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British Columbia
The Best Place on Earth
Ministry of Transportation and Infrastructure

Highway 1 Functional Planning
Project Background & Problem Definition

Delcan
TRANSPORTATION • INFORMATION TECHNOLOGY • WATER

JULY 2014
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1.0 INTRODUCTION AND OBJECTIVES

The Ministry of Transportation and Infrastructure is undertaking a planning review to determine the long term needs for the 30 km segment of the Highway 1 corridor between 216 Street and Highway 11. This project background and problem definition report iterates the project goals and objectives, summarizes previous study findings and recommendations, and identifies existing and future operational issues, along with any geometric deficiencies. Site constraints and challenges have been identified to guide the generation of options to mitigate the various operational issues and geometric deficiencies.

Subsequent reports will describe the options generated to address the previously defined deficiencies and the process employed to select a preferred option for further functional design.

As part of a separate supporting document, a business case identifying project benefits and costs is to be prepared. Geotechnical, archaeological, and environmental overviews for the project area will be prepared by Golder and Associates Ltd.

2.0 BACKGROUND

This section provides a summary of background conditions along the study corridor, including general configuration and geometry, recent changes, interchange descriptions, the outcomes of previous planning reports and inter-regional planning context.

2.1 Corridor Description

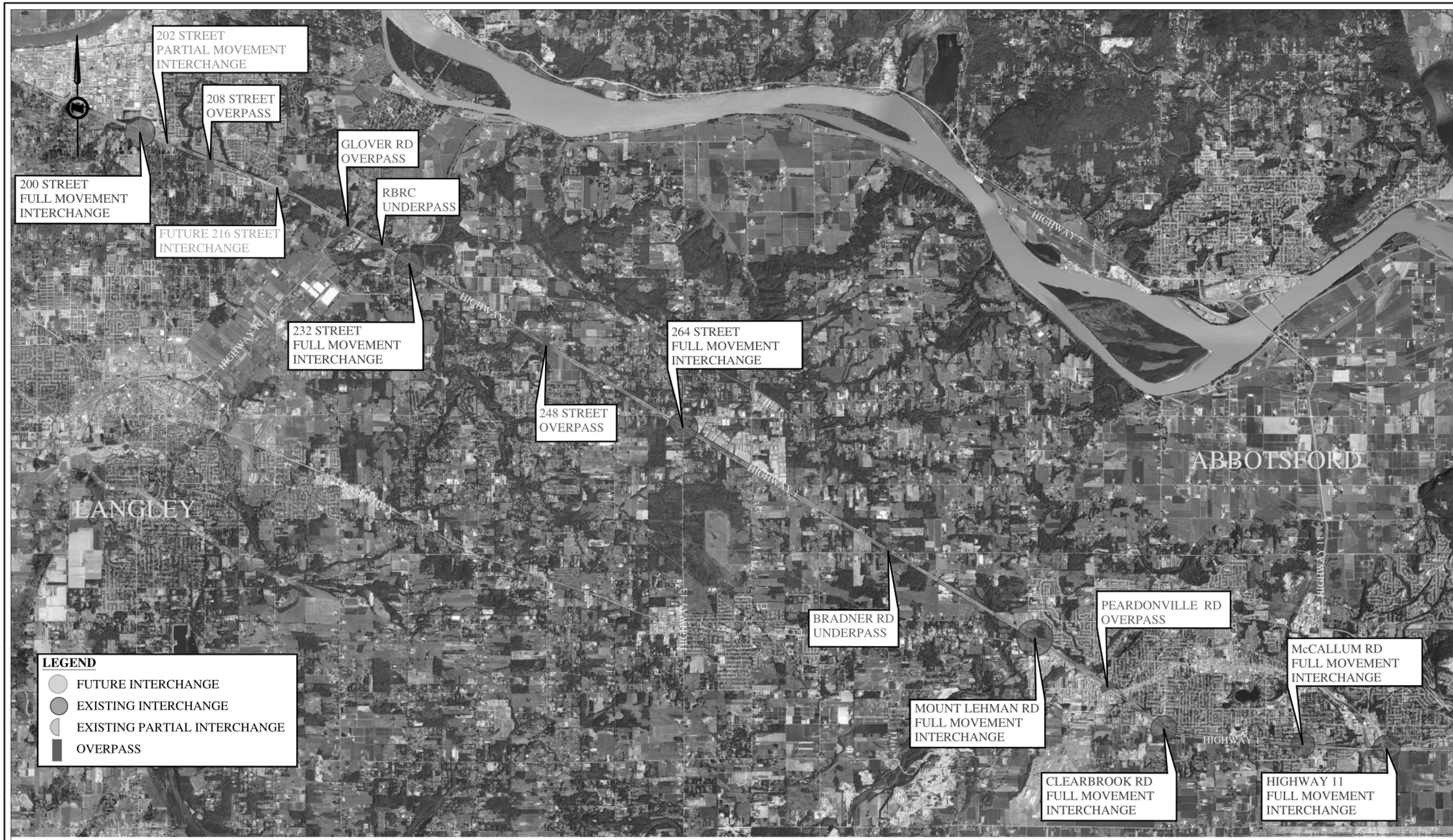
As part of the Gateway Program and subsequent Port Mann / Highway 1 project, the Highway 1 corridor between the Port Mann Bridge and 202 Street has been widened to provide a minimum of one additional lane in each direction. Parallel functional planning studies are underway to select a preferred configuration for the remaining 192 Street and 216 Street interchanges, as well as widening of the corridor between 202 Street and 216 Street. These projects are to be completed as per Gateway Program commitments by the year 2021.

East of 202 Street, no corridor-wide modifications have been made along Highway 1 as part of the Port Mann / Highway 1 project, however, over the past three years local improvements have been completed as follows:

- Eastbound truck climbing lane between 232 Street and 264 Street (recently completed – includes the replacement of the 248 Street overpass);
- Westbound truck climbing lane west of the Mount Lehman interchange;
- Expanded and reconfigured Clearbrook Road interchange;
- Expanded and reconfigured McCallum Road interchange (with roundabouts at the ramp terminals);
- Westbound truck climbing lane west of the Highway 11 interchange (through to the McCallum Road interchange.

While the above modifications result in segments with additional lane capacity, the majority of the corridor remains as a four lane divided rural freeway with a posted speed of 100 km/h.

The location of the major junctions and cross streets along the subject 216 Street to Highway 11 corridor are shown with the area context in ***Figure 1***.



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TRANS CANADA HIGHWAY No. 1

CORRIDOR CONTEXT

FIGURE 1

2.1.1 HIGHWAY 1 INTERCHANGES

The 216 Street to Highway 11 corridor features six vehicle entry / exit points as described at the following locations:

232 Street (Highway 10)

The 232 Street interchange provides access to Fort Langley to the north and provincial Highway 10 to the south. This interchange also provides access between Highway 1 and the main campus of Trinity Western University in the Township of Langley. The current road cross section on the overpass is two lanes undivided.

The configuration of the 232 Street interchange is a cloverleaf design (loop ramps in all four quadrants), which requires westbound to southbound and northbound to westbound traffic movements to weave across each other when entering/exiting the highway mainline. A similar weave operation is required for the lower volume eastbound to northbound and southbound to eastbound movements.

264 Street (Highway 13)

To the north, the 264 Street interchange serves rural properties as well as an industrial park (Gloucester Estates) in the northeast quadrant. South of Highway 1, provincial Highway 13 connects to Aldergrove and the United States border crossing. The current road cross section on the overpass is two lanes undivided.

The configuration of the 264 Street interchange is a cloverleaf design, which requires westbound exiting and northbound to westbound entering traffic movements to weave across each other when entering/exiting the highway mainline. A similar weave operation is required for the eastbound exiting and southbound to eastbound entering movements. Note that the north and south interchange ramp terminal intersections are signalized, which facilitates left turn movements across 264 Street as well as access to 56 Avenue east and west.

Mount Lehman Road / Fraser Highway

Mount Lehman Road is a north-south arterial in the City of Abbotsford connecting the Abbotsford International Airport to the south, as well as an auto mall and a major shopping centre to the north. Fraser Highway runs east-west through the interchange and provides an alternative Langley – Abbotsford connection to Highway 1. The current road cross section on the Mount Lehman section of the overpass is three lanes undivided, while the Fraser Highway crossing Highway 1 is six lanes overall, split into two directional overpasses of three lanes each.

At the interchange, the Mount Lehman Road north ramp terminal intersection includes a westbound on-ramp via a multi-lane roundabout. The east leg of this ramp terminal serves the High Street Shopping Centre. The south ramp terminal intersection is a multi-lane signalized junction with Fraser Highway. Directional ramps provide access between the highway mainline and Fraser Highway east / west in all directions except for the westbound Fraser Highway to eastbound Highway 1.

Clearbrook Road

Clearbook Road interchange is a north-south arterial in the City of Abbotsford network that provides an important gateway into the City. The current road cross section on the overpass is six lanes divided.

The north ramp terminal intersection is a multi-lane signalized junction providing access to/from Marshall Road east, a major east-west street. The south ramp terminal intersection is a multi-lane roundabout providing access to/from Marshall Road west.

McCallum Road

McCallum Road is a north-south arterial in the City of Abbotsford that provides an alternative connection to downtown Abbotsford, the Abbotsford Entertainment and Sports Centre, as well as the University of the Fraser Valley. The current road cross section on the overpass is four lanes divided.

As part of a reconstruction in 2012, the interchange was reconfigured to provide multi-lane roundabouts at the north and south ramp terminals at McCallum Road, as well as an enhanced direct connector to King Road.

Highway 11

Highway 11 is a provincial north-south highway linking Mission and Highway 7 on the north side of the Fraser River with Abbotsford and the United States border. Adjacent land use along Highway 11 is commercial / industrial. The underpass of Highway 1 consists of a four lane divided cross section.

The configuration of the Highway 11 interchange is a folded cloverleaf (Parclo A-B) with multilane signalized intersections at the north and south ramp terminals. The Loop ramps are located in the northeast and southeast quadrants.

