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To: GVTA Board of Directors

From: Sheri Plewes, Vice-President, Capital Management and Engineering  
Ian Jarvis, Chief Operating Officer

Date: December 1, 2005

Subject: **Canada Line – Controlled Access**

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*Staff Recommendation:*

That the GVTA Board:

- A. Directs staff to ensure that:
  1. The Canada Line is designed such that controlled access can be accommodated in the future; and,
  2. The ability to implement controlled access on the Canada Line as a future Change Order is maintained within the Concession Agreement;
- B. Directs staff to maintain and enhance the ongoing and planned program of safety and security initiatives including:
  1. Introducing and expanding the new GVTA Transit Police;
  2. Participating in Transport Canada's Immediate Action Plan to enhance the security of passenger rail and public transit systems;
  3. Incorporating accessibility and safety and security improvements as part of the ongoing asset renewal program for Expo Line SkyTrain stations;
  4. Consulting with regional stakeholders, customers and the public in developing new programs and initiatives to enhance human and electronic "eyes and ears" presence for SkyTrain, with emphasis on targeting particular locations and hours of operation; and,
  5. Monitoring the effectiveness of safety and security management strategies and initiatives with periodic reports to the Board;
- C. Directs staff to maintain and enhance the established strategy for managing fare evasion including:
  1. Continuing to implement the recommendations of the independent audit of the GVTA's fare evasion strategy wherever feasible;
  2. Undertaking an independent audit of the fare evasion strategy approximately every five years;
  3. Continuing to move toward prepaid fares through pricing initiatives and further introduction of Pass Programs;

4. Exploring options to enhance the fare enforcement powers of the SkyTrain Attendants through legislative amendments;
  5. Working with the Province to monitor and enhance fare violation enforcement measures such as improving collection rates, imposing minimum fines and revenue sharing;
  6. Strengthening management processes in the area of fare evasion management, including target and priority setting, and customer and public communication programs; and,
  7. Monitoring the effectiveness of the fare evasion management strategy and initiatives with periodic reports to the Board; and
- D. Directs staff to include, as a fundamental objective in the planning and design of the Smart Card system, the utilization of automated fare collection technology, in conjunction with the planned Fare Structure Review, to support organizational objectives and strategies for safety and security and fare evasion.
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## **INTRODUCTION**

Over the past several years, the public and media have maintained a strong interest in implementing “controlled access” stations on SkyTrain as a potential means to deter crime and to reduce fare evasion on the rapid transit system. “Controlled access” refers to the installation of entry and exit barriers, or faregates, for SkyTrain passenger platforms, as opposed to the proof-of-payment (POP) system currently in operation on both the Expo and Millennium SkyTrain lines.

In consideration of previous reviews of industry best practices, analysis of costs and benefits, and the development of the new GVTA Police Service, GVTA has continued to maintain the POP system on the existing Expo and Millennium SkyTrain Lines, and has taken steps to improve the management of fare evasion.

For the new Canada Line, the procurement process included “controlled access” in the Concession Agreement as a Priced Option that could be exercised by December 31, 2005. This timing would allow sufficient review and analysis regarding safety and security and fare evasion to make an informed decision on whether or not to continue with the current POP system for the Canada Line. Through the terms of the Concession Agreement, the Canada Line will be designed with the ability to incorporate faregates and staff booths at any time in the future. Therefore, the expiration of the Priced Option is not expected to materially affect any subsequent decision to implement controlled access for the Canada Line.

## **DISCUSSION**

Light Rail and Subway (Heavy Rail) systems typically implement two types of fare payment inspection systems – Proof of Payment (POP) or Controlled Access (faregates). Each system has benefits and disadvantages, and the primary decision factors in choosing

between the two systems are station/platform designs, passenger volumes and cost. In consideration of these factors, the SkyTrain Expo Line was designed to operate as a POP system. Prior to its opening, a review of fare payment inspections systems was completed for the Millennium SkyTrain Line, and resulted in the decision to operate the new line as POP, but to design the stations to be able to accommodate controlled access in the future.

With the recent approvals for construction of the Canada Line, the question of POP versus controlled access for the new line and for the existing lines has resurfaced. The Concession Agreement with InTransit BC provides for station designs that can accommodate controlled access, and also includes a Priced Option to implement controlled access.

A review of options and opportunities for enhancing safety and security, and reducing fare evasion for GVTA's existing SkyTrain and the new Canada Line was completed, and a summary of the findings is provided as Attachment A. Because past market research and consultation have found that the public perceives the issues of controlled access, safety and security and fare evasion to be strongly linked, they have been included in the scope of the review. The review comprised several input components including:

- Review of industry best practices;
- Review of other transit agencies;
- Review of GVTA strategies, initiatives, processes and data;
- Stakeholder consultation;
- Market research; and,
- Analysis of scenarios for controlling access and/or improving proof of payment fare collection.

Results of the review showed that, although there are indirect linkages between the issues of safety and security and fare evasion, they are distinctly different issues. Therefore, separate strategies and improvement initiatives should be targeted and developed for each specific issue. This approach is supported by the review of best practices literature as well as industry and public consultation.

GVTA's commitments to increasing and enhancing security personnel, such as the Transit Police, appear to be strongly supported by stakeholders, customers and the public as the most desirable method of improving real and perceived safety and security on the SkyTrain system.

Both enhanced proof of payment inspection and controlled access (faregates) have the potential to reduce fare evasion, however the cost-benefit analysis concluded that the former presents a more cost-effective solution for the GVTA at this time. The need to revisit the cost-benefit analysis will be assessed by the GVTA, as technology and operating conditions changes are considered in the future. Therefore, it is important for

GVTA to ensure that provisions are maintained for controlled access stations for the Canada Line and all future rail lines as applicable.

The review also emphasized the importance of continuous improvement in the areas of safety and security and fare evasion management, particularly with regard to customer and public perception. In addition to the GVTA's various ongoing initiatives and strategies, the imminent introduction of the new Transit Police and the current development of the Smart Card initiative provide two significant opportunities to effect highly visible improvements that will have both ongoing and long-term benefits. The development of the GVTA Transit Police has required the dedication of significant staff resources and efforts. With the introduction of the Transit Police, the management resources can now be directed towards other initiatives to improve safety and security and to improve fare evasion management strategies and processes.

## **CONCLUSIONS AND RECOMMENDATIONS**

In consideration of the following GVTA strategies, objectives and opportunities:

- Maintaining the safety and security of the public transit system is an ongoing priority for GVTA, and is identified as one of the pillars of GVTA's 2005-2010 Business Strategy;
- Safety and security of the public transit system is a major concern for transit customers and the public;
- The GVTA is in the initial stages of implementing a significant new safety and security initiative through the GVTA Transit Police, with major opportunities to provide enhanced safety and security for the new Canada Line;
- The GVTA is committed to increasing the staffing levels of the Transit Police by 20 percent by the end of 2007, and nearly doubling current Transit Police staffing levels by the end of 2009 in anticipation of the opening of the Canada Line and the Coquitlam LRT Line;
- The Federal Government has recently announced the commitment of immediate and long-term strategies and funding to enhance the security and emergency response systems of Canada's passenger rail and public transit systems in partnership with transit system owners and operators;
- The GVTA is committed to addressing accessibility and safety and security improvements as part an ongoing program of asset renewal for the 20-year old Expo Line;
- The GVTA stakeholders have indicated strong support for enhancements in physical security and additional human presence and electronic surveillance

systems as the most effective method of improving actual and perceived safety and security for customers on the rapid transit systems;

- The GVTA recognizes fare evasion as an important and ongoing concern for GVTA, its subsidiaries, customers and the public;
- The GVTA is committed to continuous improvement processes as part of its established fare evasion management strategy;
- The analysis of controlled access scenarios shows that the benefits of reduced fare evasion are not sufficient to recover the significant annual costs that would be incurred as a result; and,
- The GVTA is in the near stages of completing the first phase of a Smart Card major initiative, the development of which will provide opportunities to make significant changes and enhancements to improve the overall fare payment system, reduce fare evasion and improve public perception;

Staff recommend that the Board:

- A. Direct staff to ensure that:
  1. The Canada Line is designed such that controlled access can be accommodated in the future; and
  2. The ability to implement controlled access on the Canada Line as a future Change Order is maintained within the Concession Agreement;
- B. Direct staff to maintain and enhance the ongoing and planned program of safety and security initiatives including:
  1. Introducing and expanding the new GVTA Transit Police;
  2. Participating in Transport Canada's Immediate Action Plan to enhance the security of passenger rail and public transit systems;
  3. Incorporating accessibility and safety and security improvements as part of the ongoing asset renewal program for Expo Line SkyTrain stations;
  4. Consulting with regional stakeholders, customers and the public in developing new programs and initiatives to enhance human and electronic "eyes and ears" presence for SkyTrain, with emphasis on targeting particular locations and hours of operation; and,
  5. Monitoring the effectiveness of safety and security management strategies and initiatives with periodic reports to the Board;
- C. Direct staff to maintain and enhance the established strategy for managing fare evasion including:
  1. Continuing to implement the recommendations of the external audit of its fare evasion strategy wherever feasible;
  2. Undertaking an independent audit of the fare evasion strategy approximately every five years;

3. Continuing to move toward prepaid fares through pricing initiatives and further introduction of Pass Programs;
  4. Exploring options to enhance the fare enforcement powers of the SkyTrain Attendants through legislative amendments;
  5. Working with the Province to monitor and enhance fare violation enforcement measures such as improving collection rates, imposing minimum fines and revenue sharing;
  6. Strengthening management processes in the area of fare evasion management, including target and priority setting, and customer and public communication programs; and,
  7. Monitoring the effectiveness of the fare evasion management strategy and initiatives with periodic reports to the Board; and,
- D. Directs staff to include, as a fundamental objective in the planning and design of the Smart Card system, the utilization of automated fare collection technology, in conjunction with the planned Fare Structure Review, to support organizational objectives and strategies for safety and security and fare evasion.

# **Canada Line Controlled Access, Safety & Security and Fare Evasion**

## **Technical Report Summary**



**December 1, 2005**

## **Canada Line Controlled Access, Safety & Security and Fare Evasion Technical Report Summary**

**December 1, 2005**

### **INTRODUCTION AND PURPOSE**

Over the past several years, the public and media have maintained a strong interest in implementing “controlled access” stations on SkyTrain as a potential means to deter crime and to reduce fare evasion on the rapid transit system. “Controlled access” refers to the installation of entry and exit barriers, or faregates, for SkyTrain passenger platforms, as opposed to the proof-of-payment (POP) system currently in operation on both the Expo and Millennium SkyTrain lines.

