year	**2006**	**2026**	**2006**	**2026**	**2006**	**2026**	**2006**	**2026**
Annualized Capital Costs ($1000s)	$270	$270	$540	$540	$549	$549	$1,406	$1,406
Operating Costs ($1000s)	$500	$500	$1,000	$1,000	$725	$725	$2,080	$2,080
Total Cost	$770	$770	$1,540	$1,540	$1,274	$1,274	$3,486	$3,486
Annual Fare Revenue ($1000s)	$312	$390	$437	$583	$307	$515	$422	$673
Annual Subsidy ($1000s)	$458	$380	$1,103	$957	$967	$759	$3,064	$2,813
Daily Capacity (NB&SB)	480	480	960	960	360	360	1080	1080
Daily Demand (NB&SB)	200	260	280	360	160	260	220	340
Annual Trips (1000s)	48.0	62.4	67.2	86.4	38.4	62.4	52.8	81.6
Cost Per Trip	$16.0	$12.3	$22.9	$17.8	$33.2	$20.4	$66.0	$42.7
Revenue Per Trip	$6.5	$6.3	$6.5	$6.8	$8.0	$8.3	$8.0	$8.3
Subsidy per Trip	$9.5	$6.1	$16.4	$11.1	$25.2	$12.2	$58.0	$34.5

Note: Costs and Revenues are in constant 2006 dollars.

5.3.2 For the express bus options, annual total costs (capital and operating) are estimated at $0.77 to $1.54M in 2006 dollars. Fare revenues in 2006 could range between $0.31 and $0.44M. This translates to a cost per one-way trip between $16 and $23 in 2006, resulting in substantial subsidies. Note that at the estimated demand levels, the frequencies that were examined do not appear to be justified. Therefore a lower frequency, lower cost service could be developed.

5.3.3 By 2026, express bus demand levels would appear to justify a 40 minute frequency and the cost per ride would be approximately $12.3 at this service level, resulting in a subsidy of $6.1 per ride, respectively.

5.3.4 For the commuter rail options, annual total costs are estimated at $1.27 to $3.49M in 2006 dollars. Fare revenues in 2006 are estimated to range between $0.31 and $0.42M. This is equivalent to a cost per one-way trip of $33 to $66 in 2006. At the estimated demand level in 2006 it would appear that one train per day per direction could easily accommodate demand. By 2026, demand levels could still be accommodated with the one train configuration (possibly requiring the introduction of a third car). Cost per ride in 2026 for the one train option would be in the $20 range. Note that the one train per day option may have slightly longer travel times than those indicated in Table 4.2, as it is assumed that two Bud cars would be attached together, rather than a single Bud car travelling alone.

5.4 Benchmarking of Ridership Forecasts

5.4.1 The potential transit ridership from Cowichan Valley was estimated as part of the: Short Term Transit Feasibility Study, Travel Market Analysis. This assessment was based on observed Victoria Regional Transit System ridership from remote suburban areas in the CRD to downtown Victoria, which is thought to represent the "best case" that might apply to future transit services between Duncan and other communities in the Cowichan Valley and downtown Victoria.

5.4.2 Whereas transit was reported to serve approximately 21 percent of all commuter (work) trips to downtown Victoria in 2001 (Census Place of Work data), the highest observed transit share to downtown from relatively remote suburban areas were reported from Sooke (37 percent), Sidney (34 percent), North Saanich (24 percent), and Central Saanich (27 percent).

5.4.3 Sooke stands out as having the highest reported modal split for work trips to downtown at 37 percent in 2001. The route 61 bus offers a 66 minute ride, much of it on highways, from Sooke Town Centre to downtown Victoria, which compares to an estimated 45 minute drive by car. While Sooke and Sidney are both higher density communities, compared to the CVRD communities, the North and Central Saanich communities provide an indication of the transit ridership potential from more dispersed areas. Taken together, the experience of the remote suburban communities in the CRD suggests that the potential transit market shares for downtown work travel from the CVRD could be in the 24 to 37 percent range. Given the van pool experience, especially in Duncan, the potential could be toward the higher end of the range, so a best case figure of 35 percent was assumed in estimating the potential transit modal split for downtown oriented work trips.

