



Case Study

Ivor Strong Bridge Intelligent Transportation System Integration & Traffic Management Project

Using technology to support and enhance traditional work zone management and operational techniques.

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OVERVIEW

The Ivor Strong Bridge is located south east of Anderson Road and Bow Bottom Trail where those roads connect with Deerfoot Trail (Highway 2) in Calgary, Alberta. The bridge stretches across the Bow River, and makes up a part of the major freeway that links Calgary suburbs to the downtown core, and beyond through to the cities of Red Deer, Edmonton, and Lethbridge. The Ivor Strong Bridge has historically experienced high traffic delays on both the weekday morning and afternoon peak periods. In a typical day, the rush hour period queue lengths could stretch over several kilometers long in peak travel directions.

Alberta Transportation's Annual Average Daily Traffic data (2015) for this route shows an approximate 134,000 vehicles, making the Deerfoot Trail the busiest road in Alberta. Due to the culmination of traffic at this crossing, the Ivor Strong Bridge was carrying more than twice the volume for which it was designed. Rehabilitation of the Ivor Strong Bridge was required to replace the bridge's expansion joints.

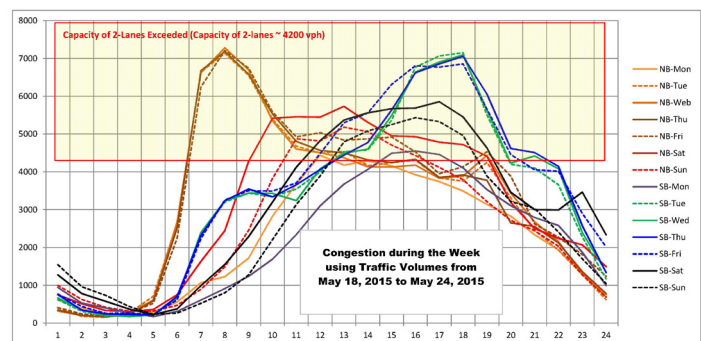
The two major challenges for this rehabilitation project were reducing traffic congestion and ensuring traveler safety. Without any traffic management measures, queues would be expected to extend to 4 to 6 kilometers long during peak hours on a typical weekday. The frequent and unpredictable occurrence of stopped vehicles in a queue in a freeway setting would also pose undesirable exposure to potential rear-end collision.

Alberta Transportation was tasked with the project and was seeking collaborators. After attending local project meetings with Alberta Transportation, ATS Traffic proposed the use of Intelligent Transportation Systems and strategic traffic management to address the impending challenges.

ATS Traffic and Alberta Transportation, along with partners Ver-Mac and project contractors and consulting engineers, began work on the Ivor Strong Bridge ITS Integration & Traffic Management Project in April of 2016, and completed the project in June 27, 2016.

CHALLENGE

Alberta Transportation was set to begin the Ivor Strong Bridge Rehabilitation Project in the Spring of 2016, but faced significant challenges with project timelines, environmental restrictions, and logistics. Knowing that the proposed project's lane restrictions on the Ivor Strong Bridge would result in the displacement of up to 4000 vehicles per hour during the peak traffic periods, the traffic management solution had to be both strategic and comprehensive.



ENVIRONMENTAL CHALLENGES

The Ivor Strong bridge deck work required a minimum ambient temperature range that ruled out winter construction (or even late Fall construction). This meant that the project had to be completed within a short window of time, with seasonal conditions prohibiting work outside of the regular construction season.

TIMELINE CHALLENGES

The project needed to be complete before the start of the 2016 Calgary Stampede, an annual event that attracts over a million visitors per year. Given the daily volume of vehicles (approximately 7200 per hour) that travel across the Ivor Strong Bridge, and the knowledge that this influx of visitors would cause this to increase substantially, the project timeline was non-negotiable.

LOGISTICAL CHALLENGES

Due to these temperature and timeline restrictions, a 3-stage construction method was immediately ruled out. Although the 3-stage construction method would keep the number of lanes on Deerfoot Trail unchanged, it would inevitably require a longer construction period. This would make it impossible to get the work done prior to Calgary Stampede, and would infringe on the province-wide restrictions on July construction. If the project began after Calgary Stampede, it would not complete until late Fall which would be too late due to the lower ambient conditions. This would also result in a higher project cost. The only viable method was to go with a 2-stage construction method with 24-hour construction.