In consideration of previous reviews of industry best practices, analysis of costs and benefits, and the development of the new GVTA Police Service, GVTA has continued to maintain the POP system on the existing Expo and Millennium SkyTrain Lines, and has taken steps to improve the management of fare evasion.

For the new Canada Line, the procurement process included “controlled access” in the Concession Agreement as a Priced Option that could be exercised by December 31, 2005. This timing would allow sufficient review and analysis regarding safety and security and fare evasion to make an informed decision on whether or not to continue with the current POP system for the Canada Line. Through the terms of the Concession Agreement, the Canada Line will be designed with the ability to incorporate faregates and staff booths at any time in the future. Therefore, the expiration of the Priced Option is not expected to materially affect any subsequent decision to implement controlled access for the Canada Line.

The purpose of this report is:

- To summarize the current situation for safety and security and fare evasion, including ongoing and planned initiatives;
- To review customer concerns and perceptions;
- To review industry and best practices in relation to safety and security and fare evasion;
- To identify and analyze scenarios to enhance safety and security and to reduce fare evasion;
- To provide recommendations for the Canada Line; and,
- To provide system-wide recommendations.



## **BACKGROUND**

### **SAFETY & SECURITY**

***The safety and security of the transit system is a top priority for GVTA.***

Maintaining the safety and security of the public transit system is an ongoing priority for the GVTA. GVTA's Vision, Mission and Values includes safety as one of its core values:

*"We will plan and deliver a transportation system that promotes the health, safety and security of employees and the public."*

The Madrid train bombing in March 2004 and the more recent terrorist attacks on the London transit system have generated a significant awareness around the need to improve safety and security on local transit systems. A major policy review of safety and security was identified as one of GVTA's corporate strategic projects for 2005, culminating in the introduction of the Transit Police in December 2005. Ensuring safety and security is identified as one of the four pillars of GVTA's 2005-2010 Business Strategy, with the following corporate strategic projects targeted for 2006:

- Implement new transit police;
- Develop public education program on security;
- Increase presence on the transit system, through staffing, electronic surveillance and implementation of Crime Prevention Through Environmental Design (CPTED) principles; and,
- Strengthen emergency preparedness and response.

***Safety and security is a major concern for transit customers and the public.***

A number of research studies have been conducted over the past decade on the issue of people's perception of personal security on the regional transit system. The market research has consistently shown that safety and security on transit is perceived as a serious issue by customers and the public. The studies show that people are generally very concerned about crime in their communities, and have specific concerns regarding safety and security concerns on transit. Based on the focus group research conducted in July 2005, the primary SkyTrain customer security concerns are listed below:

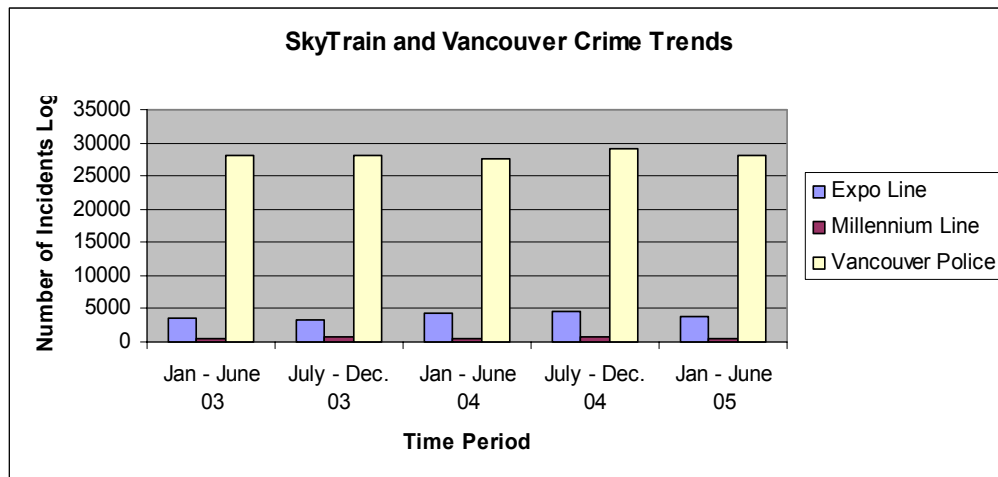
- Lack of security personnel;
- Fear of muggings / gang activity;
- Undesirables (drunks and gangs);
- Danger outside stations.

Despite the significant concerns of safety and security, customers continue to highly rate SkyTrain service overall (7.6 out 10 rating based on eNRG market research conducted in July 2005).

***GVTA data on SkyTrain crimes does not show an apparent trend.***

Figure 1 charts the data for documented incidents (crimes) from 2003, 2004 and 2005 for the Expo and Millennium Lines in six-month periods. These are compared to Vancouver's Crime Index report, which tracks incidents for all categories of crime in the City of Vancouver.

**Figure 1: SkyTrain and City of Vancouver Crime Statistics**



The chart shows that while there is slight variability in the number of crimes reported in each six-month period, there is no apparent trend to significantly higher levels of crime for SkyTrain itself, or as a proportion of citywide crime. The higher levels of incidents for Expo Line in comparison to the Millennium Line are a result of the significantly higher ridership on the Expo Line.

***GVTA is in various stages of implementing new, ongoing and planned initiatives to improve safety and security, including the introduction of the GVTA Transit Police, national security and emergency response initiatives, and ongoing SkyTrain station improvements.***

***New GVTA Police: Maintaining Order, Safety and Security on the Transit System***

Pursuant to a formal application made to the Solicitor General by GVTA in December 2003, the Solicitor General established the Greater Vancouver Transportation Authority Police Service (GVTA Transit Police) as a designated policing unit under *the Police Act* in October 2004. This new police unit will be the first of its kind in Canada, providing support for the RCMP and jurisdictional police across the region but dedicated to maintaining order, safety and security specifically on transit facilities and surrounding areas. The GVTA Transit Police mandate is to provide enforcement on the transit system as well as areas around stations and bus loops. The GVTA Transit Police will provide supplemental policing to the municipal and RCMP police to help improve safety and security for the public, passengers and GVTA and Subsidiary employees.

The GVTA Transit Police is a Designated Policing Unit under the British Columbia Police Act with the full powers of provincial police. The unit will be officially deployed beginning Sunday, December 4<sup>th</sup>, 2005, at which time close to 85 fully sworn, armed Transit Police officers will be providing round-the-clock service. Most of the GVTA Transit Police Service officers have been in service with GVTA Security as Special Provincial Constables and have had significant experience as police officers with a jurisdictional force or the RCMP. As fully sworn police officers, members of the unit will have the following authorities not granted previously to the Special Provincial Constables:

- The authority to enforce laws relating to the possession of illegal drugs and stolen property and to apprehend those wanted on outstanding warrants, and
- The authority to operate outside of GVTA property.

The GVTA Transit Police provides policing and law enforcement services to enforce the criminal laws and laws of the Province of British Columbia, particularly directed at reducing criminal activity and unlawful behaviour, maintaining public peace, and increasing safety on GVTA transit vehicles and other transit property. The GVTA Transit Police operates within the geographic area of the “transportation service region” as defined in the Greater Vancouver Transportation Authority Act.

Upon implementation, the GVTA Transit Police will primarily focus on SkyTrain, SeaBus and West Coast Express, and will operate both in and around stations. Strategic plans will include increased presence on buses and other transit property in the future. GVTA plans to increase the number of Transit Police officers in 2006 and 2007 by ten percent each year.

#### *GVTA Commitments and new Federal Funding Sources*

The Madrid train bombing in March 2004 raised the profile of transit systems as terrorist targets and since then, new safety and security initiatives have been implemented or are planned for the region’s public transit system. GVTA has taken a lead role in national coordination and information sharing through the organizing of intelligence gathering and information sharing among security organizations and other Canadian transit agencies. A dedicated Senior Manager of Emergency Preparedness and Response is to be hired shortly to oversee and coordinate GVTA’s own Emergency Preparedness and Response System.

On November 23, 2005, Transport Canada announced the commitment of \$110 million in funding for an Immediate Action Plan, to enhance the security of Canada’s passenger rail and public transit systems. GVTA will qualify for funding from two aspects of the Immediate Action Plan. The RideSecure Program, from which GVTA may be eligible for up to \$13 million, will provide financial assistance to establish a new passenger rail and public transit security program, targeted towards the high volume passenger areas of commuter rail and public transit and with a focus on mass transit systems and equipment. In addition, GVTA may be eligible for up to a further \$2.7 million to carry out full-scale mass transit emergency preparedness exercises.

This new funding may be used to support existing projects and also to trigger the commencement of the following longer-term initiatives:

- Surveillance Cameras: upgrade and possible expansion of surveillance cameras for buses, SeaBus, West Coast Express, SkyTrain cars and stations;
- Public Education and Awareness Campaign: public information campaign encouraging customers to take responsibility for protecting the transit system;
- Staff Training: training and education of approximately 4,000 GVTA and subsidiary staff on safety and security threat identification and response, including rehearsal of GVTA’s emergency response plans through mock scenarios; and,
- Security Plan: development of an in-depth security plan across GVTA’s transportation modes, including a threat-risk assessment of the multiple transit modes, and the development of an integrated response system.

*SkyTrain Station Improvements: Building Safety into Transit Facilities*

Since the construction of the Expo Line 20 years ago, the communities surrounding the stations and SkyTrain ridership have grown dramatically. Furthermore, many aspects of SkyTrain, including infrastructure and systems are scheduled for asset renewal or major maintenance upgrades. GVTA has embarked upon a series of station enhancements, including those in Table 1. To continue to address the concerns of customers and communities, accessibility, and safety and security improvements including CPTED principles will be incorporated as part of these initiatives wherever possible.