5.4.4 Assuming very good transit connections between the five main commuter communities in the CVRD and downtown Victoria, and a potential transit market share of 35 percent of average daily commuter person trips to/from downtown, it is estimated that transit services, if introduced today, would serve approximately 137 outbound commute trips in the PM or 275 downtown oriented work trips per day.[3].

5.4.5 Allowing for potential commute trips to other work destinations that would be served by the proposed bus routes, the total work related demand is estimated to be 330 per day (assuming other destinations would add approximately 20 percent more work trips).

5.4.6 The proposed bus services would attract some additional non-commuter trips for personal business and shopping, perhaps, so the benchmark estimate was increased by a further 10 percent, which suggests that the total two way bus demand could be as high as approximately 360 per day. These totals include current (and future) van pool customers who account for virtually all of the current non-auto commute trips from the study area to the CRD today.

[3] This estimate assumes that 530 of the 700 commuters would be served, 85 percent work on a given week day and 71 percent would be traveling directly to and from work (and not need their personal vehicles to serve passengers, shop etc.).

6 Summary and Conclusions

6.1.1 The main objectives of this study are to develop long range forecasts for commuter rail and express bus use along the Malahat corridor and to determine the resulting impact on vehicular demand along this corridor.

6.1.2 Based on a preliminary assessment of corridor demand, the following four service options were defined for detailed ridership analysis:

- **Express Bus Option 1A** – featuring two routes (A-Duncan and B-Shawnigan Lake), 40 minute peak period frequency, fares ranging from $3 to $7 ($7 between downtown Victoria and Duncan), travel time between Duncan and downtown Victoria at 84 minutes;
- **Express Bus Option 1B** – the same as 1A except running at a 20 minute frequency during the peak periods;
- **Commuter Rail Option 2A** – featuring 1 train per day per direction, fares between $2 and $16 ($11 between downtown Victoria and Duncan), travel time between Duncan and downtown Victoria at 82 minutes; and
- **Commuter Rail Option 2B** – the same as 2A but running 3 trains per day per direction.

6.1.3 For comparison purposes, the current automobile travel time between downtown Victoria and Duncan is approximately 60 minutes and the vehicle operating costs are $9. Average daily parking charges in downtown Victoria are approximately $4, of which the cost would be equally divided between the morning and afternoon commute.

6.1.4 Current corridor demand was estimated using a combination of existing information and surveys conducted specifically for this study. A roadside classification survey was conducted over a four day period tracking passenger car occupancy and truck categories in both directions. During this same time, a northbound OD survey was conducted to obtain information on trip purpose and OD's as well as to solicit participation in a follow-up stated preference survey. These surveys provided up-to-date information on corridor travel characteristics and served as the basis for assessing the ridership potential of express bus and commuter rail options.

6.1.5 In 2006, Annual Average Daily Traffic (AADT) on the Malahat Highway is estimated at 22,000, increasing in the summer by approximately 10 percent. During the summer, residents of the CVRD and the CRD account for approximately 73 percent of the weekday travel, with the remaining 27 percent made by non-residents (e.g. north Vancouver Island, rest of B.C., Canada and International). Work and business trips by residents account for approximately 30 percent of the total demand. During the fall, it is estimated that residents account for 83 percent of the weekday demand, while non-residents account for 17 percent. In the fall, work and business trips represent around 37 percent of the total demand.

6.1.6 Average summer weekday vehicle occupancy is estimated at between 1.7 and 1.8 persons per vehicle (dropping to between 1.6 and 1.7 in the fall). Automobiles account for approximately 94 percent of the total vehicular demand, with light and heavy trucks accounting for 6 percent.

6.1.7 A PM peak period demand forecasting model and a logit mode split model were developed for the study area based on the OD and SP survey data. These models were used to estimate

the ridership potential of the four service options in three time horizons (2006, 2016 and 2026). It is important to note that the ridership forecasts developed for this study focus on trips between the CRD and the CVRD. The proposed service options could also serve markets between the Langford area and Victoria which are not included in this assessment. However, while the additional ridership from Langford to Victoria may decrease the subsidies required to run the service, this increase in ridership will not affect traffic over the Malahat Highway, which is the focus of this study.