2.1.2 CROSSINGS OF HIGHWAY 1

In addition to the interchanges, there are overpass / underpass structures at the following locations, referenced to whether the Highway 1 mainline passes over or under the cross street:

Glover Road Underpass

Glover Road is a two lane rural road connecting Highway 10 and Trinity Western University with Fort Langley. The vertical clearance of the Glover Road structure over the highway mainline is only 4.46 m which is less than the current standards of 5.0 m and necessitates the use of an over height vehicle detection system.

Roberts Bank Rail Corridor Underpass

The Roberts Bank Rail Corridor is a critical rail line running from the Roberts Bank Terminals in South Delta to the rest of Canada. The “box” tunnel portal for the highway lanes has a clearance of only 4.40 m which is less than the current standards of 5.0 m.

248 Street Underpass

248 Street is a two lane rural road connecting the north and south sections of east Langley. As part of a recent reconstruction project, the flyover structure was replaced with a new higher clearance overpass of the highway.

Bradner Road Overpass

Bradner Road is a two lane rural road connecting the north and south parts of rural Abbotsford. At the Bradner Road overpass, the east and west legs of Downes Road intersect.

Peardonville Road Underpass

Peardonville Road is a two-lane east-west arterial linking downtown Abbotsford with Mount Lehman Road. The bridge over the highway lanes has a minimum clearance of 4.92 m which is slightly less than the current standards of 5.0 m.

Riverside Road / Railway Crossing Overpass

Riverside Road is a north-south collector road connecting downtown Abbotsford and the industrial areas along the railway. Two railway tracks (CPR and SRY) parallel Riverside Road and connect Mission and areas on the north side of the Fraser River with the United States border.

2.2 Previous MoT Studies and Concepts

The most recent corridor strategy was developed by Delcan in 2002 and covered the segment of the highway from the Port Mann Bridge to Hope. This study was a foundational document in the development of the Gateway Program, but no further study has been conducted on the corridor east of 216 Street.

Following a review and enhancement of option packages drawing on a range of road and transit network improvement themes, key elements in the 2002 strategy included a six lane Highway 1 between the 200 Street interchange and Whatcom Road

As part of the design of improvements to the Clearbrook and McCallum interchanges, as well as input to the design of the climbing lane from 232 Street to 264 Street, provisions were made for the future addition of a lane in each direction order to provide a six lane total cross section.

Fraser Valley Strategic Review of Transit

Urban Systems prepared a Strategic Review of Transit Services in the Fraser Valley, developing a 25-30 year Vision and a 20 year Strategy to guide service, facility and policy plans to encourage transit use.

The Vision was based on several important assumptions relating to demographics, land use patterns, and travel markets:

- Over 98% of the forecast growth is expected in the three major FVRD centres (Abbotsford, Chilliwack, Mission);
- The population to employment ratio is expected to reduce to a relatively balanced level of 1.9 to 1;
- Driving accounts for 90% of daily trips while transit has only a 1% share, which is lower than similar sized communities;

- 80% of all trips are local in that they start and end within the same FVRD municipality;
- 10-20% of daily trips are regional (Abbotsford to Mission, Chilliwack to Abbotsford) whereas 5-15% of daily trips are inter-regional (Abbotsford to Langley, Surrey to Chilliwack).

The resultant local vision would see Frequent Transit routes added to the street network in Chilliwack and Abbotsford, as well as the potential for a Rapid Bus Transit service on Abbotsford's South Fraser Way between Clearbrook Road and the University of the Fraser Valley.

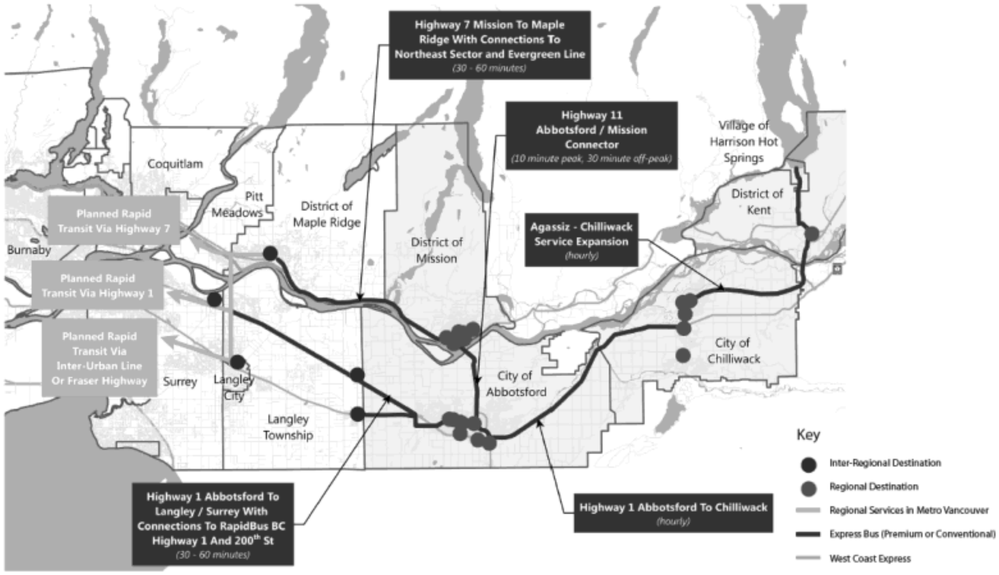
The inter-regional vision includes Express Bus services between Abbotsford and Langley / Surrey via Highway 1 (10-15 minute peak headways) and Fraser Highway as well as between Abbotsford and Chilliwack via Highway 1 (30 minute peak headways).

While a commuter rail option along the former inter-urban line was reviewed, it was concluded that the cost per rider would be significantly higher than an Express Bus type service operating in the Highway 1 median and was not a recommended part of the Vision.

As part of the 20 year implementation strategy, it was recommended to provide Frequent Transit service along Abbotsford's South Fraser Way between Clearbrook Road and the University of the Fraser Valley, as well as initiate Highway 1 Express Bus services along two routes. One route would travel between Abbotsford and Langley / Surrey (30-60 minute headways); the other would travel between Abbotsford and Chilliwack (60 minute headways).

Figure 2 shows the 20 year strategy for regional and inter-regional services.

Figure 2: Fraser Valley Transit Strategy – Regional and Inter-regional Services



2.3 Regional Planning Context

The subject Highway 1 corridor diagonally bisects communities in both the Metro Vancouver and Fraser Valley Regional Districts (FVRD). The boundary line is at the Township of Langley / City of Abbotsford border, approximately along 276 Street. A description of planning assumptions for each regional district is provided in the following sub sections.

2.3.1 METRO VANCOUVER

In Metro Vancouver, population and employment forecasts have been developed for a 2045 horizon year and are reflected within the regional travel demand model (TransLink). ***Table 1*** summarizes the current population and employment assumptions, including those for key corridor municipalities.

Table 1: Metro Vancouver Population and Employment Assumptions

Region / Municipality	Existing (2011 Base Model)		Forecast (2045)	
	Population	Employment	Population	Employment
Township of Langley	107,814	49,808	216,776	87,660
City of Langley	26,376	19,409	38,812	29,200
City of Surrey	486,230	112,120	798,746	292,773
Metro Vancouver Total	2,391,960	1,228,330	3,534,060	1,738,430

As shown, there is a significant amount of growth forecast within Metro Vancouver (approximately 1.5% per annum on average) and within the communities directly served by the subject highway corridor.

Township of Langley Master Transportation Plan

The Township of Langley completed a Master Transportation Plan in 2009. The Road Network Plan generally retains the existing classification of area roads that cross Highway 1. A new full movement interchange is anticipated at 216 Street, and a new overpass of Highway 1 at 272 Street is planned. An updated Official Community Plan for the Township is in progress.

TransLink South of the Fraser Area Transit Plan

In 2007, TransLink completed its South of the Fraser Area Transit Plan. The vision is to complete and enrich the Rapid Transit and Frequent Transit network in the communities of Delta, Surrey, and the Langleys. By the year 2031, the target mode share for all trips is 11.5% by transit. This will be accomplished by phasing in major transit corridors along Scott Road, King George Highway, 104 Avenue and Fraser Highway. RapidBus service will be provided and enhanced along Highway 1 between Langley and Lougheed Town Centre, while bus or rail rapid transit will be provided between Surrey City Centre and the South Surrey, Guildford, and Langley Town Centre areas. Frequent bus service between the 200 Street corridor (now the 202 Street Park N' Ride) and Abbotsford was also contemplated as part of the 2031 vision.

2.3.2 FRASER VALLEY REGIONAL DISTRICT

The FVRD also prepares population and employment forecasts, the most recent of which were developed for a 2036 horizon year and may be obtained from the BC Stats website. Employment forecasts were obtained from the 2004 FVRD Regional Growth Strategy. ***Table 2*** summarizes the current planning assumptions, including those for key corridor municipalities.

Table 2: Fraser Valley Population and Employment Assumptions

Region / Municipality	Existing		Forecast	
	Population (2011 Base)	Employment (2010 Base)	Population (2036)	Employment (2021, High)
City of Abbotsford	139,529	n/a	205,912	84,000
City of Chilliwack	87,632	n/a	122,197	54,000
Fraser Valley Total	287,463	133,460	408,480	188,300

As shown, there is a significant amount of growth forecast within the FVRD (approximately 1.5% per annum population growth on average) and within communities directly served by the subject highway corridor.

Inter-Regional Travel Information

A Fraser Valley travel patterns report was prepared in 2011 by Halcrow and the Fraser Valley Regional District. The report examined travel patterns revealed through the 2008 Trip Diary Survey. Of particular interest to the subject study are the trips between the FVRD and Metro Vancouver municipalities as these would have a high likelihood of utilizing the Highway 1 corridor. ***Table 3*** summarizes these key findings.

Table 3: Inter-Regional Daily Trip Information

Origin/Destination	To Metro Vancouver	To Abbotsford	To Chilliwack	To Other
From Abbotsford	12%	81%	4%	4%
From Chilliwack	5%	7%	87%	1%

Of the trips between the Fraser Valley and Metro Vancouver, over half had an origin or destination in Surrey or the Langleys.

