

Road Safety Benefits of British Columbia's High Risk Corridor Program

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1.0 Introduction

Over a decade ago, a local traffic safety committee in the Fraser Valley area of British Columbia noted a significant and alarming increase in both the collision rate and the collision severity on the highway through the Fraser Canyon. The highway, which was a section of the Trans-Canada Highway (Highway 1) between the communities of Hope and Ashcroft, had road design characteristics that were likely contributing to the poor safety performance on the corridor. Furthermore, it was determined that the commercial vehicle operators were over-represented in the collision occurrence on the corridor and that their driving behavior was also a factor in the poor safety performance on the corridor.

While it would not be unusual for a local traffic safety committee to identify a corridor as problematic, what was unique was the approach that would be adopted to address the safety needs of the corridor.

Historically, efforts to improve road safety were handled in isolation by public agencies interested in reducing collisions. Individual efforts by enforcement, engineering and education groups were recognized to have a positive impact and can reduce collisions. However, the magnitude of the safety problem on the Fraser Canyon corridor warranted a new approach, which could potentially yield greater overall safety benefits. What evolved was the British Columbia's High Risk Corridor (HRC) Program, which was created by recognizing that a safe roadway environment is a shared responsibility, involving both public and private agencies that have the ability and desire to act and implement changes that can improve the level of road safety performance. It was felt that a high risk corridor approach, which involved the coordinated and strategic efforts by the various agencies responsible and interested in road safety could yield greater overall safety benefits as compared to individual agency efforts that are undertaken in isolation.

2.0 High Risk Corridor Program in BC

The first step in the formulation of the HRC Program is to undertake a detailed safety analysis of the corridor to gain a clear understanding of the magnitude of the safety problem on the corridor and to gain some insight as to the cause of the safety problems. Safety performance functions (SPFs) are used to assess the magnitude of the safety problem on the corridor by assessing how the corridor performs in relation to the expected normal safety performance. Statistical tests of the collision characteristics are also analyzed to search for deviant patterns and trends in the collision data. The collision analysis is supported by surrogate safety data for the corridor, which could include vehicle operating speed data, traffic conflict data, and road safety risk data, which is based on the operational characteristics and design features of the corridor.

The output from the corridor's safety performance assessment is a clear understanding of the magnitude of the safety problem and the potential for road safety improvement. The analysis also provides a good understanding of the factors that are contributing to the poor safety performance. This is critical to the next step in the HRC process, which is to formulate a HRC Working Committee. The membership of the HRC Working Committee is restricted to those agencies that have the responsibility over those factors that are contributing to the poor safety performance. Furthermore, it is absolutely necessary that the members of the HRC committee have the ability and authority to act to improve safety, and are willing to do so.

The next step in the formulation of a HRC Program is the development of a strategic road safety plan for the corridor, involving all participants of the HRC Working Committee. To supplement the plan, often it will be necessary to drill-down further into the available data and information on the corridor to search for opportunities to implement road safety interventions. It may also be necessary to collect new information about the road, the driver, the vehicles or the operating environment. A road safety plan is developed with input from all working group members, outlining how each agency will target their part of the road safety problem. A detailed schedule is developed that involves the strategic deployment of multi-disciplinary road safety interventions for the corridor. Typically, the deployment of the various road safety interventions are deployed over several years, with most activities of the HRC plans being completed within a five-year timeframe.

To facilitate the delivery and monitoring of the strategic plan for the HRC Program, it is beneficial to appoint a leader from the HRC Committee. In BC, the leadership for the HRC programs was generally provided by the local Road Safety Coordinator, which is a position with the Insurance Corporation of British Columbia (ICBC). This was a logical fit for the leadership of the HRC Program because this position has a broad perspective on road safety and interacts with any and all agencies that are responsible for road safety. Furthermore, the Road Safety Coordinator has detailed local knowledge of the corridor, which helps to ensure that interventions are suitable for the corridor under review.

3.0 Examples of HRC Program in BC

The details of two separate HRC Programs in British Columbia are described below to illustrate a range of participants that can be included, as well as the range of activities that can be implemented as part of a HRC Program. The two HRC Programs include the Fraser Canyon (Highway 1) HRC Project as noted earlier, as well as the Highway 3 HRC Project, which is located between the communities of Hope to Princeton, BC.