6.1.8 In 2006, the two express bus routes could expect to attract between 200 to 280 daily trips in total (depending on frequency), while the commuter rail service could capture between 160 and 220 per day. These ridership levels translate to less than 1 percent of the daily traffic on the Malahat Highway and make up approximately 4 percent of the PM peak period traffic.

6.1.9 In 2026, the express bus routes could generate between 260 and 360 daily trips and the commuter rail could generate 260 to 340 daily trips.

6.1.10 Based on a preliminary costing analysis, annual costs for the express bus options (capital and operating) are estimated at $0.77 to $1.54M in 2006 dollars. Fare revenues in 2006 could range between $0.31 and $0.44M. This translates to a cost per trip between $16 and $23 in 2006. Note that at the estimated demand levels, the frequencies that were examined would not appear to be justified. Therefore a lower frequency, lower cost service could be developed.

6.1.11 By 2026, express bus demand levels would appear to justify a 40 minute frequency and the cost per ride would be approximately $12.3 at this service level, resulting in subsidies of $6.1 per ride.

6.1.12 For the commuter rail options, annual total costs are estimated at $1.27 to $3.49M in 2006 dollars. Fare revenues in 2006 are estimated to range between $0.31 and $0.42M. This translates to a cost per trip of $33 to $66 in 2006. At the estimated demand level in 2006 it would appear that 1 train per day per direction could easily accommodate demand. By 2026, demand levels could still be accommodated with the 1 train configuration (possibly requiring the introduction of a third car). Cost per ride in 2026 for the 1 train option would be in the $20 range.

6.1.13 In summary, the key conclusions drawn from this study are:

- The express bus and commuter rail service options tested do not appear to divert significant demand from the Malahat Highway (approximately 1 percent of daily demand and 4 percent of PM peak period demand).
- Annual costs for both the bus and rail options are high – requiring annual subsidies close to $1 million for the commuter rail option and $0.5 million for the express bus option, assuming these services were introduced in 2006.
- Vanpools appear to be a popular alternative for commuters in the region, and are an attractive alternative to commuter rail or coach bus service due to relatively low operating costs (for users) and greater flexibility of service. The existing van pool services also operate without direct subsidy.

6.1.14 Additional planning and detailed analysis would be required if further consideration is given to either the bus or the rail options.

APPENDIX A – Roadside Origin-Destination Survey

MALAHAT ROADSIDE ORIGIN-DESTINATION SURVEY FORM - JULY, 2006

A	RESP #	OFFICE USE ONLY	DATE	
B	Time	(24hr)	INTERVIEWER	
C	# OCCUPANTS (incl driver)		Occ #	

D *PERMANENT HOME - What city do you live in?*

City

1. CVRD | 2. CRD | 3. NEITHER

ENTER ADDRESS FOR CVRD / CRD

Address

Postal Code

ENTER PROVINCE/STATE FOR NON-CVRD / CRD

Province/State

E *TRIP ORIGIN - Where are you coming from on this vehicle trip?*

CIRCLE APPROPRIATE NUMBER *Read choices if necessary*

1 - Home - *(Go to F)*	5 - Shopping/Personal Business
2 - Usual Workplace	6 - Social/Recreation/Vacation
3 - Work-Related	7 - Airport/Ferry
4 - College/University/School	8 - Other

FOR CVRD / CRD *Ask for Address OR Intersection OR Landmark*

Address/Intersection/Landmark

Fill in City

City

If Unknown within CRD / CVRD, use Maps

Zone # (101-208) *Zone #*

If NOT CRD / CVRD - Enter city & province/state or destination

City

Province

F *TRIP DESTINATION - Where are you going to now?*

CIRCLE APPROPRIATE NUMBER *Read choices if necessary*

1 - Home - *(Go to F)*	5 - Shopping/Personal Business
2 - Usual Workplace	6 - Social/Recreation/Vacation
3 - Work-Related	7 - Airport/Ferry
4 - College/University/School	8 - Other