**Table 1: SkyTrain Station Improvements**

Station Enhancement	Description	Project Schedule
Public Address System	The 20-year old Expo Line PA system will be replaced with a new PA system with better communication of customer information and safety and security messages.	2007
Digital Video Recording System	The existing video recording system at SkyTrain stations will be replaced. The system records station activities monitored through the CCTV cameras. The new recording system will provide a more stable data storage media and a more efficient means of accessing records.	2006
Card Access Control System	The outdated electronic card/coded key systems used to control access to the Operating and Maintenance Centre and SkyTrain stations will be replaced. The new card access system will provide increased security and better control over secured facility access, particularly for high security, mission-critical areas on SkyTrain property.	2007
Lighting Improvements	Station lighting is being upgraded in all Expo Line SkyTrain Stations in three project phases. The new lighting levels will be consistent with the higher standard of lighting levels adopted for the Millennium Line stations.	2005 – 2008
Signage Improvements	Improved ease of use of SkyTrain will be provided for transit riders through upgrades to existing signage for increased visibility and clarity.	2006-2007

Transit Villages	A component of the Showcase Program, Transit Villages are being developed to improve the streetscape around the Surrey Central, Metrotown and Broadway/Commercial stations. The Transit Villages will be designed to provide stations that are integrated with the surrounding community, enhancing “eyes and ears” at the station.	2005-2007
Granville Station New Entry	The construction of a new, fully accessible station entry with elevator and escalator access to Granville SkyTrain Station is currently underway.	2005-2006
Lonsdale Quay Bus Loop Security Kiosk	A Security Kiosk has been located near the Lonsdale Quay bus loop to accommodate Security Personnel and their equipment and documentation, and to monitor and address safety and security activities and incidents in the area.	2005
Retail Initiatives	Opportunities have been provided for retail and other services to cater to both the expanding ridership and the community surrounding the stations. Retail facilities at SkyTrain stations will make the stations more vibrant and livelier and increase the number of “eyes and ears” at the stations, thus creating a focal point for the community and a place where people can come to feel safe.	Ongoing

FARE EVASION

***Fare Evasion is an important, and ongoing concern for the GVTA.***

Revenue loss from fare evasion is experienced by all transit organizations, including GVTA. In the early 2000s, the issue of fare evasion was repeatedly raised during the development of GVTA’s Strategic Transportation Plan, Ten Year Outlook, and 2005-2007 Three Year Implementation Plan. The perception was that reducing fare evasion would significantly increase GVTA’s revenues, and would improve the public’s confidence in the GVTA’s ability to manage the transportation network.

Table 2 shows the estimated annual fare evasion rates for SkyTrain (Expo and Millennium Lines), Bus and SeaBus based on January-April 2005 Fare Audit Survey data. The Evasion Rate is defined as the measure of passengers traveling without a fare, or with insufficient or incorrect fare, and is expressed as a percentage of riders. The Evasion Loss is the estimated revenue loss due to fare evasion, and is expressed as a percentage of total transit fare revenues (estimated at \$264 million for 2005).

**Table 2: Annual Fare Evasion by Transit Mode**

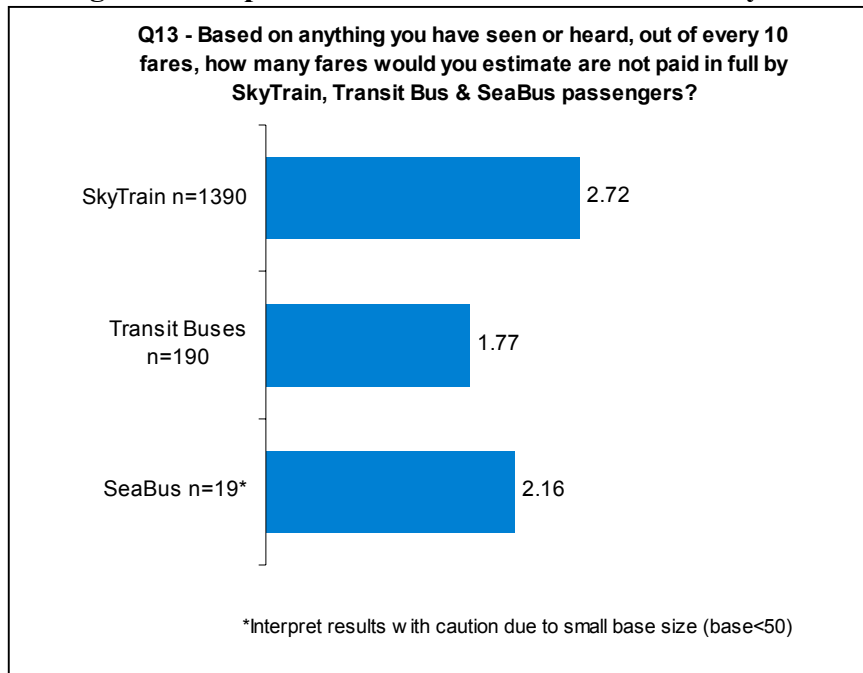
<b>Transit Mode</b>	<b>Payment System</b>	<b>Evasion Rate (% Riders)</b>	<b>Evasion Loss (% Revenue)</b>	<b>Revenue Loss</b>
SkyTrain	POP	6.3%	4.9%	\$4M
Bus	Pay on Boarding	2.6%	1.3%	\$2M
SeaBus	POP	3.9%	2.9%	
System-wide	POP/Gated	4.8%	3.4%	\$6M

Based on this data, the revenue loss from fare evasion on SkyTrain is estimated at 4.9% of the revenues that are attributed to SkyTrain, or approximately \$4 million per year. The data also shows that fare evasion occurs on all GVTA transit modes, despite the wide range of fare inspection. The Pay on Boarding system used on the buses is akin to a gated system, where all passengers are required to pay or show the correct fare prior to boarding (although without a physical barrier). Even with the equivalent of 100% fare inspection on buses, 2.6 percent of passengers still manage to fully or partially evade paying fares, through underpayment, transfer re-use, fraudulent use of concession fare media, and refusal to pay, etc. SeaBus operates on a POP system, but with a higher rate of inspection in comparison to SkyTrain, and has a documented fare evasion rate of 3.9%.

***Public perception is that fare evasion is significantly higher than the actual rates documented through the Fare Audit Survey.***

To quantify the behaviour and attitudes of adult GVRD residents on the issue of fare evasion on SkyTrain, the GVTA commissioned eNRG Research to conduct a survey of 1600 GVRD residents, which was supplemented with 504 interviews with SkyTrain users in order to have a more robust sample for station-level analysis. According to the market research respondents, only 36% feel SkyTrain does a good job of collecting fares compared to 77% for Bus and 63% for SeaBus. As shown in Figure 2, respondents estimate that 27% of SkyTrain riders are fare evaders, compared to 18% for bus and 22% for SeaBus, despite the significantly higher levels of fare inspection on these modes.

**Figure 2: Respondent Estimates of Fare Evasion by Mode**



When asked how they formulated their estimates, just under half (47%) of respondents indicated that they base their estimate on things they have seen while riding transit; 25% attribute it to media and 16% to family and friends.

The public's perception of fare evasion is clearly at odds with the results from the Fare Audit Survey in Table 2, which shows fare evasion rates (as percentage of riders) for SkyTrain, Bus and SeaBus at 6.3%, 2.6% and 3.9% respectively, for a total system-wide evasion rate of 4.8%.

***GVTA has an established strategy to manage fare evasion that is composed of several elements including fare checking and fines.***

Several initiatives and processes are planned or are currently underway to manage fare evasion under the current POP system. Review of other agencies utilizing POP for fare collection suggests that effective mitigation measures for fare evasion include:

- Increasing the visibility of inspection and enforcement personnel;
- Expanding enforcement staff;
- Increasing the cost of fines; and,
- Fare inspection blitzes.

The GVTA utilizes all of these measures in combination through its fare evasion management strategy which includes fare inspection, fare audit processes and fare enforcement.

### *Fare Inspection*

Fare inspections are primarily conducted by SkyTrain attendants (STAs) who randomly inspect fares and advise customers regarding the transit tariff. When dealing with customers who have a partial fare or are not in possession of a fare, STAs are to politely remind those customers that the proper fare is required and request that they purchase the correct fare. They cannot force customers to purchase the correct fare nor can they deny access to customers for failing to have the correct fare. If the customer does not follow the advice of the STA, they can be advised that should they continue their trip they may be subject to apprehension by GVTA Transit Police officers and issued a violation ticket. After having advised the customer of the requirement to have a proper fare, STAs are required to disengage to avoid a confrontation over a fare dispute. STAs document most of the fare inspections they complete.

STAs also provide customer services and operational and maintenance support. Fare inspection accounts for approximately 10-30 percent of their work time.

### *Fare Audits*

Transit Security fare inspection officers systematically inspect fares to maintain fare audit records, and to calculate statistically reliable fare compliance rates on bus services, SeaBus and at each SkyTrain station. The Fare Audit Survey, introduced in the mid-1980s, is carried out continuously to collect up-to-date, statistically reliable information on transit customers' methods of fare payment and on fare compliance rates. The survey is divided into three four-month periods each year - January-April; May-August; and September-December. In each period, fare inspectors conduct the audit at all 32 SkyTrain stations, the two SeaBus terminals, and on a randomly selected sample of bus routes. The Fare Audit Survey is a structured process that follows an approved methodology to calculate fare compliance. The process is subject to both internal and external reviews and, by implementing recommended changes to the fare audit methodology, the GVTA continuously improves the audit process.

### *Fare Enforcement*

The GVTA Transit Police enforce the POP system by issuing violation tickets to customers failing to possess the correct fare. Transit Police officers do not record inspections but do record violations cited. The GVTA Transit Police officers issue approximately 35,000 violation tickets per year.

Tickets for fare evasion are Provincial violation tickets, and are issued under the ticketing regulations of the Provincial Offence Act. The fines for fare evasion offences recently increased from \$46 to \$173 per offence. The increase in the value of the fine should act as a stronger deterrent for fare evasion. Since this increase is relatively new, success of this initiative has not yet been measured.

The GVTA is not responsible for fine collection, and does not receive any of the money collected from fines. The Province is responsible for fine collection, with ICBC handling the collection process for all provincial violation tickets. All fines collected from payment of tickets are paid to the Province as general revenue. The GVTA is working



with the Province to monitor collection rates, enhance the collection rate and encourage a more robust collection process. The GVTA is also working with the Province to arrange some form of revenue sharing, including proposed legislative amendments to impose minimum fine levels.

*The trend toward pre-payment of fares is an effective initiative in reducing fare evasion.*

The GVTA is estimated to have total transit revenues of \$264.4 million in 2005. A breakdown of the various sources of transit revenue since 2003 (see Table 3) shows that the proportion of cash revenue has been declining with monthly passes and FareSaver tickets increasing.