3.1 Fraser Canyon HRC Program (192 Kilometres of Highway 1: Hope to Ashcroft)

The detailed safety analysis of the collision data and road safety risk on the corridor suggested that the corridor had design and operational issues that could be improved. The analysis also suggested that speeding was a significant factor in the collisions on the corridor, suggesting poor driver behavior and non-compliance to the posted limit. It was also determined that there was a disproportionate number of collisions involving commercial vehicles and in fact, it was a certain type of vehicle / haul that was dominant in the collisions occurring on the corridor. With this information, it was then very clear which agencies should be included on the HRC Working Committee, namely:

- The BC Ministry of Transportation and Infrastructure, who would be responsible to make improvements to the roadway infrastructure;
- The RCMP, who would target the speeding problems and the poor driver behavior issues on the corridor;
- The Commercial Vehicle Safety and Enforcement Branch, who could target the problematic vehicle types operating on the corridor;
- Worksafe BC and Private Trucking Companies to help with education and awareness of the safety issues on the corridor; and,
- ICBC to facilitate the HRC Program and to provide assistance to the various agencies, including funding to help with the deployment of interventions.

The activities to support the HRC Program for the Fraser Canyon corridor were implemented between 2004 and 2007. A strategic road safety intervention plan was formulated that involved several activities, such as the following multi-disciplinary activities:

- **Engineering:** Provided enhanced curve delineation, centerline and shoulder rumble strips, the placement of additional roadside barrier, shoulder widening and pullout areas, truck roll-over signing and upgraded and enhanced the regulatory signing along the corridor.
- **Traditional Enforcement:** The RCMP increased the level of enforcement on the corridor, with specific focus on speeding and aggressive driving in critical areas with a proven collision history.
- **Targeted Enforcement:** The Commercial Vehicle Safety and Enforcement Branch schedule more vehicle safety checks at times when the likelihood of violation was optimal.
- **Education:** Worksafe BC, RCMP ICBC and a private trucking company developed a Fraser Canyon Hazard Survey, “Sharing the Road with Trucks” and the Fraser Canyon Road Hazards education and awareness plan.

3.2 Highway 3 HRC Program (125 Kilometres of Highway 3)

Although in the same geographical area of the province, the safety analysis of the Highway 3 HRC identified safety problems that were quite different than those on the Fraser Canyon. Some very localized and distinct sites emerge as problematic, which were characterized by poor roadway design features, including issues associated with design consistency. A specific temporal pattern indicated that there was a problem with weekend travelers, who travel on a Friday evening from the Greater Vancouver region to the southern interior lakes region of the province and then return late on Sunday evening back to the Vancouver area. This issue was even more distinct on long weekend during the summer months and was characterized by a higher than normal proportion of speeding and DUI related issues. Another collision pattern that was statistically over-represented was motorcycle incidents, noting that the corridor is a scenic highway with curvilinear alignment that does attract motorcyclists. The corridor was noted to have a high incident of fatal collisions on the corridor, with several incidents involving motorcycles. Finally, it was known that the corridor is susceptible to adverse weather conditions, and as such, road surface conditions was noted as a contributing factor in many collisions.

With the knowledge gained from the safety analysis of the Highway 3 corridor, the membership of the Highway 3 HRC Working Committee was formed and included the following members:

- The BC Ministry of Transportation and Infrastructure, who would be responsible to make improvements to the roadway infrastructure;
- The RCMP, who would target the excessive speeding and DUI related problems on the corridor;
- The BC Coroner's Office who were called routinely to the corridor to attend to fatal collisions on the corridor;
- The road maintenance contractor for the corridor, who are responsible for the maintenance / road clearing on the corridor; and,
- ICBC to facilitate the HRC Program and to provide assistance to the various agencies, including funding to help with the deployment of interventions.

The activities to support the HRC Program for the Highway 3 Hope to Princeton Highway were implemented between 2008 and 2012. A strategic plan was formulated that involved several activities, such as the following multi-disciplinary activities:

- **Engineering:** Provided enhanced curve delineation including LED chevrons, dynamic curve and speed warning signs, centerline and shoulder rumble strips, speed reader boards, passing lanes, and enhanced the regulatory signing along the corridor.
- **Targeted Enforcement:** The RCMP increased the level of enforcement on the corridor, with specific focus on speeding, alcohol checks, and aggressive driving in critical areas with a proven collision history.
- **Maintenance Activities:** The maintenance contractor, which is a private company, actively participated on the HRC Program and was committed to enhancing maintenance activities during times of high-risk driver behaviors and high traffic exposure.
- **Education:** BC Coroners Office, the RCMP and ICBC were committed to communicate the hazards of the corridor to high-risk users, which included the motorcycling groups that would commonly use the corridor for recreation.