FOR CVRD / CRD *Ask for Address OR Intersection OR Landmark*

Address

Fill in City

City

If Unknown within CRD / CVRD, use Maps

Zone # (101-208) *Zone #*

If NOT CRD / CVRD - Enter city & province/state or destination

City

Province

G	Will you / have you taken the Malahat Southbound today?	*1 - Yes 2 - No*
	Enter approx. time? (24hr)	*Time*
H	How many days in a typical week do you use the Malahat Highway?	#_____/ **1**. wk **2**. mth **3**. yr
I	√ If participating in SP	
	Name	*Name*
	Area Code + Phone #	*Phone*

MALAHAT ROADSIDE ORIGIN-DESTINATION SURVEY FORM - JULY, 2006

A RESP # OFFICE USE ONLY DATE

B Time (24hr) INTERVIEWER

C # OCCUPANTS (incl driver) Occ #

D PERMANENT HOME - What city do you live in?

City

1. CVRD | 2. CRD | 3. NEITHER

ENTER ADDRESS FOR CVRD / CRD

Address

Postal Code

ENTER PROVINCE/STATE FOR NON-CVRD / CRD

Province/State

E TRIP ORIGIN - Where are you coming from on this vehicle trip?

CIRCLE APPROPRIATE NUMBER Read choices if necessary

1 - Home - (Go to F) | 5 - Shopping/Personal Business

2 - Usual Workplace | 6 - Social/Recreation/Vacation

3 - Work-Related | 7 - Airport/Ferry

4 - College/University/School | 8 - Other

FOR CVRD / CRD Ask for Address OR Intersection OR Landmark

Address/Intersection/Landmark

Fill in City

City

If Unknown within CRD / CVRD, use Maps

Zone # (101-208) Zone #

If NOT CRD / CVRD - Enter city & province/state or destination

City

Province

F TRIP DESTINATION - Where are you going to now?

CIRCLE APPROPRIATE NUMBER Read choices if necessary

1 - Home - (Go to F) | 5 - Shopping/Personal Business

2 - Usual Workplace | 6 - Social/Recreation/Vacation

3 - Work-Related | 7 - Airport/Ferry

4 - College/University/School | 8 - Other

FOR CVRD / CRD Ask for Address OR Intersection OR Landmark

Address

Fill in City

City

If Unknown within CRD / CVRD, use Maps

Zone # (101-208) Zone #

If NOT CRD / CVRD - Enter city & province/state or destination

City

Province

G Will you / have you taken the Malahat Southbound today? 1 - Yes 2 - No

Enter approx. time? (24hr) Time

H How many days in a typical week do you use the Malahat Highway? #_____/ 1. wk 2. mth 3. yr

I √ If participating in SP

Name Name

Area Code + Phone # Phone

APPENDIX B – Stated Preference Survey

BRITISH COLUMBIA

July 31, 2006

Dear Survey Participant,

The BC Ministry of Transportation (MoT) and BC Transit are conducting this survey to better understand the travel patterns, behaviour, and preferences of Vancouver Island residents. Your participation in the survey will provide valuable information to the MoT and BC Transit, and assist in future decision making in regards to the Malahat corridor.

Please be assured that any information you provide will be used solely for the purposes of this survey. All personal information collected will remain confidential, and responses will not be linked to your name or telephone number.

The attached Stated Preference Survey consists of 10 brief questions. Each question has one randomly selected scenario assigned to it. Please review each question carefully and read the descriptions for each mode of travel: car, coach bus, and commuter rail. Variables such as the travel time, journey cost, and access time are different in each scenario. After reviewing the three modes, please rank each mode in order of preference, assuming you are making a trip between South Cowichan (i.e. Mill Bay or Shawnigan Lake) to downtown Victoria.

Your responses to the survey will be collected by the market research firm, Mustel Group, who will contact you by telephone in the next few days. To aid Mustel Group in recording your preferences quickly and efficiently, upon receipt of this package, please enter your responses directly onto the question sheet.