**Table 3: Transit Revenue by Source**

	<b>2003</b>	<b>2004</b>	<b>2005</b>
Cash	40%	39%	34%
Prepaid Sales <sup>1</sup>	60%	62%	66%
Total	100%	100%	100%
Note 1: Includes Monthly Passes, FareSaver Tickets (DayPasses & Canada Post) and Government of BC Passes.			

This trend has continued in 2005, with ticket and monthly pass sales exceeding expectations, while cash revenue is under budget. In 2005, prepaid sales totaled 66% of total transit fare revenues, with monthly passes representing 41%, FareSaver tickets representing 15% and Government of BC Passes representing 10%. Many customers make multiple trips on a single fare (e.g., transfer from bus to SkyTrain), so that the proportion of individual transit trips paid in cash fares is even further reduced. In 2005, only 23% of systemwide transit trips were paid for with cash, with 77% of trips made by customers using prepaid fare media.

The shift has been predominantly influenced by the fare change in January 2005. FareSaver ticket prices and all concession fares were frozen, whereas adult cash fares and monthly pass prices were increased. As a result, there has been a substantial customer shift away from using cash in favour of prepaid tickets and passes.

The continuing introduction of new U-Pass programs for universities and colleges has also been a factor in the increased proportion of prepaid fares. Previously, 75% of university riders were already using prepaid media, with the remaining 25% paying cash fares. However, the introduction of U-Pass has increased ridership in this customer market by 40%, and this entire market segment has prepaid media. Currently, the percentage of total transit trips that are made with U-Passes is around 6-7% on an annual basis. This figure will continue to grow as new institutions are added to the program.

Prepaid may provide some reduction in fare evasion as a result in fewer paper transfers, which reduces the opportunity for fraudulent transfer passing or re-sales.

As the proportion of prepaid fares increases, the benefits of POP are more pronounced. A transit system with a high percent of prepaid fares can reduce the inspection rates required and/or reduce the average time needed to inspect individual fares, thereby reducing staffing requirements. Some European systems have found that prepaid fare media was becoming so prevalent among users (e.g., 60% or higher) that there was minimal differences in fare evasion rates between POP and gated systems<sup>1</sup>.

Unfortunately, as the levels of prepaid fares increase, public perception of fare evasion typically increases, as many prepaid fare holders appear to be entering the system without evidence of ticket purchase or validation of fares.

#### *Smart Card Opportunity*

GVTA is looking at the future implementation of a Smart Card system. Smart Card technology can operate in either a POP or gated environment, or a mixed POP/gated environment. GVTA is currently studying the potential application of smart card technology across all transit modes. GVTA may review its fare payment policies and operational processes as part of subsequent developmental and design phases of the Smart Card project. Similar to prepaid fares, smart cards may provide some reduction in fare evasion due to accidental or fraudulent zone underpayment by automatically charging the rider the proper fare. Smart cards can also result in fewer paper transfers, which reduces the opportunity for fraudulent transfer passing or re-sales.

Smart Cards can also help to improve public perception of fare evasion on SkyTrain by implementing procedures such that all customers are required to “tag” their smart card upon entering a station. This will result in some level of inconvenience for pass holders, but would help to address the incorrect perception that prepaid fare holders are fare evaders.

The current phase of work is preliminary evaluation of opportunities and benefits, identification of business requirements and development of a preliminary implementation plan. This work will be completed in early 2006, and a full business case is planned for completion by the end of 2006 to allow recommendation of the Smart Card procurement and implementation as part of the 2007 Capital Program.

#### *Fare Structure Review*

The most recent Fare Structure Review was completed in 2004 as part of the fare change that went forward for January 1, 2005. The next Fare Structure Review is planned for completed prior to the next fare change in 2008. It will be initiated in the fall of 2006 and completed in 2007.

The objective of the review will be to re-examine the fare structure and process in order to come up with a fare structure that best addresses the social, service and revenue needs while balancing the trade-off between encouraging ridership and revenue generation. Key considerations that will shape the proposed fare change include:

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<sup>1</sup> Background Review of Best Practices on Fare Collection Systems in LRT

- Consistency with existing fare policy;
- Trends toward pre-payment;
- The U-pass program;
- Handy DART fares;
- Concession fares;
- The 90-minute transfer; and,
- The preparation for Smart Card use.

## **DISCUSSION**

### Separating the Issues of Safety & Security and Fare Evasion

Results from the market research, responses from regional stakeholders and data from transit peer review studies have indicated that the issues of concern for personal safety and security and fare evasion are closely linked in people's minds. However, when probed for solutions, it is clear that the optimal strategies for improving personal safety and security and for reducing fare evasion are not necessarily the same. This indicates that it is important to separate the issue of safety and security from that of fare evasion in order to seek the most appropriate approach to effectively address each concern. The remainder of this report addresses the issues and potential mitigation measures for safety and security and fare evasion separately.

### SAFETY & SECURITY

The primary inputs into the review of SkyTrain safety and security included:

- Review of other transit agencies;
- Stakeholder consultation;
- Market research; and,
- Implementation and expansion of GVTA Transit Police.

A summary of each of these elements is provided below.

#### ***Review of Other Transit Agencies***

In order to develop a comprehensive strategy to address transit safety and security the GVTA conducted a transit agency peer review survey in August of 2005. Surveys were sent to fourteen transit agencies with rail services in the US, Canada, Europe, and Japan<sup>2</sup>. The survey responses indicated that the top three customer security concerns were related to fear for personal safety, public disorder (intoxicated individuals, rude behavior, etc.), and not enough uniformed police officers. Two agencies, STM and NYC Transit,

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<sup>2</sup> The agencies contacted included: Calgary Transit, Edmonton Transit, Go Transit (Toronto), STM (Montreal), New York City Transit, WMATA (Washington, D.C.), MBTA (Boston), MUNI (San Francisco), BART (San Francisco), LACMTA (Los Angeles), TriMet (Portland), Transport for London, GVB (Amsterdam), Netherlands, and Tokyo Metro.

differentiated between customers' overall sense of security and their sense of security at night. These results are similar to GVTA experience for SkyTrain customers.

For the agencies where data was available, the number of staff responsible for rail security ranged from a low of 26 to 36 for Edmonton and Calgary, to a high of 250 to 292 for L.A. and BART. Transit police, contracted police, or local police were most often indicated as primary responders for customer-related security incidents. In comparison, GVTA has close to 85 special police responsible for security.

Table 4 shows that staffing levels range quite widely among transit agencies, from 177,000 riders per staff (LAMTA) to 1.3 million per staff (MUNI). SkyTrain ranked second best of the seven agencies that responded at 228,000 riders per staff (including STAs and Transit Police officers).

**Table 4: Comparison of Ridership to Staffing Ratios**

<b>Transit Agency</b>	<b>Fare Payment Method</b>	<b>Rail Technology</b>	<b>System Length (km)</b>	<b># Stations</b>	<b>Annual Ridership</b>	<b># Riders per Staff</b>
LACMTA (Los Angeles)	POP	Heavy Rail	28	16	63,700,000	178,000
		Light Rail	90	49		
GVTA	POP	Commuter Rail	65	8	2,000,000	228,000
		Light Rail	49	32	65,000,000	
TriMet (Portland)	POP	Light Rail	87	62	27,500,000	260,000
STM (Montreal)	Gated	Heavy Rail	65	65	218,000,000	390,000
BART (San Francisco)	Gated	Heavy Rail	174	43	91,000,000	910,000
Calgary Transit	POP	Light Rail	42	36	34,700,000	964,000
MUNI (San Francisco)	Gated/POP	Light Rail	106	9	45,000,000	1,324,000

***Stakeholders Consultation***

On November 8, 2005 GVTA made a presentation on Safety & Security and Fare Evasion for Rapid Transit Stations to a group of regional stakeholders. The attendees included representatives from: Downtown Vancouver Business Improvement Associations (DVBIA), Better Environmentally Sound Transportation (BEST), Richmond RCMP, Vancouver Police, Canadian National Institute for the Blind (CNIB), SkyTrain, West Coast Express, GVTA Transit Security and the GVTA Transit Police. During the presentation stakeholders came to the realization that there are different approaches to the issues of fare evasion and safety and security. The majority of

stakeholders supported an increase in uniformed staff on the transit system to respond to safety and security concerns. They were not convinced that gates alone would be an effective deterrent. During the consultation process stakeholders indicated that the GVTA should consider an increased security presence in off-peak periods. The GVTA should also consider ways to reduce the feeling of isolation for riders, for example, attract more riders in off-peak hours, and consider ambassador or buddy programs.

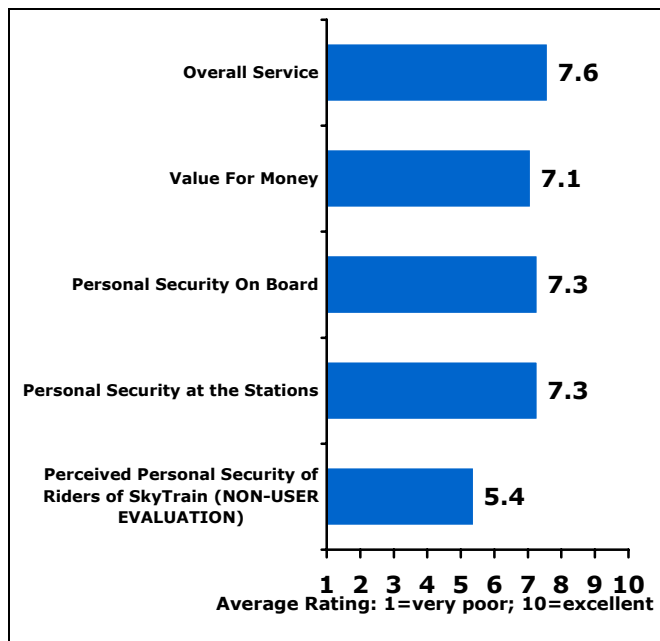
### **Market Research**

The type of security that is most appropriate is dependent on riders' perceived level of threat. To quantify the behaviour and attitudes of adult GVRD residents on the issue of personal security, the GVTA commissioned eNRG Research to conduct a survey of 1600 GVRD residents, which was supplemented with 504 interviews with SkyTrain users in order to have a more robust sample for station-level analysis.

