

**TRAFFIC SAFETY COMMITTEE**

*HIS WORSHIP, THE MAYOR  
AND COUNCILLORS*

**SUBJECT: TRAFFIC SIGNAL EMERGENCY VEHICLE PRE-EMPTION**

**RECOMMENDATION:**

1. THAT Council approve the implementation of a GPS based emergency vehicle traffic signal pre-emption project, as described in this report, with funds allocated from the Gaming Fund account.

**REPORT**

The Traffic Safety Committee, at its meeting held on 2007 November 06, received and adopted the *attached* report seeking Council's approval for the funding and implementation of a GPS based emergency vehicle pre-emption system for the City's traffic signals.

Respectfully submitted,

Councillor N. Volkow  
Chair

Councillor S. Dhaliwal  
Vice Chair

Councillor G. Evans  
Member

Copied to:	City Manager Director Finance Director Engineering Fire Chief OIC, RCMP
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**TO:** CHAIR AND MEMBERS  
TRAFFIC SAFETY COMMITTEE

**DATE:** 2007 October 30

**FROM:** DIRECTOR ENGINEERING  
FIRE CHIEF  
RCMP OFFICER-IN-CHARGE

**SUBJECT:** TRAFFIC SIGNAL EMERGENCY VEHICLE PRE-EMPTION

**PURPOSE:** To seek the Committee and Council approval for the funding and implementation of a GPS based emergency vehicle pre-emption system for the City's traffic signals.

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**RECOMMENDATIONS:**

1. **THAT** the Committee recommend Council approve the implementation of a GPS based emergency vehicle traffic signal pre-emption project as described in this report with funds allocated from the Gaming Fund account.

**REPORT**

**1.0 Introduction**

The concept of emergency vehicle pre-emption control of traffic signals and the potential benefit of pre-emption control to emergency response have long been recognized by many communities in North America. Various pre-emption systems have been deployed in many cities with great success. These systems vary widely in their approach from pre-programmed "green wave" type systems, which require pre-set emergency response routes, to more flexible systems employing vehicle mounted transmitters that send signals to receivers mounted on traffic signals.

With pre-emption systems, each signal can be programmed to provide the appropriate display, moving stopped vehicles out of the way and greatly reducing the likelihood of an approaching emergency vehicle coming up behind a group of vehicles stopped at a red light. The systems are particularly useful on divided roadways. With survival rates critical to the arrival time of emergency crews, this can add up to several minutes saved over the route travelled. Collisions involving emergency responders can also dramatically be reduced.

To: Traffic Safety Committee  
From: Director Engineering  
Re: TRAFFIC SIGNAL EMERGENCY VEHICLE PRE-EMPTION  
2007 October 30..... Page 2

## **2.0 Background on Signal Pre-emption Systems**

First generation pre-emption systems typically required a clear line of sight between the vehicle and signal. The emergency vehicle is equipped with strobe light and traffic signal with detector to place a pre-emption call. Some systems are also based on tuned siren sounds but they also share some of the line of sight issues and false calls to nearby signals are possible.

The second generation signal pre-emption equipment used radio communication for contact between the emergency vehicle and the signal controller. The radio was usually linked to a computer to provide limited data logging of the response vehicles progress.

Some of these systems have been considered in the past for traffic signal pre-emption in the City of Burnaby and discussed among the Fire, Police, and Engineering Departments. Other budget commitments and technology limitations have overshadowed the need for this type of system. Recent technology developments have made pre-emption more practical in Burnaby's complex road environment and traffic congestion has increased to the point where emergency response times are being compromised.

## **3.0 Proposed GPS Based Pre-Emption Systems for Burnaby**

The most recent evolution in pre-emption technology has seen the incorporation of Global Positioning Satellite [GPS] technology into the communications between vehicles and traffic signals. The benefits of these systems are that they can adapt to changing traffic conditions and set the upcoming traffic signal to the pre-emption state at the right time for the arrival of the vehicle at the intersection. Line of sight is also no longer an issue for these new systems as they rely on spread spectrum radio and multi-channel GPS systems. The systems are also much more secure than the older design systems, virtually eliminating the possibility of unauthorized users hacking into the network and changing the signal operation. This was an issue with some of the older strobe light based systems.

Fire and Engineering Staff have attended demonstrations of the new GPS technology and have been impressed with the capabilities of these systems. There are now a number of system vendors and numerous deployments of this equipment in North America. The RCMP have also been introduced to this concept and would realize similar benefits to Fire vehicles in emergency situations. The systems are readily adaptable to ambulances as well with the only requirement being the addition of vehicle units and programming of the system to recognize these vehicles.