Abbotsford Master Transportation Plan

In 2008, Delcan completed a Transportation Master Plan for the City of Abbotsford. The plan was based on the assumption of significant continued population and employment growth through to 2031.

The recommended plan incorporated a number of road network modifications to Highway 1 including the following:

- Six-lane widening between Mount Lehman Road and Whatcom Road;
- Replacement of the Peardonville overpass (widening to four lanes) and provision of new Townline Road overpass;
- Clearbrook Road interchange upgrade (recently completed);
- McCallum Road interchange upgrade (recently completed);
- New interchange at Atkinson Road east of Whatcom Road.

Supplemental plans for the Highway 11 corridor included a new interchange and east-west connector from Sumas Way to Maclure Road as well as four laning from McConnell Road to the United States border.

An important concern brought forward during the development of the plan was the lack of a suitable truck route connection between Highway 11 and Highway 1 through the northwest rural sector. The additional time and distance required to travel via the provincial highways route was a significant obstacle to overcome to remove truck traffic from the northwest sector.

3.0 AREA CONSTRAINTS AND CHALLENGES

In reviewing the background planning documentation as well as existing land use and natural features, a number of potential constraints and challenges to consider in developing improvements were found. These constraints can be classified as sensitive area features and land use constraints, but do not at this time include detailed geotechnical or environmental constraints (which are currently under review by Golder Associates). The constraints, identified below, will be considered in the development of any concepts that involve physical modifications to the highway footprint.

Land Use Constraints

- Agricultural Land Reserve;
- Trinity Western University Campus;
- Gloucester Estates business park;
- Hydro towers;
- Ross Road farming operations;
- Automall / High Street Shopping Centre;
- Grant Park;
- Abbotsford Hospital;
- U District development.

Environmental Constraints

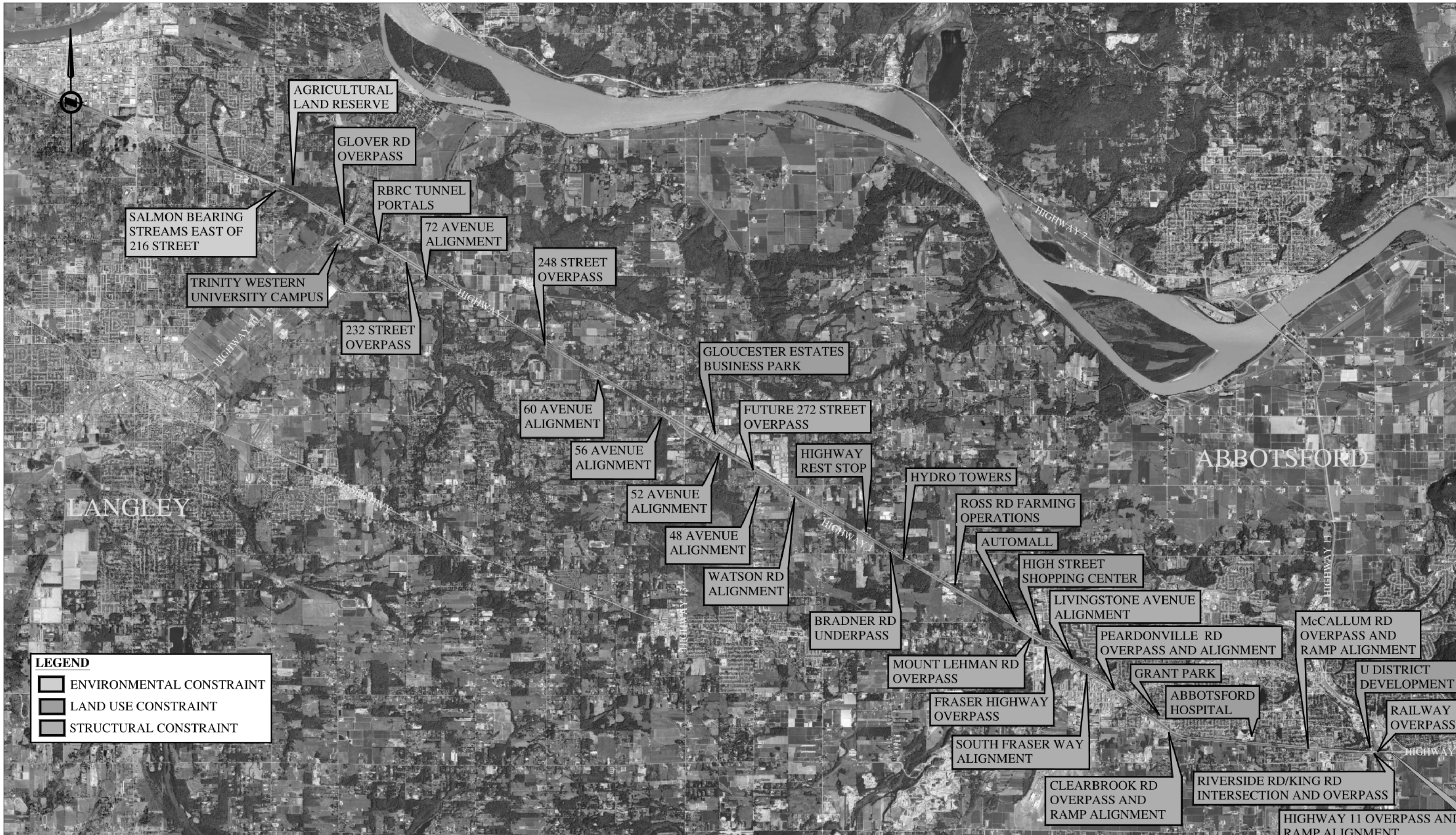
- Salmon bearing streams east of 216 Street.

Roadway / Structural Constraints

- Glover Road overpass;
- RBRC tunnel portals;
- 232 Street overpass;
- 72 Avenue alignment;
- 248 Street overpass;
- 60 Avenue alignment;

- 56 Avenue alignment;
- 52 Avenue alignment;
- Future 272 Street overpass;
- 48 Avenue alignment;
- Watson Road alignment;
- Rest stop north side;
- Bradner Road underpass;
- Mount Lehman overpass;
- Fraser Highway overpass;
- Livingstone Avenue alignment;
- South Fraser Way alignment;
- Peardonville Road overpass and alignment;
- Clearbrook Road overpass and ramp alignment;
- McCallum Road overpass and alignment;
- Riverside Road / King Road intersection and overpass;
- Railway overpass;
- Highway 11 overpass and ramp alignment.

A high level map of the area constraints is shown in ***Figure 3.***



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AREA CONSTRAINTS MAP

FIGURE 3

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4.0 TRAVEL DEMANDS

Existing and future travel demands were obtained from two sources. For existing conditions, mainline highway volumes were obtained from the nearest Ministry of Transportation and Infrastructure permanent count station, while municipal street traffic counts were obtained from the relevant municipality. Forecast conditions were obtained from TransLink's Regional Traffic Model (RTM) which includes growth and network assumptions for Abbotsford.

4.1 Existing Traffic Volumes and Operations

Current traffic volumes for the corridor were obtained from the permanent count stations located at the Glover Road overpass (P-16-7EW) and the Bradner Road underpass (P-17-4EW-N).

Figure 4 displays the monthly trends in Average Daily Traffic (MADT), Average Weekday Traffic (MAWDT) and Average Weekend Traffic (MAWET) over the course of 2012 at the Bradner Road count station. August represents the peak month of the year for average daily traffic.

Figure 4: 2012 Daily Traffic By Month

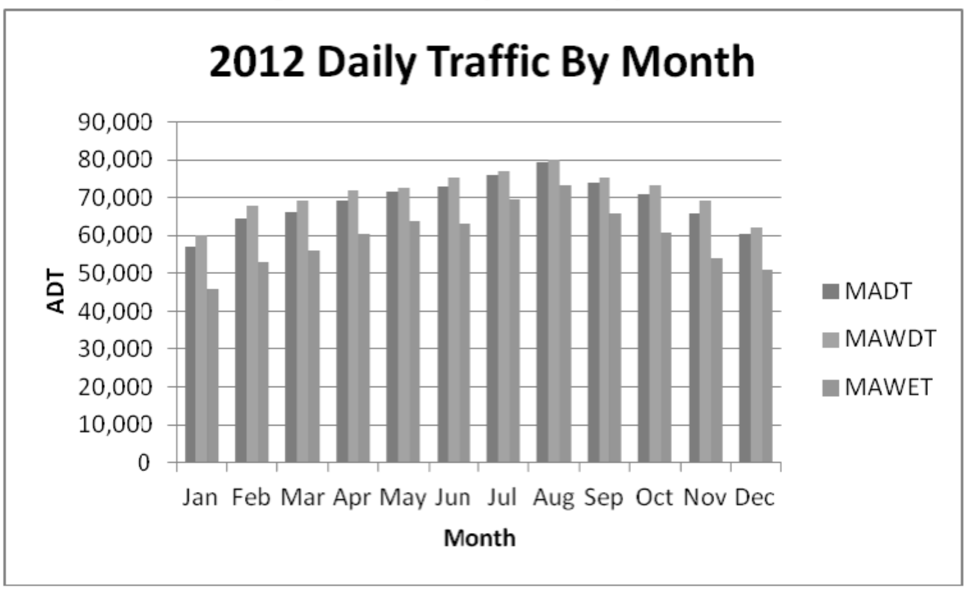
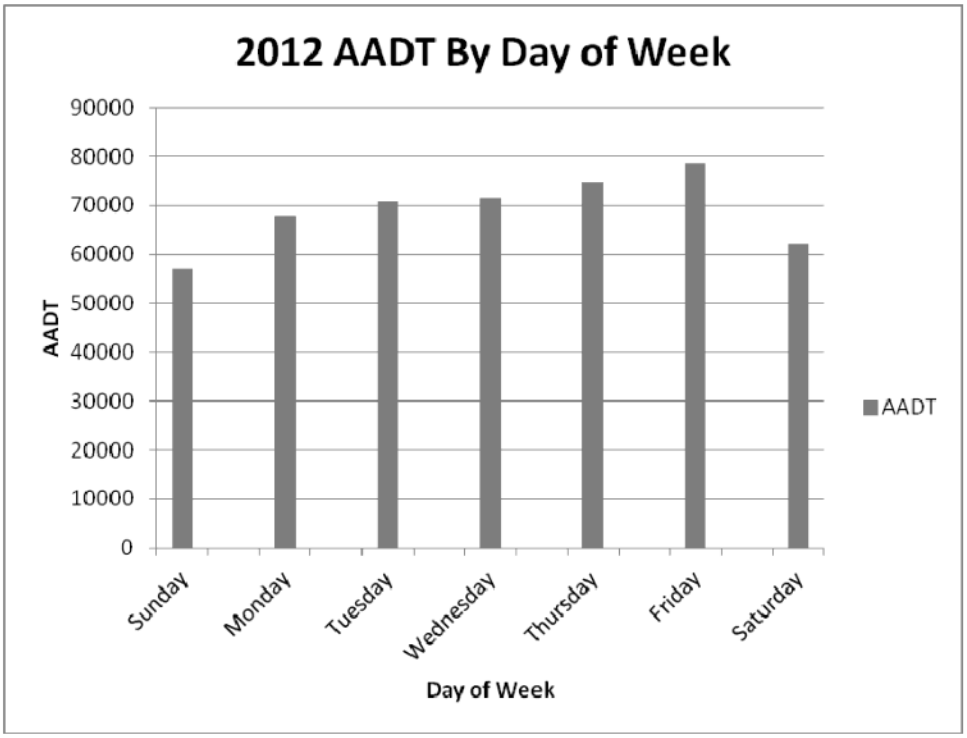