As shown in Figure 3, the results of the survey indicate that:

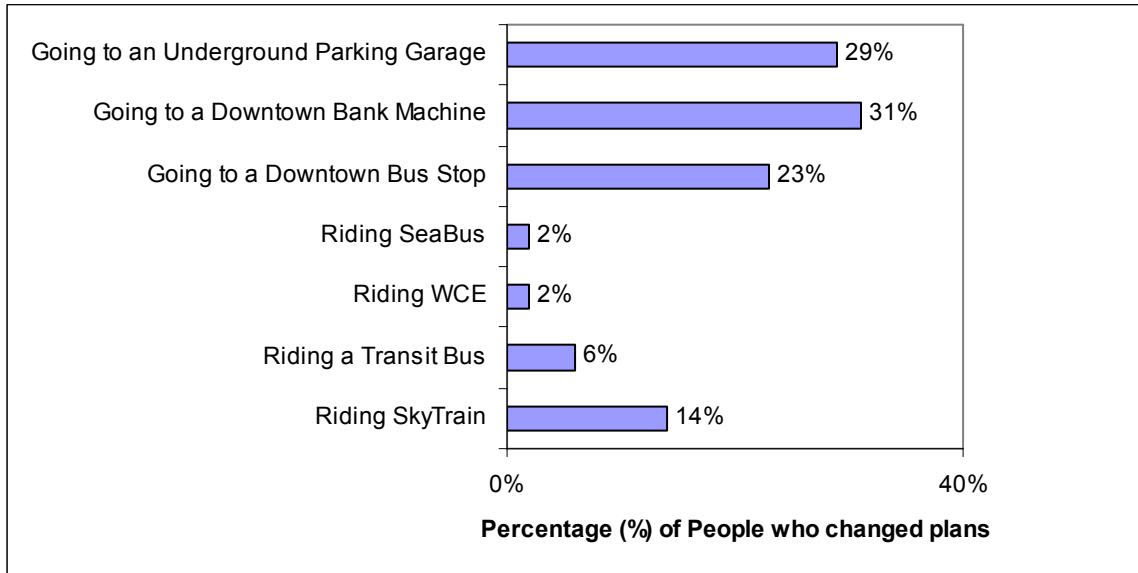
- SkyTrain riders feel the system provides good overall service (7.6/10);
- SkyTrain riders feel that personal security on board SkyTrain is moderately good at 7.3 out of 10; ratings were higher during weekday mid-day hours (7.8) and the least, on weekends after 6 pm (6.7);
- SkyTrain riders rated their personal security at SkyTrain stations at 7.3 out of 10; ratings were lower for weekend periods, particularly after 6 pm (6.5); and,
- Non-riders of SkyTrain perceive the level of personal security on SkyTrain to be much lower compared to SkyTrain riders (average rating of 5.4 out of 10).

**Figure 3: Respondent Ratings of SkyTrain Service, Value for Money and Security**



Respondents were asked whether at any time in the past month they had decided not to use any of the following transit modes because they had concerns for their personal security. For comparison, respondents were also asked whether at any time in the past month they had changed their plans to avoid going to the following locations because they had concerns for their personal security. The results are shown in Figure 4.

**Figure 4: Percent of Respondents that Altered Plans due to Safety Concerns**



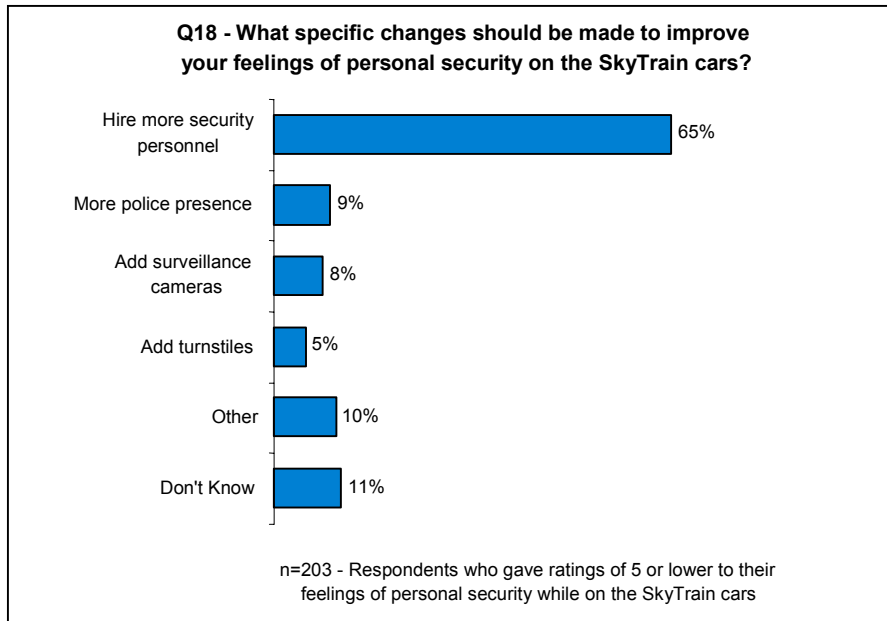
For all scenarios, a higher proportion of females changed their plans because of security concerns compared to males. Among respondents who indicated that they have changed their plans to use SkyTrain due to personal security concerns, the primary sources of their concerns were:

- Reports in the media (40%);
- Things observed while using SkyTrain (36%);
- Experiences of people they know (11%); and
- Things that happened to them while using SkyTrain (9%).

About half indicated that their safety and security concerns were due to indirect experience (media and experiences of others), and the rest were due to direct observation or personal experience.

Figure 5 illustrates that hiring additional security or police personnel was the top-of-mind response when SkyTrain riders were asked how SkyTrain could improve personal security on board (74%). Only a small proportion (5%) suggested adding turnstiles (gates) to improve personal security.

**Figure 5: Respondent Suggestions to Improve Security on SkyTrain**



***Implementation and Expansion of GVTA Transit Police***

As of December 4, 2005, there will be 85 fully sworn, armed GVTA Transit Police officers providing round-the-clock service. The GVTA Transit Police officers operate on SkyTrain and adjacent properties with a minimum of 10 officers on dayshift and a minimum of 12 officers on evening shift. The officers work in teams of two and divide the 32 stations (Expo Line and Millennium Line) into zones so that the approximate coverage is a team of two officers covering 5-6 stations.

The GVTA plans to increase the staffing levels of the Transit Police on the Expo and Millennium Lines by 10% by the end of 2006 for a total of 94 fully sworn, armed officers. An additional 10% increase over current levels on the Expo and Millennium Lines is planned by the end of 2007 for a total of 102 officers. In anticipation of staffing the Canada Line and the Coquitlam LRT Line consistent with the policing levels for Expo and Millennium Lines, the GVTA Transit Police will be nearly doubled to reach a staffing level of 180 officers by the end of 2009.

The estimated costs for the increases in GVTA Transit police levels are show in Table 5.

**Table 5: GVTA Transit Police Levels and Costs**

<b>Staffing Level</b>	<b>Expo &amp; Millennium Lines</b>	<b>Canada Line</b>	<b>Coquitlam Line</b>	<b>Total</b>
2005 Current Level	\$16.6 M (85 officers)	-	-	\$16.6 M (85 officers)
2006 + 10% increase	\$18.3 M (94 officers)	-	-	\$18.3 M (94 officers)
2007 + 20% increase	\$19.9 M (102 officers)	-	-	\$19.9 M (102 officers)
2009 Based on 2007 levels	\$19.9 M (102 officers)	\$10.0 M (52 officers)	\$5.0 M (26 officers)	\$34.9 M (180 officers)
Note: All costs are shown in 2005 Dollars.				

***Summary of Safety and Security Review***

The GVTA has already initiated or planned the following programs to address improving safety and security on SkyTrain:

- The introduction of the new GVTA Transit Police;
- Participation in Transport Canada’s Immediate Action Plan to enhance the security of passenger rail and public transit systems;
- Incorporation of accessibility and safety and security improvements as part of the ongoing asset renewal program for Expo Line SkyTrain stations; and,
- Consultation with regional stakeholders, customers and the public in developing new programs and initiatives.

Based on the transit peer review, the responses from the Stakeholders consultation and the market research, all of the above will improve real and perceived levels of safety and security on SkyTrain. An increase in the level of staffing of the GVTA Transit Police is the preferred and most effective method of improving safety and security for SkyTrain customers.

**FARE EVASION**

The primary inputs into the review of fare evasion on SkyTrain included:

- Review of industry best practices;
- Review of other rail systems;
- Stakeholder consultation;
- Market research; and,
- Cost estimates

A summary of each of these elements is provided below.



### ***Industry Best Practices***

TCRP Report 80<sup>3</sup>, previous GVTA research, and a new review of other transit agencies conducted as part of this study suggest that there are three primary deciding factors in choosing between proof-of-payment (POP) and gating:

1. **Station/platform configurations and constraints.** For rail systems with open platforms, particularly at street level where it is difficult to install faregates or designate a “fare paid” area, POP is generally used. This is why most light rail systems (which typically operate at-grade for some or all of the route) operate as POP systems rather than gated systems.
2. **Passenger volumes.** Effective POP inspection depends on inspectors being able to easily check passengers either on a train or in fare paid area. As volumes increase, it becomes logistically difficult for inspectors to move through a crowded train, or to inspect large numbers of passengers on a platform or at the bottom of stairs. The inspection requirements are also challenging from labour market and staff management perspectives. Recognizing these limitations, most very high volume subway or “metro” systems utilize faregates as the most efficient means of processing large volumes of passengers.
3. **Cost Analysis.** At low to medium passenger volumes, reasonable rates of POP fare inspection (ideally 20-30%) can be accomplished with less staff than would be required to staff booths and gate arrays in a controlled access system. As passenger volumes increase, it begins to become more cost effective to have staff in booths versus increasing POP inspection staff to maintain the inspection rate.