Thank you in advance for participating in this survey. Your assistance is greatly appreciated!

Yours sincerely,

Cindi Trowbridge

Cindi Trowbridge
Manager, Strategic Stakeholder Relations

cc: John Bodnarchuk, Project Director, Malahat Corridor Study, MoT
Helen Cook, Planning Manager, BC Transit

Ministry of Transportation

Email: cindi.trowbridge@gov.bc.ca

Mailing Address
PO Box 9850
Stn Prov Govt
Victoria BC V8W 9T5

Site Address
5C – 940 Blanshard St.
Victoria, BC V8W 3E6
Tel: (250) 480-9051
Fax: (250) 953-4974

Web Address:
www.gov.bc.ca/tran

A future prospect for the Malahat Corridor may include alternative transit options. Imagine that you are travelling between South Cowichan and downtown Victoria and there are three modes of transportation available to you: car, coach bus service, and commuter rail. Assuming that you are travelling alone, how would you travel, given the following options? Assume that there are Park and Ride lots available at both the bus and train stations and that the commuter rail provides better reliability than car or bus in terms of travel time, as the train is not impacted by traffic congestion. Both rail and coach bus stations will be accessible by the local transit service in the CVRD and CRD communities. Note that all fares and journey times shown below are one-way.
Please answer all questions and select both a first and second choice for each given scenario.



Please mark choice with an "x"

1	Scenario Letter A						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	35 mins	Travel Time on Train:	30 mins	**Car**		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	5 mins	Access Time (to and from station):	5 mins	**Bus**		
		One Way Bus Fare:	$3.00	One Way Rail Fare:	$4.00	**Train**		
		Buses Arrive Every:	15 mins	Trains Arrive Every:	15 mins			

2	Scenario Letter D						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	55 mins	Travel Time on Train:	30 mins	**Car**		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	15 mins	Access Time (to and from station):	15 mins	**Bus**		
		One Way Bus Fare:	$3.00	One Way Rail Fare:	$8.00	**Train**		
		Buses Arrive Every:	30 mins	Trains Arrive Every:	30 mins			

3	Scenario Letter L						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	55 mins	Travel Time on Train:	60 mins	**Car**		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	5 mins	Access Time (to and from station):	5 mins	**Bus**		
		One Way Bus Fare:	$3.00	One Way Rail Fare:	$8.00	**Train**		
		Buses Arrive Every:	15 mins	Trains Arrive Every:	30 mins			



Please mark choice with an "x"

4	Scenario Letter G						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	35 mins	Travel Time on Train:	45 mins	**Car**		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	15 mins	Access Time (to and from station):	5 mins	**Bus**		
		One Way Bus Fare:	$3.00	One Way Rail Fare:	$8.00	**Train**		
		Buses Arrive Every:	15 mins	Trains Arrive Every:	60 mins			

5	Scenario Letter K						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	55 mins	Travel Time on Train:	60 mins	**Car**		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	15 mins	Access Time (to and from station):	5 mins	**Bus**		
		One Way Bus Fare:	$6.00	One Way Rail Fare:	$4.00	**Train**		
		Buses Arrive Every:	30 mins	Trains Arrive Every:	60 mins			

6	Scenario Letter C						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	55 mins	Travel Time on Train:	30 mins	**Car**		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	5 mins	Access Time (to and from station):	15 mins	**Bus**		
		One Way Bus Fare:	$6.00	One Way Rail Fare:	$11.00	**Train**		
		Buses Arrive Every:	15 mins	Trains Arrive Every:	60 mins			

7	Scenario Letter N						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	55 mins	Travel Time on Train:	45 mins	**Car**		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	15 mins	Access Time (to and from station):	5 mins	**Bus**		
		One Way Bus Fare:	$3.00	One Way Rail Fare:	$11.00	**Train**		
		Buses Arrive Every:	15 mins	Trains Arrive Every:	30 mins			

Please mark choice with an "x"

8	Scenario Letter B						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	35 mins	Travel Time on Train:	30 mins	Car		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	15 mins	Access Time (to and from station):	5 mins	Bus		
		One Way Bus Fare:	$6.00	One Way Rail Fare:	$8.00	Train		
		Buses Arrive Every:	30 mins	Trains Arrive Every:	30 mins			