Figure 5 shows the relationship between the day of the week and the average daily traffic volume at the Bradner Road count station. Fridays were the highest volume days and may be reflective of the start of weekend recreational travel.

Figure 5: Traffic Volume Day of the Week Trends



Peak traffic statistics are presented in ***Table 4*** noting that the Bradner Road segment carried higher volume than the more westerly Glover Road segment over the past several years of available data.

Table 4: Representative Traffic Volume Data – Highway 1

Location	Two-Way AADT (Average Annual Daily Traffic)	% Heavy Vehicles > 12.5 m long	AM Peak Hour	PM Peak Hour
Glover Road overpass[1]	66,800	7.2%	2,595 WB 2,355 EB 4,950 Total	2,730 WB 3,170 EB 5,900 Total
Bradner Road underpass[2]	68,990	7.7%	2,785 WB 2,370 EB 5,155 Total	2,990 WB 3,270 EB 6,260 Total

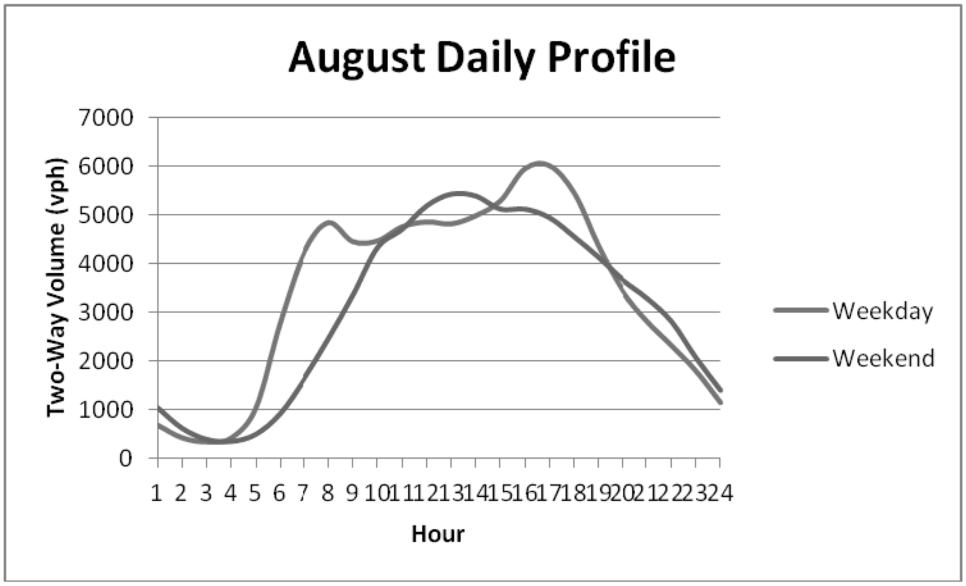
WB=Westbound, EB=Eastbound

1. May 2012 peak hour data

2. August 2012 peak hour data

Figure 6 shows an average weekday and weekend traffic profile over the month of August at Bradner Road. It is noted that these profiles reflect the influence of long weekend recreational travel.

Figure 6: August Average Daily Traffic Profile at Bradner Road



Two trends are notable from ***Figure 6***. Firstly, the typical weekday traffic volume continues to grow past the AM peak commuter "rush" hour rather than tapering off, resulting in relatively high mid-day traffic volumes. Secondly, the peak weekend traffic volume exceeds the weekday morning peak volume and the weekday mid-day volume, suggesting a substantial demand for corridor travel on Saturdays and Sundays.

With regards to historic growth, the past five years of available data indicates a relatively flat trend, averaging 0.6% per annum at Glover Road and 0.8% per annum at Bradner Road.

4.1.1 EXISTING MAINLINE OPERATIONAL PERFORMANCE

For planning / design purposes, the 30th Highest Hour for the year 2012 was identified from the permanent count stations at Glover Road and Bradner Road. An operational analysis was conducted using these volumes and applying the Highway Capacity Software for freeway segments, taking into consideration heavy vehicle percentages and the vertical profile of the highway. As shown in ***Table 5***, it was found that the mainline operates at Level of Service D for most sections. LoS D is on the lower end of acceptable performance for a major highway facility such as Trans Canada Highway 1 and is characterized by lower than free flow speeds, relatively high vehicle density, limited freedom to maneuver and queuing resulting from minor incidents / disruptions in the traffic stream.

Table 5: Existing Mainline Operational Performance

Segment	# of Lanes	Max Grade and Length	30th Highest Volume (vph)	Average Density (pc/km/h)	Average Speed (km/h)	Level of Service
216 Street to 232 Street	2 WB 2 EB	3.5% for 1,150 m WB	2,815 WB 3,055 EB 5,870 Total	16.6 WB 17.2 EB	102.4 WB 102.1 EB	D WB D EB
232 Street to 264 Street**	2 WB 3 EB*	3.0% for 800 m EB	3,415 WB 3,565 EB 6,980 Total	19.9 WB 13.0 EB	98.6 WB 105.2 EB	D WB C EB
264 Street to Mount Lehman	3 WB 2 EB	2.3% for 1,900 m WB	2,835 WB 3,520 EB 6,355 Total	11.1 WB 20.9 EB	105.2 WB 96.9 EB	C WB D EB
Mount Lehman to Clearbrook**	2 WB 2 EB		2,985 WB 2,940 EB 5,925 Total	16.8 WB 16.5 EB	102.3 WB 102.5 EB	D WB D EB
Clearbrook to McCallum**	2 WB 2 EB		3,080 WB 2,970 EB 6,050 Total	17.4 WB 16.7 EB	101.9 WB 102.4 EB	D WB D EB
McCallum to Highway 11**	3 WB 2 EB	2% for 1,950 m WB	2,840 WB 2,730 EB 5,570 Total	10.9 WB 15.3 EB	105.2 WB 102.7 EB	B WB C EB

*Third EB lane recently constructed

** Volumes estimated from Emme travel demand model

4.1.2 EXISTING INTERCHANGE RAMP VOLUMES

Exit and entrance ramp volumes were reviewed to determine major sources and sinks along the corridor. Volumes were derived from a review of previous counts and outputs from the Emme regional travel demand model. ***Table 6*** shows the current estimated ramp volumes with the subject corridor.

Table 6: Existing Ramp Volume

Location	Link	Estimated Volume	
		AM Peak	PM Peak
232 Street	EB off	300	380
	EB on	765	890
	WB off	1,000	940
	WB on	315	340
264 Street	EB off	585	575
	EB on	500	925
	WB off	450	420
	WB on	720	670
Mount Lehman / Fraser Highway	EB off	855	1,060
	WB on	585	580
	EB on	430	480
	WB off	780	730
Clearbrook Road	EB off	415	665
	EB on	435	695
	WB off	545	465
	WB on	365	370
McCallum Road	EB off	595	555
	EB on	140	315
	WB off	510	280
	WB on	560	520
Highway 11	EB off	495	635
	EB on	550	920
	WB off	875	650
	WB on	775	630

As shown, the most significant entry / exit points are between 232 Street and 264 Street and between 264 Street and Mount Lehman / Fraser Highway. Volumes are below the practical capacity of 1,200 vph per lane for directional ramps, but the cloverleaf configuration at the 232 Street and 264 Street interchanges constrains capacity due to the need for weaving between directional on / off ramp movements.

4.2 Forecast Traffic Volumes and Operations

Travel demand forecasts reflective of the potential usage of the Highway 1 corridor were estimated using the latest version of the TransLink 2045 Regional Traffic Model (RTM) which utilizes the Emme3 modelling platform. The model incorporates a number of high level planning assumptions including the population and employment forecasts for each region.

In addition to the population and employment forecast, the RTM contains assumptions regarding committed transportation infrastructure modifications that are expected to be in place by 2045. ***Table 7*** summarizes the key candidate network modifications in the adjacent Metro Vancouver jurisdictions. Those modifications that are included in the table are assumed to be committed infrastructure forming part of the base network.