### ***Review of Other Rail Systems***

The review of other agencies conducted for this study summarizes annual ridership volumes for different light rail/metro systems, and identifies the method of fare collection used:

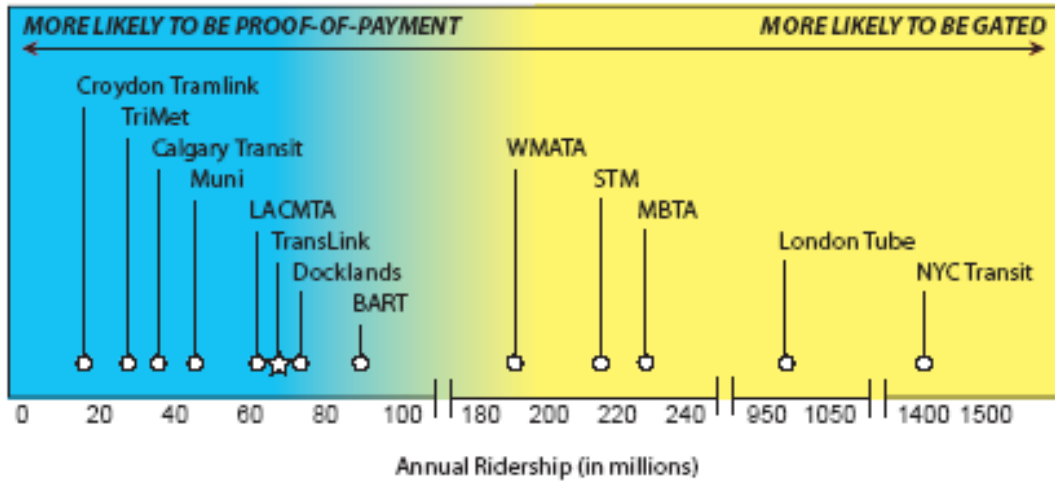
- POP systems include the following agencies: Croydon Tramlink, TriMet, Calgary Transit, LACMTA, TransLink SkyTrain, and Docklands;
- Gated systems include the following agencies: BART, WMATA, STM, MBTA, London Tube, and NYC Transit;
- Mixed/POP systems include the following agency: MUNI.

These are summarized in Exhibit 1 below to illustrate how ridership (and by extension cost) typically influences the choice between POP and gating.

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<sup>3</sup> TCRP Report 80: *A Toolkit for Self-Service, Barrier-Free Fare Collection (Chapter 2)*.

**Exhibit 1: Rail System Ridership Volumes and POP vs. Gating**



This chart shows that at low annual ridership volumes (~40 million boardings/year or less), POP is the preferred method of fare collection. The chart also shows that at very high annual ridership volumes (~100 million boardings/year or more), faregates are typically the fare collection method of choice. Most of the low volume operations are POP, and most of the high volume operations are gated.

In the middle range (roughly 40-100 million boardings/year), there is no clear preference one way or the other, though systems with lower annual ridership still tend to be more likely to use POP and those at the higher ridership end of the spectrum are more likely to be gated. Systems such as LACMTA and Docklands operate as POP systems. BART in San Francisco operates as a gated system. MUNI in San Francisco uses both gated and POP fare collection. TCRP Report 80 reported that Los Angeles (LACMTA) was considering implementing faregates on the Red Line (currently all lines are POP)<sup>4</sup>. However, the most recent discussion with LACMTA indicated that they are very satisfied with their POP system and feel the combination of fare inspectors and additional security personnel is highly effective in discouraging public disorder and crime<sup>5</sup>.

In terms of ridership, SkyTrain falls within the lower end of this middle range: i.e., ridership is higher than many POP light rail systems, but is still significantly lower than most large subway or metro systems. This suggests that from a peer review perspective, there is no clear case for adopting one method of fare collection over another, and that instead the decision needs to be made on more fundamental considerations such as cost and overall feasibility of implementation.

<sup>4</sup> TCRP Report 80: *A Toolkit for Self-Service, Barrier-Free Fare Collection*, page 1-3.

<sup>5</sup> Phone conversation with Paul Lennon, LACMTA Director of Intelligence, August 2005.

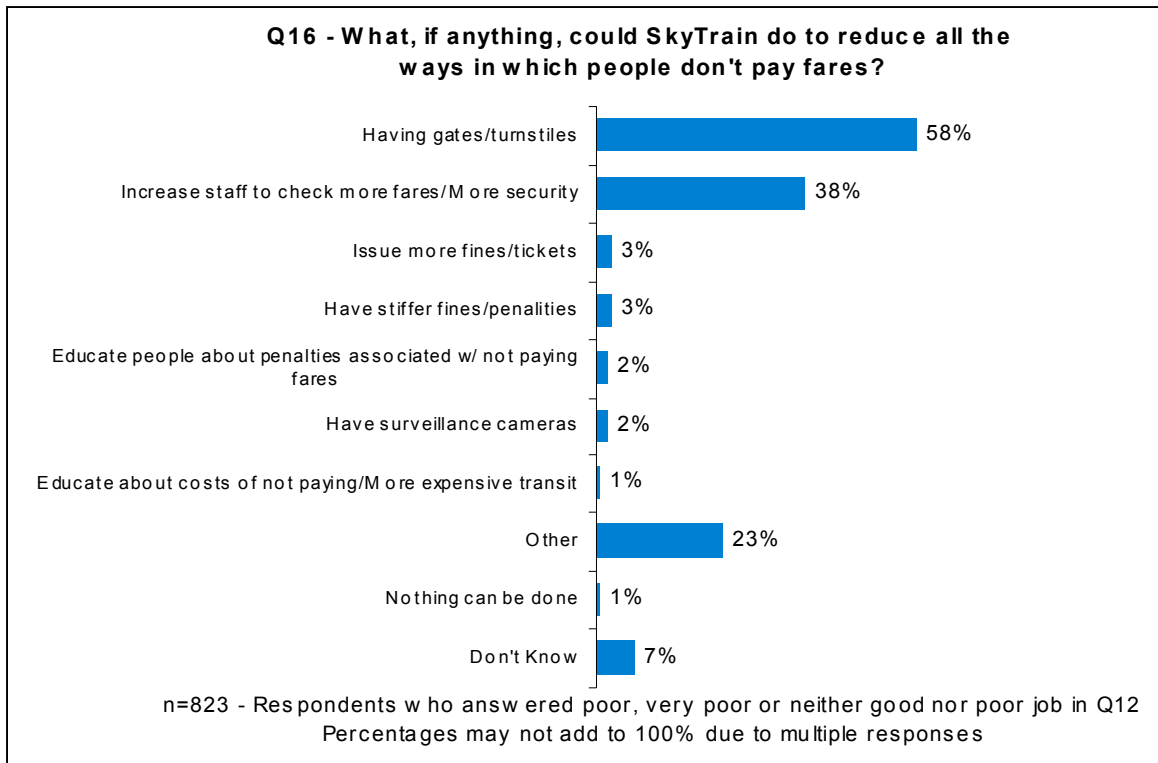
### ***Stakeholder Consultation***

During the presentation on November 8, 2005, stakeholders came to the realization that the costs of installing faregates on the existing Expo and Millennium SkyTrain Lines and the Canada Line would not be recovered by an increase in revenue from lower fare evasion rates. The majority of stakeholders preferred an approach that looked for best value solutions. The majority of stakeholders felt that increasing staff would be effective at addressing both the fare evasion and safety and security issues and felt this would provide the best value solution. Stakeholders also suggested increasing the number of tickets for fare evasion violations. One stakeholder felt that other alternatives should be pursued and evaluated before switching from the proof of payment system.

### ***Market Research***

Results from the eNRG Research shown in Figure 6 indicated that the leading suggestion to reduce fare evasion on SkyTrain was to install gates (58%) followed by having more staff to check fares (38%).

**Figure 6: Respondent Suggestions to Reduce Fare Evasion**



The primary concerns for respondents not wanting turnstiles were that they might slow down foot traffic or cause congestion (24%), that it would increase costs (18%), and because transit users do pay that it is unnecessary (15%).

## ***Cost Analysis***

In order to determine which fare collection method should be adopted for the existing SkyTrain lines and the Canada Line, an analysis of the two potential approaches was completed. The two approaches are:

1. Maintain the existing proof of payment (POP) system (status quo); or,
2. Implement faregates and deploy gate attendants to monitor gate operations on:
  - a. The existing Expo and Millennium Lines and the Canada Line; or
  - b. The Canada Line only.

Potential costs related to staffing, equipment, station modifications, and maintenance have been identified for comparative and discussion purposes. All costs are fare-inspection specific, and do not include staff costs for non-fare enforcement functions such as customer service, operations, security. These scenarios have been assessed to the level required for this report, but have not been subjected to a detailed operational analysis.

### ***Staffing Assumptions***

To avoid confusion between specific staffing functions (e.g. fare inspection, customer service), and staff positions (e.g. STAs, GVTA Police), a generic “fare inspection” function is assumed. Staffing requirements have been estimated based on the number of full time-equivalent staff positions (FTEs) required to perform this function.

Currently there are approximately 200 STA FTEs covering the SkyTrain system (Expo and Millennium Lines). STAs generally work 10-hour shifts, four days a week. To maintain coverage 365 days a year from 5:00 a.m. to 2:00 a.m. requires two shifts per operating day and approximately 2.7 FTEs per shift. Using the estimation that STAs spend on average 20% of their time on fare inspection duties, the equivalent number of “fare inspection” FTEs is calculated to be 40 FTEs. For the purpose of estimating “fare inspection” FTEs, a slightly reduced multiplier of 2.3 is used to exclude allowances for extra staff for special events and operations.

## **Scenario Descriptions**

### **1. Status Quo Scenario**

The status quo scenario assumes that the current POP fare collection environment would be maintained, and that the existing distribution of fare inspection functions between STAs and GVTA police would be retained. As noted previously, the current level of fare inspection staff effort on the Expo and Millennium Lines is approximately equivalent to 40 FTEs.

The status quo scenario also assumes that the Canada Line would operate as a POP system, and that STAs would be added to provide a level of coverage commensurate with the Expo and Millennium lines. The Canada Line has 16 stations (half the total number of

Expo/Millennium line stations), so it is assumed that under the status quo scenario the total level of effort expended on POP fare inspection would be the equivalent of 20 FTEs.

## 2. Faregate Scenarios

This approach would partially or fully eliminate POP fare inspection, replacing it with faregates that would be used to control access to some or all stations. For the purposes of this analysis, it is assumed that standard (in North America), waist-high gates would be used as has been provided for in the Millennium Line and the Canada Line designs. Gates would be of the bi-parting leaf or paddle variety (not turnstiles) as illustrated in Exhibit 2, with the ability to process approximately 30 passengers per minute.