The key goal of the HRC Program was the strategic interaction between participants and the sense of obligation to work together to reduce collisions on the corridors.

4.0 Safety Benefits of the High Risk Corridor Program

With any safety intervention, it is important to conduct a before / after evaluation to determine the effectiveness of the efforts to improve safety. For a time series road safety evaluation to be considered robust and reliable, it is necessary to correct three primary confounding factors, namely:

- **History:** Refers to the possibility that factors other than those being investigated caused part of the observed change in collisions.
- **Maturation:** Refers to the long-term collision trends over time that is beyond the impact of localized interventions (e.g., vehicle safety improvements).
- **Regression Artifacts:** The tendency of extreme events to be followed by less extreme events, without any change to the system or process.

The methodology for the evaluations of the Fraser Canyon HRC and the Highway 3 HRC involved the use of control groups to correct for the time-trend effects of history and maturation. The evaluation methodology also made use of safety performance functions and an empirical Bayes refinement technique that are used to correct for regression artifacts. Further details of the evaluation methodology can be found in Hauer ¹. The results of the before / after evaluations for the two corridors are summarized below.

4.1 Fraser Canyon HRC Safety Benefits

The evaluation examined the effect of the interventions in reducing the frequency of collisions and the effect of the interventions, which was determined by calculating an odds ratio. The safety performance results were also disaggregated by different collision characteristics, as listed below.

- Total collisions:	Collision reduction:	17.1 collisions / year
	Intervention Effect:	-15.8 % (Collision reduction)
- Severe Collisions (F+I)	Collision reduction:	6.1 collisions / year
	Intervention Effect:	-11.0 % (Collision reduction)
- PDO Collisions:	Collision reduction:	11.0 collisions / year
	Intervention Effect:	-21.1 % (Collision reduction)
- Commercial Vehicle	Collision reduction:	12.4 collisions / year
	Intervention Effect:	-27.0 % (Collision reduction)

¹ Hauer, Ezra, Observation Before-After Studies in Road Safety, First Edition, 1997, Elsevier Sciences Ltd., ISBN: 0-08-043 053 8

4.2 Highway 3 HRC Safety Benefit

The safety performance results for the Highway 3 HRC program are listed below.

- Total collisions:	Collision reduction:	13.9 collisions / year
	Intervention Effect:	-18.8 % (Collision reduction)
- Severe Collisions (F+I)	Collision reduction:	3.9 collisions / year
	Intervention Effect:	-11.1 % (Collision reduction)
- PDO Collisions:	Collision reduction:	10.0 collisions / year
	Intervention Effect:	-25.9 % (Collision reduction)
- Road Surface:	Collision reduction:	6.7 collisions / year
	Intervention Effect:	-16.8 % (Collision reduction)

5.0 **Innovative Elements of the High Risk Corridor Program**

The innovation associated with the HRC Program is largely procedural, as the interventions that are undertaken by the various road safety partners can be somewhat typical for enforcement, engineering or educational groups. The innovation comes from the interaction between road safety partners and the efforts to formulate a road safety plan for the corridor, including the scheduling of the different layers of road safety interventions that will maximize the potential to reduce collisions. The role of the leader of the HRC Working Committee is essential to ensure that strategic meetings are held at critical times throughout the year to examine specific safety concerns on the corridor, such that specific interventions can be deployed to target high-risk drivers or behaviors, high-risk locations and high-risk vehicles.

6.0 **Transferability of the High Risk Corridor Program**

The procedures from the HRC Program could easily be transferred to any jurisdiction, as long as there is the ability and willingness of the road safety partners to work together. Procedures have been formulated to engage road safety partners and to demonstrate the value of an integrated approach to road safety. BC is somewhat unique in that the public nature of the auto insurance (i.e., ICBC) provides local road safety staff throughout the province with a multi-jurisdictional focus that is ideal to provide the required leadership for a HRC Program. For a HRC Program to be effectively implemented in other locations, it will be necessary to identify a leader that can manage and motivate divergent groups to work together to realize the significant benefits that can accrue from a HRC Program.