Table 7: Metro Vancouver Transportation Network Assumptions (2045)

Location / Jurisdiction	Road Segment	From	To	Description	Included in Base Model?
Township of Langley	72 Avenue / Crush Crescent	210 Street	Glover Road	Widen to four lanes	Yes
	76 Avenue	197 Street	211 Street	New 2 lane road	Yes
	80 Avenue	216 Street	Labonte Avenue	New 2 lane road	Yes
	96 Avenue	201 Street	204 Street	New 4 lane road	Yes
	204 Street	84 Avenue	68 Avenue	New 2 lane road	Yes
	208 Street	96 Avenue	88 Avenue	Widen to four lanes	Yes
	208 Street	88 Avenue	74B Avenue	Widen to four lanes	Yes
		74B Avenue	70 Avenue	Widen to six lanes	Yes
		70 Avenue	62 Avenue	Widen to four lanes	Yes
	96 Avenue	204 Street	216 Street	Widen to four lanes	Yes
	198 Street	86 Avenue	82 Avenue	New 2 lane road	Yes
	200 Street	8 Avenue	16 Avenue	New 2 lane road	Yes
	200 Street	72 Avenue	66 Avenue	Widen to six lanes	Yes
Ministry of Transportation	Highway 1	192 Street		Full movement interchange	Yes
	Highway 1	202 Street		East facing bus/HOV ramps	Yes

Location / Jurisdiction	Road Segment	From	To	Description	Included in Base Model?
	Highway 1	208 Street	216 Street	Widen to six lanes (four general / two HOV)	Yes
	Highway 1	216 Street		Full movement interchange	Yes
	Highway 10	Intersection with 64 Avenue / Mufford Crescent		New Configuration and Laning	Yes

As shown, the RTM includes many of the committed infrastructure projects within the adjacent Metro Vancouver jurisdictions. However, upon inspection it was noted that the Fraser Valley Regional District portion of the model had not included updates made over the past several years at the following locations:

- Mount Lehman Road / Fraser Highway Interchange (new configuration);
- Peardonville Road Overpass (closure of the westbound on-ramp);
- Clearbook Road Interchange (widening and new configuration);
- McCallum Road Interchange (widening and new configuration);
- Highway 1 climbing lane sections.

In addition, the model's traffic zone structure was noted to be significantly more coarse than the sub-area model of Abbotsford that was prepared by Delcan and Terry Partridge in 2006. ***Table 8*** compares the assumed population and traffic zone structures for the Abbotsford Sub-Area Model and the current RTM.

Table 8: Travel Model Comparison

Model	Assumed Abbotsford Population (horizon year)	# of Traffic Zones
Abbotsford SAM	211,250 (2031)	149
RTM	229,670 (2045)	26

As shown in ***Table 8*** above, although the RTM accounts for updated population estimates, it offers a much coarser traffic zone structure, meaning localized traffic volume forecasts at interchanges may be less accurate due to the large zone size and resultant point loading to the road network. For these reasons and the network omissions noted above, further updates and refinement to the RTM are required to confirm forecast traffic volumes. Alternatively, the previous Abbotsford Sub-Area model may be updated to undertake traffic volume forecasts and options testing within the Abbotsford area.

4.2.1 Mainline Forecasts

While acknowledging the forecast accuracy limitations described above, the RTM was rerun to obtain preliminary 2045 baseline travel demand volumes along Highway 1. These volumes are summarized by each mode (Single Occupant Vehicles, High Occupancy Vehicles, Light Trucks, Heavy Trucks and Transit Vehicles) and segment in ***Tables 9 and 10***.

Table 9: Forecast 2045 AM Baseline Traffic Volumes

2045 AM Peak Hour	202 Street to 216 Street	216 Street to 232 Street	232 Street to 264 Street	264 Street to Mount Lehman	Mount Lehman to Clearbrook	Clearbrook to McCallum	McCallum to Highway 11	Highway 11 to Whatcom
Westbound SOV	2,580	2,240	2,770	2,380	2,300	2,360	2,680	2,460
Westbound HOV	350	310	350	310	400	480	630	690
Westbound LT	140	140	180	130	130	120	130	170
Westbound HT	400	400	440	590	580	450	450	760
Westbound Transit Vehicles	0	0	0	0	0	0	0	0
Total Westbound Vehicles	**3,470**	**3,080**	**3,730**	**3,400**	**3,420**	**3,410**	**3,880**	**4,080**
Eastbound SOV	2,220	2,340	2,320	2,360	1,900	2,150	1,760	2,030
Eastbound HOV	270	280	290	310	270	290	200	240
Eastbound LT	230	220	190	200	180	160	130	150
Eastbound HT	380	390	400	490	490	450	450	450
Eastbound Transit Vehicles	0	0	0	0	0	0	0	0
Total Eastbound Vehicles	**3,090**	**3,220**	**3,210**	**3,350**	**2,840**	**3,060**	**2,540**	**2,870**

Table 10: Forecast 2045 PM Baseline Traffic Volumes

2045 PM Peak Hour	202 Street to 216 Street	216 Street to 232 Street	232 Street to 264 Street	264 Street to Mount Lehman	Mount Lehman to Clearbrook	Clearbrook to McCallum	McCallum to Highway 11	Highway 11 to Whatcom
Westbound SOV	2,640	2,250	2,660	2,280	2,080	2,080	2,160	1,980
Westbound HOV	470	410	420	370	490	540	720	830
Westbound LT	110	110	130	90	90	70	70	80
Westbound HT	240	240	290	330	330	270	270	560
Westbound Transit Vehicles	0	0	0	0	0	0	0	0
Total Westbound Vehicles	**3,460**	**3,010**	**3,510**	**3,060**	**2,990**	**2,970**	**3,220**	**3,450**
Eastbound SOV	3,070	3,000	2,930	3,340	2,770	2,900	2,920	3,140
Eastbound HOV	430	450	390	410	360	300	260	280
Eastbound LT	110	120	110	140	110	70	40	40
Eastbound HT	280	280	280	530	530	650	650	860
Eastbound Transit Vehicles	0	0	0	0	0	0	0	0
Total Eastbound Vehicles	**3,900**	**3,850**	**3,700**	**4,410**	**3,760**	**3,920**	**3,870**	**4,320**

As shown in ***Table 9*** and ***Table 10***, assuming a practical capacity of 1,800 vehicles per hour per lane (which does not fully account for grades or other capacity reducing factors), several sections could exceed two lane capacity by 2045 (highlighted in red shading). Climbing lanes added in recent years will help to process this demand, but the need for a consistent three lane per direction cross section is most evident in the westbound and eastbound directions during the AM and PM peak hours, respectively.

4.2.2 Interchange and Approach Forecasts

In addition to mainline link capacity, there is also the issue of ensuring sufficient capacity is available on municipal road links leading to and from the highway. Capacity issues on approach / departure links suggest either insufficient capacity is available at the interchange terminals, or there is insufficient number of lanes across the highway.

Using the RTM, results indicate that a number of key links are forecast to be deficient (volume to capacity ratio > 0.90) in both peak hours, including:

At 232 Street / Highway 10:

- Eastbound on-ramp;
- Westbound off-ramp;
- Westbound on-ramp;

At 264 Street / Highway 13:

- All approaches to the 264 Street / 72 Avenue north intersection;

At Mount Lehman / Fraser Highway:

- Eastbound, westbound and southbound approaches to the Mount Lehman / Fraser Highway intersection;

Along Peardonville Road overpass:

- Westbound Peardonville Road

At Clearbrook Road:

- Westbound off-ramp

At McCallum Road:

- Southbound approach to the south off-ramp

At Highway 11:

- Westbound off-ramp

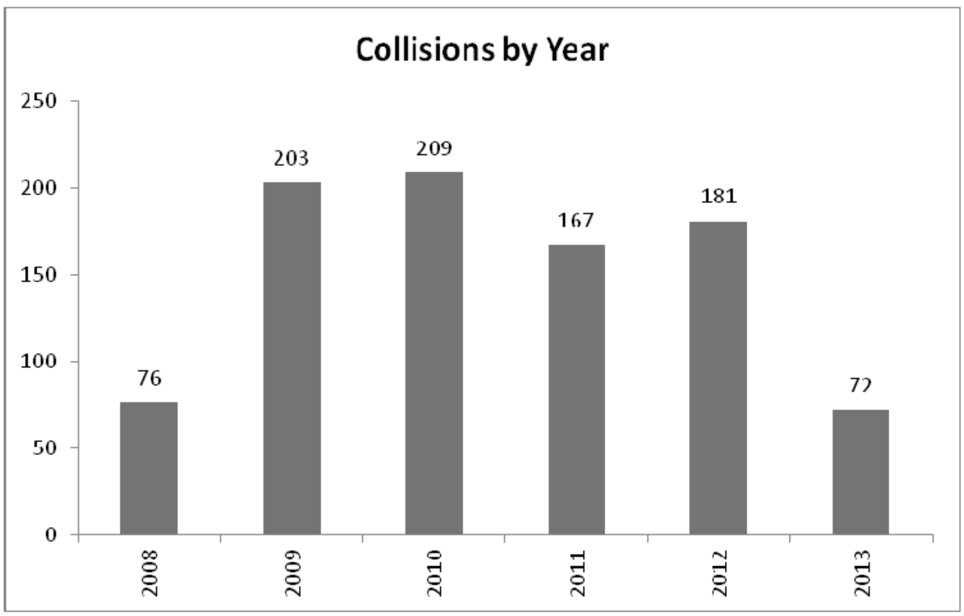
Additional modeling and refinement is required to confirm the above results and provide expanded details on ramp terminal intersection operations and queuing, particularly within the City of Abbotsford, however, it is clear even with recent interchange modifications several ramp junctions will exceed acceptable v/c ratios.

5.0 TRAFFIC SAFETY PERFORMANCE

The traffic safety performance of the highway study corridor was assessed using the MoT's Landmark Kilometre Inventory (LKI) database for collisions that have been reported to police. It is noted that ICBC insurance claims data may show a higher number of (typically more minor) collisions.