**Exhibit 2: Example Faregates Typically in Use**



Customers would purchase an electronically readable ticket or have a readable pass (i.e. the magnetic tickets available now or a future smart card). Passenger processing would function as follows:

- The ticket/pass would be inserted into a faregate at the start of the trip, and if valid would open the gate and allow the customer entry to the rail system. The originating zone of travel would be read or encoded onto the ticket by the gate;
- The ticket/pass would be inserted into a second faregate at the exit point, the fare information and originating zone would be read, and the faregate would check that the customer had paid sufficient fare. Upon confirmation of sufficient payment, the leaves or paddles would open to allow the customer to exit;
- A customer with insufficient fare to exit the system would be able to “top up” their ticket at an add-fare machine (similar to the current SkyTrain ticket vending machines), located within the fare paid area at the exit station.

This approach also assumes that there would be a booth or similar location at every station entrance/gate array staffed by a gate attendant. Faregate attendants would monitor gate operations, and also allow customers to bypass the gate if they had mobility impairments, excess luggage, a ticket that could not be electronically read (e.g. a promotional pass), or some other condition that prevented them from using the gate. The

total gate attendant FTE requirements are computed by multiplying the number of on-duty shifts by the 2.3-multiplier factor and assuming two shifts/day.

Scenario 2a: Fully Gated System

Under this scenario, the Expo, Millennium, and the Canada Lines would all be gated. Assumptions include:

- POP fare inspection would be replaced in its entirety. The en-route fare inspections currently conducted under POP would no longer be required, as for a gated system, confirmation that the correct fare has been paid does not occur until the customer exits the system, i.e., Fare Paid Zones are no longer in effect;
- On-duty staff would be provided for all entrances/gate arrays. Table 6 summarizes the total number of estimated gate attendant FTE's;
- STAs would no longer perform fare inspection duties, but would continue to perform operations and customer service duties. Current POP fare inspection would be replaced with faregate attendants; and,
- Fare evasion would drop to 2.0% system wide, representing a reasonable practical "best case".

**Table 6: Faregate Attendant Estimates**

<b>Line</b>	<b># of Entrances</b>	<b>Total Gate Attendant FTE's</b>
Expo	30	184
Millennium	15	92
Canada*	18	111
* Two of the 16 Canada Line stations have two entrances each.		

Scenario 2b: Gate Canada Line only

Under this scenario, only the new Canada Line would be gated; POP would be retained for the Expo and Millennium lines at current levels. Assumptions include:

- There would be no change to POP inspection practices or staffing levels for the Expo and Millennium lines (i.e. the status quo conditions would be retained).
- On-duty staff would be provided for the 18 Canada Line entrances/gate arrays. STAs deployed on the Canada Line would be for operational and customer service purposes; not fare inspection.
- Fare evasion on the gated Canada Line is assumed to drop to 2.0%. Fare evasion on the Expo and Millennium lines would remain at 4.9% on average.

POP fare inspection FTEs for the Expo and Millennium lines would be 40 per the base case assumptions. Gate attendant FTE's for the Canada line would be 111 as calculated in Scenario 2a.

### **Comparative Cost-Benefit Analysis**

The analysis assumes that changes in fare inspection practices would be implemented in 2010, commensurate with the opening of the Canada Line. For analysis and presentation purposes, all costs have been converted to 2006 dollars. Assumptions and cost estimates were generated using current market pricing, previous studies, and current operating costs, and were analyzed by IBI Group consultants, through with GVTA and BCRTC staff.

#### **Costs**

The cost elements include:

- **Staffing costs.** Using the fare inspection FTE estimates for the various scenarios, costs have been estimated for both POP fare inspectors and gate attendants.
- **Equipment capital costs.** Additional equipment is required for the faregate scenarios, including the faregates themselves and add-value machines that allow a customer to add funds to their ticket to exit the system. Faregate quantities were generated using a queuing analysis that estimated the total number of devices required based on a maximum queue length of 5 passengers per gate during peak periods (which results in maximum queuing times of 15-30 seconds per passenger during peak periods). There are no additional equipment costs for the POP Status Quo scenario.
- **Equipment operations and maintenance costs.** Annual costs for equipment operations and maintenance costs to support the gating scenarios were estimated at 8% of capital costs.
- **Facilities capital costs.** Costs are included to retrofit the Expo Line stations to accommodate faregates. As the Millennium line was designed to accommodate faregates, nominal improvement costs have been identified accordingly to prepare the site, run power and conduit, etc. No additional facilities operating and maintenance costs have been assumed.

It should be noted that, for consistency with the costing for the Expo and Millennium Lines, the equipment costs for the Canada Line were generated independently, and are not based on the Priced Option costs. The Priced Option costs are described in a later section of this report.

The analysis also includes an estimated ridership growth of two percent per year. The impact of this growth on gating queuing has been taken into account.

#### **Benefits**

For the purposes of this analysis, benefits have been expressed as a reduction in fare evasion – i.e., additional revenue that could potentially be realized by reducing fare evasion. The analysis looks at each station, and assumes the lesser of the current fare evasion rate or average fare evasion rate assumed for the scenario. Even with 100% fare

inspection or the installation of fare gates, some passengers may still manage to evade paying full fare by not purchasing a ticket for the full length of their trip, purchasing a concession fare when they are not eligible, and sharing or reusing passes. For this reason, the minimum fare evasion rate has been assumed to be 2%. The assumed average fare evasion rates are listed in Table 7:

**Table 7: Assumed Fare Evasion Rates**

Scenario	Average Fare Evasion Rate (for Analysis Purposes)
1. Status Quo	4.5% system-wide
2a. Gate Entire System	2.0% system-wide
b. Gate the Canada Line Only	4.5% for Expo & Millennium lines; 2.0% for the Canada line

Financial Analysis

Tables 8 and 9 summarize estimated annual fare inspection-related costs and benefits for the different scenarios (2006 dollars). Costs include annualized capital costs (20 year asset life) for the additional fare collection equipment required for the gating scenarios. Annual operating costs are for staffing costs specifically related to fare inspection, whether for POP “fare inspectors” or gate attendants. Positive numbers indicate additional cost; negative numbers indicate benefits or reduced costs.

**Table 8: Summary of Estimated Annual Fare Inspection Costs and Benefits**

Annual Cost Item	Scenario 1 Status Quo	Gating	
		Scenario 2a Full Gating	Scenario 2b Canada Line Gating
<b>Annual Operating Costs</b>			
Expo/Millennium Staffing	\$ 2,800,000	\$ 17,940,000	\$ 2,800,000
Canada Line Staffing	\$ 1,400,000	\$ 7,215,000	\$ 7,215,000
Equipment O&M	\$ -	\$ 3,539,000	\$ 971,000
<i>Subtotal Annual Operating Costs</i>	<i>\$ 4,200,000</i>	<i>\$ 28,694,000</i>	<i>\$ 10,986,000</i>
<b>Annualized Capital Costs</b>			
Expo Line	\$ -	\$ 1,666,000	\$ -
Millennium Line	\$ -	\$ 902,000	\$ -
Canada Line	\$ -	\$ 971,000	\$ 971,000
<i>Subtotal Annualized Capital Costs</i>	<i>\$ -</i>	<i>\$ 3,539,000</i>	<i>\$ 971,000</i>
<b>Total Annual Costs</b>	<b>\$ 4,200,000</b>	<b>\$ 32,233,000</b>	<b>\$ 11,957,000</b>

The annual costs related to fare payment and inspection of the two gating scenarios are considerably higher than the POP Status Quo. Full gating would cost \$28 million per year more than under POP, and gating the Canada Line only would cost nearly \$8 million more than the Status Quo.



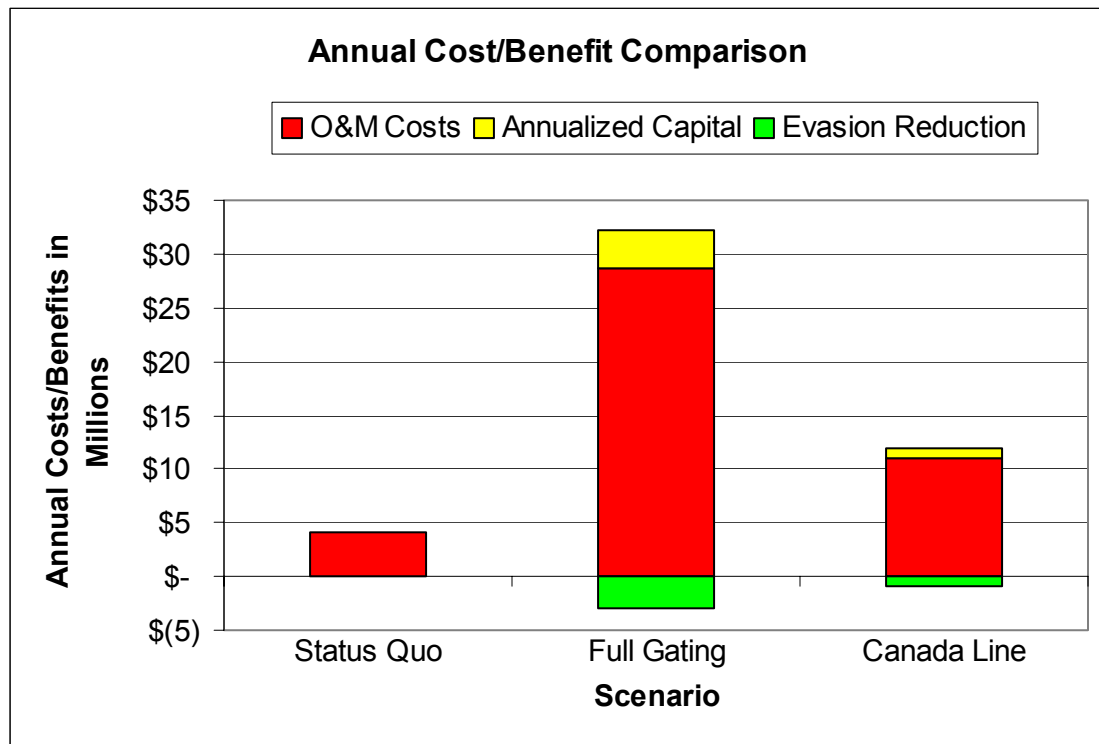
**Table 9: Summary of Annual Benefits from Fare Evasion Reduction**

Annual Benefits Item	Scenario 1 Status Quo	Gating	
		Scenario 2a Full Gating	Scenario 2b Canada Line Gating
Change in Fare Evasion Loss	\$ -	\$ (2,923,000)	\$ (862,000)

The two gating scenarios have annual revenue benefits from reduced fare evasion estimated at \$2.9 million for the full gating scenario and just under \$1 million for gating the Canada Line only.