Pre-emption of a traffic signal occurs when a signal is received by a recognized device and activates a special program entered for that type of vehicle and the approach. Different types of vehicles and different approaches may trigger a different programmed response. The unique capabilities of the GPS based equipment provides the receiver in the control cabinet with speed and vehicle information, such as the turn signal state, to allow for the clearing of vehicle and pedestrian traffic, and placing of the traffic signal to the desired state prior to the arrival of the emergency vehicle. Analysis of the turn signal state also allows the system to pre-empt the next

To: Traffic Safety Committee  
 From: Director Engineering  
 Re: TRAFFIC SIGNAL EMERGENCY VEHICLE PRE-EMPTION  
 2007 October 30..... Page 3

signal in the system before the vehicle makes its turn, providing a quicker response for closely spaced signals. Older systems were not able to adapt to differences in vehicle approach speeds sometimes causing a return to normal operation too soon or the holding of the traffic signal in pre-emption too long. The system also provides Automatic Vehicle Location [AVL] and the detailed logging of travel times for future fine tuning of response routes

The systems also have the capability of providing bus priority at traffic signals. This is accomplished through the installation of the same emitter as is used on an emergency vehicle but assigning it to a lower priority pre-emption. The traffic signal controllers used in Burnaby have low priority bus pre-emption built into their basic functions. Translink is currently evaluating several systems and may be interested in partnering with the City to provide this functionality.

**4.0 Proposed Funding for Burnaby Pre-Emption Project**

The greatest benefits of this type of system would result from a city-wide deployment. Currently, there are 218 signalized City-owned traffic signals and seven Ministry of Transportation owned traffic signals in the city that would be included in this project. The required intersection equipment would also be included with any new traffic signals that are installed in the City. The Fire Department has a fleet of 25 vehicles and the RCMP has 135 vehicles in their fleet that would need to be equipped. Certain vehicles in the City fleet may also be equipped for disaster response in the future. The system would be made available to ambulance services with the expectation that they would equip their vehicles with the necessary equipment at their expense. Translink would also be approached for inclusion of buses on a similar basis.

The estimated cost of deploying the system city-wide and equipping the vehicles of the Fire and Police Departments is \$3.0 million excluding GST. Funding for this project is broken down as follows:

	City of Burnaby Funding (\$)	Proposed Translink Funding(\$)
Major Road Network (MRN) Roads	0.875 million	0.875 million
Non-MRN Roads	1.25 Million	
Total	2.125 million	0.875 million

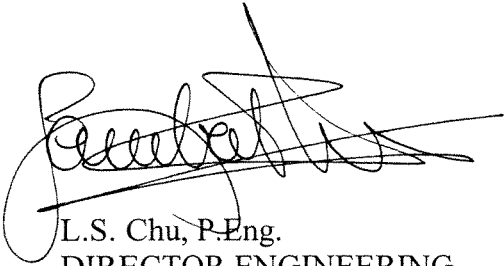
The project would be implemented over a 2-year period with a projected expenditure of \$1.75 million and \$1.25 million in 2008 and 2009, respectively. Subject to Council approval of the proposed program, staff would also submit funding application to Translink for cost sharing of the pre-emption work on the Major Road Network. Given that the project provides significant gains and public safety, it would be appropriate to fund the project from the Gaming Fund account.

To: Traffic Safety Committee  
From: Director Engineering  
Re: TRAFFIC SIGNAL EMERGENCY VEHICLE PRE-EMPTION  
2007 October 30..... Page 4

**5.0 Conclusion**

Recognizing the increase of traffic congestion problem in the city and the need to maintain the best possible response time by emergency responders in a safe manner during emergency situations, staff from Fire, RCMP and Engineering have worked together and identified the possible implementation of a city-wide traffic signal pre-emption system based on GPS technology. The recommended systems would be incorporated into the existing City traffic control network that would offer a wide range of operating options to optimize traffic flow and improve safety in emergency response.

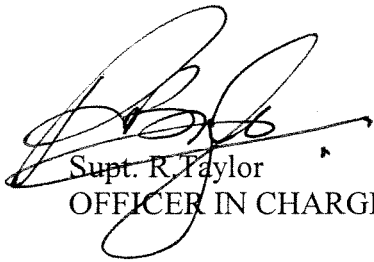
The cost of the recommended pre-emption system is approximately \$3.0 million and the project would be implemented over a 2-year period. It is recommended that the Committee and Council approve the proposed GPS based signal pre-emption systems and staff be authorized to include the required funding in the 2008 and 2009 capital budgets.



L.S. Chu, P.Eng.  
DIRECTOR ENGINEERING



R. Cook  
FIRE CHIEF



Supt. R. Taylor  
OFFICER IN CHARGE - RCMP  
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Director Finance