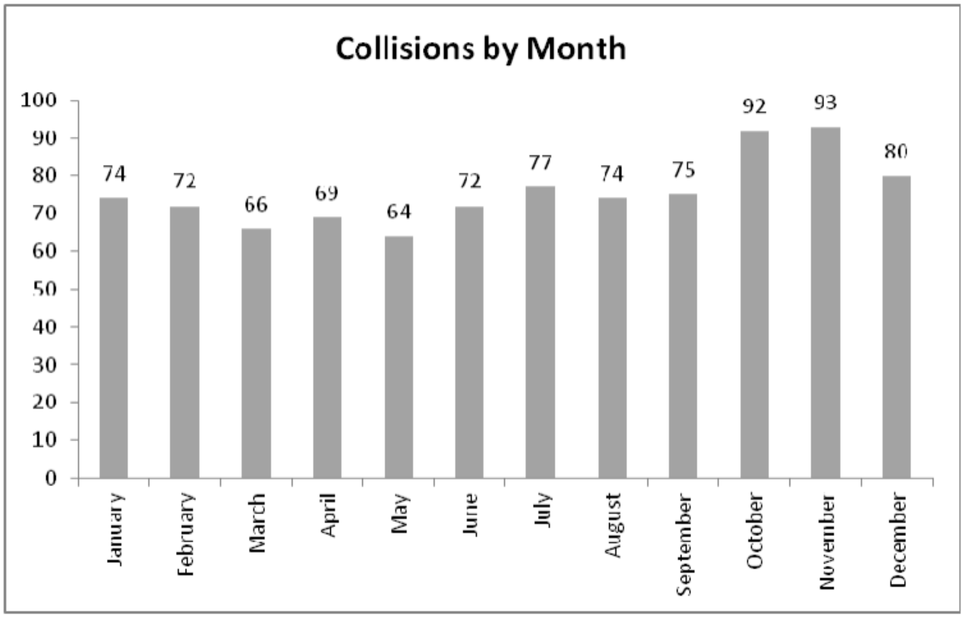
Review of the collision data indicated a total of 908 collisions over the past five years. This averages 182 per year and has followed the year to year trend as shown in ***Figure 8.*** Note that a full year of 2013 data was not available and instead the last half of 2008's collision data was used to supplement the totals. The collisions were split approximately equally between the two directions of travel (slightly more in the eastbound direction).

Figure 8: Collisions By Year (mid 2008- mid 2013)



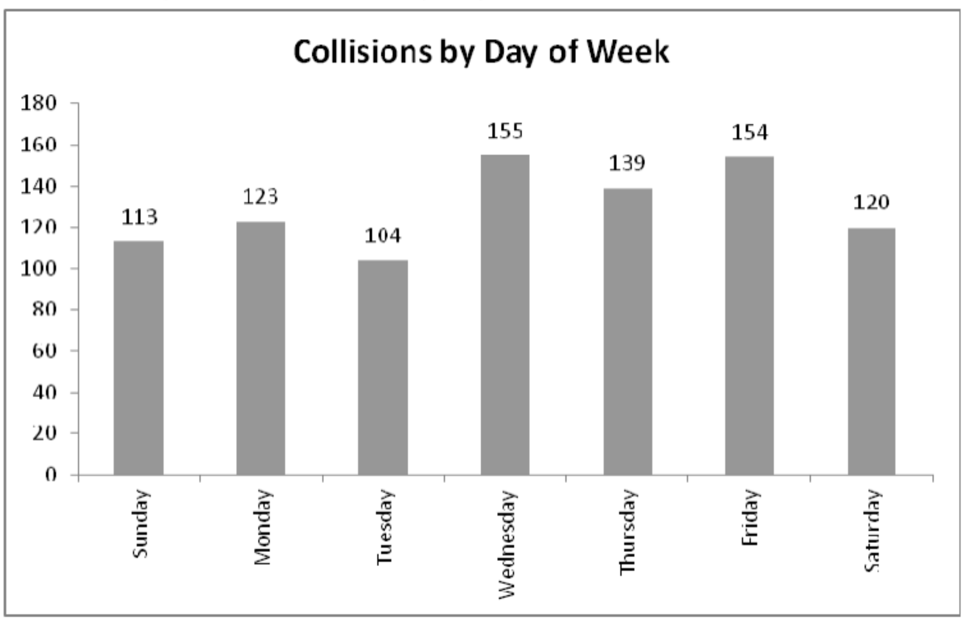
Over the five year period, a review of the monthly collision data shows that October and November have the highest number of collisions, with May having the lowest number. ***Figure 9*** shows the monthly number of collisions by month.

Figure 9: Collisions By Month (mid 2008- mid 2013)



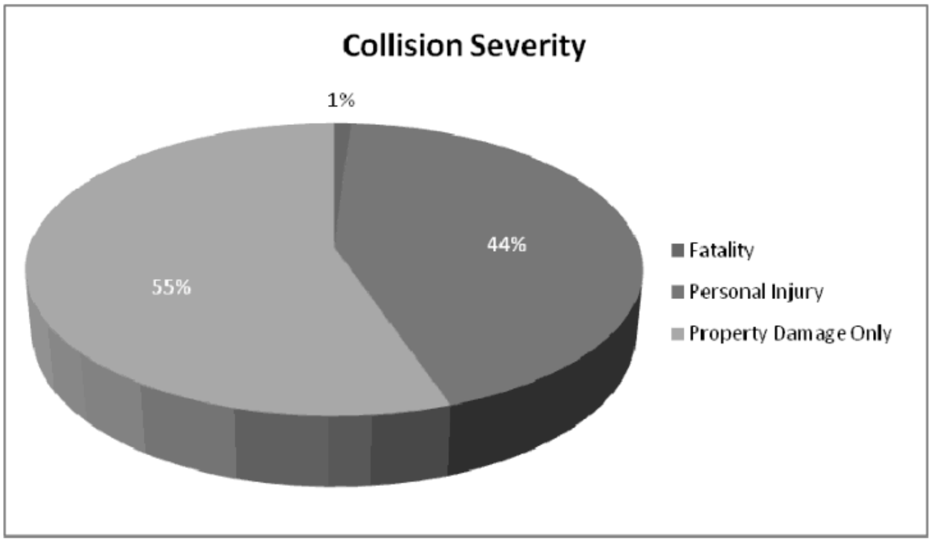
Weekly variations in collision frequency were reviewed as shown in ***Figure 10***. No significant trends were noted, although the number of collisions was higher on Wednesdays and Fridays.

Figure 10: Collisions by Day of Week (mid 2008 – mid 2013)



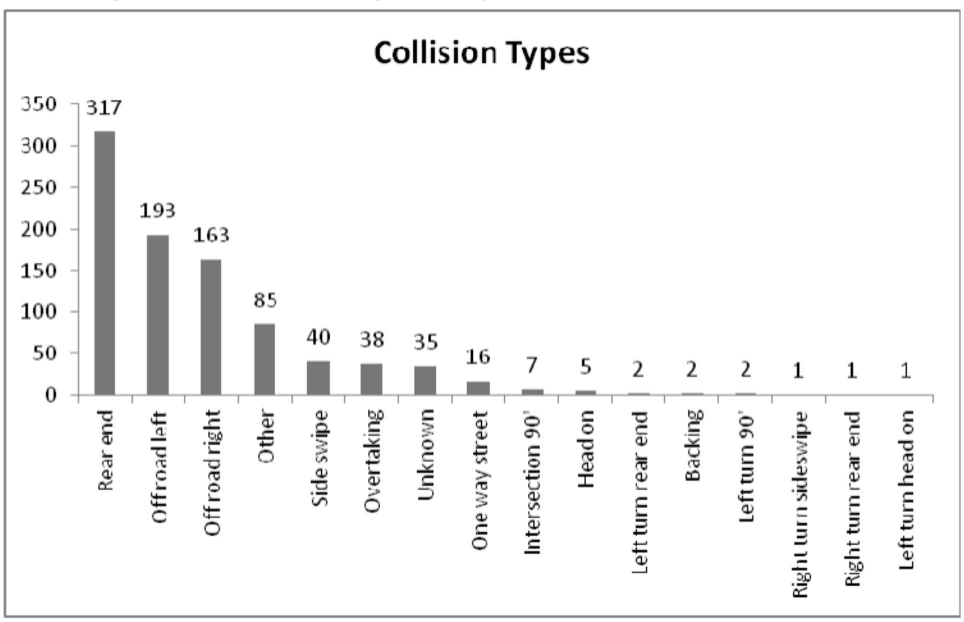
The severity of collisions is illustrated in ***Figure 11***. As shown, just over half of the collisions were property damage only, however, there were nine fatalities recorded.

Figure 11: Collisions by Severity (mid 2008 – mid 2013)



The collisions by primary occurrence are broken down in ***Figure 12***. Rear end collisions account for 35% of the total followed by off road left / right collisions totaling 39%.

Figure 12: Collisions By Primary Occurrence (mid 2008 – mid 2013)



Reviewing contributing factors, 207 of the 908 collisions (23%) cited driver inattention, 73 cited following too closely, 58 had alcohol involvement or suspected alcohol involvement and 57 fell asleep or had extreme fatigue.

Collision locations were reviewed and no substantial clusters were observed, however, the following totals were observed for the individual interchanges:

- 232 Street (137 total)
- 264 Street (142 total)
- Mount Lehman Road (110 total)
- Peardonville Road (8 total)
- Clearbrook Road (63 total)
- McCallum Road (73 total)
- Highway 11 (25 total)

MoT tracks the collision performance of similar types of facilities around the province. Key benchmarks include the provincial average collision rate (for an RFD service class for example) which can be used to calculate a critical collision rate for significance testing. ***Table 11*** summarizes key safety performance statistics for two segments (216 Street to 264 Street and 264 Street to Highway 11).

Table 11: Collision Performance Comparatives

Description	Data (mid 2008- mid 2013)
Segment Performance	
Collision Frequency (collisions/year)	181.6
Collision Rate (collisions/million vehicle kms)	0.29 (216 Street to 264 Street) 0.22 (264 Street to Highway 11)
Provincial Benchmarks	
Provincial Collision Rate (collisions/million vehicle kms)	0.20[1]

1. From Exhibit 4-4 Page 21 of BC's Default Values for Cost Benefit Analysis 2012, RFD4

As shown in ***Table 11***, both segments are above the provincial benchmarks for collision rates for Rural Freeway Divided 4 Lane Highway segments around the province.

MoT has developed social costs assigned to each collision based on relative severity. The standard values, recently updated in the report *"Default Values for Benefit Cost Analysis in British Columbia 2012 – Apex Engineering "* include $6,385,999 for fatal crashes, $135,577 for injury crashes and $11,367 for property damage only crashes. ***Table 11*** summarizes the current annual average collision costs.