However, a 2-stage construction meant that one lane had to be closed in each travel direction on Deerfoot Trail. This meant going from 3 lanes in each direction to 2 lanes in each direction, coupled with the narrowing of each lane, and a 50% reduction of the speed limit. During the project planning phase, it was clear the delays that would be caused to the 100,000+ travelers on this route were inevitable.

The ITS and Traffic Management project was designed to ensure the shortest duration of traffic disruption, while maintaining an aggressive project timeline. With the time-sensitive and disruptive nature of the proposed project, the ultimate challenge was to minimize inconvenience and maximize safety along this major corridor for Calgary commuters and travelers.

PROJECT SOLUTION

The ATS Traffic team got to work right away, developing drawings and overseeing the project management for the implementation of the ITS solution. We oversaw the organization of resources, designing the strategy based on the project challenges, and final, the execution. Our On-Street Services team was responsible for the initial placement and installation of the equipment, regular maintenance checks when required, constant monitoring of the systems, and ensuring the proper messages were being relayed to drivers.



INTELLIGENT TRANSPORTATION SYSTEMS (ITS)

Intelligent Transportation Systems improve safety and mobility on roadways, provide useful driver information, improve traffic flow, and ultimately contribute to the reduction of traffic delays, injuries, and fatalities. ITS combines data collection with data analysis to product fully automated traffic information to motorists about real-time downstream traffic conditions. These systems are made up of three major components:

- 1 Sensor** – To detect hazards such as speed or temperature. In the case of the Ivor Strong Bridge project this was the Ver-Mac Speed Mac portable radar detectors.
- 2 Software** – To collect and analyze data. For this project, the Ver-Mac Jamlogic traffic analytics software was used to collect and compute real-time data, to be broadcast to travelers.

3 Messaging – The strategic dissemination of information to travelers about downstream traffic conditions or alternative routes. For this project the Ver-Mac NTCIP-compliant Smart Work Zone portable electronic message boards were used to allow drivers ample time to reduce speed and make informed travel decision.

Given the challenges faced by the City of Calgary and Alberta Transportation, ATS Traffic proposed two Intelligent Transportation Solutions to manage traffic during the Ivor Strong Bridge rehabilitation project safely and efficiently. The first was an Automated Queue Warning system, and the second was an Alternative Routes system.

AUTOMATED QUE WARNING SYSTEM (AQW)

The AQW system consisted of Speed-Mac portable radar detectors, JamLogic traffic data analytics software and NTCIP-compliant Smart Work Zone portable electronic message boards. The AQW system warned travelers of stopped or slowed traffic ahead and gave drivers the opportunity to slow their vehicles safely reducing the risk of rear-end collisions in the work zone.

ALTERNATIVE ROUTES SYSTEM

The Alternative Route system utilized real time traffic data, JamLogic traffic data analytics software and NTCIP-compliant Smart Work Zone portable electronic message boards. The Alternative Route System provided real-time travel durations for the alternative routes and through the work zone. This allowed road users the opportunity to make informed travel decisions.



ADDITIONAL PROJECT COMPONENTS

The construction traffic management measures increased capacities of parallel corridors to accommodate traffic displaced from the Deerfoot Trail corridor. These parallel corridors included:

- Stoney Trail (Northeast and Southeast Stoney Trail)
- Barlow Trail
- 52 Street
- Memorial Drive
- McLeod Trail
- Highway 22X

Improvements along Stoney Trail were accomplished through working with the Stoney Trail Maintenance Contractor. Improvements along Calgary streets were accomplished through working with the City of Calgary.

The implementation of Permanent Dynamic Message Signs (DMS) displaying travel times on Deerfoot Trail compared to alternative routes. These Dynamic Message Signs are displayed to long distance travelers (Deerfoot Trail vs Stoney Trail) as well as shorter distance travelers (Deerfoot Trail vs Barlow Trail).