9	Scenario Letter I						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	35 mins	Travel Time on Train:	60 mins	Car		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	15 mins	Access Time (to and from station):	15 mins	Bus		
		One Way Bus Fare:	$3.00	One Way Rail Fare:	$11.00	Train		
		Buses Arrive Every:	30 mins	Trains Arrive Every:	15 mins			

10	Scenario Letter O						Preference	
Car		**Bus**		**Train**			1st	2nd
Total Car Journey Time:	45 mins	Travel Time on Bus:	35 mins	Travel Time on Train:	45 mins	Car		
One Way Car Cost (fuel, + half the parking cost):	$12.00	Access Time (to and from bus stop):	5 mins	Access Time (to and from station):	15 mins	Bus		
		One Way Bus Fare:	$3.00	One Way Rail Fare:	$8.00	Train		
		Buses Arrive Every:	30 mins	Trains Arrive Every:	60 mins			

THANK YOU!

A member of the Mustel Group survey team will contact you soon to collect your responses.

Your participation is an important part of helping to improve BC's future!

BRITISH COLUMBIA
Ministry of Transportation

BC Transit

MUSTEL GROUP
MARKET RESEARCH

Vehicle Classification Sheet

TYPE

1-3 PASSENGER VEHICLES

- Cars
- Vans
- SUVs

4 LIGHT TRUCKS

- Light Trucks - single unit, 2 axles or less
  - Panel vans
  - Cube vans

5 HEAVY TRUCKS

- Single unit – three or more axles
- Truck/Trailer Combo (rare)
- Tractor only
- Tractor/Trailer Combo
- Tractor/Container Combo

6 BUSES

- Commercial Coach Lines
- School
- Public Transit

Appendix D – Commuter Rail Cost Estimates ($2006)

Item	Units	Unit Costs				
Crew[1]	$/year/person	95,000	95,000	95,000	95,000	95,000
Vehicle Maintenance						
	$/km	1.75	1.75	1.75	1.75	1.75
	$/year[2]	75,000	75,000	75,000	75,000	75,000
Fuel	$/km per car	1.5	1.5	1.5	1.5	1.5
Track Maintenance	$/km	10,000	10,000	10,000	10,000	10,000
Vehicles	$/car	1,500,000	1,500,000	1,500,000	1,500,000	1,500,000
		Operation				
Service	days/year	240	240	240	240	240
Passengers per car	Maximum	90	90	90	90	90
Headway	minutes	NA	NA	40	40	20
Trips		1	1	2	2	3
Cars per train		2	3	2	3	2
Total Cars		2	3	4	6	6
Total Crew		3	4	6	8	8
Total Capacity	One way	180	270	360	540	540
Round trip distance	km	186	186	186	186	186
		Capital Costs				
Capital Costs						
Infrastructure	$1,000	2,000	2,000	3,000	3,000	3,000
Service life	years	20	20	20	20	20
Vehicles	$1,000	3,000	4,500	6,000	9,000	9,000
Service life	years	10	10	10	10	10
Interest rate	%/100	0.05	0.05	0.05	0.05	0.05
		Annual Costs				
Annual Costs	$1,000					
Infrastructure		160	160	241	241	241
Vehicles		389	583	777	1,166	1,166
Capital Sub total		549	743	1,018	1,406	1,406
Crew		285	380	570	760	760
Vehicle maintenance		306	459	612	919	919
Fuel		134	201	268	402	402
Operating sub-total		725	1,040	1,450	2,080	2,080
Total Annual	**$1,000**	**1,274**	**1,783**	**2,468**	**3,487**	**3,487**
		Cost per Passenger				
Daily one-way trips						
200	$/trip	27	37	51	73	73
300		18	25	34	48	48
400		NA[3]	19	26	36	36
500		NA[3]	15	21	29	29
600		NA[3]	NA[3]	17	24	24

1. Includes Overhead burden
2. Approximately 5% of initial cost
3. Exceeds capacity