Table 11: Collision Costs mid 2008 – mid 2013

Collision Severity	Unit Cost	Total Collisions	Total Cost	Annual Cost
Fatality	$6,385,999	9	$57,473,991	$11,494,798
Injury	$135,577	397	$53,824,069	$10,764,814
Property Damage Only	$11,367	502	$5,706,234	$1,141,247
Total Cost		**908**	**$117,004,294**	**$23,400,859**

In addition to the above, significant delay costs occur when highway lanes are blocked due to a collision. With 182 collisions reported to police every year, this averages a reportable collision every other day along the corridor. The actual number of collisions is higher as not all are reported to police. Even minor incidents such as vehicle breakdowns and conflicts can result in delays and queuing when traffic volumes are close to capacity.

6.0 INFRASTRUCTURE CONDITION

The condition of built infrastructure along the Highway 1 corridor is of interest as elements may be in need of maintenance or rehabilitation. In addition, some elements may not meet current design standards. This section summarizes recent MoTI infrastructure condition reports for pavement and structures, reviews the current clearances for overpass/underpass structures, and identifies locations where interchange configurations do not follow current best practices.

6.1 Pavement Condition

The paved highway surface along Highway 1 between 216 Street and Highway 11 has been grouped into each of the following condition state bins: 'Good', 'Fair', 'Poor' and 'Very Poor'.

Highways in 'Good' condition typically need only 'routine maintenance'. There will likely be few cracks, or the cracks were likely were sealed at the time of the condition survey. There will be few if any potholes and they likely were patched at the time of the survey. The ride will be generally smooth, and with only shallow rutting.

Once a highway hits ‘Fair’ condition, it should be evaluated to determine if there are any cost effective life extending rehabilitation strategies that could be applied soon to extend the life of the asset. Some ‘major maintenance’ type activities such as localized machine milling and filling, as well as sealcoat surface treatment can be applied to preserve the asset.

Once a highway is in ‘Poor’ condition, it is most likely beyond saving by ‘maintenance’ actions and is in need of more intensive and costly ‘Rehabilitation’ works.

A highway in ‘Very Poor’ condition likely needs some reconstruction before resurfacing.

Figures 12 and 13 each offer depictions of three different pavement surface condition rating values. Each is based on a ten point scale, with 10 being perfect and 0 being impassable. The three values are:

RCI - Ride Comfort Index:

This index considers the overall smoothness of the ride along the highway. It is a simple conversion of the commonly used World Bank International Roughness Index (IRI), to the BC MoT ten point scale.

BC's freeways are considered to be in a generally 'Good' state of smoothness, if their average RCI is greater than 7.5.

The average smoothness depicted in the 30 km of roughness data collected along the eastbound lanes of this section of highway is RCI = 8.1. The graph shows that 86.8% of the eastbound outside lanes are in 'Good' condition, 10.8% in 'Fair' condition, 1.3% being in 'Poor' condition, and 1.0% being in 'Very Poor' condition.

The average smoothness depicted in the roughness data collected along the westbound lanes of this section of highway is also RCI = 8.1. The graph shows that 84.6% of the westbound outside lanes are in 'Good' condition, 13.4% in 'Fair' condition, 1.3% being in 'Poor' condition, and 0.7% being in 'Very Poor' condition.

PDI or Pavement Distress Index:

This index considers the frequency of occurrence and the severity of nine different pavement surface distresses including rutting, potholes, asphalt bleeding and six different categories of pavement cracking.

BC's Freeways are considered to be in a generally 'Good', or 'not very distressed' state if their average PDI is greater than 7.0.

The average state of distress depicted in the distress data collected along of the eastbound lanes of this section of highway is 7.7. The graph shows that 80.6% of the eastbound outside lanes are in 'Good' condition, 16.9% in 'Fair' condition, 2.5% being in 'Poor' condition, and 0.0% being in 'Very Poor' condition.

The average state of distress depicted in the distress data collected along the westbound lanes of this section of highway is 8.4. The graph shows that 92.8% of the westbound outside lanes are in 'Good' condition, 6.8% in 'Fair' condition, 0.3% being in 'Poor' condition, and 0.0% being in 'Very Poor' condition.

PCR or Pavement Condition Rating:

This rating is the overall condition rating. It combines the two above factors into a single number rating. BC's Freeways are considered to be in 'Good' condition if their PCR is greater than 7.2.

The overall condition of the eastbound lanes along this section of roadway is 8.0. The graph shows that 93.6% of the eastbound outside lanes are in an overall 'Good' condition, 6.4 in 'Fair' condition, 0.0% being in 'Poor' condition, and 0.0% being in 'Very Poor' condition.

The overall condition of the westbound lanes along this section of roadway is 8.3. The graph shows that 96.7% of the westbound outside lanes are in an overall 'Good' condition, 3.3% in 'Fair' condition, 0.0% being in 'Poor' condition, and 0.0% being in 'Very Poor' condition.

Figure 13 depicts the conditions found when surveying pavement surface conditions in the eastbound direction of travel – from 216th Street toward the Highway 11 interchange.

Figure 13: Pavement Conditions Eastbound

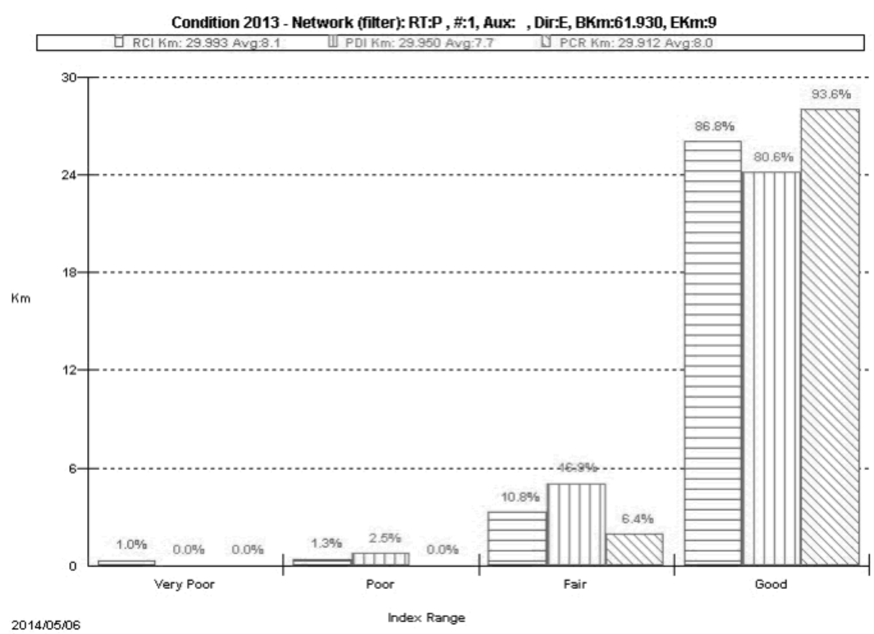
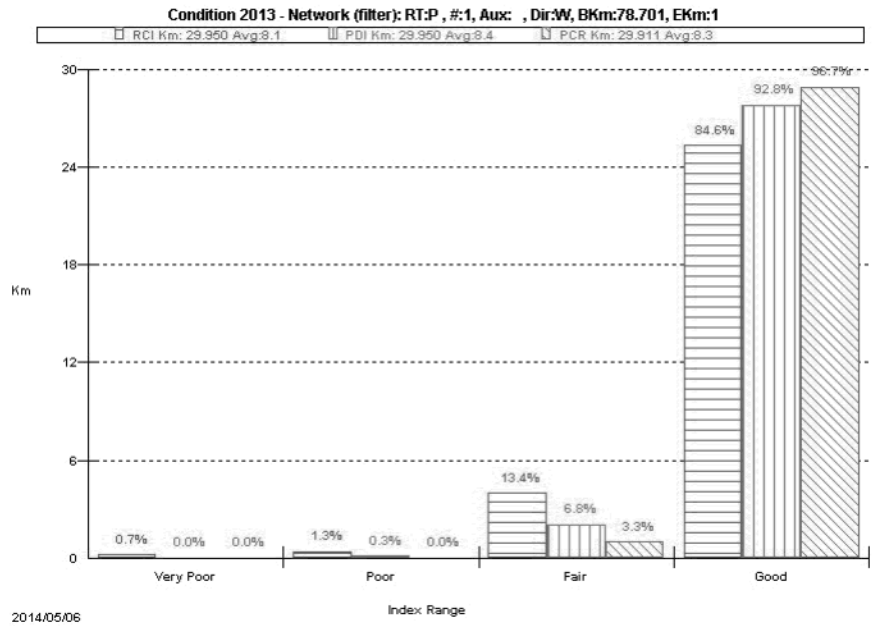


Figure 14 depicts the conditions found when surveying pavement surface conditions in the westbound direction of travel – from the Highway 11 interchange toward 216th Street.

Figure 14: Pavement Conditions Westbound



It should be noted that only the outside lanes in each direction of travel are pavement condition surveyed. For network level pavement surface condition evaluations, MoT has found that there was not enough variance in the condition of the inside lanes as compared to the outside lanes to warrant the investment required to survey all lanes. It is recognized however, that the outside lanes are typically in worse condition than the inside lanes, as the outside lanes typically carry a higher volumes of heavy truck traffic, and depending on the roadway's construction they may offer less support to the paved wearing surface.

6.2 Structure Conditions

With regards to structures such as overpasses, underpasses, retaining walls and culverts, the information in ***Table 12*** was obtained from the Ministry of Transportation and Infrastructure's Asset Management Inventory. The table includes the following measures:

The Adjusted Bridge Condition Index (Adj. BCI) is a rating that represents the condition of a bridge's components. The index is a weighted average of the Bridge Condition Index (BCI) and the Worst Primary Component Group Index, based on the results of the most recent inspection. The intent of adjusting the BCI with the Worst Primary Component Group Index is to influence the overall BCI by the condition of the worst main or primary components of the bridge. Some bridge components are not considered as it is thought that they do not significantly affect prioritization of needs.