The travel time information was determined based on vehicle data sampled from the actual traffic flow through a sampling process, using sensors that were strategically placed at various control points on the road system.

Additional Variable Message Signs (VMS) were also placed to caution Deerfoot Trail traffic of the delays ahead, and direct this traffic to alternative routes. AQW Message Signs were placed on Deerfoot Trail at 4 to 6 km north and south of the construction zone to warn motorists that:

- (i) traffic is slowing ahead, in x km; and
- (ii) traffic is stopped ahead, in x km.

The slowed traffic and stopped queue messages were generated using radar sensors placed upstream of the construction zone for both northbound and southbound directions.

The DMS and QMS information was also posted on the Alberta 511 website. Alberta Transportation placed broadcast radio messages to inform the

public about the impending start of the construction and throughout the construction period. Regular meetings were held between Alberta Transportation and the City of Calgary about the project, ensuring consistent communication between all parties.

OUTCOME

The Ivor Strong Bridge ITS Integration & Traffic Management Project, which required months of planning and several months for project completion, proved to be extremely successful. Alberta Transportation was pleased with ATS Traffic's ability to address the logistical challenges of the rehabilitation project with an innovative solution.



With an accelerated construction period and an increased volume of traffic due to lane restrictions and speed limit reductions, the project required careful planning and execution. We were able to address these challenges with the innovative solutions from our partners at Ver-Mac, our On-Street services team, and the assistance of the Alberta Transportation team, contractors, and consulting engineers.

With many stakeholders involved, including Alberta Transportation, the City of Calgary, Highway Maintenance Contractors, and Calgary residents, this project was bound to cause disruption. We managed to navigate this strategically and effectively, ensuring the project could be completed on schedule with minimal disturbance.

FEEDBACK

“ It is of paramount importance to us and our clients to keep the public informed about anticipated traffic disruptions during construction of our projects. The Intelligent Traffic System, implemented by ATS Traffic during construction work on the Ivor Strong Bridge on Deerfoot Trail in Calgary, enhanced our ability to keep the public informed. We went beyond just advising travelers of the disruptions; we were able to provide estimated travel times and alternate routes. We were pleased with the results of using the Intelligent Traffic System on the Ivor Strong Bridge project. ”

Scott Murphy, P. Eng. (MOST Engineering Ltd.)

“ The Ivor Strong Bridge Project provided an opportunity to create a comprehensive Smart Work Zone layout to address all the potential issues that can arise with projects of this size. This was a high-speed area with queues (stopped traffic) building at any time of the day, so the solution first and foremost had to address the high volume of traffic. The Smart Work Zone setup provided alternate routes that were available to balance the load of motorists travelling North and South, and informed travelers of changing conditions upstream in real time. The results from this project provided historical data that will help with future projects of this nature, and allowed us to utilize the Smart Work Zone technology to the best of its ability. ”

Raymond Bureau, Ver-Mac

PROJECT SUCCESS AND RECOGNITION

ATS Traffic, along with a series of partners including Ver-Mac and Alberta Transportation, was honoured to receive the 2017 Award of Excellence for Construction Innovation for the Ivor Strong Bridge ITS Integration & Traffic Management Project, presented at the 2017 Tri-Party Transportation Conference in Red Deer, Alberta.

Presented by the Minister of Transportation for Alberta, the honorable Brian Mason, the Minister's Awards for Transportation Innovation recognize the innovative people and organizations in Alberta who plan, design, construct, operate or maintain a roadway, transit service or related initiative.

“ These awards celebrate transportation innovations, large or small, that are paving the way toward to more efficient, sustainable and safer transportation system in our province. I am proud to present these awards to those who use their skills and creativity to constantly elevate Alberta's industry. ”

Brian Mason, Minister of Transportation - Alberta

SPECIAL THANKS

The Ivor Strong Bridge rehabilitation project was a collaborative effort, and could not have been the success that it was without the contribution of the entire project team.

We'd like to extend out gratitude to the following project partners:



- Traffic Solutions Consulting Ltd.
- MOST Engineering Ltd.
- TDM Engineering Ltd.



This photo was taken at the 2017 Tri-Party Transportation Conference in Red Deer, Alberta.

Safety forward.



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