Figure 7 provides a graphical representation of costs and benefits.

**Figure 7: Annual Costs and Benefits**



The comparison of the net annual costs shows that, even with the additional revenues from reduced fare evasion, the full gating scenario would have costs of \$25 million per year more than the Status Quo. The scenario to gate the Canada Line only would cost about \$7 million more per year than the Status Quo.

The total annual budget to operate and maintain the Expo and Millennium Lines for 2005 is \$74 million. Gating these two lines would result in an increase of approximately 33% of the current annual operating budget. The additional costs of gating the Canada Line would result in an increase to GVTA's estimated payments to the Canada Line

Concessionaire. Neither of these impacts has been planned for in the GVTA’s Ten Year Outlook or in the 2005-2007 Three Year Implementation Strategy.

**Qualitative Comparison of Scenarios**

Independent of cost, each of the scenarios has various advantages and disadvantages for consideration as summarized in Table 10.

**Table 10: Qualitative Comparison of Scenarios**

Scenario	Advantages	Disadvantages
1. Status Quo	<ul style="list-style-type: none"> <li>• Customers are familiar with current operations.</li> </ul>	<ul style="list-style-type: none"> <li>• Customer research<sup>6</sup> suggests that there is a public perception of a high level of fare evasion due, even though actual evasion rates are approximately 4.5%.</li> <li>• Could perpetuate negative impressions to the new Canada Line.</li> </ul>
2a. Gate Entire System	<ul style="list-style-type: none"> <li>• Would likely provide tangible reduction in fare evasion rates (2.0% estimated).</li> <li>• Would improve public perception regarding fare control and evasion for all rapid transit lines.</li> <li>• Staff would be available at every entrance.</li> </ul>	<ul style="list-style-type: none"> <li>• May slow and inconvenience the Canada Line customers during peak hours and special events due to queuing at the faregates – may have a negative impact on ridership.</li> <li>• May be some negative reaction from customers by changing the current, open system to a closed, gated system.</li> <li>• Does not directly support improvement in safety and security</li> <li>• Significant cost to revert to POP if gating found to be unsuccessful</li> </ul>
2b. Gate Canada Line Only	<ul style="list-style-type: none"> <li>• Would reduce potential fare evasion rates on the Canada Line to the estimated 2.0% level.</li> <li>• Could be used to evaluate effect of gating prior to making any decision to extend to the Expo and Millennium lines.</li> <li>• Would improve public perception regarding fare control and evasion for the Canada Line.</li> </ul>	<ul style="list-style-type: none"> <li>• May slow and inconvenience customers during peak hours and special events due to queuing at the faregates – may have a negative impact on ridership.</li> <li>• May be perceived as “unfair” to Canada Line riders, i.e., they have to experience queuing and other inconveniences in a gated environment, while Expo and Millennium Line customers still</li> </ul>

<sup>6</sup> See customer survey results elsewhere in this report.

	<ul style="list-style-type: none"> <li>• Provides staff at every Canada Line entrance.</li> </ul>	<p>have an “open” system.</p> <ul style="list-style-type: none"> <li>• Does not reduce fare evasion on the Expo and Millennium Lines.</li> <li>• Inconsistent fare payment systems for Canada vs. Expo &amp; Millennium Lines.</li> <li>• Does not directly support improvement in safety and security</li> <li>• Significant cost to revert to POP if gating found to be unsuccessful</li> </ul>
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***Summary of Fare Evasion Review***

GVTA has an established strategy to manage fare evasion that incorporates fare inspection, fare audits, and fare enforcement. Programs and initiatives that are currently underway to support the fare evasion management strategy include:

- Continuing to implement the recommendations of the independent audit of the GVTA’s fare evasion strategy wherever feasible;
- Continuing to move toward prepaid fares through pricing initiatives and further introduction of Pass Programs;
- Exploring options to enhance the fare enforcement powers;
- Working with the Province to monitor and enhance fare violation enforcement measures such as improving collection rates, imposing minimum fines and revenue sharing; and,
- Utilizing the development of the GVTA Smart Card initiative, in conjunction with the planned Fare Structure Review, to provide opportunities to make significant changes and enhancements to improve the overall fare payment system, reduce fare evasion and improve public perception

The analysis of POP versus gating scenarios shows that, while the two gating scenarios have the potential of reducing fare evasion relative to the Status Quo, neither recovers enough to fund the additional costs. Each scenario would result in a significant net cost increase to GVTA. Independent of cost, each of the scenarios has various qualitative advantages and disadvantages.

**CANADA LINE CONTROLLED ACCESS PRICED OPTION**

Should GVTA choose to exercise the Priced Option for Controlled Access Stations for the Canada Line, the Priced Option costs have been provided by InTransit BC, the Canada Line concessionaire, as follows:

- Capital Payments (nominal\$): \$16.6 Million

Payment Schedule

• December 31, 2005	\$638,262
• July 1, 2006	\$1,466,660
• January 1, 2007	\$3,970,392
• July 1, 2007	\$4,964,240
• January 1, 2008	\$4,028,964
• July 1, 2008	\$1,510,862

- Annual O&M Payments (2004\$): \$5.1 Million
- Asset Renewal Payment (2003\$): \$2.2 Million lump sum

Exercising this option would become a contractual obligation defined by the Concession Agreement, and would be in effect for the 30-year term of the Agreement. It would also result in unplanned impacts to GVTA's capital and operating budgets.

Through the terms of the Concession Agreement, the Canada Line will be designed with the ability to incorporate faregates and staff booths at any time in the future. Therefore, the expiration of the Priced Option is not expected to materially affect any subsequent decision to implement controlled access for the Canada Line.

## **CONCLUSIONS**

Light Rail and Subway (Heavy Rail) systems typically implement two types of fare payment inspection systems – Proof of Payment (POP) or Controlled Access (faregates). Each system has benefits and disadvantages, and the primary decision factors in choosing between the two systems are station/platform designs, passenger volumes and cost. In consideration of these factors, the SkyTrain Expo Line was designed to operate as a POP system. Prior to its opening, a review of fare payment inspections systems was completed for the Millennium SkyTrain Line, and resulted in the decision to operate the new line as POP, but to design the stations to be able to accommodate controlled access in the future.

With the recent approvals for construction of the Canada Line, the question of POP versus controlled access for the new line and for the existing lines has resurfaced. The Concession Agreement with InTransit BC provides for station designs that can accommodate controlled access, and also includes a Priced Option to implement controlled access. A review was undertaken to assess the costs and benefits of exercising the Priced Option at this time. Because past market research and consultation have found that the public perceives the issues of controlled access, safety and security and fare evasion to be strongly linked, they have been included in the scope of the current work.

The review of options and opportunities for enhancing safety and security, and reducing fare evasion for GVTA's existing SkyTrain and the new Canada Line comprised several input components including:

- Review of industry best practices;
- Review of other transit agencies;
- Review of GVTA strategies, initiatives, processes and data;
- Stakeholder consultation;
- Market research; and,
- Analysis of scenarios for controlling access and/or improving proof of payment fare collection.

Results of the study showed that, although there are indirect linkages between the issues of safety and security and fare evasion, they are distinctly different issues. Therefore, separate strategies and improvement initiatives should be targeted and developed for each specific issue. This approach is supported by the review of best practices literature as well as industry and public consultation.

GVTA's commitments to increasing and enhancing security personnel, such as the Transit Police, appear to be strongly supported by stakeholders, customers and the public as the most desirable method of improving real and perceived safety and security on the SkyTrain system.

Both enhanced proof of payment inspection and controlled access (faregates) have the potential to reduce fare evasion, however the cost-benefit analysis concluded that the former presents a more cost-effective solution for the GVTA at this time. The need to revisit the cost-benefit analysis will be assessed by the GVTA, as technology and operating conditions changes are considered in the future. Therefore, it is important for GVTA to ensure that provisions are maintained for controlled access stations for the Canada Line and all future rail lines as applicable.

The study also emphasized the importance of continuous improvement in the areas of safety and security and fare evasion management, particularly with regard to customer and public perception. In addition to the GVTA's various ongoing initiatives and strategies, the imminent introduction of the new Transit Police and the current development of the Smart Card initiative provide two significant opportunities to effect highly visible improvements that will have both ongoing and long-term benefits. The development of the GVTA Transit Police has required the dedication of significant staff resources and efforts. With the introduction of the Transit Police, the management resources can now be directed towards other initiatives to improve safety and security and to improve fare evasion management strategies and processes.

In addition to the conclusions of the report above, future planning and decision making with regard to safety and security and fare evasion on the GVTA transit system should take into consideration the following GVTA strategies, objectives and opportunities:

- Maintaining the safety and security of the public transit system is an ongoing priority for GVTA, and is identified as one of the pillars of GVTA's 2005-2010 Business Strategy;

- Safety and security of the public transit system is a major concern for transit customers and the public;
- The GVTA is in the initial stages of implementing a significant new safety and security initiative through the GVTA Transit Police, with major opportunities to provide enhanced safety and security for the new Canada Line;
- The GVTA is committed to increasing the staffing levels of the Transit Police by 20 percent by the end of 2007, and nearly doubling current Transit Police staffing levels by the end of 2009 in anticipation of the opening of the Canada Line and the Coquitlam LRT Line;
- The Federal Government has recently announced the commitment of immediate and long-term strategies and funding to enhance the security and emergency response systems of Canada's passenger rail and public transit systems in partnership with transit system owners and operators;
- The GVTA is committed to addressing accessibility and safety and security improvements as part an ongoing program of asset renewal for the 20-year old Expo Line;
- The GVTA stakeholders have indicated strong support for enhancements in physical security and additional human presence and electronic surveillance systems as the most effective method of improving actual and perceived safety and security for customers on the rapid transit systems;
- The GVTA recognizes fare evasion as an important and ongoing concern for GVTA, its subsidiaries, customers and the public;
- The GVTA is committed to continuous improvement processes as part of its established fare evasion management strategy;
- The analysis of controlled access scenarios shows that the benefits of reduced fare evasion are not sufficient to recover the significant annual costs that would be incurred as a result; and,
- The GVTA is in the near stages of completing the first phase of a Smart Card major initiative, the development of which will provide opportunities to make significant changes and enhancements to improve the overall fare payment system, reduce fare evasion and improve public perception.