The Bridge Condition Index is calculated as a weighted average of condition ratings for all or some of the 41 bridge components associated with the structure that are inspected and rated as per assigned inspection interval. The condition of a component is specified by stating what percentage of the component is in one of five condition states namely:

Excellent =1

Good = 2

Fair = 3

Poor = 4

Very Poor = 5

The average condition rating value for a component is calculated by multiplying the percentage in each condition category by the condition weighting value, and summing the results.

The Urgency Rating specifies the urgency for repair or modification of the structure. The Bridge Area Manager assigns the Urgency Rating Index when entering inspection data, according to the following guidelines:

1. No Repairs Required, No Safety Concerns - Strength: Structure retains its original design load carrying capacity and requires no repairs at this time.
2. Non Structural Repairs Required, No Safety Concerns - Strength: Structure retains its original design load carrying capacity but requires non-structural repairs.
3. Minor Structural Repairs Required, Minor Safety Concerns - Strength: The structure's original design load carrying capacity may be reduced to a minor extent; the structure requires some minor structural repairs.
4. Moderate Priority Structural Repairs Required, Moderate safety Concerns - Strength: The structure's original design load carrying capacity is reduced to a

moderate extent but no load posting is yet considered; the structure requires moderate priority structural repairs to remain in long term service.

5. High Priority Structural Repairs Required, Significant Safety Concerns - Strength: The structure's original design load carrying capacity is reduced significantly; a load posting has been applied or is being considered; the structure requires high priority structure repairs to remain in service.

Table 12: Infrastructure Condition Rating

Struct #	Structure Name	Struct. Type	Year Blt	# Spans	Total Length m	Deck Area m2	Span Type	Adj. BCI	Urg. Rating
01579	GLOVER ROAD U/P	BRIDGE	1963	6	91.7	937	Precast I-Beam	1.97	3
08019W	HWY 1 AT SALMON R WEST CUL	CULVERT	1961				Steel Multiplate	1.48	2
08019E	HWY 1 AT SALMON R EAST CUL	CULVERT	1961				Steel Multiplate	1.51	2
03858R	CP RAIL W.B. #2 WALL	RWALL	1962	NULL	8.2	NULL	Concrete Cast in Place	1.74	1
01578S	SOUTHRN R TUN HWY 1S	TUNNEL	1963	NULL	39.62	NULL	Earth Covered Tunnel	2.15	2
01578N	SOUTHRN R TUN HWY 1N	TUNNEL	1963	NULL	39.62	NULL	Earth Covered Tunnel	1.8	2
03856R	CP RAIL E.B.WALL	RWALL	1962	NULL	8.2	NULL	Concrete Cast in Place	1.39	1
03857R	CP RAIL WB #1 WALL	RWALL	1962	NULL	8.2	NULL	Concrete Cast in Place	1.73	1
04723	SIGN HWY 1/232ND WB ON RAMP	SIGN	1963	NULL	0	NULL	Monotube Cantilever	2.15	1
04725	SIGN HWY 1/232ND EB OFF RAMP	SIGN	1963	NULL	0	NULL	Monotube Cantilever	1.67	1
01648	LIVINGSTONE ROAD U/P	BRIDGE	1963	8	132.9	1342	Precast I-Beam	1.93	2
04724	SIGN HWY 1/232ND EB ON RAMP	SIGN	1963	NULL	0	NULL	Monotube Cantilever	1.29	1
01580	248TH ST (OTTER RD) U/P	BRIDGE	2014						
04721	SIGN HWY 1/264TH WB ON RAMP	SIGN	1961	NULL	0	NULL	Monotube Cantilever	2	1
01616	COUNTY LINE U/P	BRIDGE	1961	6	106	1083	Precast I-Beam	2.09	3
04722	SIGN HWY 1/264TH EB ON RAMP	SIGN	1970	NULL		NULL	Monotube Double Cantilever	1	1
01608E	BRADNER RD O/P EB	BRIDGE	1961	3	37.71	582	Concrete I-Beam	1.94	3
01608W	BRADNER RD O/P WB	BRIDGE	1961	3	37.70	582	Concrete I-Beam	1.96	3
07768	SIGN H1/FRASER HWY E	SIGN	2005	NULL	0.00	NULL	Dual Truss Cantilever	1.26	1
07769	SIGN H1/FRASER HWY E -EXIT 83	SIGN	2005	NULL	0.00	NULL	Dual Truss Cantilever	1.14	1
07770	SIGN H1/FRASER HWY-MT. LEHMAN	SIGN	2005	NULL	0.00	NULL	Dual Truss Cantilever	1.05	1
03906R	FISH TRAP CR TOP HWY 1 WB REW	RWALL	1986	NULL	51.80	NULL	Concrete Cast in Place	1.29	1
03907R	FISH TRAP CR LOW HWY 1 WB GAB	RWALL	1986	NULL	43.00	NULL	Rock Gabion	2.04	1
07771	SIGN H1/FRASER HWY E-MT LEHMAN	SIGN	2005	NULL	0.00	NULL	Single Truss Cantilever	1	1
01562	MT LEHMAN RD U/P	BRIDGE	2005	4	77.80	1131	Sgl-Cell Box Beam	1.01	1
03786R	HWY 1 WB MT.LEHMAN HILL WALL	RWALL	2008	NULL	21.00	NULL	Lockblock - Unreinforced	1	1
01554W	FRASER HIGHWAY WEST U/P	BRIDGE	2005	4	75.50	914	Sgl-Cell Box Beam	1.03	1
01554E	FRASER HIGHWAY EAST U/P	BRIDGE	2005	5	108.60	1249	Sgl-Cell Box Beam	1.01	1
01615	PEARDONVILLE RD U/P	BRIDGE	1961	6	106.31	1090	Concrete I-Beam	1.93	3
01551	CLEARBROOK U/P	BRIDGE	2010	2	59.53	1732	Sgl-Cell Box Beam	1	1
07961	CMS 15-9 MCCALLUM EB	SIGN	2001	NULL	0.00	NULL	Dual Truss Cantilever	1.05	2
01552E	MCCALLUM RD U/P (TCH EB)	BRIDGE	2010	1	22.00	334	Sgl-Cell Box Beam	1	1
01552W	MCCALLUM RD U/P (TCH WB)	BRIDGE	2010	1	22.00	334	Sgl-Cell Box Beam	1	1
01549	RIVERSIDE ROAD	BRIDGE	1962	8	122.19	3375	Concrete I-Beam	1.98	3
01550	HUNTINGDON O/P	BRIDGE	1961	3	45.97	1270	Concrete I-Beam	2.03	4

6.3 Structural Clearance

A number of structures do not meet current Ministry guidelines for clearance above a roadway (5.0 m for large structures, 5.5 m for lightweight structures). These include the following:

- Glover Road underpass structure: 4.46 m
- Roberts Bank Rail Corridor underpass tunnel portals: 4.40 m

- 232 Street underpass structure: 4.62 m
- 264 Street underpass structure: 4.60 m
- Bradner Road overpass structure: 4.90 m
- Peardonville Road underpass structure: 4.92 m
- Riverside Road overpass structure: 4.80 m
- Highway 11 overpass structure: 4.62 m

6.4 Interchange Configuration

Several interchanges currently incorporate configurations that are no longer considered best practices for high volume interchanges. At 232 Street and 264 Street, both of these numbered highway routes have an interchange with Highway 1 with a cloverleaf configuration. The cloverleaf can give rise to conflicts due to the short weaving section separating high speed entry / exit points. Although the configuration of the weave is mitigated somewhat by physical separation from the mainline, the combination of 150 m of weaving distance, heavy trucks and high speed / high volume traffic may contribute to the relatively high collision frequencies at these interchanges.

7.0 PROBLEM DEFINITION SUMMARY

Based on the foregoing analysis, there are number of issues to be reviewed in the Highway 1 functional planning study. These issues may be broken down into three categories – capacity issues, safety issues, and infrastructure condition issues.

7.1 Capacity Issues

A number of segments currently operate at LoS D, which is on the lower end of acceptable performance for a major highway facility such as Trans Canada Highway 1 and is characterized by lower than free flow speeds, relatively high vehicle density, limited freedom to maneuver and queuing resulting from minor incidents / disruptions in the traffic stream. On and off-ramp volumes are currently below the theoretical capacity of 1,200 vph, but the cloverleaf configuration at the 232 Street and 264 Street interchanges constrains capacity due to the need for weaving between directional on / off ramp movements.

Using 2045 travel demand model forecasts, it was found that volume would exceed effective capacity along many of the corridor segments, particularly in the PM peak in the eastbound direction. Municipal approach and departure links also show demand in excess of capacity, implying additional interchange improvements or new highway crossings may be warranted. Further model investigations are required to confirm the impacts of recent network changes and to better resolve traffic zone structure.

7.2 Safety Issues

The subject section of Highway 1 has a collision rate that is higher than the average for similar facilities around the province. Common collision types are rear end collisions and off road collisions, with contributing factors including driver inattention, following too closely, alcohol involvement and fatigue. In addition to the direct collision costs are significant delay costs that occur when highway lanes are blocked due to an incident. With 182 collisions reported to police every year, this averages a reportable collision every other day along the corridor

7.3 Infrastructure Configuration / Design Issues

According to MoT data, pavement conditions are generally acceptable along the corridor, with bridges, culverts and other structures in good condition or requiring mostly minor repairs.

A number of existing structures do not meet current guidelines for clearance above a roadway; with the most critical being the Glover Road underpass and the Roberts Bank Rail Corridor underpass tunnel portals. These structures are at risk of vehicle impacts and an over height vehicle warning system has been installed to mitigate risk.

At 232 Street and 264 Street, both of these numbered highway routes have an interchange with Highway 1 with a cloverleaf design. The cloverleaf is no longer a suitable design for major interchanges as it can give rise to conflicts due to the short weaving section separating high speed entry / exit points. Although the configuration of the weave is mitigated somewhat by physical separation from the mainline, the combination of 150 m of weaving distance, heavy trucks and high speed / high volume traffic may contribute to the relatively high collision frequencies at these interchanges.

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